

ColombiaMap: A mineral occurrence data set for Colombia Instructions for MapInfo and ArcGIS users

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Introduction

ColombiaMap is a GIS data set for Colombia. The *Geography* module provides infrastructure (cities, roads, political boundaries, etc.), digital topography (DEM files), shaded relief, and bathymetry. *Geology* provides an up-to-date, published geologic map and legend in vector format. The *TS Units* module provides a tectonostratigraphic map and legend based on publications from government, industry and academia. *Radiometric Dates* compiles over 4500 published ages for intrusive and extrusive igneous rocks, metamorphism, hydrothermal alteration, mineralization, inherited ages and exhumation (cooling). The *Prospect* module locates over 2100 metallic mineral mines and prospects, classifies them according to 18 deposit types, and assembles current figures for past production, resources and reserves. *Land Status* locates 20,000 metallic and non-metallic mineral concessions and concession applications (attributed with owner, status and contract date), 574 proposed strategic mineral reserve areas and 900 national parks, forest reserves, black and indigenous communities and other areas of restricted mineral entry.

The Colombia multielement geochemical data set, available separately, provides analytical data for 168,656 rock, soil, pan concentrate, water and stream sediment samples.

ColombiaMap is revised and updated as new discoveries are made, as new resources are announced and as production data is updated. Geologic maps are updated to reflect ongoing research. Pricing, payable in US currency or in shares, is covered on the final page of this data set description. New users should pay special attention to the “Installation” section.

Geography, Geology and TS Unit Modules

The *Geography* and the *Geology* modules of the ColombiaMap data set are displayed by opening “COGeography” and “COGeology.” The *Geography* module includes shaded relief and bathymetry and is accompanied by digital topography

(DEM files), infrastructure and a topographic map index. *Geology* provides, in addition, the most recent (2015) published geologic map (1:1,000,000 scale) and legend in vector format. The *TS Units* module is a tectonostratigraphic map and legend compiled using the published (2015) geologic map as a base but colored with tectonostratigraphic rock unit assignments (e.g. Cretaceous, volcanic arc-related, calc-alkaline intrusions of the South American continental margin) rather than country-specific lithologic descriptions (e.g. Antioquia batholith). The *Geography*, *Geology* and *TS Units* modules have broad application beyond the mining and exploration industry.

Radiometric Dates Module

The *Radiometric Dates* module compiles over 4500 published radiometric ages along with sample number, sample location, description, analytical method, mineral dated, error and a reference to the literature. Two additional fields record the original and the current interpretation for each date, e.g. the age of: intrusion, volcanism, metamorphism, sedimentation, exhumation, hydrothermal alteration or mineralization.

Prospect Module

The *Prospect* module, which includes the *Geography*, *Geology*, *TS Units* and *Radiometric Dates* modules is displayed by opening “COProspects.” Metallic mineral occurrences are plotted using shapes that correspond to deposit type, colors for each metal, and sizes that reflect gross contained metal value. Selecting a specific mineral occurrence will call up attached information including location, source of data, deposit type, owners, partners, past production, current resources, current reserves, status (active mine, inactive mine, resource, prospect), geologic observations, recent deals, and references to the literature along with calculated fields for total size (in tons or ounces) and contained metal value in US\$.

The Prospect module also contains a field for “geologic observations” that compiles information for each mineral occurrence, e.g. metal content (e.g. Au, Cu, Ni, Pt), mineralogy (sulfide, oxide), origin (orogenic, hydrothermal), form (lenticular, vein, stockwork) and host rock.

Land Status Module

Land status is displayed by running “COLandStatus” which plots over 20,000 metallic and non-metallic mineral concessions, 574 proposed strategic mineral reserve areas, along with national parks, forest reserves, paramos, indigenous communities and other areas of restricted mineral entry. Concessions are attributed with relevant information including owner (company or individual),

contract date, status (exploration or extraction, contract or application) and expiration date. Only official government records are used to generate the concession map. The map provides a “snapshot” of land status as of the date of compilation. For specific areas of interest, a thorough review of current status is always necessary.

The land status data set also shows national parks, forest reserves, Indian reservations, national monuments and other areas where mineral exploration and development is restricted or prohibited.

Concessions:

Metallic mineral concessions are governed by the mining code of Colombia (Law 685 of 2001). Concessions granted prior to 2001 continue to be governed by the mining law of 1969 (Law 20) or the mining law of 1988 (Law 2655). Law 1382, modifying the 2001 mining code, was passed by congress in February 2010 but was found unconstitutional in May 2011.

Concessions are administered by the National Mining Agency-ANM. This agency replaced the former INGEOMINAS in 2012. Metallic mineral exploration and exploitation concessions can measure up to 10,000 hectares in area and are governed by a single 30-year contract that can be extended for an additional 30 years. Concessions are specific to a named metallic mineral or minerals. Separate concessions may be granted, for instance, for gold and for copper.

For exploration licenses governed by the 1988 mining law, concessions are valid for two years with provision for a one-year extension; exploitation licenses are valid for ten years with provision for a ten-year extension.

For up-to-date information on any particular area, the user should consult the official mineral concession records maintained at each of the regional offices of ANM (main office: Bogota). The status of individual concessions can also be reviewed over the internet at: <http://www.cmc.gov.co:8080/CmcFrontEnd/index.cmc>.

Mineral Reserve areas:

In February of 2012, ANM established 574 strategic reserve areas. These areas are off-limits to mineral entry except by a special application process. Applications are not yet being accepted because the courts have found that ANM’s declaration of strategic mineral reserve areas was done without prior consultation with local black and indigenous communities. All of the 574 proposed strategic mineral reserve areas are affected by the court decision.

Areas of restricted mineral entry:

National parks, forest reserves and protected areas are administered by the Ministerio de Ambiente, Vivienda y Desarrollo Territorial. Indian and black

communities are administered by the Ministerio del Interior. In Colombia, national parks and some protected areas are entirely off limits to mineral exploration and development. Areas where mineral development is allowed but where special restrictions apply include:

- 1) forest reserves -exploration is permitted, reserve boundaries can be modified if a discovery is made by submitting a petition to modify the size of the reserve area “sustraccion de areas de reserva.”
- 2) Indian and Black communities – exploration and development requires the approval of the local community.
- 4) protected areas - exploration is permitted in most protected areas with the exception of swamps (cienagas). Paramos, defined as elevations above 3200 meters, are also protected. Mining requires approval of a petition to modify the reserve area “sustraccion de area de reserva.”

Subdirectories

Concessions subdirectory:

Concession information including ownership and contract date is stored in the Concessions subdirectory and is sourced from the Catastro Minero, an official registry of concessions maintained by ANM. Proposed strategic mineral reserve areas (574), not yet authorized by law, are also included.

Geology subdirectory:

The Geology subdirectory contains a geologic map and legend of Colombia in vector format. The source for this map is the 1:1,000,000 scale geologic map published by the SGC in 2015. An ArcGIS version of this map is available for free at: <http://www2.sgc.gov.co/Geologia/Mapa-Geologico-de-Colombia.aspx>

Prospect subdirectory:

Information pertaining to individual mines and mineral occurrences is stored in an MS Access database (CO_Pros.accdb). Only published, non-confidential information is provided. The Prospect subdirectory includes the following information for each mineral occurrence: prospect name, alternate names, location, location reference, deposit type, district, owners, partners, deals, total past production, production reference, reserve, reserve reference, resource, resource reference, status (active mine, inactive mine, resource, prospect), geologic observations, overall size (in ounces or tons) and contained metal value.

Mineral occurrences are classified according to 18 deposit types, listed in the following table. MapInfo cannot read MS Access queries, consequently each deposit type has a stand-alone table in the Prospect subdirectory.

Metallic Mineral Deposit Classification

Deposit Type	Symbol
Epithermal veins and stockworks (Au, Ag, Cu, Pb, Zn)	1
Epithermal disseminated (Au, Ag, Cu, Zn)	13
Epithermal veins and stockworks of Hg and Sb	8 (Hg), 10 (Sb)
Volcanogenic massive sulfide (VMS) deposits	2
Sediment-hosted (Sedex) deposits	14
Volcanogenic (Seafloor) manganese deposits	9
Sediment-hosted (U, Th, V) deposits	27
Banded iron formation (Au, Fe, Mn) deposits	21
Porphyry (Cu, Mo, Au, Ag) deposits	5
Skarn (Au, Ag, Cu, Pb, Zn) deposits	3
Iron skarn (Fe) deposits	24
Carbonate replacement (Au, Ag, Cu, Pb, Zn) deposits	22
Iron replacement (Fe) deposits	23
Greisen (Sn, W) deposits	17
IOCG (Iron-oxide copper gold) deposits (Au, Ag, Cu, Mo)	16
IOCG (U, REE, Fe) deposits	25
Alkaline Rocks and Carbonatites (U, Th, V)	18
Alkaline Rocks and Carbonatites (Sc, REE)	26
Orogenic (shear-hosted, mesothermal) deposits (Au, Ag)	4
Magmatic segregation (Cr, Pt, Pd) deposits	11
Lateritic (Ni, Co) deposits	6
Bauxite (Al, REE, Sc) deposits	12
Alluvial (Au, Ag, Pt, Pd) deposits	7
Alluvial (U, Th, REE, Sc) deposits	28
Alluvial (Fe, Sn, W) deposits	29
unassigned	99

Parks subdirectory:

The Parks subdirectory contains files that identify areas of restricted mineral entry including national parks, forest reserves, areas where a military escort was required (prior to the 2016 peace agreement with FARC), areas where local

community approval is required to conduct exploration, paramos, and other areas where mining or exploration is subject to restrictions.

Survey Indices subdirectory:

The files in this subdirectory show the location of stream sediment surveys and geophysical surveys conducted by companies, governments and international aid organizations. Stream sediment survey indices record the number of samples collected, area covered, sample density, list of elements run, and the source of the data. Geophysical survey indices show the type of survey (magnetic and/or radiometric), area covered, and the source of the image or data.

Geophysical Survey subdirectory:

Geophysical survey images provided with the ColombiaMap data set include Bouguer and Free Air regional gravity maps as well as Total Field and Reduced to Pole Aeromagnetic maps (all as raster images). Digital geophysical data is not included with the ColombiaMap data set and, as yet, has not been made available by the government.

Geography and 50K topo index subdirectories:

The Geography subdirectory includes borders, cities and towns, roads, major drainages, and principal topographic contours. The 100K topo index subdirectory includes an index to the 1:100,000 scale topographic maps for Colombia.

Geochemistry subdirectory:

This subdirectory provides multielement geochemical data for the Colombia Multielement Geochemical GIS Data set, a total of 168,656 stream sediment, rock, soil, pan concentrate and water samples collected by the SGC (Ingeominas) during the period 1998 to 2004 and released to the public in 2015. The original data set is available for free download at:

<http://geoportal.sgc.gov.co/geoportalsgc/catalog/quicklink/basesDatosPublicacion.page>.

Recursos del Caribe, S.A. (RdC) took the raw analytical data, converted text to numeric fields as appropriate, found and corrected 772 duplicate entries and 542 data entry errors and added 54,553 missing sample locations. The result, after a total of 31,538,671 edits, is a user-friendly GIS data set that can be applied with confidence.

RdC's revised and corrected geochemical data set is designed to work with the ColombiaMap data set but is available separately; it is not sold as part of ColombiaMap. Pricing information for the Colombia Multielement Geochemical GIS Data set is provided at the end of this document.

Type of Sample	Number of Samples	Elements analyzed
Pan Concentrate	4,547	Ag, Al, As, Au, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, Hg, K, Mg, Mn, Mo, N, Na, Nb, Ni, P, Pb, Pd, Pt, S, Sb, Sc, Se, Sn, Sr, Th, Ti, Tl, U, V, W, Y, Zn, Zr
Rock	65,598	Ag, Al, As, Au, B, Ba, Be, Bi, Br, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ge, Hf, Hg, Ho, In, Ir, K, La, Li, Lu, Mg, Mn, Mo, N, Na, Nb, Ni, P, Pb, Pd, Pr, Pt, Rb, S, Sb, Sc, Se, Si, Sm, Sr, Ta, Tb, Te, Th, Ti, Tl, U, V, W, Y, Yb, Zn
Soil	21,265	Ag, Al, As, Au, B, Ba, Be, Bi, Br, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ge, Hf, Hg, Ho, I, In, Ir, K, La, Li, Lu, Mg, Mn, Mo, N, Na, Nb, Nd, Ni, Os, P, Pb, Pd, Pr, Pt, Rb, Re, Ru, S, Sb, Sc, Se, Si, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, Tm, U, V, W, Y, Yb, Zn, Zr
Stream Sediment	72,536	Ag, Al, As, Au, B, Ba, Be, Bi, Br, Ca, Cd, Ce, Cl, Co, Cr, Cs, Cu, Dy, Er, Eu, F, Fe, Ga, Gd, Ge, Hf, Hg, Ho, In, Ir, K, La, Li, Lu, Mg, Mn, Mo, N, Na, Nb, Nd, Ni, P, Pb, Pd, Pr, Pt, Rb, Re, Ru, S, Sb, Sc, Se, Si, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, U, V, W, Y, Yb, Zn, Zr
Water	3774	Ag, Al, As, Au, B, Ba, Be, Bi, Br, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ge, Hf, Hg, Ho, In, Ir, K, La, Li, Lu, Mg, Mn, Mo, Na, Nb, Nd, Ni, Pb Pd Pr Pt Rb Re Ru Sb Sc Se Si Sm Sn Sr Ta Tb Te Th Ti Tl U V W Y Yb Zn Zr

Shaded Relief subdirectory:

Shaded relief tiff images are located in the Shaded Relief subdirectory. Elevation data for the shaded relief maps (provided as DEM grd files) is from the Shuttle Radar Topography Mission (SRTM) version 4 (2008) at 3 arc-second (approximately 90-meter) resolution.

Digital elevation data tiles downloaded from <http://srtm.csi.cgiar.org> were converted to Geosoft format using Global Mapper Software (version 11). The resulting grid tiles were manipulated, clipped and/or merged in MapInfo (version 11) using Discover (version 2011).

Registered raster images of the 90-meter grids were created for each of the 1:100,000 scale topographic quadrangle maps using Global Mapper (version 11) and the resulting tiles were set for display in MapInfo. In addition, the 90-meter data was re-gridded to 350 meters in order to provide a shaded relief map for the entire country.

Bathymetry subdirectory:

Regional bathymetry (as DEM grd files) was downloaded from the Marine Geoscience Data System: Global Multi-resolution Topographic Data portal (MGDS: GMRT) at <http://www.marine-geo.org/portals/gmrt/>. The bathymetric map is created from (shipboard) sonar supplemented, between tracks, by gravity and satellite altimetry data using a process described by Ryan et al., 2009:

<http://onlinelibrary.wiley.com/doi/10.1029/2008GC002332/full>. MGDS: GMRT data at

500-meter resolution was re-gridded to produce maps at an approximate resolution of 350m.

Radiometric Dates subdirectory:

The Radiometric Dates subdirectory compiles ages for 4500 samples. Each sample is attributed with sample number, location, lithology, sample description, analytical method, rock type, material dated, age, error and source of information. The data set also includes fields both the original and the current interpretation (e.g. inherited age, intrusion/crystallization age, volcanism/crystallization age, age of metamorphism, etc.)

A compilation of radiometric dates without fields for interpretation and containing only dates published prior to October, 2014 are available from the SGC (Geologic Society of Colombia) at:

http://srvags.sgc.gov.co/arcgis/rest/services/Catalogo_Dataciones_Radiometricas_Colombia

TS Units subdirectory:

This subdirectory contains files used to create a tectonostratigraphic (TS) map. The TS map uses the published geologic map from the Geology subdirectory as a base. Then, based on government, industry and academic publications, geologic map polygons are assigned attributes and colors according to their tectonostratigraphic setting. For instance, rather displaying map units according to their age and lithology (e.g. Cretaceous La Trinidad basalt), the TS_PGONS file is attributed with origin and tectonic setting (e.g. Pacific ocean floor, intra-oceanic island arc, continental margin volcanic arc, or back arc basin). The result is a tectonostratigraphic map that is easy to understand and directly applicable to mineral exploration.

Titles and legends subdirectory:

Title blocks, legends, grids, labels, and scale bars are stored here.

UTM subdirectory:

A UTM index is provided for Colombia along with grids for each of the five local datums. Grids are provided for the Bogota, East Central, East, West and Western West Zones.

Ancillary Files subdirectory:

The Ancillary Files subdirectory contains files that modify or supplement the user's GIS software. For ArcGIS users, this subdirectory includes ArcGIS layer

files and files for use with ArcToolbox. For MapInfo users, this subdirectory includes picklists, “MapInfoW.fnt” with special fonts and a file with additional projection information called “add_to_MapInfo_prj.txt.” All are described in the following section on Installation.

A file called “deposit_size_calculations_2018.xlsx” lists the formulas that are used in calculating deposit size and gross contained metal value. For instance:

$$\text{Au and Ag deposit size} = \text{past production in ounces} + (\text{resource in metric tonnes} * \text{resource grade in ppm} * 1/31.1034768) + (\text{reserve in metric tonnes} * \text{reserve grade in ppm} * 1/31.1034768)$$

$$\text{Base metal, Aluminum, Nickel, Cobalt and Chromium deposit size} = \text{past production in tons} + (\text{resource in tonnes} * 2204.623 / 2000 * \text{resource grade in percent} / 100) + (\text{reserve in tonnes} * 2204.623 / 2000 * \text{reserve grade in percent} / 100)$$

Deposit value = deposit size (in ounces for precious metals, in tons for base metals, aluminum, nickel and cobalt) * metal price. Polymetallic deposit values represent the sum of each of the contained metals.

Plots subdirectory:

The Plots subdirectory contains high resolution tiff images for the metallogenic map and the land status map of Colombia.

MapInfo Installation

Start by checking that Microsoft Access and MapInfo version 15.0 (or higher) are installed on your computer. If this is an update, backup your previous version before erasing the old data set. Copy the new data set to the root directory (C:\). Name the folder ColombiaMap (C:\ColombiaMap).

Fonts

ColombiaMap map uses several customized fonts that are not delivered with standard MapInfo software. Follow these steps to replace your “MapInfo 3.0 Compatible font” with a customized version provided in the Ancillary_Files subdirectory.

- Exit MapInfo if it is running.
- Be sure that you are displaying hidden files and folders.
 - On a machine that is running Windows 10, open Windows Explorer and go to File > “Change Folder and Search Options.” Select the “View” tab. Then, under “Hidden files and folders” select the option to “show hidden files, folders and drives”.
- Locate the file MAPINFOW.FNT on your computer.
 - On a machine that is running Windows 10, it is found in:

C:\Users\YOURUSERNAME\AppData\Roaming\MapInfo\MapInfo\Professional\1500
(for MapInfo version 15)

- Rename MAPINFOW.FNT; call it MAPINFOW_FNT.OLD
- Copy "MAPINFOW.FNT" from the Ancillary_Files subdirectory into the folder where "MAPINFOW_FNT.OLD" is located.

Datums

ColombiaMap map uses several local datums that are not delivered with standard MapInfo software. Although the data set will continue to function without making changes, it is preferable to add the custom datums to the MapInfo projection file. To do so, use any text editor to open "MapInfow.prj" from: C:\Program Files(x86)\MapInfo\Professional (for Windows 10). This file contains all of the projections that ship with your MapInfo software. From the Ancillary_Files subdirectory, copy the text contained in the file named "add_to_mapinfow_prj_file.txt" and paste it into MapInfow.prj (at the end of the file will work just fine). MapInfow.prj will now provide all local datums called by ColombiaMap.

Picklists

ColombiaMap map uses MapInfo Discover picklists to assign colors to tectono-stratigraphic units, parks and concessions. Although neither Discover nor the picklists are required to run ColombiaMap, users who want to edit the picklists (to change colors or add categories) will need to copy the .xml files from the Ancillary_Files subdirectory and paste them to the subdirectory: C:\Users\username\AppData\Roaming\Encom\Discover\Picklists

Microsoft Access Database

Mineral occurrence information for MapInfo users is stored in a Microsoft Access database, CO_Proc.accdb, located in the Prospect subdirectory. Prospects, a table in the Access database, compiles relevant information for each mineral occurrence including: location, deposit type, owners, partners, past production, current resources, current reserves, published sources for past production, resource and reserve figures, status (active mine, inactive mine, prospect), salient drill results, geologic observations, ownership, terms of recent sales and joint ventures, and references to the literature. Calculated fields show the total precious metal content in ounces, base metal content in tons, and total contained metal value in US dollars.

New mineral occurrences can be added and changes can be made to existing mineral occurrence information by using MSAccess to modify the CO_Proc

database. CO_Proc.accdb also contains a series of queries that select all deposits for each of the deposit types listed on the table under Prospect subdirectory.

A form in CO_Proc.accdb, “Update Deposit Size and Value” must be used to update gross contained metal values whenever changes are made to production, resources or reserves. This form can also be used to change the metal prices used in the calculation of gross contained metal value.

When adding records to the MSAccess database (CO_Proc.accdb), any nulls (empty fields) should be replaced with zeros (0’s) in the entries for production, resource and grade since the calculation of deposit size and value draws numeric values from those fields.

Open Database Connectivity - ODBC Issues

MapInfo connects to the Prospects database (CO_Proc.accdb) via a dsn file (COPros1.dsn) which resides in the Prospect subdirectory. All changes made to the database in MapInfo automatically flow through to the Access database when the MapInfo table COPros1.tab is saved. (MapInfo may ask you to browse to the location of the MSAccess database.) Once changes have been saved to the MSAccess database, MapInfo will give you the option to “refresh” the linked MapInfo table. Answer “yes.” If inconsistencies arise between the data in the Access database and the data in the MapInfo tables, MapInfo will issue a warning message that prompts the user to resolve the conflict.

It is best to refresh the linked MapInfo tables, including CO_Proc.tab, whenever changes are made to the mineral occurrence information whether from within MapInfo or from within Microsoft Access. After refreshing the MapInfo linked tables, close any open DBMS connections using “file > close DBMS connection” or the “disconnect DBMS” button.

MapInfo cannot read MSAccess queries. For this reason, deposit type selections are saved not only as queries in the MSAccess database but also as linked MapInfo tables in the Prospects subdirectory.

You are now ready to run ColombiaMap. Open the prospects data set and metallogenic map by opening COProspects. Open the land status data set and concession map by opening COLandStatus. You can also create your own workspaces (MapInfo) or project files (ArcGIS).

ArcGIS Installation

Install ArcGIS version 10.6 (or higher) on your computer. If this is an update, backup your previous version before erasing the old directory. Copy the new data set to the root directory of your hard drive (C:\COMap).

ESRI Geodatabase management

All mineral occurrence information is stored in CO_Proc.gdb, an ArcGIS geodatabase located in the Prospects subdirectory. Additions or changes to mineral occurrence information are made directly to the Prospects table in CO_Proc.gdb.

Most users will not need to make changes to the information that is stored in CO_Proc.gdb. However, if changes are made to production, reserves or resources, then deposit size and value fields should also be updated. These updates are made by running the Python script "UpdateProspects.pyt." The following instructions explain how to add "UpdateProspects.pyt" to ArcToolbox.

- Copy the file "UpdateProspects.pyt" from C:\COMap\Ancillary_Files\ into the "My Toolboxes" folder. A common path to this folder, for ArcMap 10.6, is:
C:\Users\[your username]\AppData\Roaming\ESRI\Desktop10.6\ArcToolbox\My Toolboxes\
- Start ArcMap, and click on the ArcToolbox button
- In the ArcToolbox window, right-click in open space below the list of toolboxes, and select "Add Toolbox"
- Navigate to the "My Toolboxes" directory and select (single-click) UpdateProspects.pyt, and then click Open.
- Select UpdateDepositSizeandValue > right click in the open space underneath > save settings > to default
- Note that the UpdateProspects.pyt file only needs to be installed once, even if you have more than one data set (e.g. CMap and EMap) installed.

Now that "UpdateProspects.pyt" is installed, follow these instructions to update deposit size and value fields in COProc.gdb:

- Open any ArcGIS mxd file.
- In the ArcToolbox window, if the UpdateDepositSizeandValue toolbox is not present, right click on open space and load settings > from default.
- In the ArcToolbox window, double-click the UpdateDepositSizeAndValue toolbox. A list of update scripts will be displayed.
- Double-click the script appropriate for the database table you have installed (e.g. if you have installed COMap, double-click on COProcUpdate). A window will appear.
- Click OK to begin running the script. Calculations may take some time ... a couple of minutes for a thousand prospect records is typical. For more records, a proportionately longer time period is needed.
- Save the mxd

Source File Connections

If the ColombiaMap data set is copied to a location other than the root directory, some mxd files will not open properly. Broken links can be repaired by resetting the links. Select (click on) the "list by source" icon. Right click on the file

that is not opening properly, select properties > source > “set data source,” and browse to the source location, for example: C:\COMap\Prospect\CO_Pro.s.gdb.

You are now ready to run ColombiaMap. Open the prospects data set and metallogenic map by opening COProspects.mxd. Open the land status data set and concession map by opening COLandstatus.mxd. Use the mxd files provided with the ColombiaMap data set or create new ones

Ordering information, copyright and disclaimer

The ColombiaMap GIS data set, including the *Geography, Geology, TS Units, Radiometric Dates, Prospect* and *Land Status* modules is available for purchase through Recursos del Caribe, S.A. To order the data set or for any questions, write to Carl Nelson at: nelson@cbmap.net.

Information on pricing is provided below. Payment is accepted in US currency or in an equivalent number of shares. Updates are free for the first year and half price for four additional years. Prospective clients are invited to “test drive” the data sets via a screen sharing session before making a purchase. Examples of the maps that can be generated using the data set are displayed on the web site at www.CBMap.net.

ColombiaMap is the property of Recursos del Caribe, S.A. It is intended for the sole use of the purchaser. The data set cannot be copied, sold, transferred, or distributed without express written permission from Carl E. Nelson.

Reasonable efforts are made to ensure that the information contained in ColombiaMap and in the Colombia Multielement Geochemical Data set is accurate and up-to-date. Carl Nelson and Recursos del Caribe, S.A. do not warrant the accuracy of information provided.

Pricing

ColombiaMap: a GIS data set for the *Geography, Geology, TS Units, Prospects, Land Status* and *Radiometric Dates* Colombia. Available as a package in **either** MapInfo or ArcGIS format for: US\$30,000
Or in **both** ArcGIS and MapInfo format for: US\$37,500

ColombiaMap is also available in stand-alone modules as follows:

<i>Geography</i> (digital elevation models and shaded relief):	\$ 5,000
<i>Geology</i> (<i>Geography</i> plus vector geology):	\$10,000
<i>Radiometric Dates</i> (radiometric dates only, with locations):	\$ 5,000
<i>TS Units</i> (<i>Geography, Geology</i> and <i>Radiometric Dates</i> plus a regional tectono-stratigraphic interpretation):	\$20,000
<i>Prospects</i> (<i>TS Units</i> plus metallic mineral mines and prospects):	\$30,000
<i>Land status</i> (<i>Geography</i> plus metallic mineral concessions, mineral reserve areas, national parks, forest reserves, paramos, indigenous communities, and other protected areas)	\$10,000
<i>Plots</i> (high resolution tiff images of the metallogenic map):	\$ 5,000

Colombia multielement geochemical GIS data set

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This document describes regional geochemical survey data sets offered by Recursos del Caribe, S.A. (RdC). The data sets were created using, as a starting point, the following Colombian government and international agency data sets.

Servicio Geológico Colombiano (SGC-2009) map of geochemical anomalies:

The SGC published a geochemical anomaly map of Colombia (Prieto et al., 2009) that displays anomalous areas for a variety of element combinations. No raw data was provided. RdC captured the anomalous areas as polygons, provided as MapInfo tables or ArcGIS shapefiles.

Servicio Geológico Colombiano (SGC-2015) data set:

In 2015, the SGC released a compilation of multielement geochemical data for 168,656 samples, including 72,536 stream sediment samples, representing 150 surveys conducted through 2010. This data set was available for several years as a free download (in MS Access format) from the SGC website.

RdC converted the geochemical data (recorded as text) to numeric fields, eliminated 772 duplicate entries, corrected 542 data entry errors, and filled in 54,553 missing sample locations. RdC's revised SGC-2015 data set, incorporating 31,538,672 edits, is provided as MapInfo tables or as ArcGIS shape files.

Mineral Deposits Research Unit (MDRU-2016) data set:

In 2016, the MDRU, in conjunction with the SGC, published an atlas that displays multielement geochemical data for 75,238 stream sediment samples in a series of 56 separate shapefiles, each with data for a single element. The MDRU-2016 data set is available for free download on the SGC website.

RdC consolidated this data set producing a single MapInfo table or ArcGIS shapefile that compiles all of the geochemical data (in columns) for each sample (in rows). This format facilitates a review of the data for any given sample. It also facilitates any statistical evaluation (e.g., generation of correlation coefficients or multivariate analysis).

RdC offers these revised data sets for sale with the aim of eliminating the need for clients to undertake the time-consuming effort involved in putting the SGC and MDRU data sets into a format that can be easily applied to exploration.

RdC’s Colombia Multielement Geochemical Data Set is designed to work either on a stand-alone basis or with ColombiaMap, a separate GIS data set offered by RdC for mineral occurrences and land status (www.cbmap.net).

The table below summarizes the contents of RdC’s Colombia Multielement Geochemical Data Set. A figure on the following page shows the sample locations.

Sample Type	Number	Elements analyzed
Pan Concentrate	4,547	Ag, Al, As, Au, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, Hg, K, Mg, Mn, Mo, N, Na, Nb, Ni, P, Pb, Pd, Pt, S, Sb, Sc, Se, Sn, Sr, Th, Ti, Tl, U, V, W, Y, Zn, Zr
Rock	65,598	Ag, Al, As, Au, B, Ba, Be, Bi, Br, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ge, Hf, Hg, Ho, In, Ir, K, La, Li, Lu, Mg, Mn, Mo, N, Na, Nb, Ni, P, Pb, Pd, Pr, Pt, Rb, S, Sb, Sc, Se, Si, Sm, Sr, Ta, Tb, Te, Th, Ti, Tl, U, V, W, Y, Yb, Zn
Soil	21,265	Ag, Al, As, Au, B, Ba, Be, Bi, Br, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ge, Hf, Hg, Ho, I, In, Ir, K, La, Li, Lu, Mg, Mn, Mo, N, Na, Nb, Nd, Ni, Os, P, Pb, Pd, Pr, Pt, Rb, Re, Ru, S, Sb, Sc, Se, Si, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, Tm, U, V, W, Y, Yb, Zn, Zr
Stream Sediment	72,536	Ag, Al, As, Au, B, Ba, Be, Bi, Br, Ca, Cd, Ce, Cl, Co, Cr, Cs, Cu, Dy, Er, Eu, F, Fe, Ga, Gd, Ge, Hf, Hg, Ho, In, Ir, K, La, Li, Lu, Mg, Mn, Mo, N, Na, Nb, Nd, Ni, P, Pb, Pd, Pr, Pt, Rb, Re, Ru, S, Sb, Sc, Se, Si, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, U, V, W, Y, Yb, Zn, Zr
Water	3774	Ag, Al, As, Au, B, Ba, Be, Bi, Br, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ge, Hf, Hg, Ho, In, Ir, K, La, Li, Lu, Mg, Mn, Mo, Na, Nb, Nd, Ni, Pb, Pd, Pr, Pt, Rb, Re, Ru, Sb, Sc, Se, Si, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, U, V, W, Y, Yb, Zn, Zr

Pricing

Colombia multielement geochemical data set: a multi-element geochemical data set (in four parts) for 168,656 samples including: 72,536 stream sediment, 4547 pan concentrate, 21,265 soil, 65,598 rock, and 3774 water samples:

Cost for the four-part data set: \$36,000
 for selected areas: \$1 per sample

Prospective clients are invited to “test drive” the data sets via a screen sharing session before making a purchase.

