ERD, Schema, & DDQ

Fixes based on Feedback from Step 1

I greatly appreciated the feedback provided by the TA for the first project step, it was insightful and helped me make my project more compatible with the project requirements. The main piece of advice given was to add another entity to my database schema to make four distinct entities, so I added a biome table. This table describes the qualities of the environment in a specified region and allows every animal to reside in one biome. To update my document to reflect the addition of a biome table, I added the following elements to my schema:

- Biome table with attributes related to the climate and annual environment
- Foreign key column to the animal table to reference the biome table
- Relationship showing how many animals may live in one biome

Project Outline

I plan to create a database to model animal species present in the Pacific Northwest and the interactions between them. I have been interested in pursuing biology more in the future and specifically ecology, and finding interesting ways to visualize unique datasets. A queryable database is a good tool to keep track of biological data, allowing me to monitor individuals and populations, and animal interactions lend themselves to the format of a relational database.

Database Outline

- **Animal** -- This table represents an individual animal and is linked to each other table in the database. Other tables reference the animal table to create all the relations in my project.
    - **ID**: The ID is a unique identifier for each animal in the table. It works as a tagging system to organize all animals present. An auto-incrementing number and the primary key for the table.
    - **Species**: The species name is a foreign key referencing the species table, and identifies the scientific name of the animal. This number references the string name of the species contained in that table, and must not be null.

- ○ **Age**: A number with 3 maximum digits representing the age of the animal.
- ○ **BiomeID:** The biomeID is a foreign key reference to the biome table and denotes the area the animal lives in.
- **Species --** This table is a reference table for individual animals. An animal's species is pulled from the species ID number, and the fields in the species table contains information about the species as a whole.
  - ○ **ID**: The species ID is a unique primary key number that represents the unique identifier of each species.
  - ○ **Name**: A string no more than 50 characters for the name of the species. This must not be empty, and has a default value of "other".
  - ○ **Feeding_type**: To provide more information about each species, this string will either be "herbivore", "carnivore", or "omnivore".
  - ○ **Native**: This will be a boolean variable, either true if the animal is a native species or false if not.
  - ○ **Domesticated**: This is another boolean value, either true for domesticated or domesticable, or false for wild.
- **Biome --** The biome table describes a geographical region and the noteworthy characteristics or the area.
  - ○ **ID**: The biome ID is a unique number that auto-increments for each specific interaction.
  - ○ **Latitude_1**: This is the latitude of the "top left" corner of the region, or most Northwestern point. It is a float value with a 10 digit limit, and must be populated be null.
  - ○ **Longitude_1**: This is the longitude of the "top left" corner of the region, or most Northwestern point. It is a float value with a 10 digit limit, and must be populated.
  - ○ **Latitude_2:** This is the latitude of the "bottom right" corner of the region, or most Southeast point. It is a float value with a 10 digit limit, and must be populated.
  - ○ **Longitude_2**: This is the longitude of the "bottom right" corner of the region, or most Southeast point. It is a float value with a 10 digit limit, and must be populated.
  - ○ **Temperature**: The annual average temperature of the biome; a rough measurement of climate trends in the are. It is a float value with a 5 digit limit, and may be null.
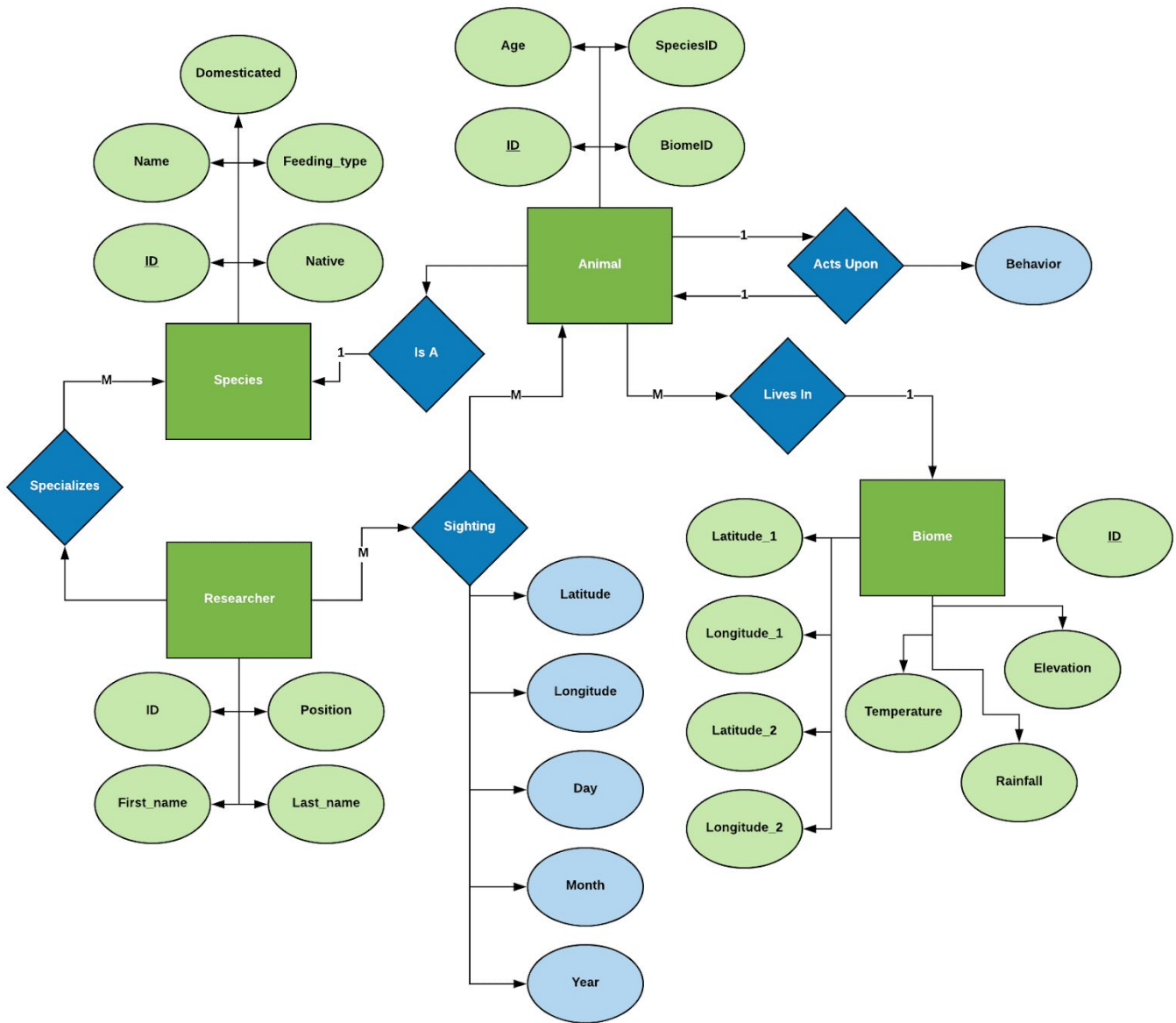
- ○ **Elevation**: The elevation of the biome is a 10 digit integer value describing the average height above sea level for the region.
  - ○ **Rainfall:** Rainfall measures the annual average rainfall in inches and is a 5 digit float.
- ● **Interaction --** The interactions table maps the relation between different animals in the environment.
  - ○ **ID**: The interaction ID is a unique number that auto-increments for each specific interaction.
  - ○ **Species_1**: The first species in the interaction relation will be the ID number of one species and can't be null.
  - ○ **Behavior**: This string established the relation between the two species, for example, "preys upon" or "nests in old den". This relation is always formatted as [species 1] [acts upon] [species 2].
  - ○ **Species_2**: The second species in the interaction relation will be the ID number of another species and can't be null. It is the species acted upon by the first.
- ● **Researcher --** The researcher table lists all researchers registered in the database. Researchers can record each sighting of an individual animal by adding entries to the sighting table.
  - ○ **ID:** A unique identifier giving each researcher an auto-incrementing number.
  - ○ **Last_name:** A string with a 50 character maximum for the researcher's last name. May not be null.
  - ○ **First_name:** A string with a 50 character maximum for the researcher's first name. May not be null.
  - ○ **Position:** A string describing the role of the researcher with a 50 character maximum, for example "undergraduate assistant" or "graduate researcher".
- ● **Speciality --** The specialities table describes the animal species that a researcher focuses on in their studies.
  - ○ **ID**: The speciality ID is an auto-incrementing value for each specific speciality a researcher has.
  - ○ **ResearcherID**: This ID value is linked to the researcher table, and pulls the value of one researcher for the relation.
  - ○ **SpeciesID:** This ID value is linked to the species table, and pulls the value of one species for the relation.

- **Sighting --** A relational table mapping a researcher to an animal that researcher has tagged. The table also describes some information about the interaction.
    - **ResearcherID:** This ID value is linked to the researcher table, and pulls the value of one researcher for the relation.
    - **AnimalID:** The ID value is linked to the animal table, and pulls the value of one animal for the relation.
    - **Day:** This is an integer value maximum 2 digits representing the day of the date.
    - **Month:** This is an integer value maximum 2 digits representing the month of the date.
    - **Year:** This is an integer value maximum 4 digits representing the year of the date.
    - **Latitude**: This is the latitude of the animal's last known location. It is a float value with a 10 digit limit, and may be null.
    - **Longitude**: This is the latitude of the animal's last known location. It is a float value with a 10 digit limit, and may be null.

Relationships

● **Animals belong to a species** – Animals are classified as one species, but a species will have many animals within it. This makes the relationship between Animals and Species *one-to-many*.

● **Animals live in a biome** – Biomes cover a square area of latitude and longitude coordinates and each animal can be placed in one current area, making the relationship *many-to-one*.

● **Species act upon each other** – This is a *many-to-many relationship*, as any number of species can interact with or be interacted with by many other species.

● **Researchers can log an animal sighting** – This is a *many-to-many relationship* as Researchers can log multiple animals, and any animal can be spotted by many different researchers.

● **Researchers can focus study on specific species** – Researchers can have any number of animal species as a speciality in the matching relation table, and any species can be focussed on by many researchers, making the relationship *many-to-many*.

Entity-Relationship Diagram

Schema

Interaction
- Species 1
- Behavior
- Species 2

Sighting
- Researcher ID
- Animal ID
- Latitude
- Longitude
- Day
- Month
- Year

Researcher
- Researcher ID
- First Name
- Last Name
- Position

Specialty
- Researcher ID
- Species ID

Biome
- Biome ID
- Latitude 1
- Longitude 1
- Latitude 2
- Longitude 2
- Temperature
- Elevation
- Rainfall

Animal
- Animal ID
- Age
- Species ID
- Biome ID

Species
- Species ID
- Age
- Feeding Type
- Domesticated
- Native