Technology Tech. Technologies, Inc.

Full Requirements Document for the Blue Lakes Project

https://github.com/mtdnichol/BlueLakesProject

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Problem Statement

The primary purpose of this project is to analyze the impact of shoreline development projects on the resiliency of lakes within the Land Between bioregion. Lakes rely on their wild shorelines, which acts as the immune, digestive, and reproductive systems of the lake. These systems are now threatened by development projects bringing new homes, factories, and roads to replace their wild areas, making it more important than ever to monitor the health of the region's lakes. However, analyzing environmental data for a region as large as the Land Between, which contains over 2400 lakes, is a daunting task. Research results are constantly in flux, and large areas face new development projects, which put immense strain on the shorelines of nearby lake basins. This impacts the health of nearby wildlife, including fish communities, reducing the resiliency of the region as a whole, though we cannot accurately estimate the true range of these effects without careful analysis of relevant data. This project marries several existing databases to form a single cohesive image of the state of each lake in the bioregion spanning from Georgian bay to Ottawa valley, outlining the impacts of shoreline development now, and over time. The Land Between offers a large collection of environmental data in the region. The Blue Lakes project also provides regional data but focused on the effects of development on shorelines. The Angler Diaries collects observational data from fish caught in the area, providing population data for fish in the given lake. Finally, the calcium content of a lake is a measure of the availability of food for local plants and algae. The work of this project is to copy these databases, and streamline the data to form a single up-to-date analysis of any given lake or region to identify areas of concern, and properly prioritize the needs of that area.

Identify the Goals of the Business Problem

1. *Purpose*: Analyze lake health on an individual basis
   a. *Advantage*: Allows researchers and users to view the health of a lake on an individual basis; recognize priority areas and required actions for specific areas
   b. *Measurement*: Program accurately determines priority areas

2. *Purpose*: Analyze the overall lake health for a given region.
   a. *Advantage*: Allows researchers and users an overview of the health of a given region; recognize specific areas that may require individual attention.
   b. *Measurement*: Program accurately determines priority areas

3. *Purpose*: Conserve biodiversity
   a. *Advantage*: Create a system of stewarded and protected habitats across the region to maintain a balanced population which can renew itself
   b. **Measurement**: Areas will not enter a stage where a species is considered "endangered"

4. *Purpose*: Sustain Water Quality
   a. *Advantage*: Maintain a significant level of "unaffectedness" so as to maintain water quality and healthy habitats
   b. **Measurement**: Number of new priority areas, or areas that are becoming at-risk

Identification of stakeholders

1. **The Land Between**

    a. A conservation organization concerned with creating adaptive solutions to the environmental impact of development in the Land Between bioregion.

    b. Focused on cooperation between sectors and levels in organizations.

    c. Require a streamlined analysis process to identify the issues impacting the bioregion.

2. **Blue Lakes**

    a. A dynamic database, providing a suite of tools and distinct datasets relating to lake health in an ESRI framework.

    b. Provide the data required to improve the health and sustainability of lakes.

    c. The current database could benefit from additional datasets of Calcium levels and the Angler Diaries.

3. **Anglers**

    a. Some Individuals rely on fishing for their food or livelihoods, others enjoy the hobby of sport fishing.

    b. Angling is a type of hook fishing, and the primary method of sport fishing.

    c. The Land Between bioregion contains a large population of anglers.

4. **Residents** (Home and cottage owners)

    a. Live within the domain of the Land Between bioregion

    b. Provide information about the lakes in their immediate vicinity. Inform about what they can do to improve their local lake health. Ability to upload data through the form of Angler Diaries

    c. Ability to view statistics related to their lake, and the ability to upload their local data

Identification of Constraints.

1. **Solution Constraints (e.g. platform constraints)**

   a. The system shall be available as an applet for both iOS and Android.

   b. The system shall be accessible via a web page

   c. The application requires an internet connection to request datasets.

   d. The system must analyze the health, changing fish communities, and overall resiliency of lakes in the Land Between bioregion.

   e. The system must analyze data provided in an ESRI framework.

2. **Partner or Collaborative Application Constraints**

   a. The system must consider the following data parameters from the Blue Lakes Project database: dissolved oxygen levels, temperatures for water columns, phosphorus levels, stocking history, and shoreline development.

   b. The system must consider data for shoreline calcium levels.

   c. The system must partner with the Angler Diaries program to collect data from fishing catch trends.

      i. The system will consider data on catch trends, fish spawning success, and the survival and growth rates for fish populations.

   d. The application will automate the analysis of new data and display results to the user within 1 second.

3. **Off-the-Shelf Software**

   a. The application must not be reliant on ready-made software or hardware, aside from the previously listed collaborations.

4. **Schedule Constraints**

   a. The application will be available by June 2021.

   b. The application beta will be available for testing before April 2021.

   c. The application will begin alpha testing before November 30th, 2020.

Naming Conventions (Terminology).

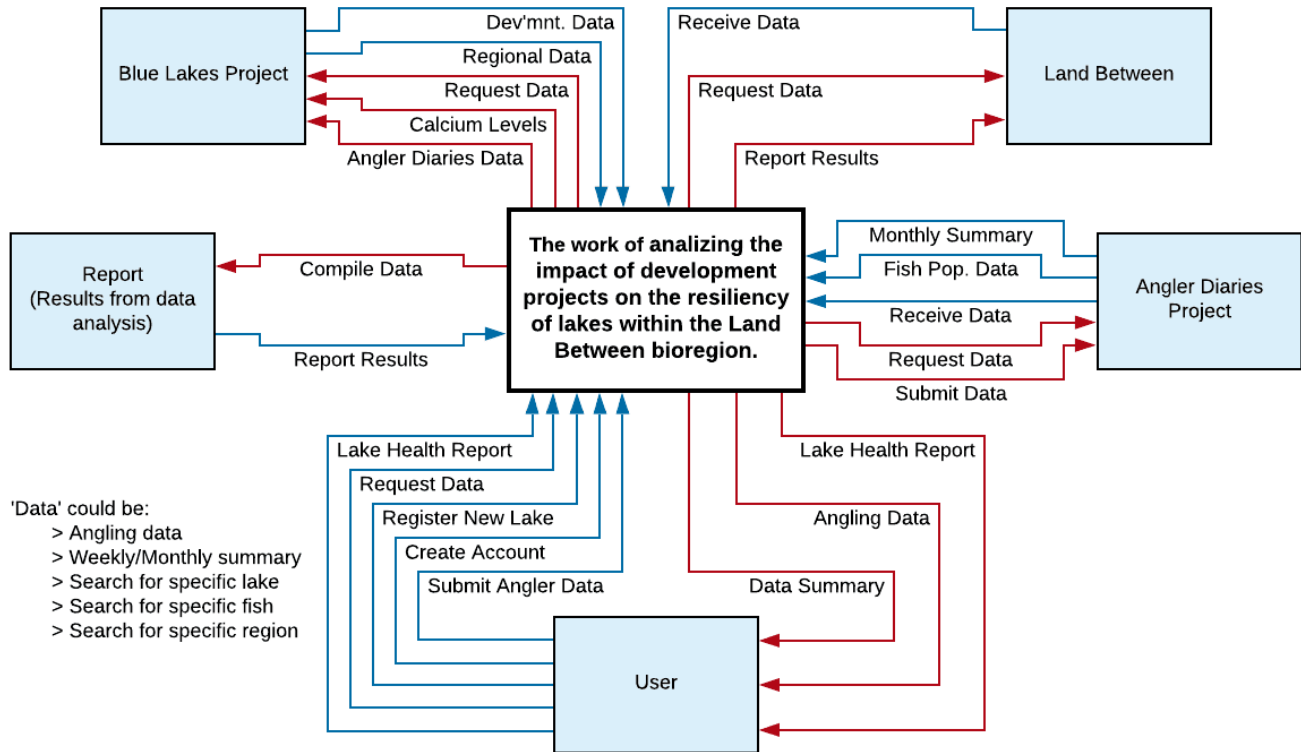|	
Alpha	A working prototype that is not yet feature-complete. A project enters alpha as an advanced proof of concept prototype, demonstrating the feasibility of the project.
Angler Diaries	A collection of time-series information from fishing trends, providing rich data on local fish populations.
Angling	A method of fishing by means of a hook (an "angle"). Angling is the primary method for sport fishing.
Application	A piece of software to be run on a specified device.
Beta	A working prototype that is mostly feature-complete. A project enters beta when it is primarily in its bug-testing phase.
Blue Lakes	Provide a dynamic database that tracks and highlights areas of concern from shoreline development or water quality. Primarily concerned with conservation.
Database	An electronically stored collection of data pertaining to a specific field or category of study.
Dissolved Oxygen	The measure of free oxygen molecules (O_2) within a lake's water. The solubility of oxygen decreases as water temperature increases (i.e. warmer water requires less oxygen to become saturated than colder water).
Epilimnion	The shallowest layer of a lake, found above the thermocline. Being exposed to the surface air, this region is the most acidic and contains the highest dissolved oxygen concentrations.
ESRI framework	Standards-based protocols to allow multiple services to run on the same framework, with little risk of compatibility issues.

Eutrophication	The reduction in dissolved oxygen levels caused by the oversaturation of mineral and organic compounds in water.
Hypolimnion	The dense, bottom-layer of a lake, found below the thermocline. This region is too deep to receive oxygen from the air, and is too deep to receive enough sunlight for photosynthesis.
Land Between	An organization focused on building the capacity for conservation and developing adaptive solutions to issues facing the Land Between bioregion.
Land Between Bioregion	A bioregion spanning across central Ontario, from Georgian Bay to the Ottawa Valley.
Metalimnion	See Thermocline.
Secchi Depth	The maximum depth at which a secchi disk (a white disk attached to a long tring) is still visible. Secchi depth is a measurement of the amount of particles and debris within a lake's waters.
Thermocline	The metalimnion, or the thin but distinct layer in a lake where temperature decreases far more drastically with depth than the layers above and below. The thermocline divides the shallower and more acidic epilimnion from the deeper and more stagnant hypolimnion.
Trophic State Index	TSI is a rating system on a scale of 1 to 100 used to classify the amount of biological activity in a body of water. A lower TSI describes a colder lake with very little wildlife, while a higher TSI describes a warmer lake with extreme amounts of wildlife.

Shoreline Development	Construction along a lake's shores, resulting in the removal or displacement of wildlife, altering the local ecosystem in the nearby shorelines. (eg. roads, home and industrial development, etc.).

Identification of the Scope

'Data' could be:
> Angling data
> Weekly/Monthly summary
> Search for specific lake
> Search for specific fish
> Search for specific region

Business Events and their Inputs / Outputs

1. **User submits new lake health report**
    a. IN : health report information
    b. OUT : report available for viewing

2. **User registers a new lake**
    a. IN : Lake information
    b. OUT : Lake available for reporting

3. **User views specific lake data**
    a. IN : Lake identifier
    b. OUT : Specified lake information and reports

4. **User shares lake health report**
    a. IN : Current lake health report
    b. OUT : Report in a shareable format

5. **User sorts lakes by health**
    a. IN : Sorting arrangement
    b. OUT : Lake listing accordingly

6. **User creates Angler Diary Account**
    a. IN : Account Information
    b. OUT : Account in Database

7. **User requests fish species in a location**
    a. IN : Fish Information
    b. OUT : Fish Statistics

8. **User requests to view lake profile**
    a. IN : Lake Identifier
    b. OUT : Specified lake information

9. **User submits angling data**
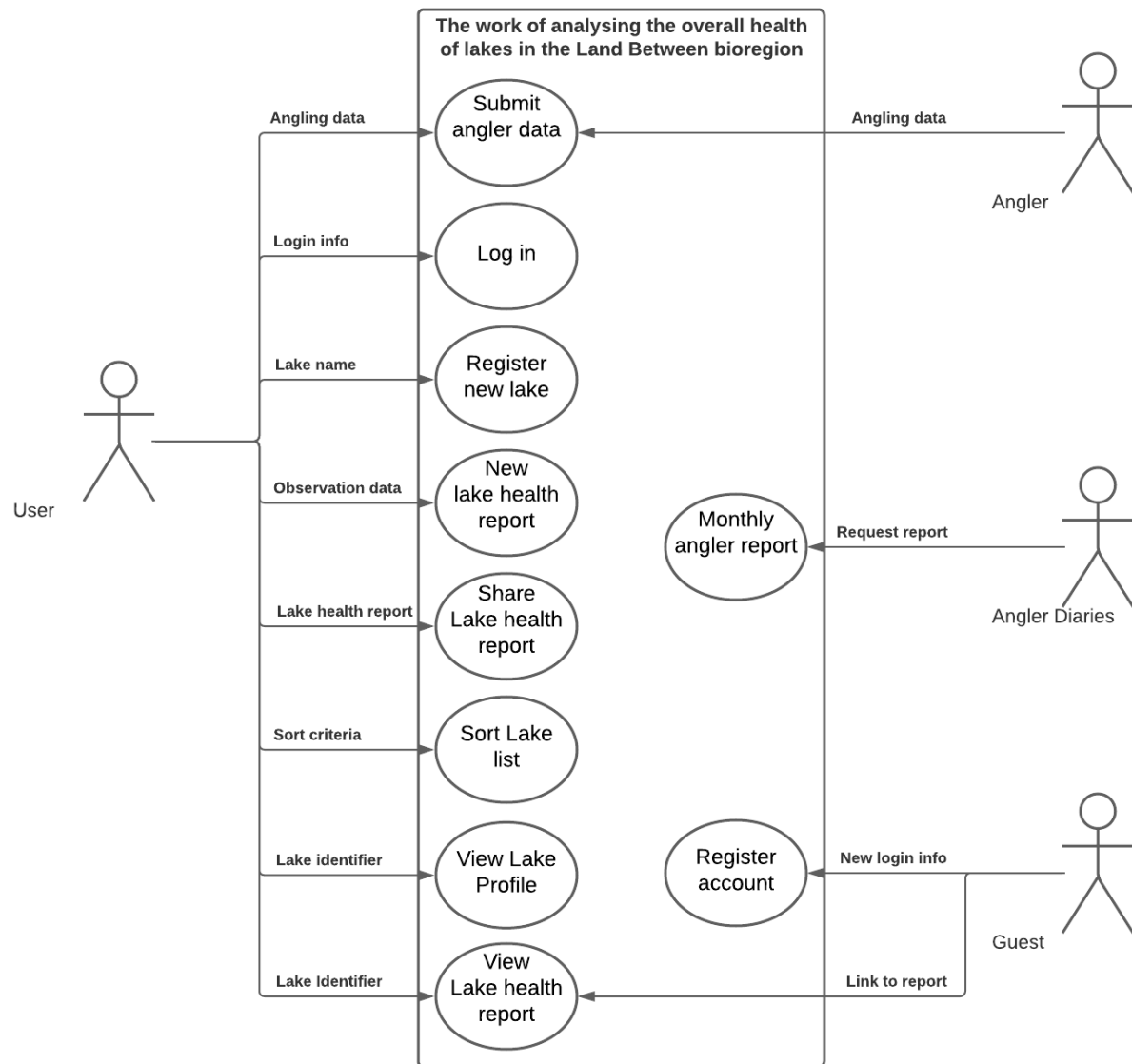   a. IN : Fish statistics and count
    b. OUT : Account in Database

10. **Angler Diaries pushing monthly fish data**
    a. IN : Fish statistics and count
    b. OUT : Account in Database

11. **User views weekly/monthly angling data for a location**
    a. IN : Location + Timeframe
    b. OUT : Angling data accordingly

Product Use Case Diagram

Individual Product Use Cases

1. **Product Use Case Name**: User login
   **Trigger**: User's username and password
   Preconditions: User must have an interface to the system (website or mobile application) as well as know their username and password
   Interested Stakeholders: User
   Actor: User
   1. System prompts the agent for their username and password
   2. System validates the agents username and password
   3. System serves profile information to user, and allows them to navigate the application

   Outcome: User is able to navigate the system via interface.
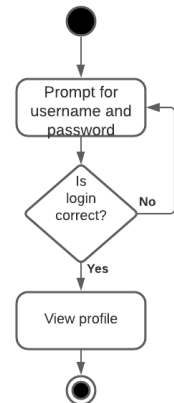
2. **Product Use Case Name**: User submits Angler Data
   Trigger: User selects to submit Angler Data
   Preconditions: User is signed in, has previously recorded angler data present.
   Interested Stakeholders: The Land Between, Blue Lakes Project, Anglers
   Actor: Angler
   1. User selects to submit angler data to Angler Diaries
   2. System prompts user to enter angler data (species, size, location)
   3. System validates entries
   4. System logs data

   Outcome: Angler submits their angling data to the system. System statistics are updated.

3. **Product Use Case Name**: User registers new lake
   Trigger: User selects to register a new lake
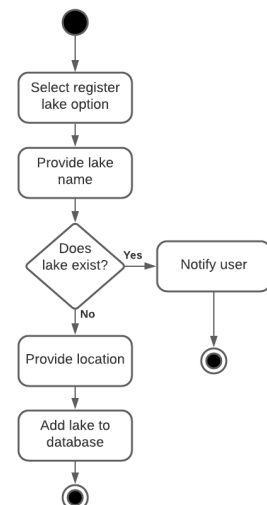   **Preconditions**: User is signed in, wants to register new lake, or is logging data for a lake that doesn't exist
   Interested Stakeholders: The Land Between, Blue Lakes Project, Residents
   Actor: User
   1. User selects to register a new lake
   2. System prompts user to enter the name of the lake
   3. System checks if the lake already exists
   4. System prompts the user to select the location of the lake
   5. System logs the new lake

   Outcome: A user registers a new lake in the database. Reports can now be made under the lake's unique identifier.
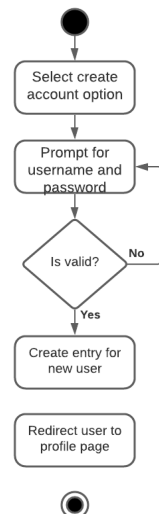
4. **Product Use Case Name**: User submits new lake health report

   Trigger: User selects to submit a lake health report.

   Preconditions: User is signed in, user has previously collected data ready

   Interested Stakeholders: The Land Between, Residents, Blue Lakes Project, Anglers

   Actor: User

   1. User selects to create a new lake health report
   2. System prompts the user to enter the name of the lake
   3. System checks if the lake exists
   4. System prompts the user to enter the collected data
   5. System validates entries
   6. System logs the entries in the Blue Lakes Project Database

   Outcome: User submits a lake health report, report is stored in the Blue Lakes Project database

5. **Product Use Case Name**: User registers new account

   Trigger: Guest chooses to register for a new account

   Preconditions: None

   Interested Stakeholders: The Land Between, Blue Lakes Project

   Actor: Guest

   1. Guest interfaces with the system through the website or mobile application
   2. Guest chooses to create a new account
   3. System prompts the guest to enter a unique username + password
   4. System validates that the username doesn't previously exist
   5. System validates that the password meets complexity requirements
   6. System creates entry for user
   7. User is redirected to profile page

   Outcome: User creates an account where they can upload and view lake health reports and status'.

6. **Product Use Case Name**: User submits angling data

   Trigger: User selects new angling report

   Preconditions: User is on website, user is logged in, lake exists

   Interested Stakeholders: Residents, Angler, Land Between, Blue Lakes

   Actor: User

   1. User selects new angling report
   2. User provides product with angling data (fish caught / time spent fishing)
   3. Product registers new report and saves it to the databases
   4. Product serves page of angler report

   Outcome: Angler data gets saved to the database

7. **Product Use Case Name**: User shares lake health report
   Trigger: User clicks share on lake health report
   Preconditions: User is on website, lake health report is completed
   Interested Stakeholders: Residents, Angler, Blue Lakes, Land Between
   Actor: User
   1. User is on report page for a specific lake's health
   2. User clicks share button
   3. Product provides sharable link to view that report

   Outcome: User now has a shareable link to provide to others with the lake health report they were viewing.
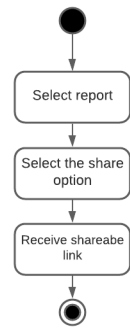
8. **Product Use Case Name**: User registers a new lake
   Trigger: User selects new lake when theirs isn't found
   Preconditions: User is on website, user is logged in
   Interested Stakeholders: Residents, Angler, Blue Lakes, Land Between
   **Actor**: User
   1. User doesn't find lake listed
   2. User selects new lake register
   3. User provides lake information (name / location / photos) to product
   4. Product updates databases to include this new lake
   5. Product serves the lake profile page

   Outcome: User added a new lake to the system, and is now able to view details & submit angler data
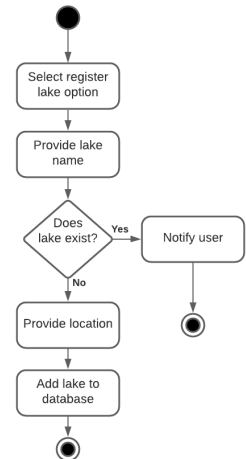
9. **Product Use Case Name**: User views a lake profile
   Trigger: User selects lake from website
   Preconditions: User has to be on website
   Interested Stakeholders: Residents, Angler, Blue Lakes
   Actor: User
   1. User clicks on link to a specific lake
   2. Product pulls information of the lake in question
   3. Product serves page with information about the lake

   Outcome: User gets to view all of the data about a specific lake
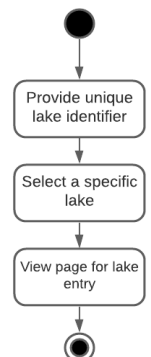
10. **Product Use Case Name**: User sorts lakes by health
    Trigger: User selects lake health filter method
    Preconditions: User has to be on the website, has to select filter by health
    Interested Stakeholders: Residents, Angler, Land Between, Blue Lakes
    Actor: User
    1. User selects list of lakes
    2. User selects filter, and filter by health
   3. Product returns filtered list by lake health

    Outcome: User gets to view a list of lakes sorted by the health of those lakes.
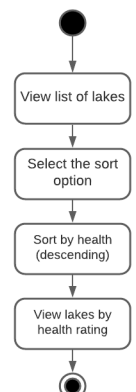
11. **Product Use Case Name**: Angler Diaries releases monthly fish data
    Trigger: Monthly
    Preconditions: None, there could be 0 lakes & 0 fish reported but the monthly report could still go out.
    Interested Stakeholders: Anglers, The Land Between, Residents
    Actor: System
    1. Product groups all reported angler data for previous month
    2. Product pushes report
    Outcome: The system has released its monthly angler fish data report.
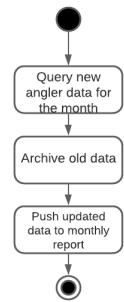
12. **Product Use Case Name**: Viewing Lake Health Report
    Trigger: User Accessing Page
    Preconditions: Lake exists, lake health report has been generated
    Interested Stakeholders: Anglers, Land Between, Residents
    Actor: Guest/User
    1. User connects to url relating to specific lake health report
    2. Product retrieves report information from database
    3. Product serves information as a webpage
    Outcome: User is able to view a specific lake health report
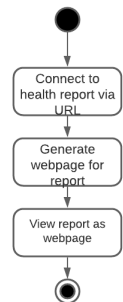
Business Use Case Scenarios

1. **Business Event**: User submits new lake health report
   Business Use Case Name: Submitting lake health report.
   Trigger: Any registered user wants to submit a lake health report
   Pre-Conditions: User must be logged on, have values ready to fill out report
   Interested Stakeholders: The Land Between, Blue Lakes
   Active Stakeholders: The Land Between, Anglers, Residents
   1. Select new lake health report optionEnter
   2. User fills in tested values
   3. User submits report
   4. Report is validated and stored in Blue Lakes Project database
   5. Values updated
   6. Report confirmation and report returned to user
   Outcome: If validated, user is sent confirmation. Otherwise notified their report has not been accepted.

2. **Business Event**: User registers a new lake
   Business Use Case Name: Register new lake
   **Trigger**: Any registered user wants to register a lake
   Pre-Conditions: User must be logged on, and the lake must not already exist in the database
   Interested Stakeholders: The Land Between, Blue Lakes
   Active Stakeholders: The Land Between, Anglers, Residents
   1. User enters lake name + location
   2. Verify that the lake does not exist
   3. Confirm that the lake exists within "The Land Between" bioregion
   4. Create new entry in Blue Lakes Project database
   5. Return confirmation to user
   Outcome: If the lake does not exist, a new lake is generated in the database. Otherwise no new entry generated, user notified lake exists.
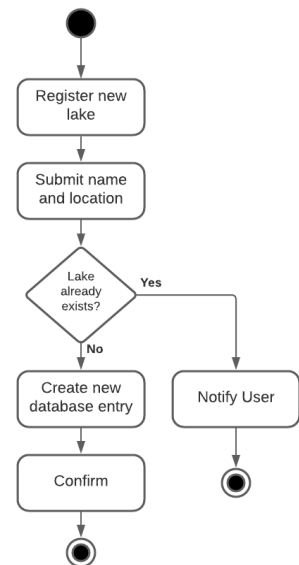
3. **Business Event**: User views specific lake data

    Business Use Case Name: View lake data

    Trigger: Any user or guest wants to view lake data

    Pre-Conditions: None

    Interested Stakeholders: The Land Between, Resident, Angler

   **Active Stakeholders**: The Land Between, Resident, Angler

      1. User inputs unique lake identifier
      2. Blue lakes project is queried for all reports of that lake
      3. All reports are displayed to user
      4. User chooses report
      5. Report is requested from Blue Lakes Project database
      6. Lake Health report is returned and displayed to the user

    Outcome: Any interested party can view reports of a specific lake that interest them
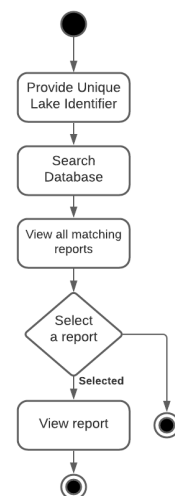
4. **Business Event**: User shares lake health report

    Business Use Case Name: Share lake health report

    Trigger: Any user wants to share a lake health report

    Pre-Conditions: User is logged on, report exists

    Interested Stakeholders: Resident, Angler, The Land Between

    Active Stakeholders: Resident, Angler, The Land Between, Blue Lakes Project

      1. User selects a lake health report
      2. Chooses to share report
      3. Report is queried from Blue Lakes database and converted to a sharable format (PDF)
      4. Report is returned to user
      5. User chooses to download the report

    Outcome: User downloads the report, and can share it with whomever they choose.

5. **Business Event**: User sorts lakes by health

    Business Use Case Name: Sort by lake health

    Trigger: Any user wants to sort all lakes

    Pre-Conditions:

    Interested Stakeholders: Resident, Angler, The Land Between

    Active Stakeholders: Resident, Angler, The Land Between, Blue Lakes Project

      1. Users view list of all lakes
      2. User requests for lakes to be sorted by lake health
      3. Blue Lakes Project database returns sorted query
      4. Lakes with lowest health rating displayed at top presented to the user

    Outcome: Users can view all lake healths, and identify areas of concern.
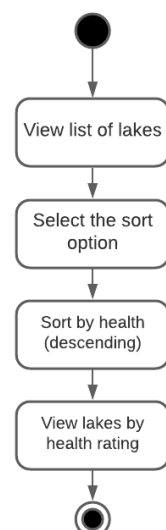
6. **Business Event**: User creates Angler Diary account

   Business Use Case Name: Create Angler Diary account
   Trigger: Any resident or guest wants to create an account
   Pre-Conditions: None
   Interested Stakeholders: Resident, Anglers
   Active Stakeholders: Resident
   1. Resident accesses application through website or mobile app
   2. Select create account
   3. Creates a unique username and password
   4. Entry is created in Angler Diaries database
   5. Displays their account page

   Outcome: A resident creates an angler account that allows them to upload angler diaries data
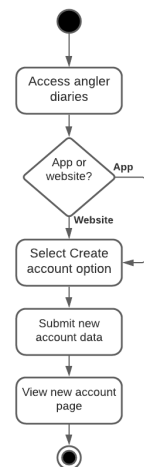
7. **Business Event**: User requests fish species in a location

   Business Use Case Name: View species statistics
   Trigger: Any user or guest wishes to view angler reports of a specific fish
   Pre-Conditions: Entry of that species in a given location exists
   Interested Stakeholders: Resident, Anglers, The Land Between
   Active Stakeholders: Anglers, Resident, The Land Between
   1. User queries a fish
   2. User views all reports of that fish
   3. User queries by location
   4. User is able to view past reports of fish in that area

   Outcome: A user is able to see a general report, or specific reports of fish in an area.

New

8. **Business Event**: User requests to view a lake profile

   Business Use Case Name: View lake profile
   Trigger: Any user wishes to view a lake's profile
   Pre-Conditions: User is signed in, lake exists
   Interested Stakeholders: Anglers, Resident, The Land Between
   Active Stakeholders: Anglers, Resident, The Land Between
   1. User enters unique lake identifier
   2. Select lake
   3. Redirected to lakes page
   4. Lake statistics, reports data displayed on page

   Outcome: User is able to view general information about a lake, as well as a summary of previous reports and developments over time
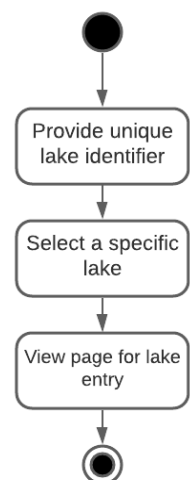
10. **Business Event**: User submits angling data

　　　Business Use Case Name: Submit angling data
　　　Trigger: Angler wants to upload data
　　　Pre-Conditions: Anger has data ready, angler signed into Angler Diaries account
　　　Interested Stakeholders: Anglers, The Land Between
　　　Active Stakeholders: Anglers

　　　　1. Angler chooses to upload report
　　　　2. Enters species, size, location
　　　　3. Report is stored in Angler Diaries database
　　　　4. Angler is sent confirmation

　　　Outcome: Angler uploads data regarding their catches, information is reflected in the database

11. **Business Event**: Angler Diaries pushing monthly fish data

　　　Business Use Case Name: Push monthly Angler Diaries report
　　　Trigger: Monthly time-based trigger
　　　Pre-Conditions: Data exists
　　　Interested Stakeholders: The Land Between, Anglers
　　　Active Stakeholders: The Land Between

　　　　1. Angler data collected over the month is pushed to current data
　　　　2. Old data archived

　　　Outcome: The angler data on the lakes remains consistent. Old archived data is still accessible through weekly/monthly reports, as well as general lake health profiles.
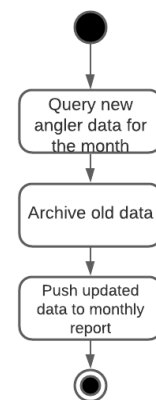
12. **Business Event**: User views weekly/monthly angling data for a location

　　　Business Use Case Name: View angling data
　　　Trigger: Any user views weekly/monthly angling reports
　　　Pre-Conditions: Weekly/Monthly reports must be compiled
　　　Interested Stakeholders: The Land Between, Anglers
　　　Active Stakeholders: The Land Between, Anglers

　　　　1. User chooses a location
　　　　2. Angler Diaries database queried for reports in that location
　　　　3. Reports are displayed to user
　　　　4. User selects and reviews the reports

　　　Outcome: User can select and review any report relating to angler diaries.

Non-Functional Requirements

Look and Feel

Description: The product should be easy to use.

> **Rationale**: Researchers and residents will both be uploading data about lake health and angler diaries. The process must not be complicated to retain users for consistent data.
> **Fit Criterion**: More than 90% of the user base should be able to upload a report within the first 10 minutes.
> **Source**: Michael Nichol
> **Customer Satisfaction**: 5
> **Customer Dissatisfaction**: 5
> **Dependencies**: None
> **Conflicts**: None

Description: The product should be easy to learn.

> **Rationale**: Since residents and researchers with varying technological backgrounds will use this app to communicate data, it must be easy to learn.
> **Fit Criterion**: The layout should not be complicated, users should have a good understanding of the application within a 1 week period.
> **Source**: Michael Nichol
> **Customer Satisfaction**: 5
> **Customer Dissatisfaction**: 5
> **Dependencies**: None
> **Conflicts**: None

Usability and Humanity

Description: The product should provide results and data fast.

> **Rationale**: In order for residents and researchers to be informed on the health of a region, the statistics and graphics should be displayed quickly.
> **Fit Criterion**: Results of a query should be displayed within 3 seconds
> **Source**: Michael Nichol
> **Customer Satisfaction**: 5
> **Customer Dissatisfaction**: 5
> **Dependencies**: Cell Service, internet service provider, server network speeds
> **Conflicts**: None

Description: The product should be easy to navigate

> **Rationale**: All parties must be easily able to navigate the menus in the application without searching for obscure buttons.
> **Fit Criterion**: Large buttons should be used in menus with icons that make navigation intuitive to the user
> **Source**: Michael Nichol
> **Customer Satisfaction**: 5
> **Customer Dissatisfaction**: 5

Dependencies: Device size
Conflicts: None

Description: The product shall be accessible to all residents, fishers, and researchers
    Rationale: Anyone who wishes to download the application, and report lake health or angler diaries in their area, or view their lake's health shall be able to do so.
    Fit Criterion: No group is restricted from using the application.
    Source: Michael Nichol
    Customer Satisfaction: 5
    Customer Dissatisfaction: 5
    Dependencies: Account types
    Conflicts: None

Description: The product shall be available only in English
    Rationale: Developers are not proficient in other languages. Any translation must be done by the browser or application itself.
    Fit Criterion: The product will be available only in English.
    Source: Michael Nichol
    Customer Satisfaction: 5
    Customer Dissatisfaction: 5
    Dependencies: None
    Conflicts: Users of other languages.

Performance

Description: The product should have the capacity to support 100 users simultaneously.
    Rationale: Many researchers or residents may be using the application at one time. It is important that they are all able to upload data and review reports simultaneously.
    Fit Criterion: The system must be stress tested to operate properly with 100 simultaneous users. Server load should be monitored and alert if over 70% capacity.
    Source: Michael Nichol
    Customer Satisfaction: 5
    Customer Dissatisfaction: 5
    Dependencies: Hardware capacity
    Conflicts: None

Description: The product should provide updated region reports fast.
    Rationale: When researchers upload their data, they want to quickly see how their results have affected the health of the region.
    Fit Criterion: Updated results should be available within 1 minute from when the report was uploaded.
    Source: Michael Nichol
    Customer Satisfaction: 5
    Customer Dissatisfaction: 5
    Dependencies: Cell service, internet service provider, server network speeds and load.
    Conflicts: None

Description: The product should be fault tolerant (ie. work properly in cases where there is a huge overload on the network due to a large volume of queries)
Rationale: In order to provide users with lake reports, the product should anticipate a heavy workload.
Fit Criterion: All users should have no issues with server-side latency or lag when using the application
Source: Michael Nichol
Customer Satisfaction: 5
Customer Dissatisfaction: 5
Dependencies: None
Conflicts: None

Operational & Environmental

Description: The product shall be compliant with the standards of The Blue Lakes and The Land Between
Rationale: The product is a representation of the client to researchers and the general public. It must uphold their standards in terms of language, logos, images, and any other aspects of the application.
Fit Criterion: The client must review and approve the final product prior to release.
Source: Michael Nichol
Customer Satisfaction: 5
Customer Dissatisfaction: 5
Dependencies: None
Conflicts: None

Description: The product should be available to run on all browsers.
Rationale: Since researchers, fishers and residents use a variety of internet browsers the product should support them all
Fit Criterion: The product must be tested and validated on Chrome, Safari, Internet Explorer, and Firefox. No user should have issues accessing the content of a page.
Source: Michael Nichol
Customer Satisfaction: 5
Customer Dissatisfaction: 5
Dependencies: None
Conflicts: None

Description: The product should be available to run on both Android and IOS.
Rationale: Users must be able to download an application on a device of their choice, and be able to upload or view data from any IOS or Android device. Eliminating one or both of these eliminates large groups of potential users.
Fit Criterion: A user can access the product from any device.
Source: Michael Nichol
Customer Satisfaction: 5
Customer Dissatisfaction: 5
Dependencies: None
Conflicts: None

Maintainability & Support

Description: The product should require a maximum maintenance of 2 hours every month.

Rationale: The product will require improvements over time to the operation or aesthetic of the application.

Fit Criterion: The maintenance period should be a fixed time, therefore user's and researchers can expect to not use the application during the scheduled maintenance period. Users should be notified of upcoming maintenance to the application, as well as changes made.

Source: Michael Nichol

Customer Satisfaction: 5

Customer Dissatisfaction: 5

Dependencies: None

Conflicts: None

Description: The client will be responsible for the maintenance and support of the application after completion of the final version of the product.

Rationale: Developers are no longer enrolled in the 4000Y course at Trent University.

Fit Criterion: The client should be well informed of the product, and how it operates. The client takes over support and maintenance of the product after April 2021.

Source: Michael Nichol

Customer Satisfaction: 5

Customer Dissatisfaction: 5

Dependencies: None

Conflicts: None

Security

Description: The product should ensure the security and integrity of data.

Rationale: The product stores sensitive user information such as their name, address, date of birth, and password.

Fit Criterion: User information shall be transferred only through secure methods.

Source: Michael Nichol

Customer Satisfaction: 5

Customer Dissatisfaction: 5

Dependencies: None

Conflicts: None

Description: The product should ensure the privacy of user data.

Rationale: Users data must be protected against intrusions.

Fit Criterion: All information must be encrypted while being transmitted. Passwords must be encrypted with modern hashing algorithms. No staff will have access to users passwords, a small number of staff will have access to the databases where user data is stored.

Source: Michael Nichol

Customer Satisfaction: 5

Customer Dissatisfaction: 5

Dependencies: None
Conflicts: None

Description: The product should ensure that users permissions are limited to their account type
Rationale: Users should have limited access to different portions of the app, and only have permissions to update, edit, or view the data related to their account type.
Fit Criterion: Users should not be able to access data outside of their accounts permissions.
Source: Michael Nichol
Customer Satisfaction: 5
Customer Dissatisfaction: 5
Dependencies: None
Conflicts: None

Cultural

Description: The product shall not be offensive to any group of peoples.
Rationale: All parties should be able to access the application without feeling discriminated against or offended.
Fit Criterion: No user is offended by the product
Source: Michael Nichol
Customer Satisfaction: 5
Customer Dissatisfaction: 5
Dependencies: None
Conflicts: None

Legal

Description: The product should be compliant with the privacy laws of Canada
Rationale: Since the system contains sensitive information about its users, their data must be private.
Fit Criterion: The product must be validated to ensure it is compliant with all Canadian privacy laws
Source: Michael Nichol
Customer Satisfaction: 5
Customer Dissatisfaction: 5
Dependencies: None
Conflicts: None

Functional Requirements

Event/BUC #: 1

> **Description**: As a user I want to submit a new lake health report so that I contribute to the overall status of the region, and I can get an updated report of the status of my region.
> **Rationale**: Users must be able to submit data regarding bodies of water, and others be able to view the report.
> **Source**: Discussion of BUC with developers.
> **Fit Criterion**: Users are able to upload lake health reports.
> **Customer Satisfaction**: 5
> **Customer Dissatisfaction**: 5
> **Dependencies**: None
> **Conflicts**: None

Event/BUC #: 2

> **Description**: As a user I want to have the ability to register a new lake so that I can submit data about that body of water.
> **Rationale**: If a lake does not previously exist in the database, users must be able to create a new lake entry to log data on it.
> **Source**: Discussion of BUC with developers.
> **Fit Criterion**: User is able to create entries for a lake not previously in the database.
> **Customer Satisfaction**: 5
> **Customer Dissatisfaction**: 5
> **Dependencies**: None
> **Conflicts**: Lake already exists.

Event/BUC #: 3

> **Description**: As a user I want to be able to view specific lake data so that I am able to analyze lake status and data on an individual basis.
> **Rationale**: Users should be able to view specific lake information and reports using a lakes identifier.
> **Source**: Discussion of BUC with developers.
> **Fit Criterion**: Users enter a unique lake identifier, and specified lake information and reports are returned to the user.
> **Customer Satisfaction**: 5
> **Customer Dissatisfaction**: 5
> **Dependencies**: Existing lake reports for specified lake.
> **Conflicts**: None

Event/BUC #: 4

Description: As a user I want to be able to share lake health reports so that other parties can easily few and analyze the data.

Rationale: Users will want to share specific lake report documents and statistics among each other. It should be easy for users to share this information in a native method opposed to copying it themselves.

Source: Discussion of BUC with developers.

Fit Criterion: Users can select specific lake reports and obtain an output of the report in a sharable format such as a link or PDF.

Customer Satisfaction: 5

Customer Dissatisfaction: 5

Dependencies: Lake report exists, users device can download report.

Conflicts: None

Event/BUC #: 5

Description: As a user I want to have the ability to sort lakes by health rating so that I can outline priority areas.

Rationale: Users should be able to sort the lakes by their health to accurately identify priority areas and focus their efforts on those areas in particular.

Source: Discussion of BUC with developers.

Fit Criterion: Each lake or region is accurately assigned a health rating based on various chemical parameters. Lakes can be retrieved, sorted, and displayed based on this metric.

Customer Satisfaction: 5

Customer Dissatisfaction: 5

Dependencies: Health algorithms and ratings.

Conflicts: None

Event/BUC #: 6

Description: As a user I want to create an Angler Diary Account so that I can submit angling data.

Rationale: Users should be able to collect and submit data about the fish that they catch to contribute to fish population data and lake health data.

Source: Discussion of BUC with developers.

Fit Criterion: Users can register as an angler for Angler Diaries.

Customer Satisfaction: 5

Customer Dissatisfaction: 5

Dependencies: None

Conflicts: None

Event/BUC #: 7

    Description: As a user I want to request fish species in a location so that I can view fish population and statistics for a given region.

    Rationale: Users should be able to review angling data for lake regions.

    Source: Discussion of BUC with developers.

    Fit Criterion: Users can query angling data by lake or region, and are returned with previously reported angling diary results.

    Customer Satisfaction: 5

    Customer Dissatisfaction: 5

    Dependencies: Angling data has been reported.

    Conflicts: None

Event/BUC #: 8

    Description: As a user I want to view lake profiles so that I can view the statistics of that lake.

    Rationale: Users should be able to view the profile of a lake and see its health over time. This allows the user to view trends in the data.

    Source: Discussion of BUC with developers.

    Fit Criterion: User can query a lake by its identifier, and view a detailed page of the lake's health and history

    Customer Satisfaction: 5

    Customer Dissatisfaction: 5

    Dependencies: Lake exists

    Conflicts: None

Event/BUC #: 9

    Description: As a user I want to submit angling data so that my angling results are recorded.

    Rationale: Angling diaries users will want to submit data about the fish they have caught, to track previous catches, and assist researchers with fish health, populations, and species.

    Source: Discussion of BUC with developers.

    Fit Criterion: Anglers are able to submit data about the fish they catch.

    Customer Satisfaction: 5

    Customer Dissatisfaction: 5

    Dependencies: None

    Conflicts: None

Event/BUC #: 10

    Description: As a user I want Angler Diaries to push monthly fish data so that I have updated angling statistics for an area each month.

    Rationale: Angling reports should be updated on a monthly basis to keep the results up-to-date.

    Source: Discussion of BUC with developers.

    Fit Criterion: Angler Diaries data is pushed every month, and user data should be reflected in the database.

    Customer Satisfaction: 5

    Customer Dissatisfaction: 5

    Dependencies: Users report angling data.

    Conflicts: None

Event/BUC #: 11

> **Description**: As a user I want to view angling data for various time intervals for a given location so I can analyze fishing statistics and count for a given area.
>
> **Rationale**: Users should be able to view angling statistics for a specific lake to see what species are present, as well as their current populations.
>
> **Source**: Discussion of BUC with developers.
>
> **Fit Criterion**: Weekly and monthly angling reports should be generated.
>
> **Customer Satisfaction**: 5
>
> **Customer Dissatisfaction**: 5
>
> **Dependencies**: Users report angling data
>
> **Conflicts**: None

Event/BUC #: 12

> **Description**: As a guest I want to view a lake health report so that I can analyze the data and communicate with other users.
>
> **Rationale**: Users should be able to share lake health reports with guests who are not registered.
>
> **Source**: Discussion of BUC with developers.
>
> **Fit Criterion**: Visitors without an account are able to view lake health reports that are shared to them.
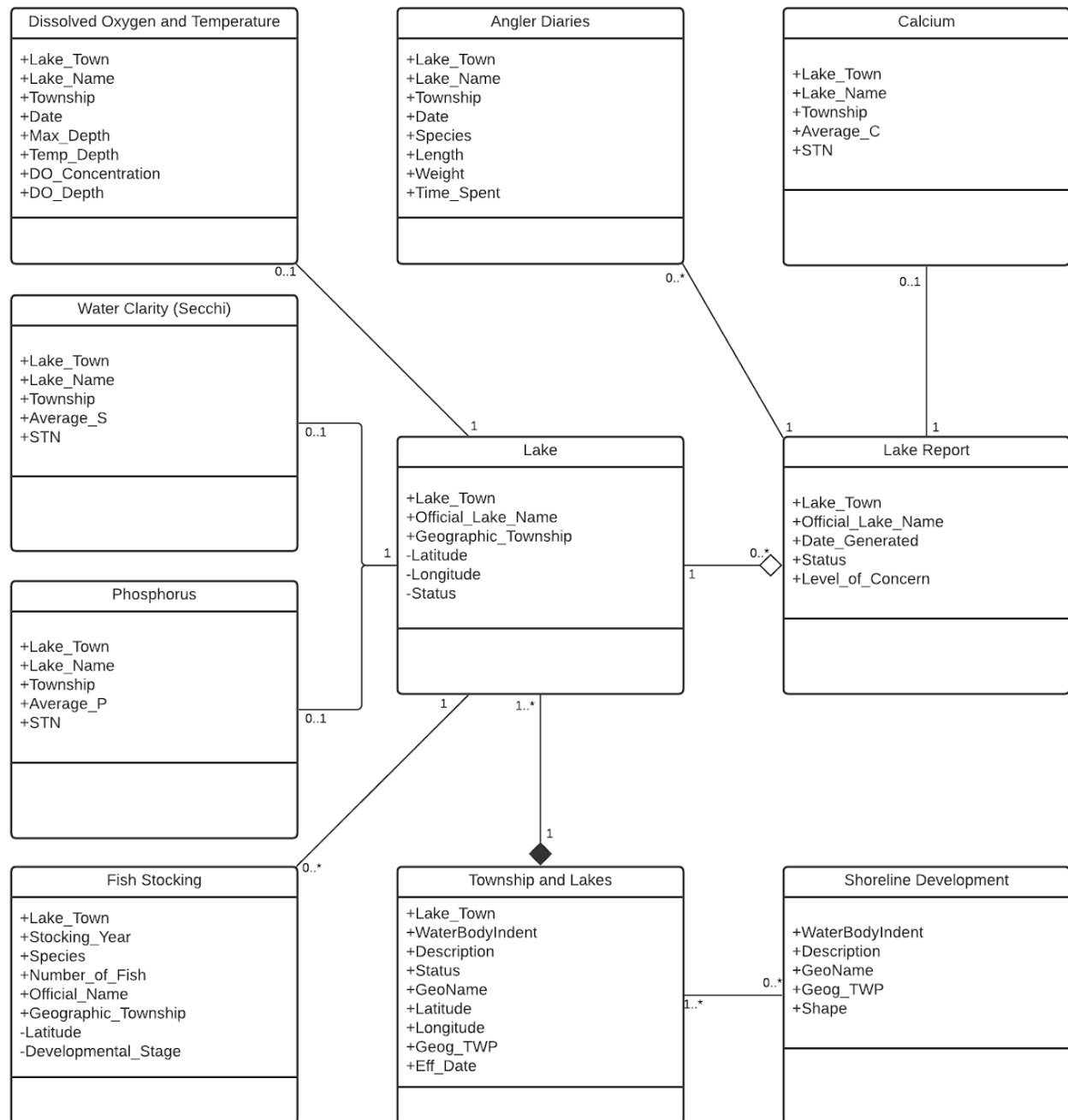>
> **Customer Satisfaction**: 5
>
> **Customer Dissatisfaction**: 5
>
> **Dependencies**: None
>
> **Conflicts**: None

Business Data Model and Data Dictionary

Data Model

Data Dictionary

Classes:

- Dissolved Oxygen and Temperature: Class contains a body of waters dissolved oxygen levels and temperatures at various depths in the lake
- Water Clarity (Secchi): Class contains a body of water's transparency or turbidity in bodies of water by using a Secchi Disk (A Secchi disk is an 8-inch (20 cm) disk with alternating black and white quadrants. It is lowered into the water of a lake until it can no longer be seen by the observer.)
- Phosphorus: Class contains a body of water's phosphorus levels
- Fish Stocking: Fish stocking information which pertains to fish raised in a hatchery and released into a body of water.
- Angler Diaries: User submissions of fish that they have caught in a body of water
- Lake: A geographic location where a large body of water exists.
- Township and Lakes:
- Calcium: Class contains a body of water's calcium levels
- Lake Report: Lake report is report generated using reported values to evaluate a lake's health. Status and level of concern are generated here.
- Shoreline Development: How is a shoreline developing over time

Attributes:

- Lake_Town: String
- Lake_Name: String
- Township: String
- Date: DateTime
- Max_Depth: double
- Temp_Depth: double
- DO_Concentration: double
- DO_Depth: double
- Average_S: double
- STN: double
- Average_P: int
- Stocking_Year
- Species: id
- Number_of_Fish: int
- Official_Name: String
- Greographic_Township
- Developmental_Stage
- Length: double
- Height: double
- Time_Spent: int
- Official_Lake_Name
- Latitude: Decimal(8,6)
- Longitude: Decimal (9,6)
- Status: "Healthy" || "Healthy?" || "Sensitive" || "Fragile"
- WaterBodyIndent: double
- Description: String
- GeoName: String
- Geog_TWP: double
- Eff_Date: DateTime
- Average_C: double
- Date_Generated: DateTime
- Level_of_Concern: "Low" || "Medium" || "High"
- Shape: String

Jared Mezzatesta, Michael Nichol, & William Wilkins

Risk Assessment

1. ***Risk***: Database outage, test results cannot be viewed or uploaded
   a. ***Probability***: Low
   b. ***Effect***: Catastrophic, program failure

2. ***Risk****: A* user is unable to immediately upload results in remote locations.
   a. ***Probability***: Moderate, especially in areas with poor cell phone service.
   b. ***Effect***: Mild. Time-based data may lose accuracy.

3. ***Risk***: Mobile application becomes out of date, or incompatible with the new OS.
   a. ***Probability***: Moderate
   b. ***Effect***: Mild, compatibility update may be required

4. ***Risk***: Application development timelines aren't met.
   a. ***Probability***: Moderate
   b. ***Effect***: Moderate, due dates may need to be pushed.

5. ***Risk***: Not enough users reporting data to Angler Diaries for proper data
   a. ***Probability***: Low
   b. ***Effect***: Severe, incomplete data results in inaccurate data analysis.

6. ***Risk***: Global pandemic requires all researchers to quarantine in their homes.
   a. ***Probability***: High
   b. ***Effect***: Moderate, data collection will be paused for a minimum of 2 weeks.

7. ***Risk***: Software is inefficient at analyzing data.
   a. ***Probability***: low
   b. ***Effect***: Fatal, requires complete rework of the project.

8. ***Risk***: Database retrieval takes longer than 1 second.
   a. ***Probability***: low
   b. ***Effect***: Moderate, potentially frustrating user experience.

9. ***Risk***: The user interface is not intuitive.
   a. ***Probability***: low
   b. ***Effect***: Catastrophic. Usability requires that the software is easy to use.

10. ***Risk***: A user records incorrect or incomplete data.

    a. ***Probability***: low

    b. ***Effect***: Mild, it is unlikely that enough users would report erroneous data to impact the analysis.