Communicating spatial knowledge

WAMRSA 2012 Washington GIS Conference

May 7-9 • Greater Tacoma Convention & Trade Center

OSGeo Cascadia Chapter

Introduction to gvSIG CE

and

geo-processing with sextante

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TERRA GIS

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Workshop Goals

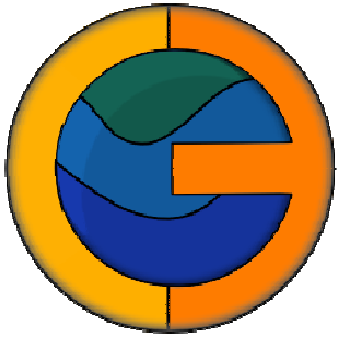
- Overview of gvSIG CE & Sextante
- Get impression of gvSIG & Sextante functionality
- Introduce some of the basic functionality hands on

Workshop Outline

- **Introduction - presentation style** — about 60 minutes
  to gvSIG CE Desktop GIS
- **Using gvSIG CE** — about 75 minutes
  "Hands-on" exercises and examples
  General use of gvSIG: editing of GIS data, layout & cartography and accessing spatial databases
- **Spatial Analysis & Geo-processing with gvSIG CE & SEXTANTE** — about 75 minutes
  "Hands-on" exercises and examples
  The exercises will cover the use of spatial analysis and geo-processing tools in gvSIG for raster and vector data

Part I

Introduction to



gvSIG CE Desktop GIS

What is Open Source (GIS)?

Open source means that the source code is available to the general public for use, distribution, and modification from its original design free of charge (among a long list of other requirements)

Open Source ≠ Open Standards

While most open source geospatial software is built on the standards of the Open Geospatial Consortium (OGC) the term "Open Source" it is not synonymous with Open Standards because both proprietary and open source software can be compliant with the OGC Open Standards.
http://www.opengeospatial.org

OSGeo is the organization that supports the development of the highest quality open source geospatial software.
http://www.osgeo.org

Why use it ? General and incomplete listing

- User is in control
  - Pick you favorite operating system: supports many operating systems: Windows-Linux-Solaris-…
  - No licensing issues (did we install one to many PCs with software XY?)
  - Vendor independency
  - Access to source code: don't like something, need changes to the core system, need extensions – hire somebody to change it right now
- High performance, high quality, high interoperability
  - Distributed programming effort, highly modular…
  - System heterogenity - less prone to hacker attacks and viruses
  - Interoperable – very advanced support of OGC open standards
- Exceptional Support - Commercial and non commercial
  - Mailing lists, user groups, Conferences, IRC channels
  - Fast response times for bug fixes
    typically tracked on the web accessible and open to everybody to report or fix a bug
- It is free

Licenses

Table 1: List of common FOSS software licenses

Name	Style	software
GNU-GPL	strong copyleft license, derived works have to be available under the same copyleft	GRASS, QGIS, gvSIG, Mapbender, PostGIS, GeoServer, AveiN!
LPGL	compromise between copyleft and more permissive licenses, has copyleft restrictions on the program itself, but not on other software linking with the program.	Mapnik, MapGuide
MIT	permissive license, permits reuse within proprietary software (license has to be distributed with that software)	MapServer, GDAL/OGR, Proj4
BSD	permissive license, little restriction, close to the public domain	Ka-Map, FeatureServer, TileCache, OpenLayers
Mozilla (MPL)	hybrid of modified BSD and GPL.	MapWindow, Mozilla Firefox

PROJ4 Library - EPSG Definitions

```
# USA Contiguous Albers Equal Area Conic
<102003> +proj=aea +lat_1=29.5 +lat_2=45.5 +lat_0=37.5 +lon_0=-96 +x_0=0 +y_0=0 +ellps=GRS80 +datum=NAD83 +uni
# Spherical Mercator
<900913> +proj=merc +a=6378137 +b=6378137 +lat_ts=0.0 +lon_0=0.0 +x_0=0.0 +y_0=0 +k=1.0 +units=m +nadgrids=@nu
# SR-ORG Projection 6627 - Google Mercator - Open Street Map
<6627> +proj=merc +lon_0=0 +k=1 +x_0=0 +y_0=0 +ellps=WGS84 +datum=WGS84 +units=m +no_defs

# Anguilla 1957 / British West Indies Grid
<2000> +proj=tmerc +lat_0=0 +lon_0=-62 +k=0.999500 +x_0=400000 +y_0=0 +ellps=clrk80 +units=m +no_defs  no_defs
#
<2
#
<2
#
<2
#
<2
#
<2
#
<2
#
<2
#
<2008> +proj=tmerc +lat_0=0 +lon_0=-55.5 +k=0.999900 +x_0=304800 +y_0=0 +ellps=clrk66 +units=m +no_defs  no_de
# NAD27(CGQ77) / SCoPQ zone 3
<2009> +proj=tmerc +lat_0=0 +lon_0=-58.5 +k=0.999900 +x_0=304800 +y_0=0 +ellps=clrk66 +units=m +no_defs  no_de
# NAD27(CGQ77) / SCoPQ zone 4
<2010> +proj=tmerc +lat_0=0 +lon_0=-61.5 +k=0.999900 +x_0=304800 +y_0=0 +ellps=clrk66 +units=m +no_defs  no_de
```

Projection definition

 # USA Contiguous Albers Equal Area Conic

<102003> +proj=aea +lat_1=29.5 +lat_2=45.5 +lat_0=37.5 +lon_0=-96 +x_0=0 +y_0=0 +ellps=GRS80 +datum=NAD83 +units=m no_defs <>

gvSIG – Generalidad Valenciana

Conselleria d'Infraestructures i Transport

- project - Spanish Community of Valencia
- mid range Desktop GIS
- based on open standards
- part of gvPONTIS project

  http://www.gvpontis.gva.es/fileadmin/conselleria/images/Documentacion/memoria/gvpontis_ingles.pdf

- based on gvSIG
- Community effort, started 2011
- Open International Edition
- many plug-ins integrated
  ArcSDE, Postgis, Grass, SAGA & sextante
- http://gvsigce.org

- Home
- Community
- About gvSIG CE
- News
- Events
- Documentation

Welcome

gvSIG CE is a community driven GIS project based on a version of gvSIG bundled with SEXTANTE, GRASS GIS and SAGA that is maintained by gvSIG enthusiasts and open source supporters.

READ MORE: WELCOME

Team Introduction

Currently a group of GIS specialists from several countries are involved in gvSIG CE.

READ MORE: TEAM INTRODUCTION

Downloads

A technical preview of the upcoming gvSIG Community Edition 1.0 is available for download now!

Download
gvsig-ce-1.0.sv...zip

READ MORE: DOWNLOADS

gvSIG Products

- gvSIG & gvSIG CE
- gvSIG Mobile
- gvSIG Mini
- Extensions
  - Raster and Remote Sensing
  - Network
  - Sextante
  - Navtable
  - 3 D
  - ArcSDE

Extensions

Navtable

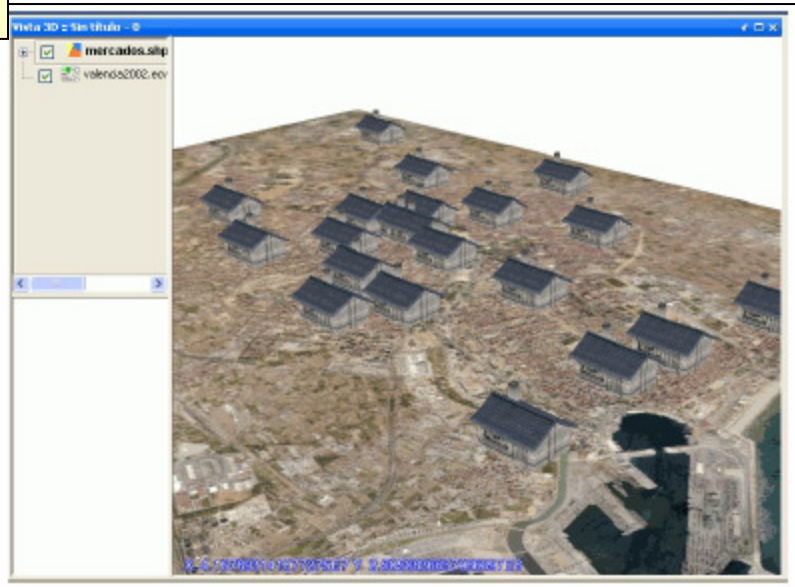
NavTable: sp_provinzen.shp

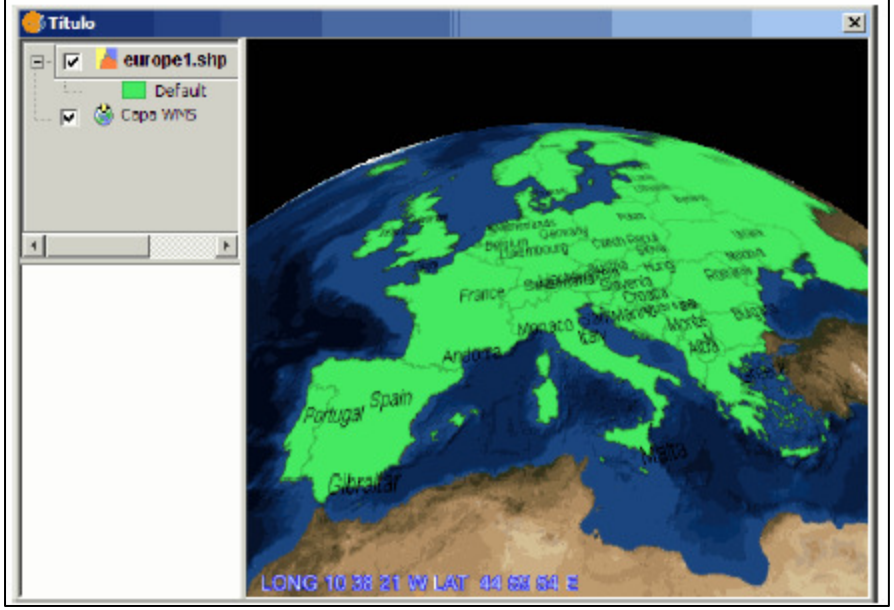
Selected | Select | Always Zoom | Fixed Scale

Attribute	Value
OBJECTID	1
AREA	7.98074764672E9
PERIMETER	1032580.03328
P20099_	2
P20099_ID	1
NOMBRE99	Coruña (A)
SHAPE_LENG	1032579.97286
SHAPE_AREA	7.98074766336E9
PROV	15
COM	12
DPROV	15
test	0
Hotlink	
Geom_LENGTH	1032580
Geom_AREA	7980747663

1 /116

3 D





gvSIG Mobile

- Compatible gvSIG 2.0
- Mobile GIS
- WFS
- Legend
- Labeling
- Editing
- Routes
- POI

gvSIG Mini

Visualization of map tiles on mobile phones

GPS

OSM Maps, Yahoo Maps, Microsoft Maps, etc.

Phone Cache

2 Versions

- Android
- Java – CLDC

GNU/GPL

http://www.gvsigmini.org

- Project of the Spanish province of Extremadura

  Sistema Extremeno de Analisis Territorial

- Geo-processing tool set - software library
- more than 280 spatial functions
  raster and vector processing

  originally targeted at forestry usage, initially based on SAGA GIS
- Java based plug-ins for Desktop GIS
  - gvSIG and OpenJUMP 1.3
  - ArcGIS 9.3.1 and 10.X
  - QGIS 1.7 +

Main supporter of **gvSIG**	Generalitat Valencia (GVA) - Province of Valencia, Spain
Type	Desktop GIS
Functionality	Multilingual Desktop GIS - Analysis functions can be greatly extended when installing Sextante. Many extensions.
Operating systems	Unix/Linux, Windows
Project started	2003
Implementation	Java
OS libraries	GeoTools and JTS
PostGIS support	Yes
License	GPL

gvSIG and Sextante facts

Main supporter of **Sextante**	Sextante Team, Victor Olaya, Juan Carlos Giménez
Functionality	Comprehensive set of spatial vector data and image analysis tools
Operating systems	Unix/Linux, Windows
Project started	2004
Implementation	Java
OS libraries	built on top of SAGA GIS functionality
PostGIS support	Yes
License	GPL

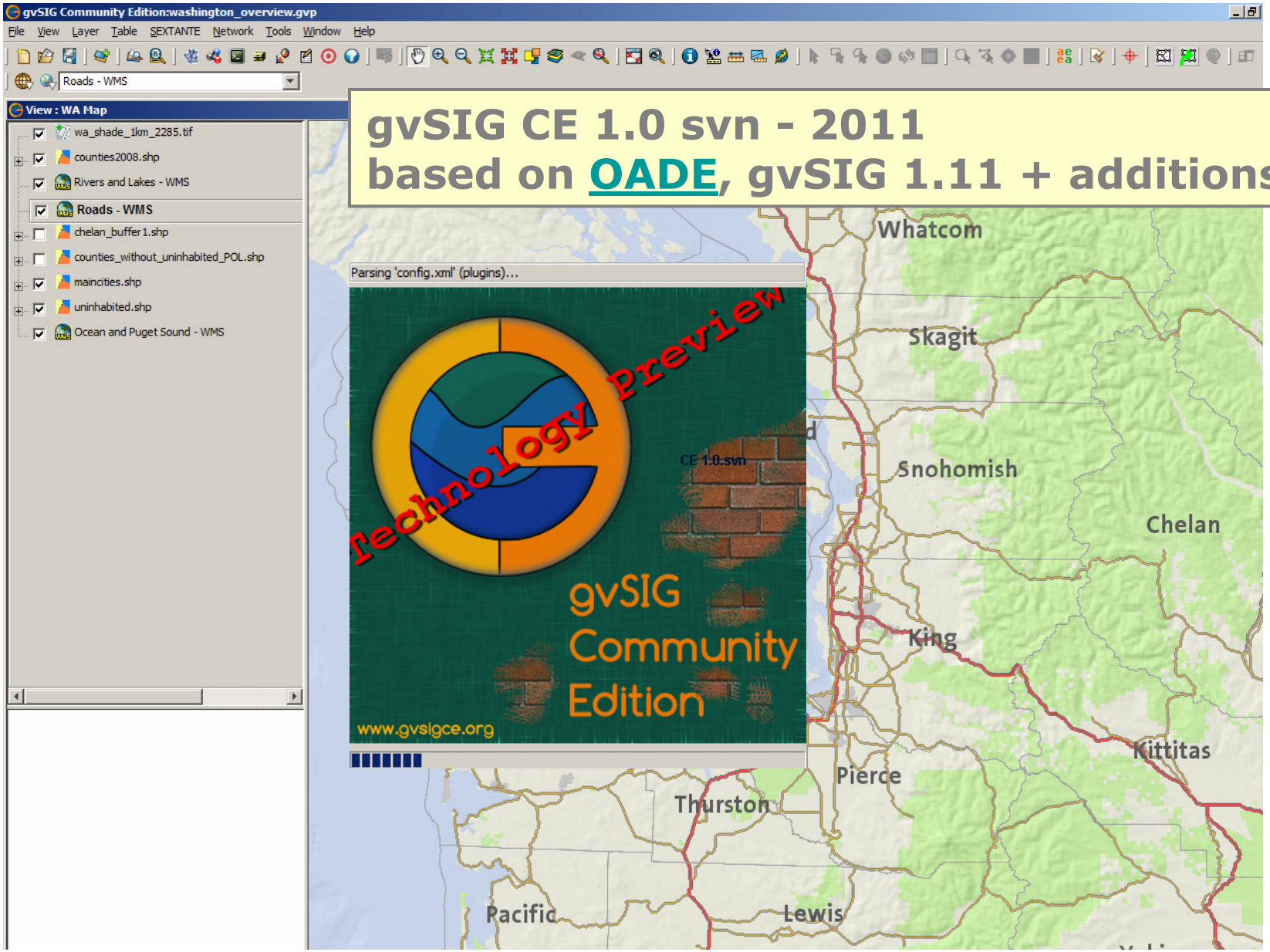
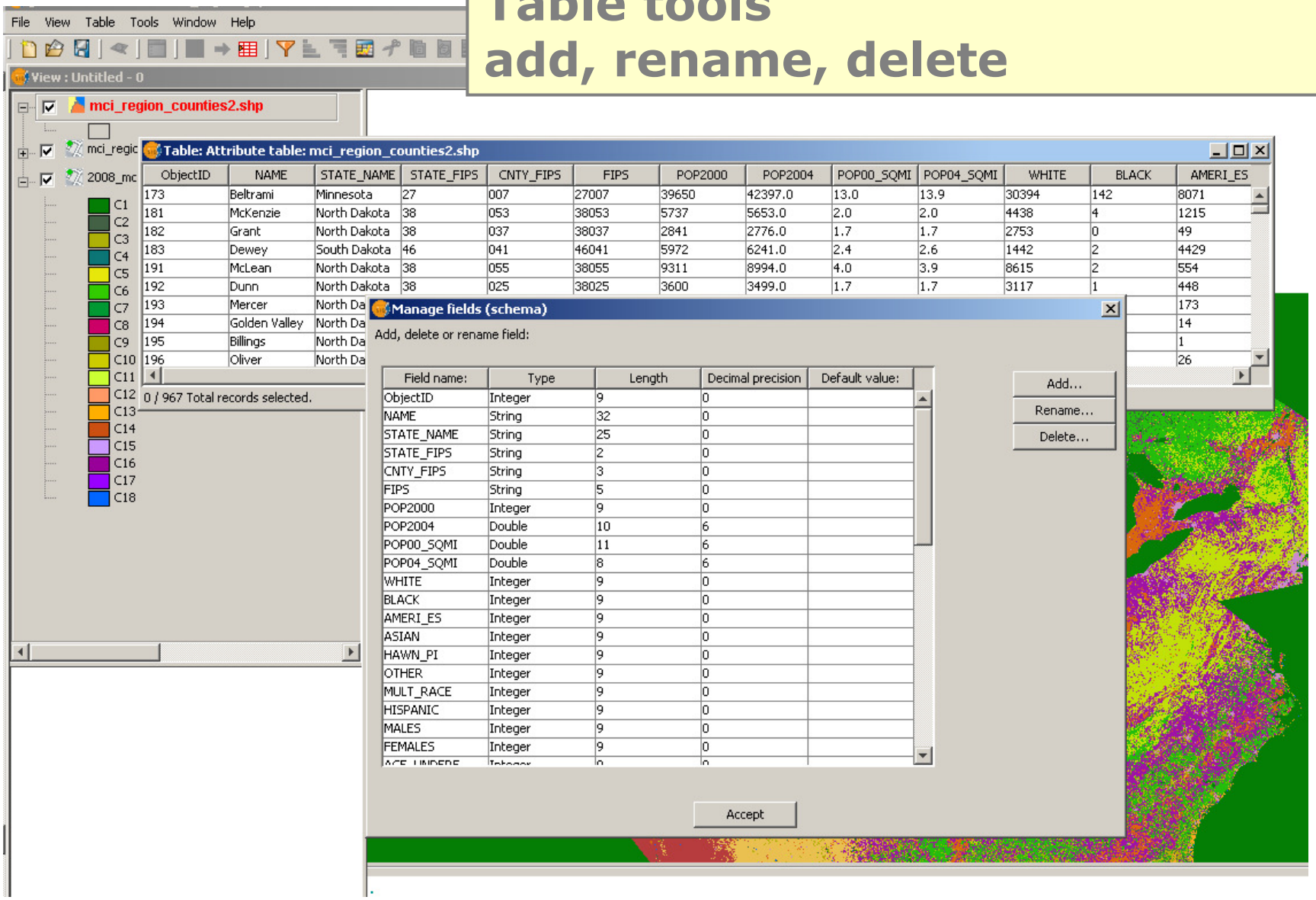
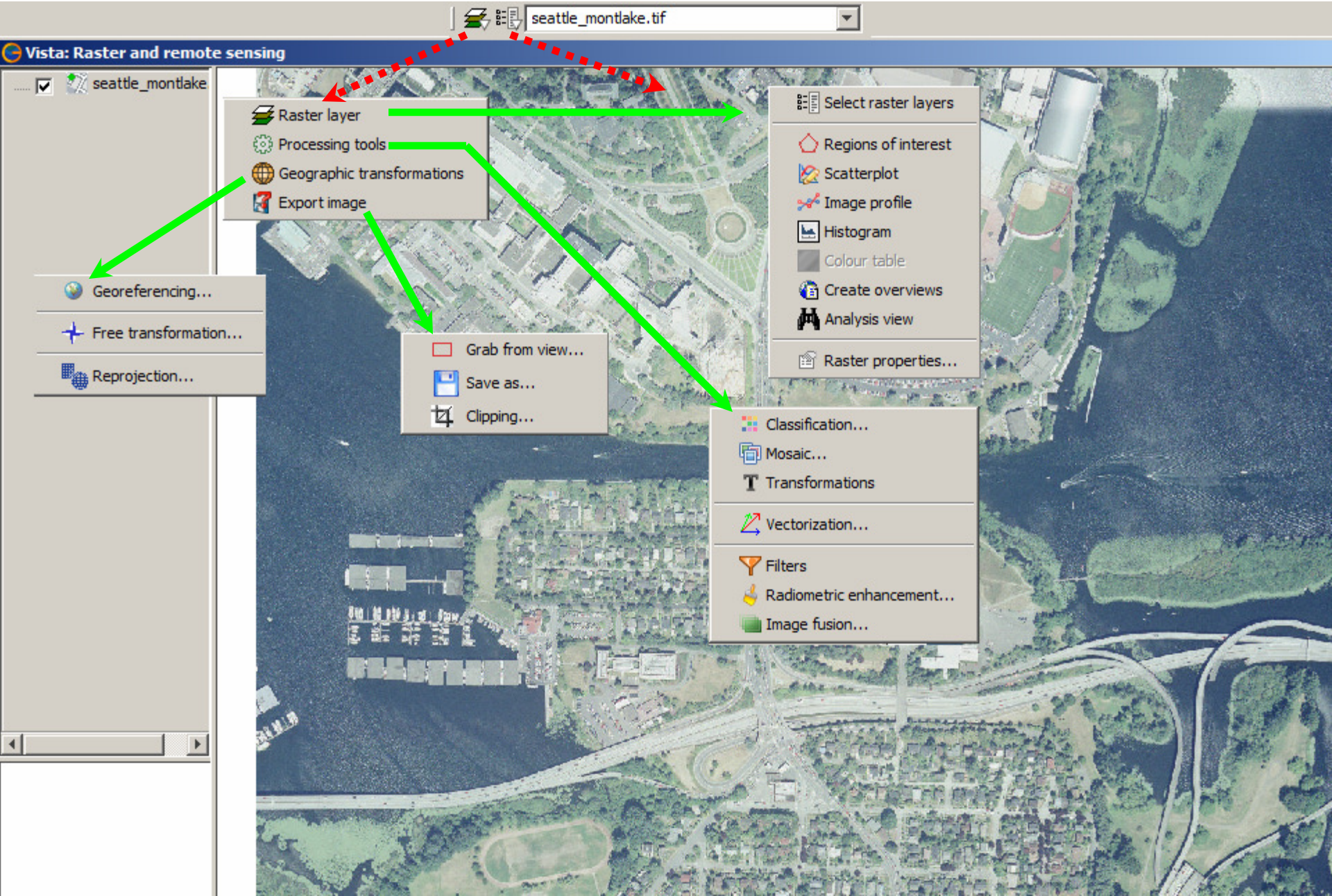

gvSIG Community Edition:washington_overview.gvp
File View Layer Table SEXTANTE Network Tools Window Help
Roads - WMS
View : WA Map
wa_shade_1km_2285.tif
counties2008.shp
Rivers and Lakes - WMS
Roads - WMS
chelan_buffer1.shp
counties_without_uninhabited_POL.shp
maincities.shp
uninhabited.shp
Ocean and Puget Sound - WMS
gvSIG CE 1.0 svn - 2011
based on OADE, gvSIG 1.11 + additions
Parsing 'config.xml' (plugins)...
Technology Preview
CE 1.0.svn
gvSIG
Community
Edition
www.gvsigce.org
Whatcom
Skagit
Snohomish
Chelan
King
Kittitas
Pierce
Thurston
Pacific
Lewis

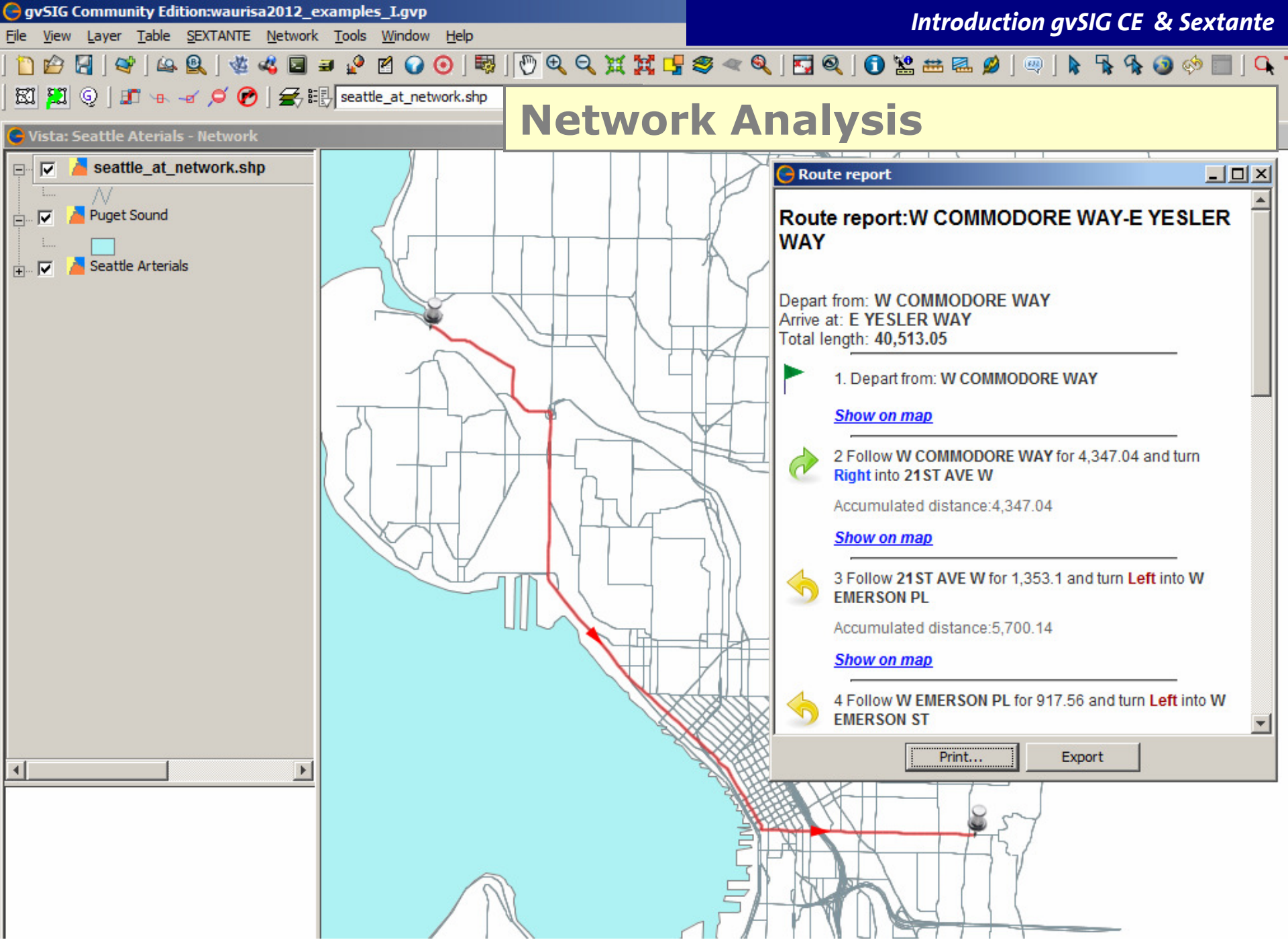
Table tools
add, rename, delete



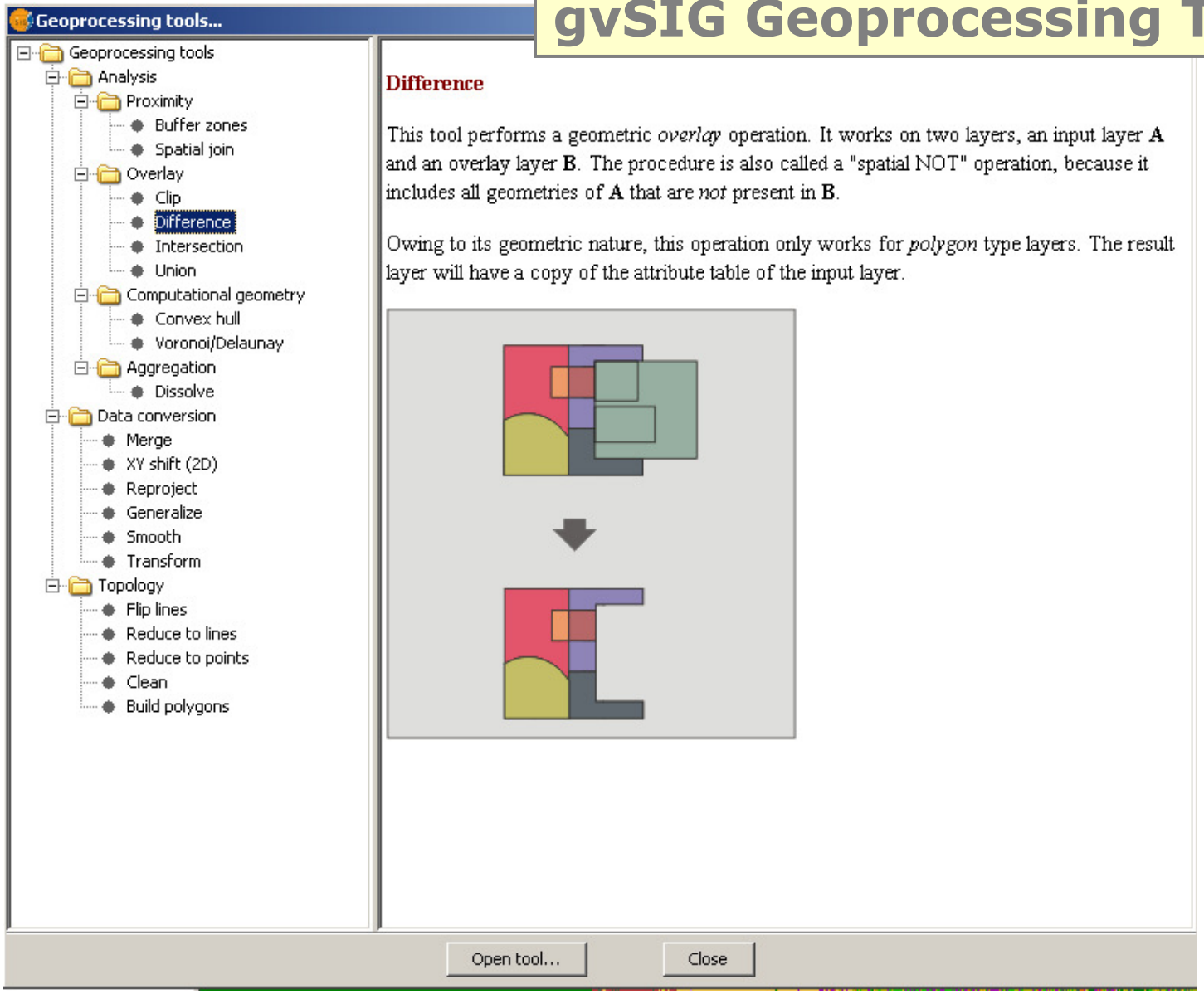
Raster and remote sensing



Network Analysis

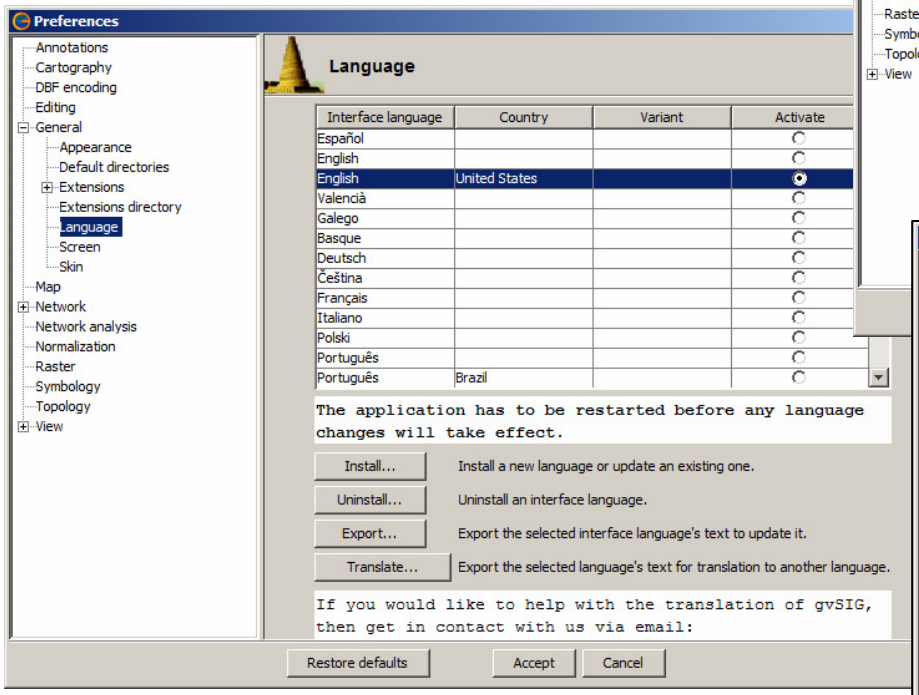


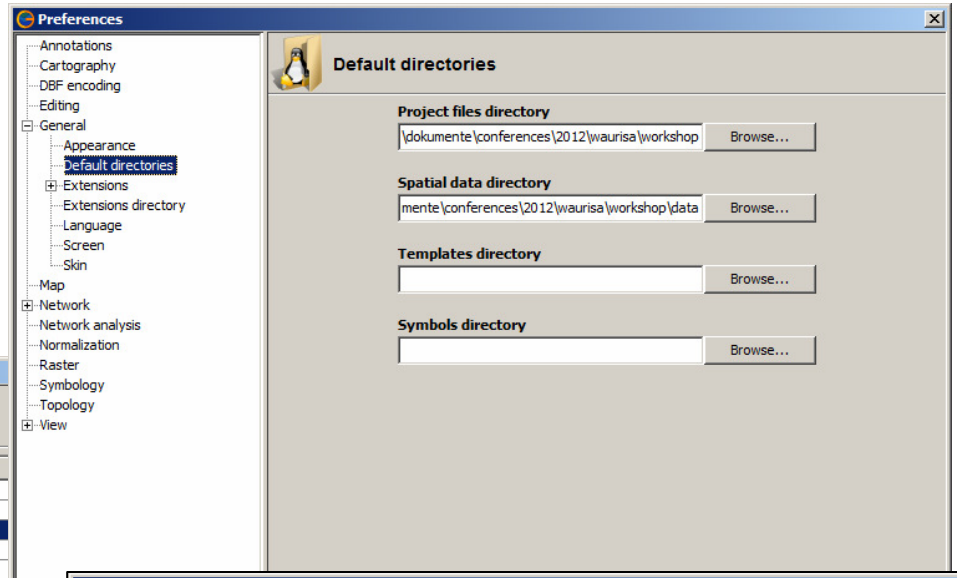
gvSIG Geoprocessing Tools

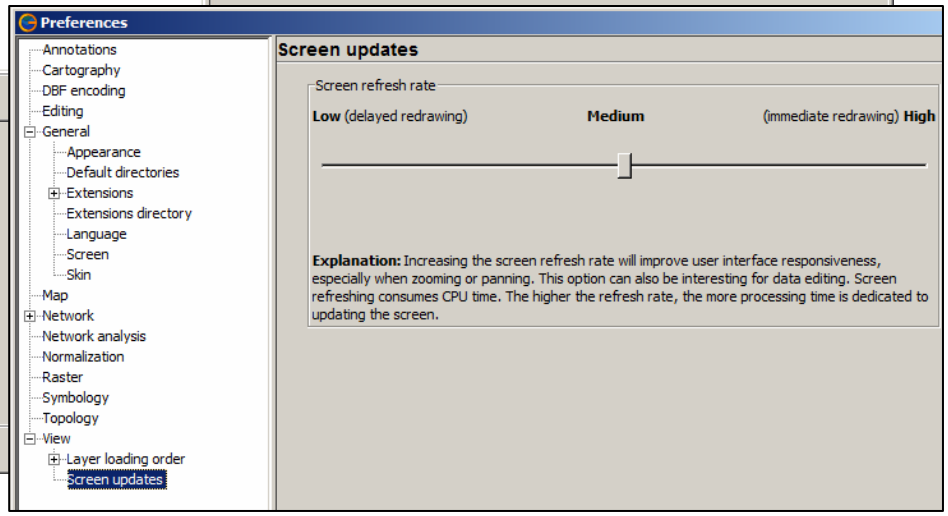


General Settings

- language
- default directories
- screen updates

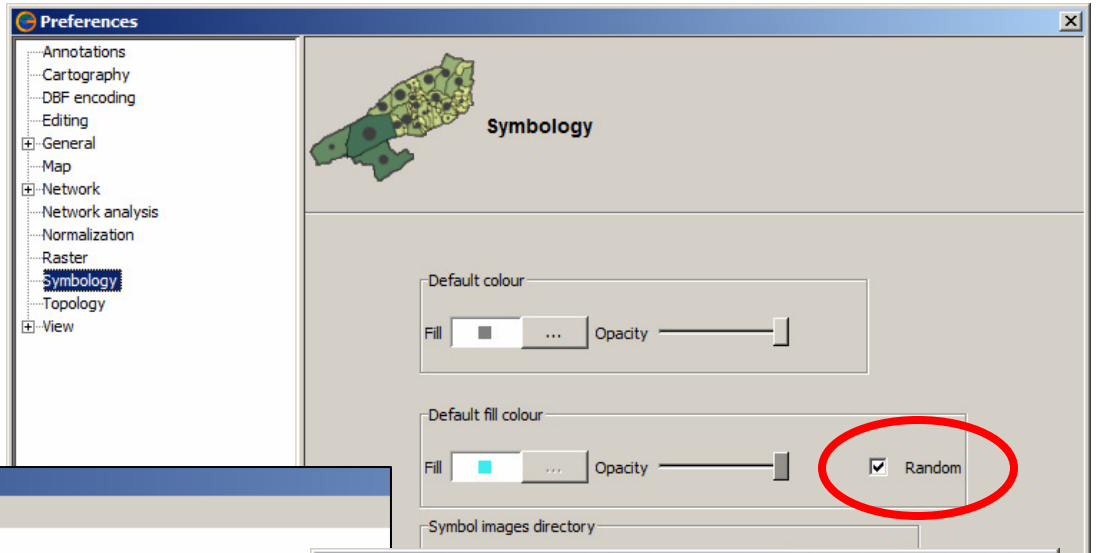


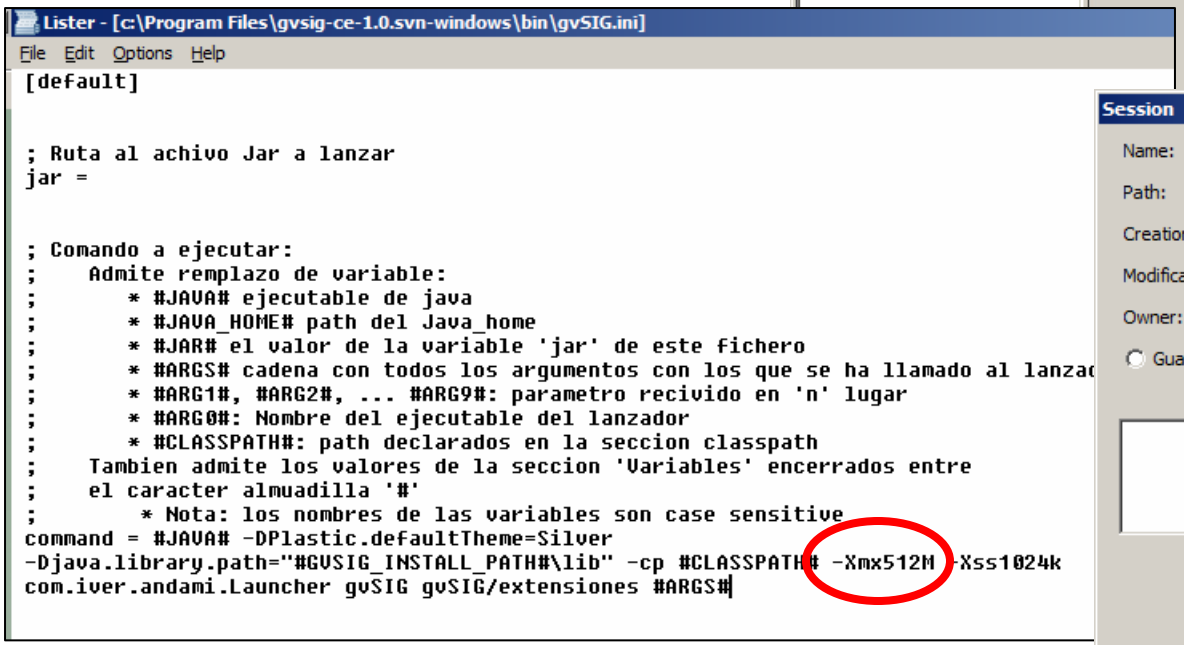


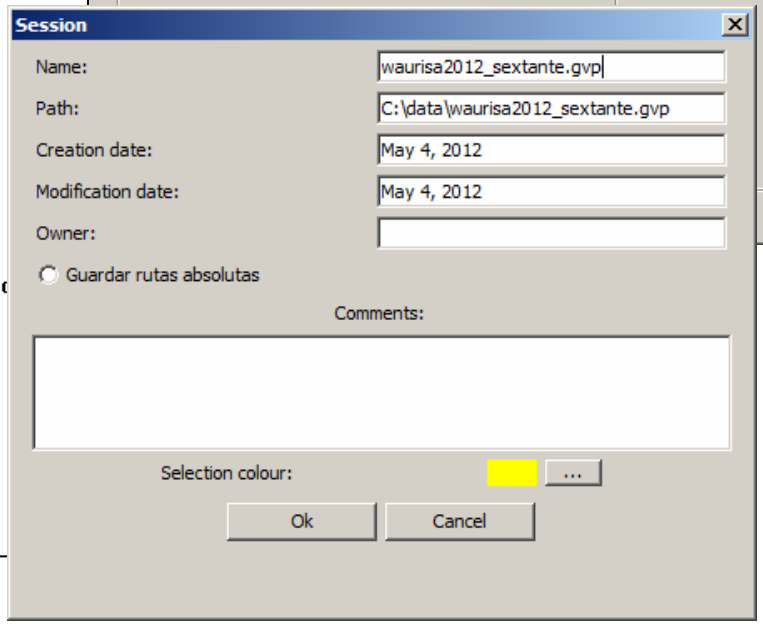


General Settings

- symbology
- relative path (session)
- Java RAM: gvsig.ini







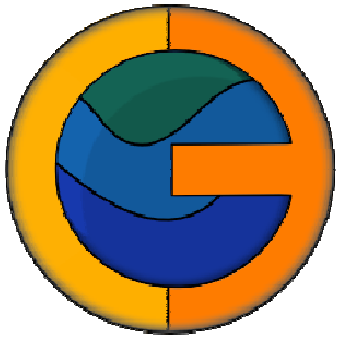
Resources

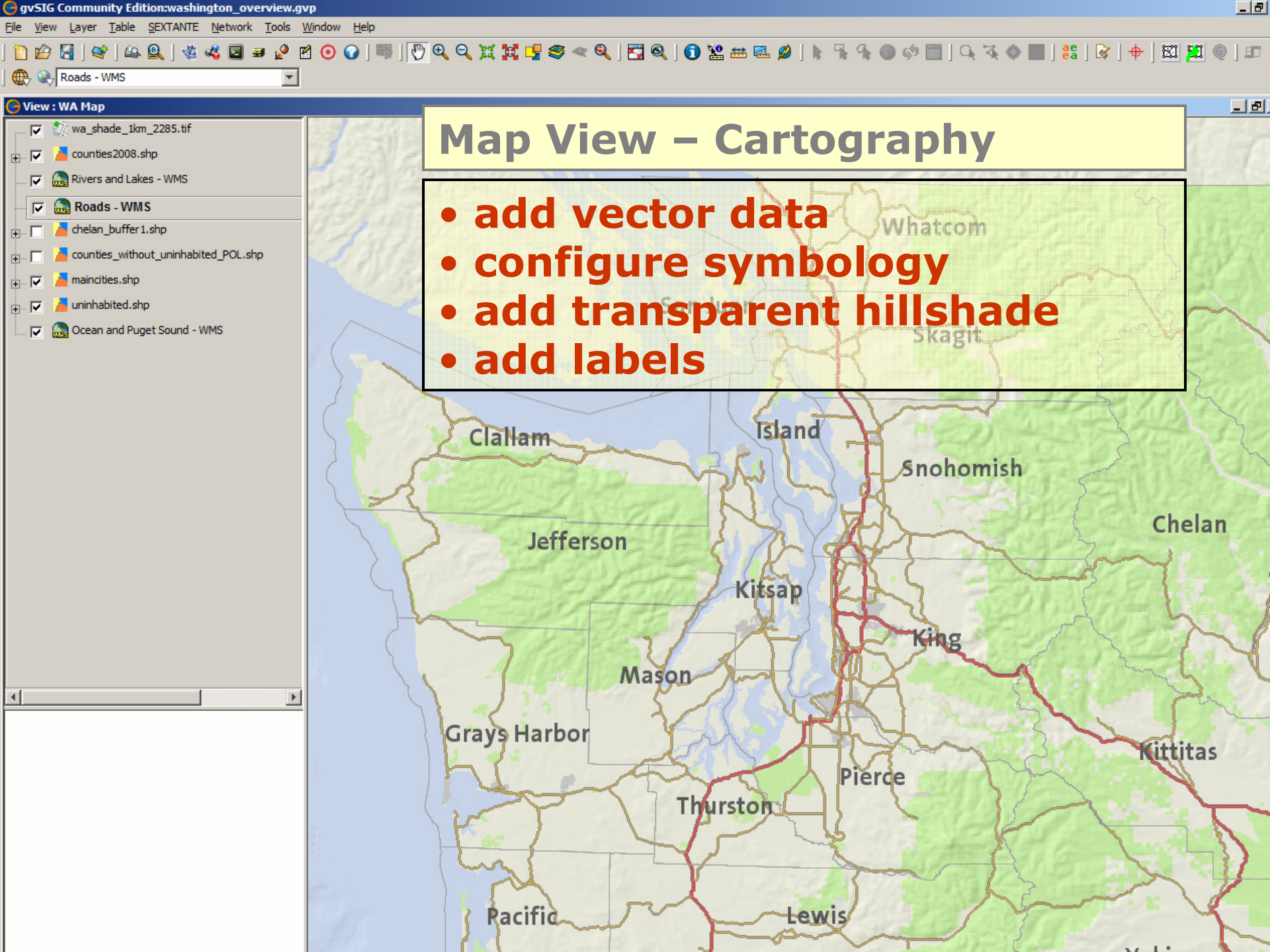
- gvSIG CE
  - gvSIG CE http://gvsigce.org
  - gvSIG http://www.gvsig.org
  - Information at CSGIS
  - OSGEO quickstart tutorial
- SEXTANTE
  - www.sextantegis.com
  - sextante videos
  - Grass GIS http://grass.fbk.eu/
  - Saga http://www.saga-gis.org/en/index.html

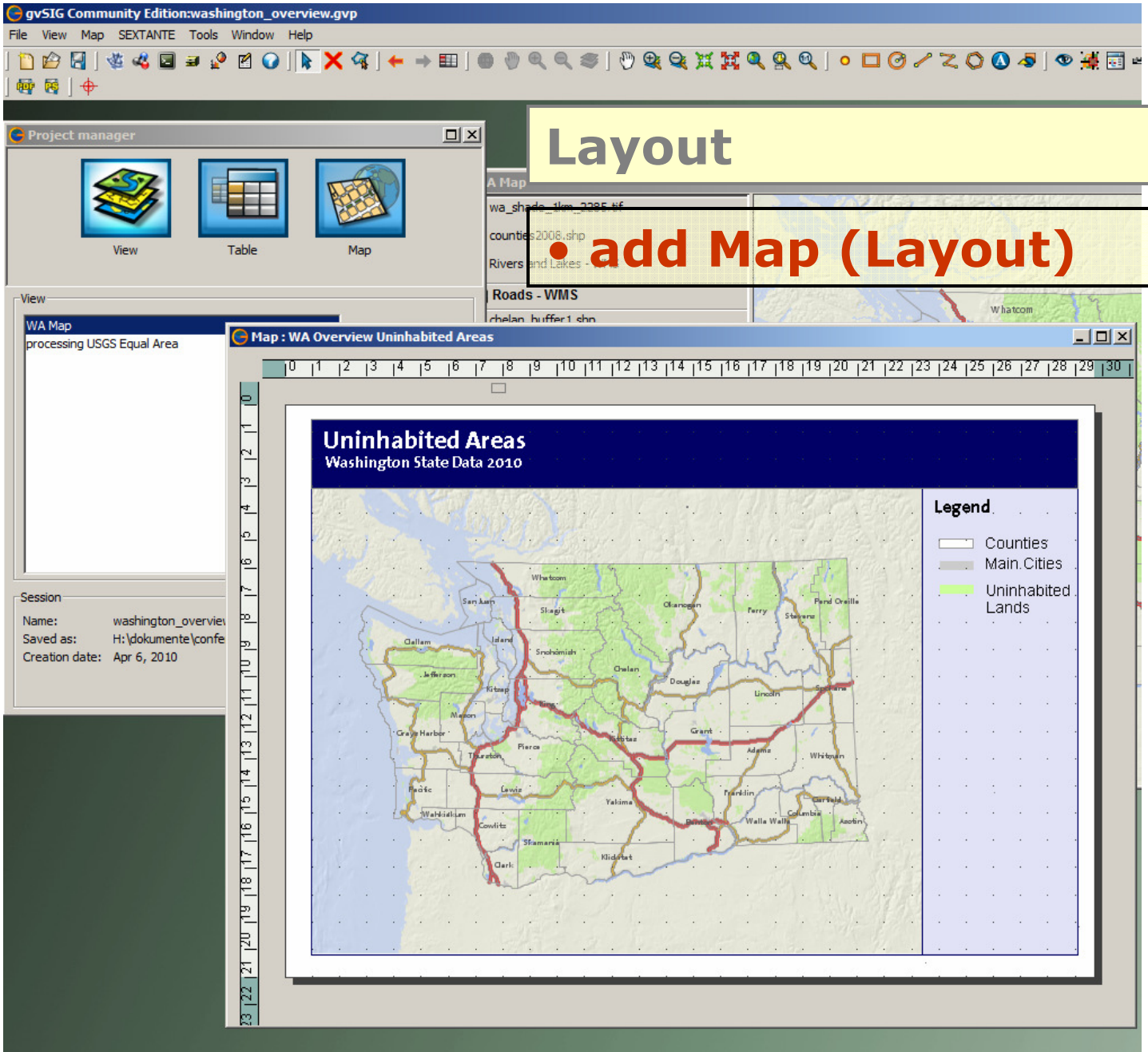
Part II

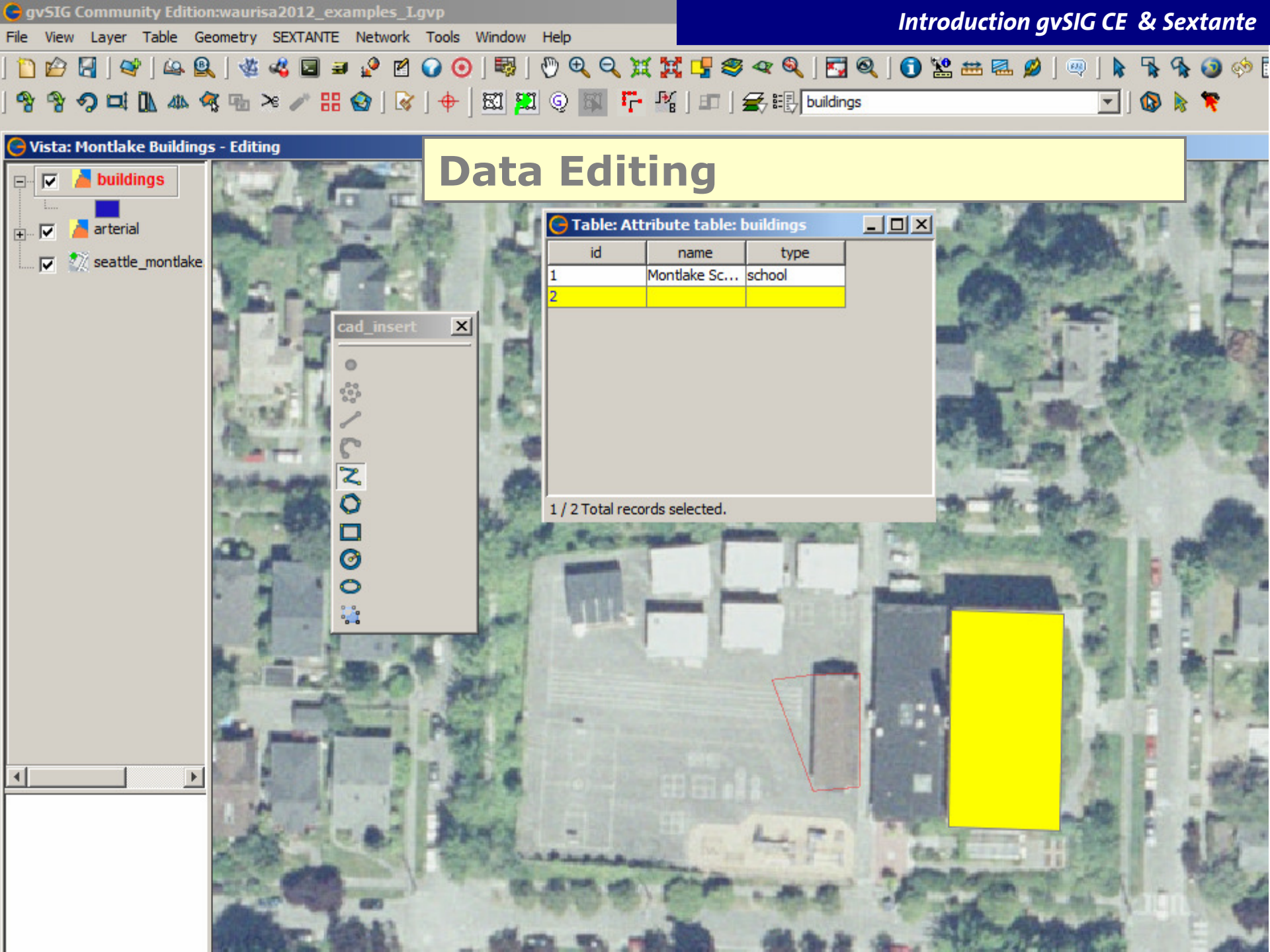
"Hands-on" exercises and examples

using gvSIG CE

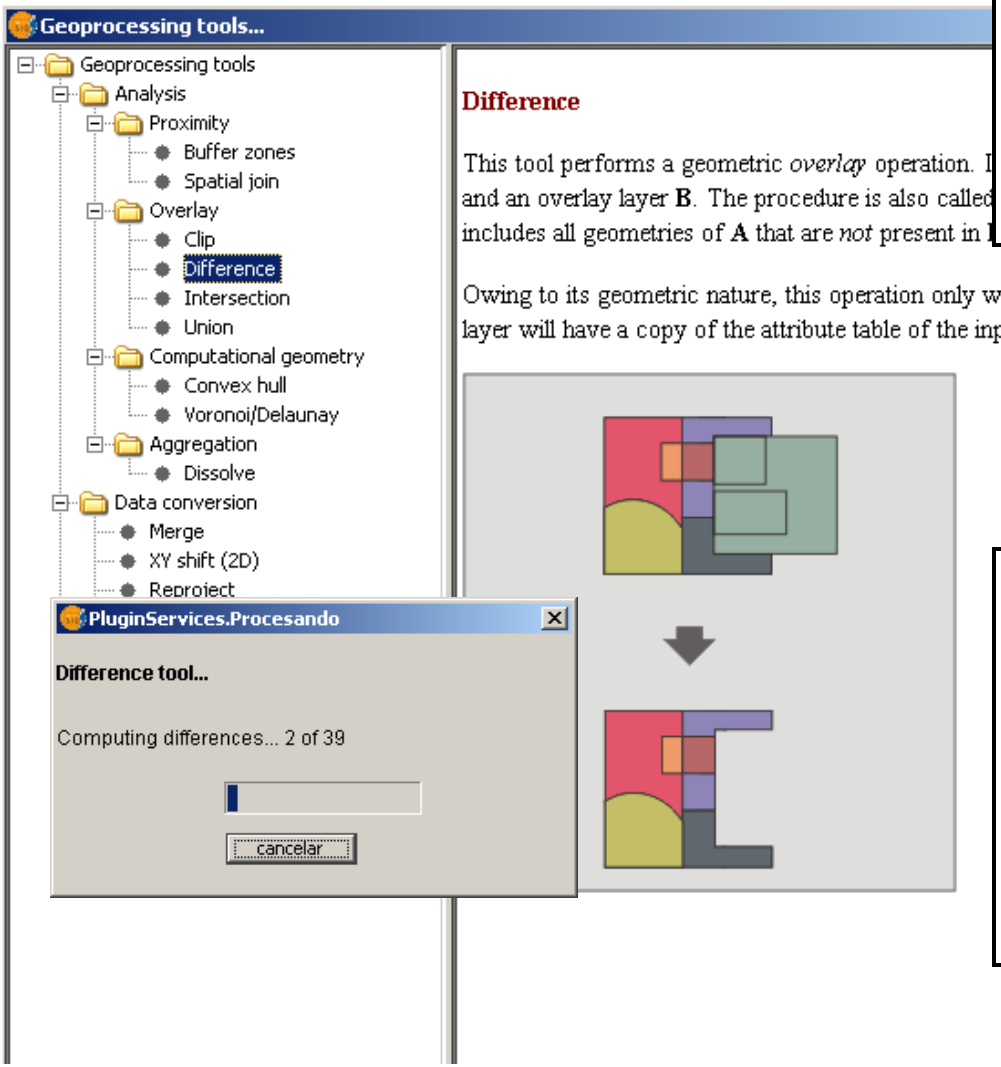


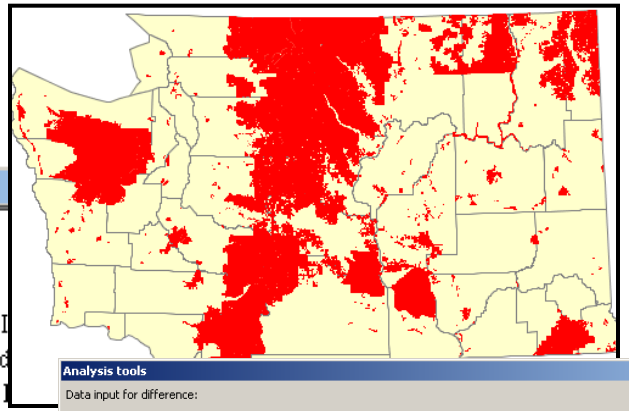

gvSIG Community Edition:washington_overview.gvp
File View Layer Table SEXTANTE Network Tools Window Help
Roads - WMS
View : WA Map
wa_shade_1km_2285.tif
counties2008.shp
Rivers and Lakes - WMS
Roads - WMS
chelan_buffer1.shp
counties_without_uninhabited_POL.shp
maincities.shp
uninhabited.shp
Ocean and Puget Sound - WMS
Map View – Cartography
• add vector data
• configure symbology
• add transparent hillshade
• add labels
Whatcom
Skagit
Clallam
Island
Snohomish
Chelan
Jefferson
Kitsap
King
Mason
Grays Harbor
Kittitas
Pierce
Thurston
Pacific
Lewis

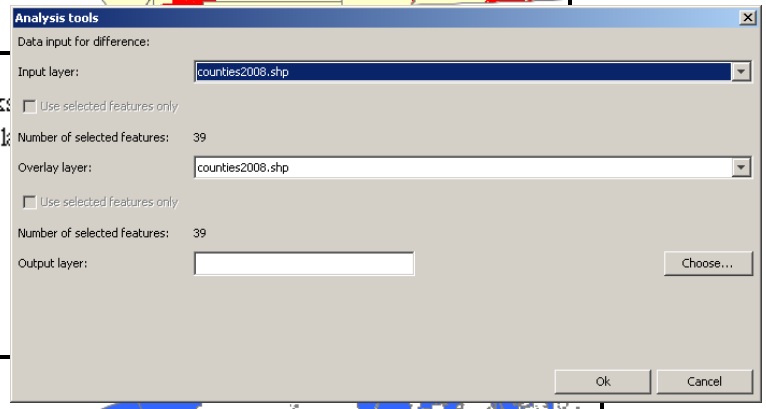

gvSIG Community Edition:washington_overview.gvp
File View Map SEXTANTE Tools Window Help
Project manager
View
Table
Map
Layout
• add Map (Layout)
View
WA Map
processing USGS Equal Area
Session
Name: washington_overvie
Saved as: H:\dokumente\confe
Creation date: Apr 6, 2010
Roads - WMS
Map : WA Overview Uninhabited Areas
Uninhabited Areas
Washington State Data 2010
Legend
Counties
Main.Cities
Uninhabited Lands

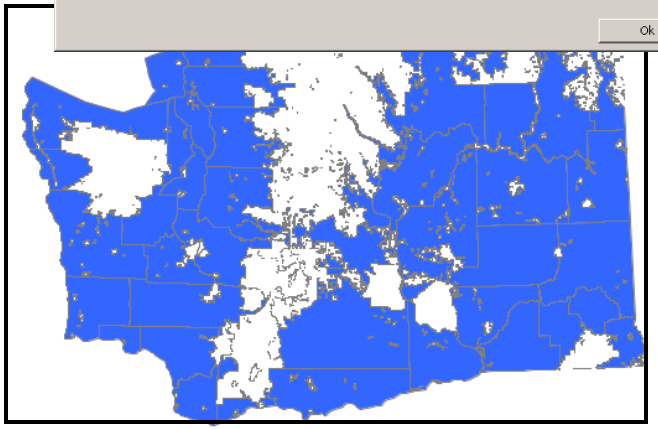

gvSIG Community Edition:waurisa2012_examples_1.gvp
File View Layer Table Geometry SEXTANTE Network Tools Window Help
buildings
Vista: Montlake Buildings - Editing
buildings
arterial
seattle_montlake
Data Editing
cad_insert
Table: Attribute table: buildings
id name type
1 Montlake Sc... school
2
1 / 2 Total records selected.

Overlay - Difference

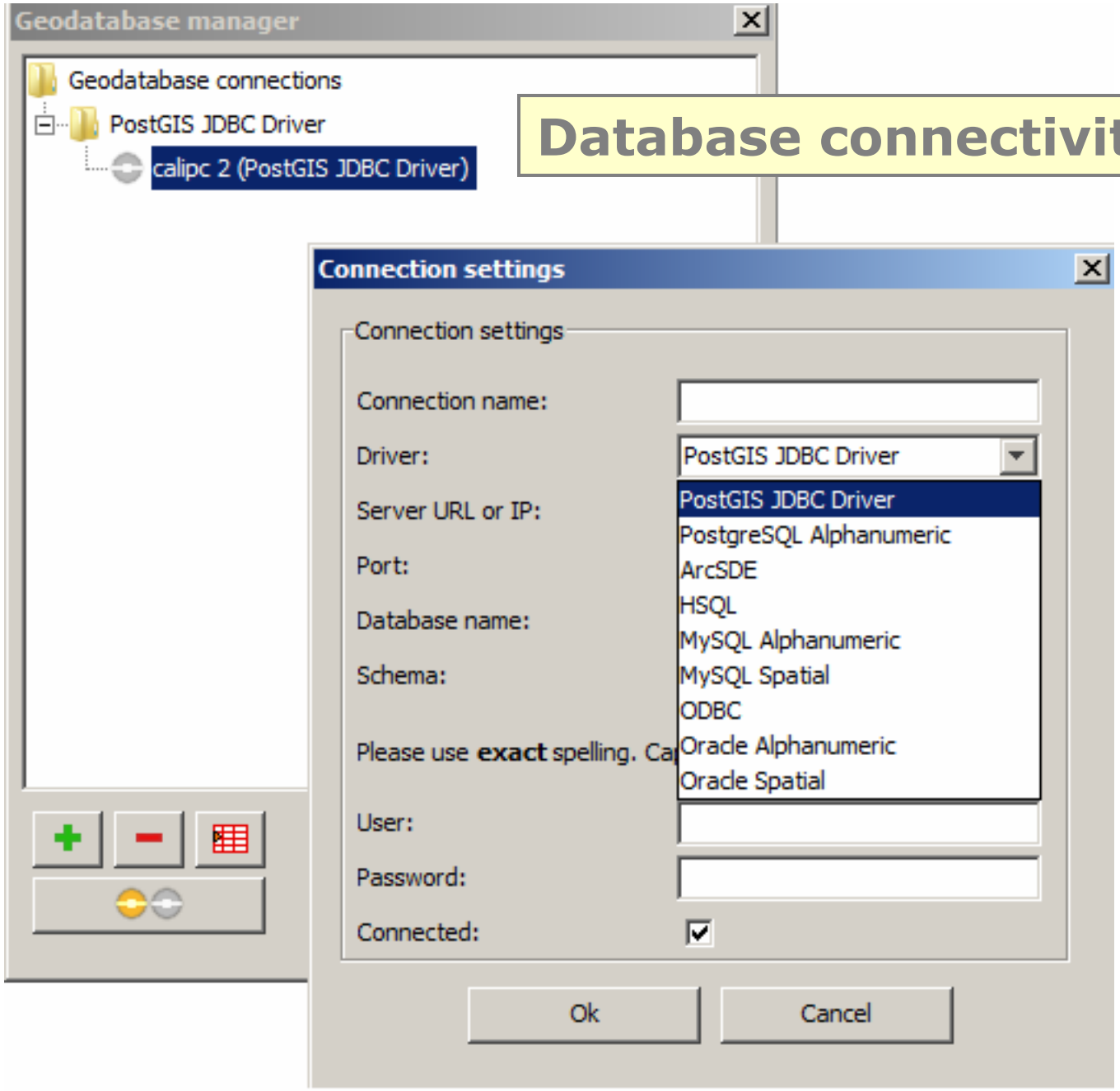








Database connectivity



Connectivity - Spatial Databases

e.g. PostGIS – Spatial Database

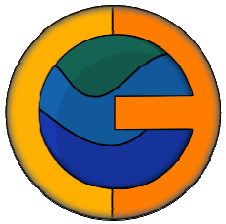
and Oracle Spatial, ArcSDE, MySQL

- PostGIS is an extension for PostgreSQL
- adds support for geographic objects to PostgreSQL
- enables PostgreSQL server to be used as a backend spatial database for GIS
- Spatial operations and analysis simply mean running a (spatial) SQL query in the database
- Similar functions as SDE and much more ….

Part III

"Hands-on" exercises and examples for

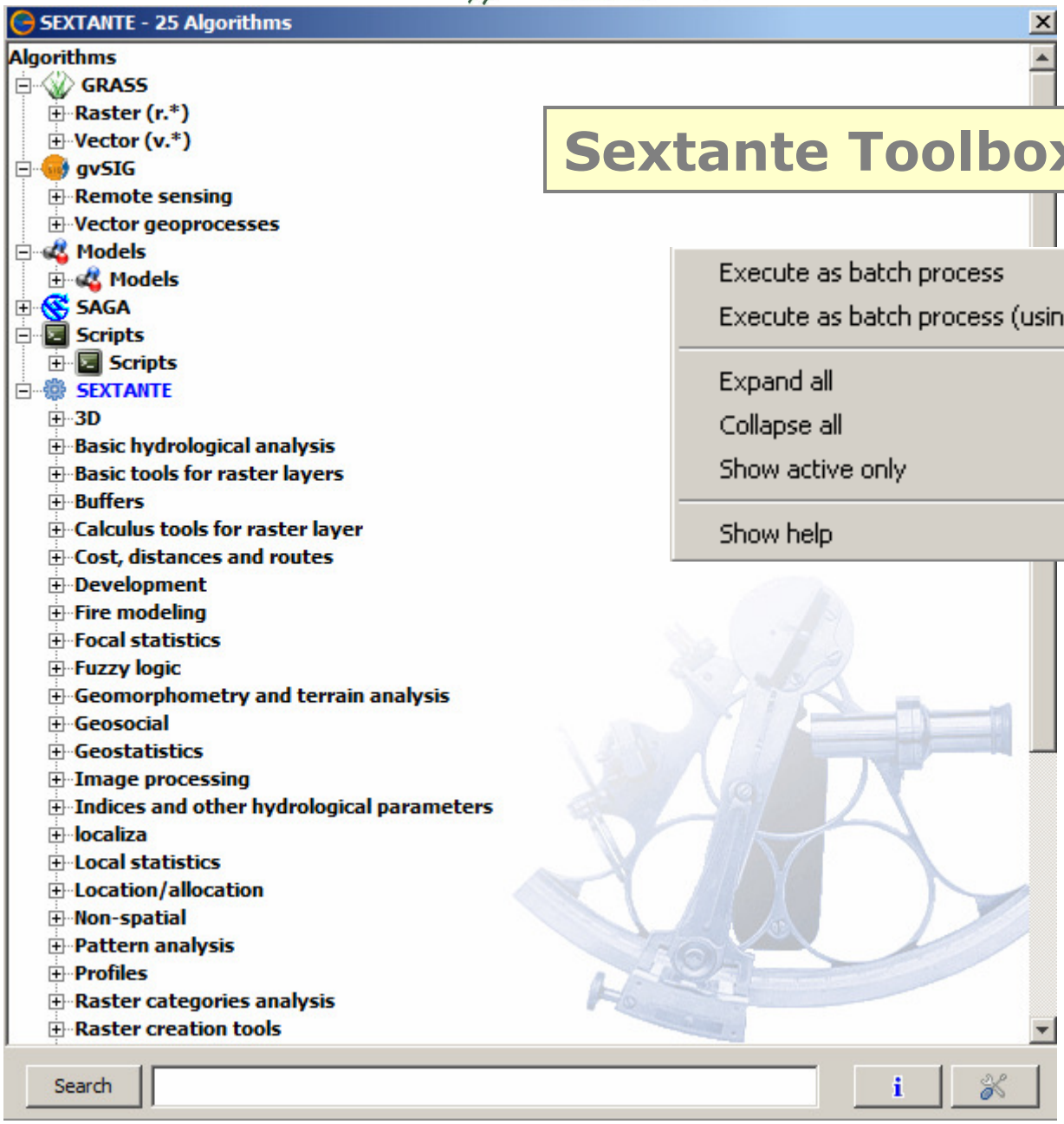
Spatial Analysis and Geo-processing with gvSIG CE and SEXTANTE



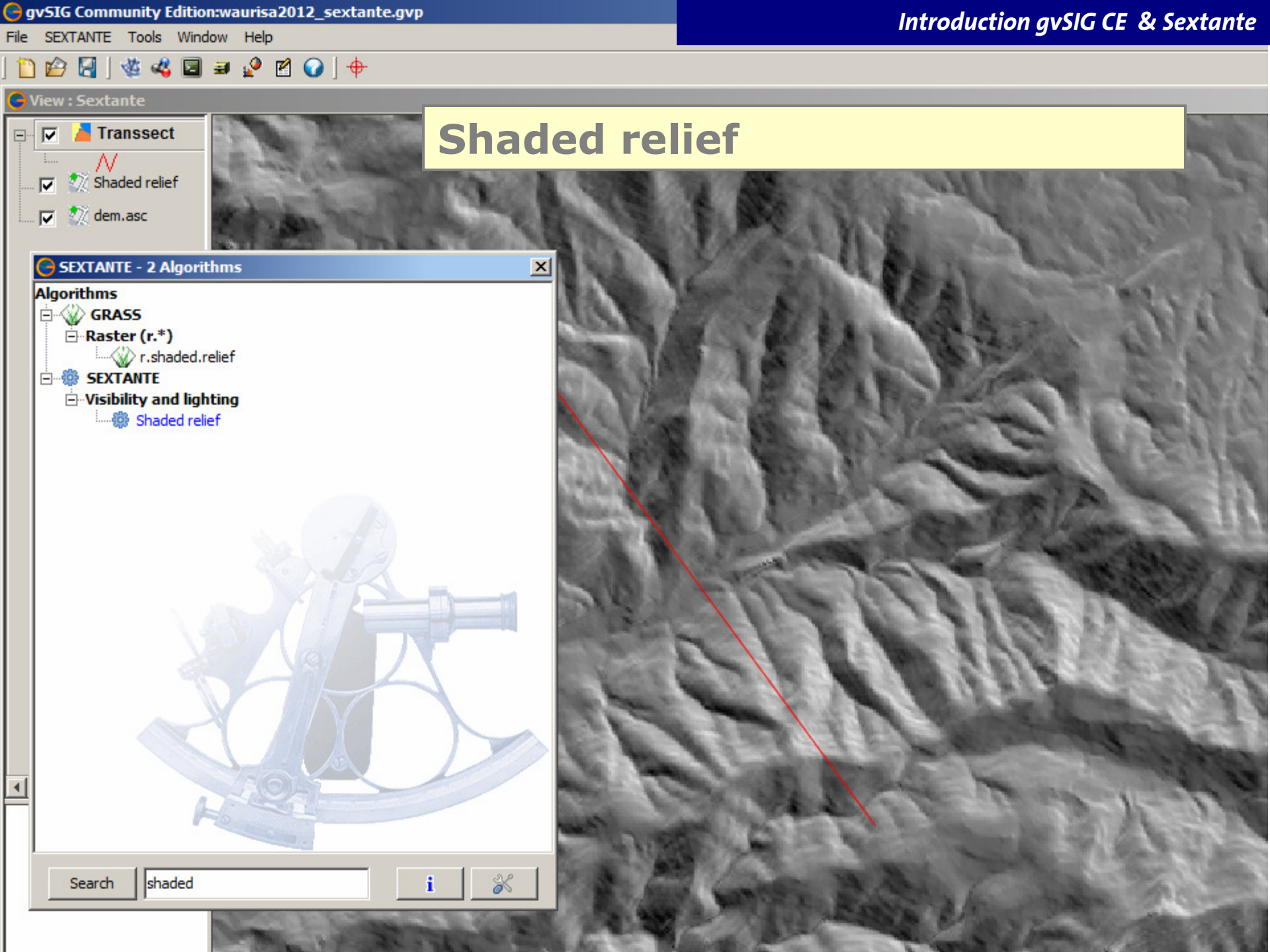
Functionality

- provides tools & toolbox
  - native algorithms
  - access to other libraries SAGA, Grass and R
- Model Builder
- Batch processing
- Programming environment
- WPS wrapper
- Command Line tools

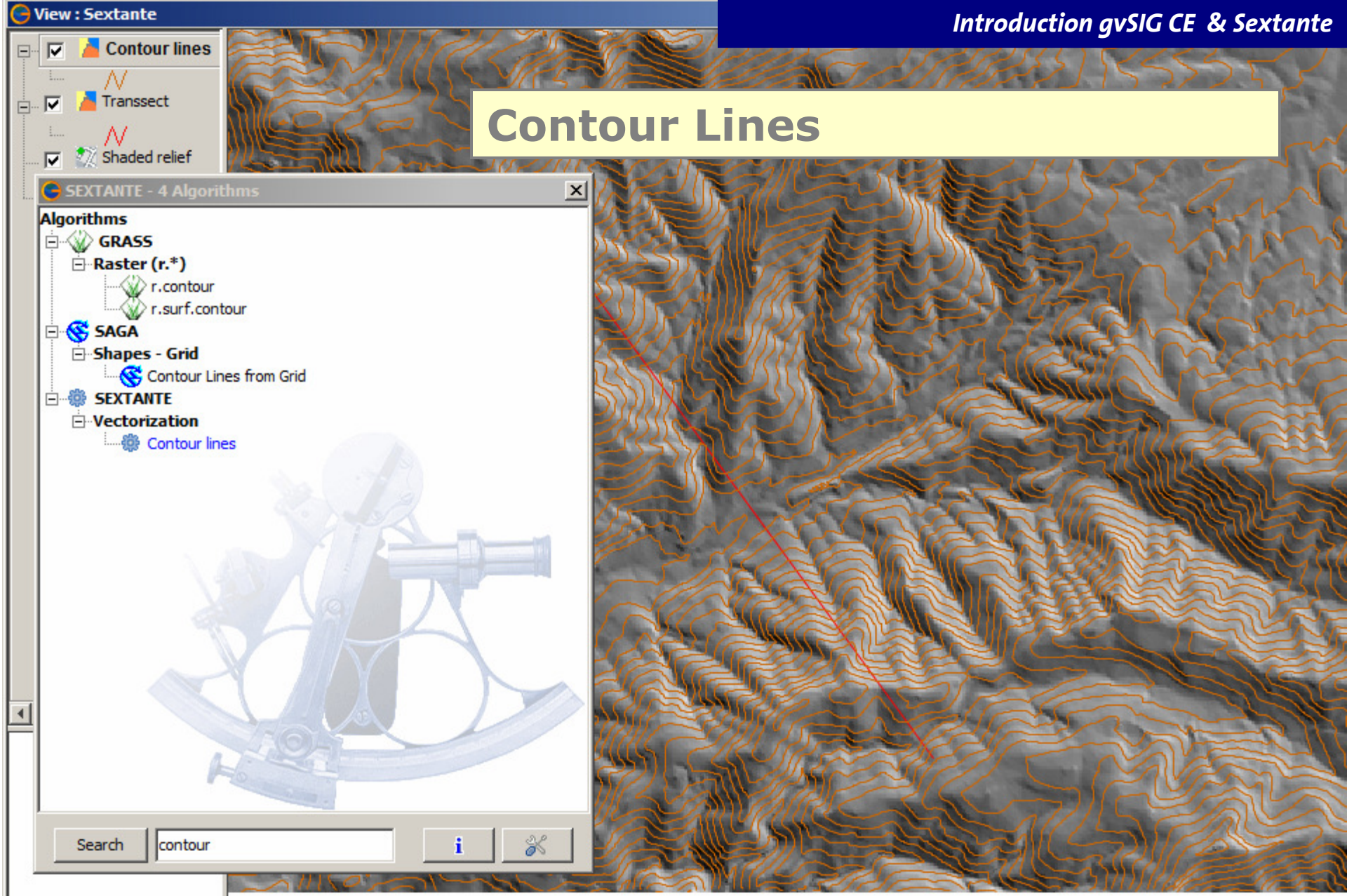
Sextante Toolbox in gvSIG CE



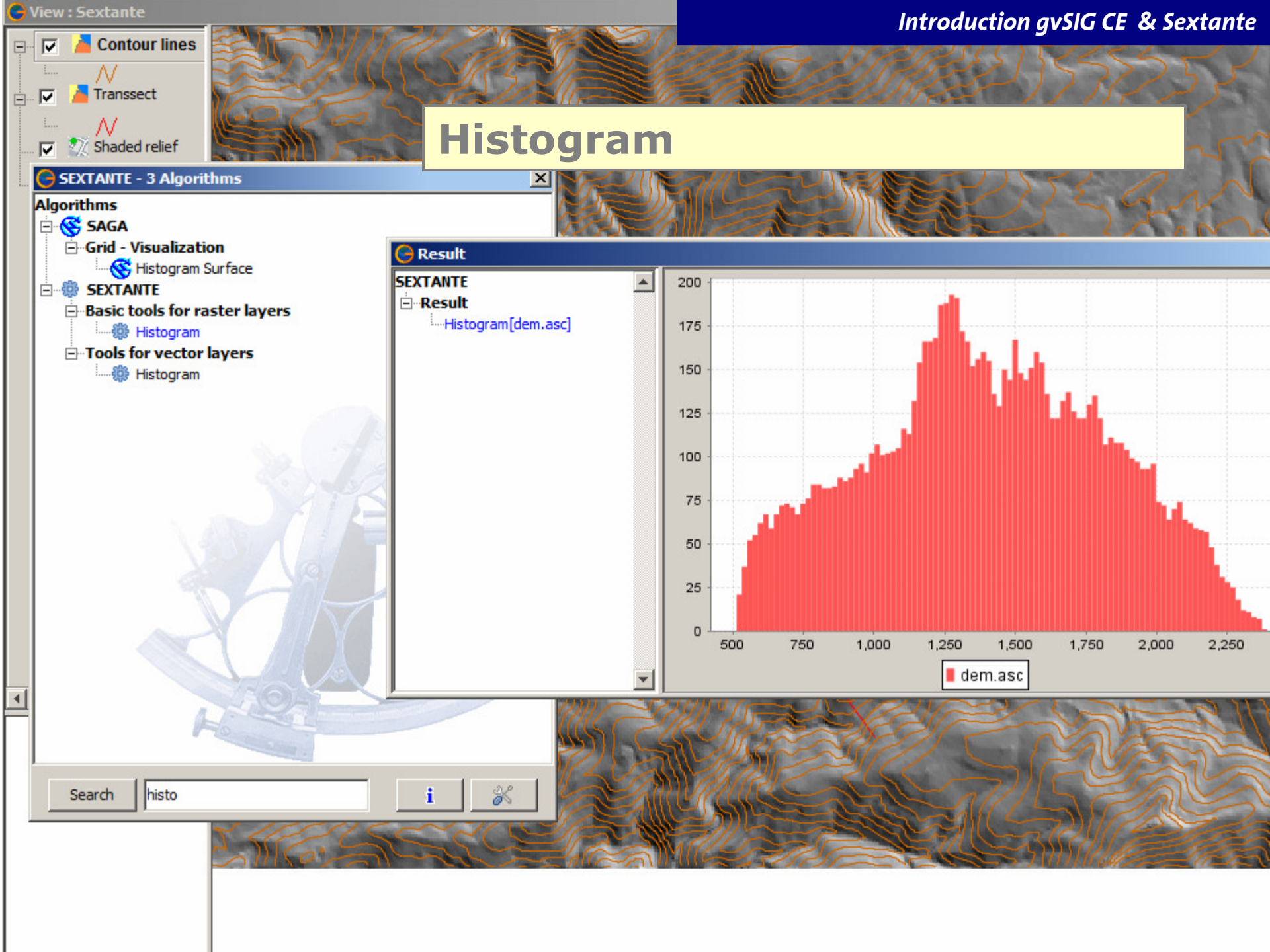
Shaded relief



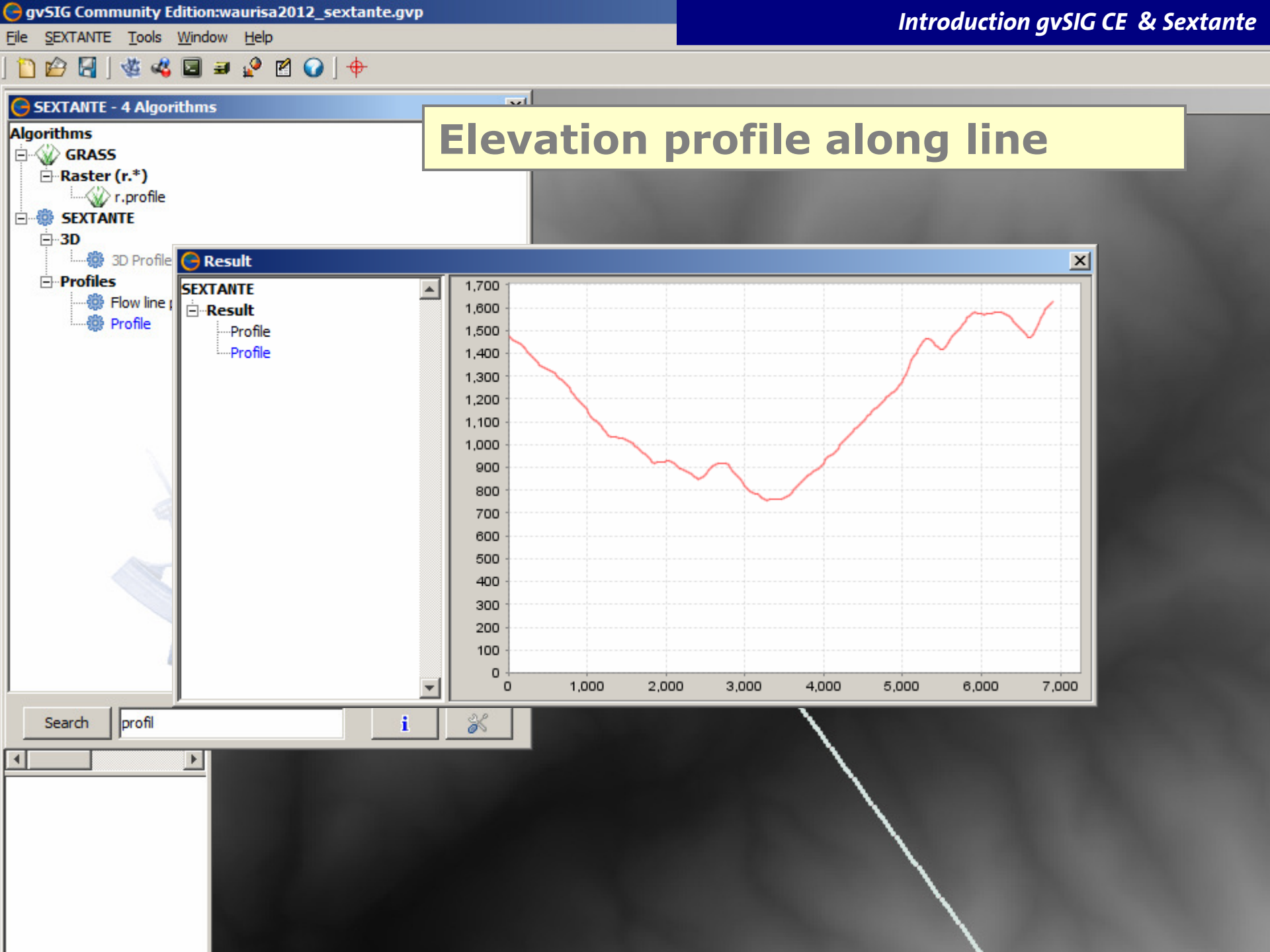
Contour Lines



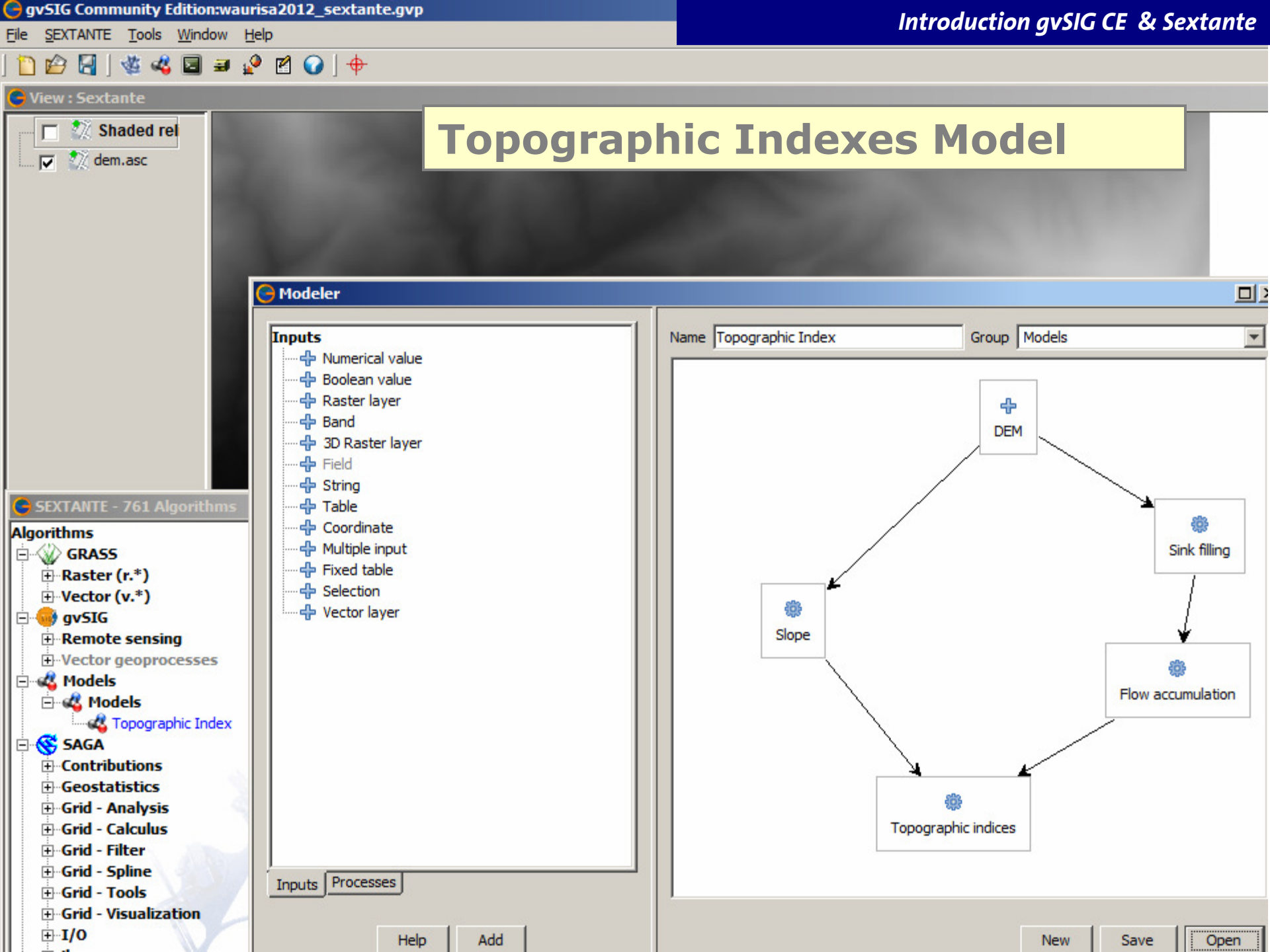
Histogram


View : Sextante
Contour lines
Transsect
Shaded relief
SEXTANTE - 3 Algorithms
Algorithms
SAGA
Grid - Visualization
Histogram Surface
SEXTANTE
Basic tools for raster layers
Histogram
Tools for vector layers
Histogram
Search
histo
Result
SEXTANTE
Result
Histogram[dem.asc]
200
175
150
125
100
75
50
25
0
500
750
1,000
1,250
1,500
1,750
2,000
2,250
dem.asc

Elevation profile along line



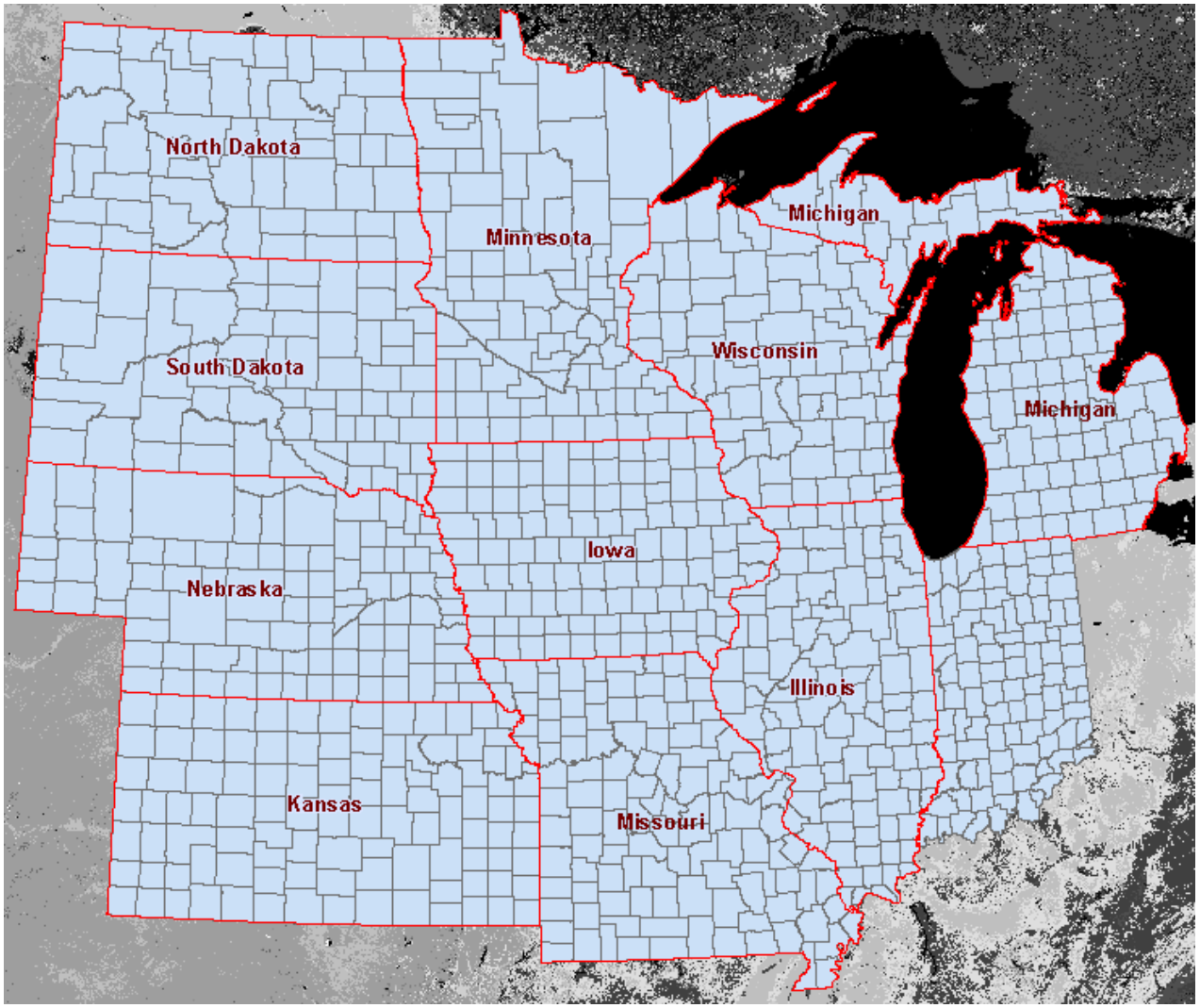
Topographic Indexes Model



Land cover area/county

example: determine land cover classes coverage for each State and break down by County.

For each of the 962 Counties in the 12 State region report area in m^2



Land cover area/county

Using NASA MODIS 500m Imagery

Land Cover Type Yearly L3 Global 500m MCD12Q1

ftp://e4ftl01u.ecs.nasa.gov/MOTA/MCD12Q1.005/

+

Counties Layer

class	value
water	0
evergreen needleleaf forest	1
evergreen broadleaf forest	2
deciduous needleleaf forest	3
deciduous broadleaf forest	4
mixed forests	5
closed shrubland	6
open shrublands	7
woody savannas	8
savannas	9
grasslands	10
permanent wetlands	11
croplands	12
urban and built-up	13
cropland/natural vegetation mosaic	14
snow and ice	15
barren or sparsely vegetated	16
unclassified	254

Land cover area/county

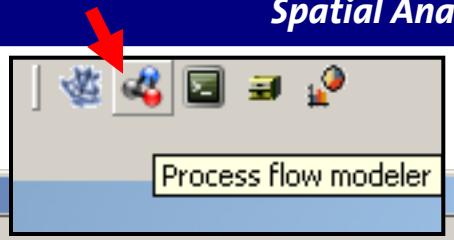
Result would be a table like this (Counties shown with FIPS code ids)

Table: lc1.dbf

FIPS	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12
26003	81.0	186.0	4.0	4330.0	5257.0	20.0	4.0	38.0	0.0	19.0	27.0
26009	102.0	31.0	11.0	79.0	86.0	0.0	0.0	39.0	0.0	4.0	35.0
26013	69.0	100.0	15.0	4491.0	5085.0	0.0	0.0	39.0	0.0	4.0	66.0
26019	169.0	85.0	0.0	1674.0	445.0	26.0	0.0	25.0	0.0	3.0	45.0
26029	72.0	46.0	0.0	263.0	449.0	6.0	0.0	21.0	0.0	14.0	26.0
26033	5.0	283.0	9.0	592.0	1855.0	0.0	0.0	32.0	0.0	0.0	15.0
26041	124.0	138.0	13.0	1214.0	9309.0	2.0	2.0	110.0	0.0	19.0	187.0
26043	5.0	38.0	6.0	2619.0	4956.0	4.0	0.0	10.0	0.0	4.0	5.0
26053	134.0	99.0	5.0	6964.0	5483.0	1.0	0.0	5.0	0.0	0.0	68.0
26055	125.0	114.0	5.0	1069.0	639.0	11.0	0.0	73.0	0.0	22.0	68.0
26061	166.0	196.0	12.0	5703.0	3782.0	0.0	1.0	21.0	0.0	5.0	121.0
26071	46.0	101.0	34.0	5517.0	7087.0	0.0	1.0	4.0	0.0	4.0	46.0
26083	255.0	460.0	5.0	1683.0	3812.0	0.0	0.0	38.0	0.0	0.0	103.0
26085	0.0	6.0	0.0	113.0	138.0	0.0	0.0	2.0	0.0	0.0	0.0
26089	279.0	187.0	7.0	969.0	436.0	37.0	3.0	55.0	0.0	24.0	109.0
26095	81.0	366.0	2.0	1994.0	7088.0	16.0	6.0	125.0	0.0	6.0	103.0
26097	215.0	74.0	12.0	746.0	3634.0	3.0	6.0	30.0	0.0	10.0	112.0
26101	34.0	52.0	0.0	2634.0	785.0	8.0	0.0	52.0	0.0	15.0	34.0
26103	183.0	586.0	37.0	4417.0	14183.0	25.0	2.0	210.0	1.0	21.0	171.0
26109	63.0	49.0	12.0	2007.0	6361.0	4.0	0.0	45.0	0.0	0.0	116.0
26131	117.0	48.0	2.0	7971.0	5276.0	15.0	0.0	18.0	0.0	13.0	54.0
26133	0.0	0.0	0.0	70.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0
26153	203.0	354.0	13.0	1391.0	8597.0	6.0	1.0	120.0	0.0	45.0	166.0
26165	20.0	57.0	4.0	2419.0	857.0	7.0	0.0	62.0	0.0	4.0	25.0
27031	140.0	172.0	10.0	566.0	3126.0	0.0	0.0	8.0	0.0	0.0	44.0
55003	0.0	0.0	0.0	374.0	169.0	0.0	0.0	0.0	0.0	0.0	0.0
55009	18.0	14.0	0.0	58.0	27.0	0.0	0.0	30.0	0.0	9.0	39.0
55019	0.0	1.0	0.0	457.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0
55029	251.0	160.0	4.0	182.0	714.0	1.0	4.0	66.0	0.0	8.0	117.0
55037	0.0	13.0	6.0	2721.0	2401.0	0.0	0.0	0.0	0.0	0.0	0.0

0 / 50 Total records selected.

Land cover area/county



Modeler

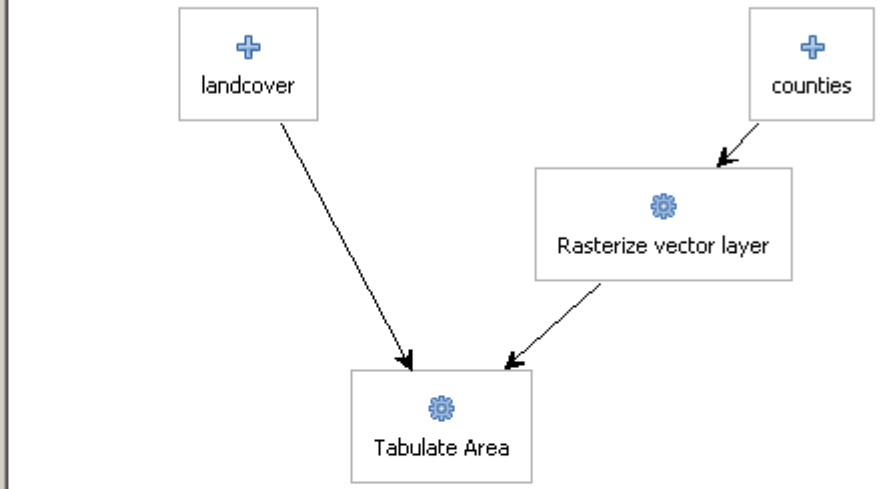
Procedures
- Tools
  - Buffers
  - Cost, distances and routes
  - Fire modeling
  - Focal statistics for neighbo
  - Fuzzy logic
  - Geomorphometry and terr
  - Geostatistical simulations
  - Geostatistics
  - Hydrological analysis tools
  - Hydrological indices and pa
  - Image processing
  - Local statistics
  - Location/allocation
  - Models
    - calculate landcover typ
    - tab area1
    - test1
  - Pattern analysis
  - Profiles
  - Raster algebra
  - Raster categories analysis
  - Raster creation tools

Sea...

Inputs | Procedures

Help | Add

Name: tab area1 | Group: Models



Run | New | Save | Open

Land cover area/county

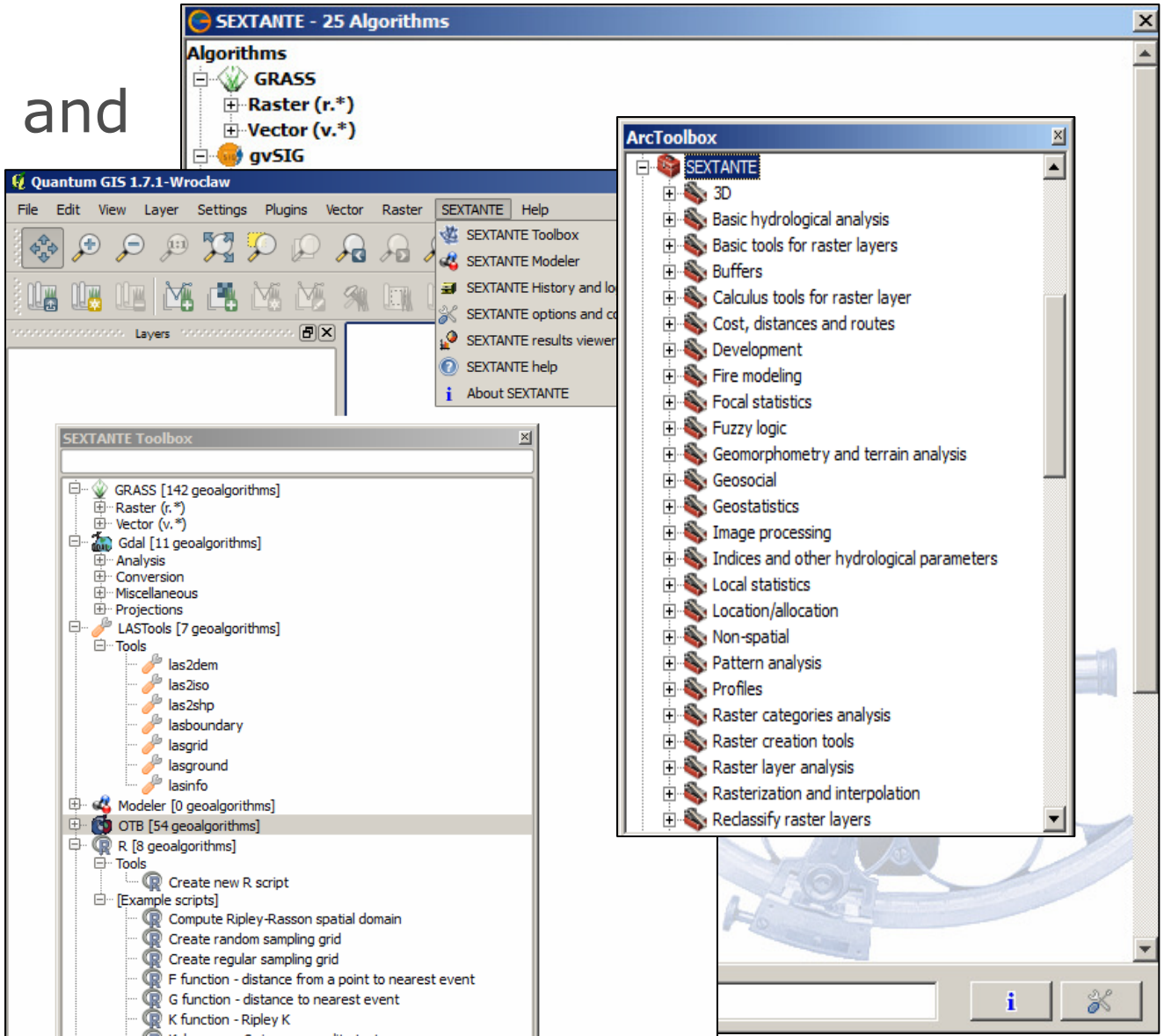
Create Model

- Input layer 1: counties in project area
- Input layer 2: land cover raster image (layer 3)

- Process step 1: rasterize County layer
- Process step 2: tabulate area operation:
  - input rasterized County layer (3) -> regions
  - land cover raster -> values
  - limit to view extent (not to start a lengthy analysis)
  - check tabulated result table
  - export to MS Excel (or open office/ libre office)
  - process in MS Excel (transpose)
  - join to Counties layer …

SEXTANTE Everywhere

- gvSIG CE and
- **ArcGIS**
- **QGIS**
- …



Contact me with questions

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