# 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.
- 3 versions: SQL 1(1986), SQL 2(1992), SQL 3(1999)
- 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