Project Inga Database

Student Names List

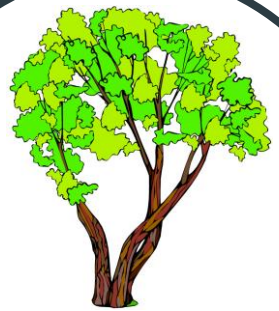
Date

Coley-Kursar Lab
Department of Biology: University of Utah

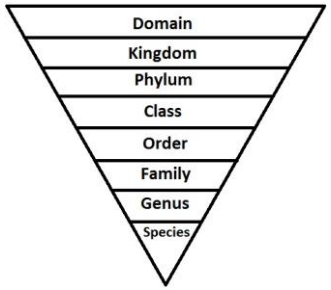
- Neotropical Tree Genus: Inga
- Evolution of Anti-Herbivore Defenses
- Need Database to Store Research Data

Entity Types

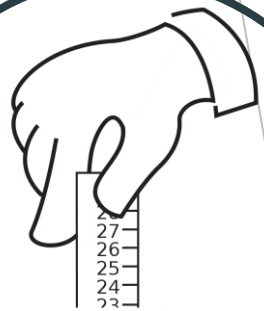
SITE



PLANT

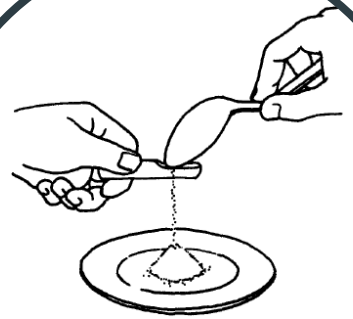


SPECIES

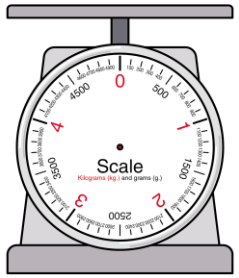


FIELD EVENT

CHEM COLLECTION



EXTRACTION



RESULT

Data Requirements
Entities

- Plant:
  - Plant_ID, Plant_Num, Trail_Address, Note
- Species:
  - Species_Code, Species_Name, Genus, Authority, Note
- Site:
  - Site_Name, Country, Latitude_Deg, Latitude_Min, Longitude_Deg, Longitude_Min, Temp, Annual_Rain, Rain_Seasonality, Rain_Seasonality_Pdf, Altitude, Soil, Soil_Pdf, Note

Data Requirements
Entities

- Field Event:
  - Field_Event_ID, Plant_DBH, Plant_Height, Plant_Size, Plant_Light, Collector, Date, Note
- Chemistry Collection:
  - Chem_Coll_ID, Chem_Coll_Num, Fresh_Weight, Box_Number, Unused_Material. Percent_Expansion, Status, Use, Type, Note
- Extraction:
  - Extraction_ID, Method, Chemist, Date, Notebook_Page, Notebook_Num, Note
- Result:
  - Chemical_Class, Weight, LC/MS_Image

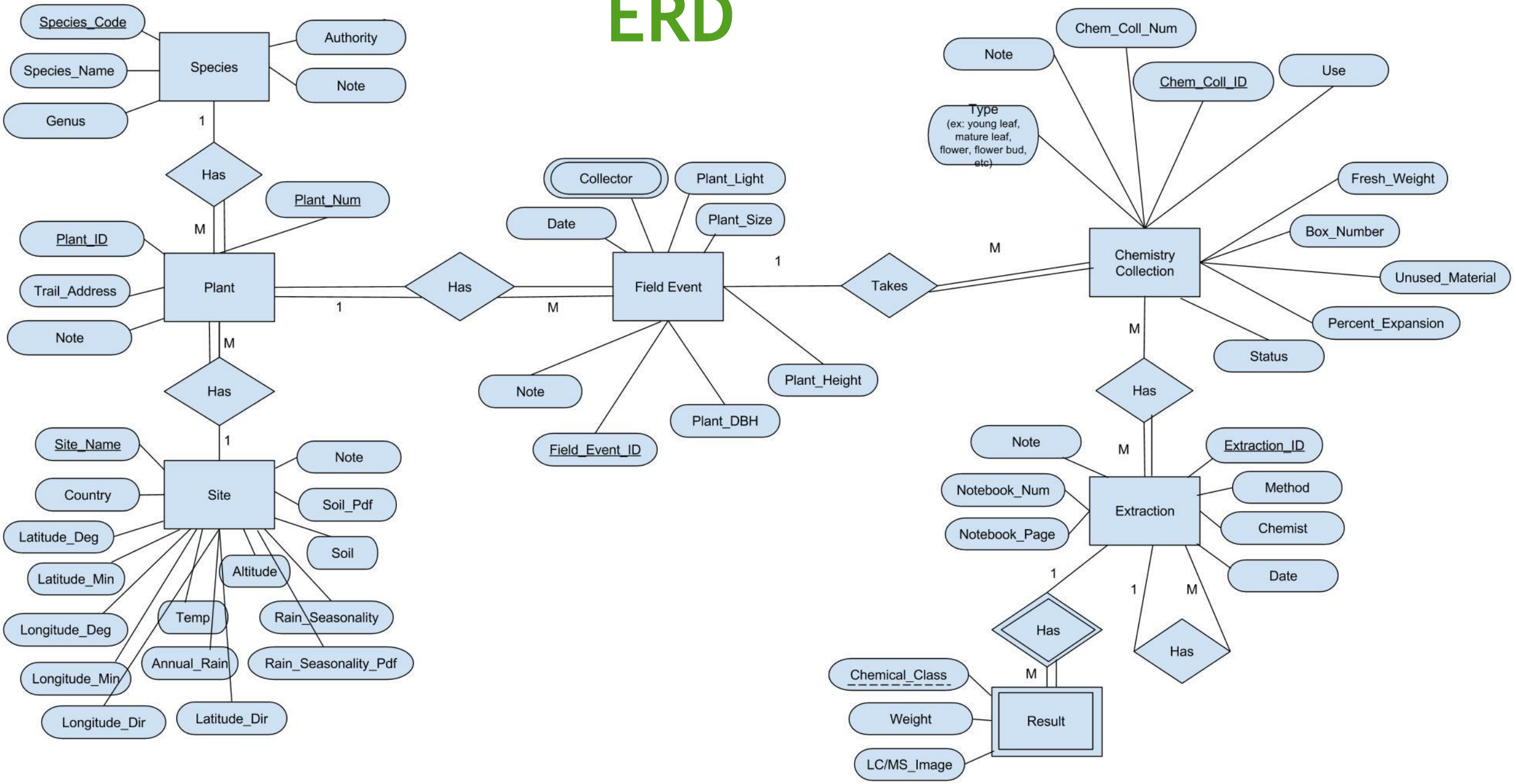
Data Requirements
Relationships

- Site – Plant:
  - A Site may have many Plants or no Plants.
  - Each Plant must have a Site
- Plant – Species:
  - A Plant may have only one Species.
  - Each Species may relate to more than one Plant or no Plants.
- Plant – Field Event:
  - Each Plant must have one Field Event.
  - Each Field Event relates to one Plant.

Data Requirements
Relationships

- Field Event – Chemistry Collection
  - Each Field Event may take no Chemistry Collections or many.
  - Each Chemistry Collection must be connected to one Field Events.
- Chemistry Collection – Extraction
  - Each Chemistry Collection may have many Extractions or none.
  - Each Extraction may have one Chemistry Collection or many
- Extraction – Result:
  - Each Extraction may have many Results or none.
  - Each Result may come from one Extraction.

ERD


Species_Code
Species_Name
Genus
Species
Authority
Note
1
Has
M
Plant_Num
Plant_ID
Trail_Address
Note
Plant
M
Has
1
Site_Name
Country
Latitude_Deg
Latitude_Min
Longitude_Deg
Longitude_Min
Longitude_Dir
Site
Note
Soil_Pdf
Soil
Altitude
Temp
Rain_Seasonality
Annual_Rain
Rain_Seasonality_Pdf
Latitude_Dir
1
Has
M
Collector
Date
Plant_Light
Plant_Size
Field Event
Note
Field_Event_ID
Plant_DBH
Plant_Height
1
Takes
M
Chem_Coll_Num
Note
Chem_Coll_ID
Use
Type
(ex: young leaf, mature leaf, flower, flower bud, etc)
Fresh_Weight
Box_Number
Unused_Material
Percent_Expansion
Status
Chemistry Collection
M
Has
Note
Notebook_Num
Notebook_Page
Extraction_ID
Method
Chemist
Date
Extraction
M
1
Has
M
1
M
Has
Chemical_Class
Weight
LC/MS_Image
Result

Relational Model

Plant (Plant_ID, Plant_Num, Species_Code, Site_Name, Trail_Address, Note)

Foreign Key (Species_Code) References Species (Species_Code)

Foreign Key (Site_Name) References Site (Site_Name)

Species (Species_Code, Species_Name, Genus, Authority, Note)

Site (Site_Name, Country, Latitude_Deg, Latitude_Min, Latitude_Dir, Longitude_Deg, Longitude_Min, Longitude_Dir, Temp, Altitude, Annual_Rain, Rain_Seasonality, Rain_Seasonality_Pdf, Soil, Soil_Pdf, Note)

Relational Model

Field_Event (Field_Event_ID, Plant_ID, Date, Plant_Light, Plant_Size, Plant_Height, Plant_DBH, Note)

Foreign Key (Plant_ID) References Plant (Plant_ID)

Collector (Field_Event_ID, Collector)

Foreign Key (Field_Event_ID) References Field_Event (Field_Event_ID)

Chem_Collection (Chem_Coll_ID, Chem_Coll_Num, Field_Event_ID, Type, Percent_Expansion, Use, Fresh_Weight, Box_Number, Status, Unused_Material, Note)

Foreign Key (Field_Event_ID) References Field_Event (Field_Event_ID)

Relational Model

Extraction (Extraction_ID, Date, Method, Chemist, Notebook_Num, Notebook_Page, Note, Parent_Extraction_ID)

Foreign Key (Parent_Extraction_ID) References Extraction (Extraction_ID)

Extraction_Result (Extraction_ID, Chemical_Class, Weight, LC/MS_Image)

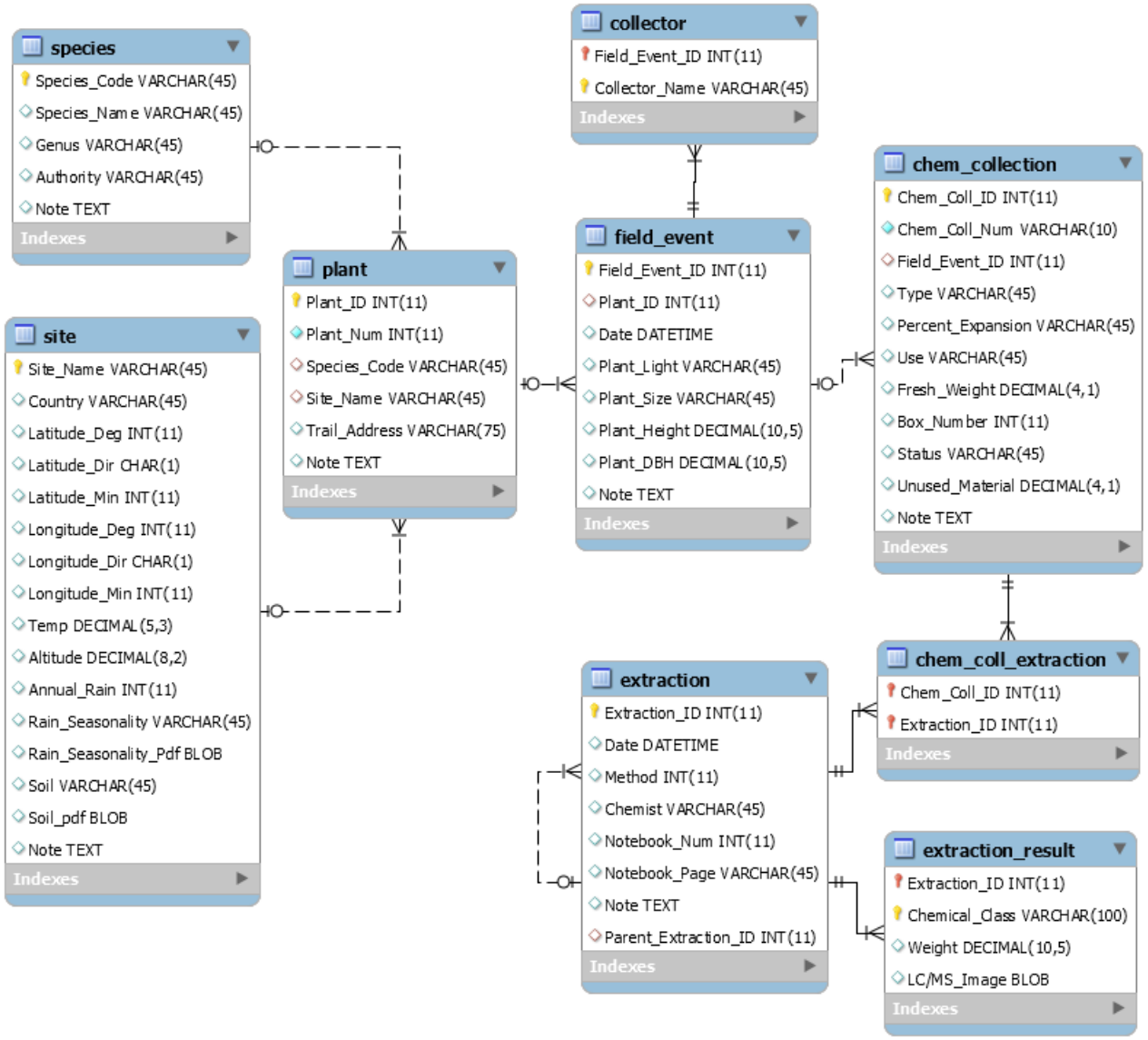
Foreign Key (Extraction_ID) References Extraction (Extraction_ID)

Chem_Coll_Extraction (Chem_Coll_ID, Extraction_ID)

Foreign Key (Chem_Coll_ID) References Chem_Collection (Chem_Coll_ID)

Foreign Key (Extraction_ID) References Extraction (Extraction_ID)

Physical Data Model



View, Queries, and Demonstration

View

- Extraction Results View

Queries

- Average plant_height at each site by species_code
- Number of species of each chemical collection status type
- List all species found at each site
- Average weight per chemical class by different type of collection (young leaf, mature leaf, etc)
- Average weight per chemical class for plants in different kinds of light (shade vs. sun vs. int)

Extraction Results View

```
create or replace view extraction_results_view as select site_name as 'Site
    name', plant.plant_num as 'Plant #', species.species_name as 'Plant
    species', chemical_class as 'Chemical class', weight as 'Result weight'
from extraction_result, extraction, chem_coll_extraction, chem_collection,
    field_event, plant, species
where extraction_result.extraction_ID = extraction.extraction_ID and
    extraction.extraction_ID = chem_coll_extraction.extraction_ID and
    chem_coll_extraction.chem_coll_ID = chem_collection.chem_coll_ID and
    chem_collection.field_event_id = field_event.field_event_id and
    field_event.plant_id = plant.plant_id and
    plant.species_code = species.species_code
order by site_name asc, plant.plant_id asc;
```

Average Plant Height at each Site by Species Code

```
select plant.Site_Name as 'Site name', plant.Species_Code as 'Species
    code', avg(field_event.plant_height) as Avg_Plant_Height
from field_event, plant
where field_event.plant_id = plant.plant_id
group by species_code
order by avg_plant_height;
```

Number of Species in each Chemical Collection Status type (extraction, ground, leaf)

```
Select cc.status as 'Chem Collection Status', Count(distinct
    p.Species_Code) as '# of distinct species'
from chem_collection as cc, plant as p, field_event as f
where cc.Field_Event_Id=f.Field_Event_Id and f.Plant_ID=p.Plant_ID
group by cc.status;
```

List all Species found at each Site

```
select plant.Site_Name as 'Site name', plant.Species_Code as 'Species
    Code', species.Species_Name as 'Species name'
from plant, species
where plant.species_code = species.species_code
group by plant.species_code
order by plant.site_name;
```

Average Weight by Chemical Class by different Type of Collection (young leaf, mature leaf, etc)

```
select chem_collection.type as 'Type of plant collection',
    extraction_result.Chemical_Class as 'Chemical class result',
    avg(extraction_result.weight) as 'Avg result weight' from
    extraction_result, chem_collection, extraction, chem_coll_extraction
where extraction_result.extraction_ID = extraction.extraction_ID and
extraction.extraction_ID = chem_coll_extraction.extraction_ID and
chem_coll_extraction.chem_coll_ID = chem_collection.chem_coll_ID
group by chem_collection.type, extraction_result.Chemical_Class;
```

Average Weight per Chemical Class for Plants in different kinds of Light (shade vs. sun vs. int)

```
select field_event.plant_light as 'Light Condition of Plant',
    extraction_result.Chemical_Class as 'Chemical Class',
    avg(extraction_result.weight) as 'Avg Result Weight' from
    extraction_result, chem_collection, extraction, chem_coll_extraction,
    field_event
where extraction_result.extraction_ID = extraction.extraction_ID and
extraction.extraction_ID = chem_coll_extraction.extraction_ID and
chem_coll_extraction.chem_coll_ID = chem_collection.chem_coll_ID and
chem_collection.field_event_ID = field_event.field_event_ID
group by field_event.plant_light, extraction_result.Chemical_Class;
```