

Databases – combining information  
from multiple tables

# Multiple tables

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- ▶ It is often not efficient to include all information of interest in a single table



Site	Family	Genus	Species	# of Indivs
6	ACERACEAE	ACER	SACCHARINUM	1
8	ACERACEAE	ACER	SACCHARINUM	1
9	ACERACEAE	ACER	SACCHARINUM	1
5	ACERACEAE	ACER	SACCHARUM	1
7	ACERACEAE	ACER	SACCHARUM	1
9	ACERACEAE	ACER	SACCHARUM	6
5	CAPRIFOLIACEAE	VIBURNUM	LENTAGO?	2
1	CORNACEAE	CORNUS	FLORIDA	4
10	CORNACEAE	CORNUS	FLORIDA	5
2	CORNACEAE	CORNUS	FLORIDA	1
3	CORNACEAE	CORNUS	FLORIDA	3
4	CORNACEAE	CORNUS	FLORIDA	5
5	CORNACEAE	CORNUS	FLORIDA	1
6	CORNACEAE	CORNUS	FLORIDA	6
7	CORNACEAE	CORNUS	FLORIDA	2
8	CORNACEAE	CORNUS	FLORIDA	5
9	CORNACEAE	CORNUS	FLORIDA	4
10	CUPRESSACEAE	JUNIPERUS	VIRGINIANA	2
10	FABACEAE	CERCIS	CANADENSIS	1
2	FABACEAE	CERCIS	CANADENSIS	1
8	FABACEAE	CERCIS	CANADENSIS	2
1	FAGACEAE	QUERCUS	ALBA	2
2	FAGACEAE	QUERCUS	ALBA	1
3	FAGACEAE	QUERCUS	ALBA	2
4	FAGACEAE	QUERCUS	ALBA	1
5	FAGACEAE	QUERCUS	ALBA	3
6	FAGACEAE	QUERCUS	ALBA	2
7	FAGACEAE	QUERCUS	ALBA	3
8	FAGACEAE	QUERCUS	ALBA	3

# Multiple tables

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- ▶ It is often not efficient to include all information of interest in a single table
- ▶ Inefficient because
  - ▶ We store more data than we need
  - ▶ We have to enter more data than we need to
  - ▶ Entering more data leads to more mistakes (and more time and energy finding them)
  - ▶ Makes it hard to change things later on



# Multiple tables

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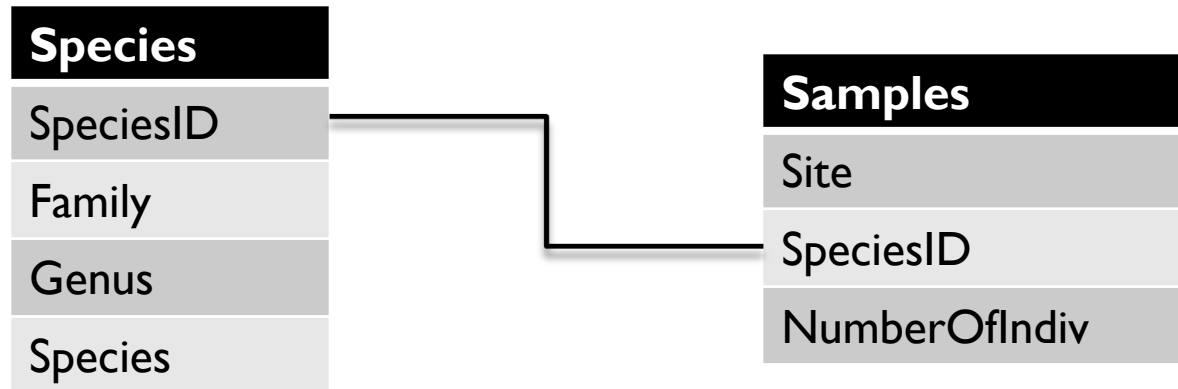
- ▶ To solve these problems we store data in multiple tables
- ▶ And connect the data in different tables using Joins or Relationships (hence Relational Database)



# Joins

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- ▶ Represented in Access (and other graphical systems) by lines connecting two tables



# Kinds of relationships

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- ▶ **One-to-one**

- ▶ Each table has only a single record for each unique value of the joining fields

- ▶ **One-to-many**

- ▶ One table has only a single record for each unique value of the joining fields and the other has multiple records

- ▶ **Many-to-many**

- ▶ Both tables have multiple records for each unique value of the joining fields



# Kinds of relationships

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- ▶ **Many-to-many**

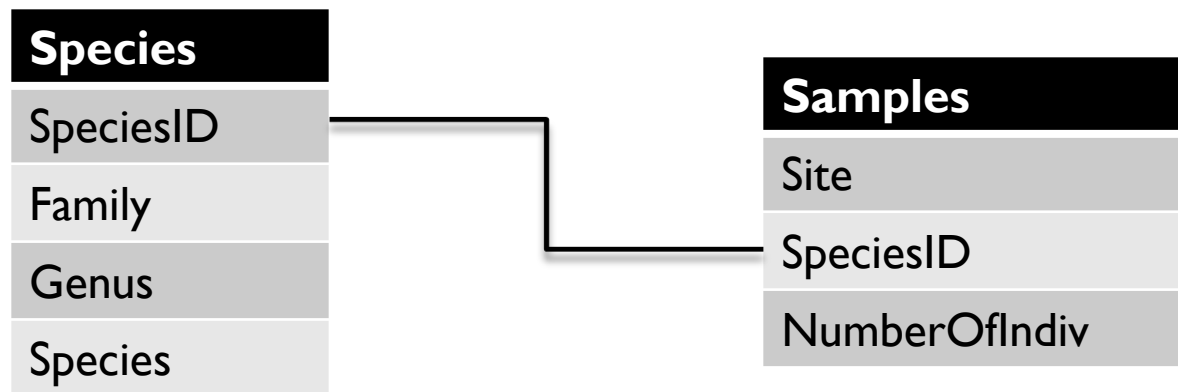
- ▶ Both tables have multiple records for each unique value of the joining fields



# Joins

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- ▶ When tables are joined queries can combine records from both tables
- ▶ By looking for matching values for the joining fields
- ▶ In a one-to-many context think of this as
  - ▶ Displaying all of the relevant fields from the many table with the relevant values from the one table filled in by looking up their appropriate value.



## Samples Table

Site	SpeciesID	# of Indiv
6	AS	1
8	AS	1
9	AS	1
5	AS	1
7	AS	1
9	AS	6
5	VL	2
1	CF	4
10	CF	5
2	CF	1
3	CF	3
4	CF	5
5	CF	1
6	CF	6
7	CF	2
8	CF	5
9	CF	4
10	JV	2
10	CC	1
2	CC	1
8	CC	2
1	QA	2
2	QA	1
3	QA	2
4	QA	1
5	QA	3
6	QA	2
7	QA	3
8	QA	3

## Species Table

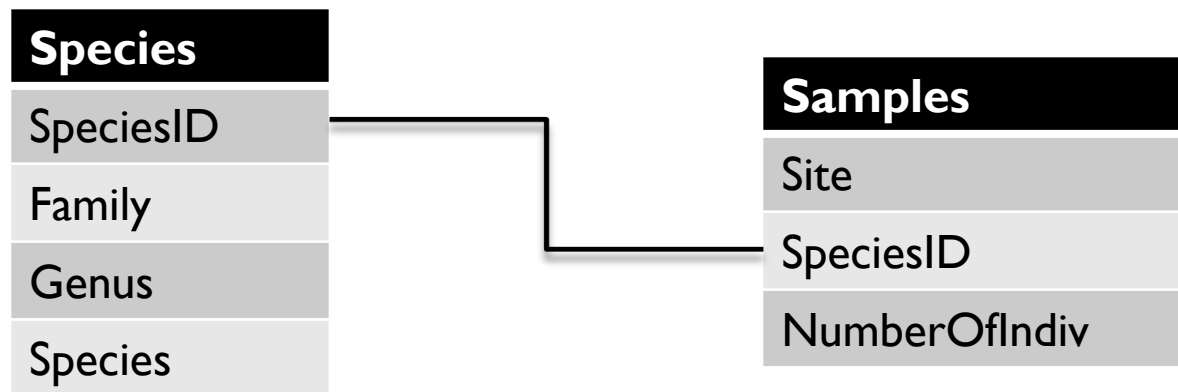
SpeciesID	Family	Genus	Species
AS	ACERACEAE	ACER	SACCHARINUM
VL	CAPRIFOLIACEAE	VIBURNUM	LENTAGO?
CF	CORNACEAE	CORNUS	FLORIDA
JV	CUPRESSACEAE	JUNIPERUS	VIRGINIANA
CC	FABACEAE	CERCIS	CANADENSIS
QA	FAGACEAE	QUERCUS	ALBA



# Joins

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- ▶ When tables are joined queries can combine records from both tables by looking for matching values for the joining fields
- ▶ In a one-to-many context think of this as
  - ▶ Displaying all of the relevant fields from the many table with the relevant values from the one table filled in by looking up their appropriate value.



Site	SpeciesID	Family	Genus	Species	# of Indiv
6	AS	ACERACEAE	ACER	SACCHARINUM	1
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5	VL	CAPRIFOLIACEAE	VIBURNUM	LENTAGO?	2
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3	CF	CORNACEAE	CORNUS	FLORIDA	3
4	CF	CORNACEAE	CORNUS	FLORIDA	5
5	CF	CORNACEAE	CORNUS	FLORIDA	1
6	CF	CORNACEAE	CORNUS	FLORIDA	6
7	CF	CORNACEAE	CORNUS	FLORIDA	2
8	CF	CORNACEAE	CORNUS	FLORIDA	5
9	CF	CORNACEAE	CORNUS	FLORIDA	4
10	JV	CUPRESSACEAE	JUNIPERUS	VIRGINIANA	2
10	CC	FABACEAE	CERCIS	CANADENSIS	1
2	CC	FABACEAE	CERCIS	CANADENSIS	1
8	CC	FABACEAE	CERCIS	CANADENSIS	2
1	QA	FAGACEAE	QUERCUS	ALBA	2
2	QA	FAGACEAE	QUERCUS	ALBA	1
3	QA	FAGACEAE	QUERCUS	ALBA	2
4	QA	FAGACEAE	QUERCUS	ALBA	1
5	QA	FAGACEAE	QUERCUS	ALBA	3
6	QA	FAGACEAE	QUERCUS	ALBA	2
7	QA	FAGACEAE	QUERCUS	ALBA	3
8	QA	FAGACEAE	QUERCUS	ALBA	3



# Joins

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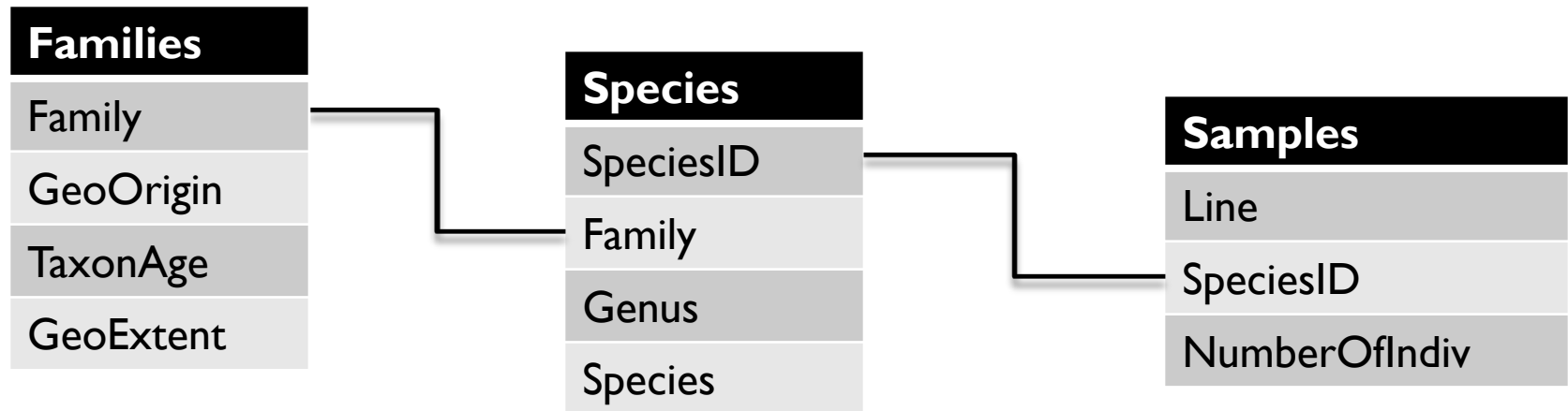
- ▶ When tables are joined queries can combine records from both tables
- ▶ By looking for matching values for the joining fields
- ▶ In a one-to-many context think of this as
  - ▶ Displaying all of the relevant fields from the many table with the relevant values from the one table filled in by looking up their appropriate value.
- ▶ Excludes records where either value is NULL/EMPTY in the joined fields
  - ▶ For basic or Inner Joins



# Nested Joins

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- ▶ Tables can be strung together using joins so that two tables are only connected to each other through a third table



# Types of Joins

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- ▶ **Inner**

- ▶ Returns rows where there is a match in both tables

- ▶ **Left**

- ▶ Returns all rows from the left table even if there is no match in the right table

- ▶ **Right**

- ▶ Returns all rows from the right table even if there is no match in the left table

- ▶ **Full**

- ▶ Returns where there is a match in one of the tables

