



ASOR Cultural Heritage Initiative

QGIS

Module 02.11: Vectors: Points, Lines & Polygons

Jared Koller | William Reynolds



ASOR QGIS Module 02.11 – Vectors: Points, Lines & Polygons

QGIS is a free and open source Geographic Information System (GIS), or geodatabase, licensed under the GNU General Public License. QGIS runs on Linux, Unix, Mac OSX, Windows and Android and supports numerous vector, raster, and database formats and functionalities. Download QGIS here: <https://qgis.org/>.

QGIS users can view, edit, and analyze spatial information through its free software toolkit.

This **ASOR Tutorial (02.11)** of vector layers (shapefiles) in QGIS.

KEY CONCEPTS

- ❖ **Vectors in QGIS** – Vector data (shapefiles) represent geographic features as points, lines, or polygons, each with distinct properties and uses in spatial analysis.
- ❖ **Point Data** – Points represent discrete locations with coordinate pairs (x,y, and sometimes z). They are used for mapping specific objects, density analysis, and intra-site artifact distribution.
- ❖ **Line Data** – Lines represent one-dimensional features such as roads, rivers, or walls. They help document archaeological features, model landscapes, and analyze movement or trade networks.
- ❖ **Polygon Data** - Polygons represent areas with defined boundaries, useful for documenting site extents, analyzing spatial relationships, and modeling regions at various scales.
- ❖ **Archaeological Applications** – Points, lines, and polygons allow archaeologists to visualize, analyze, and model spatial patterns, supporting activities like site documentation, predictive modeling, and cultural heritage management.

TYPES OF VECTORS (SHAPEFILES)

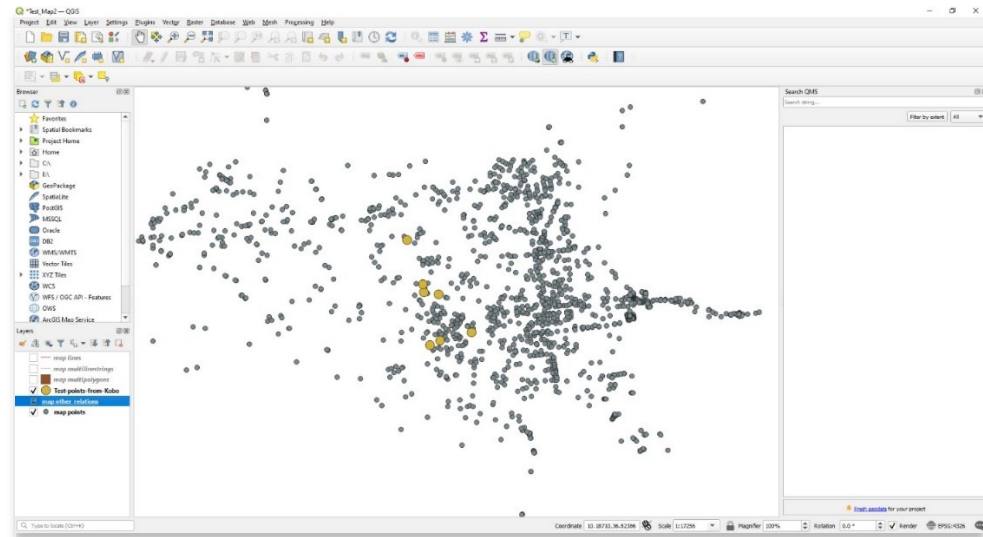
Shapefiles are vector-based data, which can be incorporated into a GIS project in three ways:

(1) points, (2) lines, and (3) polygons

Point Data

Key Characteristics

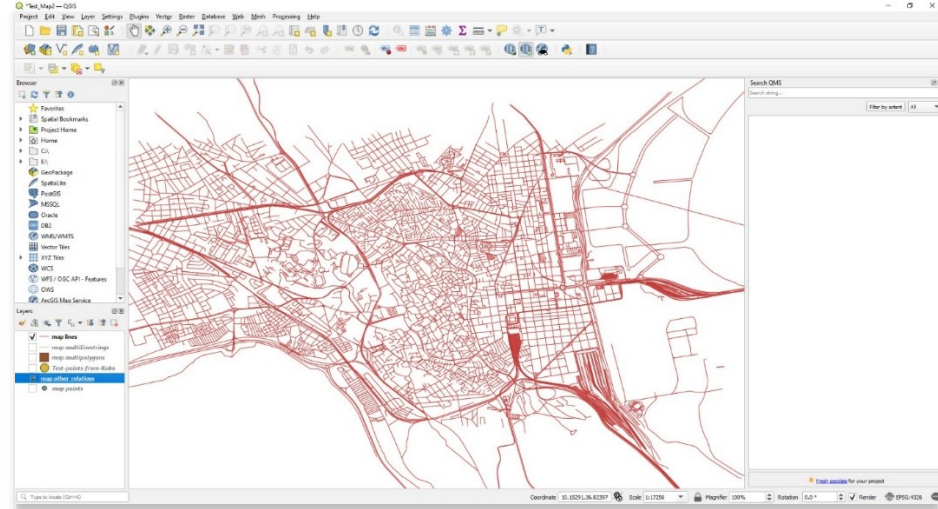
- **Zero-Dimensional:** Points represent locations with no measurable length or area.
- **Coordinate Pairs:** Each point has a unique X and Y coordinate, often a latitude and longitude pair, to define its specific position on Earth.
- **Distinct Entities:** Point data is used for discrete objects that are not connected or contiguous, unlike lines or polygons.
- **3D Data:** Some points, like aircraft locations or underground subway stations, also require a Z-value (height) to accurately represent their position in three-dimensional space.



Examples

- **Distribution analysis:** GIS allows archaeologists to visualize and analyze the spatial patterns of point-located data, revealing clusters or trends in the distribution of objects or sites across a landscape.
- **Density mapping:** Point data can be used to generate density maps (heatmaps) that show the concentration of finds across an area, highlighting high-activity zones or areas of specific artifact concentrations.
- **Intra-site analysis:** Within an excavation, points can be used to analyze the distribution of artifacts and features to understand how space was used, such as distinguishing areas for food preparation from those for tool making.

Line Data



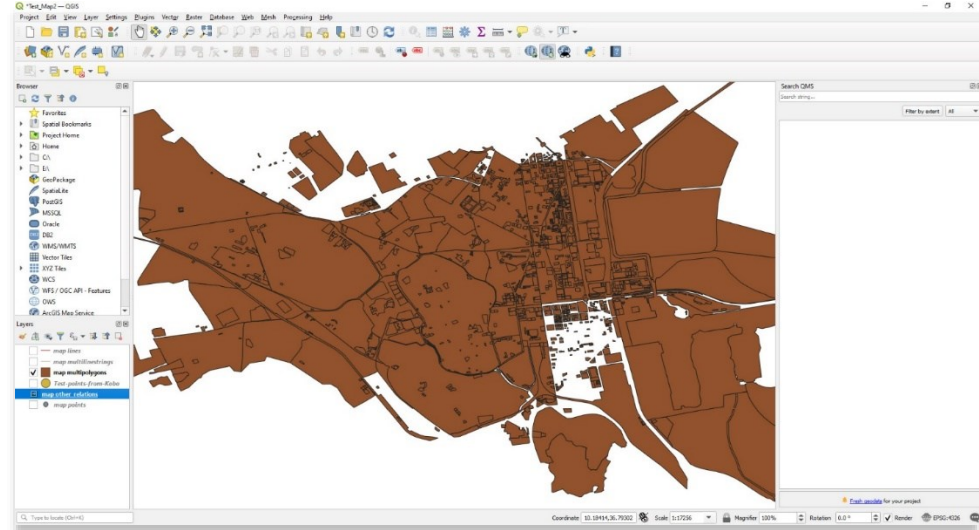
Key Characteristics

- **Linear Features:** Line data represents linear features such as roads, rivers, or trails.
- **One-Dimensional:** Lines are one-dimensional, meaning they have length but no area.
- **Start and End Points:** Most line features have a defined starting point and an ending point.
- **Coordinates:** Line data stores its shape and location using a series of connected x,y coordinates.
- **Attributes:** Line features are associated with attribute data that describes their real-world characteristics, such as road names or types.

Examples

- **Mapping site features:** Line data is used to map and document linear archaeological features during excavation and survey. This includes recording features like trenches, walls, pathways, and irrigation canals.
- **Documenting landscapes:** At a regional scale, archaeologists use line data to model ancient road networks, rivers, shorelines, and defensive walls. This helps in analyzing how ancient societies interacted with their surrounding environment.
- **Predictive modeling:** Line data, such as old roads or elevation contours, is often used in predictive models. These models analyze the landscape to identify areas with a high potential for undiscovered archaeological sites.
- **Movement and visibility analysis:** By mapping historical routes, archaeologists can perform cost-path analysis to model ancient transportation and trade networks. This reveals potential human movement patterns and how they might have influenced settlement locations.

Polygon Data



Key Characteristics

- **Vector format:** Polygons are a form of vector data, defined by a series of ordered x and y coordinates that close to form an area. Each coordinate pair, or vertex, defines the precise boundary of the feature.
- **Detailed boundaries:** By representing an area's precise boundaries, polygon data provides a more accurate and truthful representation of a feature's physical extent than point or line data. This is critical for assessing the size and scope of sites.

Examples

- **Site documentation:** Polygons are used to delineate the boundaries of entire archaeological sites or specific areas of interest, such as excavation units or architectural features.
- **Intra-site analysis:** By creating polygons for different zones within a single site, archaeologists can analyze the spatial distribution of artifacts, features, and other occurrences. This can help identify activity areas, such as workshops or residential zones.
- **Predictive modeling:** Archaeologists can use polygons to define areas of known archaeological potential. By analyzing the environmental characteristics of these areas (such as elevation and proximity to water sources), they can create predictive models to identify other likely locations of undiscovered sites.

Key Characteristics

- **Topological relationships:** Polygons allow archaeologists to define the spatial relationships between features, such as adjacency (sharing a boundary) and containment (one polygon being inside another). This can illustrate how different archaeological sites or features relate to one another within a landscape.
- **Attribute data:** Each polygon is linked to an attribute table containing descriptive information about the feature it represents. This can include details like site type, cultural period, excavation dates, and artifact types found within the area.
- **Modifiable scale:** Polygons maintain their geometry and precision at any scale. They do not lose detail when zoomed in, which makes them ideal for representing features from small excavation units to large regional territories.

Examples

- **Resource management:** Polygons are used to manage cultural heritage resources and plan for conservation. Maps showing protected areas, such as conservation areas and historic buildings, can inform decisions about land use and development.
- **Regional analysis:** Polygons can define the territories of past cultures or the distribution patterns of different settlement types. For example, a study using Thiessen polygons identified shifts in Neolithic settlement patterns, showing how settlement size and density evolved over time.
- **Landscape analysis:** By combining polygon data with other GIS data types, such as raster-based elevation models, archaeologists can conduct least-cost path analyses to understand how ancient populations moved across landscapes.

RESOURCES

QGIS Download: <https://qgis.org/>



VIEW ALL ASOR TUTORIALS FOR FREE

asor.org/chi/chi-tutorials