

Integrating Style Files and Carto Representation into the Geological Map Flow Process (The GSC's implementation of the FGDC geologic symbology)

By Dave Everett and Vic Dohar

Natural Resources Canada
601 Booth Street
Ottawa, ON K1A 0E8
Telephone: (613) 996-9353
Fax: (613) 952-0738
email: deverett@NRCan.gc.ca

PREFACE

This poster presents the process of creating Federal Geographic Data Committee (FGDC) and Geological Survey of Canada (GSC) symbols for an ESRI style file and Cartographic (carto) Representation. Additionally, a master Excel spreadsheet is used to generate domains for feature coding and symbolizing geologic features, and to maintain harmony between the FGDC style item codes and carto representation rule IDs. The procedures below are in sequence and show as an example how fold feature symbols are managed. These procedures are integrated in the GSC's Geological Map Flow project to assist cartographers in map production.

SYMBOL REFERENCE AND REQUISITION

The FGDC Digital Cartographic Standard for Geologic Map Symbolization is used as the base point for the standard style file and carto representations that will be used in the Geological Map Flow process. The entire library of symbology has been created except for those that limitations in the ArcGIS software would not allow. Some of the map elements such as state location maps, bar scales, declination arrows, etc. were not created. The Geological Map Flow project has other means to create these map surround elements.

If the author cannot find a suitable symbol in the FGDC standard (either because it does not exist in the standard or they strongly feel that a second option is needed), then they fill out a Symbol Creation Form (figure 1). On this form they state the type of symbol needed, colour, whether the symbol is based on an existing one, a description for it's use in the legend, notes on the symbol's usage and a detailed drawing of the symbol (giving as many dimensions as possible). This form is then passed on to a Legend Review Committee. This committee reviews the request and decides if an existing standard symbol should be used instead or if the new symbol should be created. This committee also fills out the second page of the form, which provides the database designers with the information needed to incorporate the new symbol into the bedrock or surficial data models. These data models store and manage geologic feature from which the maps are derived. Once approval is given, the form is passed to the Symbol Steward who then creates the symbol in the standard style file and as a carto representation.

5—FOLDS

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.1—Anticlines				
5.1.1	Anticline (1st option) Identity and existence certain, location accurate		<i>arrow linewidth 2 mm</i> <i>color 100% magenta</i> <i>HB-8</i> <i>40°</i> <i>5.5 mm</i> <i>linewidth .25 mm</i> <i>12.0 mm</i> <i>1.475 mm</i>	Place fold trace where axial surface of anticline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (anticline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.1.2	Anticline (1st option) Identity or existence questionable, location accurate			
5.1.3	Anticline (1st option) Identity and existence certain, location approximate			
5.1.4	Anticline (1st option) Identity or existence questionable, location approximate			
5.1.5	Anticline (1st option) Identity and existence certain, location inferred			
5.1.6	Anticline (1st option) Identity or existence questionable, location inferred			
5.1.7	Anticline (1st option) Identity and existence certain, location inferred		 <i>1.5 mm</i> <i>.75 mm</i> <i>.75 mm</i> <i>3.5 mm</i> <i>.75 mm</i> <i>.75 mm</i>	

TO BE COMPLETED BY REQUESTER

SYMBOL CREATION FORM

Requested by: _____ Date submitted: mm/dd/yyyy

Type: Line Marker (point) Fill (area) Colour: Black CMYK: % % % %

Reference to existing symbol: Document: _____ Symbol: _____

Associated Text Position: _____ FGDC Category: _____
 Suggest New Category: _____

FGDC Description: _____

Notes on Usage: _____

Detailed Drawing: _____

Instructions and Samples on page 3

TO BE COMPLETED BY LEGEND REVIEW COMMITTEE

FEATURE ATTRIBUTES

Requested by: _____ Date submitted: mm/dd/yyyy

Approved: Declined: By: _____ Date: mm/dd/yyyy

Reason: _____

Use FGDC Description as written on page 1
 Modified FGDC Description: _____

Use Notes on Usage as written on page 1
 Modified Notes on Usage: _____

Bedrock Feature Class: _____ Surficial Feature Class: _____

Lines
 Feature: _____ Subfeature: _____ Confidence: _____
 Altitude: _____ Generation: _____ Status: _____
 Depositional Environment: _____ Sense: _____

Points
 Feature: _____ Subfeature: _____ Confidence: _____
 Altitude: _____ Generation: _____ Method: _____ Status: _____
 Depositional Environment: _____ Sense: _____

Areas
 Feature: _____ Subfeature: _____ Confidence: _____
 Altitude: _____ Generation: _____ Method: _____ Status: _____
 Depositional Environment: _____ Sense: _____

Symbol Created by: _____ Date created: mm/dd/yyyy Assigned FGDC#: _____

Figure 1. Symbol reference and requisition. The top portion of the figure depicts a piece of the FGDC standard for authors to choose symbology. If a symbol does not exist, the forms depicted on the bottom are used to draw and describe the new symbol for a Legend Committee to approve. The second page of the form is used to fill out information needed about the new symbol for the database designers to add it to the standard geodatabase.

FONT CREATION

Each point symbol or line decoration is drawn to scale in CorelDraw (figure 2). A template has been set up with a 420 mm by 420 mm bounding box which has been determined to be the optimal dimension, comparable to specifying the size of the symbol in an ArcGIS style file. After the symbol is drawn to scale, it must be a single object and all lines must be converted to outlines. Once this is achieved, the symbol is centered on the template and scaled to 420 mm in its largest dimension with “keep aspect ratio” turned on. It is then exported to a True-type font under the next available character number (available numbers are 33 to 126 and 161 to 255, others are system reserved).

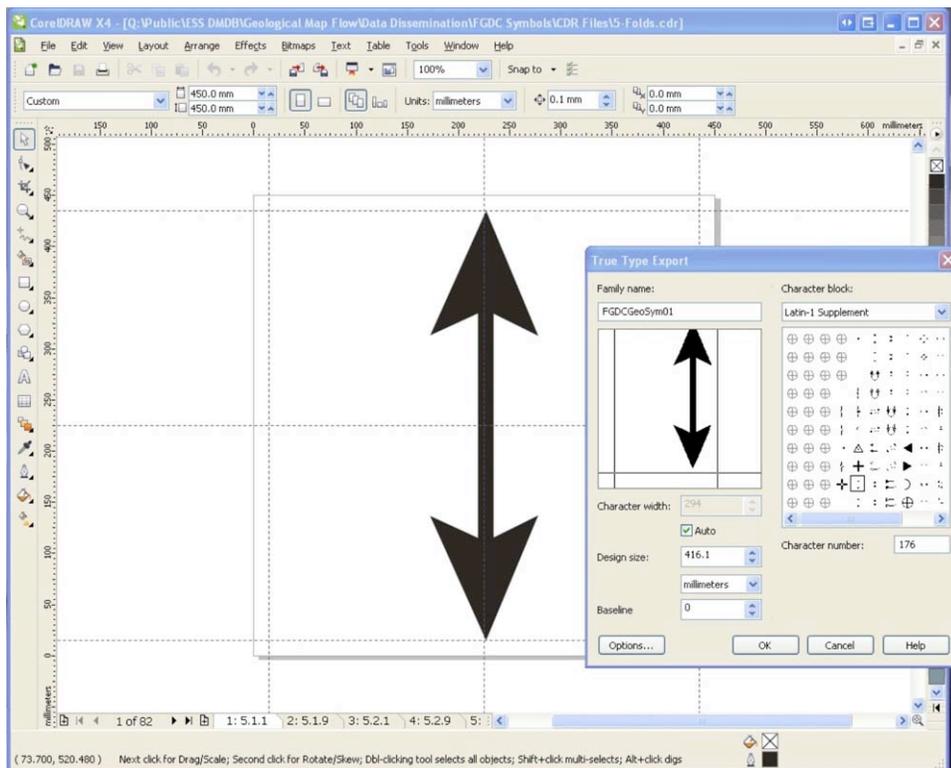


Figure 2. Font creation in Corel Draw.

CREATE STYLE ITEM AND CHECK SYMBOL

Once the True-type font has been updated, the complete symbol is created using the ArcGIS Style Manager (figure 3). Each layer of the symbol is built to specifications provided on the Symbol Creation Form (for example, mark/gap line pattern, size of marker, colour, etc.). The new symbol is categorized according to which FGDC category it best fits and given a style item number that matches the FGDC standard. The newly created symbol is then brought into an ArcGIS .mxd and checked for sizing, orientation and point of origin. Sizes may have to be

adjusted to achieve specified dimensions and offset values may have to be applied to point symbols so the point of origin occurs in the correct location.

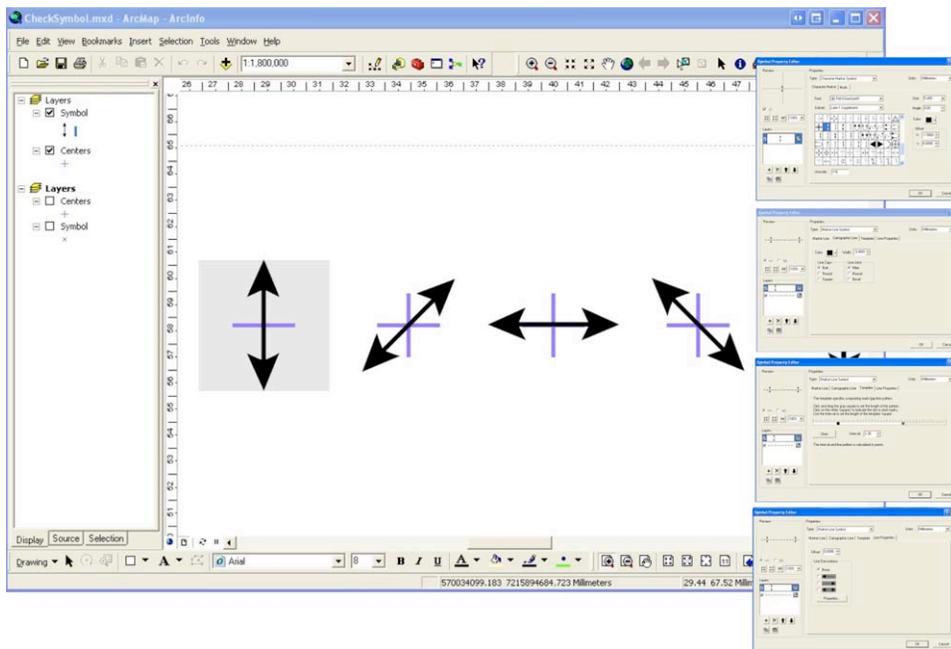


Figure 3. Creating the style item and checking the symbol in ArcGIS.

GENERATE CARTO REPRESENTATION

All symbols in the style file are imported/converted into carto representation rules and stored in a master geodatabase template under the appropriate representation which corresponds to a feature class in the geodatabase (figure 4). Each representation rule is checked to ensure that sizing and spacing accuracy was maintained after the conversion. A master Excel spreadsheet exists to aid in maintaining the sequence of carto representation RuleIDs. It contains a worksheet for each feature class that has the FGDC reference number and description, the style file number for “match to style” and the assigned RuleID. These fields are critical in the following steps where domains are created and a consistent relationship exists between style number and the RuleID.

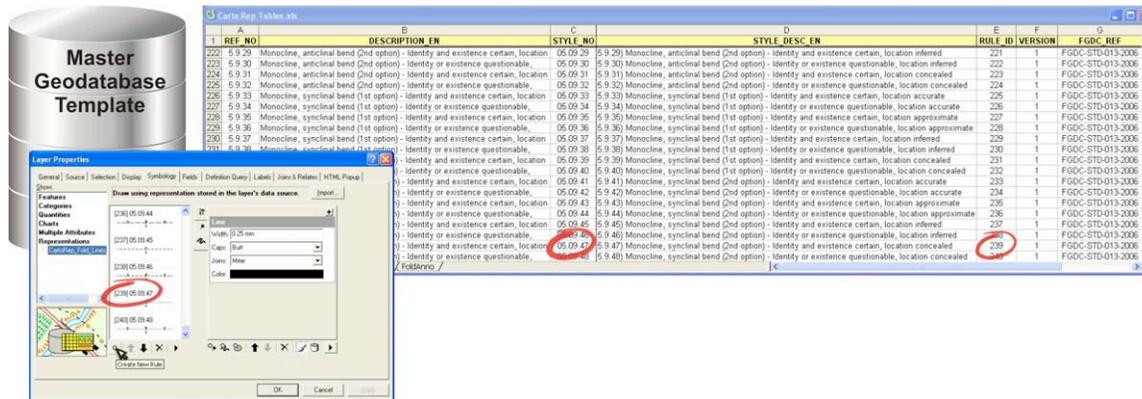


Figure 4. Generating the carto representation. This gives a view of the master spreadsheet that is maintained to keep correlation (circled in red) between the carto representation RULE_ID that are stored in a master geodatabase template and the Symbol number stored in the standard style file.

CONVERT TABLE TO DOMAIN

The fields STYLE_NO and STYLE_DESC_EN in each Excel worksheet are used to create a coded value domain for each feature class in the project geodatabase (figure 5). This procedure is required to be applied to each feature class in the geodatabase. In the future, a geoprocessing tool could be created to automate this process.

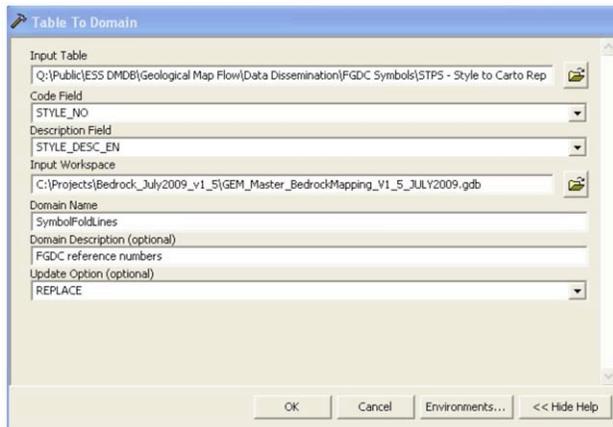


Figure 5. Converting symbols in the table to domains.

ASSIGN DOMAIN

In ArcCatalog, each of the domains are then assigned to the SYMBOL field in each of the corresponding feature classes (figure 6). The SYMBOL field is then used in ArcMap, to render the feature on the map using “Match to Symbols in a Style”.

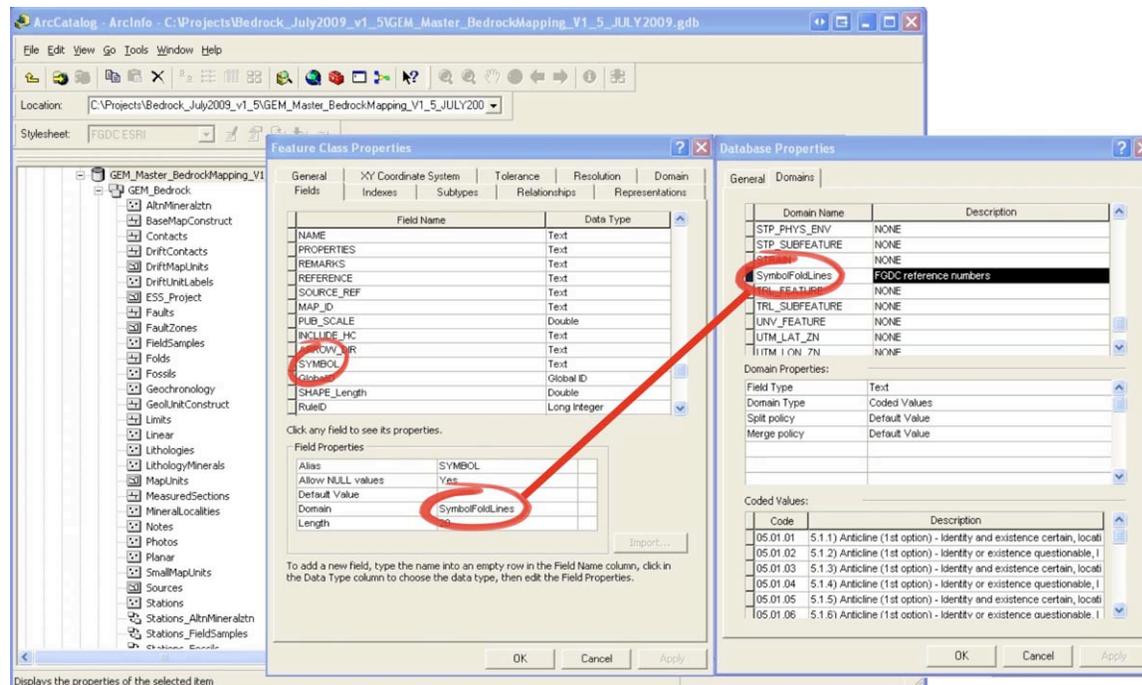


Figure 6. Assigning domains to the feature's Symbol field.

COPY CARTO REPRESENTATIONS

Using the Capture Representation Tool (by Ryan Clark, Arizona Geological Survey; see References, below), copy the carto representation rules from the master geodatabase template for each feature class in the project geodatabase. Browse to the desired feature class in the master geodatabase and supply a name for the new representation class (figure 7). This tool ensures that the RuleID number sequence is maintained as listed in each Excel worksheet.

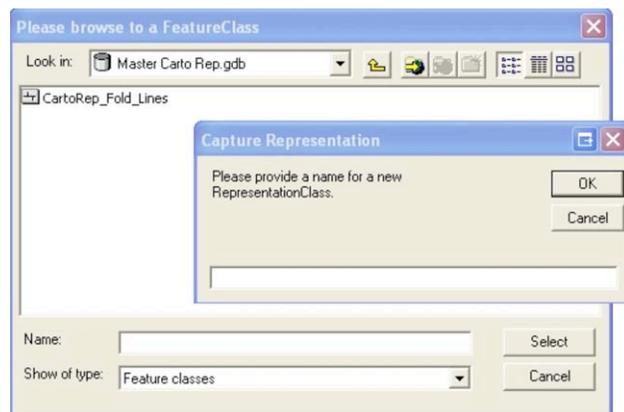


Figure 7. Copying carto representation rules for each feature class from the master geodatabase template to the project geodatabase.

JOIN TABLE

In ArcMap, join each individual Excel worksheet to the layer's attribute table in order to calculate the RuleID field (figure 8). The join is based on the SYMBOL value in the layer and the STYLE_NO in each Excel worksheet (many to one).

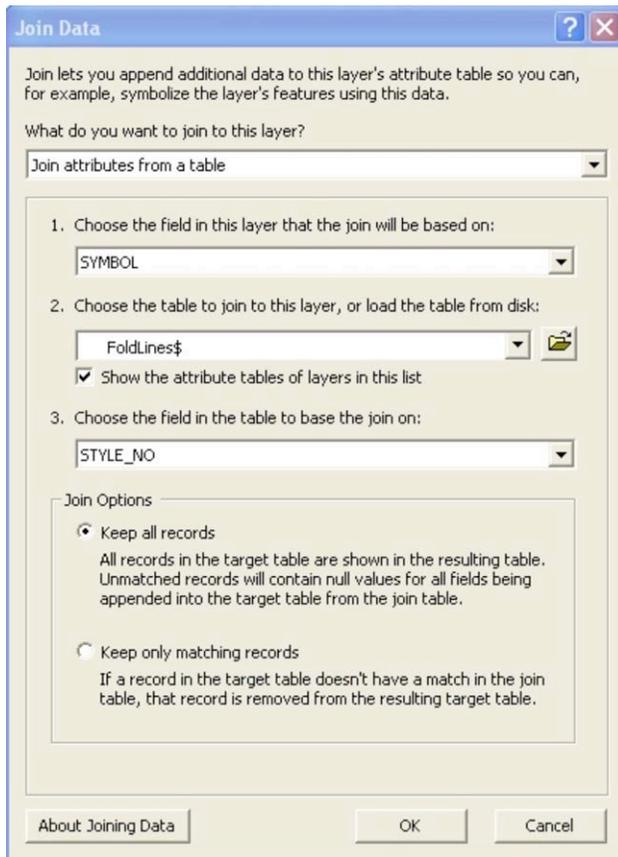


Figure 8. Joining attributes in the master Excel spreadsheet to each feature class attribute table.

FEATURE CODING

A FGDC symbol from the domain description [e.g., 5.1.2) Anticline (1st option) - Identity or existence questionable, location accurate] is assigned to the SYMBOL field (figure 9). The coded value domain [e.g., 05.01.02] is actually used in the “Match to Style”. This provides a simple method for geologists to symbolize features during map compilation as well as providing some standardization.

With the Excel worksheet joined to the layer attributes, the RuleID can be calculated to equal the value of the RULE_ID field in the joined Excel worksheet. This will ensure that the carto representation rule ID matches the FGDC symbol stored in the SYMBOL field.

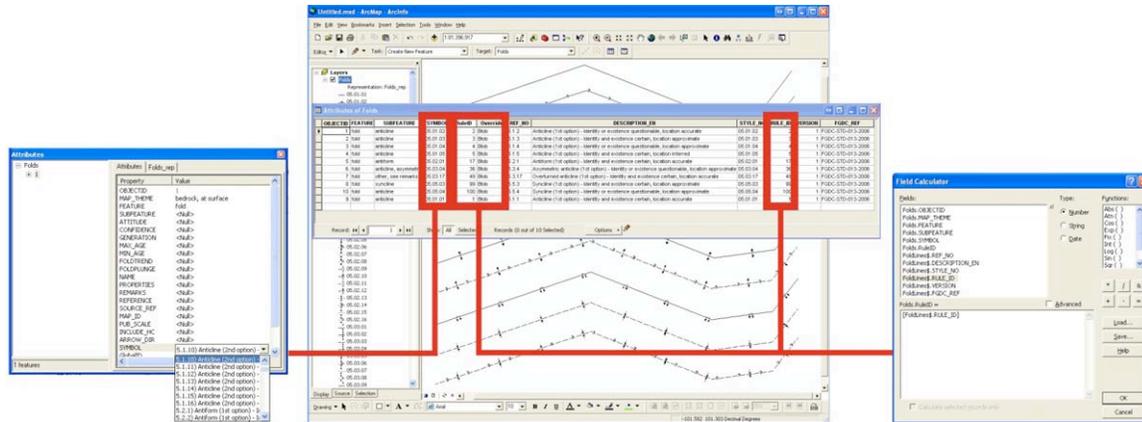


Figure 9. Feature coding. The left side depicts assigning an FGDC symbol (with domain description) to the Symbol field of the feature class. The coded value of the domain (which is the style file symbol number) is used to render the feature using “Match to Symbol in a Style”. The right side depicts assigning the RULE_ID value from the joined master spreadsheet to the carto representation RULE_ID of the feature class.

REFERENCES

- Clark, Ryan, 2009, Arizona Geological Survey, Capture Representations: an ArcScript available as a download from ESRI Support Center, <http://arcscrips.esri.com>.
- Federal Geographic Data Committee [prepared for the Federal Geographic Data Committee by the U.S. Geological Survey], 2006, FGDC Digital Cartographic Standard for Geologic Map Symbolization: Reston, Va., Federal Geographic Data Committee Document Number FGDC-STD-013-2006, 290 p., 2 plates, http://ngmdb.usgs.gov/fgdc_gds/.

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