



Skeletonizing Polygons Using PostGIS

DATA SET

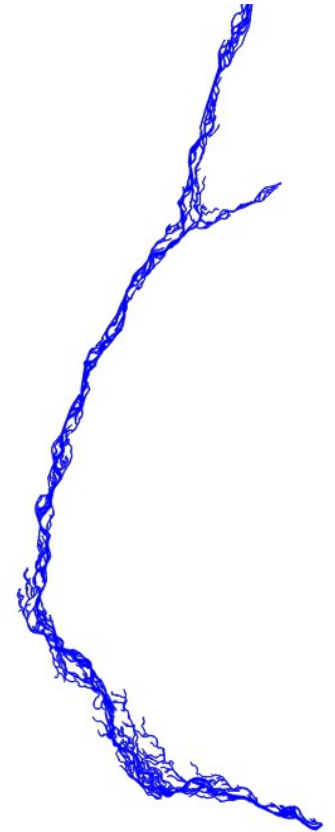
- Vegetation Layer



- Water data extracted



- Snake River



1:150,000

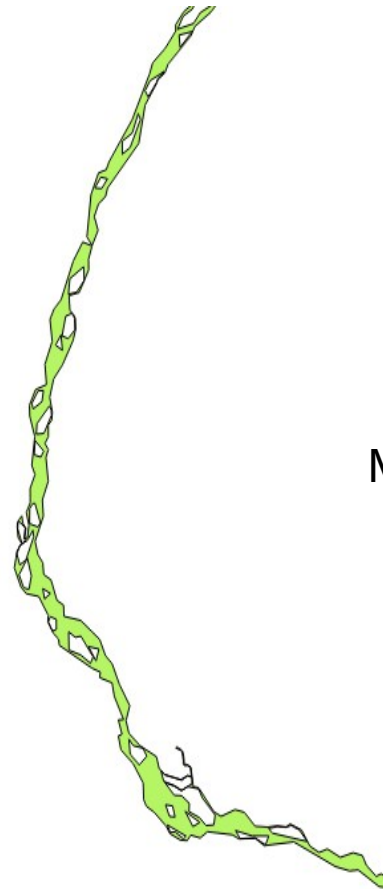
Previous Simplification Results

Different Algorithms = Different Results



QGIS, PostGIS,
OpenJump

Douglas-Peucker Algorithm

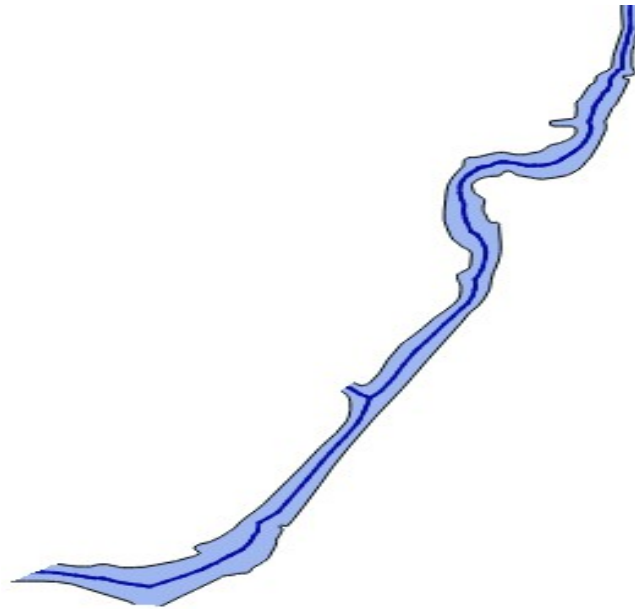


Mapshaper 0.7%

Visvalingam Algorithm

THE GOAL

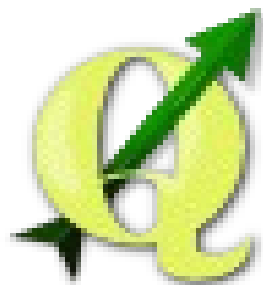
Extract the center line of a river from
a polygon data set



Tools



GRASS GIS



QGIS

PostGIS/SFCGAL

PostGIS is a spatial database extender for PostgreSQL object-relational database.

SFCGAL is a C++ wrapper library around CGAL that provides 2D and 3D geometric functions.

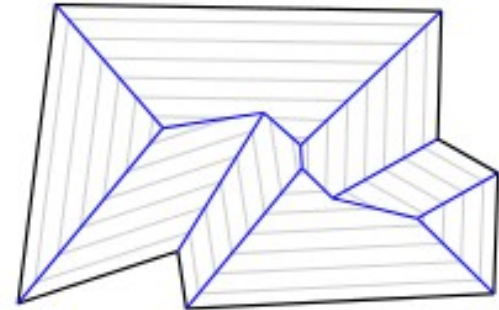
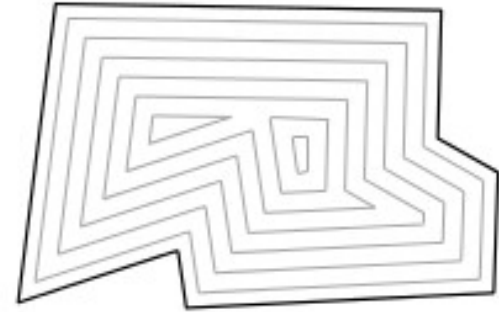
CGAL = The Computational Geometry Algorithms Library

2D Straight Skeleton and Polygon Offsetting

The straight skeleton of a polygon is defined by a continuous shrinking process in which the edges of the polygon are moved inwards parallel to themselves at a constant speed.

As the edges move in this way, the vertices where pairs of edges meet also move.

If one of these moving vertices collides with a nonadjacent edge, the polygon is split in two by the collision. The straight skeleton is the set of curves traced out by the moving vertices in this process.



ST_StraightSkeleton — Compute a straight skeleton from a geometry

```
CREATE TABLE snake_partskeleton AS  
  SELECT st_straightskeleton(snake_part.wkb_geometry) AS wkb_geometry  
  FROM snake_part;
```

```
ALTER TABLE snake_partskeleton  
  OWNER TO postgres;  
GRANT ALL ON TABLE snake_partskeleton TO postgres;  
GRANT SELECT ON TABLE snake_partskeleton TO pgselectonly;
```


Output

Problem: Need to get rid of the dangles



Possible Solutions

1. PostGIS - negative buffer and st_crosses
2. GRASS GIS – remove dangles

PostGIS

negative buffer and st_crosses

The screenshot shows a 'SQL window - tc_angie [PostGIS]' interface. The SQL query is as follows:

```
select pid,wkb_geometry from snake_partskeleton_single,  
(select st_buffer(snake_part.wkb_geometry,(-1)::double precision)as geom from snake_part)as buff  
where not(st_crosses(snake_partskeleton_single.wkb_geometry,buff.geom))
```

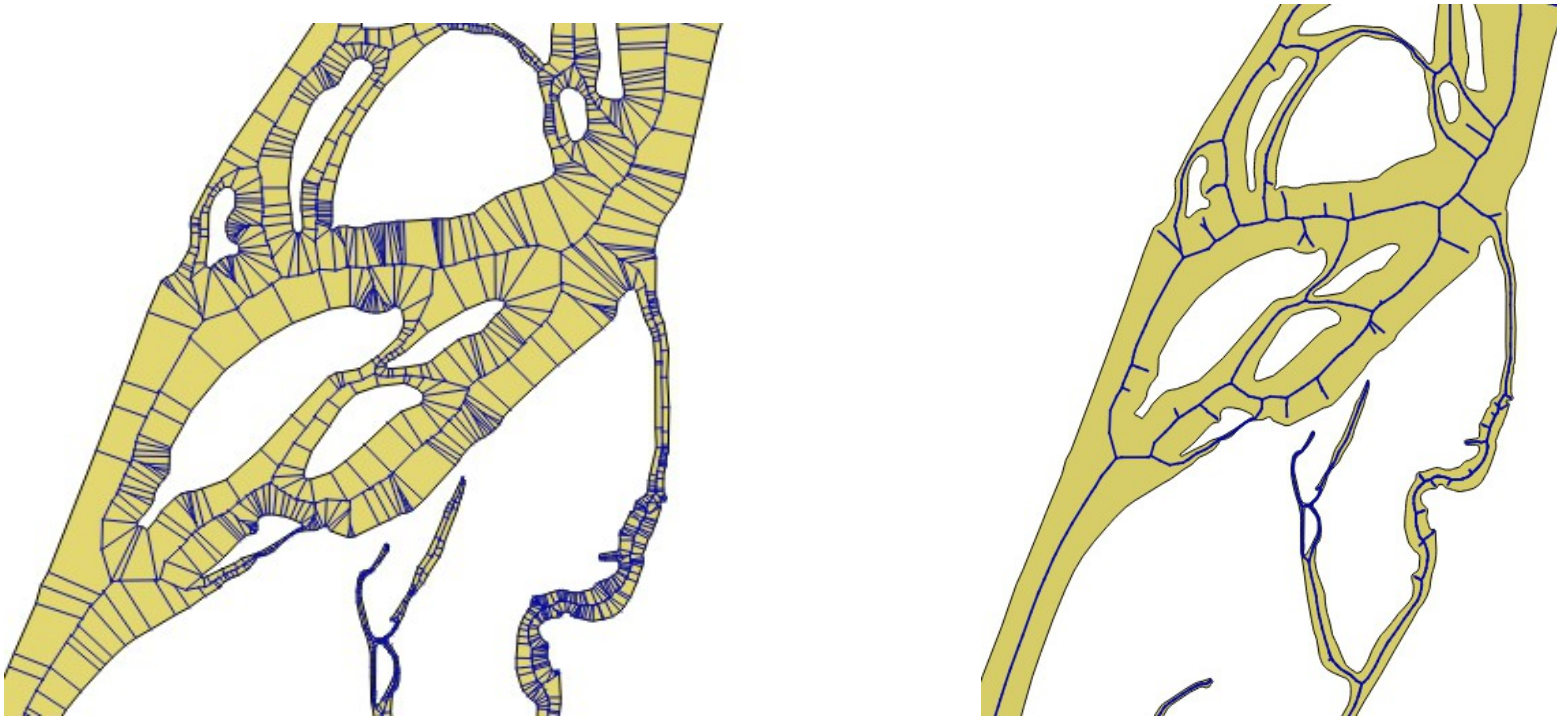
Below the query, the execution status is shown: 'Execute (F5) 1678 rows, 34.5 seconds'. The results are displayed in a table with 5 rows and 3 columns: 'pid', 'wkb_geometry', and an unnamed column. The first five rows are visible, showing 'pid' values 382, 383, 1640, 1641, and 1642, and 'wkb_geometry' values starting with '01020000209B0...'. The bottom section of the window has options to 'Load as new layer', with 'Column with unique integer values' set to 'pid' and 'Geometry column' set to 'wkb_geometry'. There are buttons for 'Retrieve columns', 'Load now!', and 'Close'.

	pid	wkb_geometry
1	382	01020000209B0...
2	383	01020000209B0...
3	1640	01020000209B0...
4	1641	01020000209B0...
5	1642	01020000209B0...



PostGIS

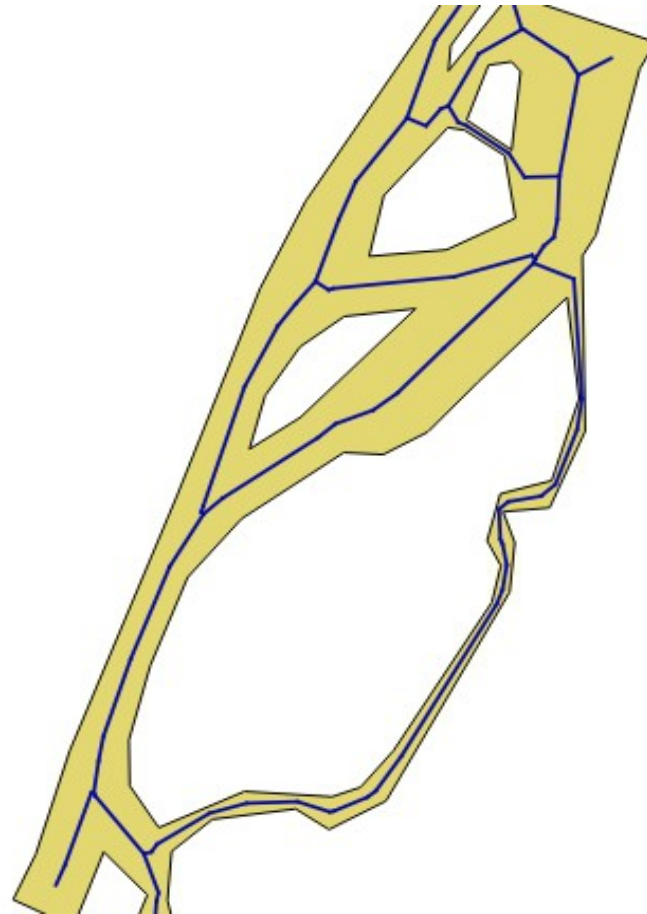
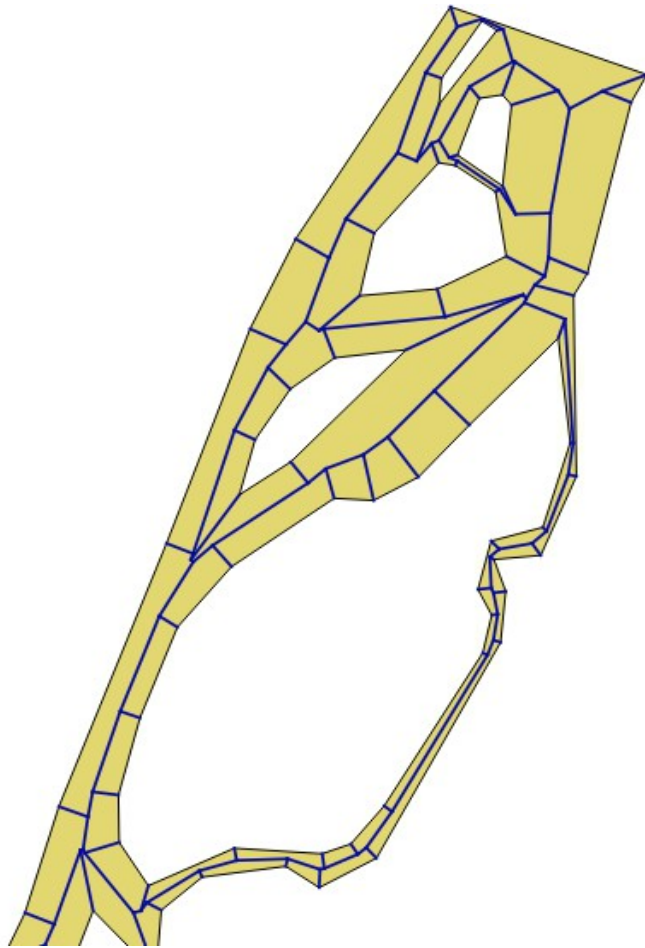
negative buffer and st_crosses



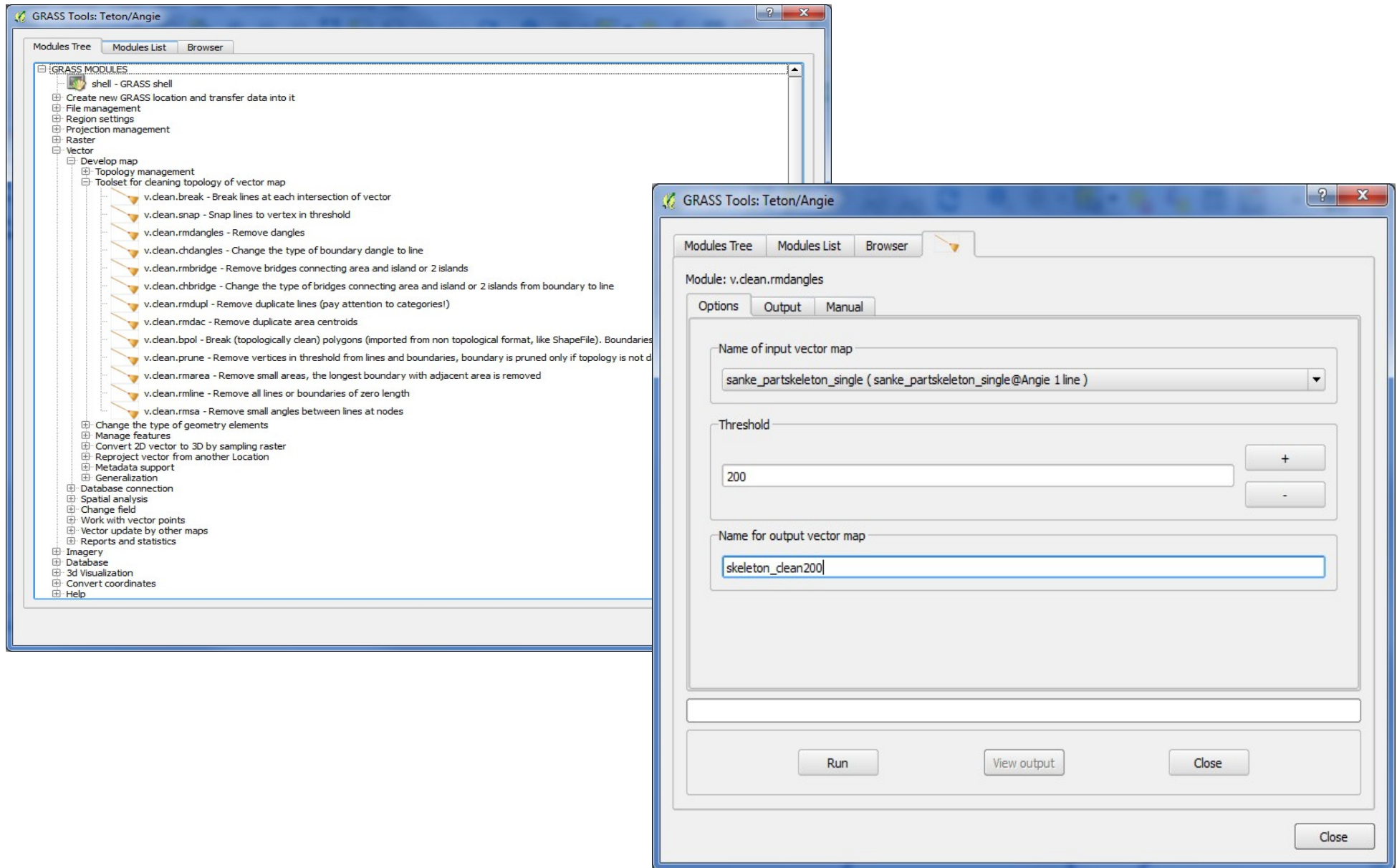


Increase buffer – loose parts

Using simplified polygon layer



GRASS GIS via QGIS



Tool = v.clean.rmdangle

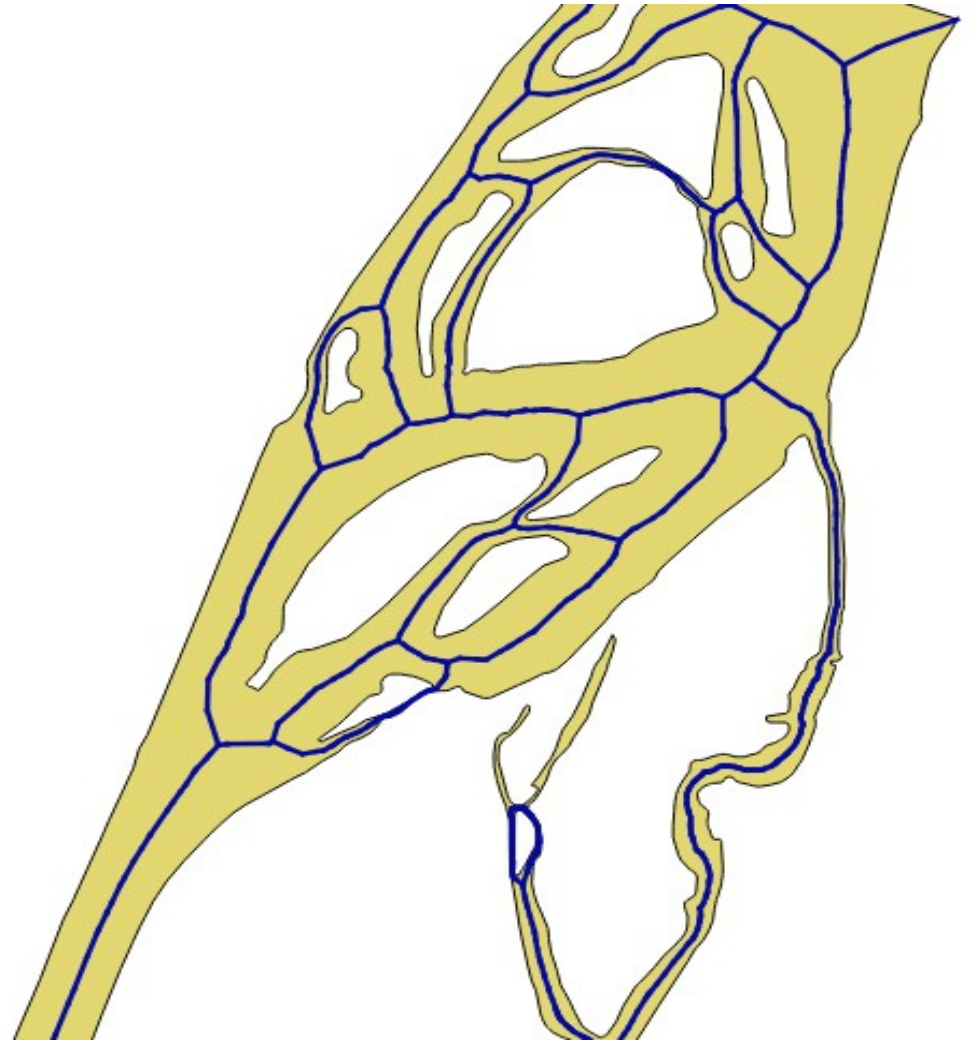
A line/boundary is considered to be a dangle if no other line of given type is on at least one end node.

The rmdangle tool deletes a dangle if the length is shorter than thresh or $\text{thresh} < 0$.

Threshold = 100'



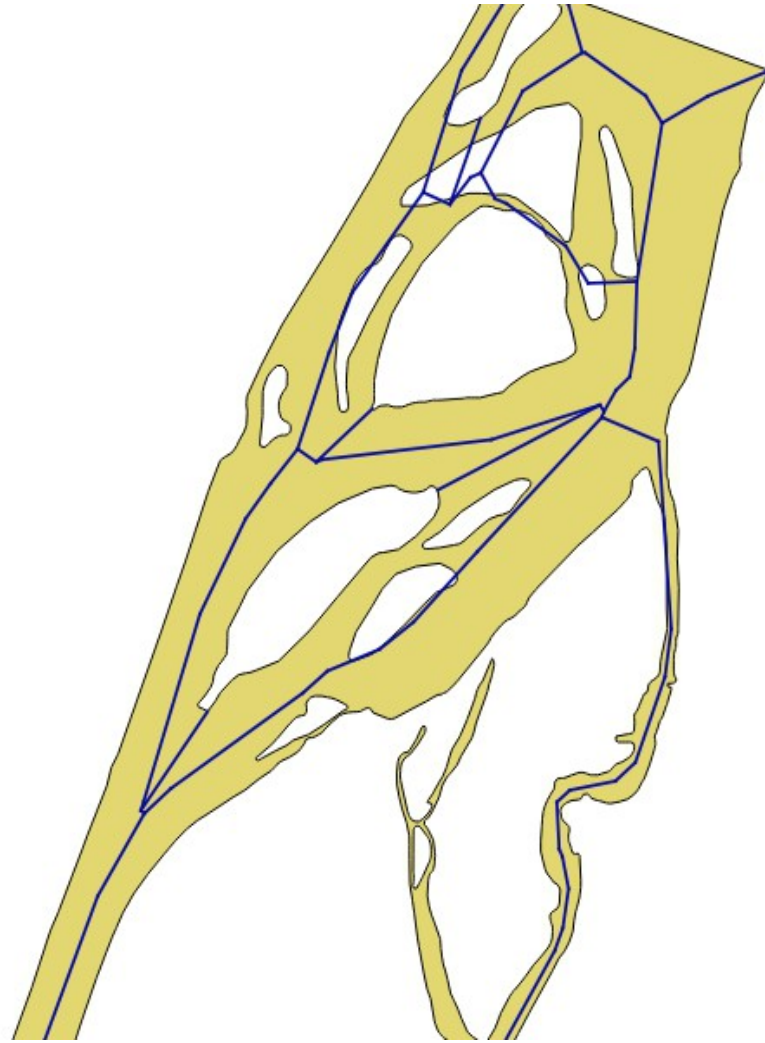
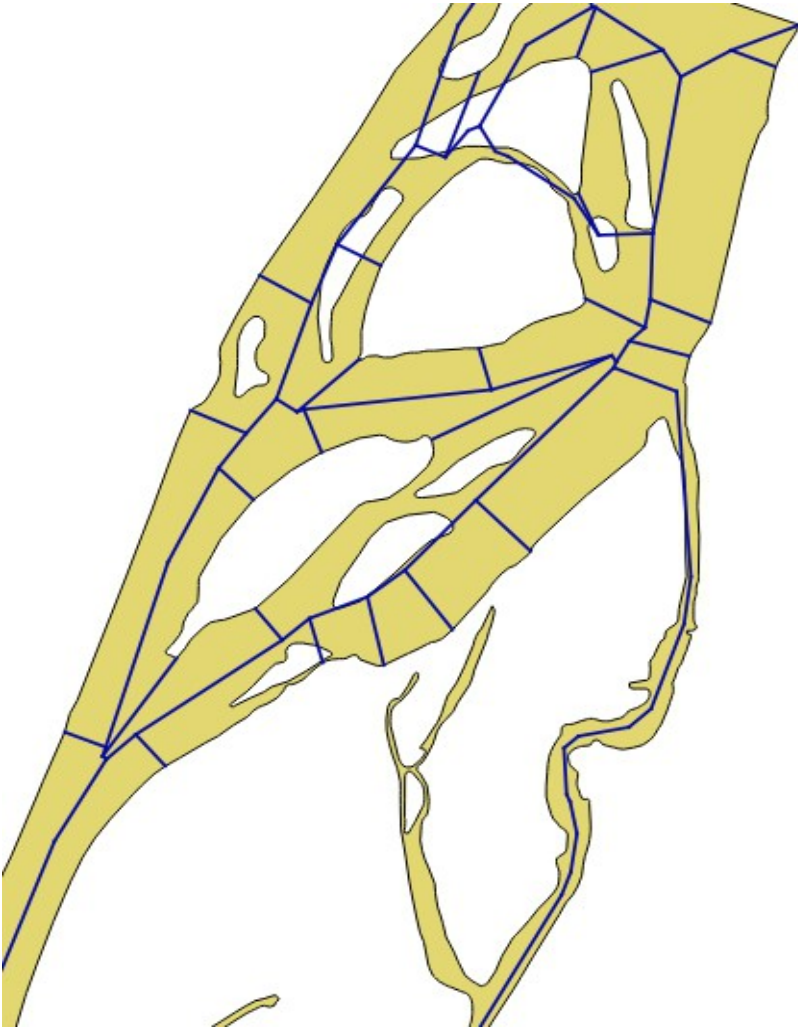
Threshold = 200'



Using simplified polygon layer

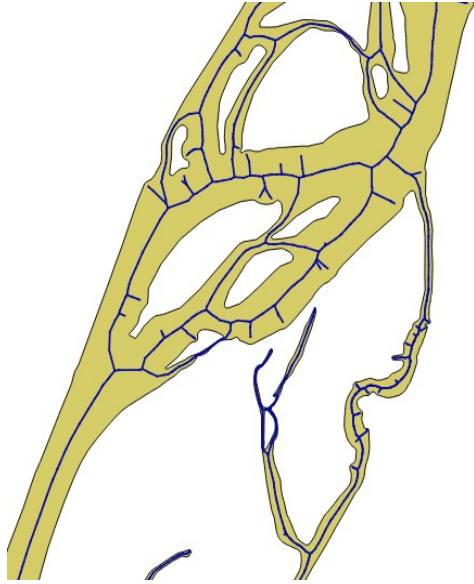
Threshold = 100'

Threshold = 200'

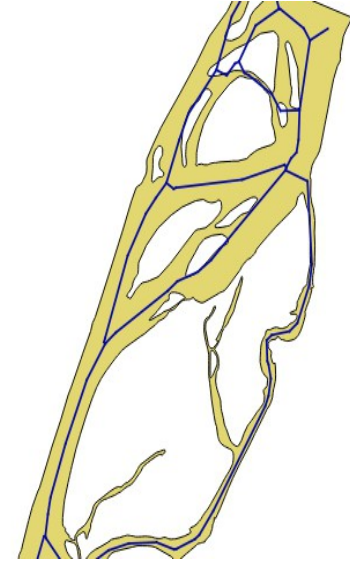


Remember THE GOAL

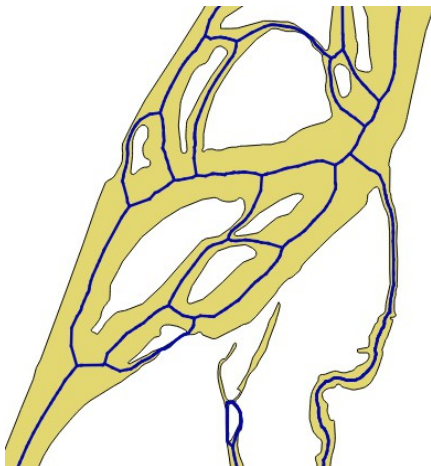
Extract the center line of a river from a polygon data set



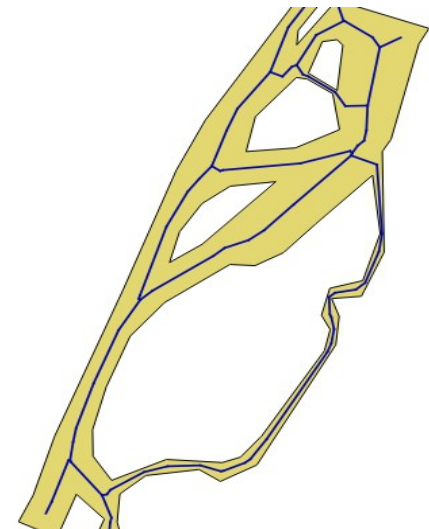
PostGIS



simplified polygon



GRASS



simplified polygon

Next Steps

- ST_ApproximateMedialAxis
- Use to create a stream flow network?
- Use for labeling purposes on maps and mapserver

Questions?

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