Data Selector - User Guide

Release 1.0.1

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CHAPTER 1

Preface

The most up to date version of this documentation can be found in **HTML** and **PDF** form on ReadTheDocs[1].

1.1 Recommended User Knowledge

1.1.1 Users

This user guide assumes that users of the Data Selector tool have:

- General IT experience including use of Microsoft Windows.
- Experience in the use of a relevant GIS application supported by the tool (currently ArcGIS or MapInfo), including selecting and querying features and attributes.
- An understanding of the data held in the Recorder6 database that has been configured for use by the Data Selector tool.

1.1.2 Administrators

It is recommended that a person within each organisation is designated as the tool and database administrator. This person should:

- Have an understanding and experience of IT systems management.
- Understand relational database structures.
- Have an good understanding of how to write Structure Query Language (SQL).
- Become familiar with how the Data Selector tool has been configured within the organisation.
- Have a good understanding of XML.

[1] https://readthedocs.org/projects/dataselector-userguide/

1.2 Reading Guide

This Preface explains a little about the Data Selector tool, the community of people who develop and use it, and the licensing conditions for using and distributing it. It also explains how to read this user guide.

Introduction (page 7) explains why the Data Selector tool is needed, what it does and where it comes from.

Extending Recorder6 (page 11) is a brief outline of how and how Recorder6 can be extended to enable the Data Selector tool to get the most out of your biological data.

Setting up the tool (page 19) describes how to install and set up the Data Selector tool.

Running the tool (page 43) describes how to run the Data Selector tool.

Writing SQL introduces how to write SQL queries to be used in the Data Selector tool. [Coming soon!]

FAQs (page 57) has a list of commonly asked questions and their answers.

Appendix (page 59) contains examples of the XML configuration files for MapInfo and ArcGIS, lists known issues with the tool and contains a copy of the GNU Free Documentation License v1.3 covering this guide.

1.3 Licensing

The code for the Data Selector tool is 'open source' and is released under the GNU General Public License (GPL) v3[2]. Users are free to install it on as many computers as they like, and to redistribute it according to the GPLv3 license.

This guide is released under the GNU Free Documentation License (FDL) v1.3[3]. Permission is granted to copy, distribute and/or modify this document under the terms of the license.

Please remember, however, that the tool cost a lot of money to develop and still requires further development and ongoing support. Hence any contributions towards costs would be gratefully received. Enquiries can be made via email to either Hester[4] or Andy[5].

1.4 Useful links

Related community links:

- Administrators (ArcGIS[6] and MapInfo[7]) - Release notes and installers for ArcGIS and MapInfo systems.
- Developers (ArcGIS[8] and MapInfo[9]) - Source code for the Data Selector Tool.

[2] http://www.gnu.org/licenses/gpl.html
[3] http://www.gnu.org/licenses/fdl.html
[4] Hester@HesterLyonsConsulting.co.uk
[5] Andy@AndyFoyConsulting.co.uk
[6] https://github.com/LERCAutomation/DataSelector--ArcObjects/releases/
[7] https://github.com/LERCAutomation/DataSelector-MapInfo/releases/
[8] https://github.com/LERCAutomation/DataSelector--ArcObjects
[9] https://github.com/LERCAutomation/DataSelector-MapInfo

- Issues (ArcGIS[10] and MapInfo[11]) - Details of known issues and existing change requests.

1.5 Acknowledgements

Many thanks are due to all the LERCs in the south-east of England and their staff who have, and continue to, fund and contribute to the Data Selector tool. It takes many developers, testers and users to build a truly useful tool (especially users who care enough to test new releases, report bugs and discuss feature requests).

[10] https://github.com/LERCAutomation/DataSelector--ArcObjects/issues
[11] https://github.com/LERCAutomation/DataSelector-MapInfo/issues

1.6 Conventions used in this user guide

The following typographical conventions are used in this manual:

`Ctrl-A` Indicates a key, or combination of keys, to press.

Commit Indicates a label, button or anything that appears in user interfaces.

Tools... -> About Indicates a menu choice, or a combination of menu choices, tab selections or GUI buttons.

`C:\Program Files (x86)\MapInfo\Professional` Indicates a filename or directory name.

Tip: Tips can help save time or provide shortcuts.

Note: Notes explain things in more detail or highlight important points.

Caution: Warnings where users should pay attention.

CHAPTER 2

Introduction

2.1 Background

Many LERCs use Recorder 6 for entering, collating and querying records of species and habitats. Recorder 6 is a very versatile system and is the package of choice within the LERC community where efficiency, flexibility and scalability are critical. For querying data it not only has an inbuilt Report Wizard which will produce reports from the most common data tables, but it also comes with a reporting system (XML reports) which can be used to report on all tables in the database, either by running one of the extensive selection of XML reports installed with Recorder 6 or by adapting an existing XML report or writing your own.

However, although the Recorder database structure is well documented it is very complex and requires time and expertise to master it - this can make it appear complicated for many users. One solution is to create an SQL script that exports all of the regularly used data from the complex Recorder 6 tables into one or more simplified SQL database tables (currently MapInfo or ArcGIS). These tables can then be used for both standard and bespoke reporting and analysis, and more importantly can be used to plot the data as points and/or polygons for use directly in a GIS application.

Note: The Recorder database structure is based on the NBN data model which is documented in the Documentation Wiki on the Recorder web site.

To facilitate the querying of data from these new simplified tables a new interface was developed - the **Data Selector** tool. The Tool was originally developed for use with MapInfo for Greenspace Information for Greater London (GiGL) but is now available for use with both MapInfo and ArcGIS and is used by a number of LERCs.

2.2 Tool overview

The Data Selector Tool presents a simple user interface to extract information from Recorder 6 based on the selection criteria and desired format specified by the individual user. It is integrated into the user interface of the installed GIS application (currently MapInfo or ArcGIS) - appearing as a button or menu item. The tool itself has a simple interface (*The Data Selector tool interface* (page 8)), requiring a minimum of input (a set of SQL clauses to be used in the selection, an output format and an output file destination are the only required items). Once set up, the tool communicates with both the GIS system and an associated SQL database to extract the required data. The output files can be created as MapInfo TAB format (.tab) files or ESRI shapefile (.shp) files (depending upon the installed GIS application), Comma Separated Value (.csv) files or plain Text (.txt) files.

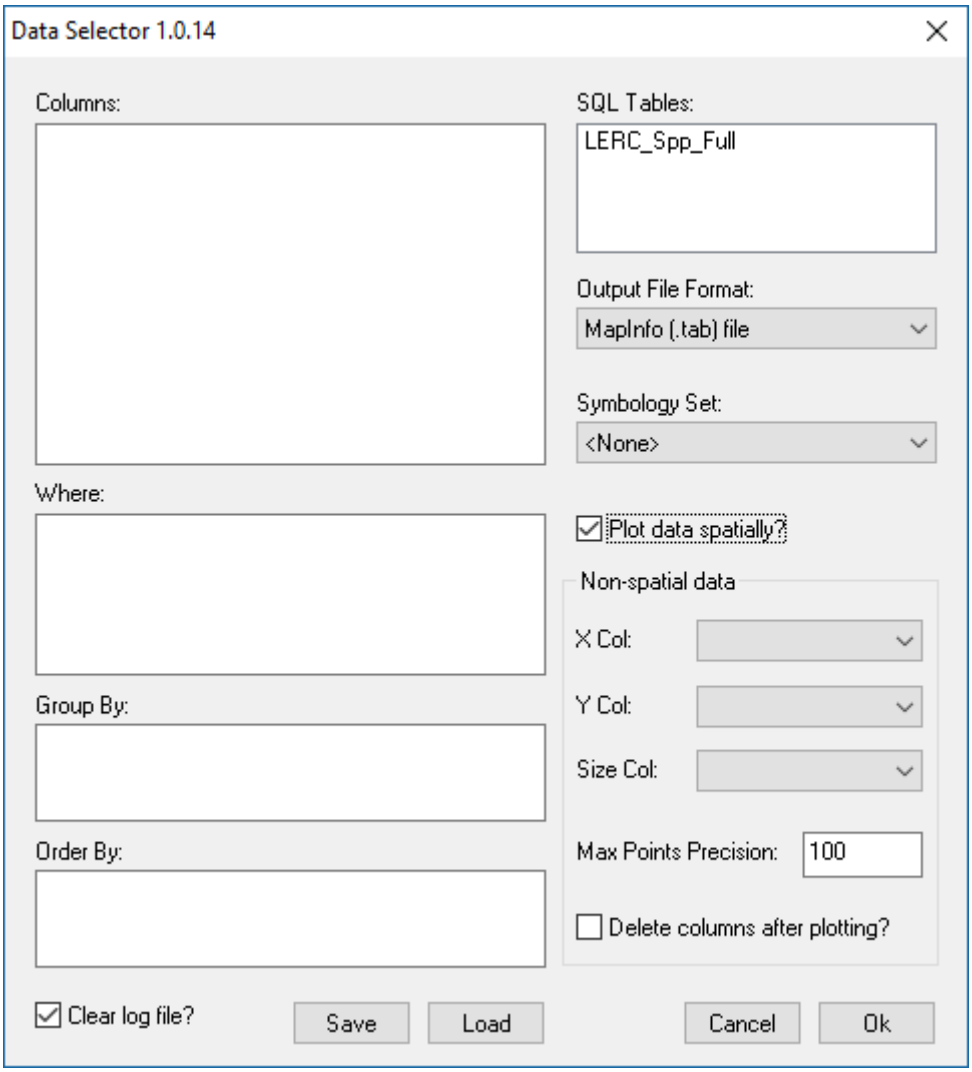

Fig. 2.1: The Data Selector tool interface

Queries used in the tool can be saved and loaded so they can be used again-and-again and run by all users. When the tool runs the query entered by the user will be passed to SQL Server to be executed against the selected SQL table. Any errors in the syntax of the query will be displayed in a pop-up message. The results of a successful execution will be saved in the required format and, if the output is a MapInfo .tab file a symbology will be applied to the records if required. The tool also generates a log of the execution results which details the steps that were taken during the process and the number of records selected and output. The process is discussed in this document in the section on *using the tool*

(page 43).

Defining the default values for some options in the tool is done via a configuration document written in XML. Using this document the user can configure: * The default location of the output folder and the default output format. * The location of the default folder for saving and loading queries. * The default columns used for plotting non-spatial data, or re-plotting already spatial data (MapInfo version only). * Definitions of different sets of symbology to apply to output .tab files and the default set to use (MapInfo version only).

Using this configuration file, each individual LERC can tailor the Data Selector Tool to its individual requirements. Examples of the XML file are included in the *Appendix* (page 59), and the process of setting up this file is discussed in the section on *setting up the tool* (page 19).

2.3 Benefits

There are a number of clear benefits to using the Data Selector tool for carrying out data selections from Recorder6.

1. The tool enables the user to query and extract data directly from the Recorder6 database using a simple user interface within the GIS application without even needing to start the Recorder6 application.
2. Queries can be saved for future use which is particularly useful for increasing efficiency if a query is run on a regular basis.
3. Queries can be created by more experienced users in the LERC, or commissioned to be developed by a 3rd party, to meet specific requirements. It is even possible to share queries between LERCs (if based on a common set of attributes).
4. Query results can be plotted directly in GIS applications, as MapInfo (.tab) tables (MapInfo version only) and ESRI (.shp) shapefiles, for immediate visual and spatial analysis, as well as being output as spreadsheet (.csv) files and text (.txt) files.
5. The master SQL tables can be updated as and when required (for example, following a specific import of data or after amending or validating a set of records) or run on a regular basis by scheduling a task in SQL Server. This provides great control over when data is included in any data queries and extracts.
6. The format and content of the data in the SQL tables can be tailored to match each LERCs requirements and data holdings ensuring that only data that meets the necessary conditions is included in any queries and that data is presented exactly as expected.

CHAPTER 3

Extending Recorder 6

3.1 SQL Server

3.1.1 Master Table

In order for the Data Selector tool to be able to extract species records from Recorder6 a SQL script must be run periodically to create and update a master table in the Recorder6 database. The SQL script will be specific to your requirements based on a whole host of considerations. For example:

- Which columns/attributes to be defined in the table.
- Which surveys, events, samples and occurrences to include in the table.
- Whether any confidential surveys, species or occurrences should be included/excluded or flagged as confidential in the table.
- Whether any sensitive species should have their precision altered in the table.
- What species designations are to be included and how they should appear in the table (e.g. into which columns and using what abbreviations).
- How any occurrence abundance/counts and associated measurement qualifier/types should appear in the table.
- If zero abundance records are to be included in the table (in which case they would be clearly flagged as zero abundance).
- If a cut-off date for specific taxonomic groups or species is used to flag them as historic records.
- If the standard Recorder6 taxon group names or more bespoke group names are used (e.g. splitting 'terrestrial mammal' into 'Mammals - Terrestrial (bats)' and 'Mammals - Terrestrial (excl. bats)'.
- Whether unverified and/or unchecked records are included in the table.
- How record dates are to appear (e.g. as vague date range or as just single dates).
- If any specific records are to be flagged (e.g. bat records containing 'roost' or 'hibern' in any record/sample comments or measurements, or bird records containing 'breed', 'bred' or 'nest').

Note: Multiple master SQL tables, or multiple views on the same SQL table, can be created as required.

3.1.2 Spatial Data

If your Recorder6 database is running on a more recent version of SQL Server (i.e. SQL Server 2008 or later) then it supports 'Geometry' and 'Geography' spatial data type. In this case the master table can also be 'spatialized' by setting the geometry for all records as points and/or polygons. This enables spatial queries to be performed within SQL Server rather than the GIS application thereby reducing the work load in GIS and utilising the likely increased performance capabilities of many servers running SQL Server.

In order to 'spatialize' the master table additional steps in the SQL script are run to calculate the geometry of all records based on their grid reference. The geometry can be calculated as points and/or polygons based on the requirements of the LERC and how the data will be used. Once spatialized, records from the master table can be directly plotted and viewed as points or polygons in GIS. In addition, queries can be executed in SQL Server using the spatial location of the records in much the same way that spatial queries can be performed in GIS. This reduces the overheads in GIS and means that the number of records exported from SQL Server into GIS can be much reduced.

Note: If your Recorder6 database is running on an older version of SQL Server (i.e. SQL Server 2005 or earlier) then it does not support 'Geometry' and 'Geography' spatial data type. But don't worry, all is not lost! Although the master table cannot be 'spatialized', the records can optionally be plotted as points and/or polygons by the Data Selector tool in GIS if the selected output type is a .tab or .shp file (depending on the host GIS application).

3.2 The Data Selector tool

3.2.1 Tool components

There are three component parts to the Data Selector tool that work together to automate the process described above:

1. Spatial data held in a SQL Server database (a stored procedure for its extraction is also required).
2. An XML configuration file that specifies how the tool is set up and how data will be saved by default.
3. The Data Selector tool itself.

The Data Selector tool is used within a GIS environment but it does not require any particular data layers to be preloaded in the GIS.

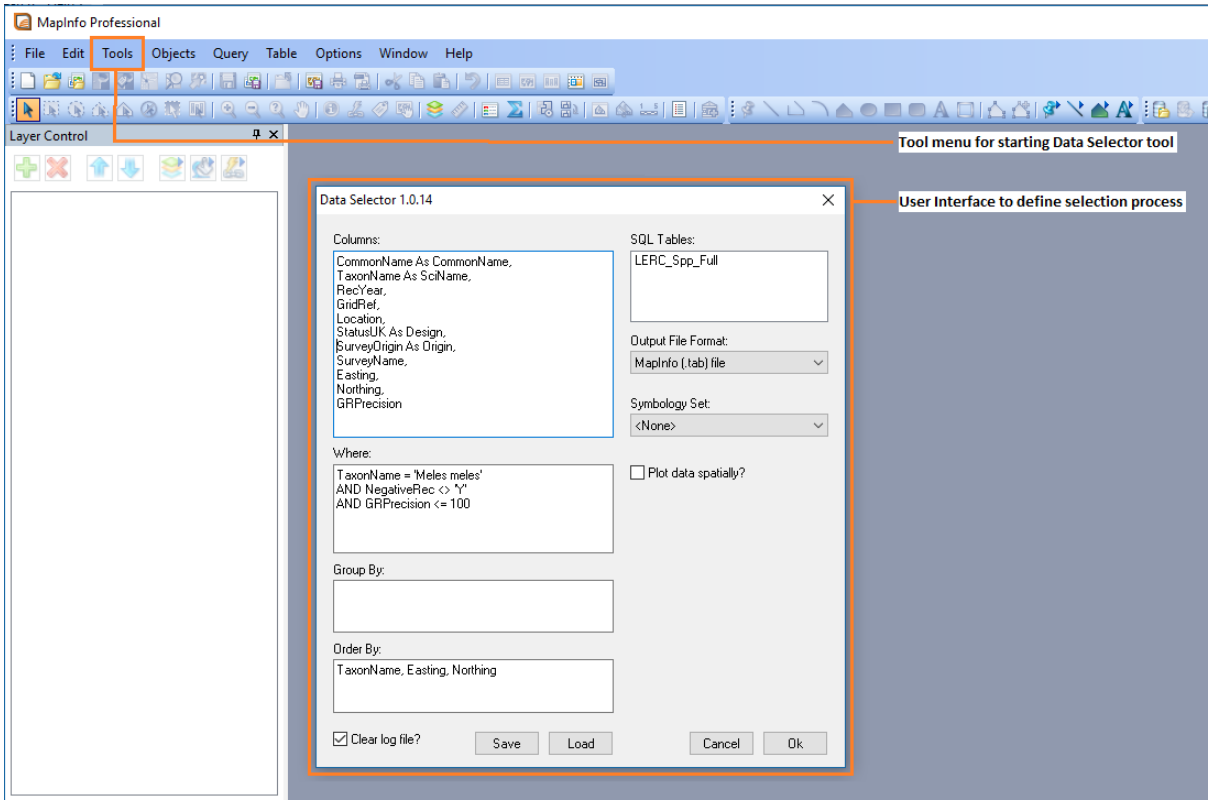

Fig. 3.1: The Data Selector tool within the MapInfo environment

3.2.2 Tool workflow

The Data Selector tool requires minimum user input in order to perform queries once it is configured. The simple workflow is as follows (see Fig. 3.2):

1. The user selects which SQL master table to query.
2. The user lists all the attributes (columns) from the selected SQL table to return (or enters '*' to return all attributes).
3. The user specifies any 'Where' selection criteria, if any, to apply when selecting records from the SQL table.
4. If required, the user can also specify any 'Group By' and 'Order By' criteria to apply when selecting records from the SQL table.
5. The user selects what output format should be created for the selected records.
6. Optionally, the user can choose one of the pre-defined symbology sets (only applicable for MapInfo .tab output files).
7. The user can also choose to spatially plot the data (or re-plot the data if it is already spatialized) as points and/or polygons.
8. There is also an option to clear the log file before use.
9. Once the user clicks **OK** the process starts.

In essence, the process that the tool follows is identical to the manual process a user would perform:

1. The required columns and records from the SQL table are selected based on the specified criteria.

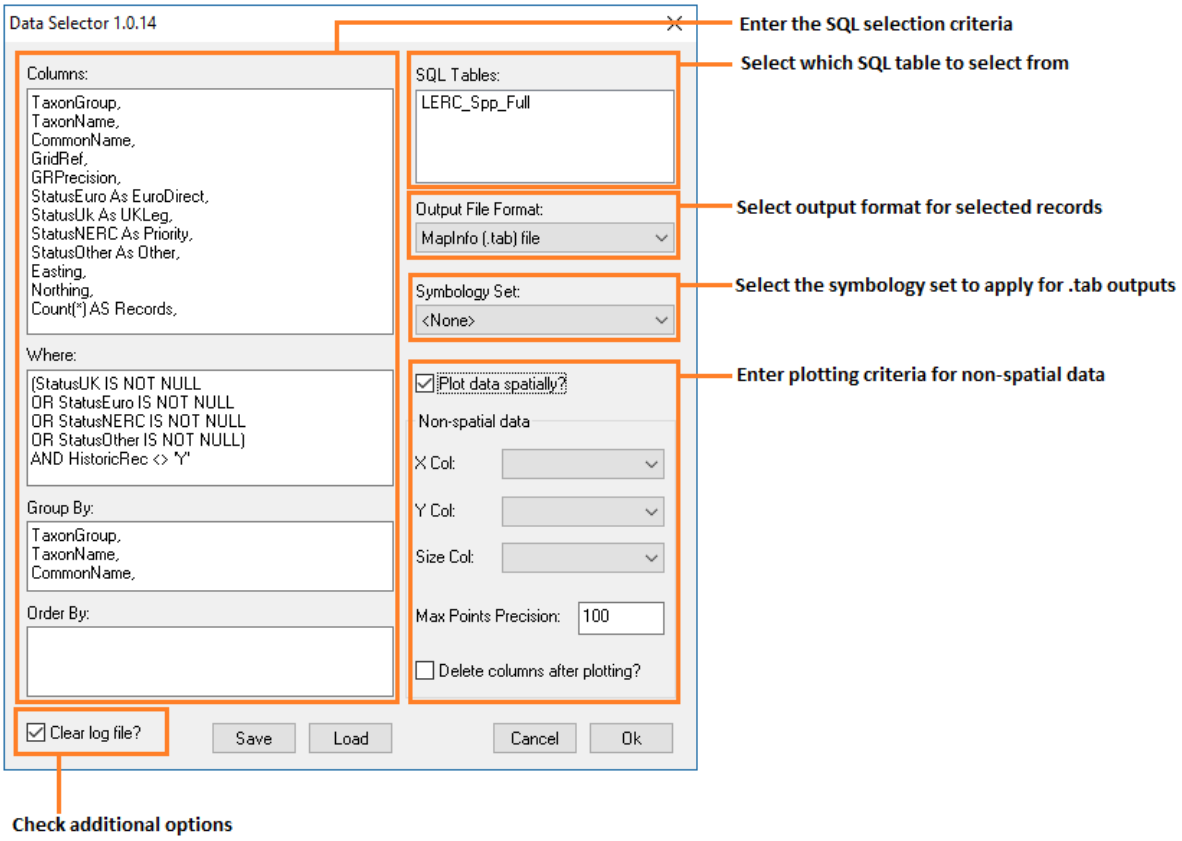

Fig. 3.2: The Data Selector tool workflow

2. The selected records are saved to the target file in the required output format.
3. If chosen, and the output file is a GIS layer, the records are spatially plotted as points and/or polygons.
4. If the output file is a MapInfo .tab file any chosen pre-defined symbology will be applied to the output records.
5. During the process the tool records its progress to a log file and, when the process finishes, this log file is displayed allowing the user to assess the success of the data selection.

3.3 Tool outputs

When the process finishes, the output is added to the GIS interface, either as a new GIS layer or as a non-spatial text table.

3.3.1 Output files

When the tool is used in MapInfo, output GIS layers can be generated in MapInfo (.tab) format or converted into an ArcGIS (.shp) shapefiles. When used in ArcGIS the tool will output GIS layers as ArcGIS (.shp) shapefiles or as file- or personal-geodatabase feature classes. An example of the output the tool can generate is showin in Fig. 3.3.

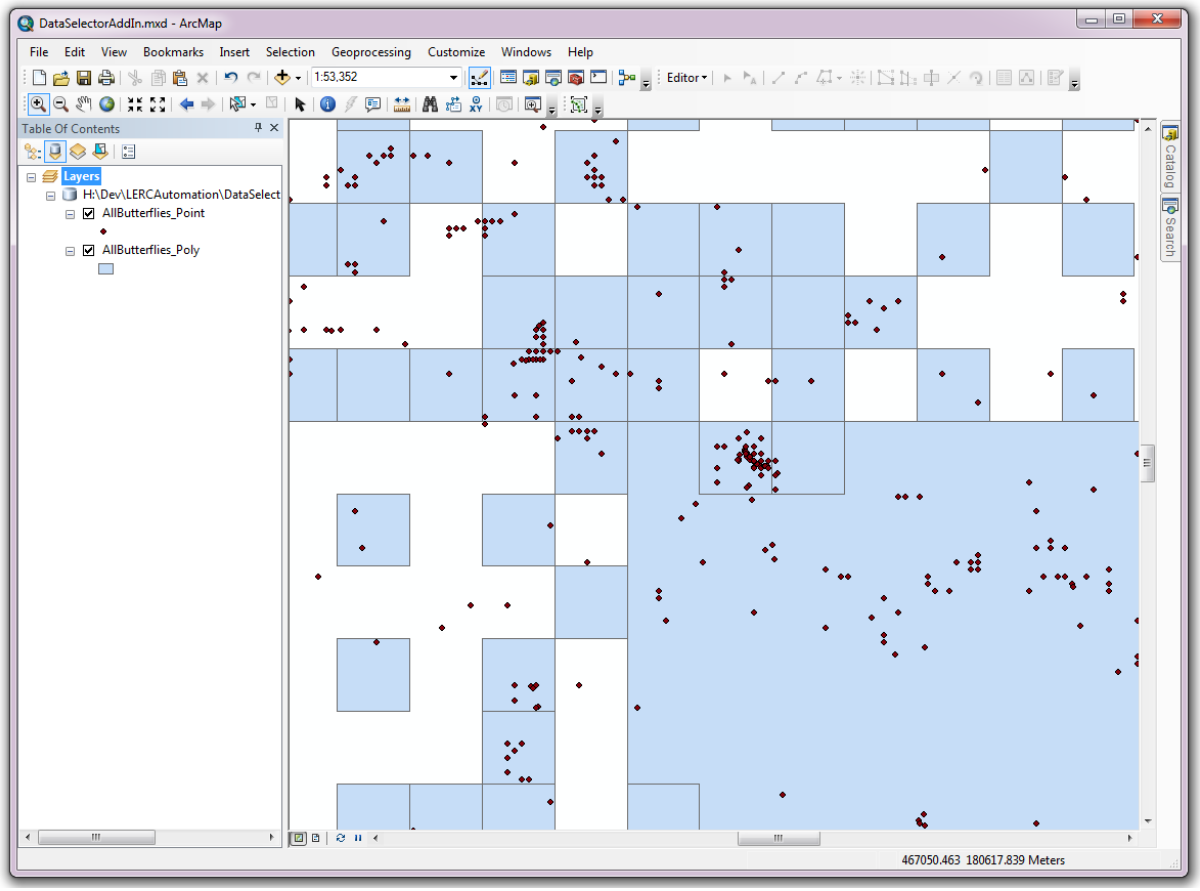

Fig. 3.3: Example of a GIS spatial output from the Data Selector tool

Text file outputs can be generated in CSV format (Fig. 3.4) or TXT format.

	A	B	C	D	E	F
1	Taxon_Group	SpeciesCount	MaxAbundance	FirstYear	LastYear	Records
2	amphibians	15	8000	1894	2015	7248
3	bacteria	5	1	1972	2014	12
4	birds	446	74000	1885	2015	343237
5	chromista	35	80	1972	2015	181
6	fish - bony	76	200	1899	2014	2137
7	fish - jawless	4	8	1967	2014	8
8	foraminifera	1	0	2013	2013	2
9	fungi	1936	350	1877	2016	27857
10	higher plants - clubmosses	1	5000	1874	2014	421
11	higher plants - conifers	59	95	1895	2015	5034
12	higher plants - ferns	44	1500	1799	2015	36277
13	higher plants - flowering plants	2344	100000	1576	2015	1024166
14	higher plants - horsetails	8	200	1801	2015	4746
15	higher plants - quillworts	1	0	1927	2012	37
16	invertebrates - alderflies	3	5	1934	2014	90
17	invertebrates - ants, bees, sawflies & wasps	872	10000	1816	2014	36461

Fig. 3.4: Example of a text file output from the Data Selector tool

Finally, the log file details each step that was taken during the process, and gives some feedback about the outcome of the process. This includes reporting on the chosen options for the selection, the number of records that were selected, if the output contains spatial data, and if any symbology was applied to the output table (Fig. 3.5).

The following chapters, *setting up the tool* (page 19) and *running the tool* (page 43), will guide you through setting up and operating the tool in such a way that these tool outputs meet the general requirements of data selection within your organisation.

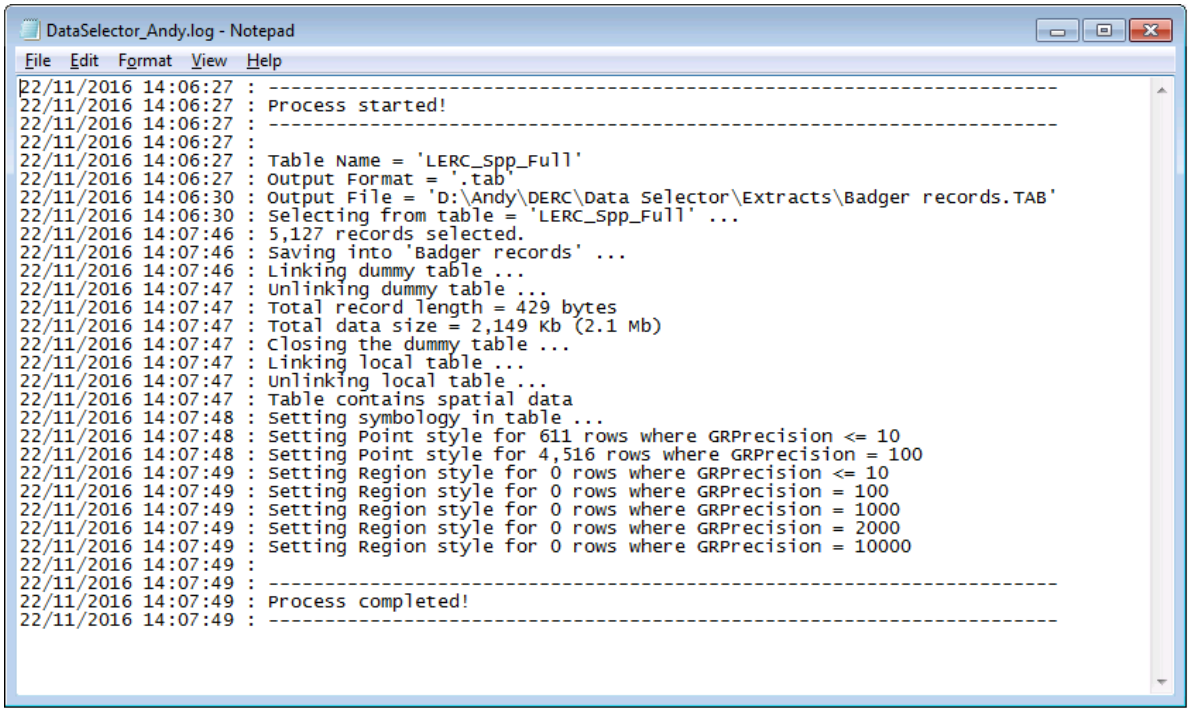

Fig. 3.5: Example of a Data Selector tool log file

CHAPTER 4

Setting up the tool

Before the Data Selector tool will function, it needs to be installed and configured. It is recommended that the configuration is carried out first, although the steps are interchangeable for the ArcGIS implementation.

4.1 Configuring the tool

The configuration is stored in an XML file called 'DataSelector.xml', and there are some differences in the contents of this file between the MapInfo and the ArcGIS implementations of the tool. Please ensure that you are using the correct XML file, examples of both of which can be found in the *Appendix* (page 59). Attributes and settings are presented as nodes (beginning with a start node, e.g. `<example>`, and finishing with an end note, e.g. `<\example>`), with the value for the setting held between the `<value>` and `<\value>` tag.

> **Caution:** The name of the configuration file must be 'DataSelector.xml'. The tool will not load if a different name is used.

The XML file can be edited in a text editor such as Notepad or Wordpad, or using a more feature rich XML editor such as as Sublime Text[12]. The configuration file contains general attributes of the tool. The structure is roughly the same for both implementations of the tool.

> **Caution:** It is important that the structure of the file is maintained as it is presented in the *Appendix* (page 59). Any changes to the structure may result in the Data Selector tool not loading, or not working as expected.

Once editing has been completed and the edits have been saved, it is recommended that the configuration file is opened using an internet browser such as Internet Explorer which will help highlight any editing

[12] https://www.sublimetext.com/3

errors – only if the structure of the file is valid will the whole file be displayed in the internet browser.

Note: It is recommended that the configuration file is kept in a central (network) location, so that all users use the same configuration. Additionally, in case of the MapInfo implementation of the tool, it is essential that the configuration file is kept in the same folder as the compiled version of the tool.

4.1.1 Special characters in XML

The characters `&`, < and > are not valid within values and, so in order to be used, must be **escaped** with XML entities as follows:

< This must be escaped with `<` entity, since it is assumed to be the beginning of a tag. For example, `RecYear < 2010`

> This should be escaped with `>` entity. It is not mandatory – it depends on the context – but it is strongly advised to escape it. For example, `RecYear > 1980`

& This must be escaped with `&` entity, since it is assumed to be the beginning of a entity reference. For example, `TaxonGroup = 'Invertebrates - Dragonflies & Damselflies'`

4.1.2 Setup for ArcGIS

General attributes for ArcGIS

The configuration file deals with a series of general attributes for the Data Selector tool. These general nodes specify where files are kept, which SQL Server to connect to, which SQL Server tables to make available and other overall settings. Details on these attributes (and their typical values where known) are given below. The list follows the order within which the attributes are found in the configuration file. This version of the configuration details is valid for the ArcGIS version 1.0.2 of the Data Selector tool.

LogFilePath The folder to be used for storing log files. This folder must already exist.

FileDSN The location of the File DSN that specifies to ArcGIS which SQL Server database to connect to.

ConnectionString The connection string to establish an ADO connection to the source SQL Server database.

DefaultExtractPath The default folder where output files will be stored. This can be overridden by the user when executing the tool.

DefaultQueryPath The default folder where queries will be saved and loaded. This can be overridden by the user when executing the tool.

DefaultFormat The default format of the output files to be created. Options available are 'Geodatabase', 'Shapefile', 'CSV file', 'dBase file' and 'Text file'.

DatabaseSchema The schema in the SQL Server database containing the source SQL tables. This is typically 'dbo'.

IncludeWildcard The **Include** wildcard for table names to list all the tables in SQL Server that can be selected by the user.

ExcludeWildcard The **Exclude** wildcard for table names in SQL Server that should **NOT** be available for selection by the user. This enables temporary and user-specific tables to be hidden in the tool interface.

RecMax Currently not used but must exist in XML.

DefaultSetSymbology Currently not used but must exist in XML.

LayerLocation Currently not used but must exist in XML.

EnableSpatialPlotting Currently not used but must exist in XML.

> **Caution:** All entries in the configuration file are **case sensitive**. Most common errors in the setting up of the tool are caused by using the incorrect case for entries.

4.1.3 Setup for MapInfo

General attributes for MapInfo

The configuration file deals with a series of general attributes for the Data Selector tool. These general nodes specify where files are kept, which SQL Server to connect to, which SQL Server tables to make available and other overall settings. Details on these attributes (and their typical values where known) are given below. The list follows the order within which the attributes are found in the configuration file. This version of the configuration details is valid for the MapInfo version 1.0.14 of the Data Selector tool.

ToolTitle The title to use for the program in the MapInfo Tools menu.

LogFilePath The folder to be used for storing log files. This folder must already exist.

FileDSN The location of the File DSN that specifies which SQL Server database to connect to.

DefaultExtractPath The default folder where output files will be stored. This can be overridden by the user when executing the tool.

DefaultQueryPath The default folder where queries will be saved and loaded. This can be overridden by the user when executing the tool.

DefaultFormat The default format of the output files to be created. Options available are 'tab', 'shp', 'csv' and 'txt'.

DatabaseSchema The schema in the SQL Server database containing the source SQL tables. This is typically 'dbo'.

TableListSQL The SQL statement used to list all the species tables in SQL Server that can be selected by the user.

RecMax The maximum number of records what will be extracted in any one extract file.

DefaultSymbologySet The default symbology set number that should be used for .tab files. The number corresponds to the order of the symbology sets defined in the *MapInfoTables* (page 24) nodes. A value of '0' (zero) sets the default to '<None>' so that no symbology will be set by default.

DefaultSpatialPlotting The default for whether the SQL database tables can be spatially plotted. If 'Yes' the interface will display options for specifying how the data will plotted. If 'No' the options for specifying how the data will plotted are hidden in the user interface.

Note: Even if the selected SQL Server table is spatially enabled it is possible to re-plot the data (for example, using a different grid size or as points instead of polygons, or vice-versa)

CoordinateSystem The spatial coordinate system to use for mapping when plotting data.

DefaultSpatialColumns This section defines the default SQL Server table columns to use for creating spatial data. It has the following entries:

XColumn The default column containing the X co-ordinates (eastings). This can be overridden by the user when executing the tool.

YColumn The default olumn containing the Y co-ordinates (northings). This can be overridden by the user when executing the tool.

SizeColumn The default column containing the grid size (precision) to be plotted. This can be overridden by the user when executing the tool.

DefaultPointsPrecision The default **maximum** precision for plotting polygons as points. Any records where the 'SizeColumn' is less than or equal to this value will be plotted as points. Any records where the 'SizeColumn' is greater than this value will be plotted as polygons. This can be overridden by the user when executing the tool.

DialogSize Indicates the user interface dialog size for the tool. Options are 'Norm' or 'Max'. It is generally recommended that 'Max' is used unless the dialog does not fit in the desktop.

Symbology attributes for MapInfo

MapInfoTables This section defines the symbology sets available for applying to any MapInfo .tab outputs. It has the following entries:

All symbology sets are found within the `<MapInfoTables>` node. For each symbology set, which can be selected and applied to an output MapInfo .tab file, a new child node must be created. The node name (e.g. 'SymbologySet1') is not important but must be unique. A simplified example of a symbology set is shown in Fig. 4.1.

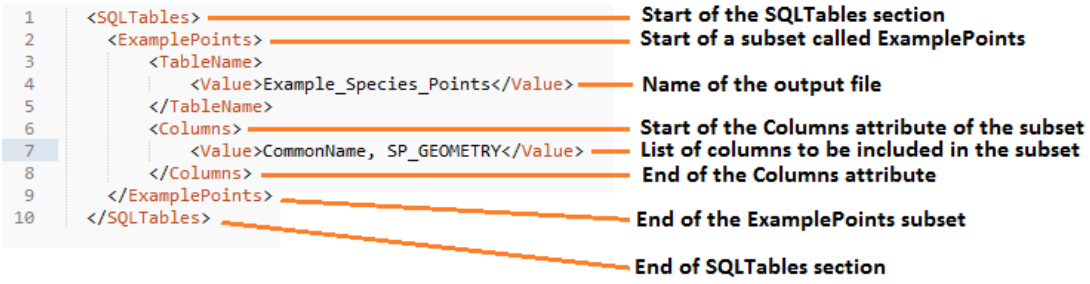

Fig. 4.1: Example of symbology set attributes configuration (MapInfo)

Desc An attribute describing the symbology set. This will appear in the interface drop-down list.

Symbology Each set contains only one child node `<Symbology>>` under which multiple symbols can be specified. set Each symbol is specified between <Symbol> and </Symbol> tags and is defined by the following child nodes:

Clause The clause that defines the records which will be assigned this symbol. This can be left blank to apply the symbology to all records with the same <Object> type specified below.

Object The object type that is symbolised using this symbol (e.g. `Region`). Options are 'Point', 'Line' or 'Region'.

Symbol The style to be used for the symbol. This attribute only applies to `Point` objects.

Pen The style to be used for the symbol border (outline). This attribute applies to `Region` objects.

Brush The style to be used for the symbol infill. This attribute applies to `Region` objects.

Tip: In order to find the syntax for the Pen and Brush attribute, set the desired symbol for a polygon (region) layer through **Options => Region style**, then write `Print CurrentBorderPen()` in the MapBasic window and hit enter. The printed pen definition (e.g. `2,2,10526880`) can be used in the `Pen` attribute. Repeat with `Print CurrentBrush()`.

Caution: All entries in the configuration file are **case sensitive**. Most common errors in the setting up of the tool are caused by using the incorrect case for entries.

4.2 Setting up the SQL Server database

In addition to any SQL tables containing records to be extracted using the Data Selector tool, an auxiliary table must also be present in the SQL Server database in order for the tool to be able to select data from tables held in SQL Server. This table is as follows:

Spatial_Tables table This table contains information about any SQL data tables that may be used by the tool. The table has the following columns:

Table 4.1: Valid date and time format specifiers

Column	Description
TableName	The name of the data table
OwnerName	The database owner, usually `dbo`
XColumn	The name of the column holding the X coordinates of the record
YColumn	The name of the column holding the Y coordinates of the record
SizeColumn	The name of the column holding the grid size of the record (in metres)
IsSpatial	Bitwise column (1 = Yes, 0 = No) defining whether the table is spatially enabled
SpatialColumn	If the table is spatially enabled, the name of the geometry column (e.g. `SP_GEOMETRY`)
SRID	The name of the spatial reference system used to plot the records
CoordSystem	The coordinate system of the spatial data in the table
SurveyKeyColumn	The column containing the survey key for each record

Note: The British National Grid *SRID* value is `Earth Projection 8, 79, "m", -2, 49, 0.9996012717, 400000, -100000 Bounds (-7845061.1011, -15524202.1641) (8645061.1011, 4470074.53373)`

Caution: This table must be filled out correctly for each SQL table that is available to the Data Selector tool.

Note: A number of stored procedures that are used by the tool for selecting the required records must also be present in the SQL Server database. To obtain copies of these procedures please contact Hester[13] or Andy[14].

[13] Hester@HesterLyonsConsulting.co.uk
[14] Andy@AndyFoyConsulting.co.uk

4.3 Installing the tool

4.3.1 Installing in ArcGIS

Installing the tool in ArcGIS is straightforward. There are a few different ways it can be installed:

Installation through Windows Explorer

Open Windows Explorer and double-click on the ESRI Add-in file for the Data Selector tool (Fig. 4.2).

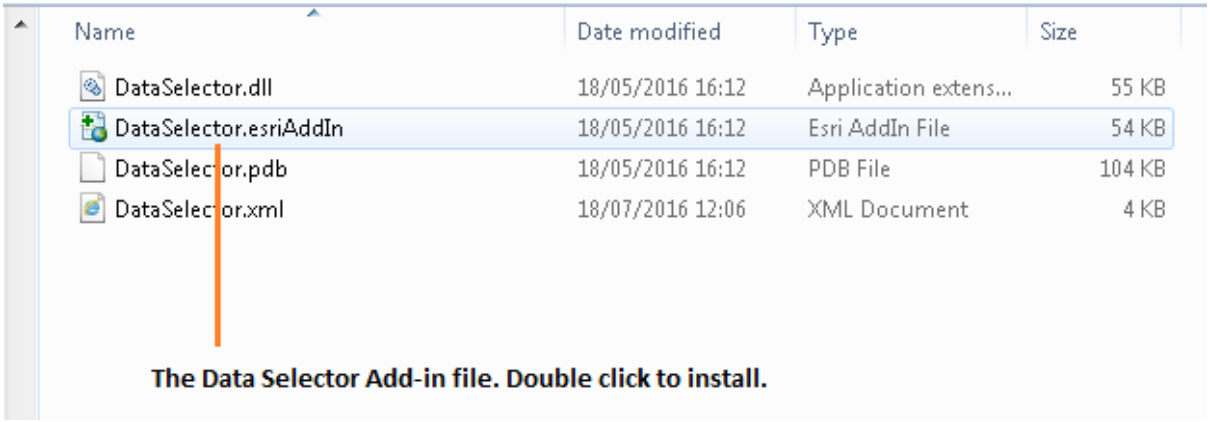

Fig. 4.2: Installing the Data Selector tool from Windows Explorer

Installation will begin after confirming you wish to install the tool on the dialog that appears (Fig. 4.3).

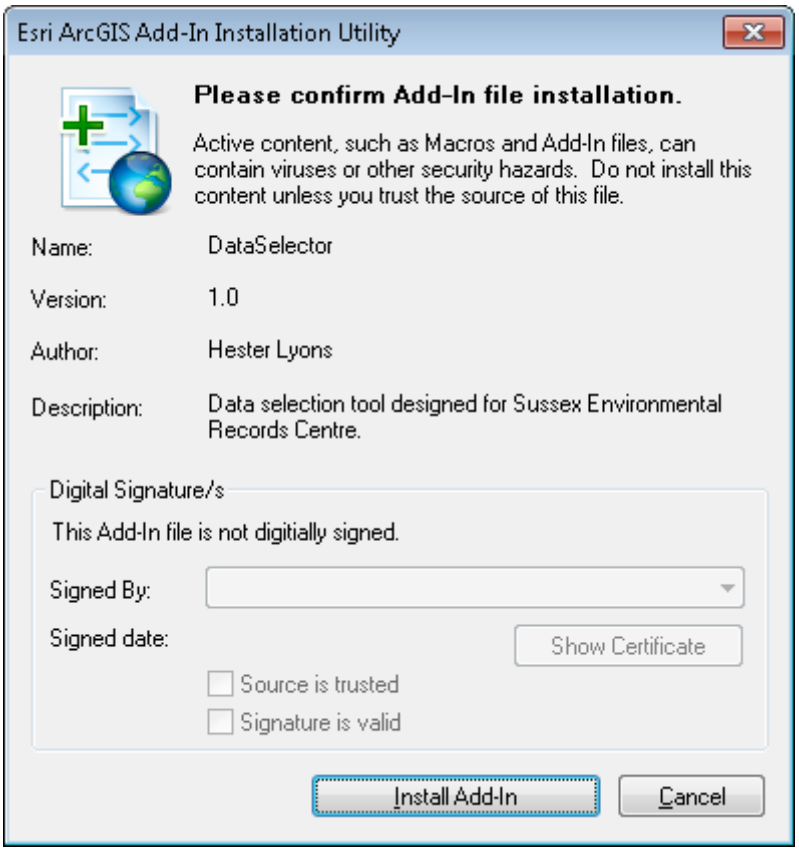

Fig. 4.3: Installation begins after clicking 'Install Add-in'

Once it is installed, it will become available to add to the ArcGIS interface as a button (see *CustomisingToolbarsArcGIS* (page 31)).

Note: In order for this process to work all running ArcMap sessions must be closed. The tool will not install or install incorrectly if there are copies of ArcMap running.

Installation from within ArcMap

Firstly, open the Add-In Manager through the Customize menu (Fig. 4.4).

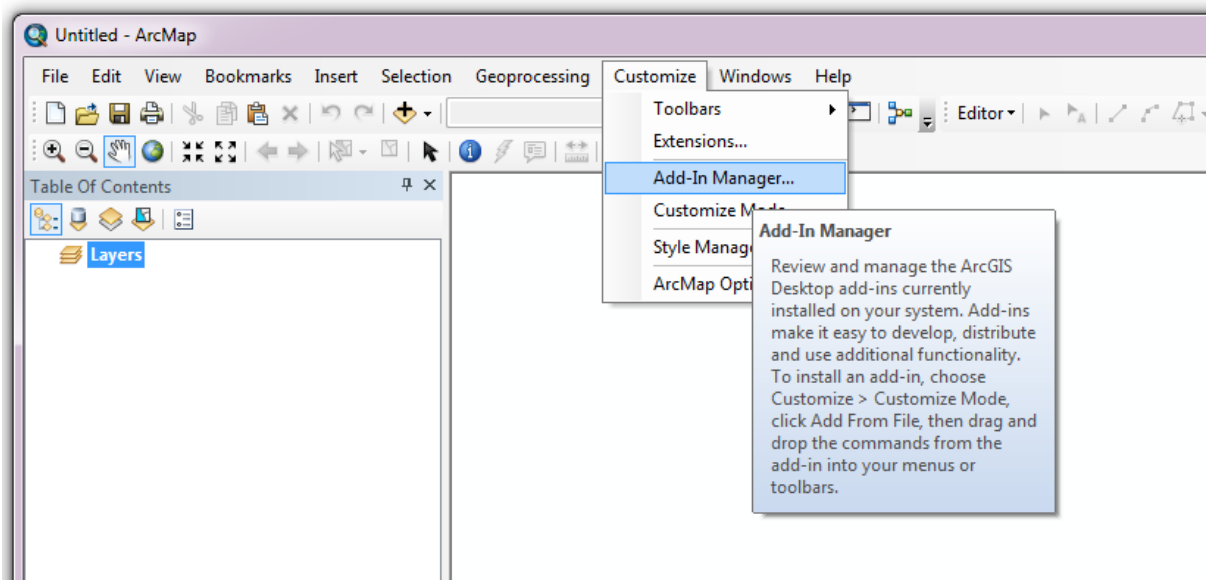

Fig. 4.4: Starting the ArcGIS Add-In Manager

If the Data Selector tool is not shown, use the **Options** tab to add the folder where the tool is kept (Fig. 4.5). The security options should be set to the lowest setting as the tool is not digitally signed.

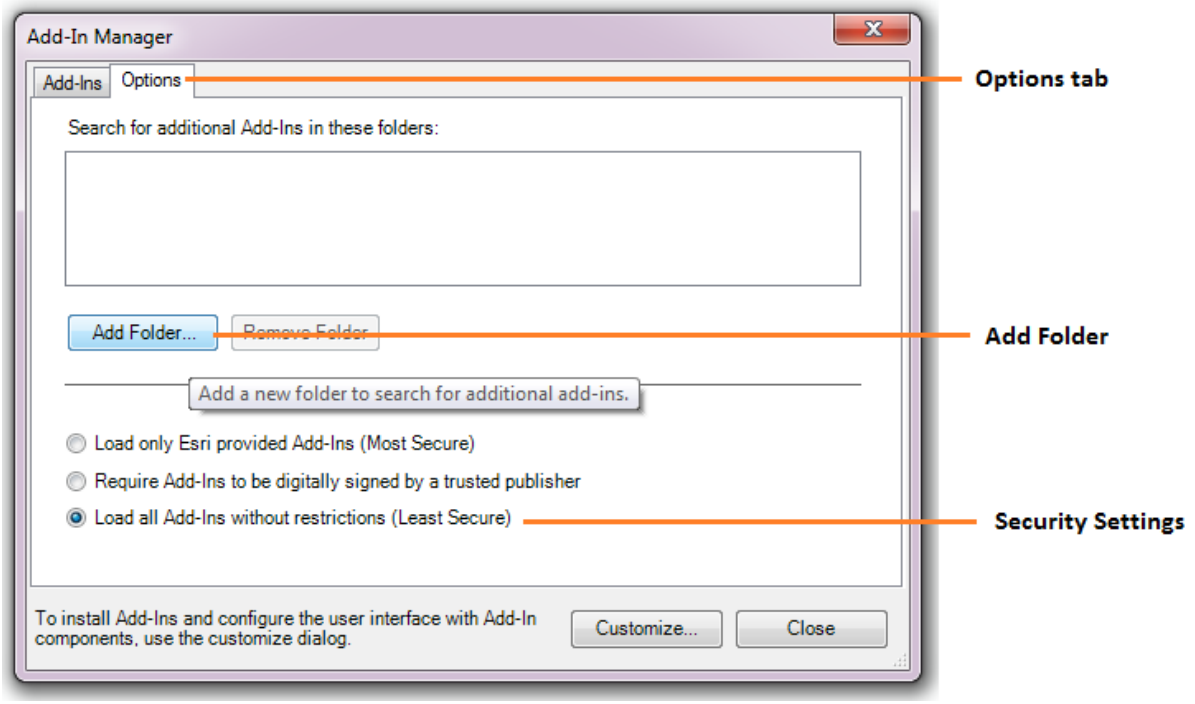

Fig. 4.5: The 'Options' tab in the ArcGIS Add-In Manager

Once the tool shows in the Add-In Manager (Fig. 4.6), it is available to add to the ArcGIS interface as a button (see *CustomisingToolbarsArcGIS* (page 31)).

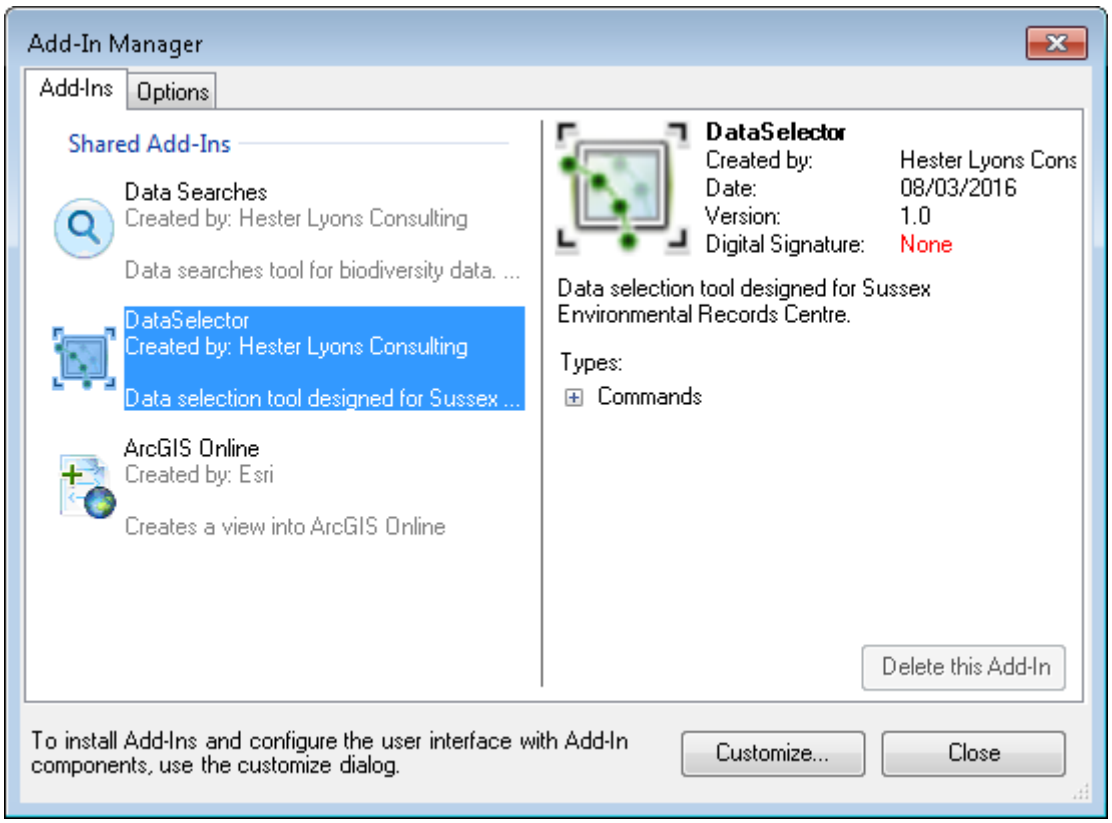

Fig. 4.6: The ArcGIS Add-In Manager showing the Data Selector tool

Customising toolbars

In order to add the Data Selector tool to the user interface, it needs to be added to a toolbar. It is recommended that this customisation is done inside a document, but it can be done so that the toolbar always appears in ArcGIS (see Fundamentals of Saving your Customizations[15] for an explanation of how customisations are stored within ArcGIS).

Customising toolbars is done through the Customize dialog, which can be started either through the Add-In Manager (by clicking **Customize**, see Fig. 4.6), or through choosing the 'Customize Mode...' option in the Customize Menu (Fig. 4.7).

[15] http://desktop.arcgis.com/en/arcmap/10.3/guide-books/customizing-the-ui/fundamentals-of-saving-your-customizations.htm

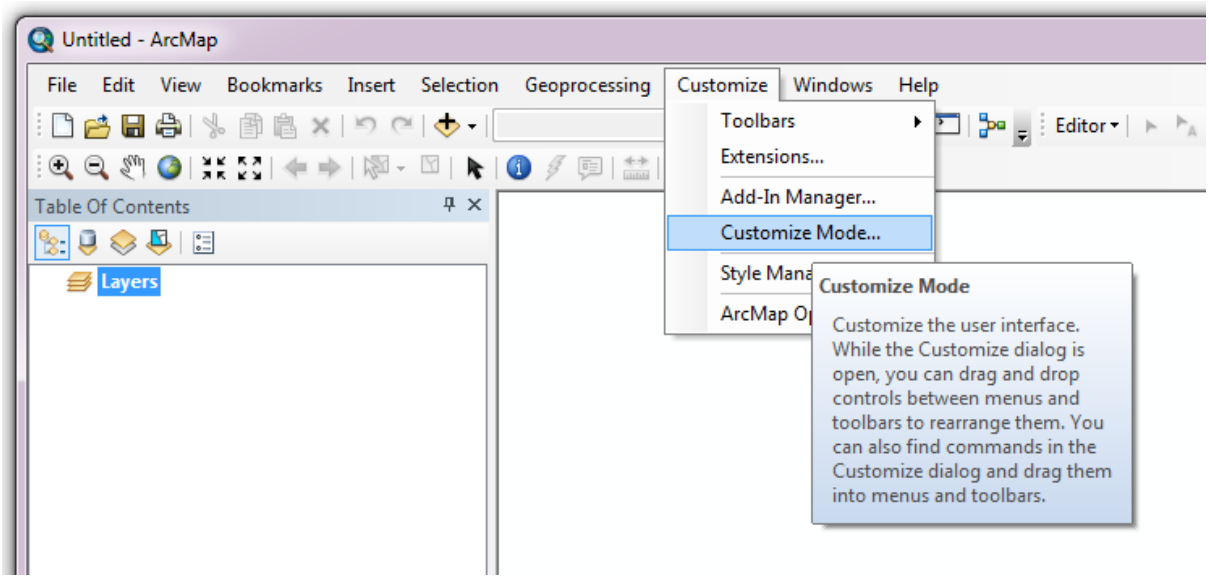

Fig. 4.7: Starting Customize Mode in ArcGIS

Once this dialog is open, select or clear the check box 'Create new toolbars and menus in the document' as required in the **Options** tab (Fig. 4.8).

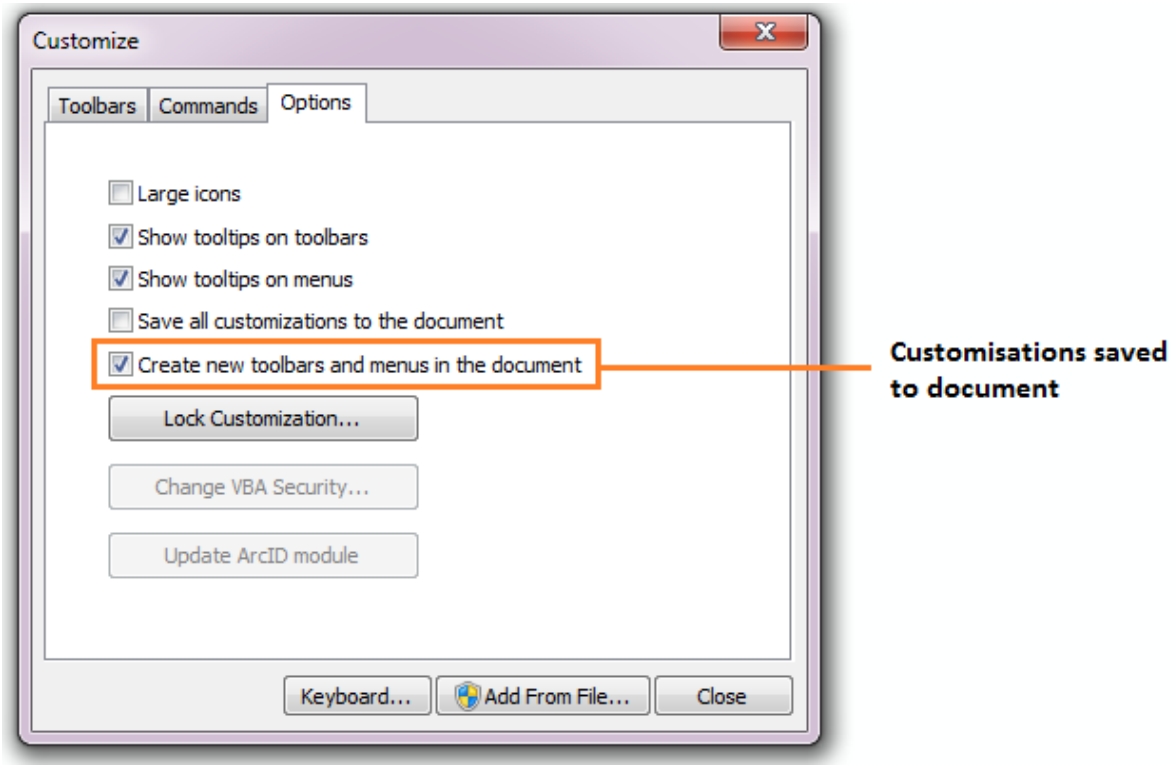

Fig. 4.8: Customising the document in ArcGIS

It is recommended that the button for the Data Selector tool is added to a new toolbar. Toolbars are created through the **Toolbars** tab in the Customize dialog, as shown in figures Fig. 4.9 and Fig. 4.10.

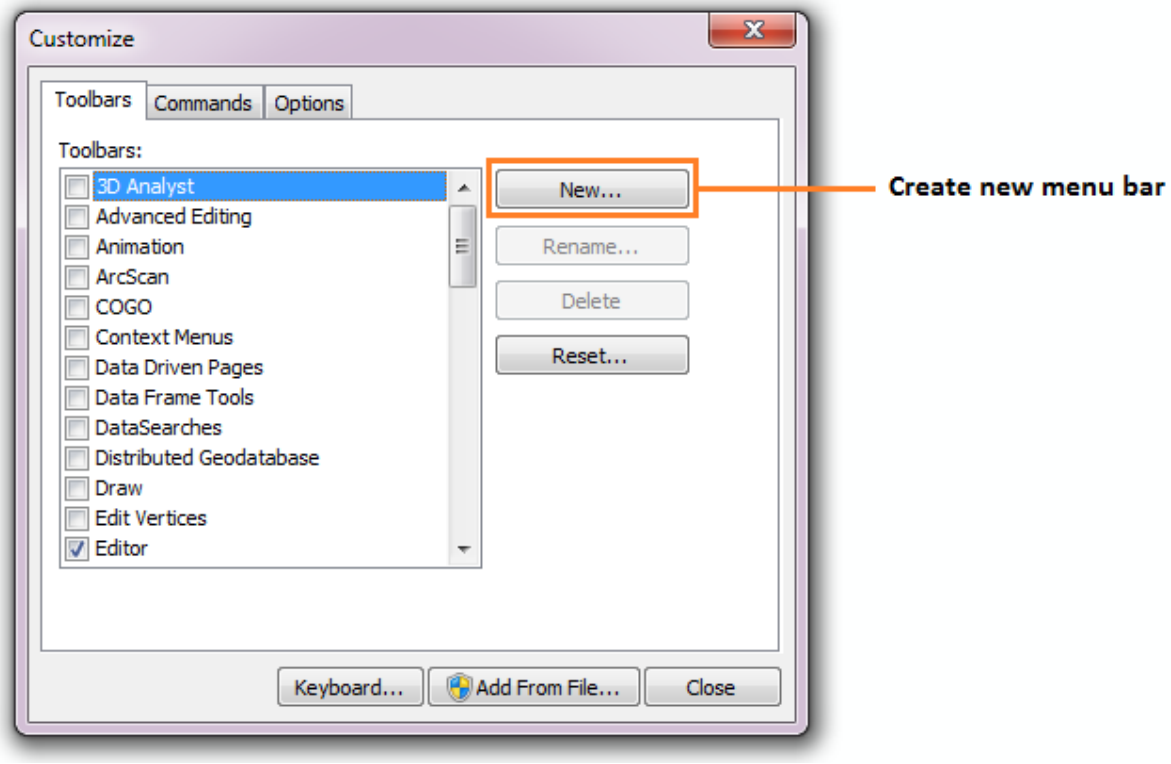

Fig. 4.9: Adding a new toolbar in ArcGIS

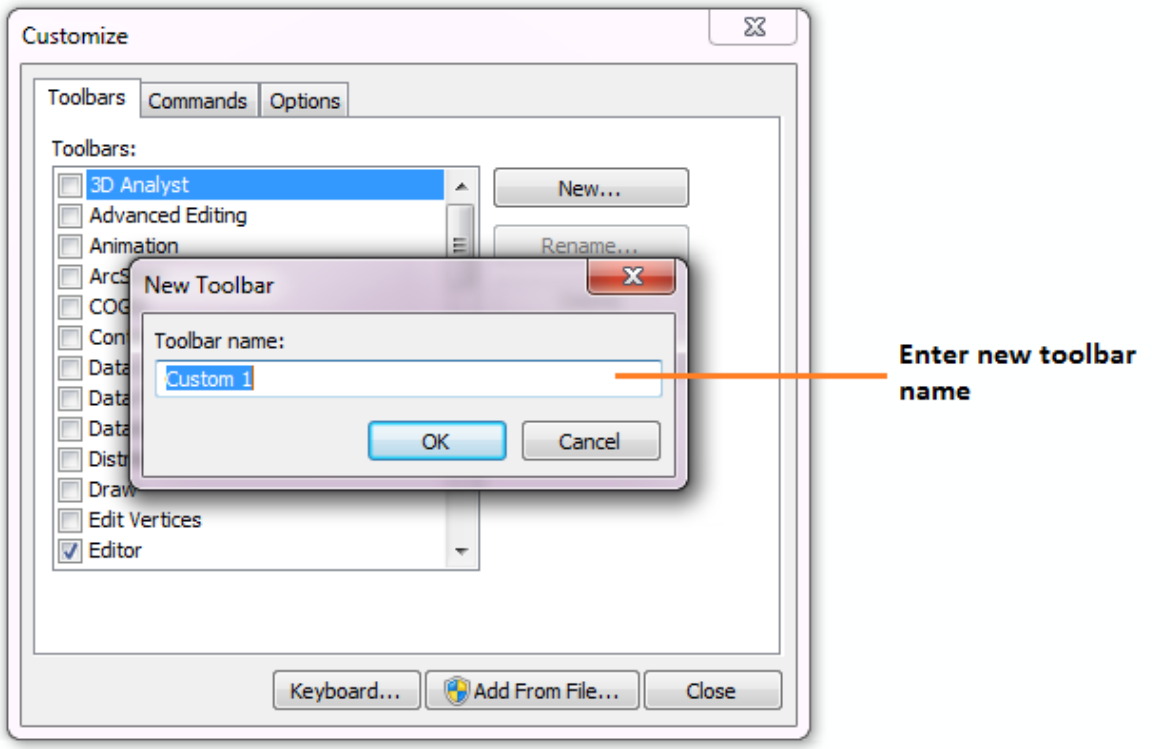

Fig. 4.10: Naming the new toolbar in ArcGIS

Once a new toolbar is created and named, it is automatically added to the ArcMap interface as well as to the Customize dialog (Fig. 4.11. In this case the toolbar was named 'TestToolbar').

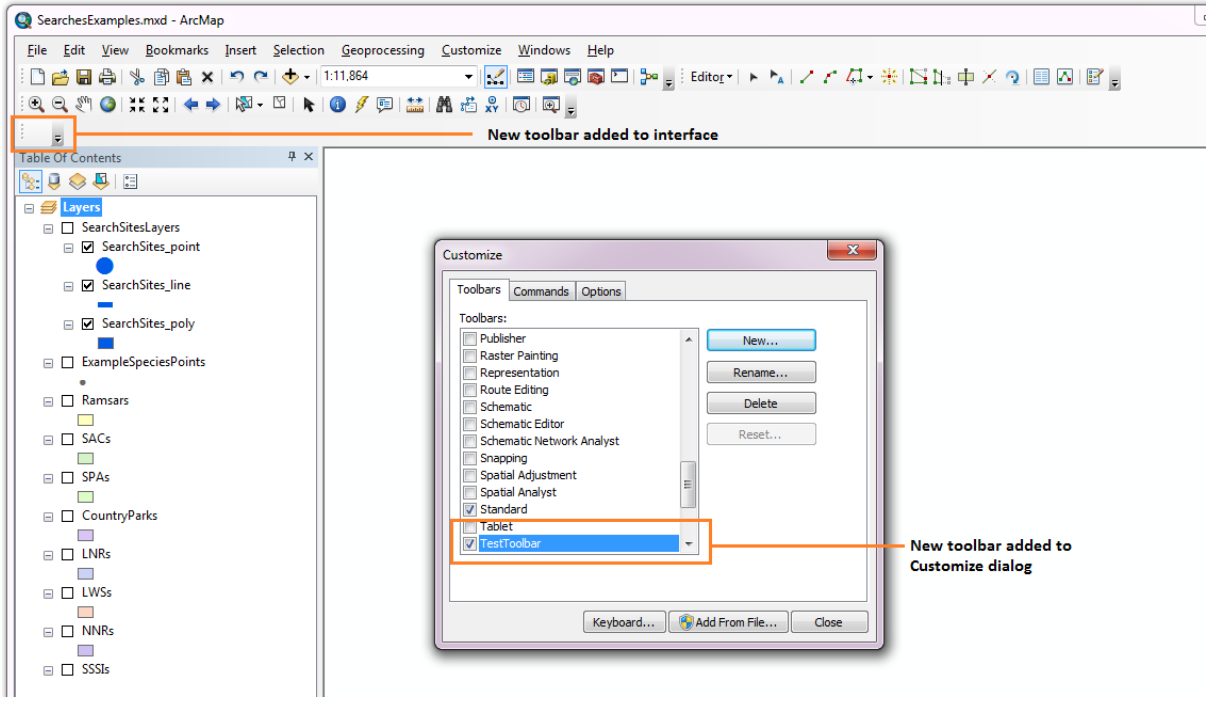

Fig. 4.11: New toolbar added to the ArcGIS Interface

As a final step the Data Selector tool is added to the toolbar. This is done from the **Command** tab in the Customize dialog (Fig. 4.12). Click on **Add-In Controls** and the Data Selector tool will be shown in the right-hand panel.

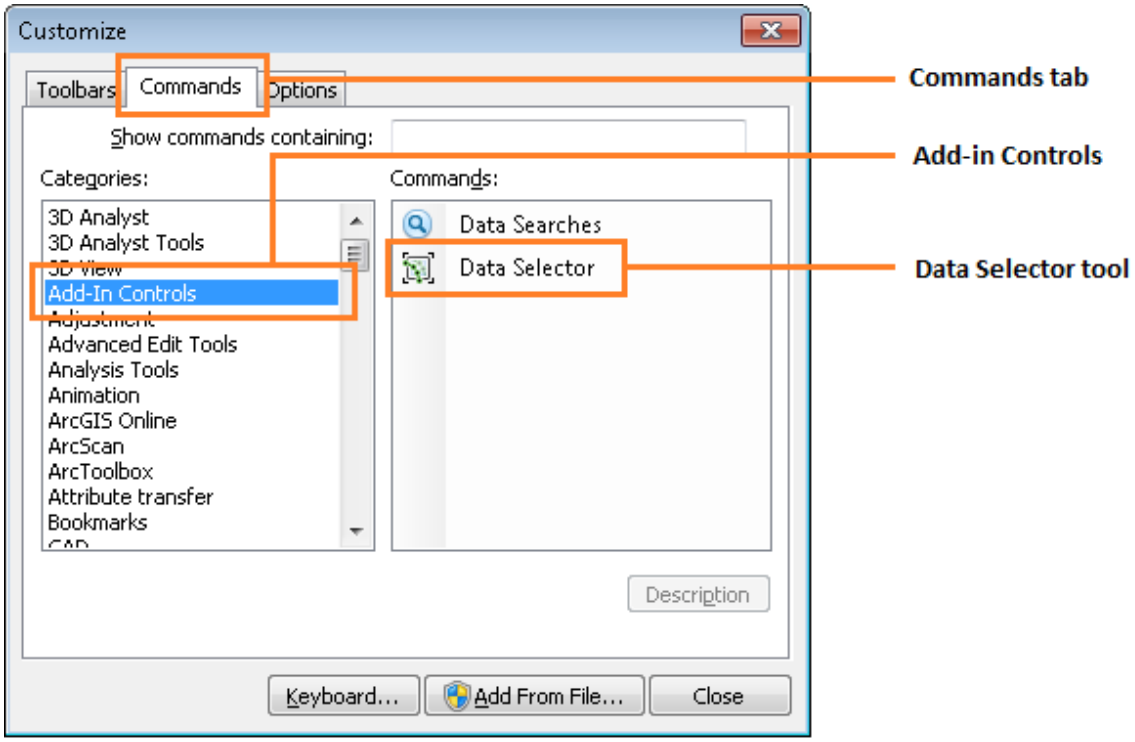

Fig. 4.12: Finding the Data Selector tool in the add-in commands

To add the tool to the toolbar, simply drag and drop it onto it (Fig. 4.13). Close the Customize dialog and **save the document**. The Data Selector tool is now ready for its final configuration and first use.

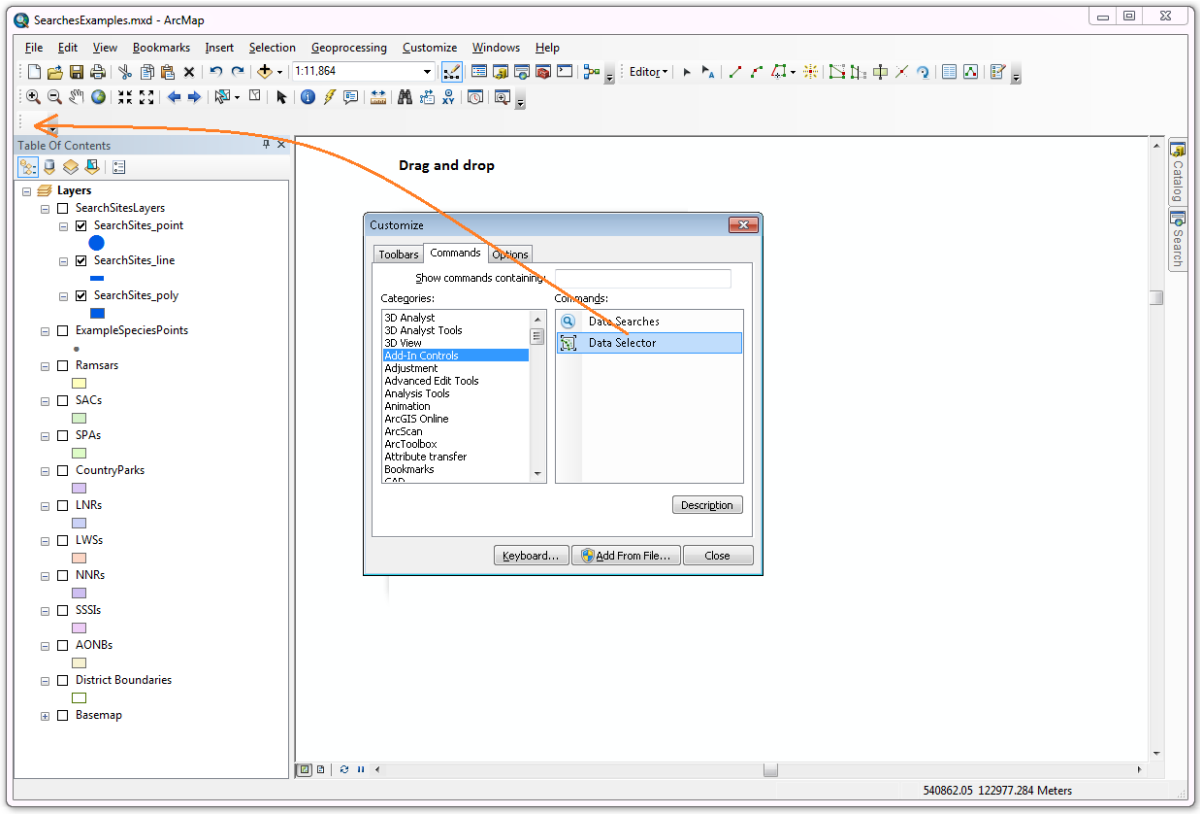

Fig. 4.13: Adding the Data Selector tool to the new toolbar

In order to function, the tool needs to know the location of the XML configuration file. The first time the tool is run, or whenever the configuration file is moved, a dialog will appear asking for the folder containing the XML file (Fig. 4.14). Navigate to the folder where the XML file is kept and click **OK**. If the XML file is present and its structure is correct, the Data Selector form will be shown. Even if the tool is not run at this time, the location of the configuration file will be stored for future use.

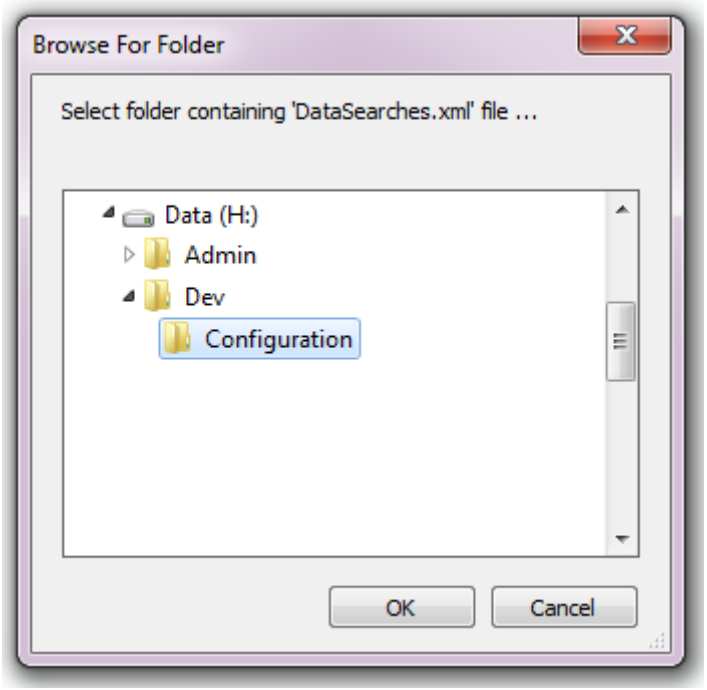

Fig. 4.14: Locating the configuration file folder

4.3.2 Installing in MapInfo

To install the tool in MapInfo, make sure that the configuration of the XML file as described above is complete, that the XML file is in the same directory as the tool MapBasic application (.MBX). Then, open *Tool Manager* in MapInfo by selecting `Tools --> Tool Manager...` in the menu bar (Fig. 4.15).

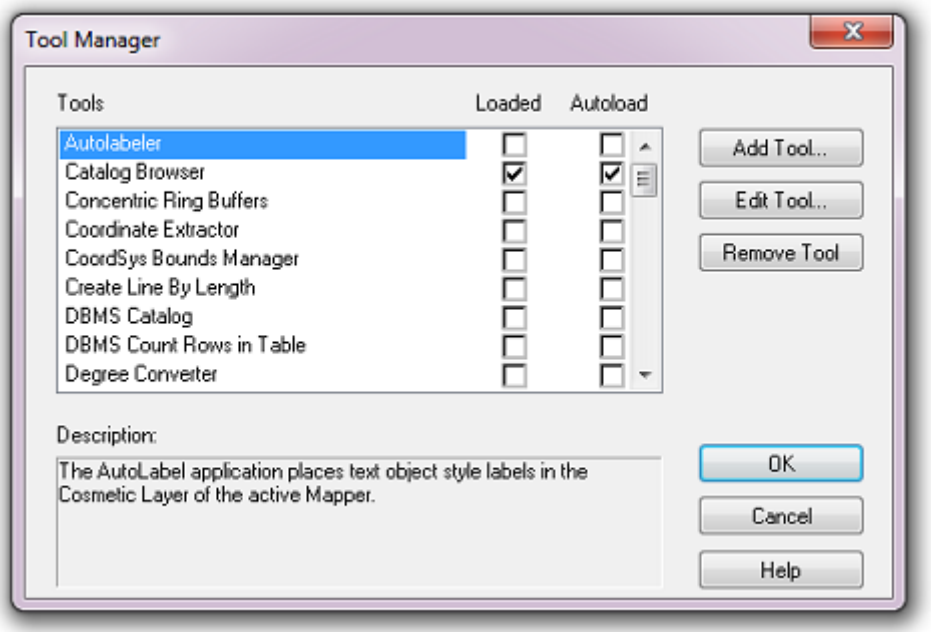

Fig. 4.15: The Tool Manager in MapInfo 12 or earlier

In the *Tool Manager* dialog, click **Add Tool...**, then locate the tool using the browse button . . . on the *Add Tool* dialog (Fig. 4.16). Enter a name in the **Title** box (e.g. 'DataSelector'), and a description if desired. Then click **Ok** to close the *Add Tool* dialog.

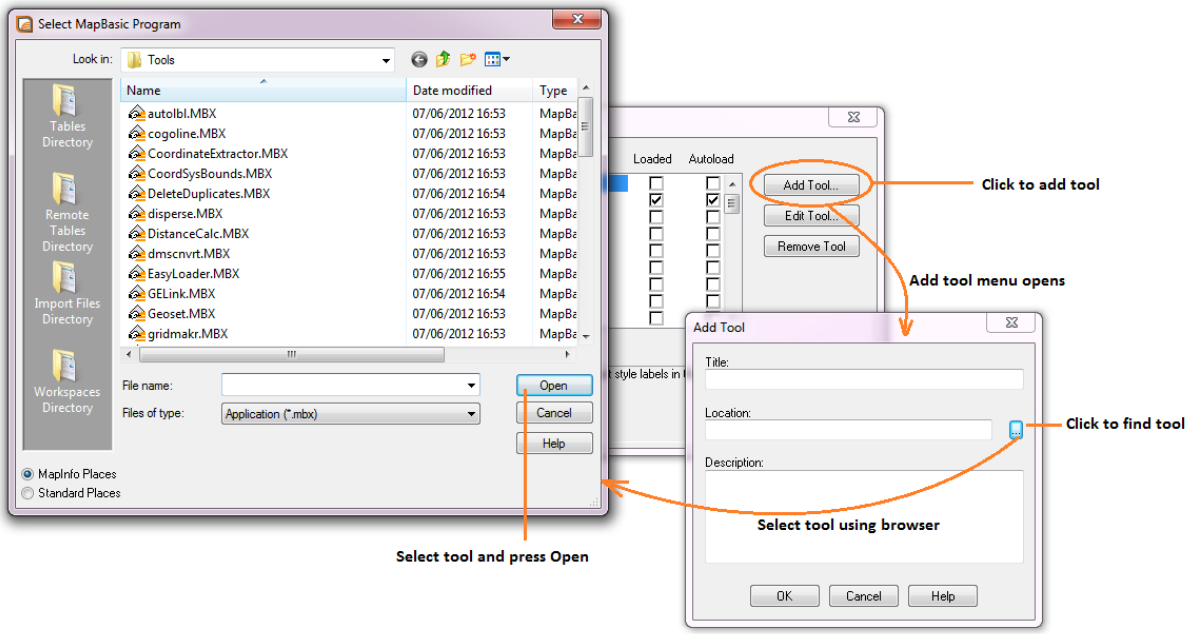

Fig. 4.16: Adding a tool in Tool Manager

The tool will now show in the *Tool Manager* dialog (Fig. 4.17) and the **Loaded** box will be checked. To load the tool automatically whenever MapInfo is started check the **AutoLoad** box. Then click **Ok** to close the *Tool Manager* dialog.

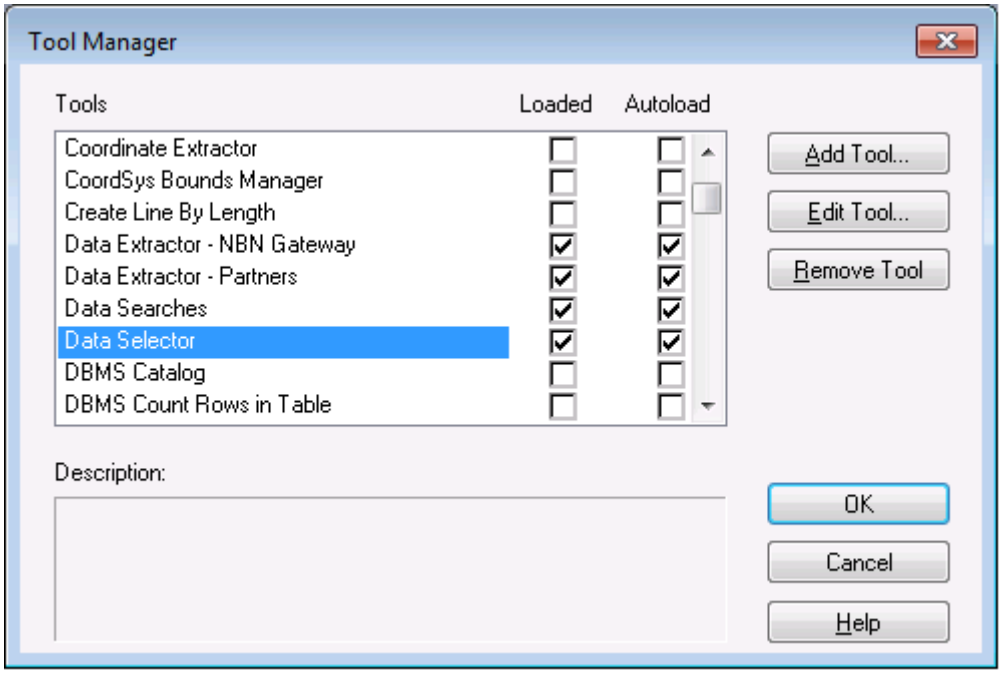

Fig. 4.17: The Data Selector tool is loaded

The tool will now appear as a new entry in the *Tools* menu (Fig. 4.18).

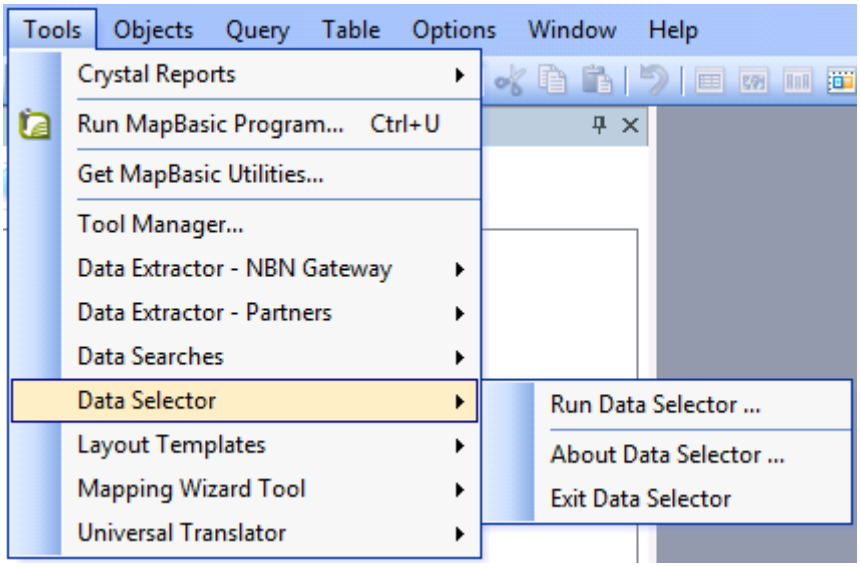

Fig. 4.18: The Data Selector tool menu

Note: The name that will appear in the *Tools* menu is dependent on the *ToolTitle* (page 23) value in the configuration file, **not** the name given when adding the tool using the Tool Manager.

CHAPTER 5

Running the tool

5.1 Instructions

The operation of the Data Selector tool is explained in this section. While the interface is similar between the ArcGIS and MapInfo implementations of the tool, there are some differences. These are pointed out where relevant throughout this document.

As discussed in the *Setting up the tool* (page 19) section, the Data Selector tool is operated from the GIS application. It relies on the SQL tables containing any data that may be selected and a configuration document for setting up the tool. Therefore, before running the tool, ensure the following conditions are met:

- The XML configuration document has been set up correctly and is named correctly.
- The Data Selector tool has been installed and set up.

See also:

Please refer to the *setup* (page 19) section for further information about any of these requirements.

5.1.1 Opening the form

To open the Data Selector tool in ArcGIS, click on the **Data Selector tool** button (Fig. 5.1).

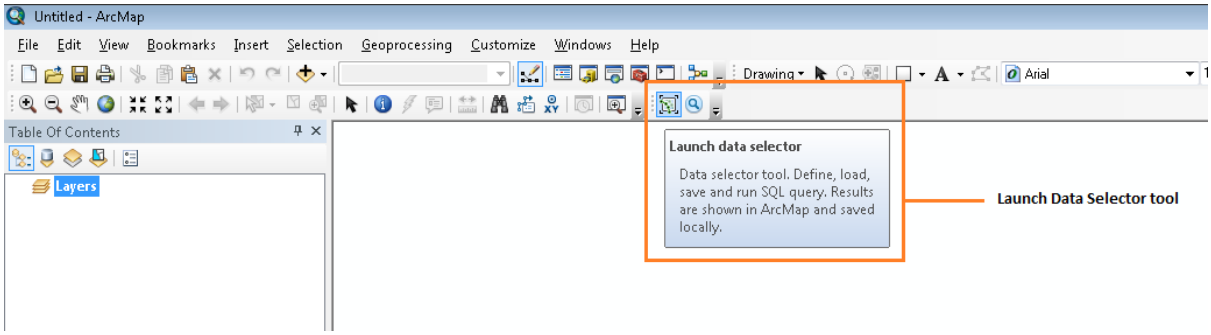

Fig. 5.1: Launching the Data Selector tool (ArcGIS)

To open the Data Selector tool in MapInfo, select **Tools... -> Data Selector** in the *Tools* menu (Fig. 5.2).

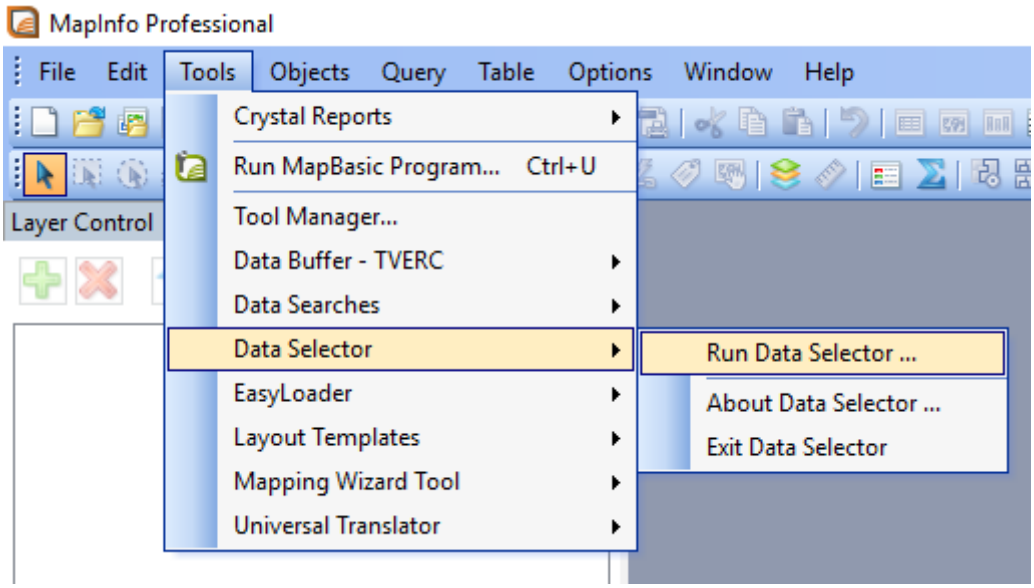

Fig. 5.2: Launching the Data Selector tool (MapInfo)

If there are any structural issues with the XML document, the tool will display a message with the error it has encountered, and not load any further.

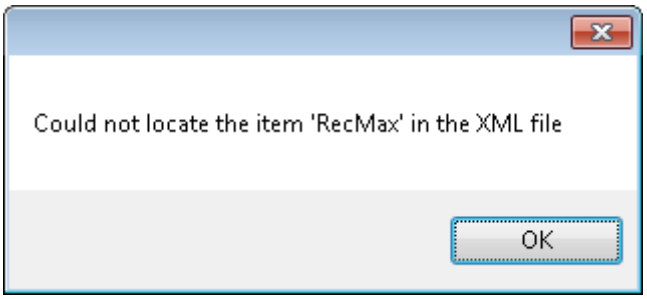

Fig. 5.3: Example warning message displayed for any XML structural issues

Provided that the XML document is otherwise correct, the form will display (Fig. 5.4).

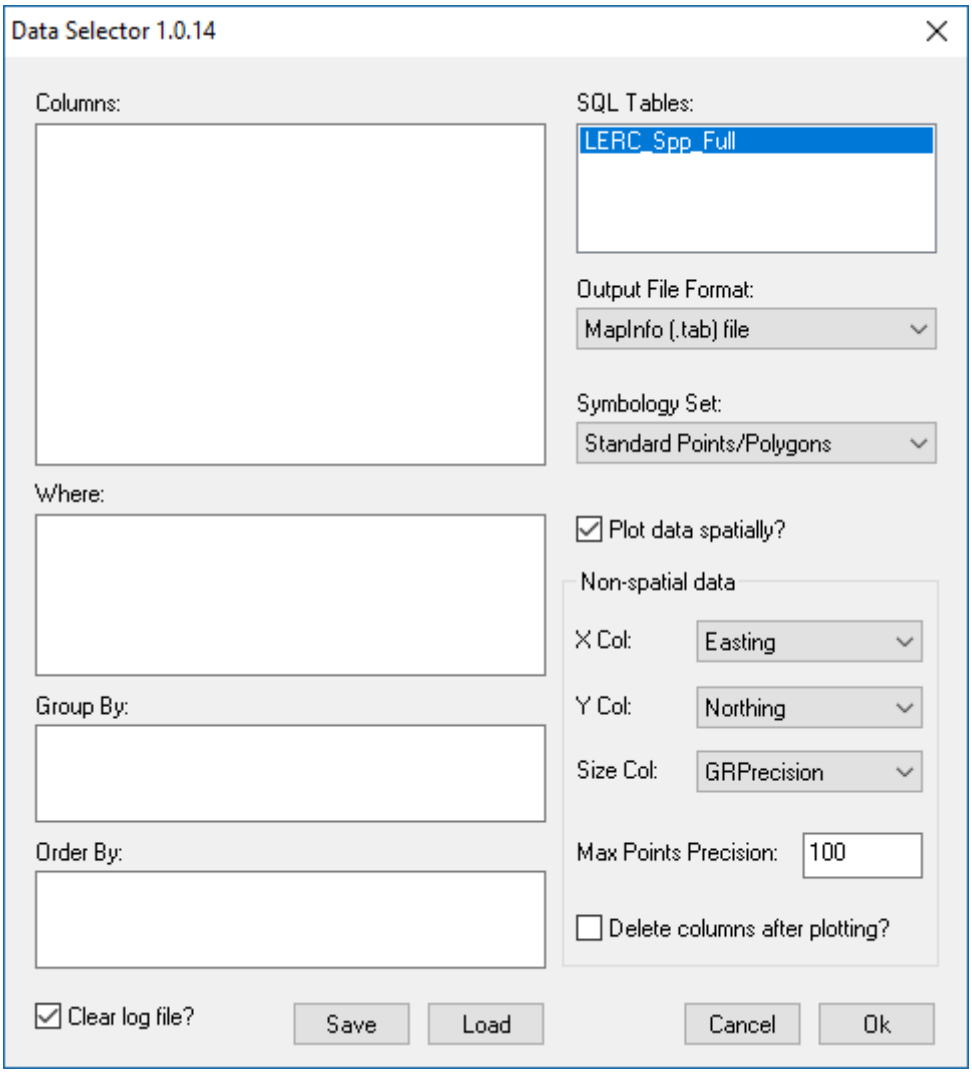

Fig. 5.4: The form displaying the available SQL tables and options (MapInfo)

5.1.2 Using the form

Select the required source table in the **SQL Tables** box (Fig. 5.5).

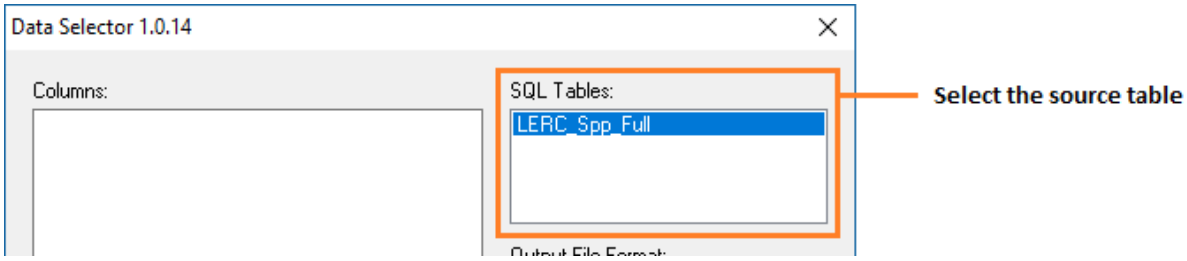

Fig. 5.5: Select the required source table in the SQL tables list

Select the output file format to contain the selected records (Fig. 5.6).

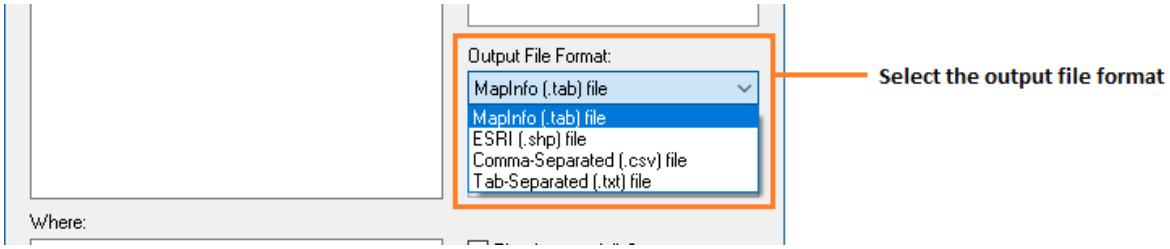

Fig. 5.6: Select the output file format

The following options are available in MapInfo:

- **MapInfo (.tab) file**
- **ESRI (.shp) file**
- **Comma-separated (.csv) file**
- **Tab-separated (.txt) file**

The following options are available in ArcGIS:

- **Geodatabase**
- **Shapefile**
- **Text file (tab delimited)**
- **CSV file**

If you have selected 'MapInfo (.tab) file' as the output file format (only available in MapInfo) you can optionally also select one of the pre-defined symbology sets to apply to the output file (Fig. 5.7). Symbology sets are specified in the configuration file

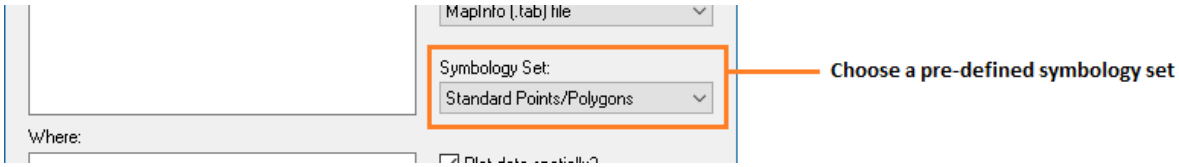

Fig. 5.7: Select a symbology set to apply to the records (MapInfo only)

If you have selected 'ESRI (.shp) file' (available in ArcGIS or MapInfo) or 'MapInfo (.tab) file' (available only in MapInfo) as the output file format you can optionally also select if the records should be spatially plotted or re-plotted (Fig. 5.8). In ArcGIS, the records are automatically plotted if a geometry field is included.

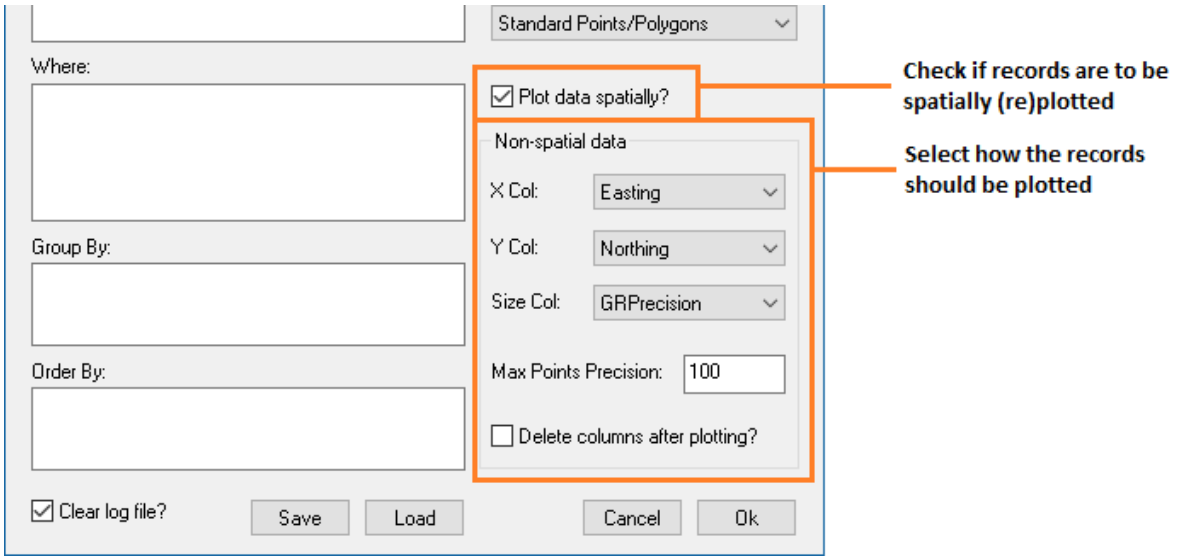

Fig. 5.8: Select a symbology set to apply to the records (MapInfo only)

Finally, select whether the log file should be overwritten, and whether the spatial columns should be deleted after use (MapInfo only). Now the form is set up to enter and run your query.

5.1.3 Entering queries

Specify the columns and SQL clauses that you wish to use to query the selected table. All syntax should adhere to SQL Server SQL syntax, and it is important that the correct part of the query is entered in the correct text box. Bear in mind when writing your query that the tool is designed to run a SELECT query only, and that it will not execute an action query. Simply enter the columns you wish to select in the `Columns` box, including any changes in name (e.g. `CommonName as Name`), your selection clause in the `Where` box, and your Group By and Order By clauses in their relevant boxes as appropriate. A number of examples are shown in Fig. 5.9 (a simple query including geometry), Fig. 5.10 (a spatial query using grouping) and Fig. 5.11 (a non-spatial, or tabular, query).

Note: If a Group By clause is included for a query that includes a spatial element, the geometry must be grouped too using SQL specific syntax (see Fig. 5.10 for an example using an aggregate function).

Note: It is not necessary to include key words such as `SELECT`, `WHERE`, `GROUP BY` and `ORDER BY`. Doing so will make the tool fail.

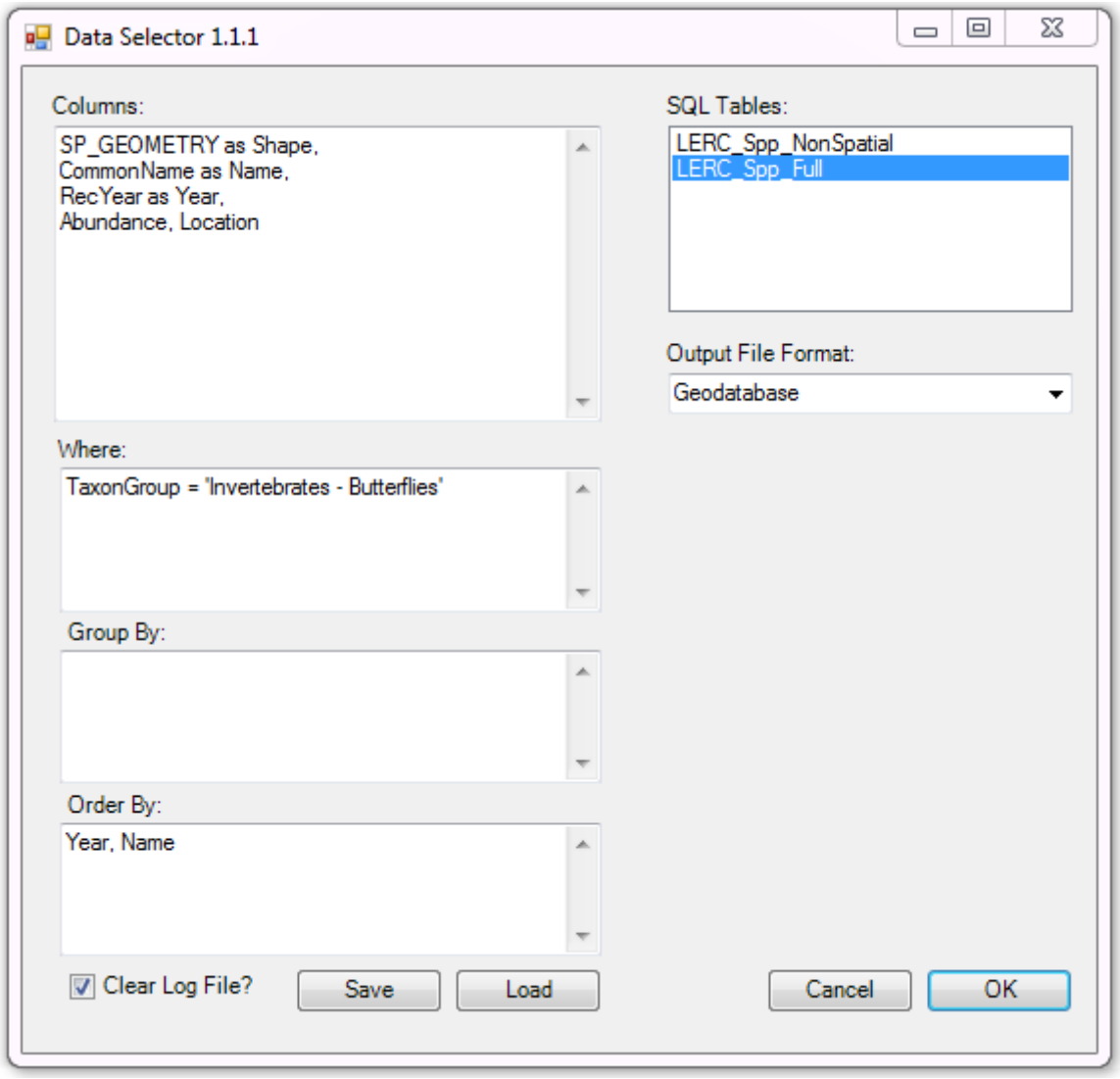

Fig. 5.9: Example of a simple query using geometry (ArcGIS)

If no spatial element is selected in the query, the output will be tabular. An example of such a query is shown in Fig. 5.11, where a simple report is generated of the number of records for each taxon group.

5.1.4 Running the query

Once the correct query has been entered and the output format selected, and the plotting and symbology defined (MapInfo only), check whether the log file should be overwritten using the `Clear Log File` check box. Then, click *OK*. You will be prompted for an output file (Fig. 5.12). Enter a name for your output and click *Save*. If an existing file is selected, the tool will prompt you for permission to overwrite this, or to choose a different name. Once the output name has been selected the tool will begin the process.

Depending on which version of the tool you are using, and whether you are generating a spatial or a

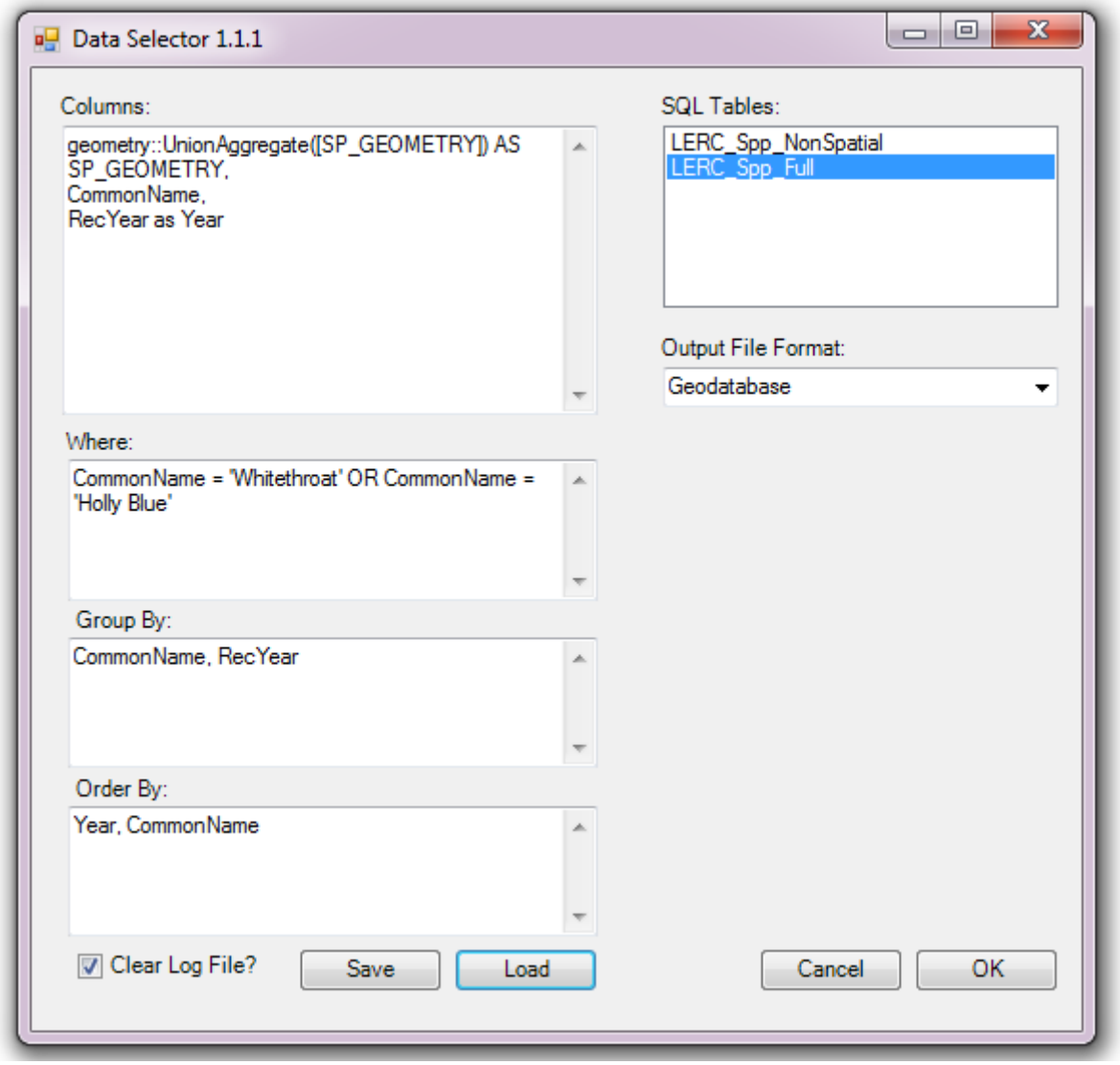

Fig. 5.10: Example of a query using spatial grouping (ArcGIS)

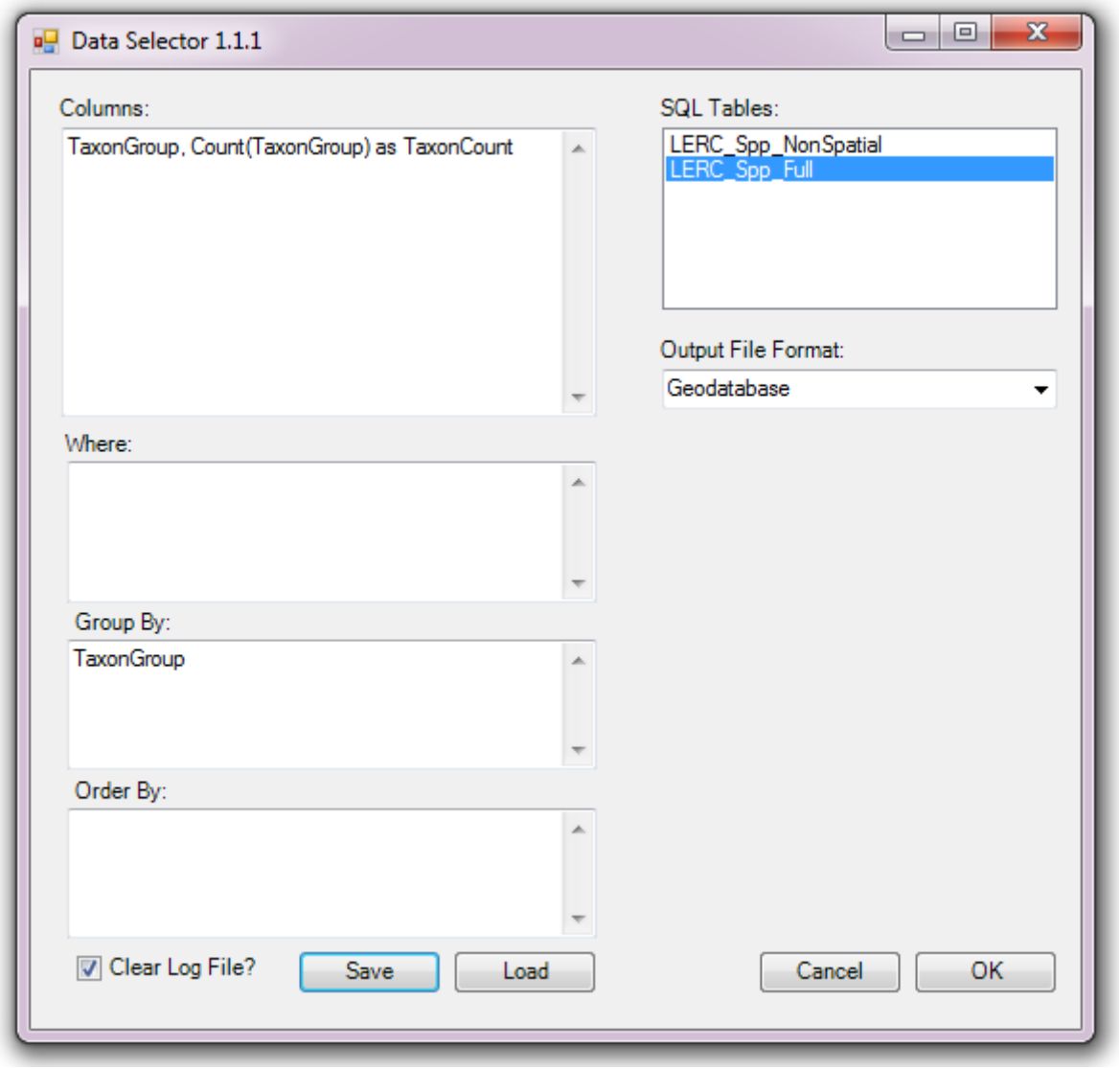

Fig. 5.11: Example of a summary query with tabular output (ArcGIS)

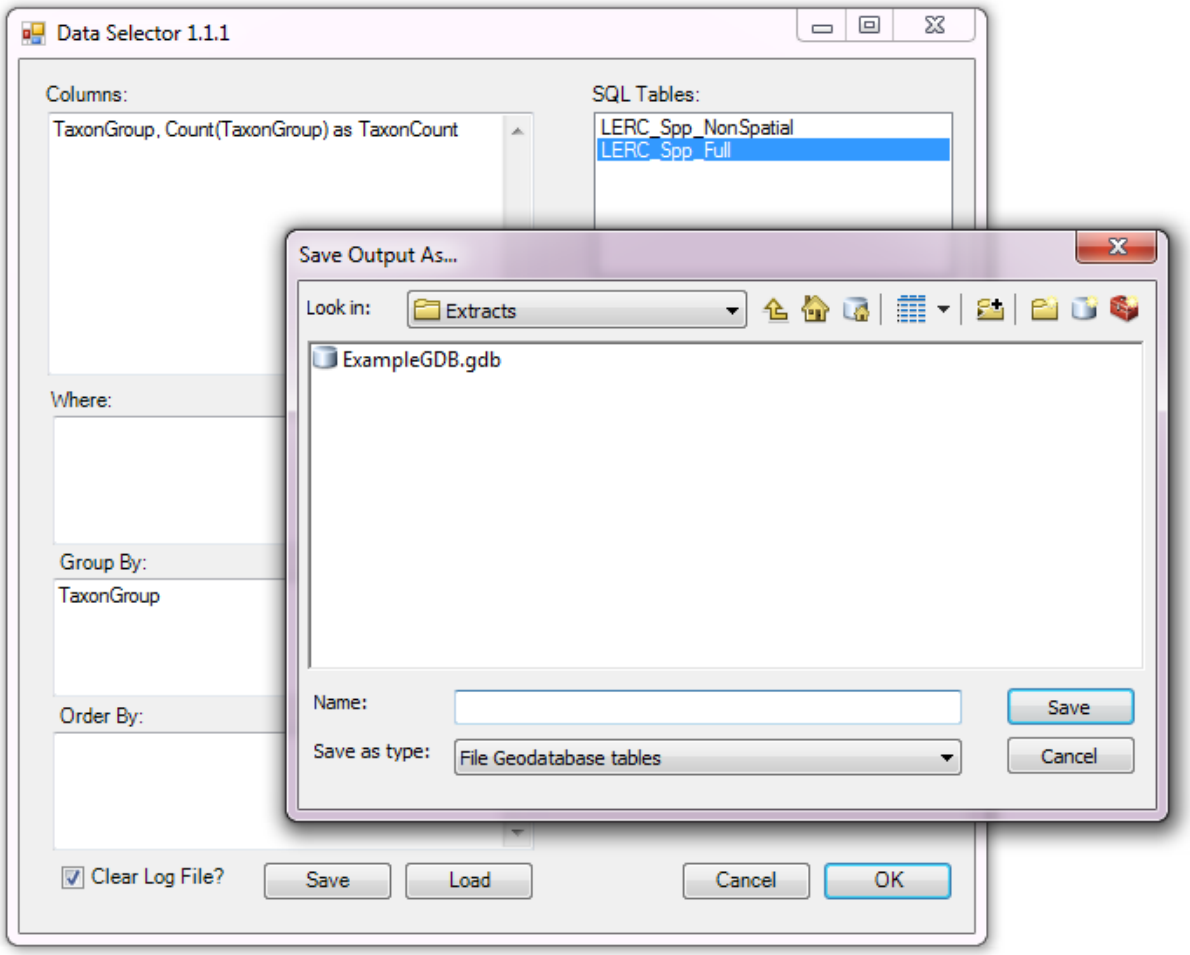

Fig. 5.12: Enter the name for your output file.

tabular output, the output will be created and shown as follows:

- If you are using **MapInfo** and are creating a **spatial** output layer, it will be added to the view and shown.
- If you are using **ArcGIS** and are creating a **spatial** output layer, it will be split into point and polygon layers as required and added to the view in a grouped layer.
- If you are using **MapInfo** and are creating **tabular** output in **CSV or TXT** format, it will not be added to the view.
- If you are using **ArcGIS** and are creating **tabular** output, or **MapInfo** and creating **tabular** output in **.tab** format, it will be added to the view and shown.

An example of spatial and tabular outputs in ArcGIS is shown in Fig. 5.13 and Fig. 3.4.

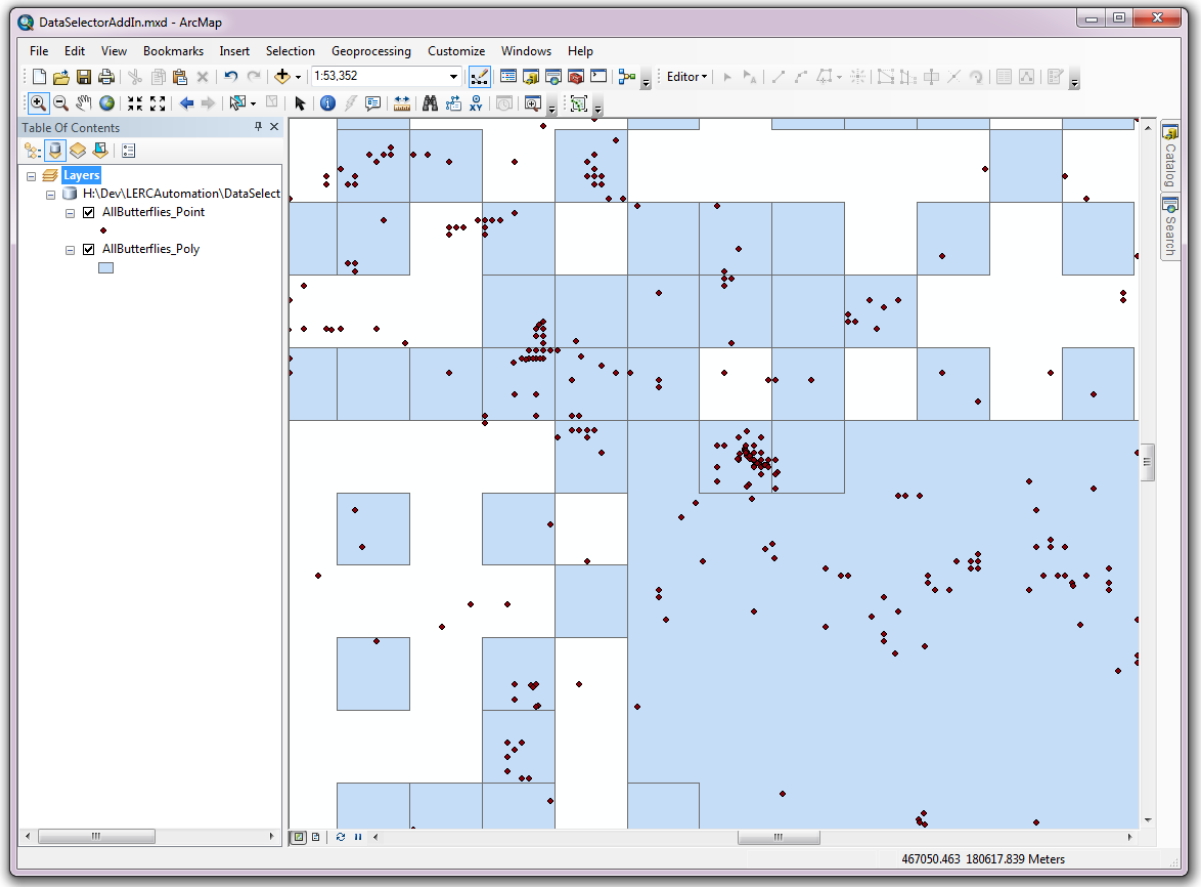

Fig. 5.13: Example output from a spatial query (ArcGIS; Zoomed in to maintain confidentiality)

Once the process has finished, a messagebox will ask you whether you wish to close the form (Fig. 5.15). After you have made your choice the log file is shown (Fig. 5.16) so you can check the process has completed correctly, and the results will be added to the screen as discussed above. Note that the log file entries are different between ArcGIS and MapInfo versions.

5.2 Loading & saving queries

Queries can be saved for future use, so once a query has been written and saved it can be loaded and re-run by any user at any time and it will output results from the most up-to-date copy of the database.

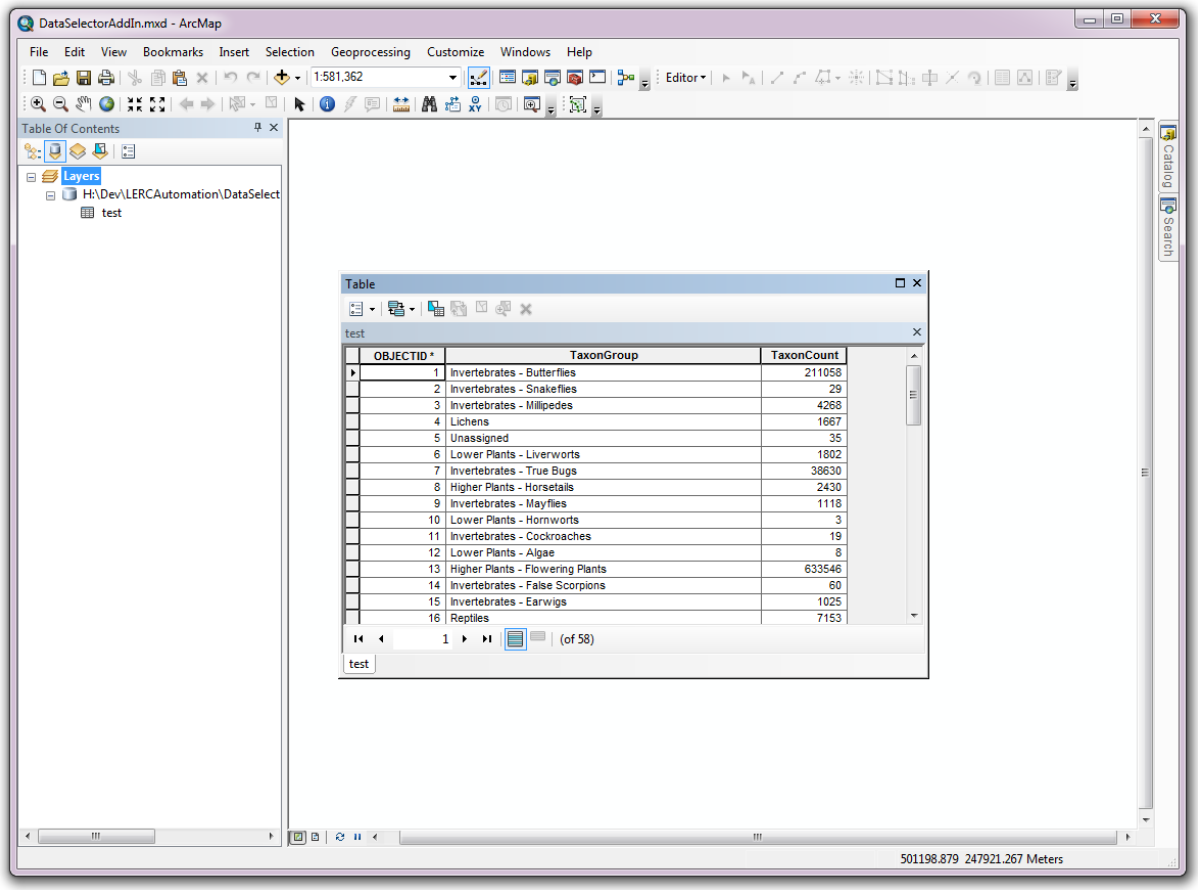

Fig. 5.14: Example output from a non-spatial query (ArcGIS)

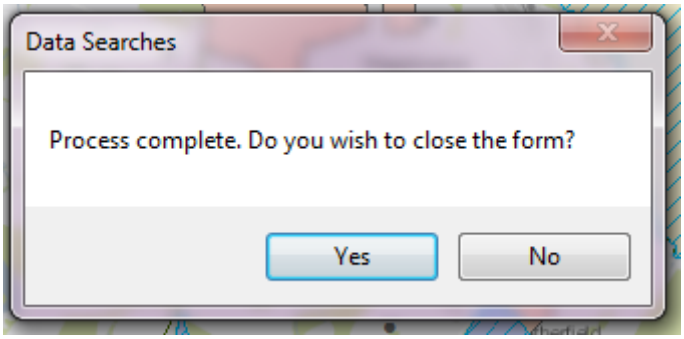

Fig. 5.15: User is asked whether the form should be closed after the process finishes

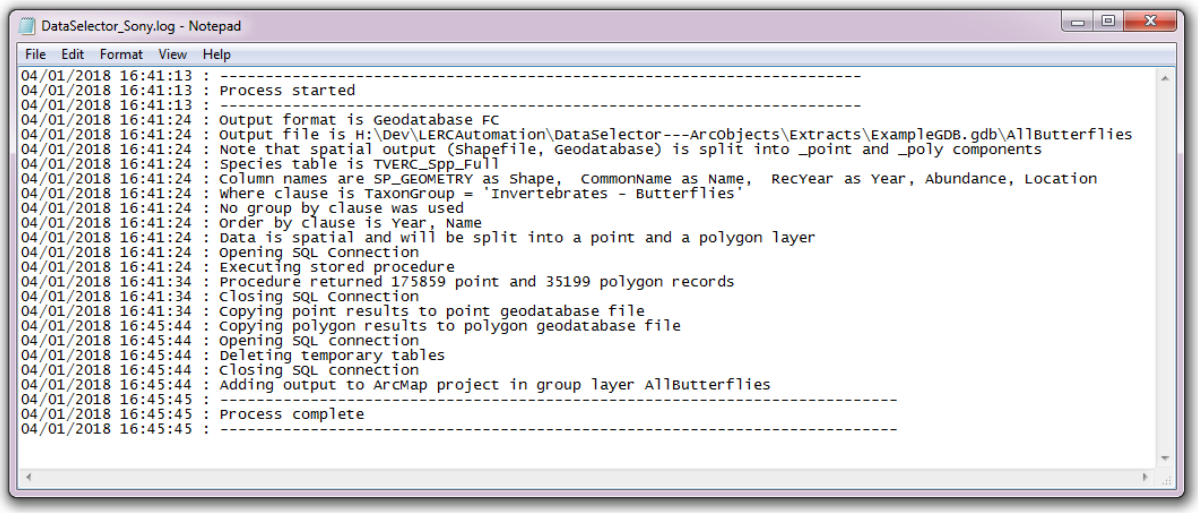

Fig. 5.16: The log file is shown when the process finishes (ArcGIS)

Queries can be saved or loaded by using the `Save` and `Load` buttons (Fig. 5.17). They are saved as a simple text file with minimal formatting.

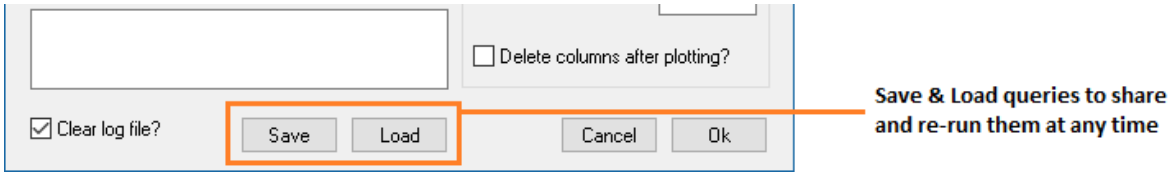

Fig. 5.17: Save and load queries (MapInfo)

CHAPTER 6

Frequently Asked Questions

This is a list of Frequently Asked Questions about the Data Selector tool. Feel free to suggest new entries!

6.1 General questions

How do I get a copy of the tool?

The source code as well as the installer setups can be downloaded from GitHub (MapInfo[16] or ArcGIS[17]). Please ensure that you use the correct configuration file, examples copy of which are also included with the releases.

Can several people use the tool at the same time?

Any number of users can use the tool if they have a copy of the tool installed or loaded in their own copy of ArcGIS or MapInfo. Where outputs are written to a central (network) location, it is important to ensure that no two users are saving to the same files at the same time as this can lead to unexpected results.

Does the tool work with QGIS?

Currently only ArcGIS and MapInfo implementations of the tool exist. However, if funding was available the tool could be adapted to also support QGIS.

6.2 Operating the tool

One of the SQL Server tables I want to use isn't showing in the form. How do I get it to show up?

This issue will arise if the layer isn't being selected by the SQL statement in the XML configuration document. Please refer to the *setup* (page 19) section and adjust the TableListSQL statement, and the Include and Exclude wildcards as appropriate.

[16] https://github.com/LERCAutomation/DataSelector-MapInfo/releases
[17] https://github.com/LERCAutomation/DataSelector---ArcObjects/releases

I got an error message about a SQL error

If there is an error in any of the selection criteria (i.e. the 'Columns', 'Where', 'Group By' or 'Order By' fields) then a SQL error message may appear. The contents of the message will vary between MapInfo and ArcGIS but both will contain some information about the nature of the SQL error. The details of the error are generated by SQL Server and will generally be specific to the nature of the error (e.g. 'Incorrect syntax near ...' or 'Invalid column name ...'), but they can sometimes be more cryptic.

How do I learn how to use SQL syntax?

There are some excellent free online resources available to learn how to write SQL queries. Some examples are The W3 Schools tutorial[18] and the Tutorialspoint SQL tutorial[19]. When writing your queries bear in mind that the tool is set up to run a SELECT query only.

6.3 Tool issues

How do I report a new bug or propose a change in the tool?

Please check the existing known issues and change requests on the LERCAutomation pages on GitHub (ArcGIS[20], MapInfo[21]) before reporting/proposing new issues or changes. If you have a new issue or request you can submit it there and it will be picked up by the developers. Alternatively, you can email suggestions to Hester[22] or Andy[23].

[18] https://www.w3schools.com/sql/
[19] https://www.tutorialspoint.com/sql/
[20] https://github.com/LERCAutomation/DataSelector---ArcObjects/issues
[21] https://github.com/LERCAutomation/DataSelector-MapInfo
[22] Hester@HesterLyonsConsulting.co.uk
[23] Andy@AndyFoyConsulting.co.uk

CHAPTER 7

Appendix

7.1 Example XML file for ArcGIS

Below is an example of XML that might be used to set up the Data Selector tool in ArcGIS. Note, many of the settings have been included for illustration only and it is up to each user or LERC to ensure the system is configured to their requirements.

```
<?xml version="1.0" encoding="utf-8"?>

<!--
WARNING: This file should be changed carefully and a backup should be
taken before any changes so that they can be backed out.  Changed lines
can also be commented out as below.
-->

<!--
This config file contains all the variables used by the DataSelector
ArcObjects add-in.

The 'configuration' node is the 'root' node and signifies the start of the
contents of the configuration file.

The 'DataSelector' node contains all of the entries relating to the
ArcObjects add-in variables.

Each entry relates to a file, folder, table name, column name or SQL
statement used by the ArcObjects add-in to select and export species data
for use in GIS or as a spreadsheet.
-->

<configuration>
<DataSelector>

  <!-- The existing file location where log files will be saved with output
       messages -->
```

```
  <LogFilePath>
    <value>H:\DataSelector\LogFiles</value>
  </LogFilePath>

      <!-- The path to the DSN configuration file that contains the␣
↪connection
       details for the SQL Server database -->
  <FileDSN>
    <value>H:\DataSelector\Config\TVERCConn.sde</value>
  </FileDSN>

  <!-- Connection string for ADO connection (to allow stored procedures to
       be run with parameters) -->
  <ConnectionString>
    <value>Server=SONY\SQLEXPRESS; Database=NBNData;
           Integrated Security=True;</value>
  </ConnectionString>

  <!-- The existing file location where extracts will be saved by default -
↪->
  <DefaultExtractPath>
    <value>H:\DataSelector\Extracts</value>
  </DefaultExtractPath>

  <!-- The existing file location where queries will be saved and loaded
       by default -->
  <DefaultQueryPath>
    <value>H:\DataSelector\Queries</value>
  </DefaultQueryPath>

  <!-- The default format of the output files to be created -->
  <DefaultFormat>
    <value>Geodatabase</value>
  </DefaultFormat>

  <!-- The schema used in the SQL Server database -->
  <DatabaseSchema>
    <value>dbo</value>
  </DatabaseSchema>

  <!-- the Include wildcard for table names to list all the species tables
       in SQL Server that can be selected by the user to extract from -->
  <IncludeWildcard>
    <value>*</value><!--*TVERC_Spp_* -->
  </IncludeWildcard>

  <!-- the Exclude wildcard for table names that should NOT be used for
       species tables in SQL Server that can be selected by the user to
       extract from -->
  <ExcludeWildcard>
    <value>*TVERC_Spp_*_*</value>
  </ExcludeWildcard>

</DataSelector>
</configuration>
```

7.2 Example XML file for MapInfo

Below is an example of XML that might be used to set up the Data Selector tool in ArcGIS. Note, many of the settings have been included for illustration only and it is up to each user or LERC to ensure the system is configured to their requirements.

```
<?xml version="1.0" encoding="utf-8"?>

<!--
WARNING: This file should be changed carefully and a backup should be
taken before any changes so that they can be backed out.  Changed lines
can also be commented out as below.
-->

<!--
This config file contains all the variables used by the DataSelector
MapBasic tool.

The 'configuration' node is the 'root' node and signifies the start of the
contents of the configuration file.

The 'DataSelector' node contains all of the entries relating to the
MapBasic tool variables.

Each entry relates to a file, folder, table name, column name or SQL
statement used by the MapBasic tool to select and export species data for
use in GIS or as a spreadsheet.
-->

<configuration>
<DataSelector>

  <!-- The title to use for the program in the Tool menu -->
  <ToolTitle>
    <value>Data Selector</value>
  </ToolTitle>

  <!-- The existing file location where log files will be saved with output
       messages -->
  <LogFilePath>
    <value>D:\Andy\GiGL\Data Selector\Logs</value>
  </LogFilePath>

  <!-- The location of the File DSN that specifies which SQL Server␣
↪database
       to connect to -->
  <FileDSN>
    <value>D:\Andy\GiGL\Data Selector\SQL Server\NBNData.dsn</value>
  </FileDSN>

  <!-- The existing file location where extracts will be saved by default -
↪->
  <DefaultExtractPath>
    <value>D:\Andy\GiGL\Data Selector\Extracts</value>
  </DefaultExtractPath>

  <!-- The existing file location where queries will be saved and loaded by
```

```
      default -->
  <DefaultQueryPath>
    <value>D:\Andy\GiGL\Data Selector\Queries</value>
  </DefaultQueryPath>

  <!-- The default format of the output files to be created -->
  <DefaultFormat>
    <value>tab</value>
  </DefaultFormat>

  <!-- The schema used in the SQL Server database -->
  <DatabaseSchema>
    <value>dbo</value>
  </DatabaseSchema>

  <!-- The SQL statement used to list all the species tables in SQL Server
       that can be selected by the user to extract from -->
  <TableListSQL>
    <value>Select table_name From information_schema.tables Where table_
↪name
           Like 'GiGL[_]Spp[_]%' And table_name Not Like 'GiGL[_]Spp[_]%[_]
↪%'
           Order By table_name</value>
  </TableListSQL>

  <!-- The maximum number of records what will be extracted in any one
       extract -->
  <RecMax>
    <value>10000000</value>
  </RecMax>

  <!-- The default for whether the symbology should be set for .tab files
       or not -->
  <DefaultSymbologySet>
    <value>2</value>
  </DefaultSymbologySet>

  <!-- The default for whether the SQL database tables will be spatially
       plotted -->
  <DefaultSpatialPlotting>
    <value>No</value>
  </DefaultSpatialPlotting>

  <!-- The spatial coordinate system to use for mapping -->
  <CoordinateSystem>
    <value>Earth Projection 8, 79, "m", -2, 49, 0.9996012717, 400000,
           -100000</value>
  </CoordinateSystem>

  <!-- The table columns used for creating spatial data -->
  <DefaultSpatialColumns>
    <XColumn>
        <value>Eastings</value>
    </XColumn>
    <YColumn>
        <value>Northings</value>
    </YColumn>
```

```
  <SizeColumn>
      <value>GRPrecision</value>
  </SizeColumn>
</DefaultSpatialColumns>

<!-- The default maximum precision for plotting polygons as points -->
<DefaultPointsPrecision>
  <value>100</value>
</DefaultPointsPrecision>

<!-- The User interface dialog size ("Norm" or "Max") -->
<DialogSize>
  <value>Max</value>
</DialogSize>

<!-- The symbology sets available for applying to any MapInfo .tab
     outputs -->
<MapInfoTables>
  <SymbolSet1 Desc="Standard Points/Polygons">
      <Symbology>
          <Symbol>
              <Clause>
                  <Value>GRPRECISION &lt;= 10</Value>
              </Clause>
              <Object>
                  <Value>Point</Value>
              </Object>
              <Symbol>
                  <Value>2,65,255,12,MapInfo Dispersed Group,0,0</Value>
              </Symbol>
          </Symbol>
          <Symbol>
              <Clause>
                  <Value>GRPRECISION = 100</Value>
              </Clause>
              <Object>
                  <Value>Point</Value>
              </Object>
              <Symbol>
                  <Value>2,64,255,14,MapInfo Dispersed Group,0,0</Value>
              </Symbol>
          </Symbol>
          <Symbol>
              <Clause>
                  <Value>GRPRECISION &lt;= 10</Value>
              </Clause>
              <Object>
                  <Value>Region</Value>
              </Object>
              <Pen>
                  <Value>2,2,10526880</Value>
              </Pen>
              <Brush>
                  <Value>5,10526880</Value>
              </Brush>
          </Symbol>
          <Symbol>
```

```
                <Clause>
                    <Value>GRPRECISION = 100</Value>
                </Clause>
                <Object>
                    <Value>Region</Value>
                </Object>
                <Pen>
                    <Value>2,2,10526880</Value>
                </Pen>
                <Brush>
                    <Value>5,10526880</Value>
                </Brush>
            </Symbol>
            <Symbol>
                <Clause>
                    <Value>GRPRECISION = 1000</Value>
                </Clause>
                <Object>
                    <Value>Region</Value>
                </Object>
                <Pen>
                    <Value>2,2,10526880</Value>
                </Pen>
                <Brush>
                    <Value>5,10526880</Value>
                </Brush>
            </Symbol>
            <Symbol>
                <Clause>
                    <Value>GRPRECISION = 2000</Value>
                </Clause>
                <Object>
                    <Value>Region</Value>
                </Object>
                <Pen>
                    <Value>2,2,10526880</Value>
                </Pen>
                <Brush>
                    <Value>6,10526880</Value>
                </Brush>
            </Symbol>
            <Symbol>
                <Clause>
                    <Value>GRPRECISION = 10000</Value>
                </Clause>
                <Object>
                    <Value>Region</Value>
                </Object>
                <Pen>
                    <Value>2,2,10526880</Value>
                </Pen>
                <Brush>
                    <Value>1,10526880</Value>
                </Brush>
            </Symbol>
        </Symbology>
    </SymbolSet1>
```

```
  </MapInfoTables>

</DataSelector>
</configuration>
```

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```
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