

The Creation of Multiple Scale Databases in the NHGIS

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Overview

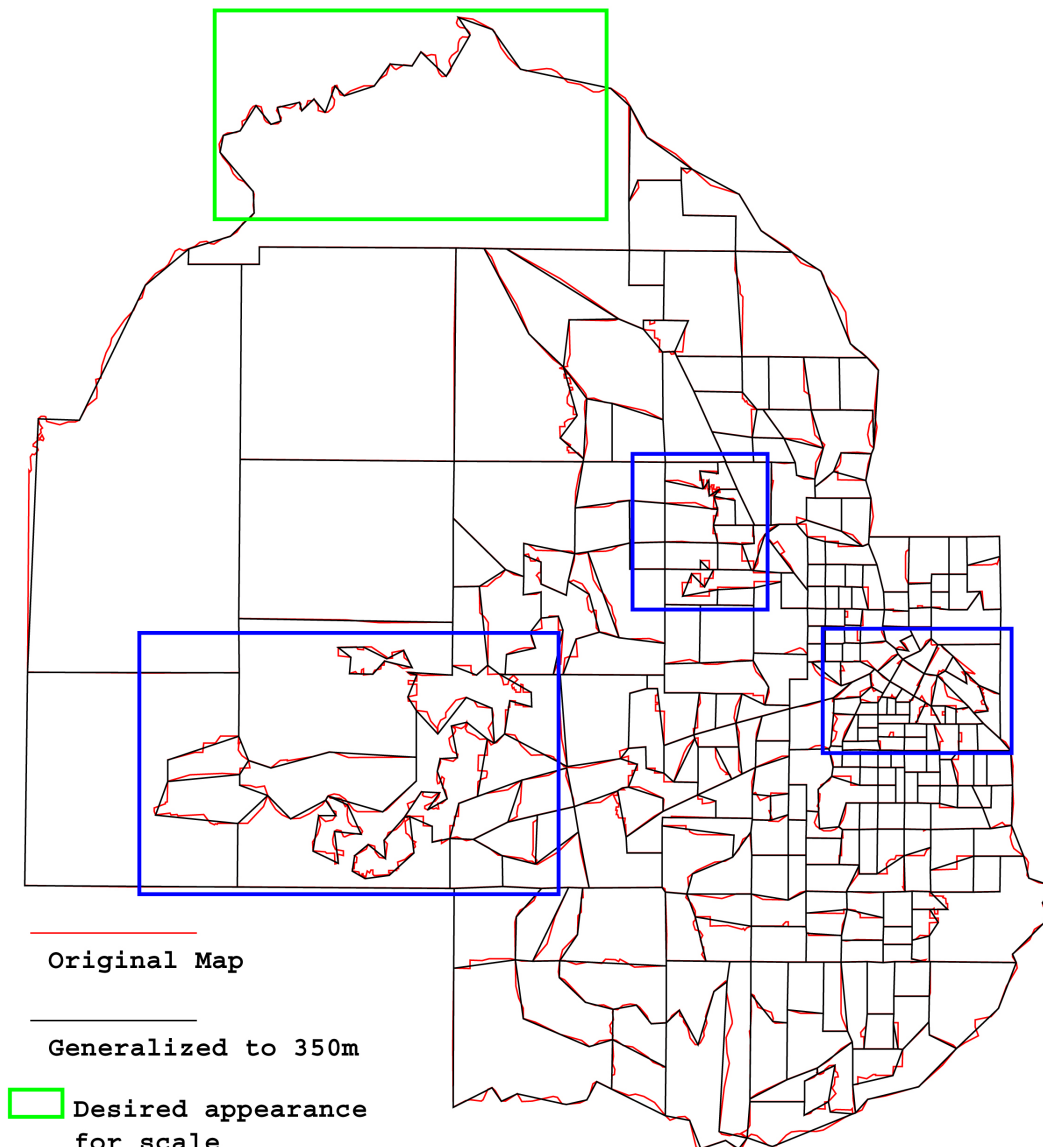
- ◆ Generalization Special Project
- ◆ Done in conjunction with tract/county editing
- ◆ Goal: produce different versions of the boundary databases differing by level of generalization
 - Example target scales
 - 1:150,000
 - 1:400,000
 - 1:1,000,000

Presentation Overview

- ◆ Illustrate three topics
 - Generalization problems
 - Automatic categorization of lines
 - Initial look an approach we are experimenting with
- ◆ Next steps

Effects of Uniform Generalization

Douglas-Peucker Algorithm



Original Map

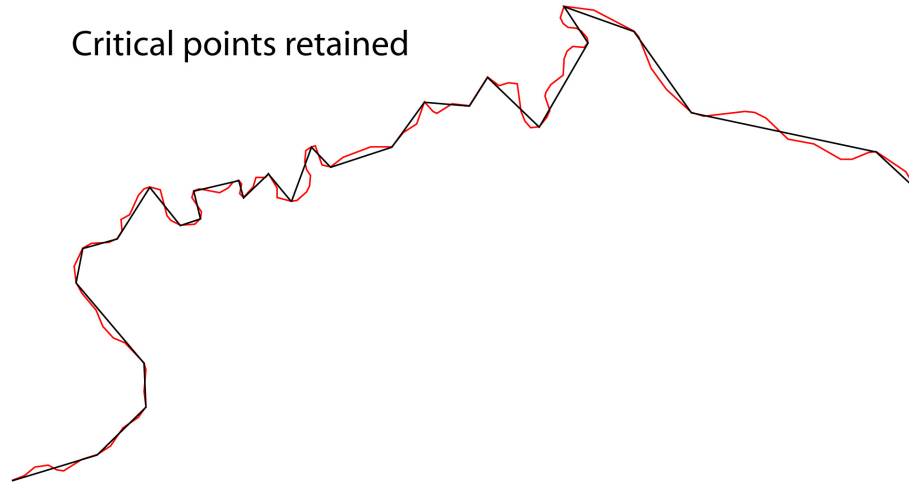
Generalized to 350m

Desired appearance
for scale

Critical points lost

aprox. 1:250000 when displayed
on a 8.5" x 11" page

Critical points retained



Critical points lost



Fundamental Problem

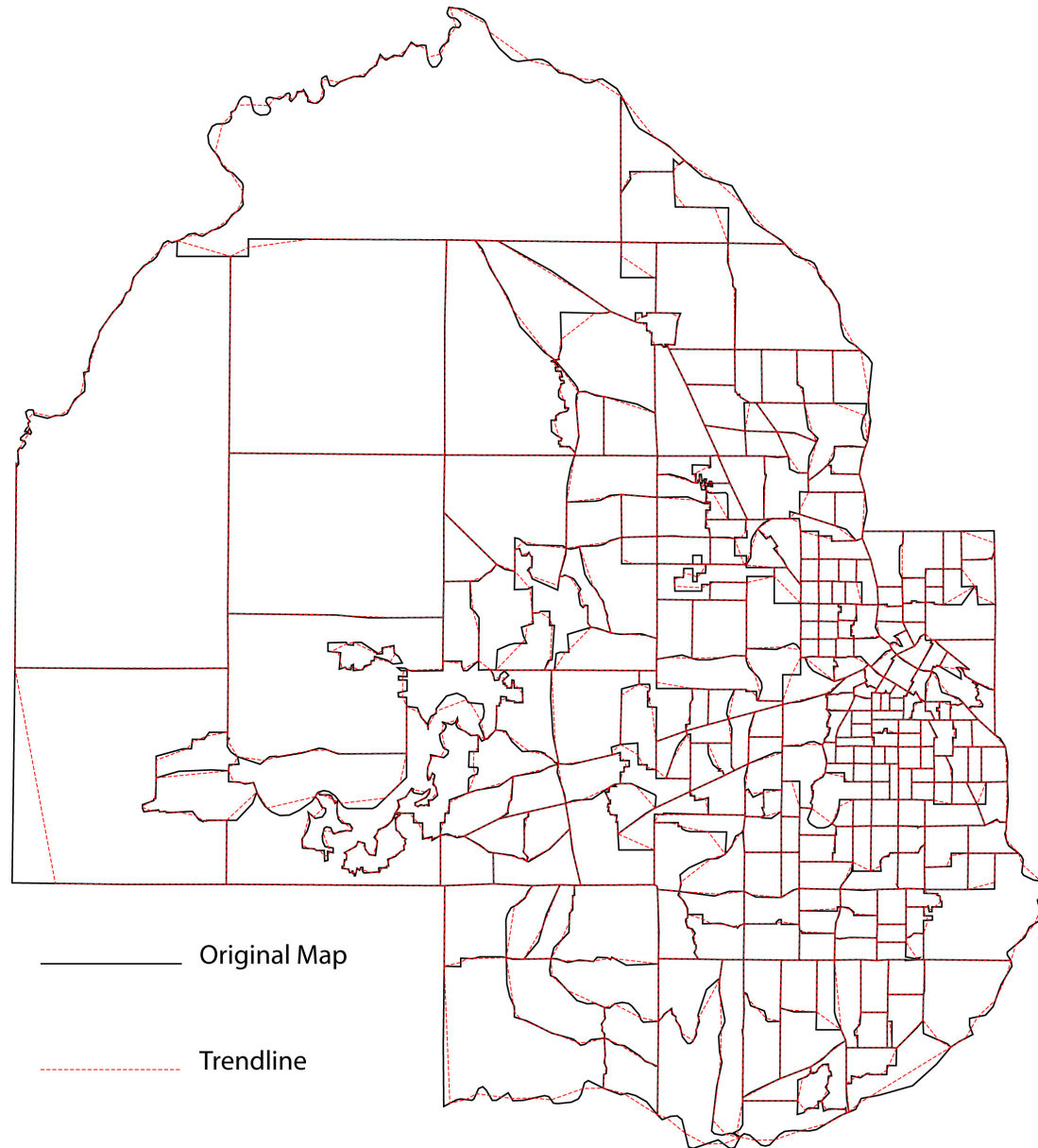
- ◆ Applying common line simplification procedures uniformly to our boundary files is deemed unacceptable
 - Based on visual examination
- ◆ Manual intervention is also unacceptable
 - Due to size of database

Trendlines

- ◆ Trendline – line connecting inflection points
 - Highly correlated with fractal dimension
 - Based on work by Philippe Thibault
- ◆ Generate a complexity measure from trendline

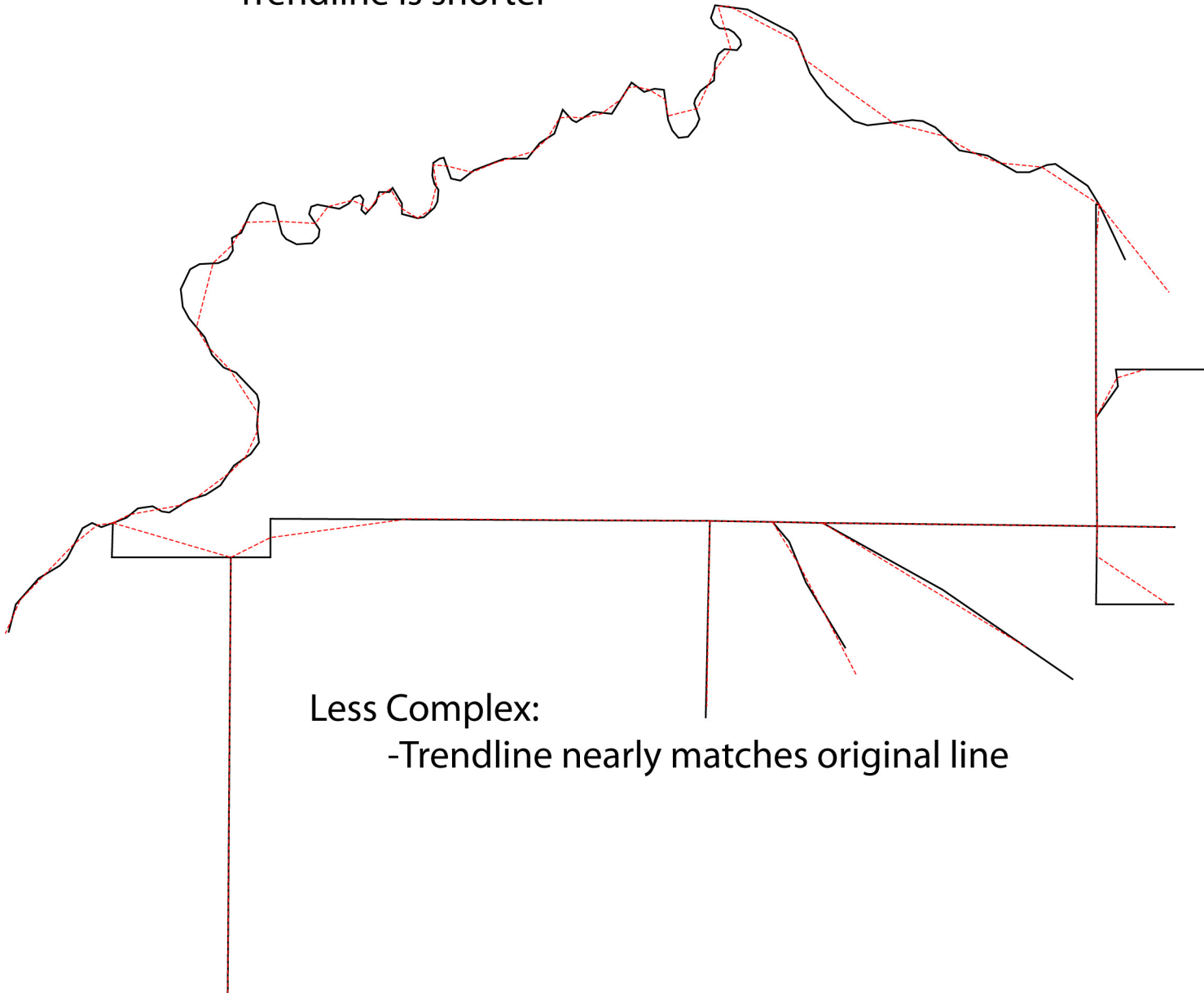
Trendlines:

A line connecting the inflection points of the original line



More Complex:

- Trendline intersects original line multiple times
- Trendline is shorter

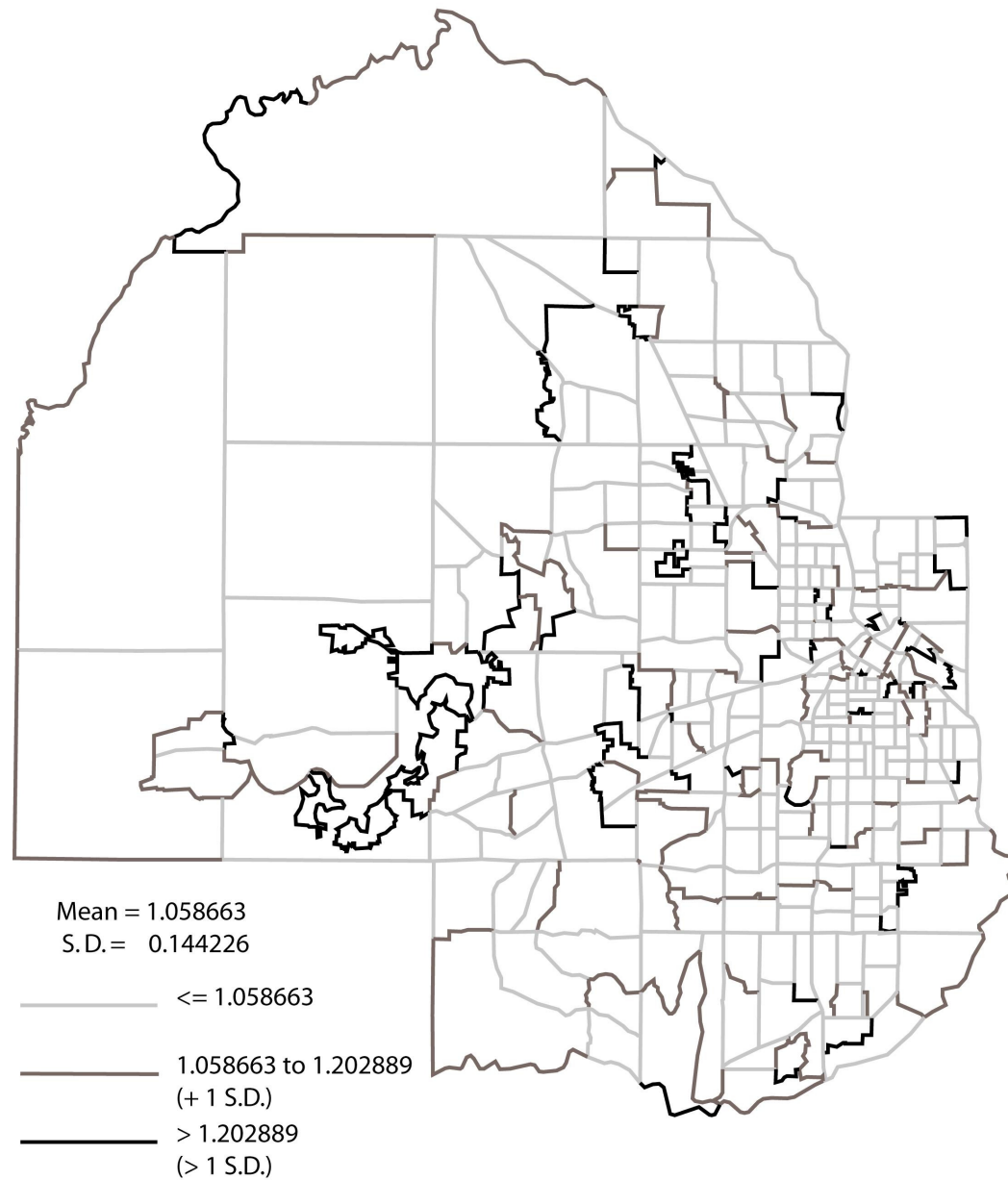


Less Complex:

- Trendline nearly matches original line

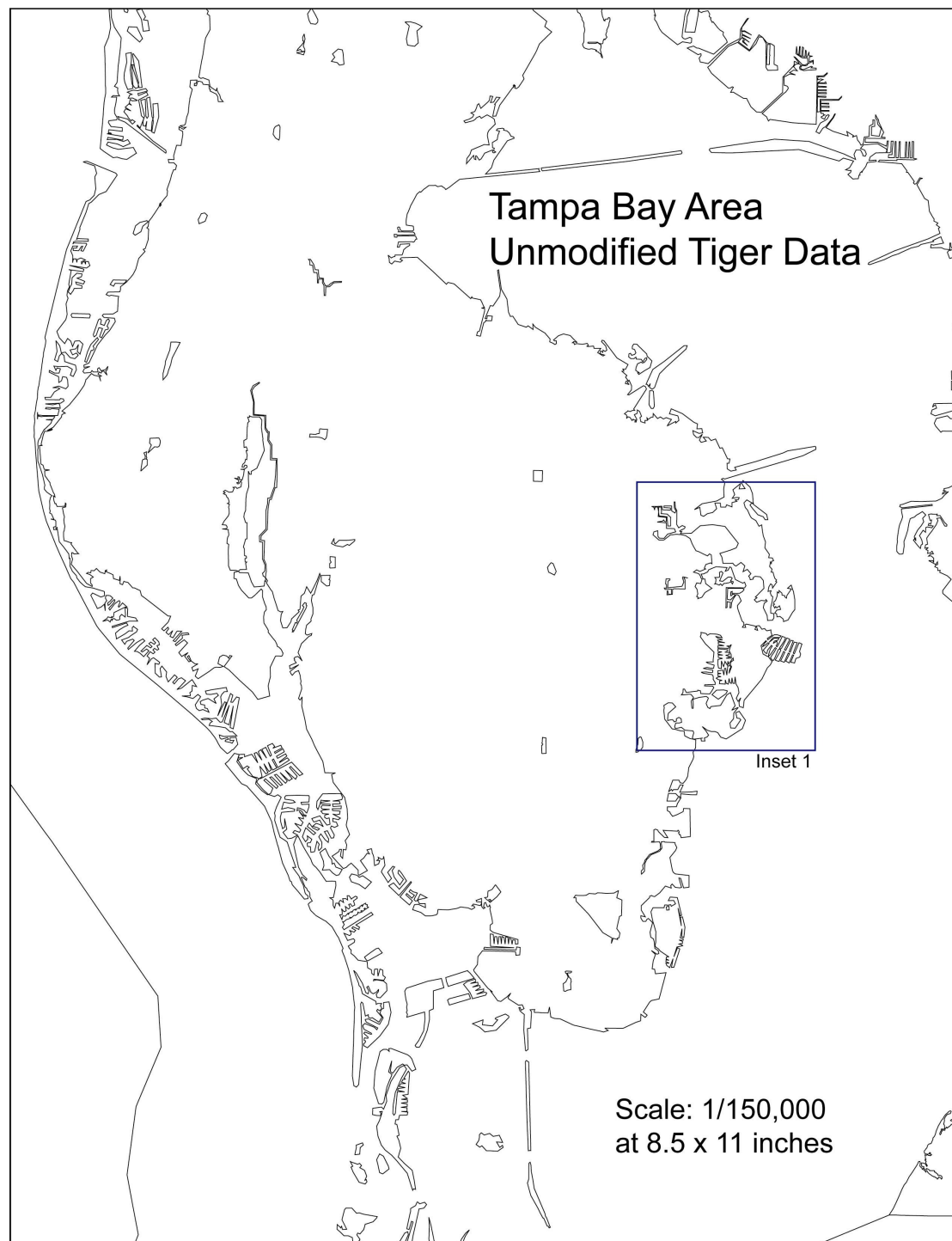
Sinuosity as a Complexity Measure

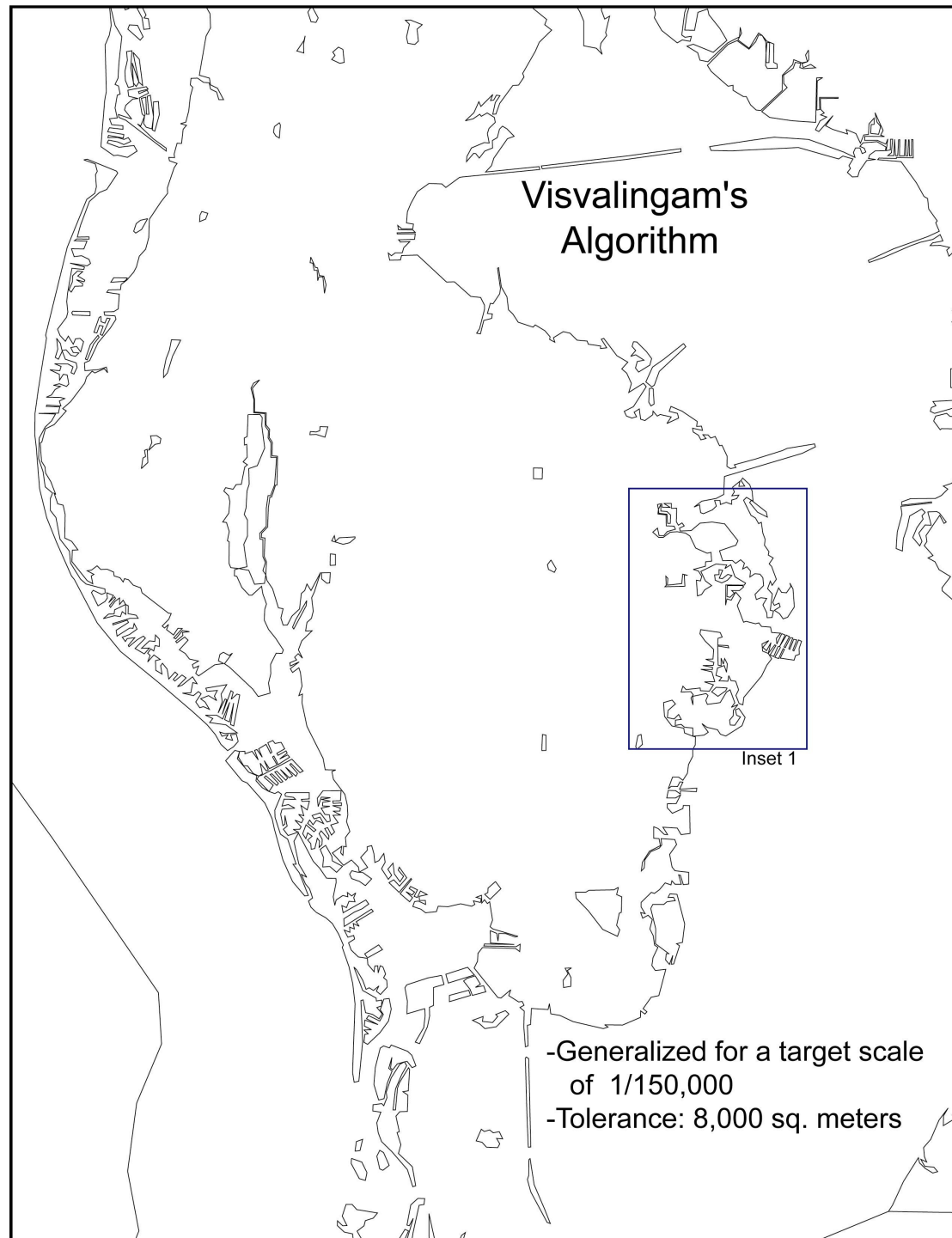
$\text{Sinuosity} = \text{line length} / \text{trendline length}$

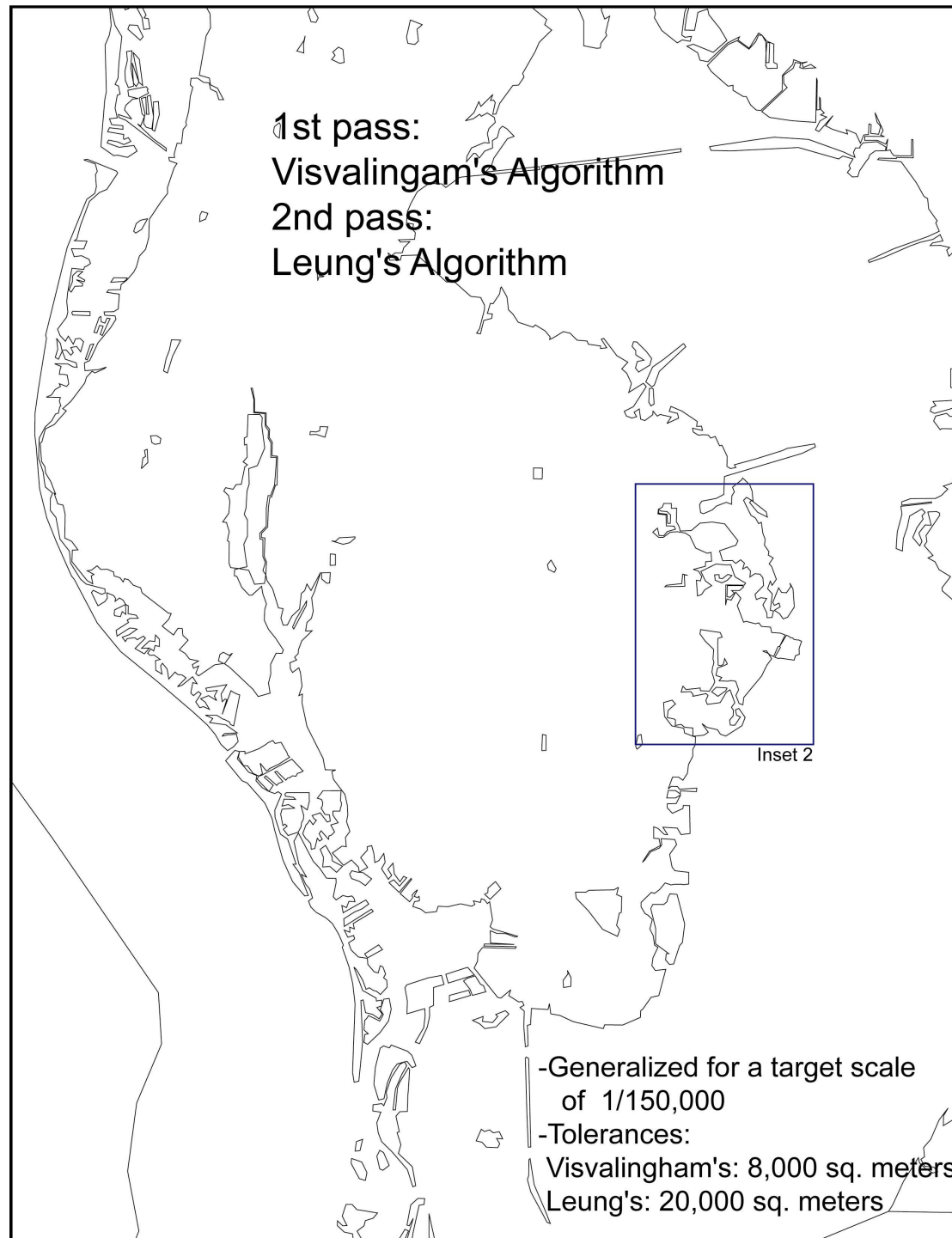


Current Experimentation

- ◆ Two-pass procedure for generalizing coastal areas
 - Visvalingam's algorithm
 - Leung's algorithm
 - Kai Chi Leung – an NHGIS RA



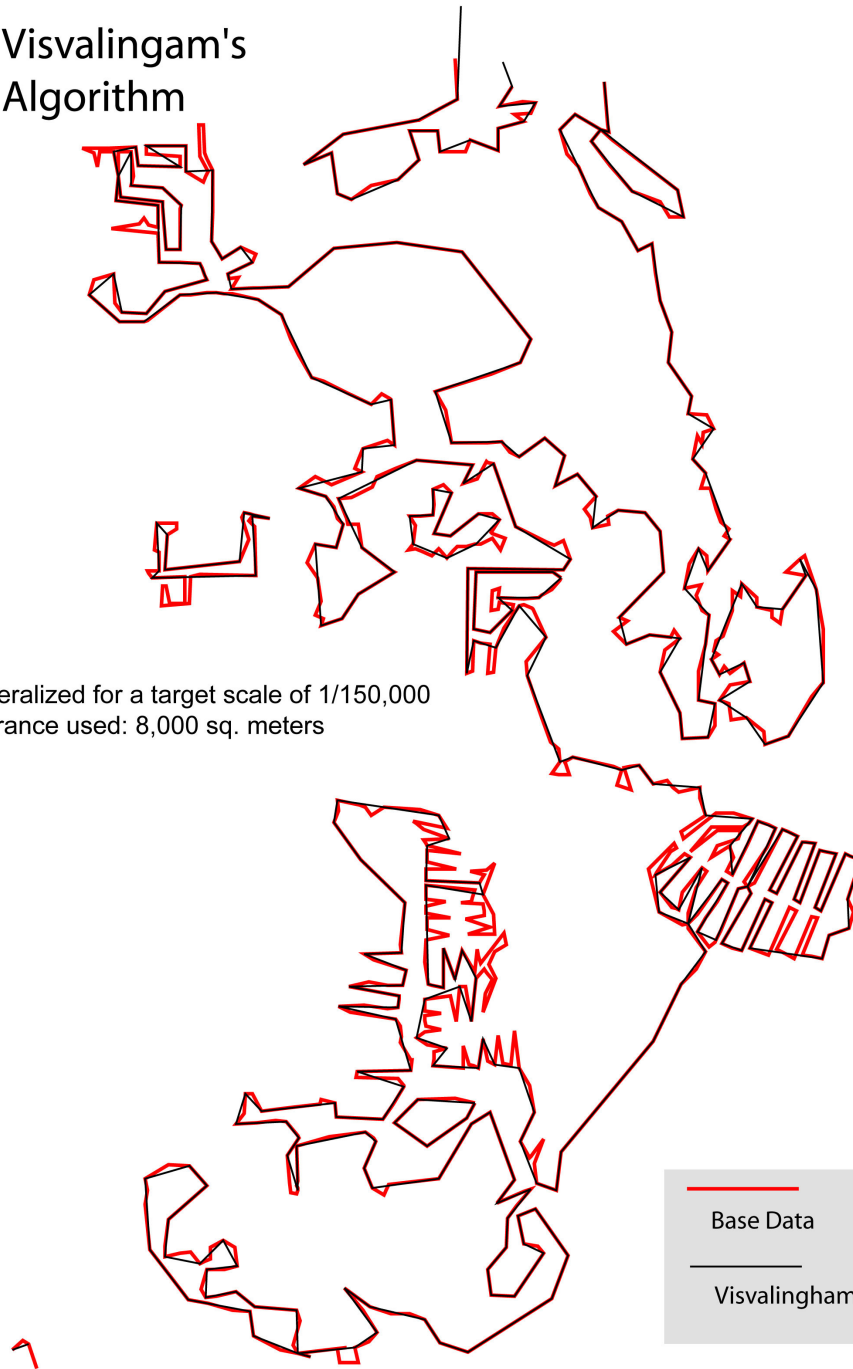




Visvalingam's Algorithm

Inset 1

Generalized for a target scale of 1/150,000
Tolerance used: 8,000 sq. meters



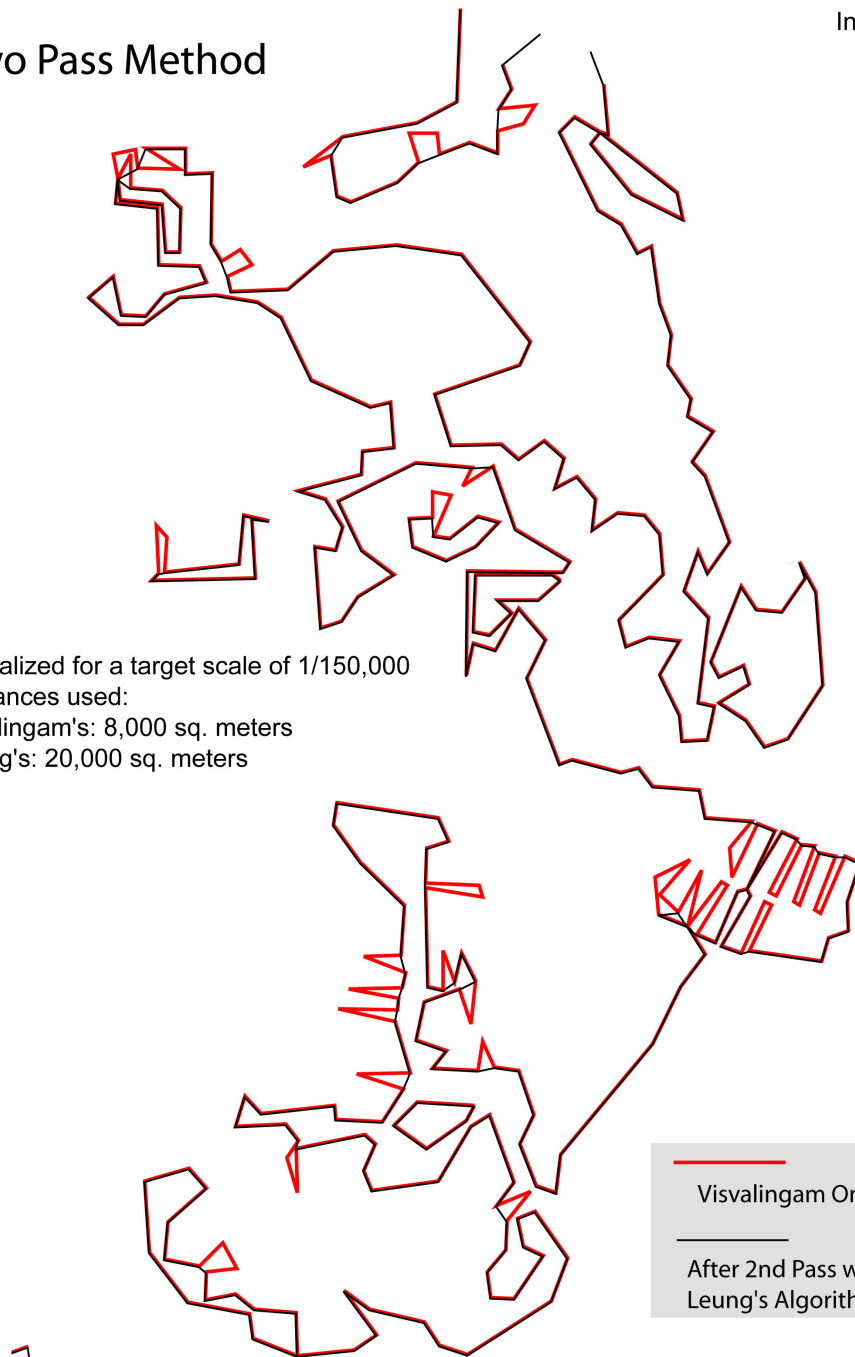
Base Data

Visvalingam's

Two Pass Method

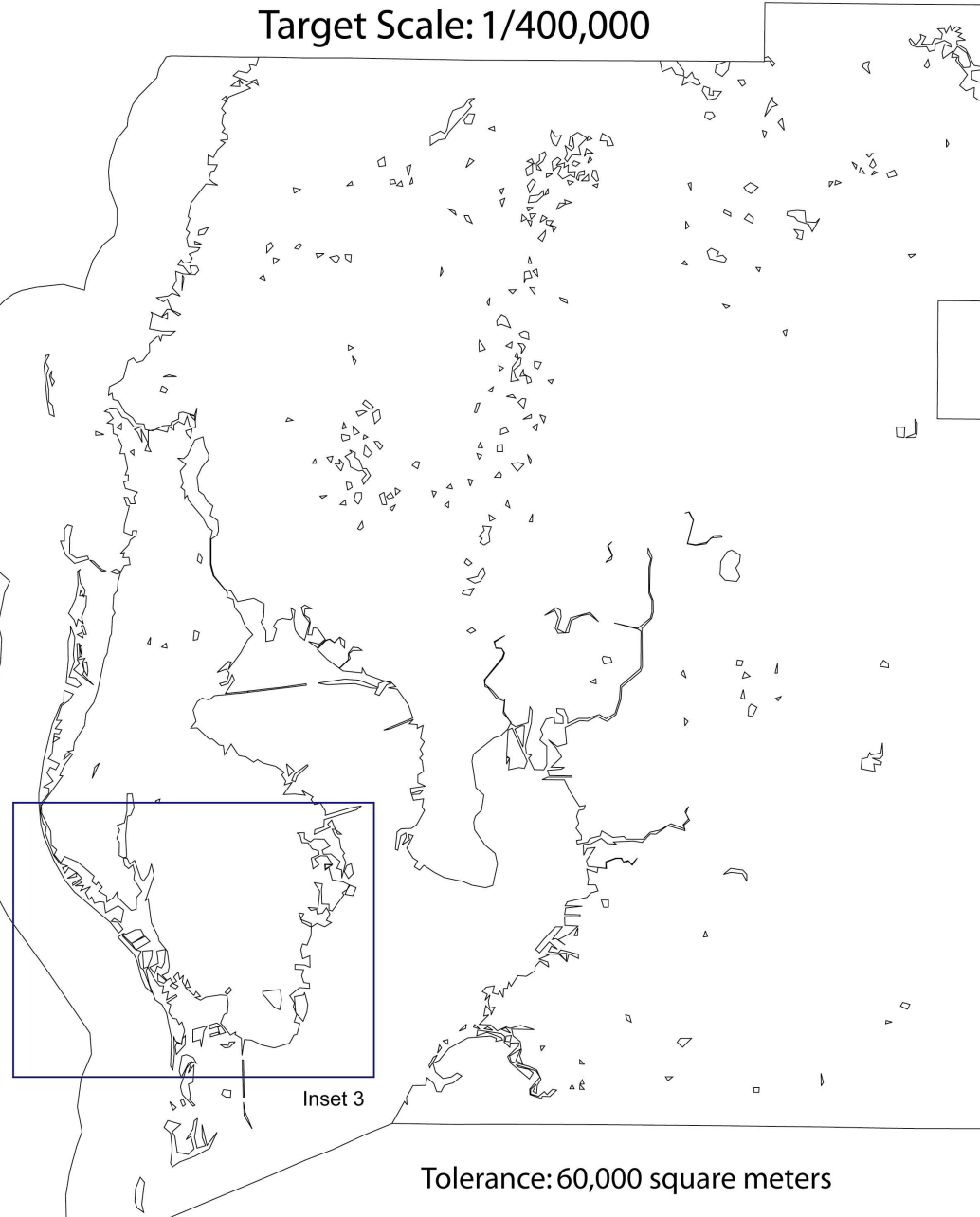
Inset 2

Generalized for a target scale of 1/150,000
-Tolerances used:
Visvalingam's: 8,000 sq. meters
Leung's: 20,000 sq. meters



Visvalingam's Algorithm

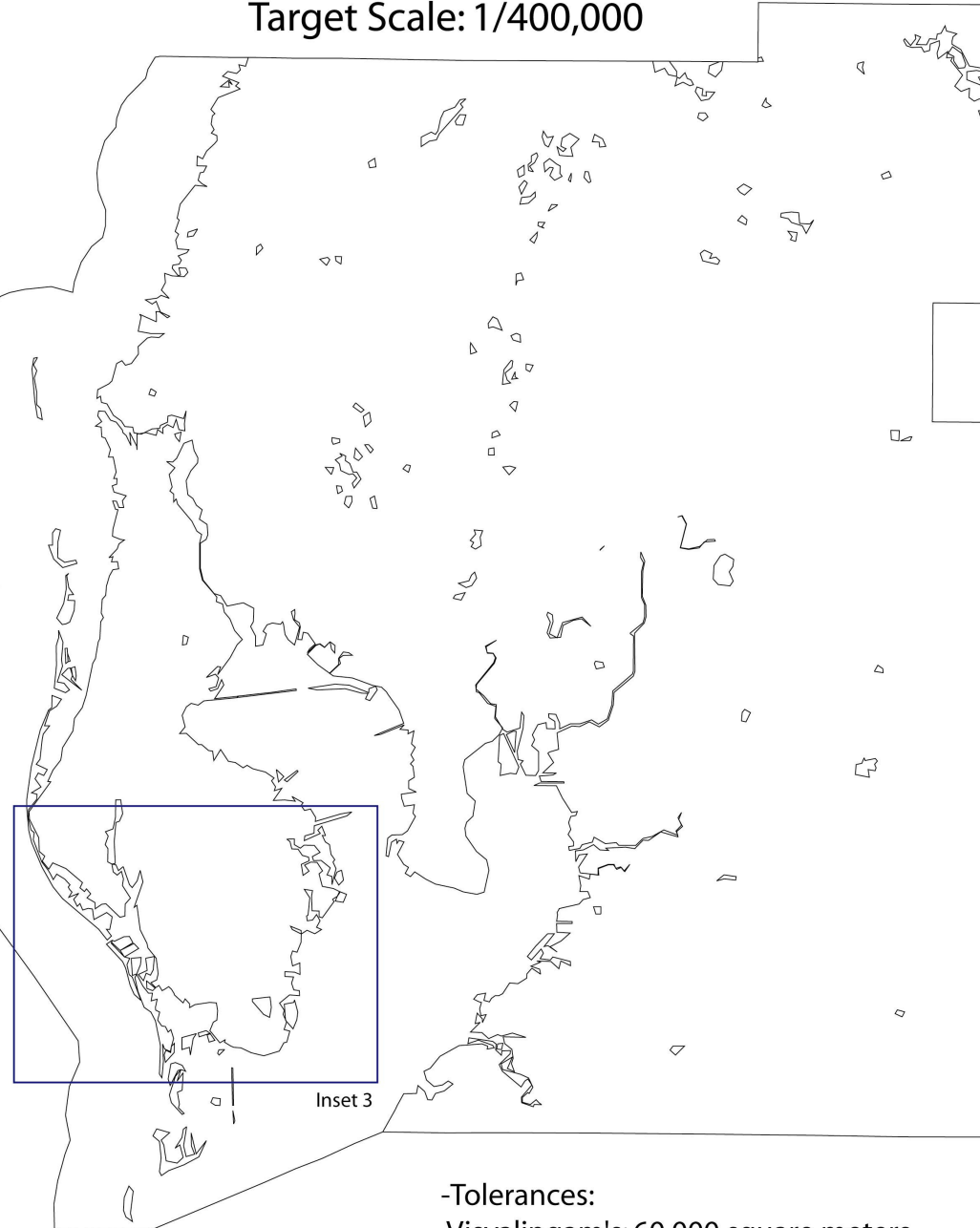
Target Scale: 1/400,000



Tolerance: 60,000 square meters

Two Pass Method

Target Scale: 1/400,000



-Tolerances:
Visvalingam's: 60,000 square meters
Leung's: 200,000 square meters

Two Pass Method



Generalized for a target scale of 1/400,000

-Tolerances used:

Visvalingham's: 60,000 sq. meters

Leung's: 200,000 sq. meters

Visvalingham Only

After 2nd Pass w/
Leung's Algorithm

Visvalingam's Algorithm

Target Scale: 1/1,000,000



Tolerance: 400,000 square meters

Two Pass Method

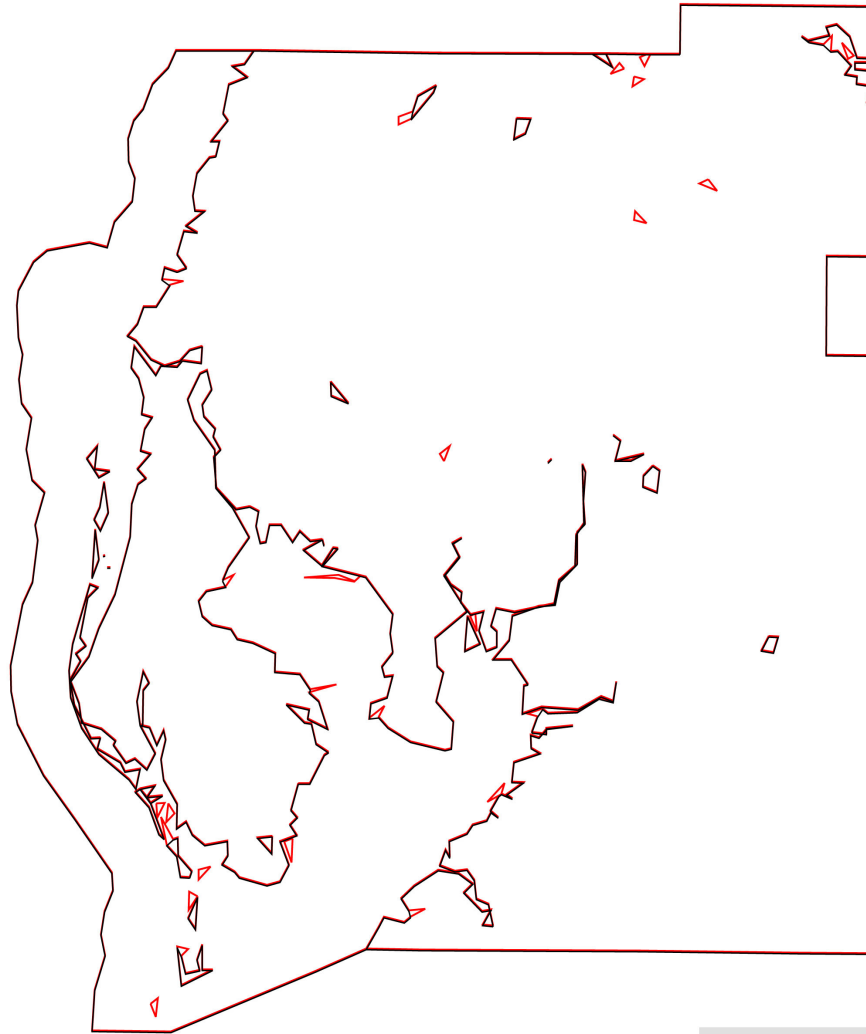
Target Scale: 1/1,000,000



-Tolerances:
Visvalingam: 400,000 square meters
Leung: 1,000,000 square meters

Two Pass Method

Inset 4
(blow-up of 1:1,000,000 target scale)



Generalized for a target scale of 1/1,000,000
-Tolerance used:
Visvalingam 400,000 sq. meters
Leung's 1,000,000 sq. meters

Visvalingam's Only

After 2nd Pass w/
Leung's Algorithm

Next Steps

- ◆ Continue to test complexity measures
- ◆ Experiment with the application of smoothing procedures after simplification
- ◆ Test methods on other places
 - Maine coastline
 - Louisiana delta