Outline

1. What is a Query? Query Language?
2. Example Database Tables
3. SQL Overview: 3 Components
4. SELECT statement with 1 table
5. Multi-table SELECT statements
6. Why spatial extensions are needed?
7. 1-table spatial queries
8. Multi-table spatial queries
9. Trends
Learning Objectives

• Upon completion of this module, students will be able to
  • List 3 components of SQL
  • Create and populate tables using SQL
What is SQL?

- Is a standard query language for relational databases
- Supports logical data model concepts
- Supported by major brands. e.g. IBM DB2, Oracle, MS SQL Server, Sybase, etc.
- Can express common data intensive queries
- SQL 1 and SQL 2 are not suitable for recursive queries
SQL and Spatial Data Management

• ESRI Arc/Info included a custom relational DBMS named Info
• Other GIS software can interact with DBMS using SQL
  • Using open database connectivity (ODBC) or other protocols.
• In fact, many software application use SQL to manage data in back-end DMBS
• And a vast majority of SQL queries are generated by other software
• Although we will be writing SQL queries manually!
Three components of SQL

1. Data definition language (DDL)
   - Creation and modification of relational schema
   - Schema objects include relations, indexes, etc

2. Data manipulation language (DML)
   - Insert, delete, update rows in tables
   - Query data in tables
Three components of SQL

• 3. Data control language (DCL)
  • Concurrency control, transactions
  • Administrative tasks, e.g. set up database users, security permissions

• Focus for now
  • A little bit of table creation (DDL) and population (DML)
  • Primarily Querying (DML)
Creating Tables in SQL

- **Table definition**
  - “CREATE TABLE” statement
  - Specifies table name, attributes names and data types
  - Create a table with no rows
  - See an example

```
CREATE TABLE River(
  NAME varchar(30),
  Origin varchar(30),
  Length number,
  Shape LineString
);
```
Creating Tables in SQL

- Related statements
  - ALTER TABLE modifies table schema if needed
  - DROP TABLE removes an empty table
Populating Tables in SQL

- Adding a row to an existing table
  - “INSERT INTO” statement
  - Specifies table name, attributes names and values
  - Example:
    
    ```
    INSERT INTO River(Name, Origin, Length)
    VALUES (‘Mississippi’, ‘USA’. 6000)
    ```
Populating Tables in SQL

- Related statements
  - SELECT statement with INTO clause can insert multiple rows in a table
  - Bulk load, import commands also add multiple rows
  - DELETE statement removes rows
  - UPDATE statement can change values within selected rows
Query: Exercise

Exercise:
Which one of the following operations is NOT in data definition language?

a) INSERT
b) ALTER
c) DROP
d) CREATE