DIGITAL MAPPING TECHNIQUES 2023

The following was presented at DMT'23
May 21 - 24, 2023

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2023)

http://ngmdb.usgs.gov/info/dmt/

Migrating Legacy Geologic Maps into GeMS using GeoMapMaker

A large number of geologic maps exist in various genera of GIS software and diverse data structures prior to the GeMS specification. It is desirable to migrate such legacy maps efficiently into "full GeMS", taking advantage of the fact that they are already digital rather than struggling with their idiosyncrasies. We present a general, largely automated procedure to accomplish the migration utilizing the AZGS GeoMapMaker add-in for Esri ArcGIS Pro together with Pro's built-in capabilities for cross-referenced geodatabase loading.

PROGRESS on

XR Loader

Tool for Map Archaeology and Curation

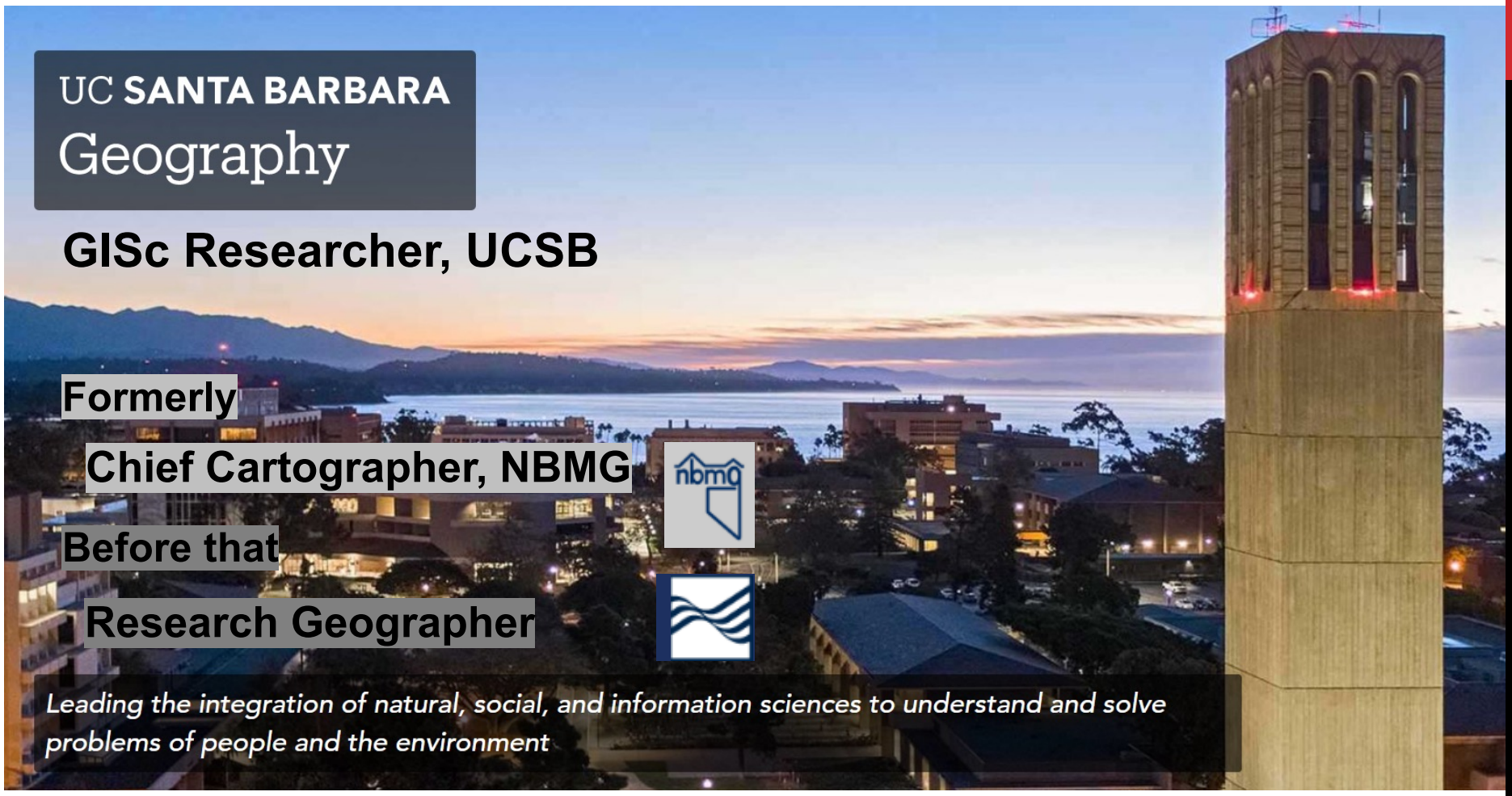
Jordan T. Hastings
UC Santa Barbara

Independent Research

Carlos Gutierrez
CA Resources / CGS

Andrew Zaffos
AZ Geological Survey

BACKGROUND



Advanced love / hate relationship with geologic maps in GIS databases

FOREGROUND

Simplify, simplify

Different focus – the map-user

Result of six-month leave from NBMG ca. 2010, to assist Magma Energy, a geothermal startup

No ArcGIS

Rockware and Excel

FOREGROUND

Another different focus – <u>conservatorship</u>

Result of my own 20-year experience in preserving a map as GIS technology rolls forward

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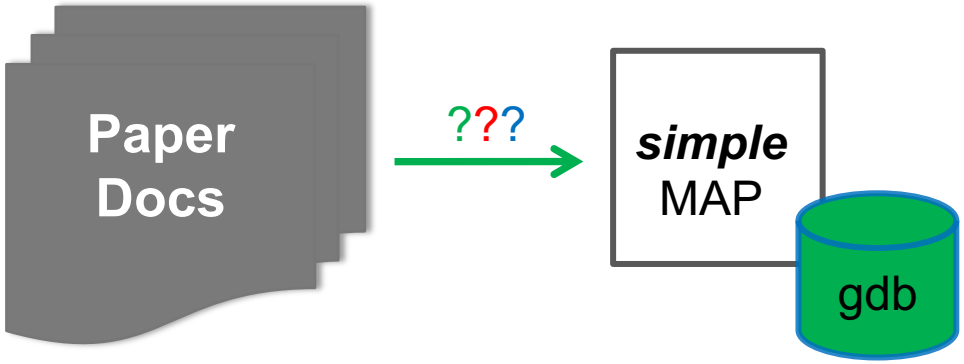
Pre ArcMap

Arc/INFO, AI roughly digital, poor support



XRLOADER - Motivations

Dan Morse (Mississippi Survey) at DMT'22

"Can GeMSQLite help me get started with GeMS " - No

Hastings (since 2004)

! Began work w/ Art Sylvester (UCSB) on Tahoe-Donner map

Gutierrez & Hastings (since 2012)

? Is CGS MS-60 Tahoe-Donner map available in GeMS *yet*

XRLOADER – What Is It?

Tool(s) for getting started with GeMS

Take inventory of existing GIS-related data

Help migrate selected data into GeMS

Prepare for GeMS validation ala USGS

Jump to ArcGIS Pro – cut the cord to ArcMap

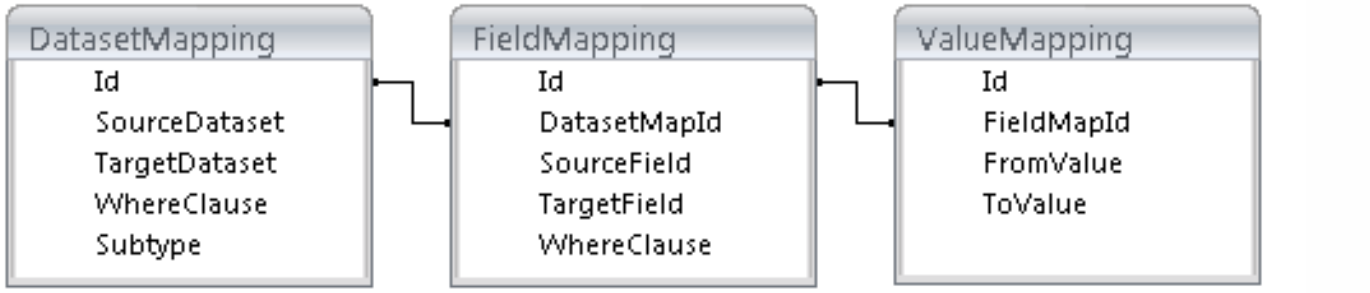
XRLOADER – How's it Work?

Leverage Esri's Cross-Reference Load Tools

1. **Create a "recipe" for Loading a variety of files into a geodatabase** – *recipe itself in a geodatabase*
2. **Load the Target geodatabase per the recipe, from coverages, shapefiles, or geodatabases –** *one swell foop!*

XRLOADER – How it Works

Esri's Cross-Reference *Geodatabase*



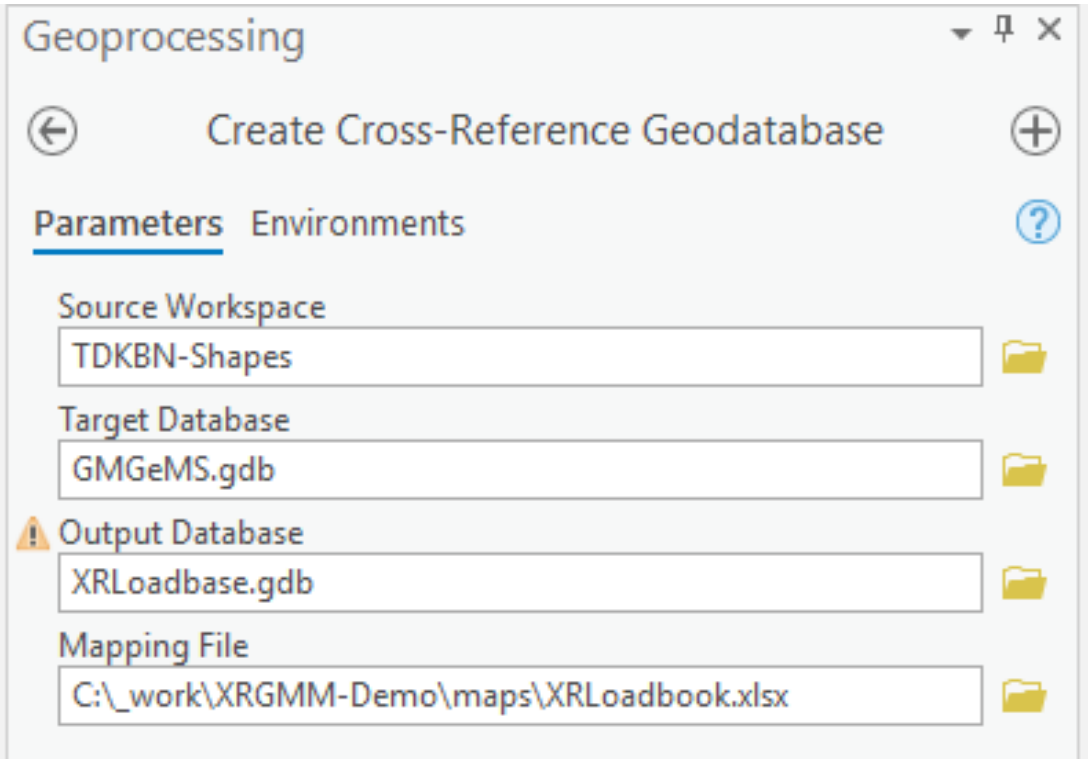
	Id *	SourceDataset	TargetDataset	WhereClause
1	1	CAF	ContactsAndFaults	
2	2	MUP	MapUnitPolys	
	Click to add new ro			

	Id *	DatasetMapId	SourceField	TargetField	WhereClause
1	1	1	LType	Type	
2	2	2	MapUnit	MapUnit	
3	3	2	PType	Label	
4	4	2	IdentityCo	IdentityConfidence	<Null>
5	5	1	LocationCo	LocationConfidence...	<Null>
	Click to add new row.				

	Id *	FieldMapId	FromValue	ToValue
1	1	5	-9	10
	Click to add new row.			

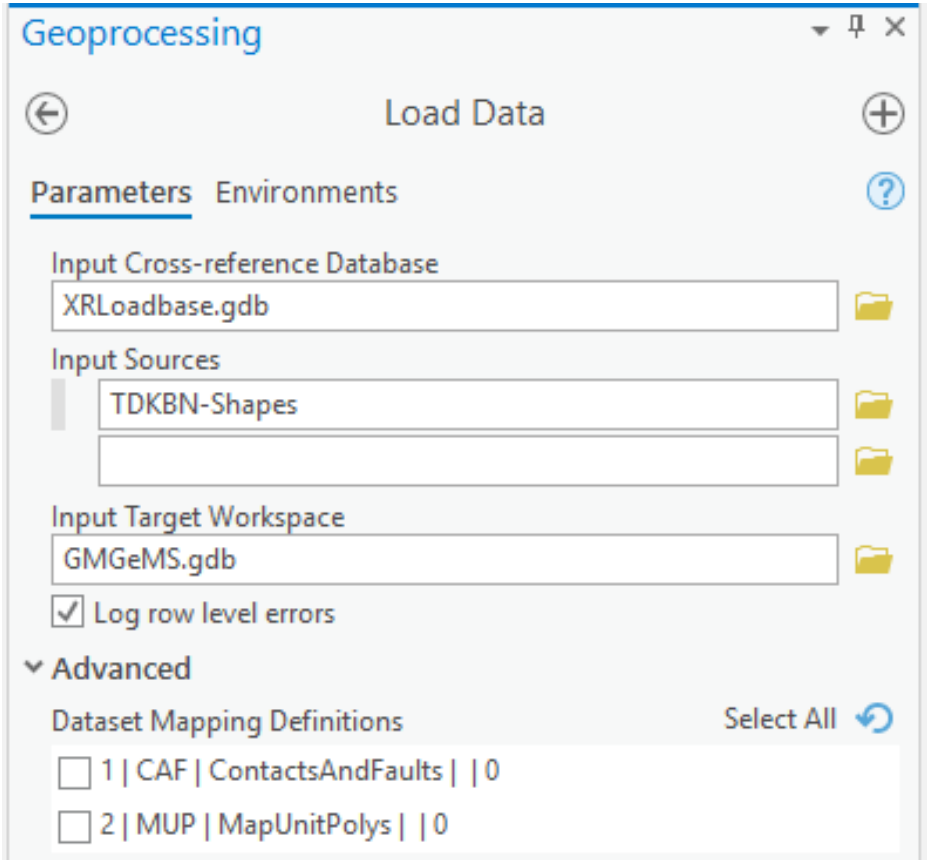
XRLOADER – How it Works

1. Create Esri's "Recipe"

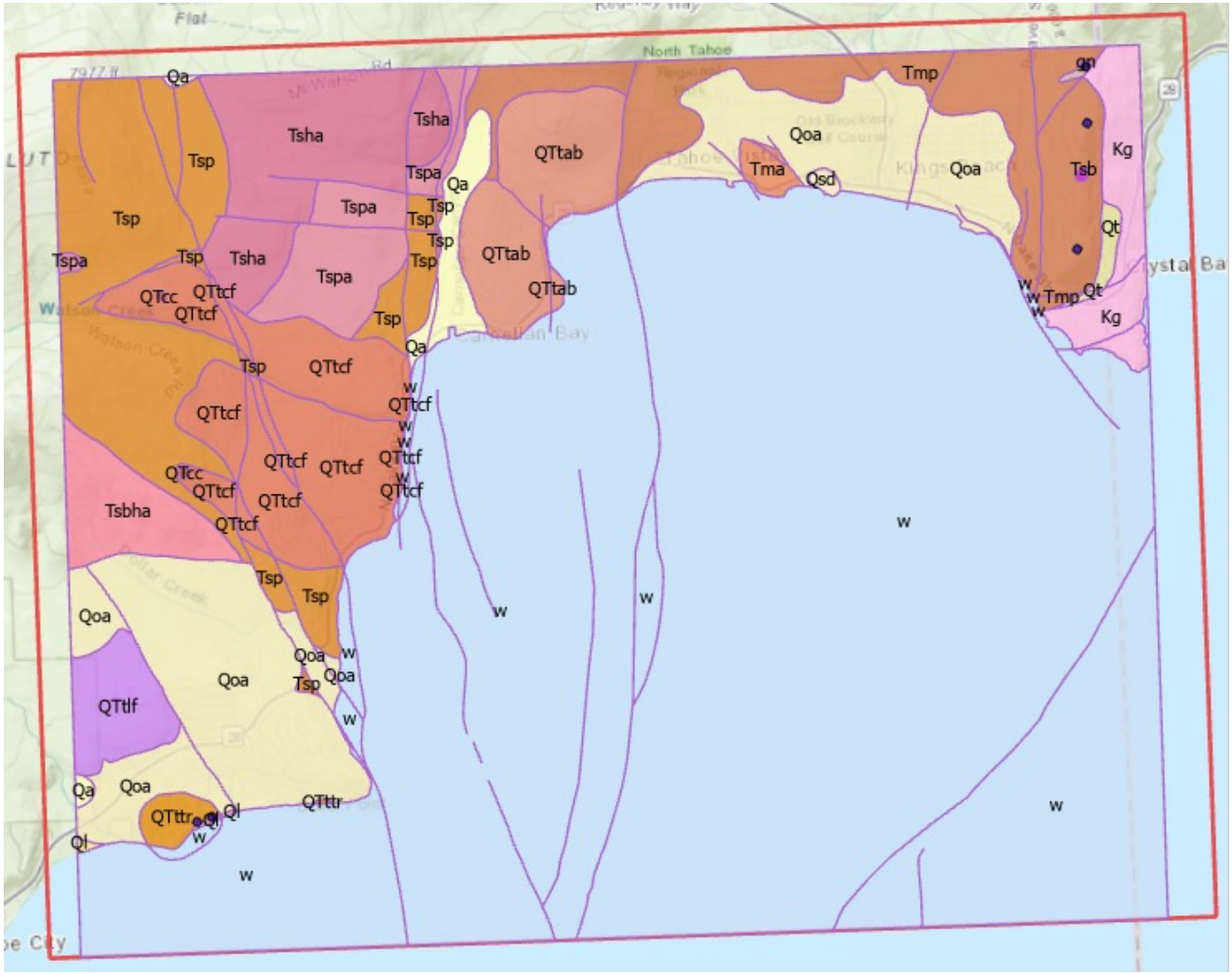


XRLoader – How it Works

2. Use Esri's "Recipe"



XRLOADER – Results!



XRLOADER – Tool 1

XRLoader.ipynb – Python in Jupyter Notebook

- Controlled by three text strings
- Recursively “walks” the whole workspace
- Creates a ‘.manifest.txt’ of the workspace

XRLoader – Tool 1

XRLoader.ipynb – Python in Jupyter Notebook

Introduction

Cross-Reference (XR) Loading is built-in Esri ArcGIS Pro functionality that assists with transforming large, potentially complicated older GIS data structures from coverages, shapefiles, a/or geodatabases (Soures) to a new geodatabase (Target).

In [ ]:
```
top = r'C:\_work\XRGMM-Demo\map1'
source = r'\data'
target = r'\GMGeMS.gdb'
```

.manifest.txt - Notepad

File Edit Format View Help

```
Inventory of C:\_work\XRGMM-Demo\map
\data\MS_060_TDKBN-Shapes\CAF.shp, 207 rec [Source]
 <omitted>
\data\MS_060_TDKBN-Shapes\MUP.shp, 79 rec [Source]
  FID,OID,4
 <omitted>
\data\MS_060_TDKBN-Shapes\OSP.shp, 5 rec [Source]
 <omitted>
\data\MS_060_TDKBN-Shapes\NClip.shp, 1 rec [Source]
  FID,OID,4
  Shape,Geometry,0
  Name,String,60
\data\MS_060_TD_v1.1.gdb\DescriptionOfMapUnits, 0 rec [Source]
  OBJECTID,OID,4
  MapUnit,String,10
  Name,String,254
  FullName,String,254
  Age,String,254
  Description,String,3000
  HierarchyKey,String,254
  ParagraphStyle,String,254
  Label,String,30
  Symbol,String,254
  AreaFillRGB,String,254
  AreaFillPatternDescription,String,254
  DescriptionSourceID,String,50
  GeoMaterial,String,254
  GeoMaterialConfidence,String,254
  DescriptionOfMapUnits_ID,String,50
```

Notebook

```
. 207 rec [Source]
. 79 rec [Source]
le, 1 rec [Source]
. 5 rec [Source]
s - Table, 0 rec [
```

XRLoader – Tool 2

XRLoader.xlsm – Interactive Excel Workbook

- **Reads the '.manifest.txt' file …**
  … writes the Esri Cross-Reference geodatabase

  1. Auto-Matches Datasets (Source(s) → Target)
  2. Auto-Matches Fieldsets (Source(s) → Target)
  3. Exports the exact Esri 'Loadbase.xlsx' *model*

  Allows manual tweaks at every step

XRLOADER – Tool 2

1. Datasets Auto-Matched

	A	B	C	
1	**Type**	**Container**	**Dataset**	**Fields**
2				
3	Target	\GMGeMS.gdb\	DescriptionOfMapUnits	*, MapUnit, Name, FullName, A
4	Target	\GMGeMS.gdb\	DataSources	*, Source, Notes, URL, DataSour
5	Target	\GMGeMS.gdb\	Glossary	*, Term, Definition, DefinitionS
6	Target	\GMGeMS.gdb\	GeoMaterialDict	*, HierarchyKey, GeoMaterial, I
7	Target	\GMGeMS.gdb\GeologicMap\	Stations	*, FieldID, LocationConfidenceM
8	Target	\GMGeMS.gdb\GeologicMap\	OrientationPoints	*, Type, Azimuth, Inclination, S
9				
10				
11	Target	\GMGeMS.gdb\GeologicMap\	ContactsAndFaults	*, Type, IsConcealed, LocationC
12	Source1	\data\MS_060_TD_v1.1.gdb\GeologicMap\	ContactsAndFaults	*, Shape_Length, Type, IsConce
13				
14	Target	\GMGeMS.gdb\GeologicMap\	MapUnitPolys	*, MapUnit, IdentityConfidence
15	Source1	\data\MS_060_TD_v1.1.gdb\GeologicMap\	MapUnitPolys	*, Shape_Length, Shape_Area, I
16	Source2	\TDKBN\GMGeMS.gdb\GeologicMap\	MapUnitPolys	*, MapUnit, IdentityConfidence
17				
18				
19	Source1	\data\MS_060_TD_v1.1.gdb\	~~DescriptionOfMapUnits~~	*, MapUnit, Name, FullName, A
20	Source1	\data\MS_060_TD_v1.1.gdb\	DataSources	*, Source, Notes, URL, DataSour

XRLOADER – Tool 2

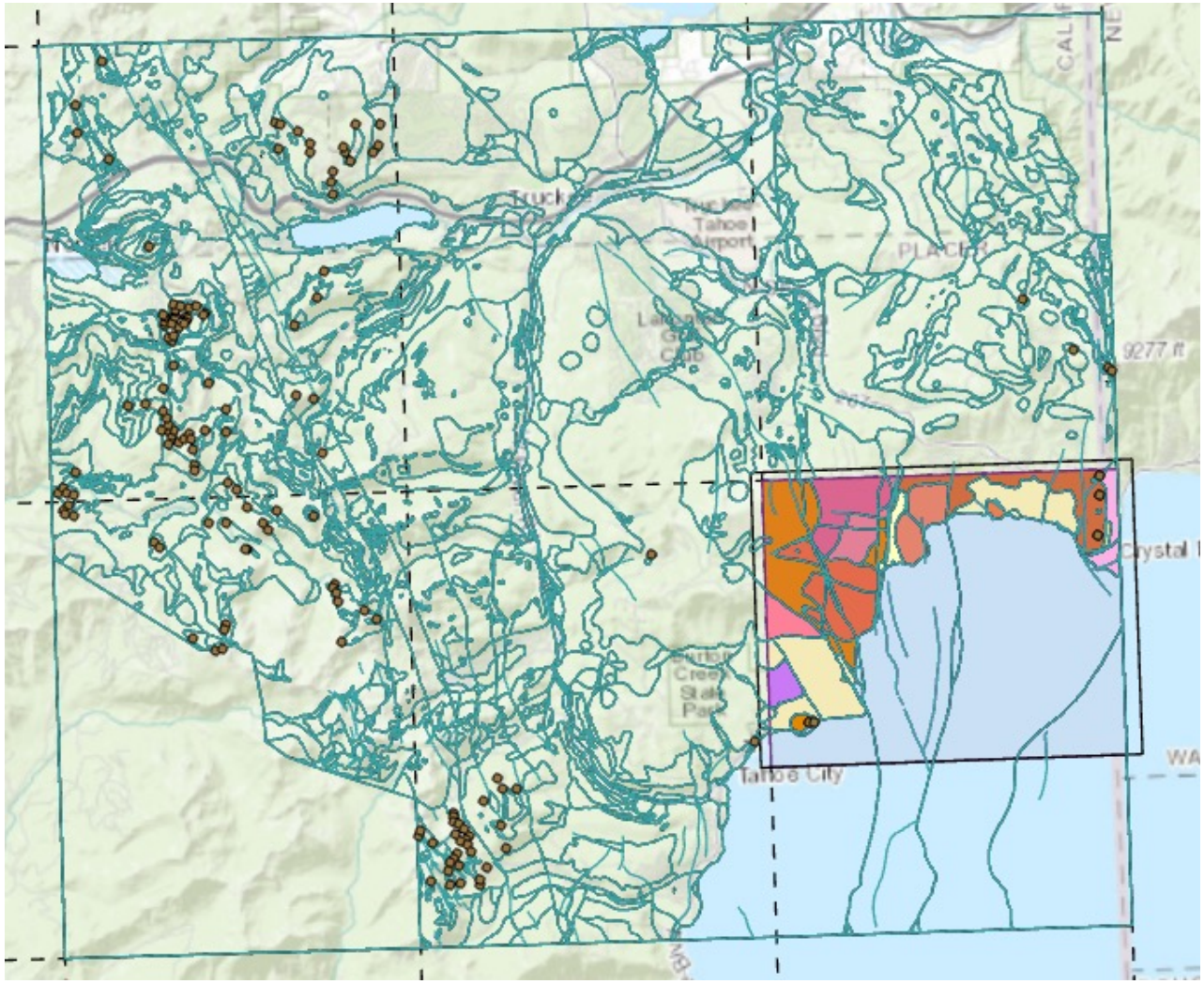
2. Fieldsets Auto-Matched

	A	B	C	D
1	**Source Dataset**	**Fields**	**Target Dataset**	**Fields**
2				
3	**ContactsAndFaults**		**ContactsAndFaults**	
4		**Type**		**Type**
5		**IsConceal**		**IsConcealed**
6		**LocationCo**		**LocationConfidenceMeters**
7		**Label**		**Label**
8		**Symbol**		**Symbol**
9		**Notes**		**Notes**
10		**CAF_ID**		**ContactsAndFaults_ID**
11		~~**Shape_Length**~~		~~**created_user**~~
12		LTYPE		~~**created_date**~~
13				
14	**MapUnitPolys**		**MapUnitPolys**	
15		***MapUnit***		***MapUnit***
16		**IdentityCo**		**IdentityConfidence**
17		**Label**		**Label**
18		**Symbol**		**Symbol**
19		**MUP_ID**		***MapUnitPolys_ID***
20		PTYPE		GlobalID
21		~~**Shape_Length**~~		~~**created_user**~~
22		~~**Shape_Area**~~		~~**created_date**~~

bolded if exact match
italicized if patial match
~~stricken~~ if not loadable

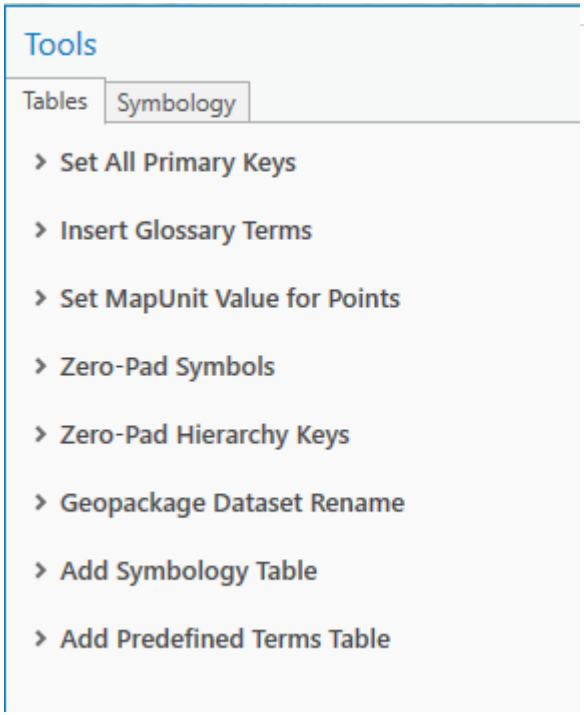
underlined iif to be loaded

MS_60 TAHOE-DONNER



GeoMapMaker – afterwards

Gets started quickly w/"bare-bones" GeMS



File | C:/Users/Hastings/AppData/Local/Temp/12/ArcGISPro...

Symbology: Passed

Rule	Result
Table exists.	Passed
No duplicate tables.	Passed
No missing fields.	Passed
No missing ContactsAndFaults symbols	Passed
No duplicate ContactsAndFaults symbols	Passed
No missing OrientationPoints symbols	Passed
No duplicate OrientationPoints symbols	Passed

DataSources: Failed

Rule	Result
Table exists.	Passed
No duplicate tables.	Passed
No missing fields.	Passed
No empty/null values in required fields.	Passed
No duplicate ids.	Passed
No unused data sources.	Unused data source: DAS000
No missing data sources.	Passed

DescriptionOfMapUnits: Failed

GeoMapMaker – afterwards

Gets started quickly w/"bare-bones" GeMS

- Editing the DAS, DMU and other tables
- Rebuilding all (or selected) polygons
- Preparing pre-validation Reports

Many ancillary benefits, because of "recipe"

- **Research spatial-data outside GIS**
- **Build once, use repeatedly, standardly**
- **Combine multiple, disparate sources**
- **Roll forward with GeMS revisions**
- **Dig deeper into field *values***

GeoMapMaker/XRLoader – discussion?

THANKS!

[end]