

GRASS PROGRAMS BY FUNCTION

GRASS Version 5.0

GENERAL PROGRAMS

Start the point-and-click user interface for GRASS

tcltkgrass

General location and mapset management commands

g.access	Control access to your mapset by other users
g.gisenv	Query present location and mapset
g.mapsets	Query presently accessible mapsets or change access
g.setproj	List or change projection information for the location

Copy, list, remove, rename maps, icons, labels, regions, groups, or 3dviews

g.copy	Copy maps, icons, labels, regions, groups, or 3dviews
g.list	List the maps, icons, labels, regions, groups, or 3dviews
g.remove	Remove maps, icons, labels, regions, groups, or 3dviews
g.rename	Rename maps, icons, labels, regions, groups, or 3dviews

Help

g.help	GRASS interactive help
g.version	Interactively list information about the GRASS version

Misc.

g.tempfile	Creates a temporary file and prints the file name. Designed for shell scripts that need to use large temporary files. GRASS provides a mechanism for temporary files that does not depend on /tmp.
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INPUT/OUTPUT PROGRAMS

Input or import data into GRASS

Into raster maps

i.in.erdas	Creates raster files from ERDAS files.
m.in.e00	Input Arc/Info .e00 files
m.in.stf1.tape	Filter to extract lines from a text file based on column contents, especially for Bureau of the Census STF1 files
m.lulc.USGS	Creates raster map layers from a Composite Theme Grid (CTG) file created by m.lulc.read . m.lulc.read extracts the CTG data from an ASCII landuse/landcover (lulc) CTG format file supplied by the USGS
m.lulc.read	Extracts Landuse/Landcover data in the ASCII Composite Theme Grid (CTG) data format distributed by the USGS in to a working file for m.lulc.USGS
m.sdts.read	Reads files in ISO 8211 (FIPS 123) format and dumps contents to screen and/or file
m.strip99s	Strips the no data, '99', areas out and replaces them with spaces (after

	raster import with r.in.miads)
m.tiger.region	Finds geographic region information for U.S. Census Bureau TIGER input data
r.in.arc	Convert an ESRI ARC/INFO ascii raster file (GRID) into a (binary) raster map layer.
r.in.ascii	Convert an ASCII raster text file into a (binary) raster map layer.
r.in.bin	Import a binary raster file.
r.in.doq	Import digital orthophotographs into GRASS raster map
r.in.dted	Imports DTED I & DTED II into GRASS Lat-Lon location
r.in.elas	Import an ELAS raster file into a GRASS raster map
r.in.gdal	Import GDAL supported raster file into a binary raster map layer
r.in.gridatb	Imports GRIDATB.FOR map file (TOPMODEL) into GRASS raster map
r.in.ll	Converts raster data referenced using latitude and longitude coordinates to a UTM-referenced map layer in GRASS raster format
r.in.miads	Imports SCS MIADS format raster data into GRASS raster map layer
r.in.png	Import non-georeferenced PNG format Image into GRASS raster file.
r.in.poly	Create raster maps from ascii polygon/line data files in the current directory
r.in.ppm	Converts an ASCII/BINARY PPM image file to a GRASS raster file
r.in.shape	Read an ArcView Shapefile (polygons and lines)
r.in.sunrast	Converts a SUN raster file to a GRASS raster file
r.in.tang	Imports Tangent raster data into GRASS raster map layer
r.in.tiff	Imports a TIFF (8 or 24 bit) raster file into GRASS raster file(s)
r.in.utm	Imports an utm raster map into a GRASS raster map layer.

Into site lists

s.in.ascii	Convert an ASCII listing of site locations into a GRASS site list file.
s.in.dbf	Import a dBase table of site locations into a GRASS site list file.
s.in.shape	Read an ArcView Shapefile with points or multipoint shapes

Into vector maps

v.import	This program performs all of the processes that are needed to convert ASCII DLG files, binary DLG files, ASCII SCS-GEF files, ASCII ARC Ungenerate files, ASCII DXF files, and ASCII vector files into binary vector files.
v.in.arc	Imports vector data in ARC/INFO ungenerate format into GRASS.
v.in.ascii	Converts ASCII vector map layers into binary vector map layers.
v.in.atlas	Imports vector maps from Atlas GIS??
v.in.dlg	Converts an ASCII USGS DLG-3 Optional file to a binary GRASS vector (dig) file.
v.in.dlg.scs	Developed to handle DLG-3 ASCII import of data, specifically a DLG WITHOUT category/attribute codes. DLG files with this affliction will require a flat ASCII file having a 1 to 1 correspondence between DLG area number and a text label.
v.in.dlg2	Converts an ASCII or binary USGS DLG-3 (bdlg) file to a binary GRASS vector (dig) file.

v.in.dxf	Converts files in DXF format to ASCII or binary GRASS vector file format.
v.in.dxf3d	Converts the Z values of DXF files to attribute GRASS vector file format.
v.in.gshhs	Import Global Self-consistant Hierarchical High-resolution Shoreline (GSHHS) data
v.in.mif	Import of MapInfo vector files
v.in.poly	This program creates a vector map of polygons of specified radius around center points which may be input as coordinate pairs from a file or from standard input.
v.in.sdts	Imports SDTS vector data, conforming to the Topological Vector Profile, into GRASS, creating GRASS vector map(s) and associated attribute files ready to be installed in a relational database.
v.in.shape	Read an ArcView Shapefile
v.in.tig.basic	This program creates a GRASS vector map in the current mapset (UTM or Lat-Long locations only) with labelled line segments constructed from the end points (nodes) from the Type 1 TIGER file records and shape points from the Type 2 TIGER file.
v.in.tig.lndmk	This program creates a GRASS site or vector map of Census "Landmark" features in the current mapset (UTM or Lat-Long locations only) with labelled points, areas or lines constructed from the TIGER file records. Each point or area Landmark is a record in the Type 7 TIGER/Line file for a county.
v.in.transects	Imports "transects" into a GRASS vector map. A transect is a line (or an area) which is described by a starting coordinate, a direction or azimuth, (or backward, forward, rightside, and leftside distances from the line transect), and a length (in meters or feet).

Input US Census data

m.in.stf1.tape	Filter to extract lines from a text file based on column contents, especially for Bureau of the Census STF1 files
m.tiger.region	Finds geographic region information for U.S. Census Bureau TIGER input data
v.apply.census	This program reads a previously selected subset of STF1 or PL94-171 U.S. Census Bureau demographic records (see m.in.stf1.tape), and creates a site list or vector file.
v.in.tig.basic	This program creates a GRASS vector map in the current mapset (UTM or Lat-Long locations only) with labelled line segments constructed from the end points (nodes) from the Type 1 TIGER file records and shape points from the Type 2 TIGER file.
v.in.tig.lndmk	This program creates a GRASS site or vector map of Census "Landmark" features in the current mapset (UTM or Lat-Long locations only) with labelled points, areas or lines constructed from the TIGER file records. Each point or area Landmark is a record in the Type 7 TIGER/Line file for a county.

Input US Geological Survey (USGS) or US Military digital elevation data

m.bsplrit	Splits a large (greater than 1,048,000 megabyte) binary file into smaller portions.
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m.dem.examine	Provides a terse description of USGS Digital Elevation Model (DEM) data files stored on 1/2-inch magnetic tape
m.dem.extract	Extracts USGS Digital Elevation Model (DEM) data from 1/2-inch magnetic tape
m.dmaUSGSread	Extracts digital terrain elevation data (DTED) produced by the Defense Mapping Agency (DMA) but supplied by the USGS (in a different tape format) on 1/2-inch magnetic tape.
m.dted.examine	Provides a terse description of level 1 and 2 digital terrain elevation data (DTED) files produced and distributed by the Defense Mapping Agency (DMA) on 1/2-inch magnetic tapes
m.dted.extract	Extracts digital terrain elevation data (DTED - levels 1 and 2) produced and supplied by the Defense Mapping Agency (DMA) on 1/2-inch magnetic tapes
m.examine.tape	Provides a description of the files on a 1/2-inch magnetic tape.
m.flip	Flips elevation data extracted from systems that retrieve data by rows from south to north
m.futil	Merge 2 ascii files, re-arrange the column order of an ascii file, or divide an ascii file.
m.rot90	Rotate a raster map 90 degrees

Output or export data from GRASS

From a raster map

r.out.arc	Converts a raster map layer into an ESRI ARCGRID file
r.out.ascii	Converts a raster map layer into an ASCII text file
r.out.bin	Exports a GRASS raster to a binary array. Can also output GMT compatible header or BIL world and header files
r.out.elas	Export a GRASS raster map layer to an ELAS raster file
r.out.gridatb	Exports GRASS raster map to GRIDATB.FOR map file (TOPMODEL)
r.out.mpeg	Raster File Series to MPEG Conversion Program.
r.out.png	Export GRASS raster as non-georeferenced PNG image format
r.out.pov	Converts a raster map layer into a height-field file for POVRAY.
r.out.ppm	Converts a GRASS raster file to a PPM image file at the pixel resolution of the CURRENTLY DEFINED REGION
r.out.rlc	Exports a GRASS raster to a RLC encoded binary file.
r.out.tga	Exports a GRASS raster file to a 24bit TGA file
r.out.tiff	Exports a GRASS raster file to a 8/24bit TIFF image file at the pixel resolution of the currently defined region. Can also output a TIFF world file or a tiled TIFF
r.out.xyz	Export GRASS raster files into xyz format.

From a site list

s.out.ascii	Converts a GRASS site list file into an ASCII listing of site locations and their descriptions.
s.out.e00	Write an Arc-Info point coverage in e00 format.

From a vector map

v.export	Converts binary vector files into formatted ASCII files for transfer to other computer systems.
v.out.arc	Exports GRASS vector files to ARC/INFO's "ungenerate" file format.
v.out.asciid	Converts a binary GRASS vector map layer into an ASCII GRASS vector map layer.
v.out.atlas	Exports vector maps to Atlas GIS format??
v.out.dlg	Converts binary GRASS vector data to DLG-3 Optional vector data format.
v.out.dxf	Generates an ASCII DXF (AutoCad) file from a GRASS vector ASCII file.
v.out.e00	Write an Arc-Info line/polygon coverage in e00 format
v.out.idrisi	A quick and dirty export routine from GRASS to IDRISI.
v.out.mapinfo	Convert site, line, area data to MapInfo format??
v.out.mif	Exports GRASS vector maps to MapInfo vector file
v.out.moss	Converts GRASS site, line, or area data into MOSS import format.
v.out.sdts	Creates an SDTS dataset conforming to the Topological Vector Profile from a GRASS vector map layer.
v.out.shape	Export GRASS vectors files to ESRI Shapefile format.
v.sdts.dq.cp	The program provides assistance for the preparation of the five data quality report modules (Lineage, Positional Accuracy, Attribute Accuracy, Logical Consistency, and Completeness) required in an SDTS transfer dataset.
v.sdts.meta	This menu-driven Tcl/Tk program enables the user to prepare and install supplementary metadata and data quality reports for a vector map preceding the creation of an SDTS transfer dataset.
v.sdts.meta.cp	The program provides assistance for the preparation of supplemental metadata for an SDTS export dataset.

COORDINATE/MAP PROJECTION PROGRAMS

m.datum.shift	Datum shift program. Return geographic coordinates based on a different datum than the one used to obtain the original coordinates.
m.gc2ll	Convert geographic to lat.-long. coordinates
m.ll2gc	Convert lat.-long. to geographic coordinates
m.ll2u	Convert lat.-long. to UTM coordinates
m.proj	General projection utility for raster maps
m.region.ll	Converts UTM coordinates falling within the current geographic region to geographic (latitude/longitude) coordinates.
m.u2ll	Convert UTM coordinates to lat.-long. coordinates
r.proj	Re-project a raster map from one location to the current location (no datum transformation yet)
s.proj	Allows the user to re-project a sites file from one location to the current location (no datum transformation yet).
v.proj	Allows a user to convert a vector map in a specified mapset of a specified location (different from current) with projection of input location to the vector map in a current mapset of current location with projection of current location (both projections are defined by corresponding PROJ_INFO files).

DATABASE PROGRAMS

d.ask	Prompts the user to select a GRASS data base file from among files displayed in a menu on the graphics monitor.
d.db	Displays points from database table in the display window.
d.what.db	View/edit attributes of selected DB site.
db.columns	List all columns for a given table
db.connect	Connect to the database through DBMI
db.createdb	Create an empty database
db.databases	List all databases for a given driver
db.describe	Describe a table (in detail)
db.drivers	List all installed DBMI drivers
db.dropdb	Remove a database
db.droptable	Remove a table from database
db.execute	Execute any SQL statement
db.select	Select data from database
db.tables	List all tables for a given database
g.ask	Prompts the user for the names of GRASS data base files
g.filename	Prints GRASS data base file names
g.findfile	Searches for GRASS data base files and sets variables for the shell
v.db.reclass	Changes vector category values for an existing vector map according to results of SQL queries.
v.to.db	Load values (e.g., category, label, area) from a vector map to a database.

DISPLAY PROGRAMS

Start, stop, and erase display windows and the frames inside display windows

d.erase	Erase the contents of the active display frame with user-defined color.
d.frame	Manages display frames on the user's graphics monitor. Create, erase, or select a frame for output.
d.mon	To establish and control use of a graphics display monitor.
nviz	Visualization and animation tool for GRASS data

Add maps to display window in 2-D

General

d.display	Interactively display maps and map elements (e.g., barscale).
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Composite maps

d.his	Produces and displays a raster map layer combining hue, intensity, and saturation (his) values from user-specified input raster map layers.
d.rgb	Produces and displays a false color composite from 3 raster maps representing red, green, and blue

Database table

d.db	Displays points from database table in the display window.
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Raster maps

d.rast Display a raster map and raster overlays in the display window.

Site lists/points

d.icons Displays points, as icons, at user-defined locations in the active display frame on the graphics monitor.
p.icons Display/Paint icon generator
d.points Displays points from a file in the display window.
d.site.labels Labels points from a sites file in the display window.
d.sites Displays points from a sites file in the display window.
d.sites.qual Displays points from a sites file in the display window; identical to d.sites except adds the possibility of using rules to select a subset of the sites for display.

Vector maps

d.vect Display a vector map in the display window.
d.vect.cats Display one category of a vector map in the display window.
d.vect.labels Labels vectors using the attribute value or the category value. Performs automated placement of labels for a vector map on the current graphics monitor.

Add maps to display window in 3-D

Raster maps

d.3d Displays three-dimensional images based on raster map layers

Add graphic elements to the display window

d.graph Program for generating and displaying simple graphics to the graphics display monitor.
d.mapgraph Generates and displays simple graphics on map layers drawn in the active graphics monitor display frame.

Add map elements (e.g., barscale) to the display window

d.barscale Displays a barscale on GRASS monitor.
d.scale Displays a barscale on GRASS monitor (seems to be identical to d.barscale).
d.colortable To display the color table associated with a raster map layer.
d.geodesic Displays a geodesic line, tracing the shortest distance between two geographic points along a great circle, in a longitude/latitude data set.
d.grid Overlays a user-specified grid in the active display frame on the graphics monitor.
d.legend Add a graphic legend to the display window.
d.legend.thin Improved version of d.legend that allows:
- Thinning the categories to be represented in the legend
- Displaying a continuous gradient of all categories in the legend
- Interactive mouse placement of the smooth gradient box.
d.rhumblines Display a rhumbline for a longitude/latitude data set.

Add histograms, linegraphs, or profile plots to the display window

d.histogram	Displays a histogram in the form of a pie or bar chart for a user-specified raster file.
d.linegraph	Display a linegraph for x versus y data on the display window.
d.profile	Interactive profile plotting utility with optional output.

Add text to the display window

d.font	Selects the font in which text will be displayed on the user's graphics monitor.
d.label	Creates and displays text labels in the active display frame on the graphics monitor.
d.labels	Interactively (only) place labels on the display window.
d.menu	Creates and displays a menu within the active frame on the graphics monitor.
d.paint.labels	Add labels stored in a labels file (from d.labels) to the display window.
d.text	Add text of a particular size and color at a specific place on the display window.
d.title	Add a title of a particular size and color.
p.icons	This program allows the user to create and maintain icons which are used by the p.map and d.icons commands to depict sites.
p.labels	This module allows the user to create or modify labels files. These labels files, which are stored in the database, define text information for printing with p.map and for graphics display with d.paint.labels.

Interactively pan, zoom, or otherwise change the region in the display window

d.extend	Set window region from currently displayed raster, vector and sites maps with largest map region.
d.pan	Pan (move spatially) or zoom a raster, vector, or site map
d.zoom	Zoom a raster, vector, or site map

Manually zoom or otherwise change the region in the display window

g.region	Set region to match default region, any map, particular north, south, east, or west limits, or change the resolution, or save the present region
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Get information about cell resolution and change cell resolution

g.region	Get information about resolution or change the resolution of the present region
m.qcalc	Calculate a table showing (1) cell size in square feet, acres, and hectares, (2) acres in square feet, hectares, and cells, (3) hectares in square feet, acres, and cells. The user specifies a range of values (e.g., 1 to 10) and these conversions are shown in a table for each value in the range.

Get information from the display window

d.area	Obtains area/perimeter information on vector polygons.
d.measure	Measures the lengths and areas of features drawn by the user in the active display frame on the graphics monitor.
d.what.rast	Allows the user to interactively query the category contents of multiple

raster map layers at user-specified locations within the current geographic region.

d.what.sites Allows the user to interactively query site list descriptions.

d.what.vect Allows the user to interactively query a vector map layer at user-selected locations within the current geographic region.

d.where Allows the user to interactively query the geographic coordinates of a point on the display window.

Adjust colors of maps in display window

d.colorlist Output a list of all available display colors with a configurable separator

d.colormode Allows the user to establish whether a map will be displayed using its own color table or the fixed color table of the graphics monitor.

d.colors Interactive changes in colors on the display window.

Display and edit information for small parts of raster maps

d.rast.arrow Display directional information from a raster map.

d.rast.edit Interactively edit an integer raster map

d.rast.num Display the values in a small area of an integer raster map.

Geographically register or adjust the coordinates for a map

d.fix.ortho Interactively shift a map in east and/or north directions

Save commands sufficient to re-create the current display window

d.save Create a list of commands for recreating screen graphics.

IMAGERY PROGRAMS

Image group management

i.group Create or modify sets of raster maps that make up a group.

i.target This program targets an imagery group to a GRASS database

Input maps to imagery groups from files

i.in.erdas Creates raster files from ERDAS files.

Input maps to imagery groups from tapes

i.tape.mss

i.tape.mss.h An imagery function that extracts header information from LANDSAT Multispectral Scanner (MSS) imagery data stored on half-inch tape

i.tape.other An imagery function that extracts scanned aerial imagery (NHAP, etc.) and satellite imagery (TM, SPOT, etc) from half-inch or 8mm tape.

i.tape.slc ERS1.SAR.SLC CEOS file tape extraction (ERS RADAR data extractor).

i.tape.spot An imagery function that extracts SPOT imagery from half-inch tape.

i.tape.tm An imagery function that extracts LANDSAT Thematic Mapper (TM) imagery from half-inch tape.

i.tape.tm.fast An imagery function that extracts Thematic Mapper (TM) imagery from tape media

Output images to other image processing programs

i.out.erdas Output an imagery group or maps in ERDAS format

Image statistical analysis

i.cca Canonical components analysis (cca) program for image processing.
i.fft Fast Fourier Transform (FFT) for image processing.
i.ifft Inverse Fast Fourier Transform for image processing.
i.pca Principal components analysis (pca) program for image processing.
i.shape Performs spatial shape identification and classification on a raster map.
i.texture Calculate 14 measures of image texture for a raster map.

Image classification and accuracy assessment

i.class Supervised classification?
i.cluster An imagery function that generates spectral signatures for land cover types in an image using a clustering algorithm. The resulting signature file is used as input for i.maxlik, to generate an unsupervised image classification.

i.gensig Generates statistics for i.maxlik from raster map layer.
i.gensigset Generate statistics for i.smap from raster map layer.
m.ipf Iterative proportional fitting for error matrices. Uses an error or confusion matrix produced by r.coin or r.kappa, smooths zero counts, and does iterative proportional fitting to normalize the matrix.

m.kappa Calculate error matrix and kappa parameter for accuracy assessment of classification result

r.kappa Calculate error matrix and kappa parameter for accuracy assessment of classification result.

i.maxlik An imagery function that classifies the cell spectral reflectances in imagery data based on the spectral signature information generated by either i.cluster, i.class, or i.gensig.

i.smap An imagery function that performs contextual image classification using sequential maximum a posteriori (SMAP) estimation.

Image feature mapping

i.rvi.prediction Calculates ground features, e.g. plant cover, by remote sensing data using a given regression model

r.rvi.prediction Calculates ground features, e.g. plant cover, by remote sensing data using a given regression model.

Make composite maps from maps in an imagery group or from several raster maps

i.colors Allows the user to interactively assign red, green, and blue colors to the band files in an imagery group while viewing the display of the combined bands on the graphics monitor

i.composite An imagery function that creates a color composite image from three imagery band files specified by the user.

i.grey.scale An imagery function that assigns a histogram contrast stretch grey scale color table to a raster map layer.

i.his.rgb Convert a histogram-intensity-saturation set of maps to a red-green-blue

	set of maps.
i.quantize	An interactive imagery function that creates a raster map layer whose color table is based on the red, green, and blue color values present in existing, user-specified imagery group files.
i.rgb.his	Convert a red-green-blue set of maps to a histogram-intensity, saturation set of maps.
r.composite	Combines red, green and blue map layers into a single composite map layer.
r.his	Generates red, green and blue raster map layers combining hue, intensity, and saturation (his) values from user-specified input raster map layers

Image registration and orthorectification

i.ortho.photo	Interactively orthorectify maps in an imagery group
i.points	An imagery function that enables the user to mark coordinate system points on an image to be rectified and then input the coordinates of each point for creation of a coordinate transformation matrix. The transformation matrix is needed as input for the GRASS program i.rectify.
i.points3	An imagery function that enables the user to mark coordinate system points on an image to be rectified and then input the coordinates of each point for determination of transformation parameters. The transformation parameters are needed as input for the GRASS program i.rectify3
i.rectify	Spatially register an image to geographic coordinates
i.vpoints	Identifies coordinate pairs of points from a vector map or keyboard entry and corresponding points in an image.

Edge detection

i.zc	Zero-crossing "edge detection" raster function for image processing.
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GENERAL RASTER PROGRAMS

Get summary information about a single raster map

r.cats	Prints category values and labels associated with user-specified raster map layers.
r.describe	Prints terse list of category values found in a raster map layer.
r.info	Outputs basic information about a user-specified raster map layer
r.report	Reports acres, hectares, or number of cells as well as miles, meters, or kilometer for each category in a raster map layer.
r.stats	Generates area statistics for raster map layers. Can print total area, number of cells, percent cover for each category. Can also print category value, row, and column, as well as easting and northing for each cell.
r.sum	Sums up the raster cell values.
r.surf.area	Surface area estimation for rasters.

Get information about a single raster map at specific points

d.what.rast	Allows the user to interactively query the category contents of multiple
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raster map layers at user-specified locations within the current geographic region.

r.what Queries raster map layers on their category values and category labels at specific easting and northing locations, which are typed in.

s.sample Sample a raster file at site locations.

Get information about a single raster map along transects or profiles

r.profile Outputs the raster map layer values lying on user-defined line(s)

r.transect Outputs raster map layer values lying along user defined transect line(s).
Can output the raw values or the median or average.

Get information from two or more raster maps

Given a base map, get information for corresponding areas in a cover map

r.average Finds the average of values in a cover map within areas assigned the same category value in a user-specified base map.

r.median Finds the median of values in a cover map within areas assigned the same category value in a user-specified base map

r.mode Finds the mode of values in a cover map within areas assigned the same category value in a user-specified base map

r.statistics Category or object oriented statistics. Can calculate distribution, average, mode, median, standard deviation, variance, skewness, kurtosis, minimum, maximum, and sum for cells in a cover map given categories in a user-specified base map.

r.volume Calculates the volume of data "clumps", and (optionally) produces a GRASS site_lists file containing the calculated centroids of these clumps.

Quantify the relationship between two or more raster maps

r.coin Tabulates the mutual occurrence (coincidence) of categories for two raster map layers.

r.covar Outputs a covariance/correlation matrix for user-specified raster map layer(s).

r.distance Locates the closest points between objects in two raster maps.

m.ipf Iterative proportional fitting for error matrices. Uses an error or confusion matrix produced by r.coin or r.kappa, smooths zero counts, and does iterative proportional fitting to normalize the matrix.

Create new raster maps by digitizing on screen

r.digit Digitize on screen to produce a raster map.

Create new raster maps by reclassing, rescaling, or resampling

r.reclass Creates a new map layer whose category values are based upon the user's reclassification of categories in an existing raster map layer.

r.reclass.scs SCS version of r.reclass; only operates as interactive program

r.recode Rescale data with range a:b to a new range and adjust category values to fit the new range.

r.resample GRASS raster map layer data resampling capability. Often this is run after

r.reclass in order to create a separate new map, since r.reclass simply creates a reclass table relative to the original map.

r.rescale.eq Rescales histogram equalized the range of category values in a raster map layer

Create new raster maps by quantitative or logical analysis

r.binfer Bayesian expert system development program.

r.infer Outputs a raster map layer whose category values represent the application of user-specified criteria (rules statements) to other raster map layers' category values.

r.mapcalc Raster map calculator to add, subtract, multiply, divide and do many other calculations on raster maps

Create new raster maps by combining other raster maps

r.combine Allows category values from several raster map layers to be combined.

r.cross Creates a cross product of the category values from multiple raster map layers.

r.mapcalc Raster map calculator to add, subtract, multiply, divide and do many other calculations on raster maps

r.patch Creates a composite raster map layer by using known category values from one (or more) map layer(s) to fill in areas of "no data" in another map layer

r.weight Weight provides the researcher with a computer driven mathematical method for doing weighted map overlays. Landscape characteristics are assigned weights, each location's characteristics then yield a total weight based on the sum of the weights assigned to its characteristics.

r.weight.new New version of r.weight??

r.weight2 r.weight2 is the non-interactive version of r.weight. Both programs allow the user to assign numeric values (i.e., "weights") to individual category values within raster map layers. These weights are then distributed locationally throughout a raster map layer based on the distribution of the categories with which they are associated.

Create new raster maps by spatial analysis

r.buffer Creates a raster map layer showing buffer zones surrounding cells that contain non-NULL category values.

r.circle Creates a raster map containing concentric rings around a given point.

r.clump Recategorizes data in a raster map layer by grouping cells that form physically discrete areas into unique categories.layer.

r.grow Generates an output raster map layer with contiguous areas grown by one cell (pixel).

r.neighbors Replace a cell value with the standard deviation, variance, diversity, or interspersion value in windows of size from 1-25 cells (odd values only)

Create new raster maps that are random

r.random Creates a raster map layer and site list file containing randomly located

	sites.
r.random.cells	Generates random cell values with spatial dependence.
r.random.surface	Generates random surface(s) with spatial dependence
r.surf.gauss	GRASS module to produce a raster map layer of gaussian deviates whose mean and standard deviation can be expressed by the user. It uses a gaussian random number generator from Press, Flannery, Teukolsky and Vetterling (1988) - Numerical Recipes in C.
r.surf.random	GRASS module to produce a raster map layer of uniform random deviates whose range can be expressed by the user. It uses the random number generator described in Press, Flannery, Teukolsky and Vetterling (1988) - Numerical Recipes in C.

Use a mask to restrict analysis to a particular part of the map

r.mask	Create and destroy raster MASK files for highlighting and operating on particular map categories
r.mask.points	Examines and filters lists of points constituting lines to determine if they fall within current region and mask and optionally an additional raster map.

Interpolate or smooth a raster map

r.bilinear	Bilinear interpolation utility for raster map layers.
r.mfilter	Raster file matrix filter.
r.neighbors	Makes each cell category value a function of the category values assigned to the cells around it, and stores new cell values in an output raster map layer. Can use average, median, mode, minimum, maximum in windows of odd sizes from 1-25 cells.
r.surf.contour	Surface generation program from rasterized contours.
r.surf.idw	Surface interpolation utility for raster map layers.
r.surf.idw2	Surface generation program.

Convert raster maps to site lists or vector maps

Convert raster maps to site lists

r.to.sites	Converts point data in a GRASS raster map layer into a GRASS site_lists file.
r.volume	Calculates the volume of data "clumps", and (optionally) produces a GRASS site_lists file containing the calculated centroids of these clumps.

Convert raster maps to vector maps

r.contour	Produces a GRASS binary vector map of specified contours from GRASS raster map layer.
r.line	Creates a new binary GRASS vector (v.digit) file by extracting linear features from a thinned raster file
r.poly	Extracts area edges from a raster map layer and converts data to GRASS vector format.
r.thin	Thins non-zero cells that denote linear features in a raster map layer.

Raster utilities: Modify color tables, compress maps, quantize, create support files

r.colors	Creates/Modifies the color table associated with a raster map
r.colors.paint	Create/modify colors for a particular printer
r.compress	Compress/uncompress a raster map.
r.quant	This routine produces the quantization file for a floating-point map
r.support	Allows the user to create and/or modify raster map layer support files. Note: Interactive mode offers more functionality than command line mode. Can use this program to update the header file, histogram and range files, category files, color table, history file, or create or reset the null file for a raster map.
r.timestamp	Print/add/remove a timestamp for a raster map.

Change the projection of a raster map

r.proj	Re-project a raster map from one location to the current location (no datum transformation yet)
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SPECIALIZED RASTER PROGRAMS

AGNPS

r.agnps50.run	Assess nonpoint source pollution origination and movement in a watershed
r.agnps50.view	View AGNPS model output

Cost-surface analysis

r.cost	Outputs a raster map layer showing the cumulative cost of moving between different geographic locations on an input raster map layer whose cell category values represent cost.
r.spreadpath	Recursively traces the least cost path backwards to cells from which the cumulative cost was determined.

Fire-spread modeling

r.ros	Generates three, or four raster map layers showing 1) the base (perpendicular) rate of spread (ROS), 2) the maximum (forward) ROS, 3) the direction of the maximum ROS, and optionally 4) the maximum potential spotting distance.
r.spread	Simulates elliptically anisotropic spread on a graphics window and generates a raster map of the cumulative time of spread, given raster maps containing the rates of spread (ROS), the ROS directions and the spread origins. It optionally produces raster maps to contain backlink UTM coordinates for tracing spread paths (GRASS Raster/Display Program)

Landscape ecology

i.shape	Performs spatial shape identification and classification on a raster map.
i.texture	Calculate 14 measures of image texture for a raster map.
i.zc	Zero-crossing "edge detection" raster function for image processing.

Regression modeling

r.linear.regression Linear regression calculation from data stored in ASCII file
r.rational.regression Linear and nonlinear regression calculation from data stored in ASCII file

Soil-erosion modeling

r.cn Generates a SCS curve number map layer
r.watershed Watershed basin analysis program. Can output new maps showing the number of cells draining through each cell, the drainage direction each basin and half-basin, stream segments, and data needed for modeling soil erosion using the Universal soil loss equation.
r.weighted.cn Generates a weighted SCS curve number map layer

Solar radiation/shading analysis

r.sun Computes solar illumination (incidence) angle raster maps for given time and latitude and solar irradiance (direct solar radiation) raster maps for given day and latitude. They are computed from elevation, slope and aspect raster maps. Sunrise, sunset times, declination for given day are displayed along with solar azimuth and zenith angle for specified local time. The shadowing effect of the topography is optionally incorporated.
r.sunmask Calculates cast shadow areas from sun position and DEM. Either A: exact sun position is specified, or B: date/time to calculate the sun position by r.sunmask itself.

Terrain analysis

r.param.scale Extracts terrain parameters from a DEM. Uses a multi-scalar approach by taking fitting quadratic parameters to any size window (via least squares)
r.resamp.rst Reinterpolates and computes topographic analysis from input raster file to a new raster file (possibly with different resolution using regularized spline with tension and smoothing.
r.slope.aspect Generates raster map layers of slope, aspect, curvatures and partial derivatives from a raster map layer of true elevation values.
r.topidx Creates topographic index, $\ln(a/\tan(\beta))$, map from elevation map.

Terrain - generate fractal terrain

r.surf.fractal GRASS module to create a fractal surface of a given fractal dimension. Uses spectral synthesis method. Can create intermediate layers showing the build up of different spectral coefficients (see Saupe, pp.106-107 for an example of this). Use this module to generate naturally looking sythetical elevation models (DEM).

Viewshed modeling

r.los Line-of-sight raster analysis program

Watershed analysis

r.basins.fill Generates a raster map layer showing watershed subbasins.
r.drain Traces a flow through an elevation model on a raster map layer.
r.fill.dir Filters and generates a depressionless elevation map and a flow direction

r.flow	map from a given elevation layer. Construction of slope curves (flowlines), flowpath lengths, and flowline densities (upslope areas) from a raster digital elevation model(DEM).
r.flowmd	Construction of slope lines (flowlines), flowpath lengths and flowline densities from a raster digital elevation model using a modified multiple directions algorithm.
r.hydro.CASC2D	Fully integrated distributed cascaded 2D hydrologic modeling
r.water.fea	An interactive program that allows the user to simulate storm water runoff analysis using the finite element numerical technique.
r.water.outlet	Watershed basin creation program.
r.watershed	Watershed basin analysis program. Can output new maps showing the number of cells draining through each cell, the drainage direction, each basin and half-basin, stream segments, and data needed for modeling soil erosion using the Universal soil loss equation.

SITE LIST PROGRAMS

Get summary information and statistics about a single site list

s.info	Reports attribute, label, and other information about a sites file. Reads the entire sites file and reports header & label information, type of category, number of attributes & dimensions, and min and max values for each dimension, attribute, or category.
s.univar	Calculates univariate statistics of site lists. This includes the number of sites, mean, standard deviation, coefficient of variation, minimum, first quartile, median, third quartile, and maximum.
s.windavg	Reads a site list averaging the selected attribute among all sites that fall within each cell defined by the current region settings. The output gives the coordinates of the center of the cell and the average (mean) of the attribute values for the sites within the cell.

Get information about a sites at specific points

d.what.sites	Allows the user to interactively query a site list using the mouse. Outputs the easting, northing coordinate values and descriptions of site(s) nearest to the user-specified location(s) on user-named site list.
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Test site lists for normality

s.normal	Tests for normality for sites.
s.problt	Normal probability plot of a GRASS site list.

Use a site list for geostatistical analysis or spatial pattern analysis

m.svfit	Fit and plot semivariograms
s.medp	Median polish for a GRASS site list.
s.qcount	Chooses n circular quadrats of radius r such that they are completely within the bounds of the current region and no two quadrats overlap. The number of sites falling within each quadrat is counted and indices are calculated to estimate the departure of site locations from complete spatial

randomness.
s.sv Sample semivariogram of a GRASS site list.

Create a new site list by digitizing

v.digit A menu-driven, highly interactive map development program used for vector digitizing, editing, labeling and converting vector data to raster format.

Create random site lists

r.random Creates a raster map layer and site list file containing randomly located sites.
s.perturb Random location perturbations of GRASS sites.
s.random Randomly generate a GRASS site list containing n sites.
v.random Allows a user to create a GRASS site_lists file containing sites randomly placed within an area of a vector map.
v.scale.random Allows a user to create a GRASS site_lists file containing sites randomly placed within an area. This program is designed as an interface to v.random to aid the user in determining the number of dots to locate.

Create a Delaunay triangulation or Voronoi diagram/Thiessen polygons

s.delaunay Uses an existing site list to do Delaunay triangulation, putting the results in a binary vector file (vectname).
s.voronoi Uses an existing site list to create a Voronoi diagram (Thiessen polygons) in a binary vector file (vect).

Use a site list to obtain information about a raster map

s.sample Samples a GRASS raster map at the site locations in the input file by either cubic convolution interpolation, bilinear interpolation, or nearest neighbor sampling (default).

Convert a site list to a raster or vector map with points

s.to.rast Converts a site file to a raster map
s.to.vect Converts a GRASS site_lists file into a vector file.

Convert a site list to a raster map by interpolation

s.surf.idw Surface interpolation from sites data by Inverse Distance Weighted algorithm.
s.surf.rst Interpolation and topographic analysis from given site data to GRASS floating point raster format using regularized spline with tension

Change the projection of a site list

s.proj Allows the user to re-project a sites file from one location to the current location (no datum transformation yet).

Use a site list for specialized purposes

s.territory Calculates territory consumption for animal based on distributed positions
s.vol.rst Interpolates the values to 3-dimensional grid from point data (climatic

s.what stations, drill holes etc.) given in a 3D sites file named input. Allows the user to query site list descriptions. Outputs the category values and optionally category labels. User types in easting and northing.

VECTOR PROGRAMS

Get summary information about a single vector map

v.info Information about a vector map's boundaries, projection, data type, category number, data base location and mapset, and history are put into a table and written to standard output.

v.report Generates a table showing the area present in each of the categories of a user-selected data layer. Area is given in hectares, square meters, and square kilometers

v.stats Prints information about a binary GRASS vector map layer. Information includes the number of lines, nodes, areas, islands, and attributes.

Get detailed information about a single vector map

v.dump Report detailed information on a vector map, including information on areas, lines, islands, categories, and nodes.

Get information about a single vector map at specific points or in specific areas

v.area Display GRASS area and perimeter information for GRASS vector map. Then user can select area on map by clicking with mouse within the desired area. Selected area will be highlighted in selected color on graphics display. On regular screen area information will be displayed, in square meters, hectares, acres, and square miles, Perimeter measurements, in meters, feet, and miles, are also displayed.

v.distance Calculate the distance from a point to the nearest line or point in a vector map. User types in easting and northing coordinates.

v.what Query the category contents of a (binary) vector map layer at user-selected locations. The mouse can be used or easting and northing can be typed.

Create new vector maps by digitizing

v.digit A menu-driven, highly interactive map development program used for vector digitizing, editing, labeling and converting vector data to raster format.

Create new vector maps by reclassing or editing a vector map

v.db.reclass Changes vector category values for an existing vector map according to results of SQL queries.

v.reclass Creates a new map layer whose category values are based upon the user's reclassification of categories in an existing vector map layer.

v.rmedge Selects edge vectors from an existing vector map, removes them, and creates a new vector map.

Create new vector maps by merging or combining two or more vector maps

v.cutter	This program provides a way to generate new maps based on an intersection of two existing maps. It in effect provides a way to create masked versions of vector maps. Both lines, sites, and polygons are clipped correctly.
v.make.subj	Designed to create a common category file from maps of areas that have the same category labels, but different category values; and that must be joined/merged together.
v.merge	Designed to merge maps for areas that have the same category labels, but different category values associated with those labels.
v.patch	Allows the user to combine any number of vector map layers together to create one composite vector map layer.
v.patch.scs	Patch 2 or more vector maps together.

Create specialized vector maps: Circles around sites

v.bubble	Create "polygon" circles or bubbles around points read from an existing "site_lists" file. The "site_lists" points will be the centers for those bubbles with one bubble created per point. The size of the bubble is relative to the z value (or "height" attribute") at that point.
v.circle	Creates a vector file which consists of circle(s) which uses each point in a "site_lists" file as the center of those circle(s).

Create specialized vector maps: Grids, USGS quadrangle boundaries

v.mkgrid	Create a binary format, vector map representation of a regular coordinate grid.
v.mkquads	Creates a GRASS vector map layer and/or site list and/or geographic region definition file for a USGS 7.5-minute quadrangle.

Analyze autocorrelation in a vector map

v.autocorr	Calculate spatial autocorrelation statistics for GRASS vector file.
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Interpolate a vector map of elevation contours to produce a raster map

v.surf.rast	Interpolation and topographic analysis from given contour data in vector format to GRASS floating point raster format using regularized spline with tension.
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Label or clean a vector map

Label: Attach attribute values to sites, lines, and polygons

v.alabel	Allows the user to bulk-label currently unlabeled polygons (area features) in a binary GRASS vector file (i.e., a dig file).
v.build.polylines	Builds polylines from the lines in a binary vector file. It outputs the polylines in either binary or ASCII vector format, and if requested, copies the attribute and category files from the original file.
v.cadlabel	Attaches labels to (binary) vector contour lines that have been imported to GRASS from DXF format.
v.llabel	Allows the user to bulk-label currently unlabeled points or lines (not area features) in a binary GRASS vector file (i.e., a dig file).

Clean: Remove dangles, dead lines, extra points, and duplicate lines, areas, or points

v.clean	Cleans out dead lines in GRASS vector files.
v.prune	The GRASS program v.prune allows the user to remove extra points from a vector file.
v.rm.dangles	Removes dangling vectors from vector map.
v.rmdup	Removes duplicate lines, areas, and points from a binary vector file.
v.spag	This program will fix vector data that were not digitized in correct GRASS vector format. It will create a node at every line crossing, and will delete all hanging lines of length less than the specified threshold.

Convert vector maps to database files, raster maps, or site lists

v.to.db	Load values (e.g., category, label, area) from a vector map to a database.
v.to.rast	Transforms (binary) GRASS vector map layers into GRASS raster map layer format.
v.to.sites	Extracts data from a GRASS vector map layer and stores output in a new GRASS site_lists file.

Vector utilities:

v.mk_stats	Generate statistics file for a vector map
v.mkstats	New version of v.mk_stats??
v.support	v.support builds GRASS support files for (binary) GRASS vector data files. These support files supply topology (dig_plus) and category (dig_att) information that are needed by other GRASS programs
v.timestamp	Print/add/remove a timestamp (date and time) for a vector map

Change the projection of a vector map

v.proj	Allows a user to convert a vector map in a specified mapset of a specified location (different from current) with projection of input location to the vector map in a current mapset of current location with projection of current location (both projections are defined by corresponding PROJ_INFO files).
v.transform	Transforms an ASCII vector map layer from one coordinate system into another coordinate system. This program has been used to import vector files that were in scanner or digitizer (x,y) coordinates and to transform these into UTM coordinates.

PRINTING PROGRAMS

p.chart	Prints the color chart of the currently selected printer
p.colors	This function allows the user to modify a color table for a raster map layer, by assigning colors to the categories in the raster map layer based on printer color numbers (instead of red, green, blue percentages).
p.icons	This program allows the user to create and maintain icons which are used by the p.map and d.icons commands to depict sites.
p.labels	This module allows the user to create or modify labels files. These labels files, which are stored in the database, define text information for printing

	with p.map and for graphics display with d.paint.labels.
p.map	Use a file of mapping instructions to produce a printout
p.map.new	Use a file of mapping instructions to produce a printout
p.ppm	Reads portable pixmap (ppm) files created by PPM utilities
p.select	Select a printer from the printer list
ps.icon	Creates and modifies icons for use with ps.map
ps.map	Use a file of mapping instructions to produce a printout on a postscript printer or to a file
ps.select	Select a postscript device for GRASS hardcopy output