CPSC 304 Project Cover Page

Milestone #: 1

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Group Number: 9

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By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

2. Project Descriptions

a. What is the domain of the application? Describe it.

i. The domain of the application is **Ecology**, broadly defined by Biology.

b. What aspects of the domain are modeled by the database?

i. Ecology is a branch of biology concerned with the relationships between and within biotic and abiotic factors in nature. The application aims to model these biotic and abiotic components of different bioregions, called **biomes**, in British Columbia and how they interact. Formally, a biome is a community of flora and fauna that occupies a major habitat, with examples including the biomes Tundra, Temperate Rainforest, etc. More specifically, a biome is a bioregion that has distinguishable combined abiotic features of climate, soil and water availability, which often dictates the organisms that can persist in the environment. Our application includes entities under this umbrella such as organisms, climate, and soil type, and relationships such as how a spanning geographic barrier can result in speciation (separation of species) within these biomes. A real-world application would be a query in which the user would be interested in the plants that live in the biome present in their city.

ii. Explanation of how each entity belongs to the domain:

- Soil and Climate: Greatly affects how the biome is distinguished amongst other biomes, but can not act as a primary key as multiple biomes could have the same soil and climate, but support different life – which results in different categorization. It has great precursors to organism survivability.
- Organism: A key study of ecology, biomes are used to identify how the organisms in an environment are a product of its abiotic and terrestrial components.
- Geological Commodities, Geographic Barriers & Natural Disasters: Has large impacts on the soil and types of organisms that reside in a location. They are also well-studied topics in ecology, and thus would be great to query.
- Location: Aids in further breaking down the different cities in British Columbia that make up a biome.
- MORE INFORMATION ABOUT THESE RELATIONSHIPS IN Q6

3. Database Specifications:

a. What functionality will the database provide?

i. This application is targeted towards individuals interested in the many different ecoregions of British Columbia, along with the flora and fauna it supports. Here are some example functionalities of the database:

- A forest fire could have occurred in Kelowna, BC, and thus, an input of the natural disaster type and location could provide information about the plants and animals that reside in that area. The soil type entity might also provide information to deduce the pace of ecological succession (community recovery) in that specific area.
- If an individual grew up in Kamloops, they can input the city name to receive information about the biomes that compose the region – along with its climate, geographic barriers, flora and fauna, and the soil types present. Perhaps the flora and fauna that inhabit the region boasts a specific trait that ensures success in natural selection.
- If an individual identifies an animal in British Columbia, they can enter the animal's name as an input and find its attributes, along with different regions they inhabit.
- Conservationists can input a location and view all the natural disasters that occurred in that area along with the date, and perhaps notice a pattern or a threat to biodiversity.

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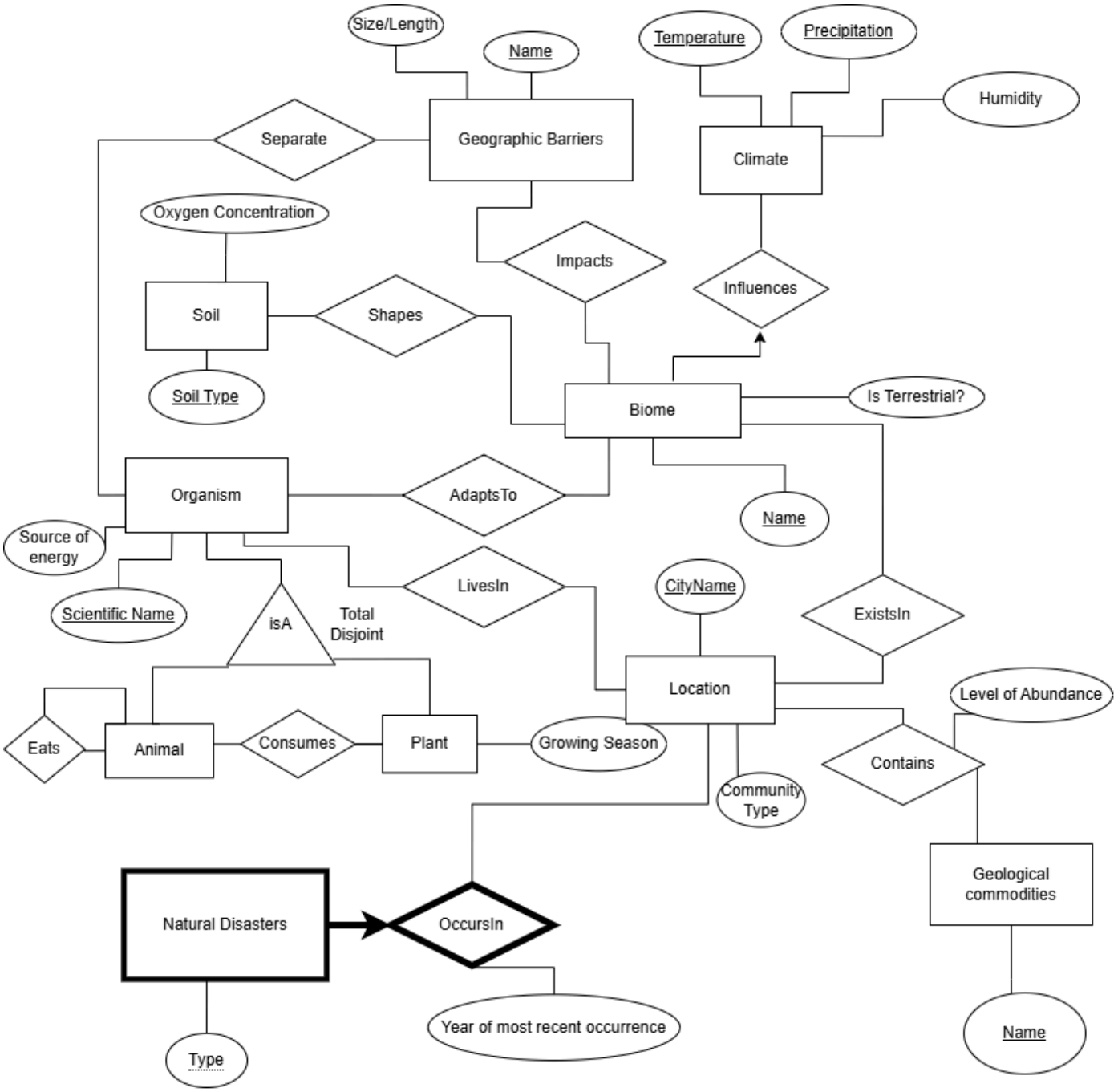
4. ER Diagram Insertion



5. Make sure the E/R diagram adheres to expectations listed above.
Choices explained below in Q6.

6. Other comments, as appropriate, to explain your project.

Project Explanation

Background: The concepts of biomes in Ecology exist to observe similarities between multiple areas (such as climate, soil, flora and fauna), and group them into one "biome". Scientists have found that the abiotic features have a strong correlation to the type of species it supports. For example, a desert in Africa and a desert in Asia have similar hot temperatures and water availability, and thus might support similar organisms that can adapt to such scarce resources. Despite these two continents being far apart, these two areas could be more similar to each other than any other area in their own continent. Biomes have relevance in many areas of ecology, such as studies in speciation, adaptations, succession, and many more. Our project aims to model these bioregions of British Columbia.

Weak Entity: (Many) Natural Disasters **OccursIn** (One) Location

- [Explanation: A natural disaster type (i.e: fire) by itself does not provide useful information in the context of British Columbia. However, requiring users to input a location along with the type of natural disaster provides meaningful information about the region and species affected, along with how that natural disaster translates into how effective primary or secondary succession is for that soil type (which is related to the biome). Therefore, it is sensible to represent this relationship as a weak entity.]

IsA Relationship: Organism is either an Animal or a Plant (Total and Disjoint)

- [Explanation: Although there are obviously many more organisms outside of the animal and plant category, this project focuses on these two domains of life for simplification. Furthermore, we assume that a plant can not be an animal, and an animal can not be a plant – though such exceptions could exist in ecology.]

7 Entities: Climate, Geographic Barriers, Biome, Location, Soil, Organism, Geological Commodities *(Does Not include Natural Disasters from Weak Entity Relationship)*

7 Relationships:

- (Many) Soil **Shapes** (many) Biome
    - [Explanation: A biome consists of many soil types, and the soil type is one of the distinguishing features of a biome as it determines the life it supports. One soil type can be present in many biomes.]
- (Many) Organism **AdaptsTo** (many) Biome
    - [Explanation: Biomes can have many organisms, and one organism can adapt to many different biomes.]
- (Many) Organism **LivesIn** (Many) Location
    - [Explanation: Similar to the previous point, a location can have many different organisms, and one organism can live in many different locations.]
- (Many) Location **ExistsIn** (Many) Biome
    - [Explanation: Assumes that one city might possibly have multiple biomes within British Columbia, and evidently, one biome has multiple cities]
- (Many) Geographic Barriers **Impacts** (Many) Biome
    - [Explanation: Some geographic barriers such as the Rocky Mountains span multiple cities – and even provinces, and thus a geographic barrier impacts multiple biomes, and biomes have multiple geographic barriers]
- (Many) Locations **Contains** (Many) Geological Commodities
    - [Explanation: Geological commodities in this context refers to the geology present in British Columbia, such as the abundance of zinc, jade, nickel or certain rare metals. A geological commodity can be present in many locations, and the location can have many geological commodities.]
- (One) Climate **Influences** (Many) Biome
    - [Explanation: A biome is distinguished from other biomes mainly through its climate. Therefore, the climate of a biome is consistent and multiple climates are not used to refer to a single biome. However, if other aspects such as soil and water availability differ a lot, many different biomes can have the same climate, but be distinguishable through other aspects.]
- (Many) Animal **Consume** (Many) Plant
    - [Explanation: Many animals consume many different types of plants, and plants are consumed by many different animals.]

- (Many) Animal **Eats** (Many) Animal
    - [Explanation: Many animals eat many different types of animals, and an animal is eaten by many different animals.]

Further Notes about Attributes:

- **Source of Energy is an Attribute of Organism:** Sources of Energy can be classified into five categories: Carnivore, Herbivore, Omnivore, Mixotroph or Autotroph.

7. An explicit acknowledgment about your use of AI tools in this assignment.
There is no use of GenAI in this project.