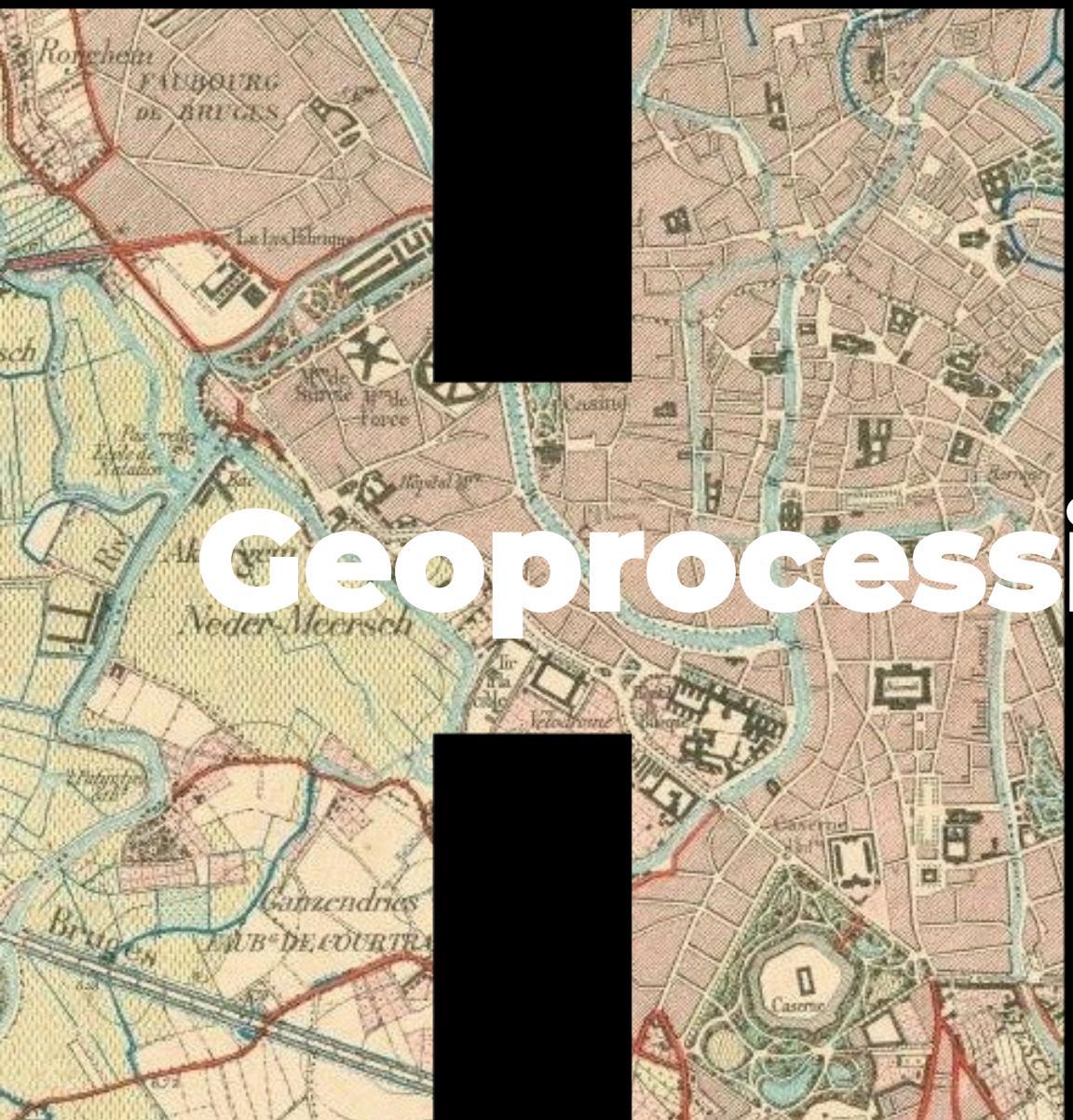


Project GeoICT

2021-2022

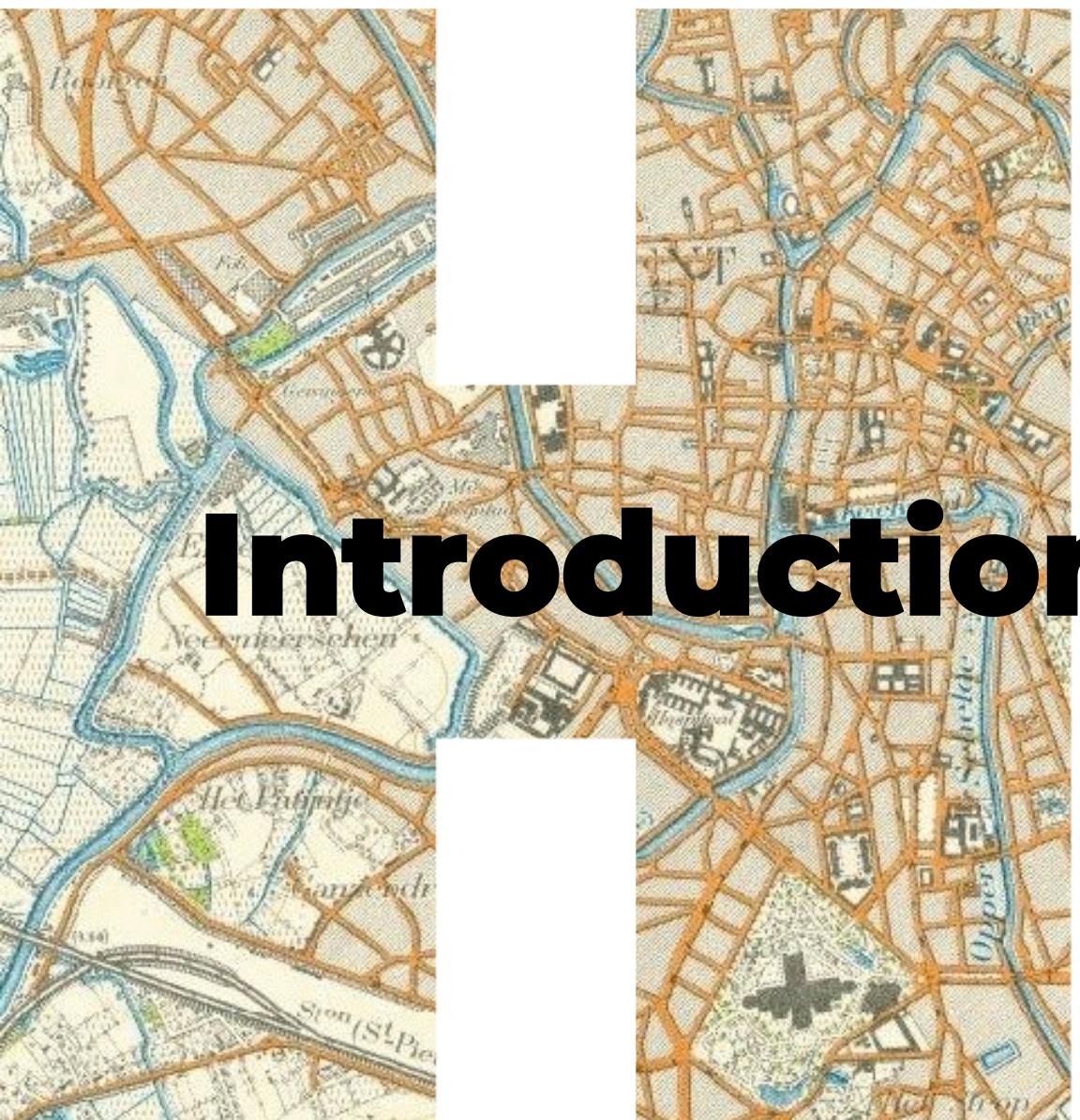
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Geoprocessing

Project GeolCT

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Introduction

Geoprocessing

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Why geoprocessing

- Some data does not (always) give answers
 - Answer given by parts of features
 - Answer given by complex relations with other features
- Data processing and data analysis required to convert data to information
- Allows to answer (complex) spatial questions

Difference with spatial queries

- Geoprocessing frequently preceded to allow asking questions
- Queries limited to attributes and entire features, rather than looking inside parts of the feature or complex relations between features
- Queries results in subsets of input dataset

Some background

What kind of data?

- Geoprocessing-algorithms are frequently suitable for either vector data, or raster data (not both)
- Here: primary focus on vector data

- ▶  Cartography
- ▶  Database
- ▶  File tools
- ▶  Graphics
- ▶  Interpolation
- ▶  Layer tools
- ▶  Network analysis
- ▶  Raster analysis
- ▶  Raster terrain analysis
- ▶  Raster tools
- ▶  Vector analysis
- ▶  Vector creation
- ▶  Vector general
- ▶  Vector geometry
- ▶  Vector overlay
- ▶  Vector selection
- ▶  Vector table
- ▶  GDAL
- ▶  GRASS
- ▶  LAStools
- ▶  Qgis2threejs
- ▶  SAGA

Some background

Help and support

- QGIS: limited explanation of various tools
- QGIS website and forums: are full of information
- Conceptual descriptions...

The screenshot shows the QGIS documentation website for version 2.8. The page title is "Vector Spatial Analysis (Buffers)". It includes a table of contents on the left and an overview section with a detailed description of spatial analysis.

Table of Contents:

- USER GUIDE/MANUAL
- USER GUIDE/MANUAL PDF'S
- PYQGIS COOKBOOK
- DOCUMENTATION GUIDELINES
- A GENTLE INTRODUCTION IN GIS
 - Preamble
 - Introducing GIS
 - Vector Data
 - Vector Attribute Data
 - Data Capture
 - Raster Data
 - Topology
 - Coordinate Reference Systems
 - Map Production
 - Vector Spatial Analysis (Buffers)**
 - Spatial Analysis (Interpolation)

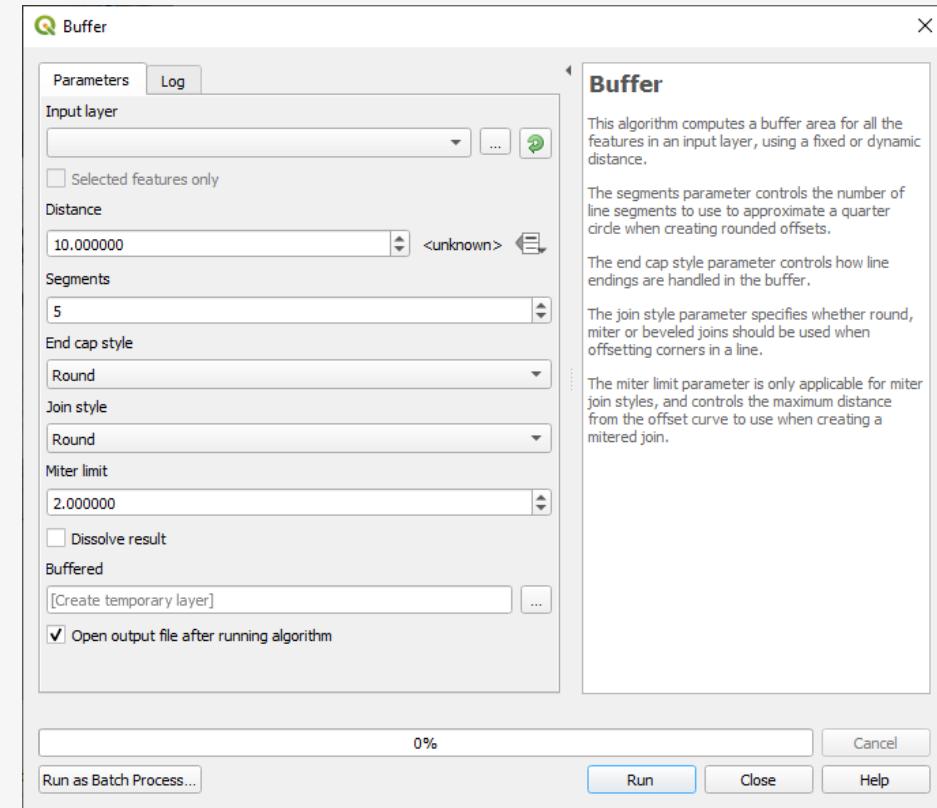
Vector Spatial Analysis (Buffers) Overview:

Objectives: Understanding the use of buffering in vector spatial analysis.

Keywords: Vector, buffer zone, spatial analysis, buffer distance, dissolve boundary, outward and inward buffer, multiple buffer

Text:

Spatial analysis uses spatial information to extract new and additional meaning from GIS data. Usually spatial analysis is carried out using a GIS Application. GIS Applications normally have spatial analysis tools for feature statistics (e.g. how many vertices make up this polyline?) or geoprocessing such as feature buffering. The types of spatial analysis that are used vary according to subject areas. People working in water management and research (hydrology) will most likely be interested in analysing terrain and modelling water as it moves across it. In wildlife



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Important geoprocessing tools in QGIS

Geoprocessing

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Geoprocessing tools in QGIS

Vector →

Geoprocessing tools:

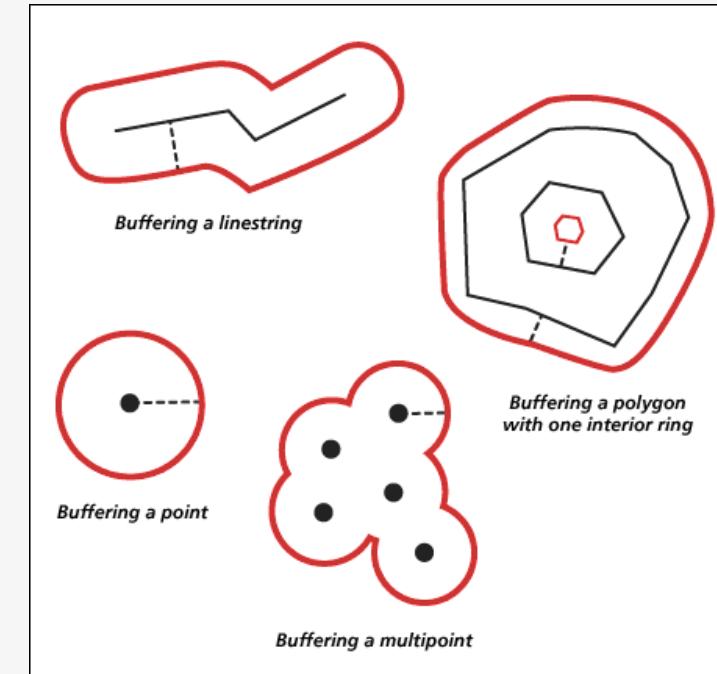
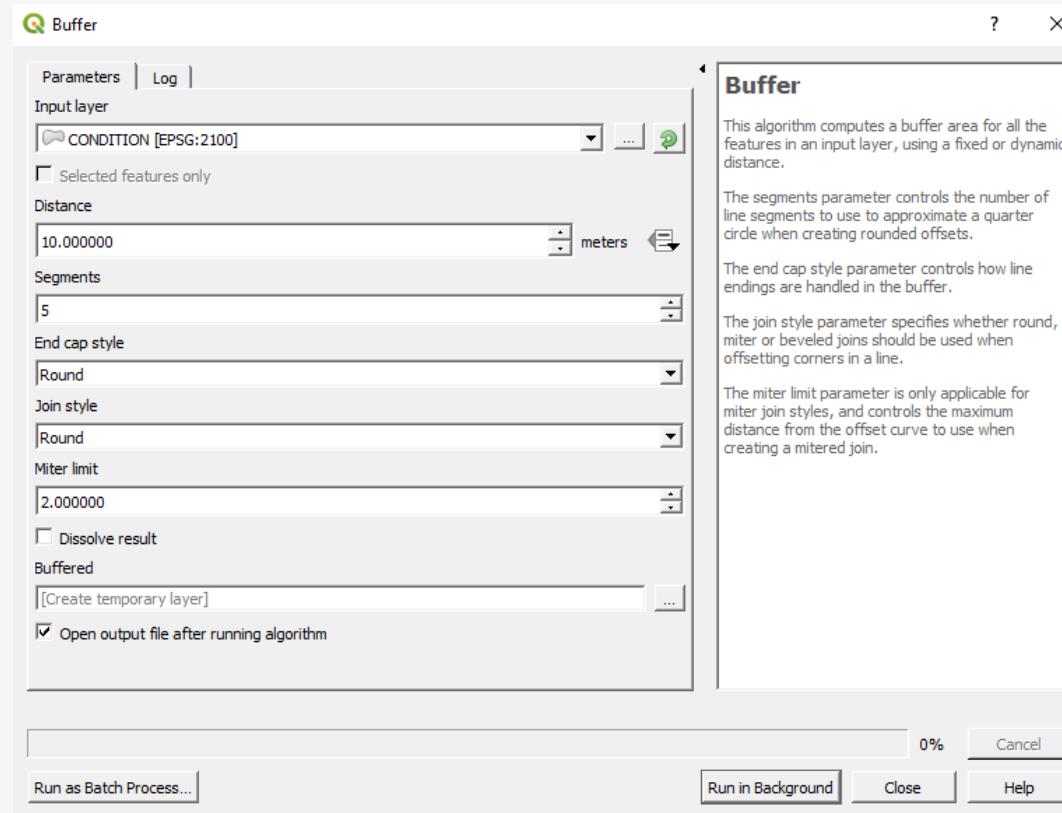
-  Buffer...
-  Clip...
-  Convex Hull...
-  Difference...
-  Dissolve...
-  Intersection...
-  Symmetrical Difference...
-  Union...
-  Eliminate Selected Polygons...

Toolbox →

Vector ...:

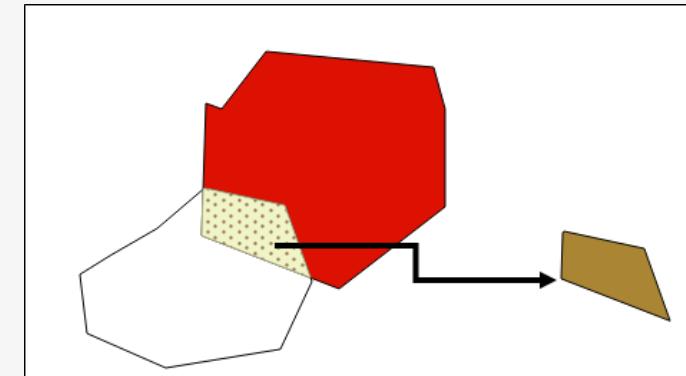
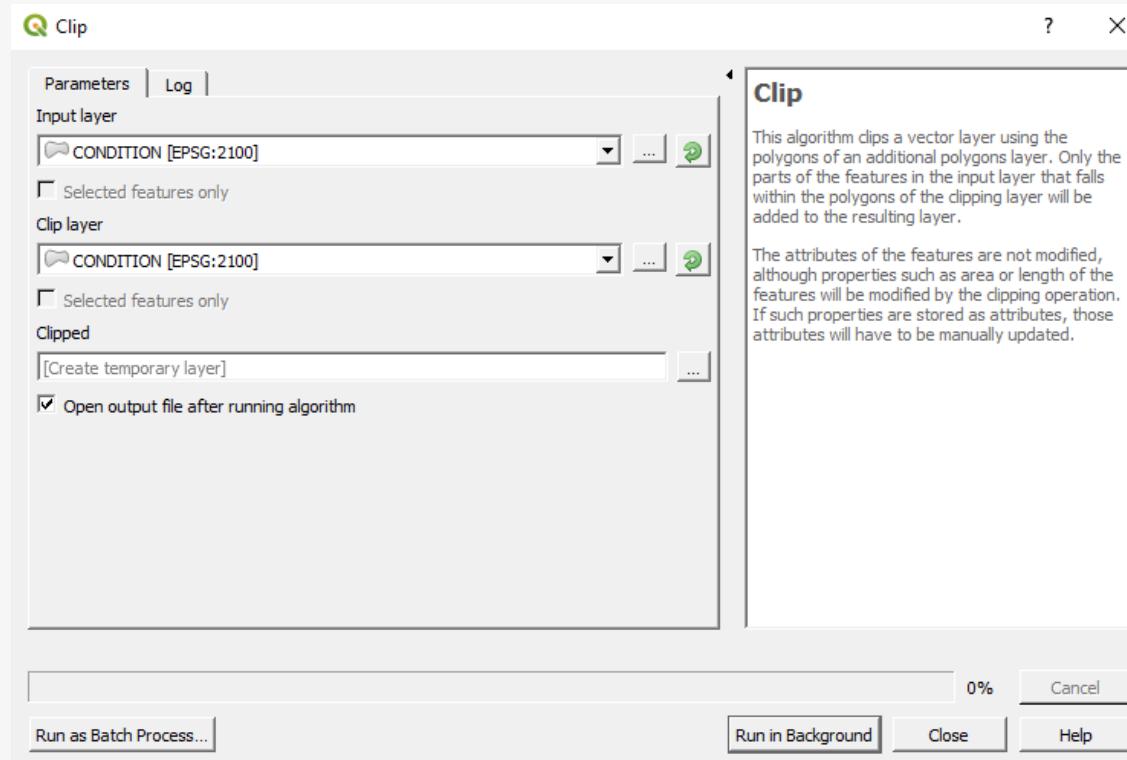
-  Vector analysis
-  Vector creation
-  Vector general
-  Vector geometry
 -  Add geometry attributes
 -  Aggregate
 -  Boundary
 -  Bounding boxes
 -  Buffer
 -  Centroids
 -  Check validity
 -  Collect geometries
 -  Concave hull (alpha shapes)
 -  Concave hull (k-nearest neighbor)
 -  Convert geometry type
 -  Convex hull
 -  Create layer from extent
 -  Create wedge buffers
 -  Delaunay triangulation
 -  Delete holes
 -  Densify by count
 -  Densify by interval
 -  Dissolve

Fixed or variable buffer distance

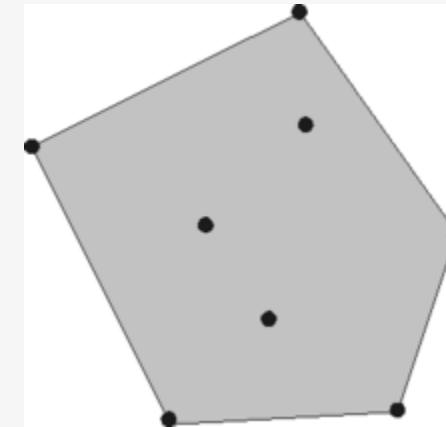
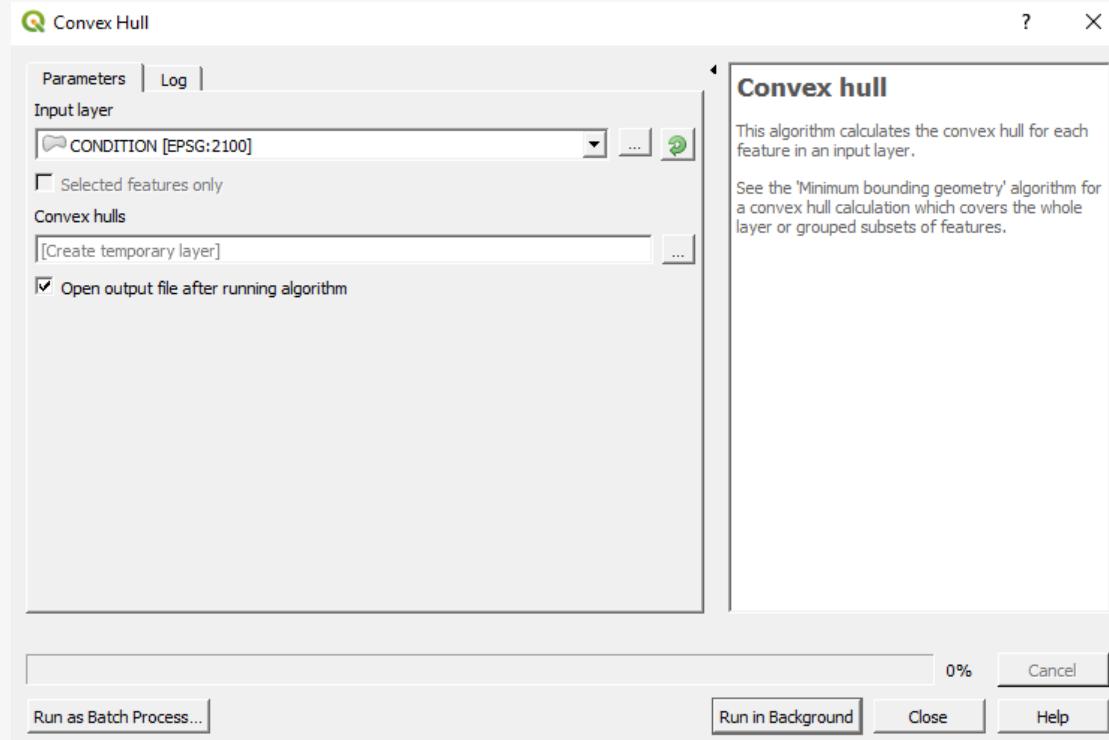


Important geoprocessing tools in QGIS

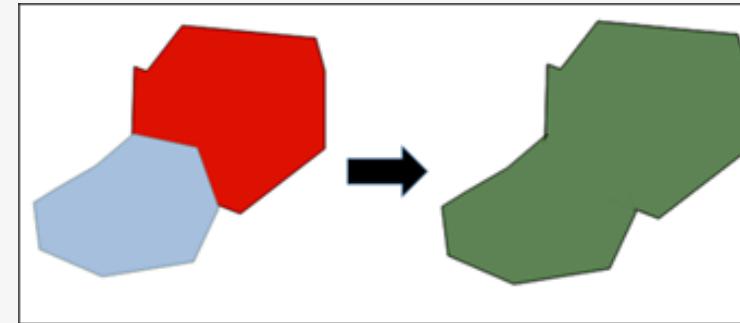
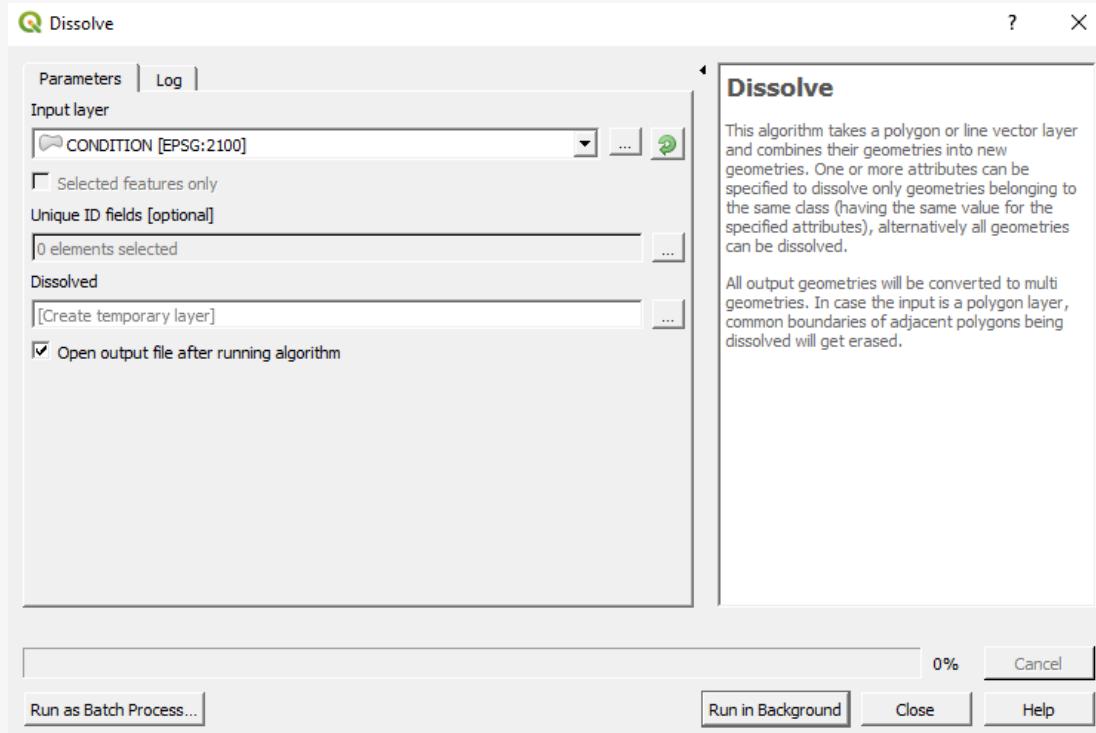
Clip



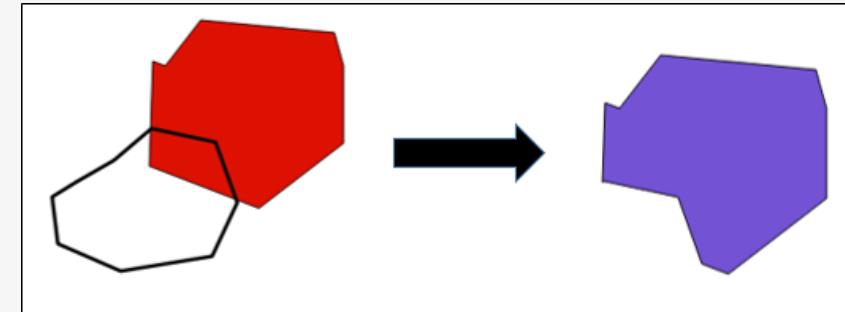
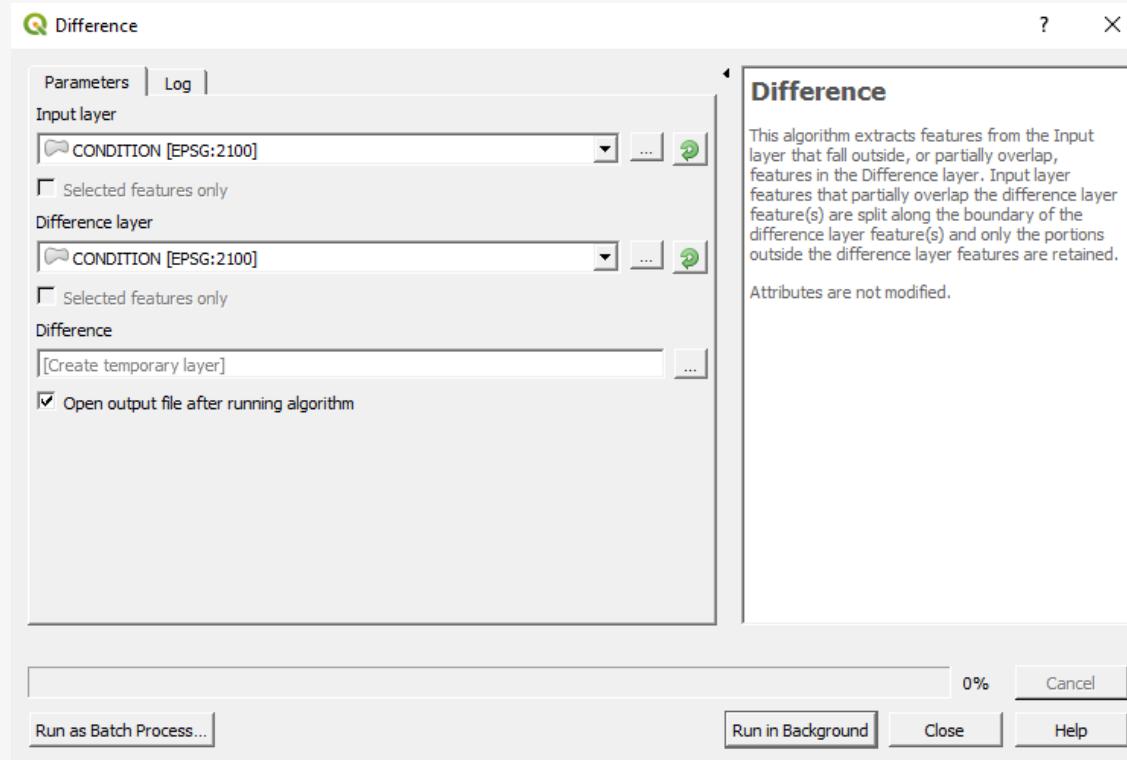
Convex hull



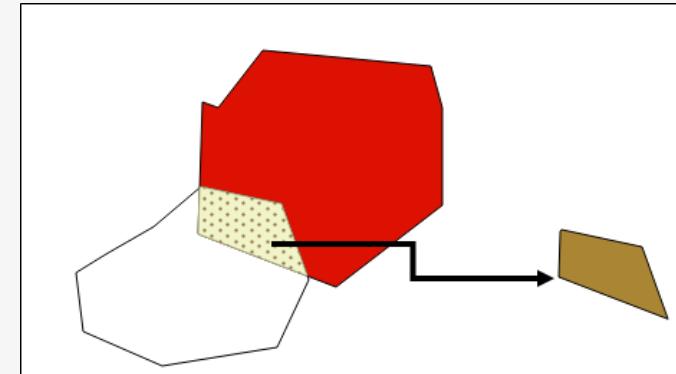
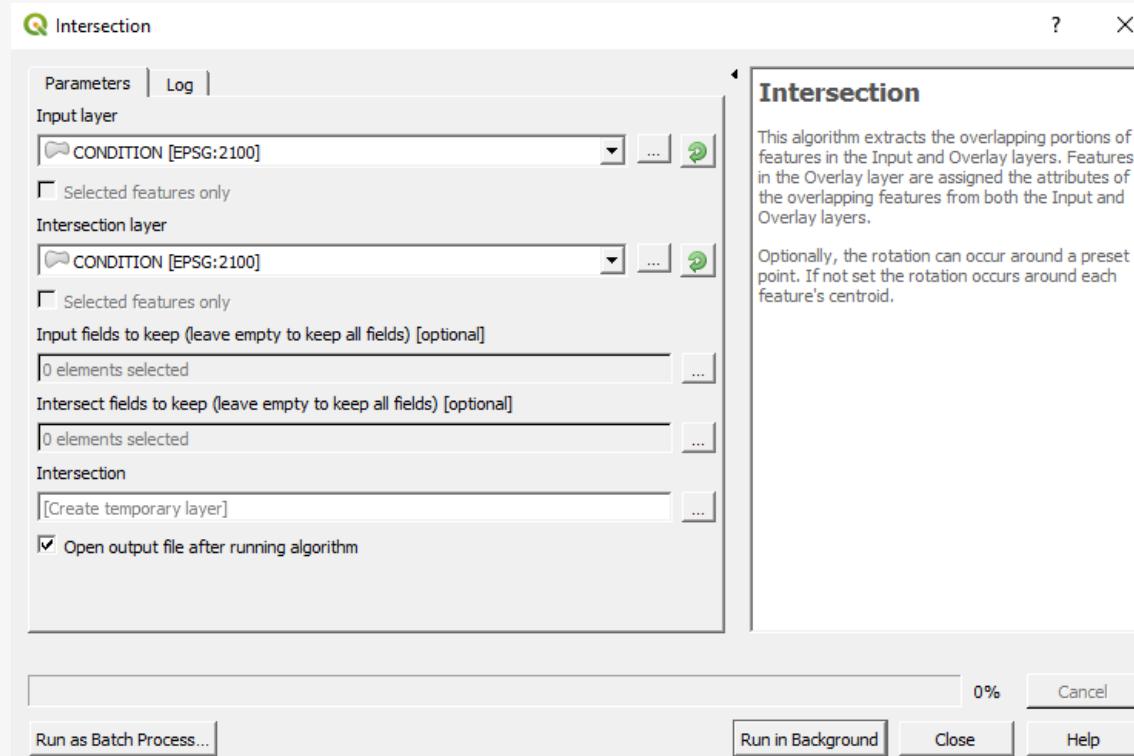
Dissolve: all or based on unique id



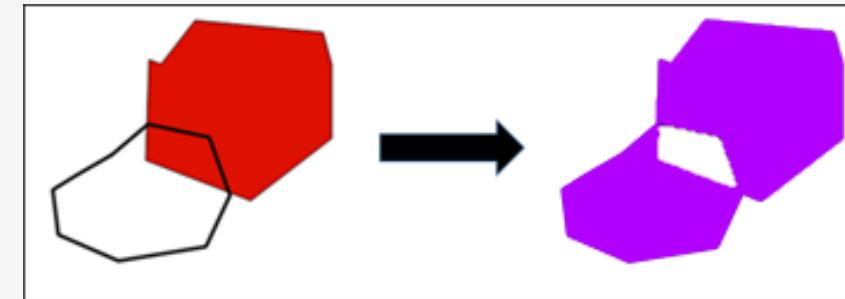
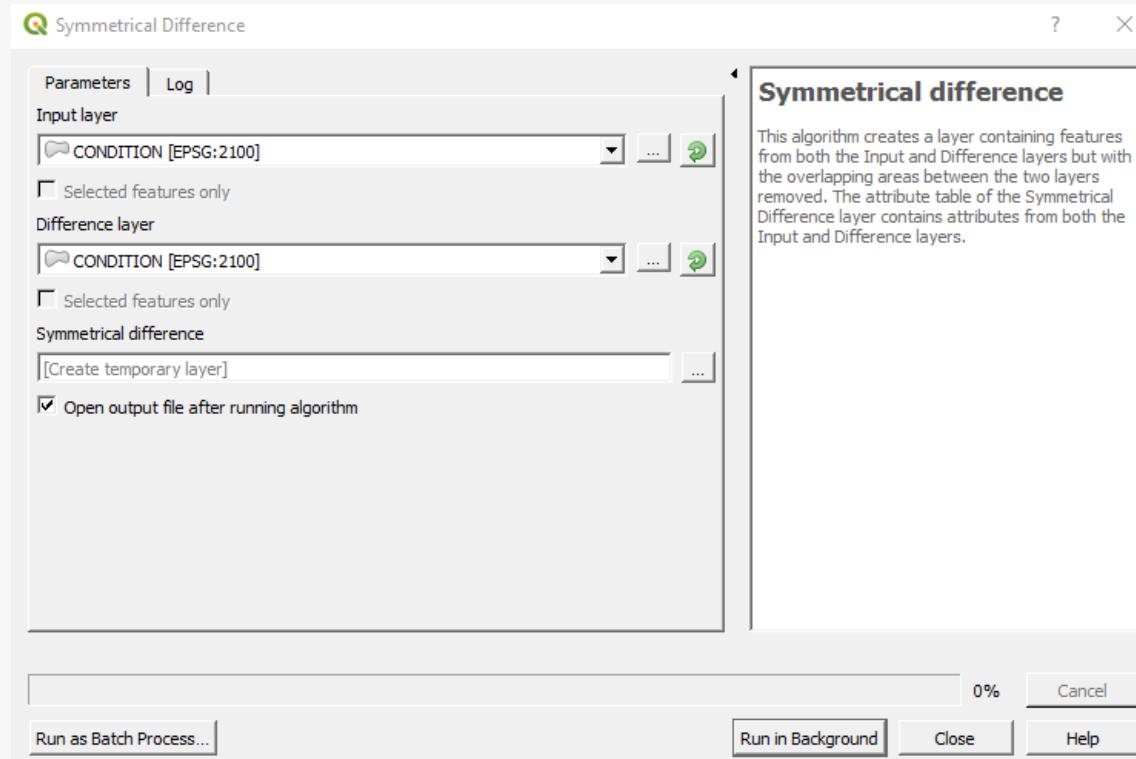
Difference



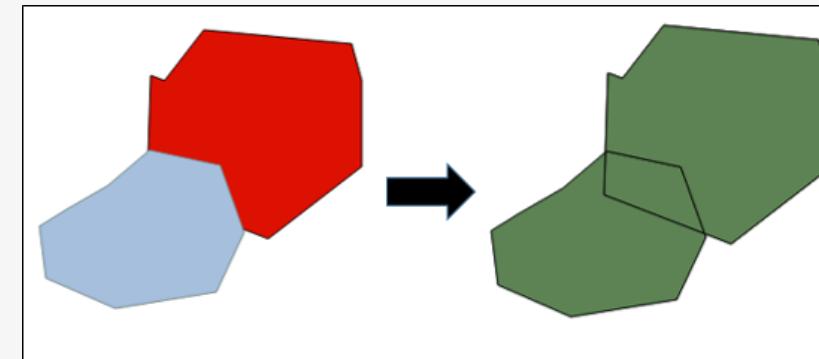
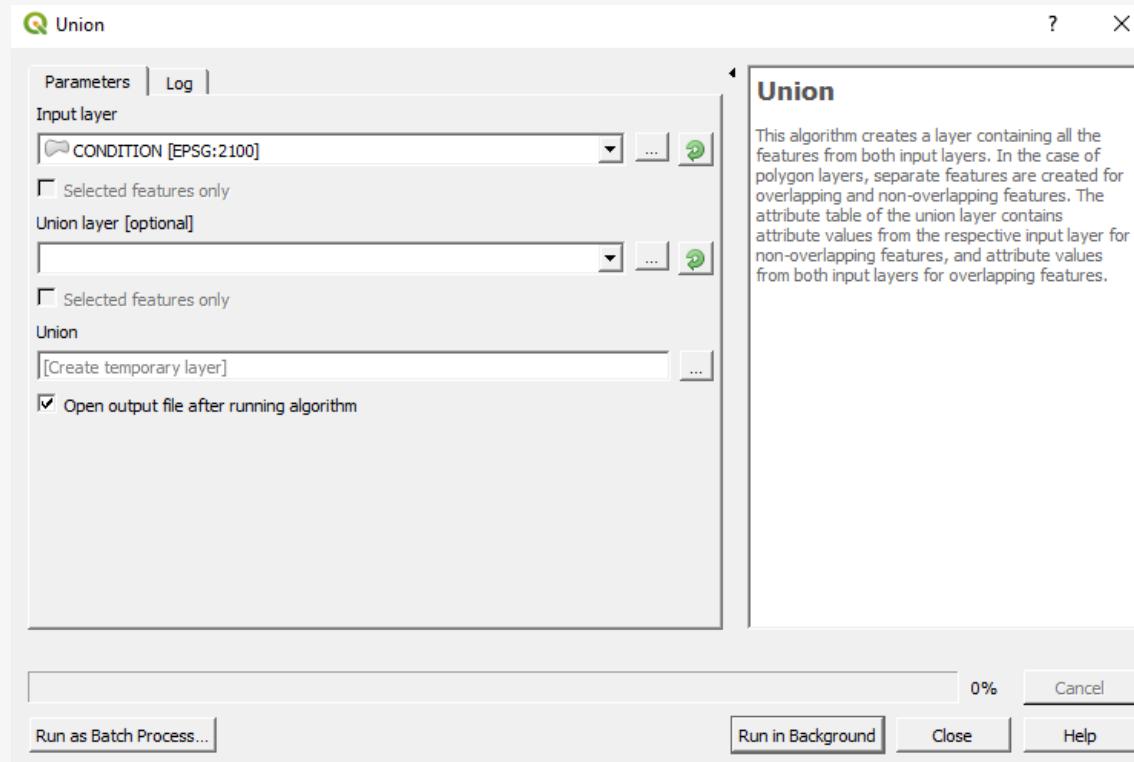
Intersection



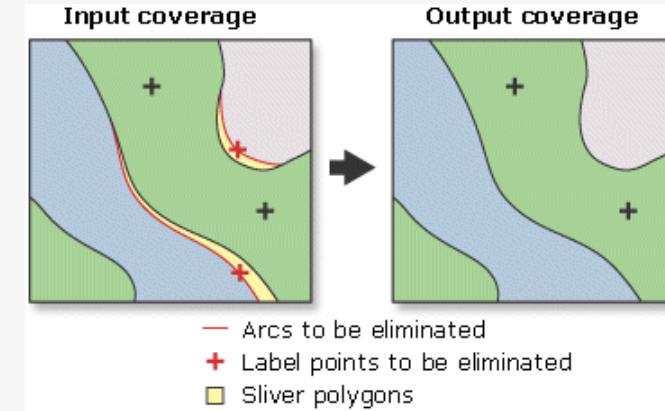
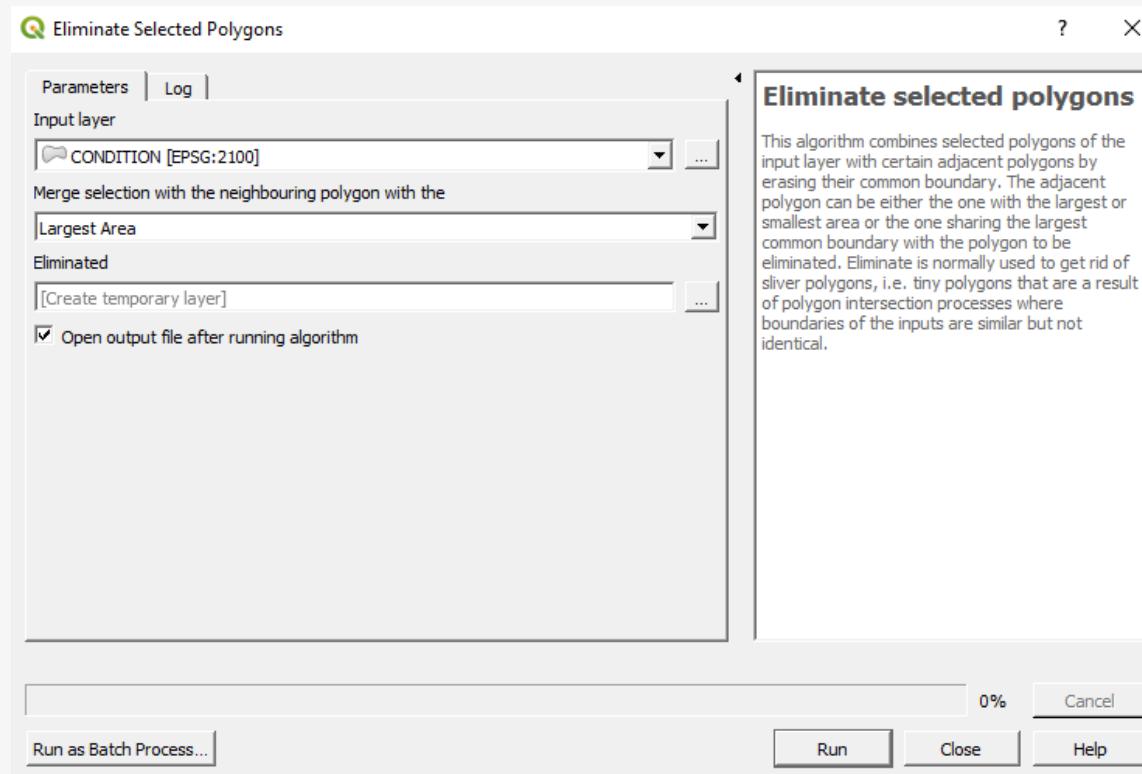
Symmetrical Difference



Union

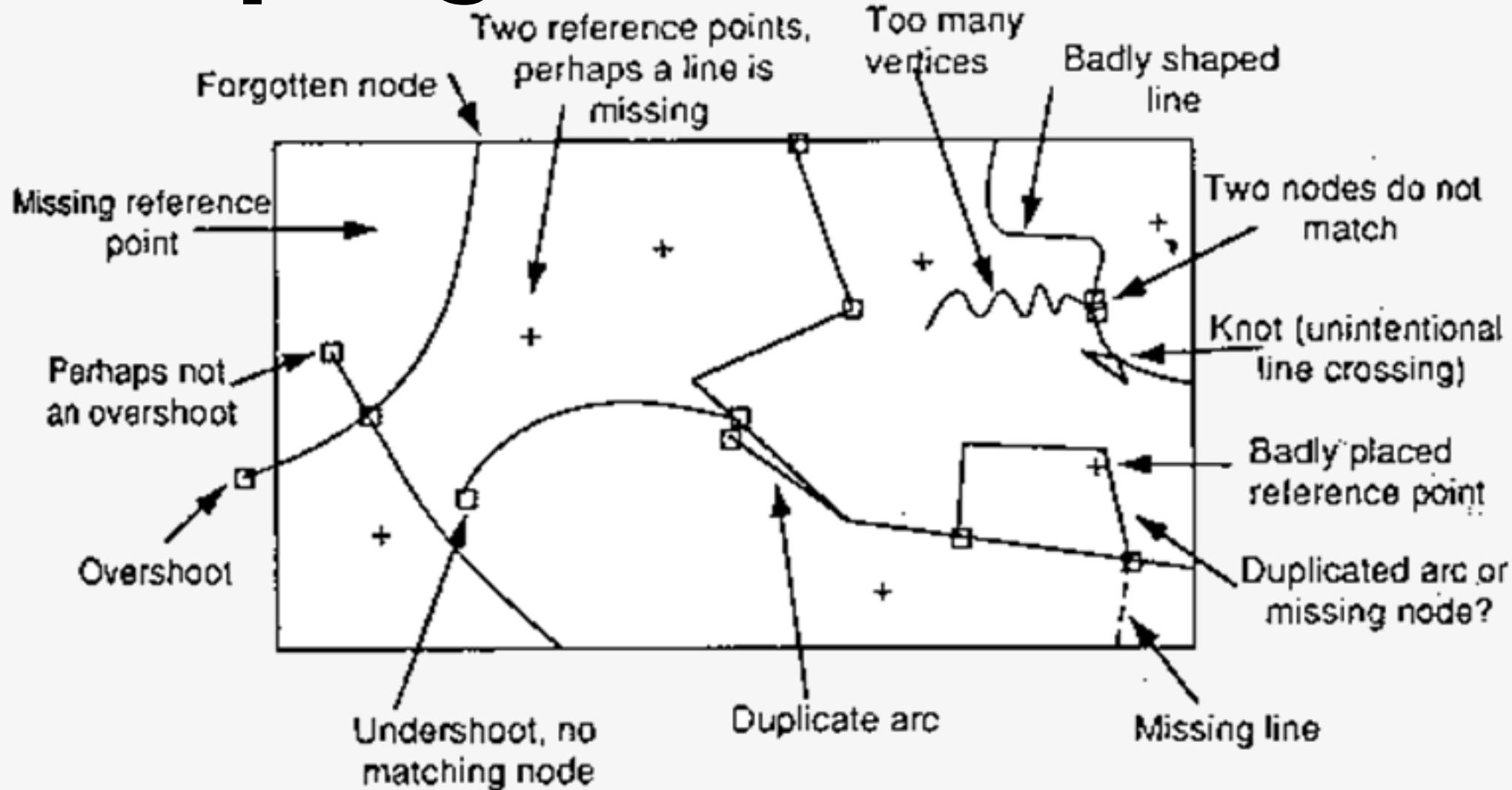


Eliminate Selected Polygons

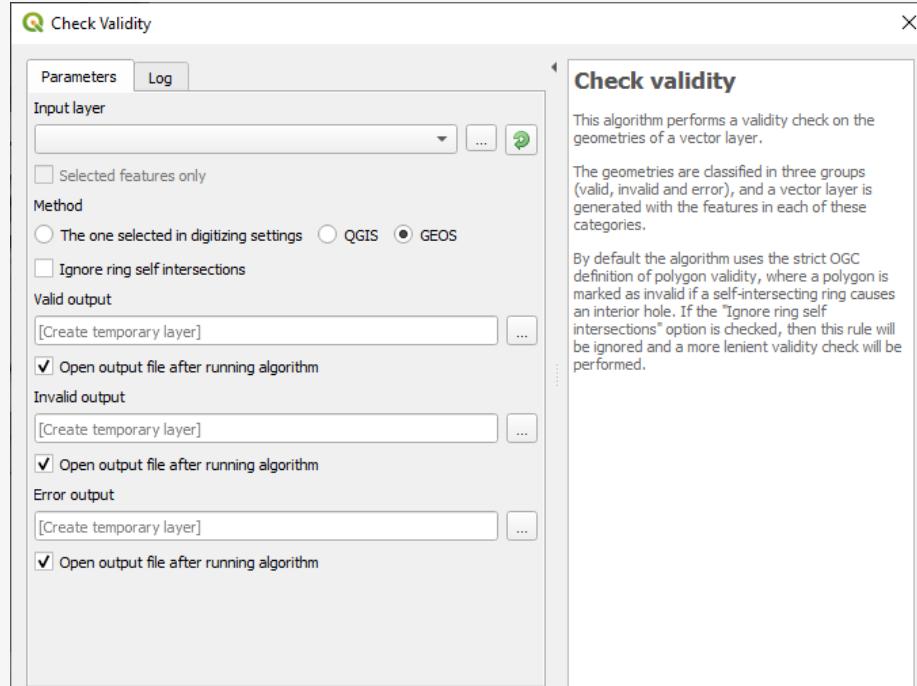


(=sliver removal)

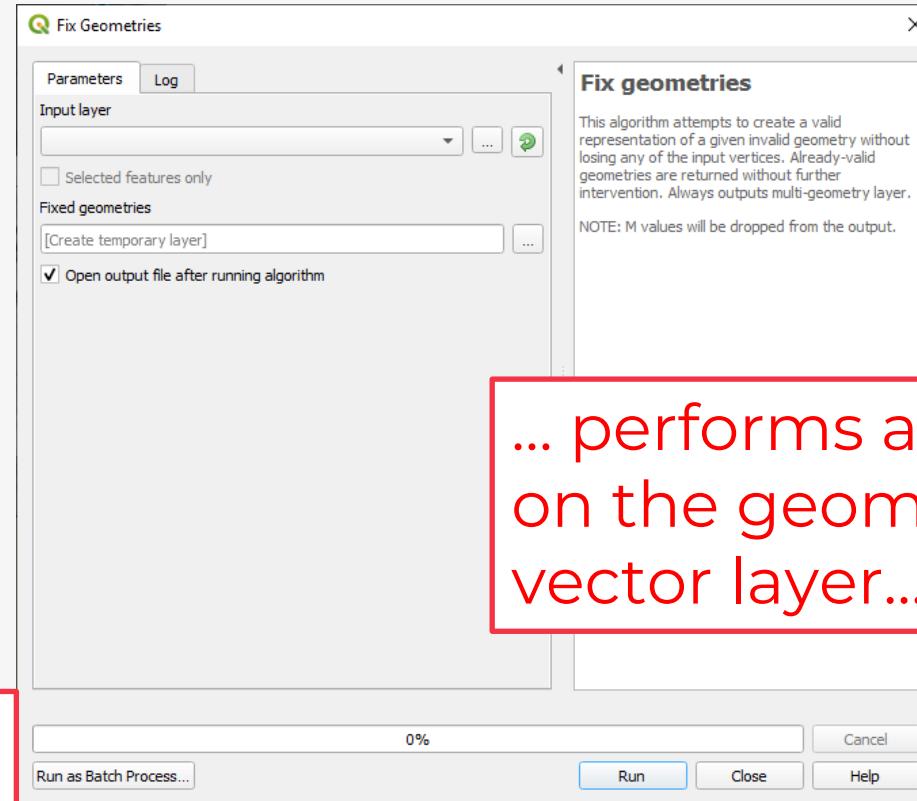
Topological errors



Topological errors

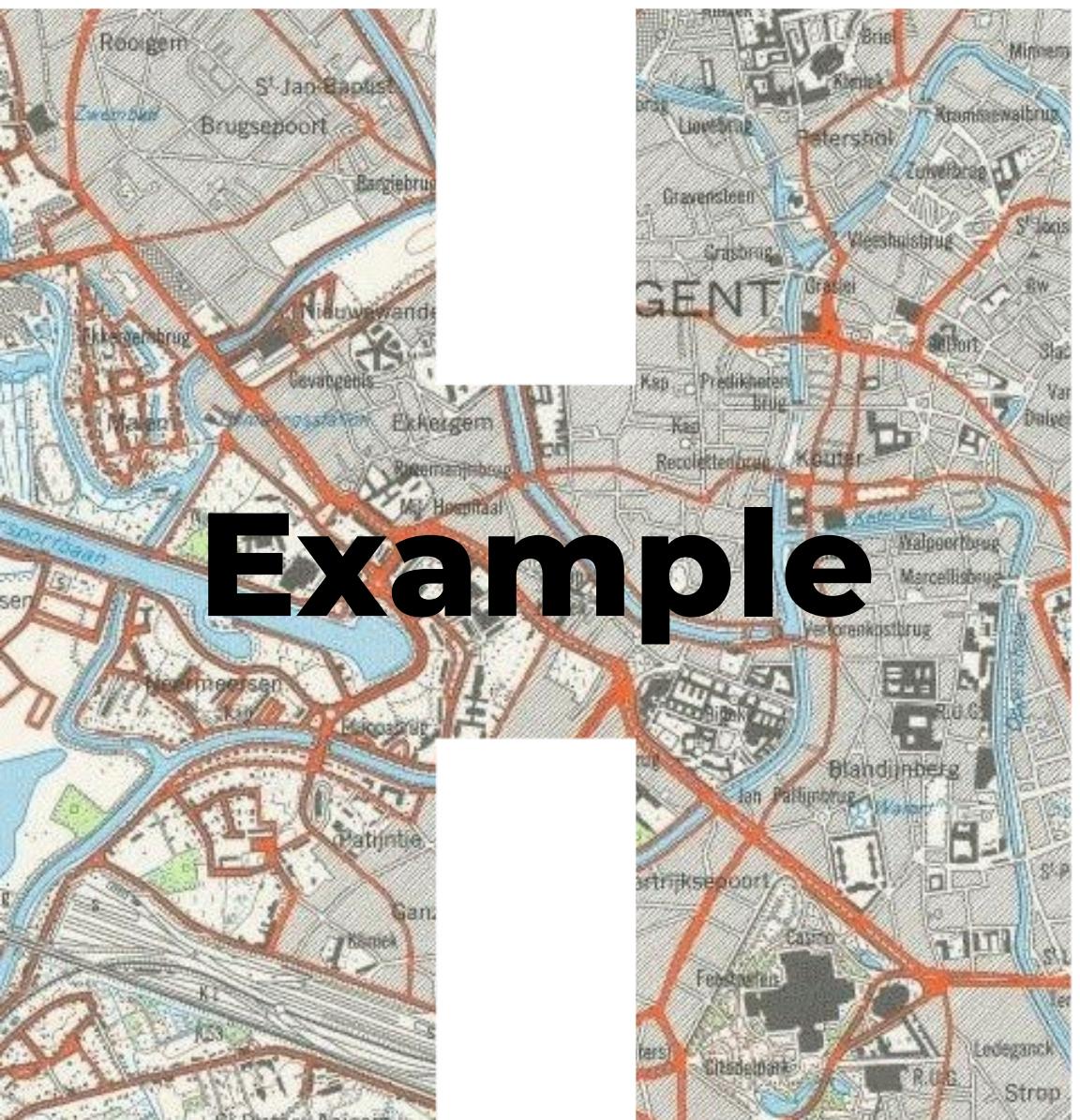


... attempts to create a valid representation of a given invalid geometry without losing any of the input vertices...



Sometimes required when spatial data has topological errors (apparent after error message...)

... performs a validity check on the geometries of a vector layer...



Example

Geoprocessing

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Example

Context

Objective:

Make extraction from 'AncientPlaceNames_Pleiades' within Iran that are at least 1 km near a major river or at least 5 km from the sea

Data:

- Sites: AncientPlaceNames_Pleiades
- Countries: ne_10m_admin_0_countries
- Rivers: ne_10m_rivers_lake_centerlines

Example

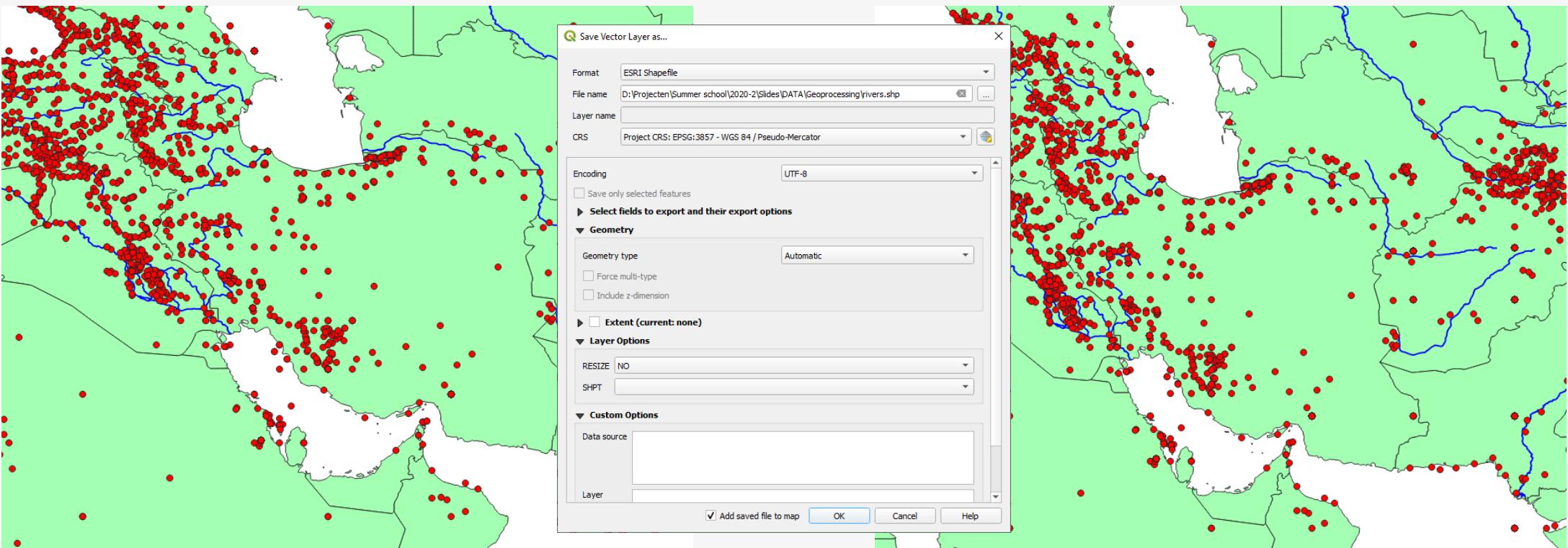
Steps

Make extraction from 'AncientPlaceNames_Pleiades' within Iran that are at least 1 km near a major river or at least 5 km from the sea:

1. Transform data to Pseudo Mercator (EPSG:3587)
2. Select Iran and neighboring countries
3. Dissolve administrative boundaries
4. Buffer (-5km) with administrative boundaries
5. Symmetrical difference between dissolve and buffer
6. Select rivers and buffer (1km)
7. Union river buffers and coastal buffers
8. Clip union with Iran
9. Select sites that intersect with resulting polygon

Example

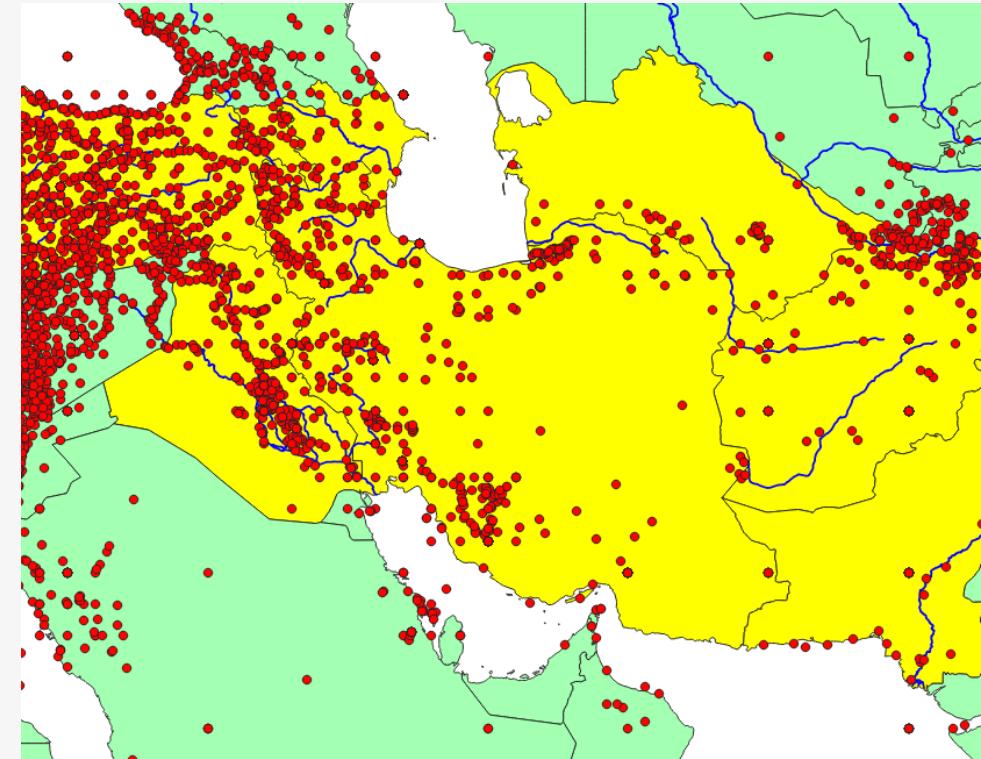
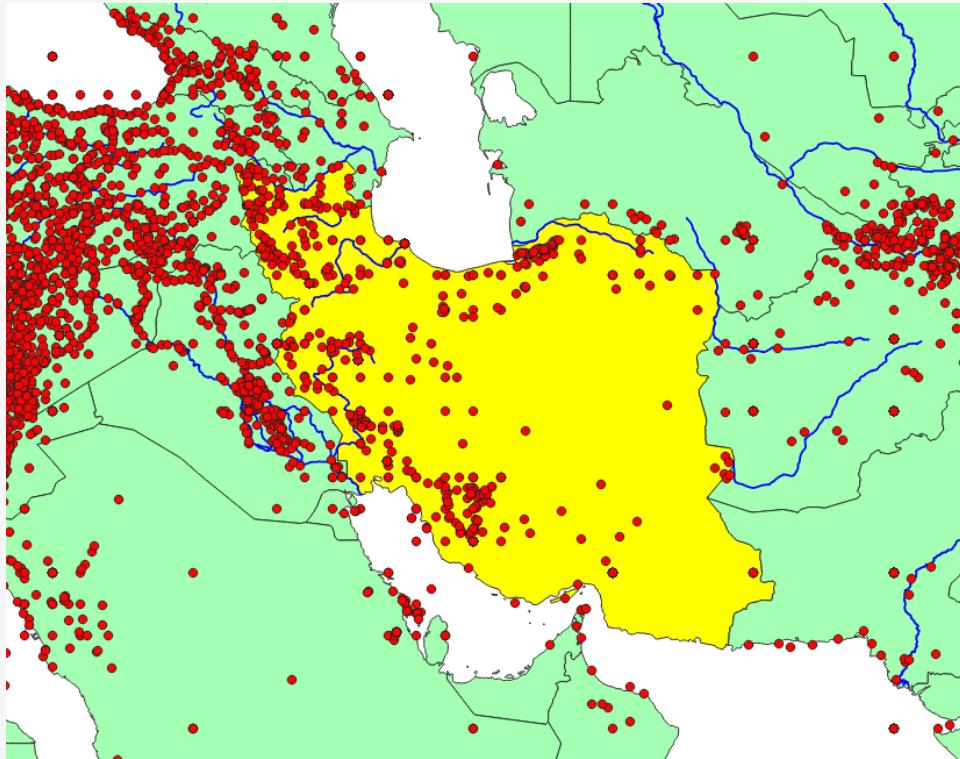
1. Transform data to Pseudo Mercator



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Example

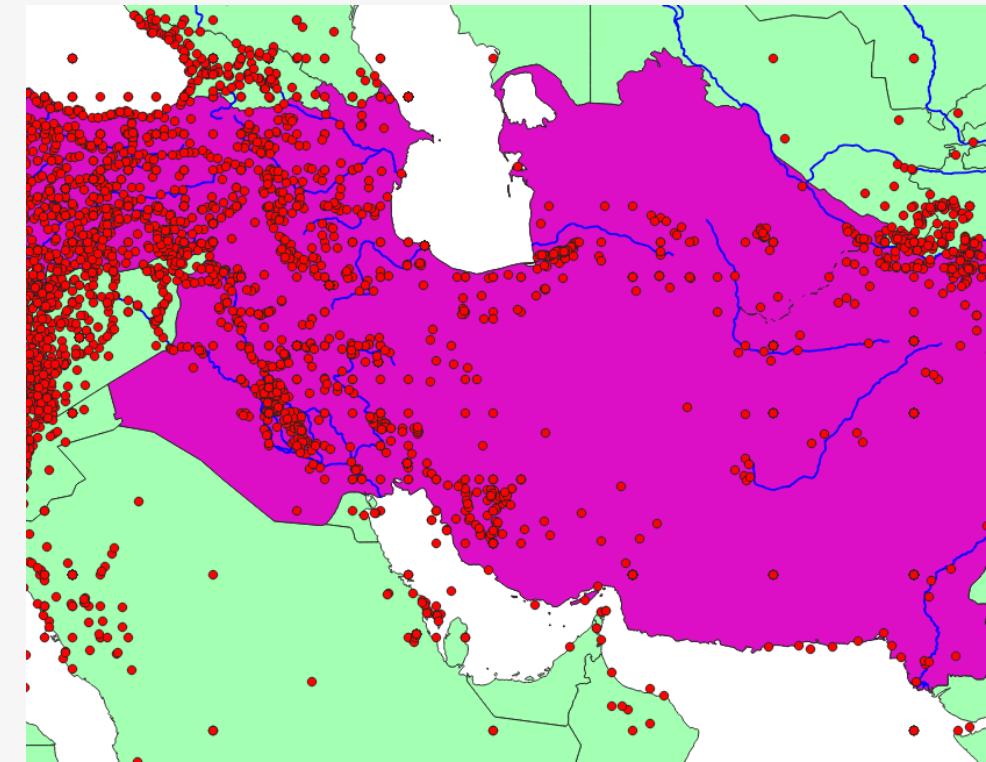
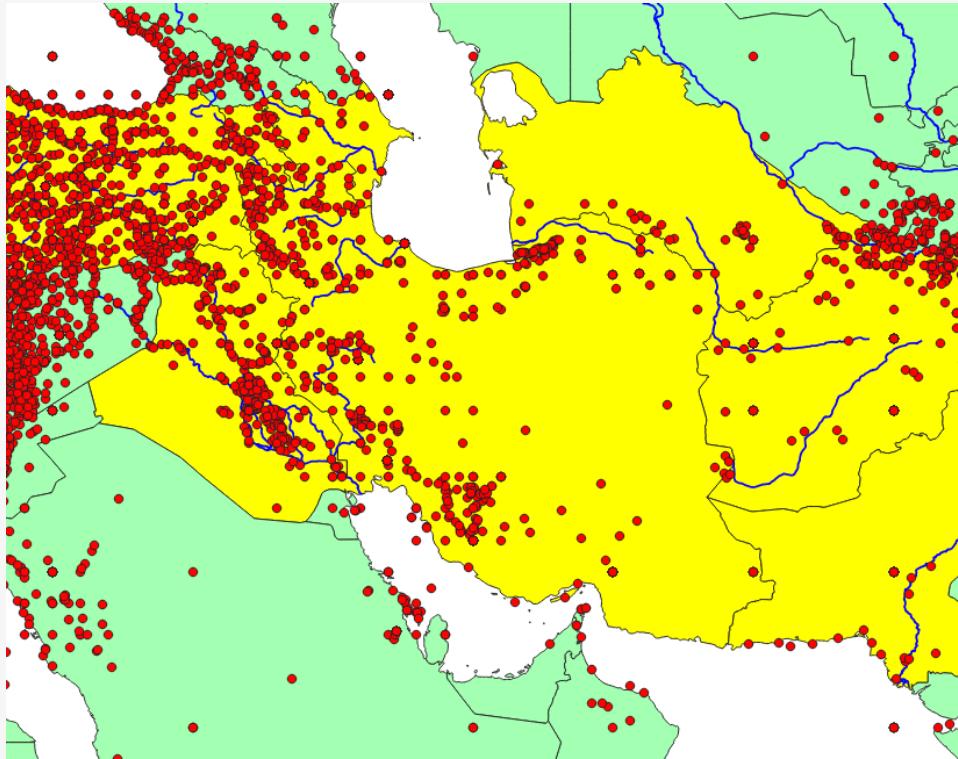
2. Select Iran and neighboring countries



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Example

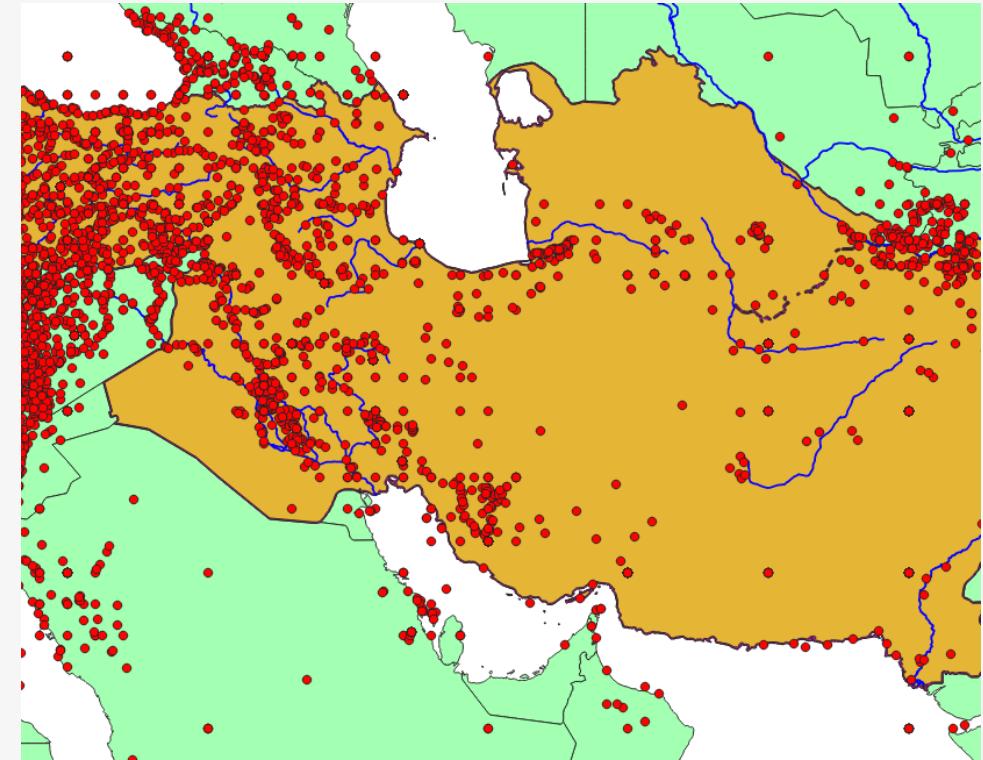
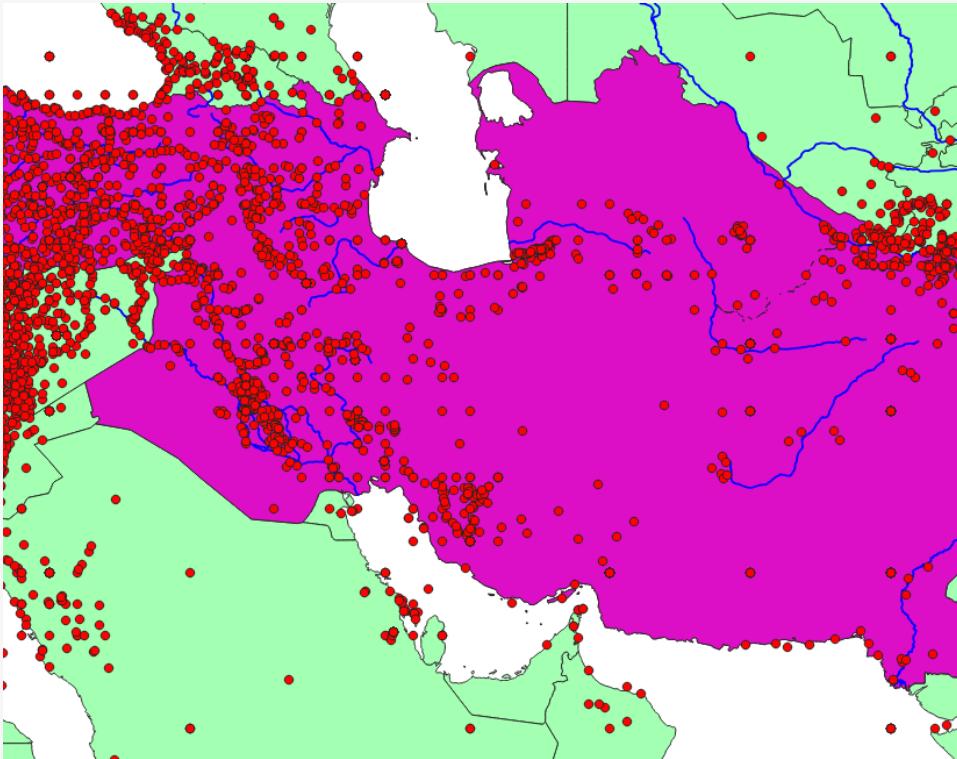
3. Dissolve administrative boundaries



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Example

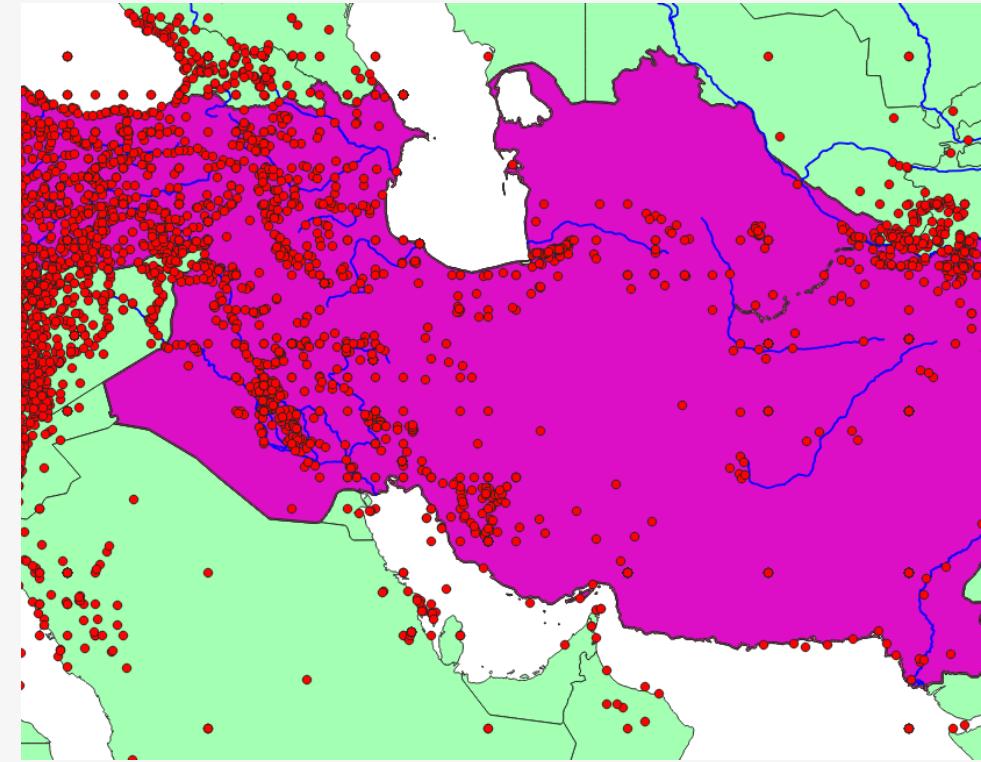
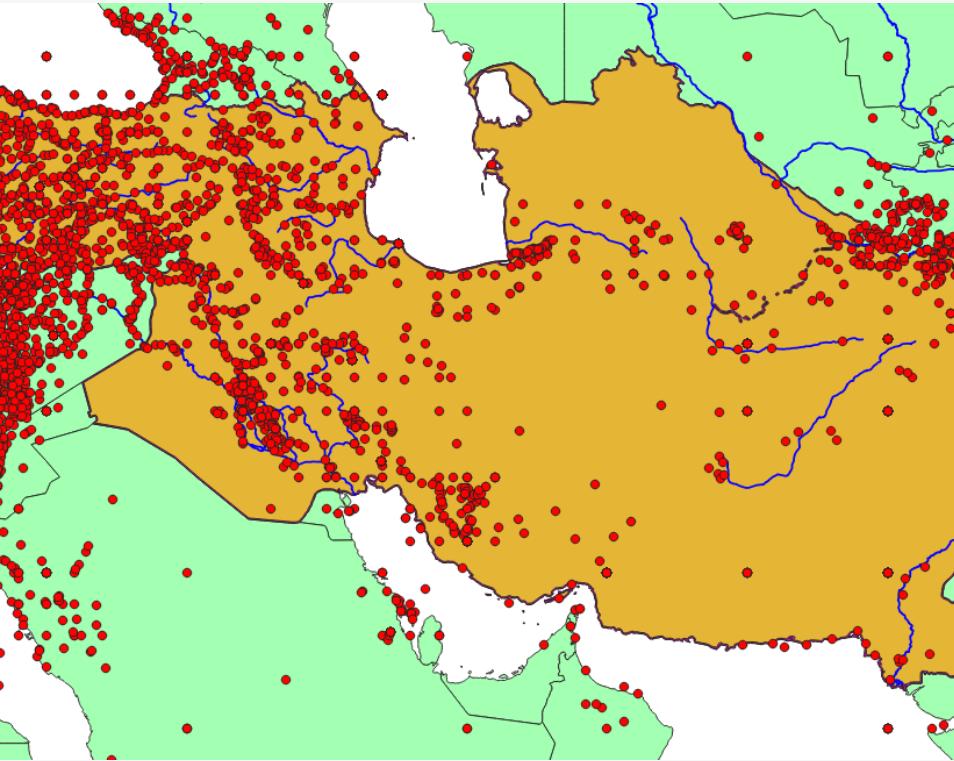
4 Buffer (-5km) with administrative boundaries



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Example

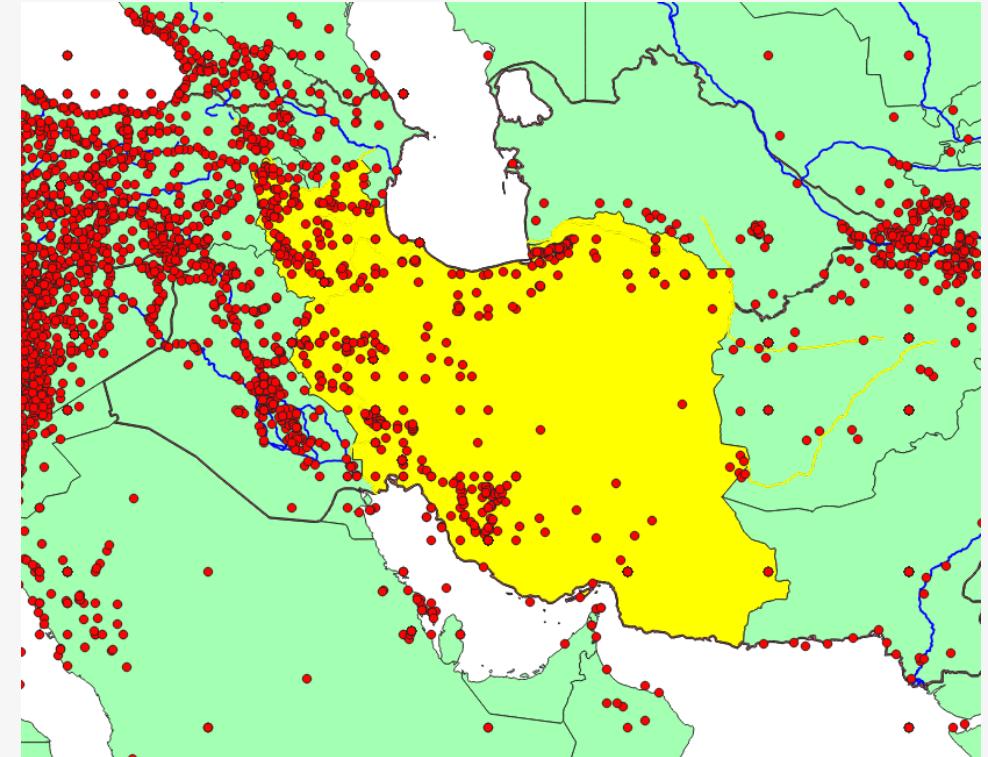
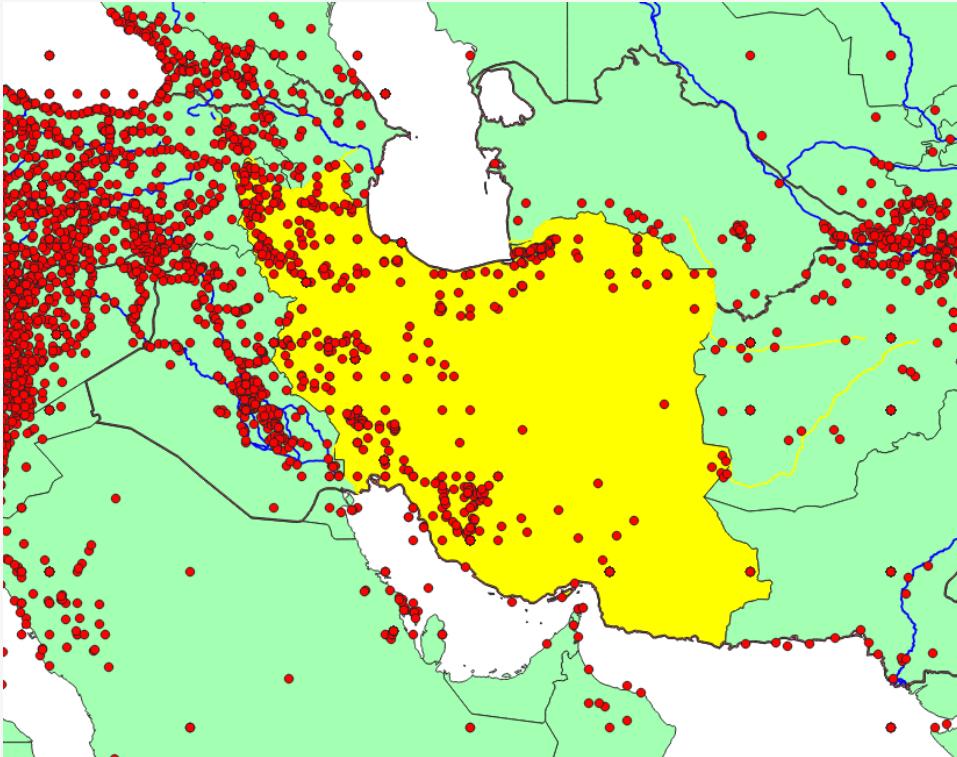
5. Symmetrical difference between dissolve and buffer



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Example

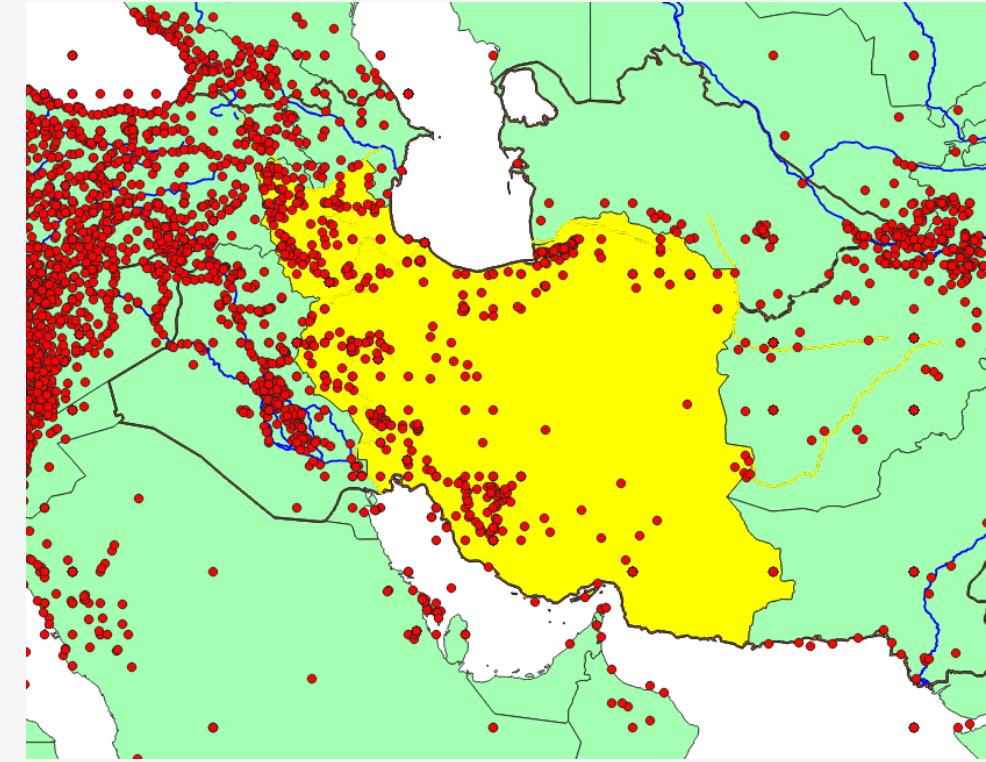
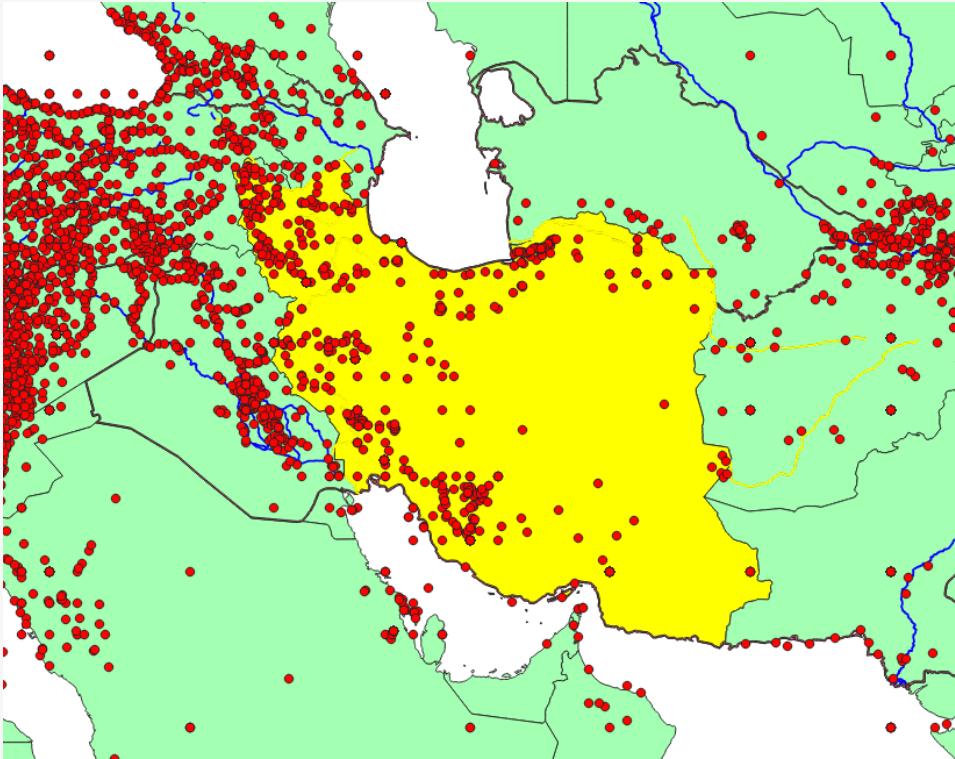
6. Select rivers and buffer (1km)



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Example

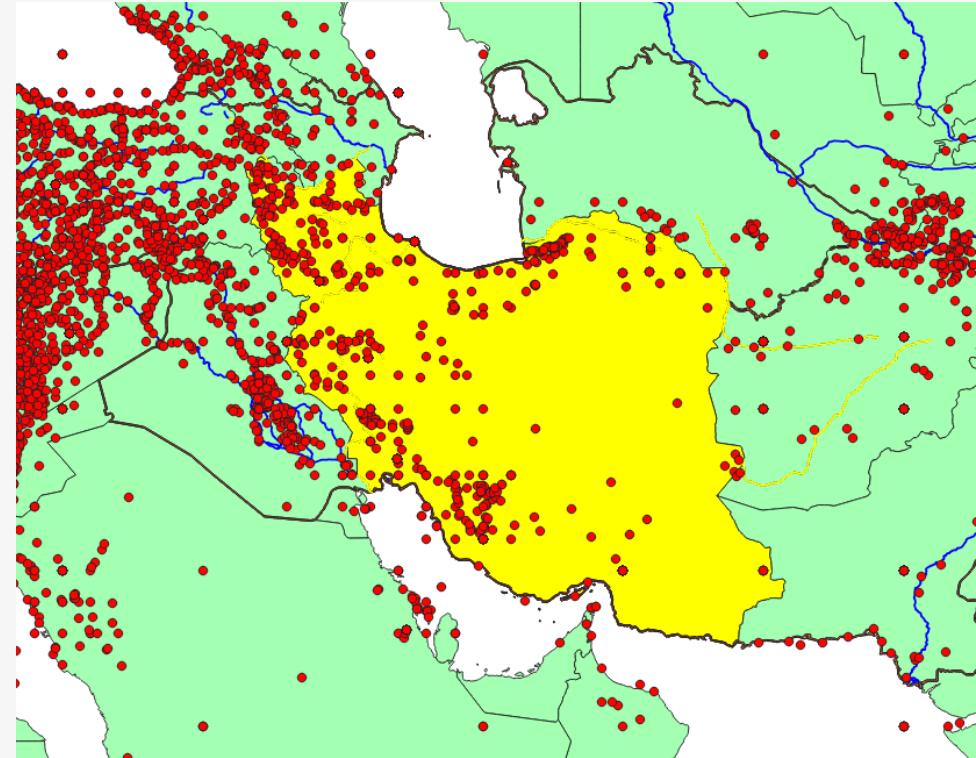
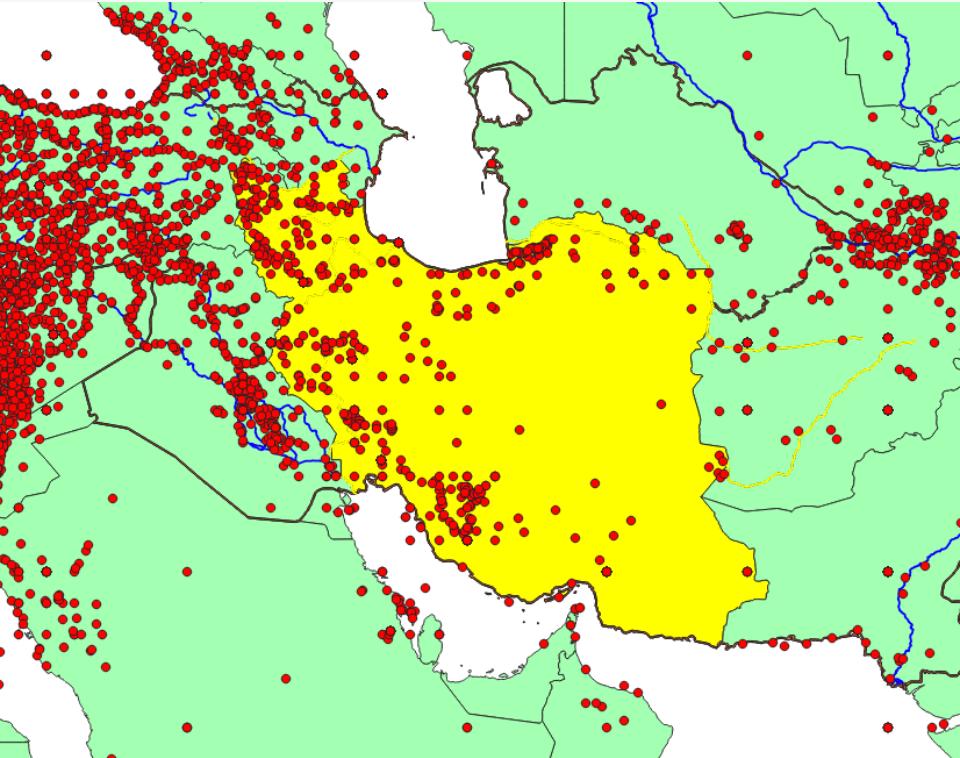
7. Union river buffers and coastal buffers



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Example

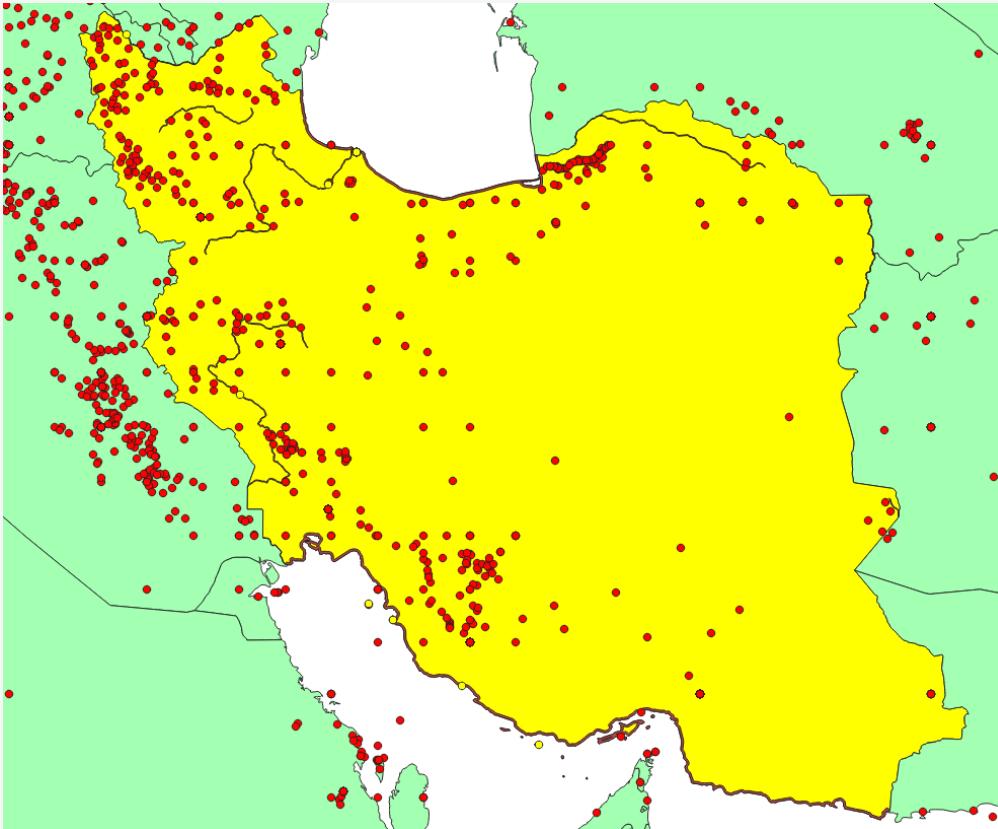
8. Clip union with Iran



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Example

9. Select sites that intersect with resulting polygon



Example

Result



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Example

Resume

Make extraction from 'AncientPlaceNames_Pleiades' within Iran that are at least 1 km near a major river or at least 5 km from the sea:

1. Transform data to Pseudo Mercator (EPSG:3857)
2. Select Iran and neighboring countries
3. Dissolve administrative boundaries
4. Buffer (-5km) with administrative boundaries
5. Symmetrical difference between dissolve and buffer
6. Select rivers and buffer
7. Union river buffers and coastal buffers
8. Clip union with Iran
9. Select sites that intersect with resulting polygon



Geoprocessing

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