A Flexible Framework for Data Preservation and Distribution

Andrew Zaffos and Laura Bookman

Arizona Geological Survey,
University of Arizona
Tucson, Arizona

THE UNIVERSITY OF ARIZONA

ARIZONA GEOLOGICAL SURVEY AZGS

Today's themes

Extensibility

- Your data WILL change
- Technology WILL change

Multi-Path

- Distribute your data widely
- Make your data adaptable

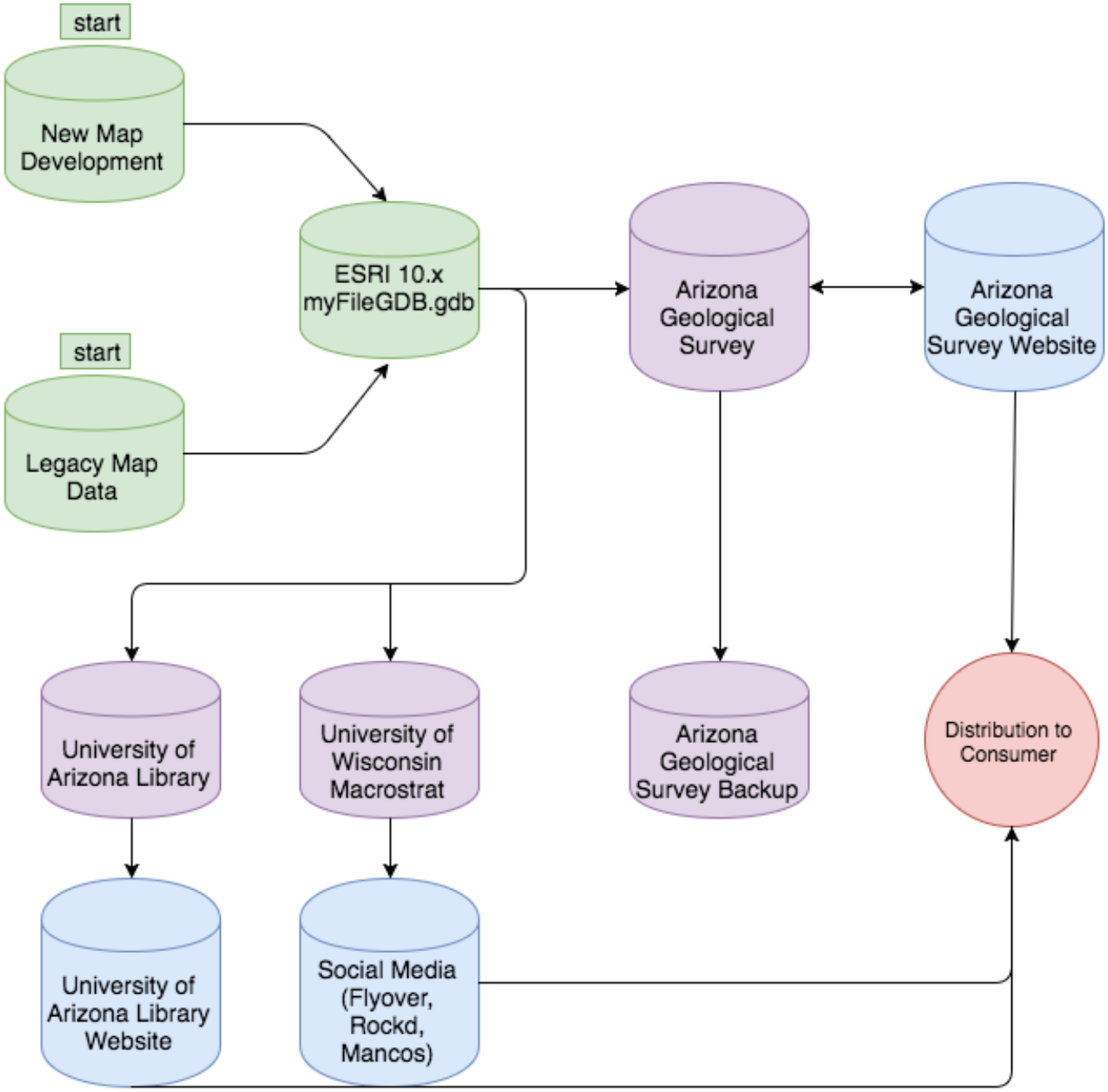
Enhancement

- Interpolating or Extrapolating info
- Don't stress about the front-end

Background

For nearly 120-years, Geologists of the Arizona Geological Survey and it's predecessors have explored, investigated, and mapped the geology of Arizona.

Their work is compiled in numerous geologic maps, circulars and reports, and now digital information datasets.



Creation

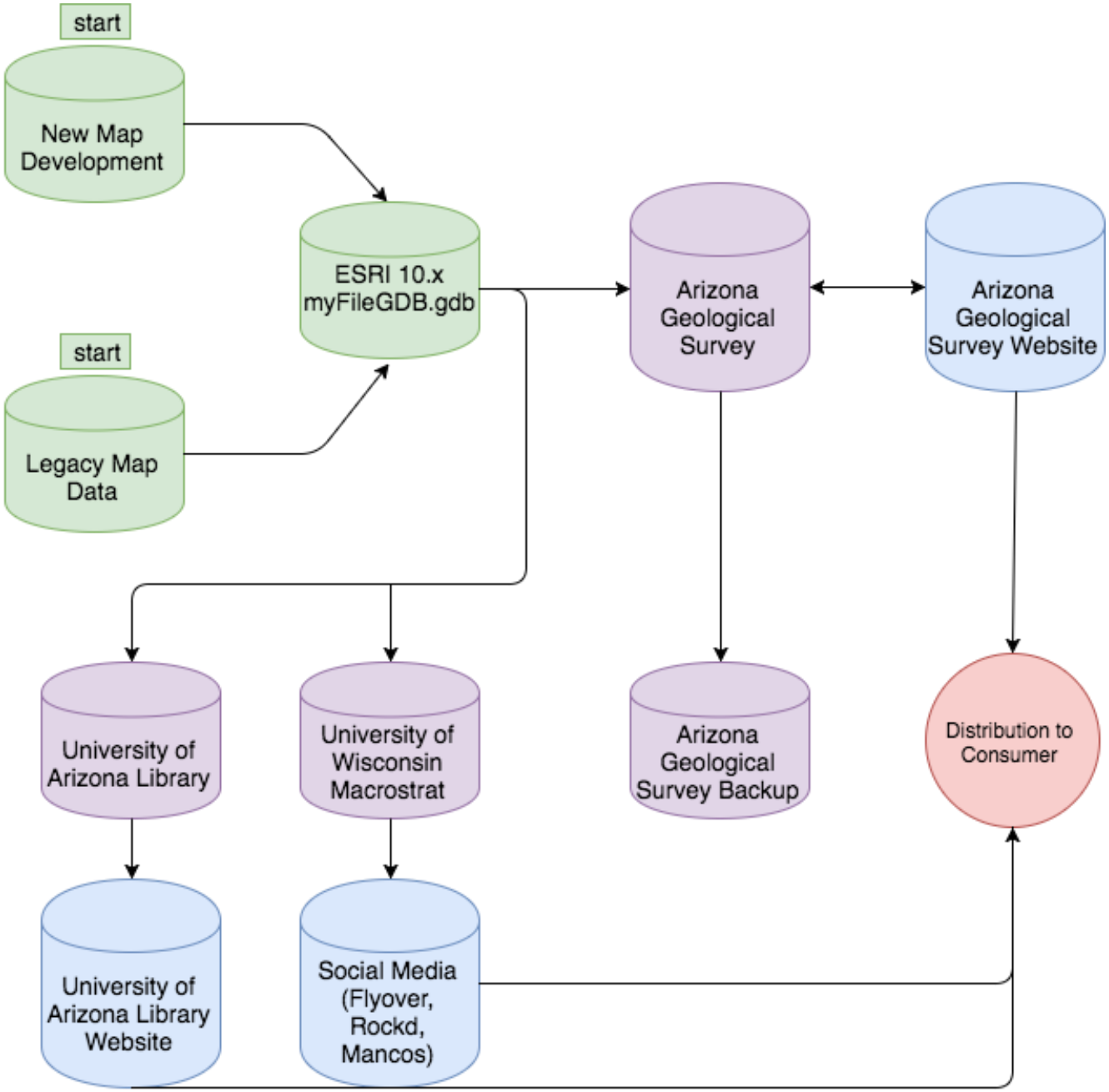
- Live Sync
- Conversion
- Documentation

Preservation

- Multi-path
- Open Source
- Searchable
- Automation
- Conversion

Distribution

- Multi-path
- Multi-format



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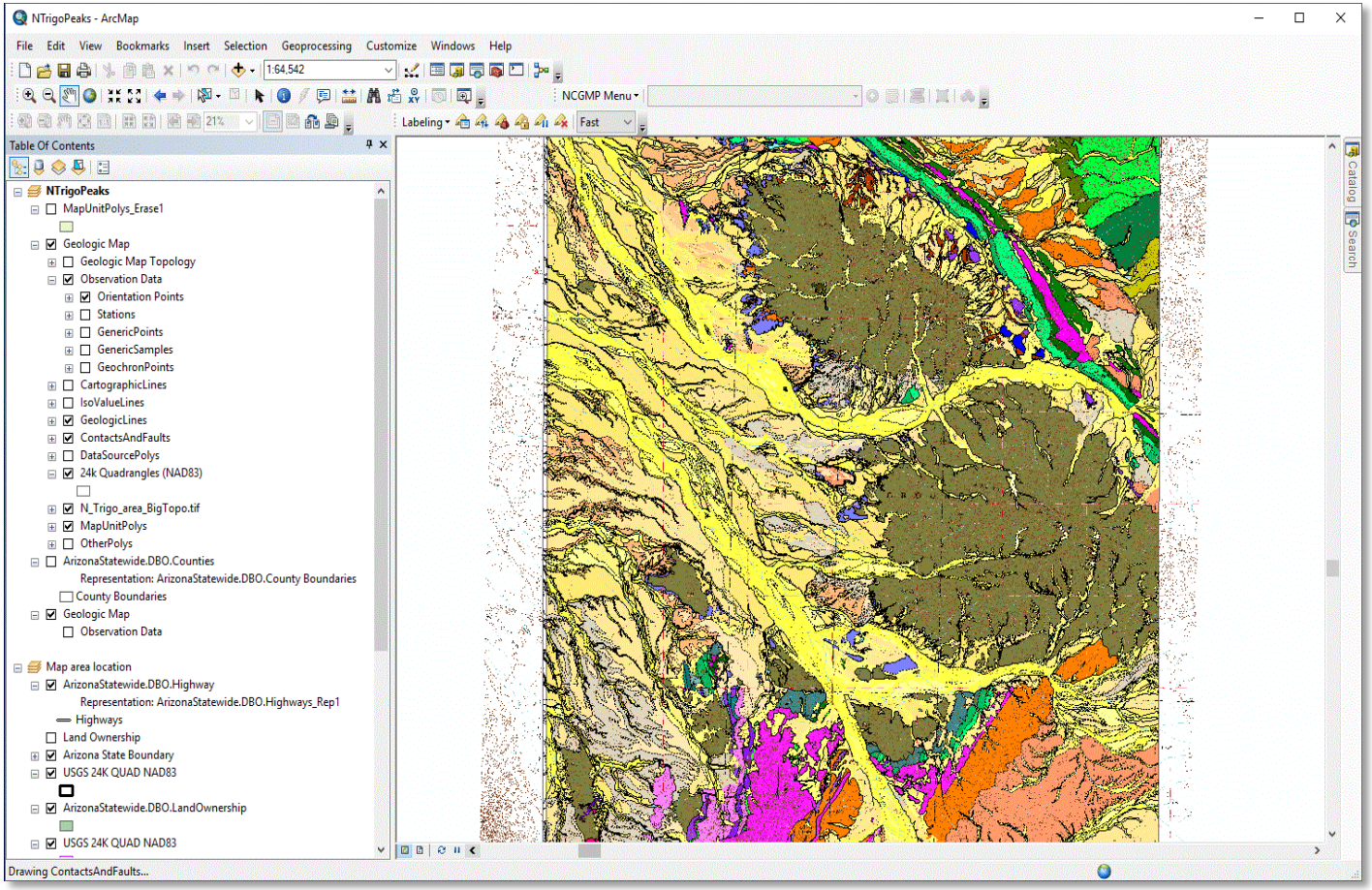
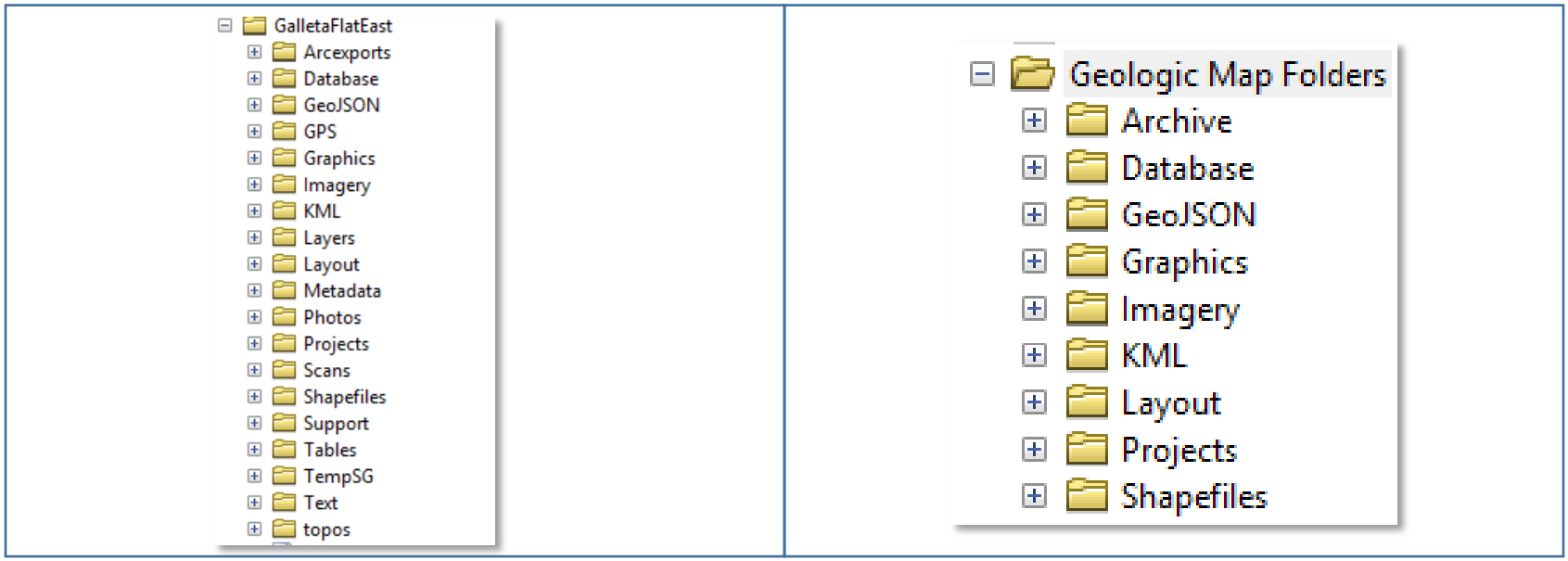
Creation: Conversion

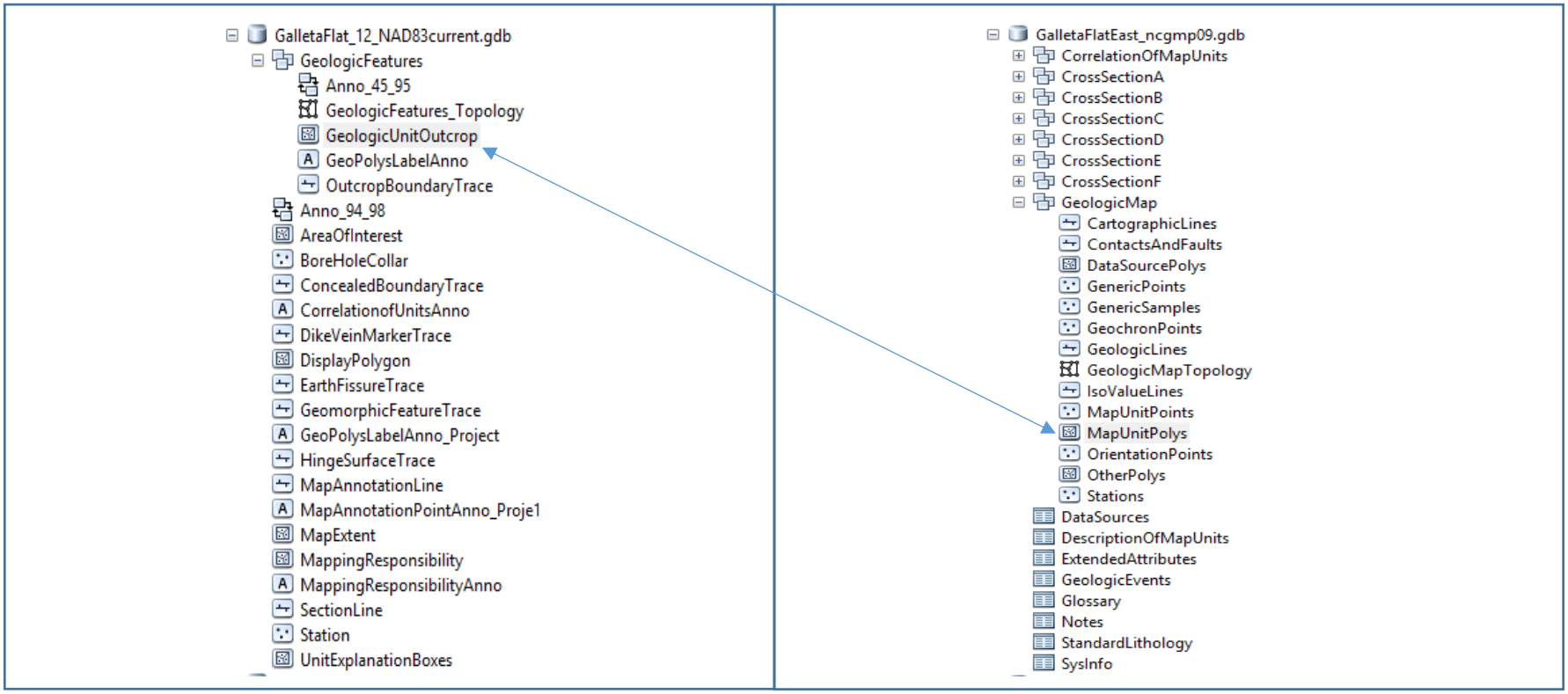
Since 2000, our geologic maps have been constructed using evolving versions of ESRI ArcGIS programs.



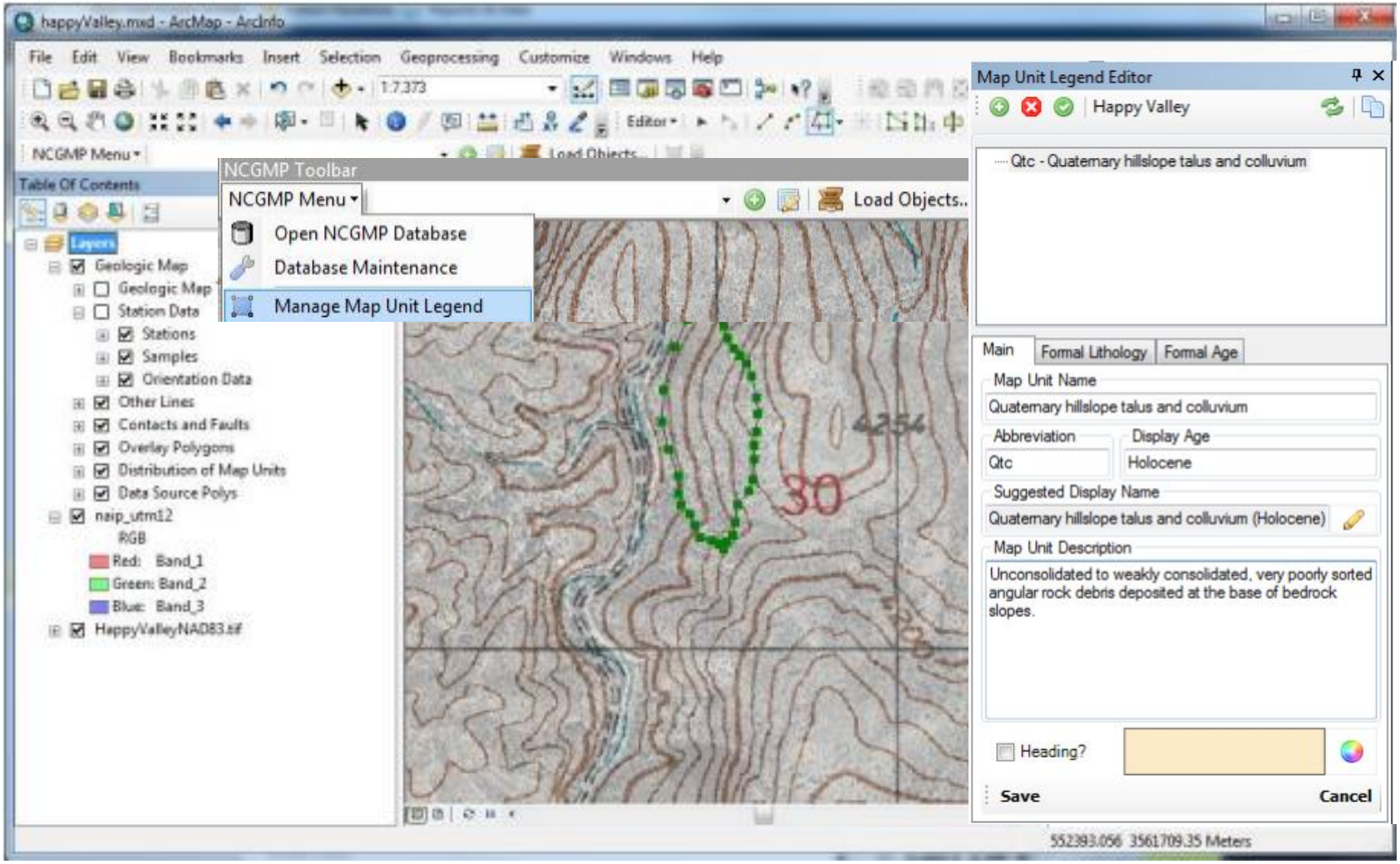
Creation: Conversion



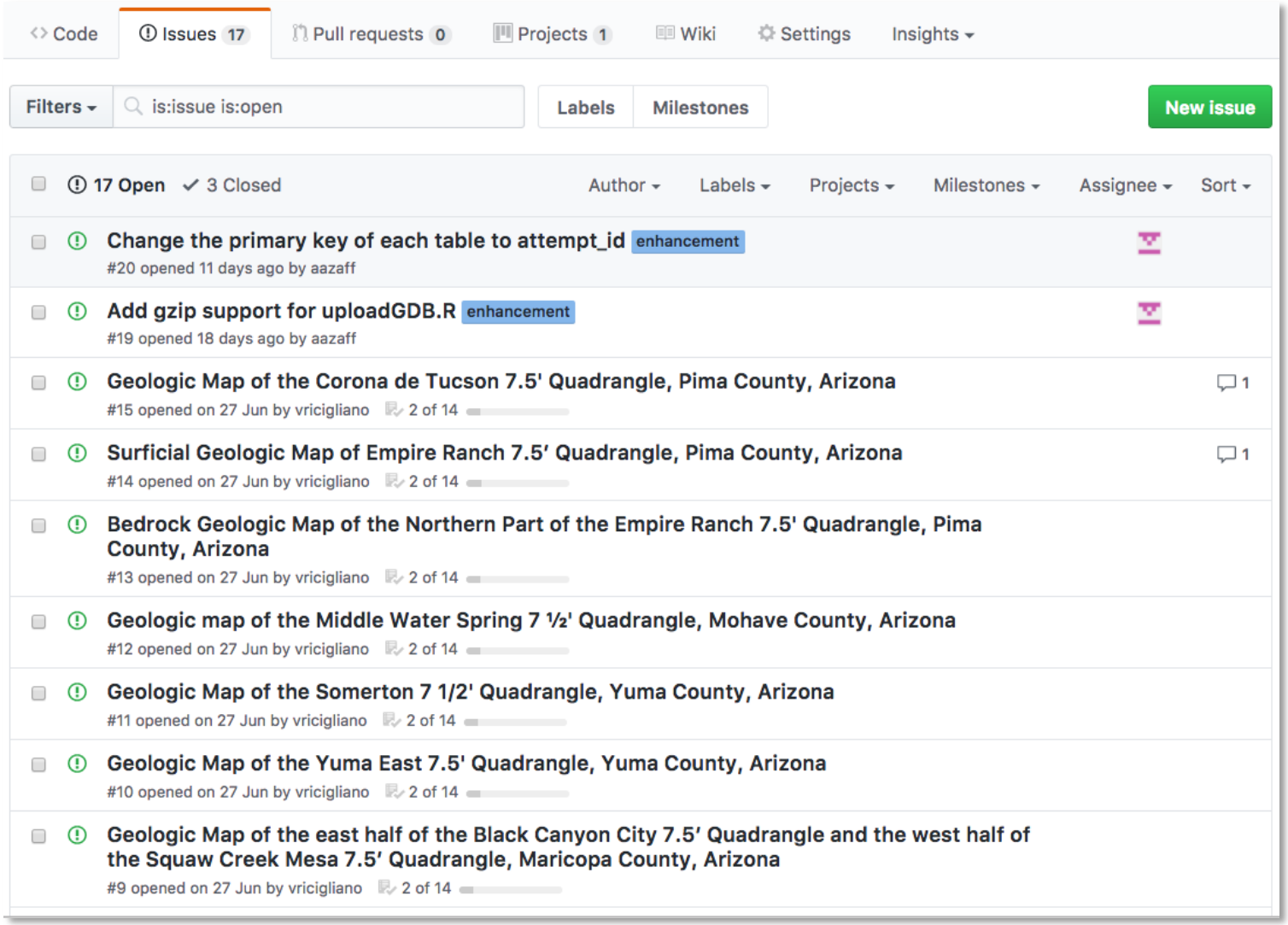
Creation: Conversion



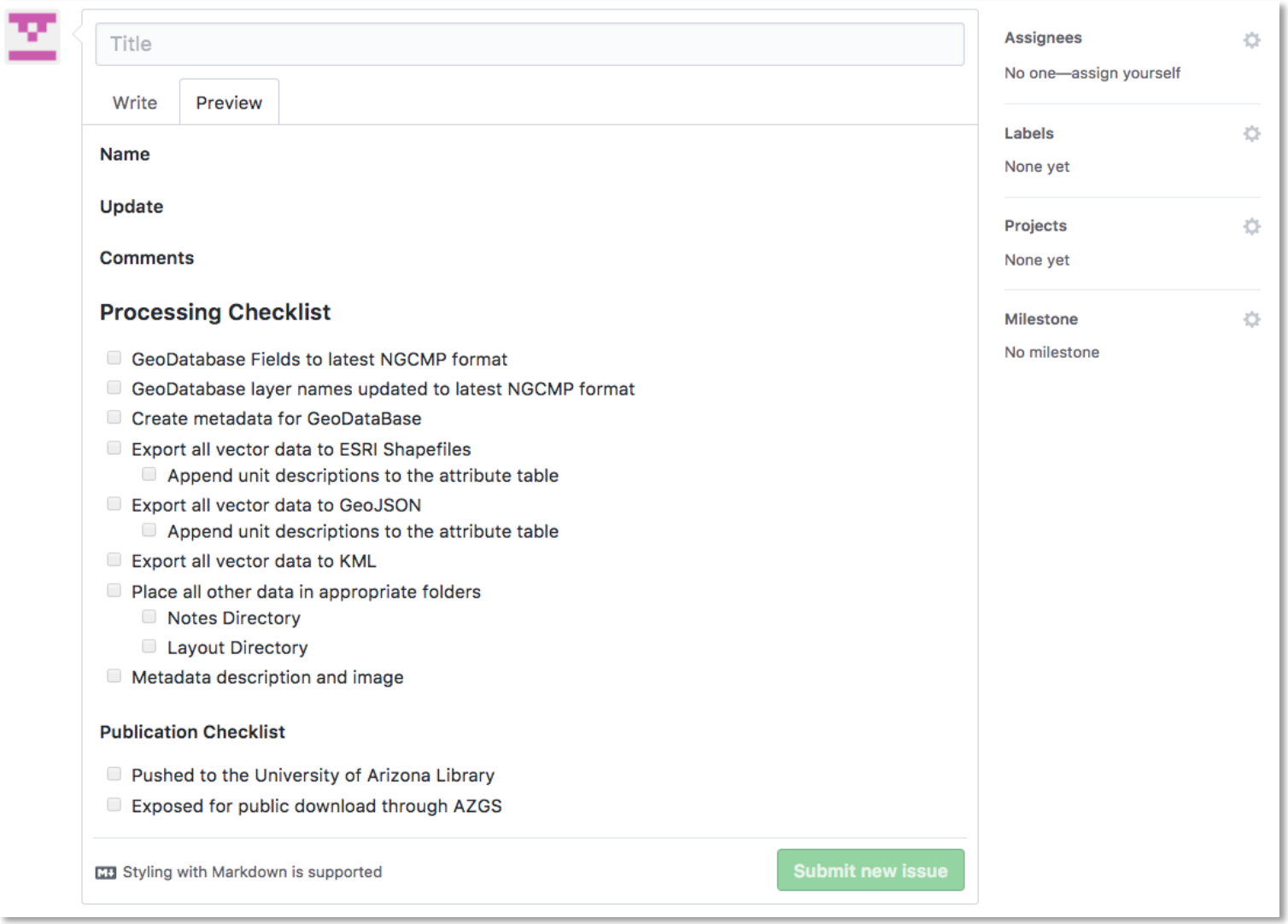
Creation: Live Sync



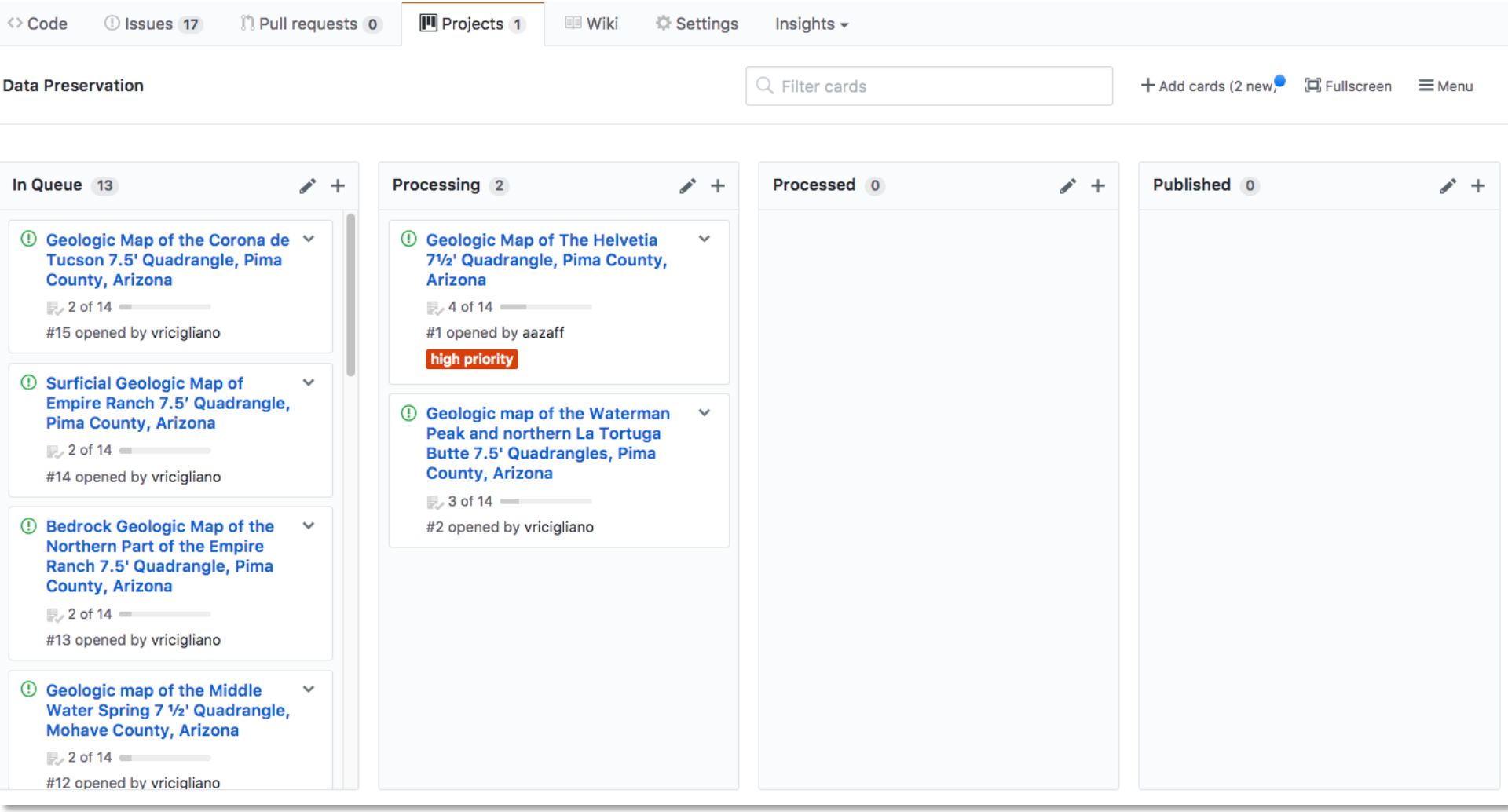
Creation: Documentation

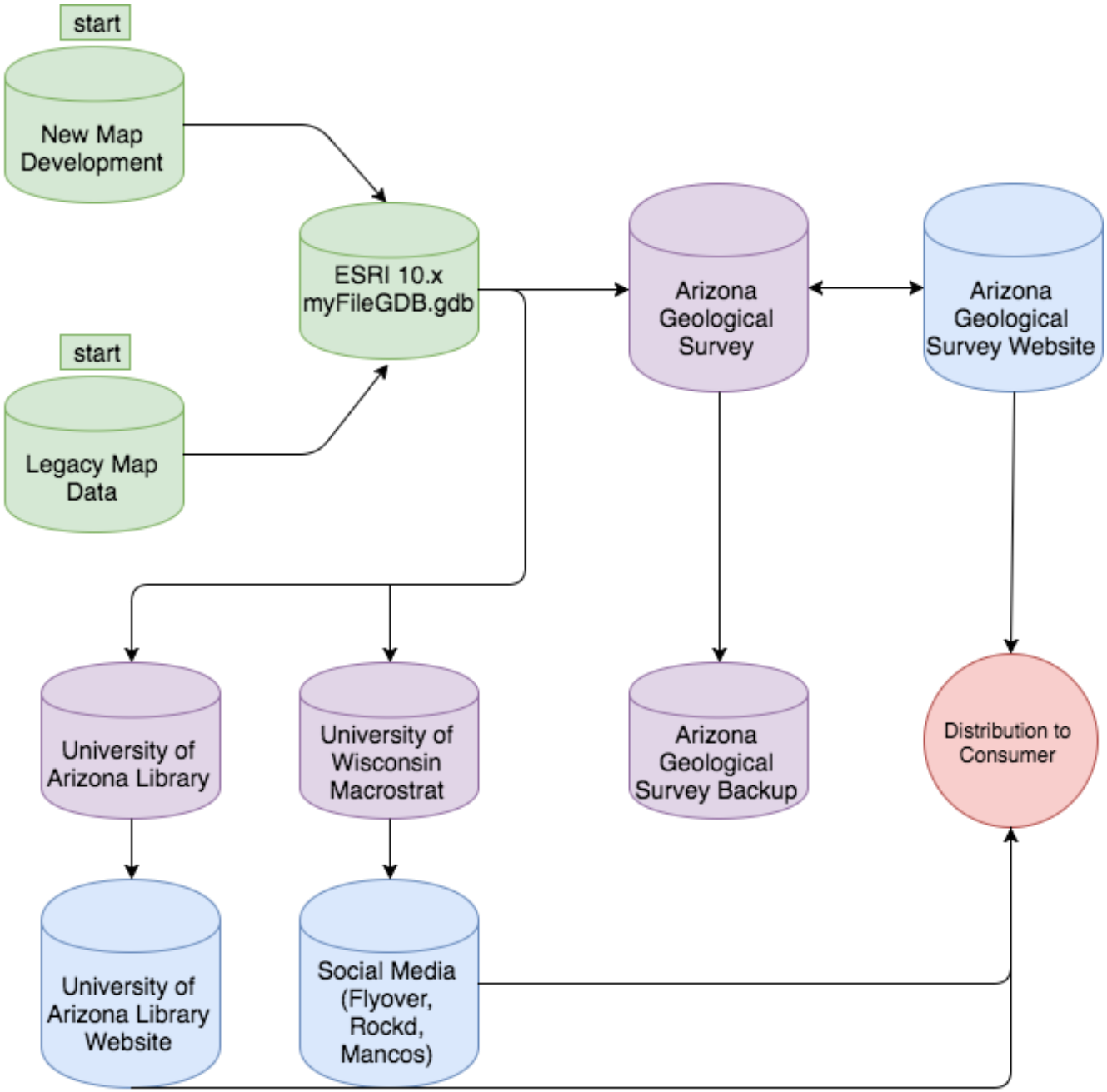


Creation: Documentation



Creation: Documentation





Creation

- Live Sync
- Documentation
- Low-Cost

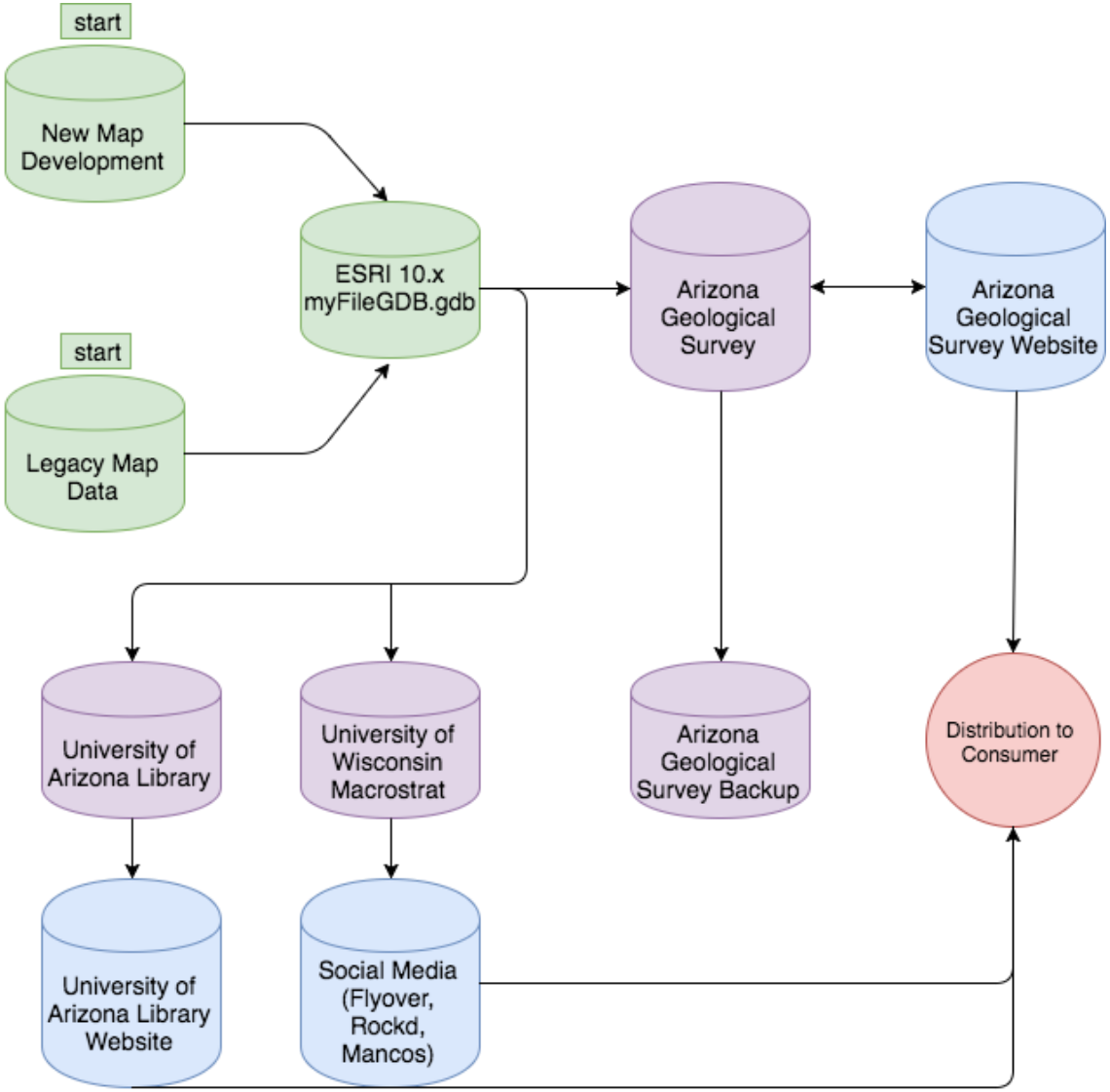
Preservation

- Multi-path
- Open Source
- Searchable
- Automation
- Conversion

Distribution

- Multi-path
- Multi-format

Preservation: Multi-path

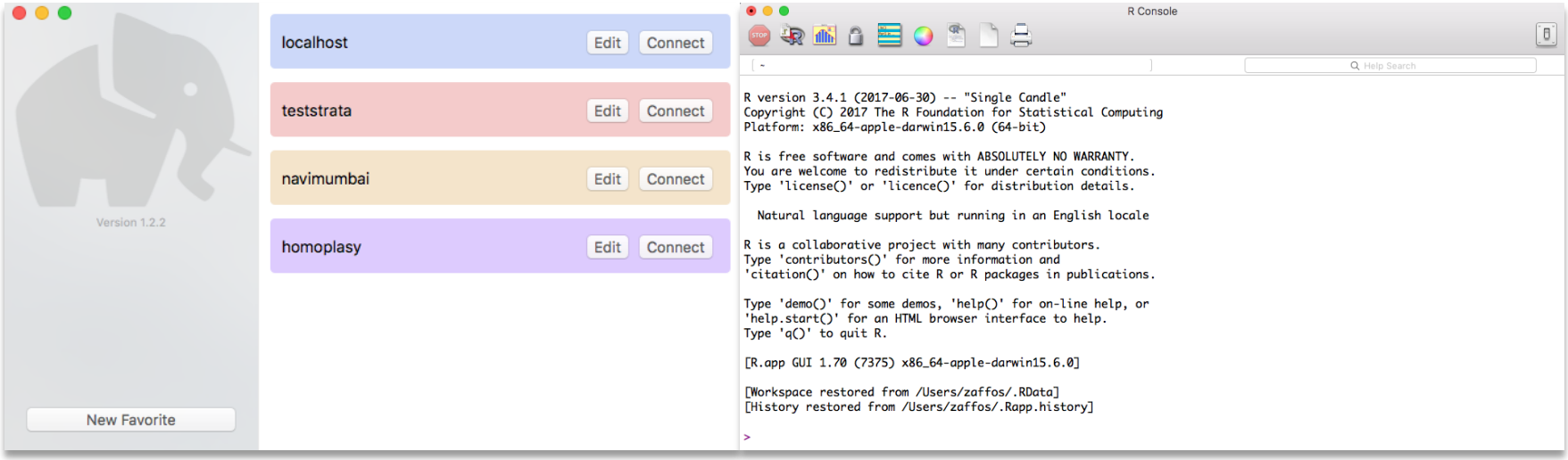


ARIZONA GEOLOGICAL SURVEY AZGS

ARIZONA
University of Ariz Library

The Macrostrat Database
integrated global stratigraphy

Preservation: Open Source



Benefits

- Free
- Community-Supported
- Computationally Fast
- Cross-Platform Compatible

- It's the right way to do it!!

Challenges

- Difficult to install
- Requires coding literacy

Preservation: Automation

GDAL: ogr2ogr

www.gdal.org/ogr2ogr.html

DESCRIPTION

This program can be used to convert simple features data between file formats performing various operations during the process such as spatial or attribute selections, reducing the set of attributes, setting the output coordinate system or even reprojecting the features during translation.

-f *format_name*:
output file format name (default is ESRI Shapefile), some possible values are:

```
-f "ESRI Shapefile"
-f "TIGER"
-f "MapInfo File"
-f "GML"
-f "PostgreSQL"
```

-append:
Append to existing layer instead of creating new

-overwrite:
Delete the output layer and recreate it empty

-update:
Open existing output datasource in update mode rather than trying to create a new one

-select *field_list*:
Comma-delimited list of fields from input layer to copy to the new layer. A field is skipped if mentioned previously in the list even if the input layer has duplicate field names. (Defaults to all; any field is skipped if a subsequent field with same name is found.) Starting with OGR 1.11, geometry fields can also be specified in the list.

-progress:
(starting with GDAL 1.7.0) Display progress on terminal. Only works if input layers have the "fast feature count" capability.

-sql *sql_statement*:
SQL statement to execute. The resulting table/layer will be saved to the output. Starting with GDAL 2.1, the @filename syntax can be used to indicate that the content is in the pointed filename.

-dialect *dialect*:
SQL dialect. In some cases can be used to use (unoptimized) OGR SQL instead of the native SQL of an RDBMS by passing OGRSQL. Starting with GDAL 1.10, the "SQLITE" dialect can also be used with any datasource.

-where *restricted_where*:
Attribute query (like SQL WHERE). Starting with GDAL 2.1, the @filename syntax can be used to indicate that the content is in the pointed filename.

-skipfailures:
Continue after a failure, skipping the failed feature.

-spat *xmin ymin xmax ymax*:
spatial query extents, in the SRS of the source layer(s) (or the one specified with -spat_srs). Only features whose geometry intersects the extents will be selected. The geometries will not be clipped unless -clipsrc is specified

-spat_srs *srs_def*:
(OGR >= 2.0) Override spatial filter SRS.

-geomfield *field*:
(OGR >= 1.11) Name of the geometry field on which the spatial filter operates on.

Preservation: Automation

```
zaffos — azaffos@azaffos-development: ~/GitRepositories/data_preservation_processing/development — ssh -L 5444:127.0.0.1:5432 azaffos@10.208.1.128 — 172×34
azaffos@azaffos-development:~/GitRepositories/data_preservation_processing/development$ ls
configureDatabase.R  downloadFile.R  undoAttempt.R  uploadGDB.R  uploadShapes.R
azaffos@azaffos-development:~/GitRepositories/data_preservation_processing/development$ Rscript configureDatabase.R /home/azaffos/uploads/Helvetia_ncgmp09.gdb preservation
Loading required package: RPostgreSQL
Loading required package: methods
Loading required package: DBI
Loading required package: rgdal
Loading required package: sp
rgdal: version: 1.2-8, (SVN revision 663)
 Geospatial Data Abstraction Library extensions to R successfully loaded
 Loaded GDAL runtime: GDAL 2.2.1, released 2017/06/23
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 Loaded PROJ.4 runtime: Rel. 4.9.2, 08 September 2015, [PJ_VERSION: 492]
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 Linking to sp version: 1.2-5
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<PostgreSQLResult>
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azaffos@azaffos-development:~/GitRepositories/data_preservation_processing/development$ Rscript uploadGDB.R /home/azaffos/uploads/Helvetia_ncgmp09.gdb preservation helvetia
Loading required package: RPostgreSQL
Loading required package: methods
Loading required package: DBI
[1] TRUE
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Loading required package: RPostgreSQL
Loading required package: methods
Loading required package: DBI
[1] TRUE
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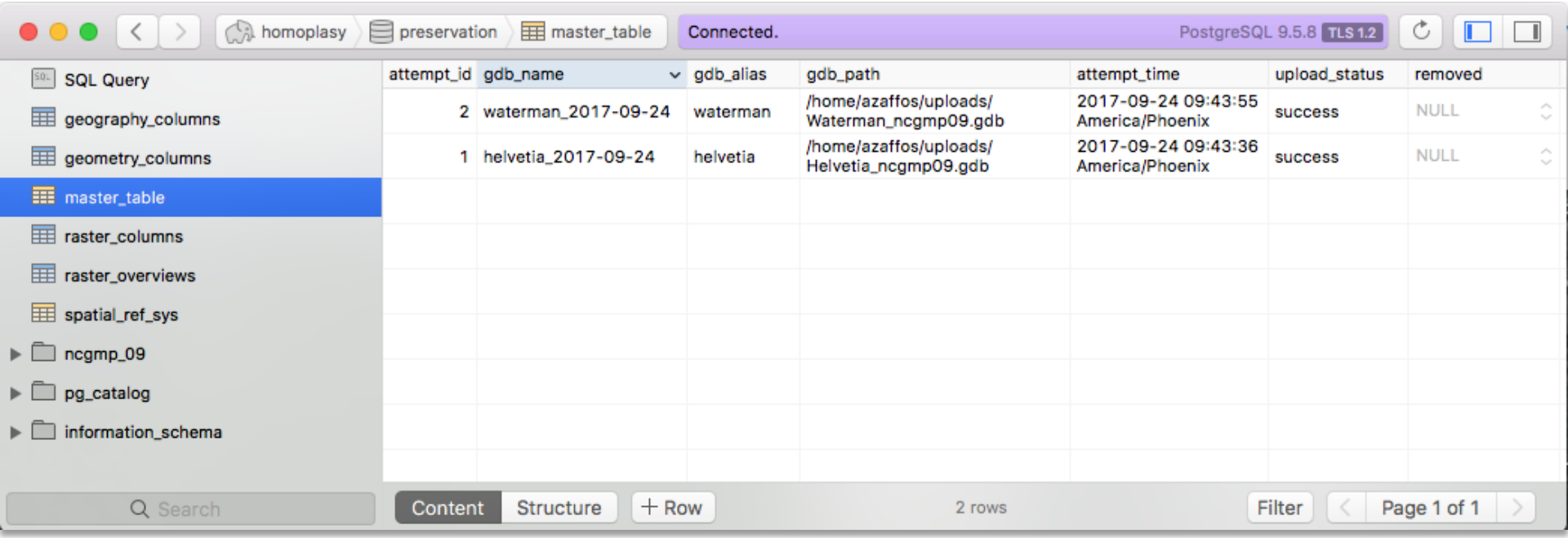
Preservation: Documentation



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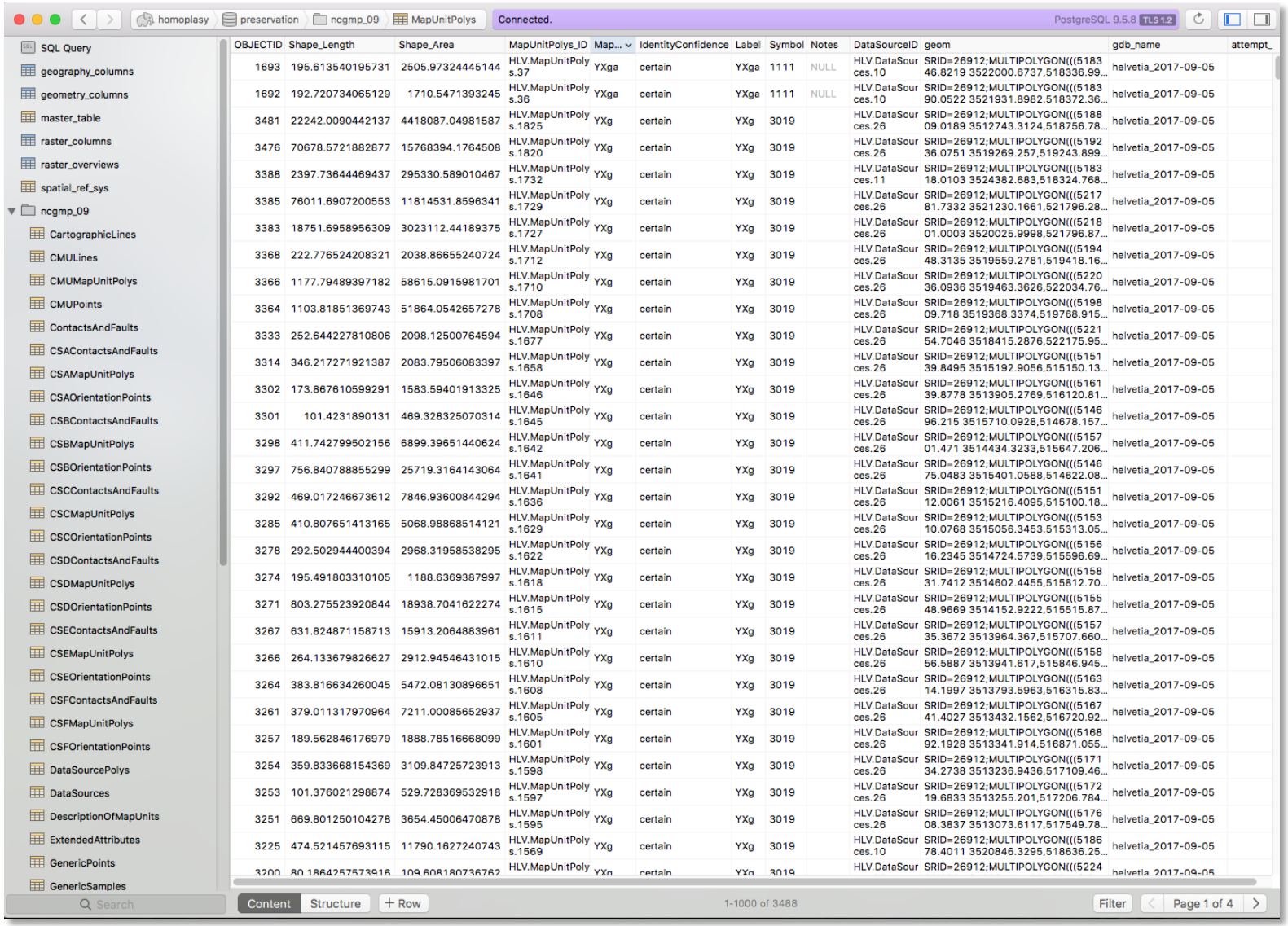
1	helvetia_2017-09-24	helvetia	/home/azaffos/uploads/Helvetia_ncgmp09.gdb	2017-09-24 09:43:36 America/Phoenix	success	NULL

Preservation: Search



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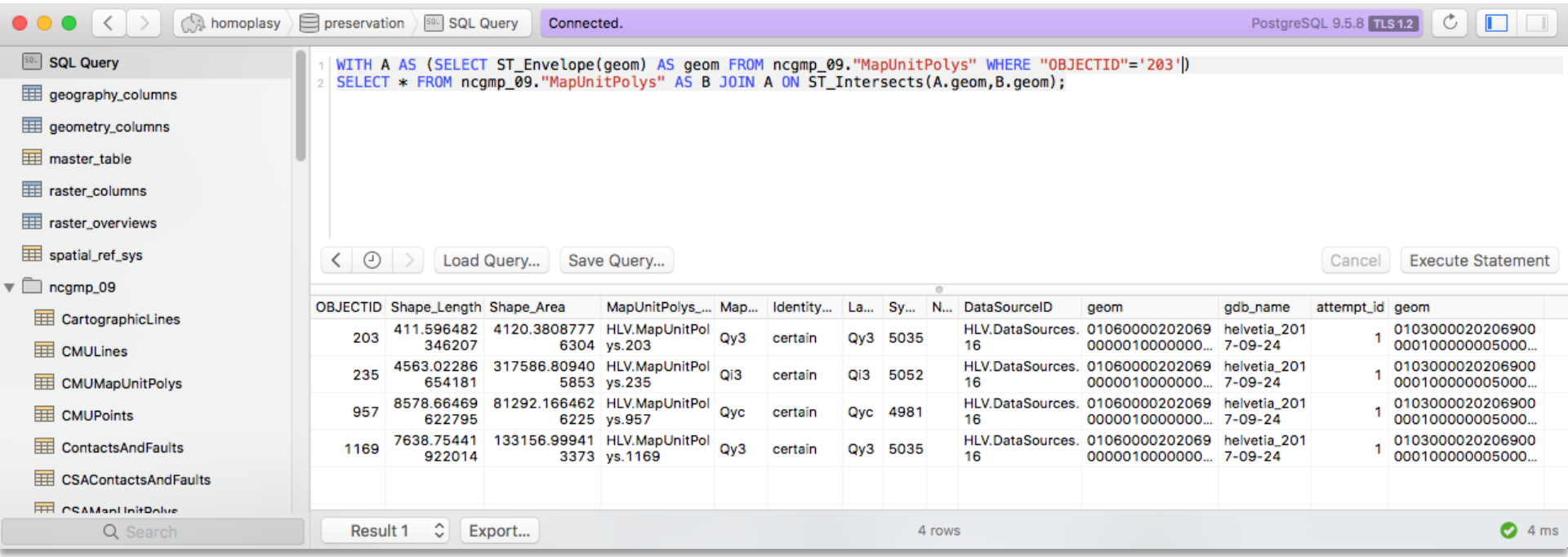
Preservation: Search



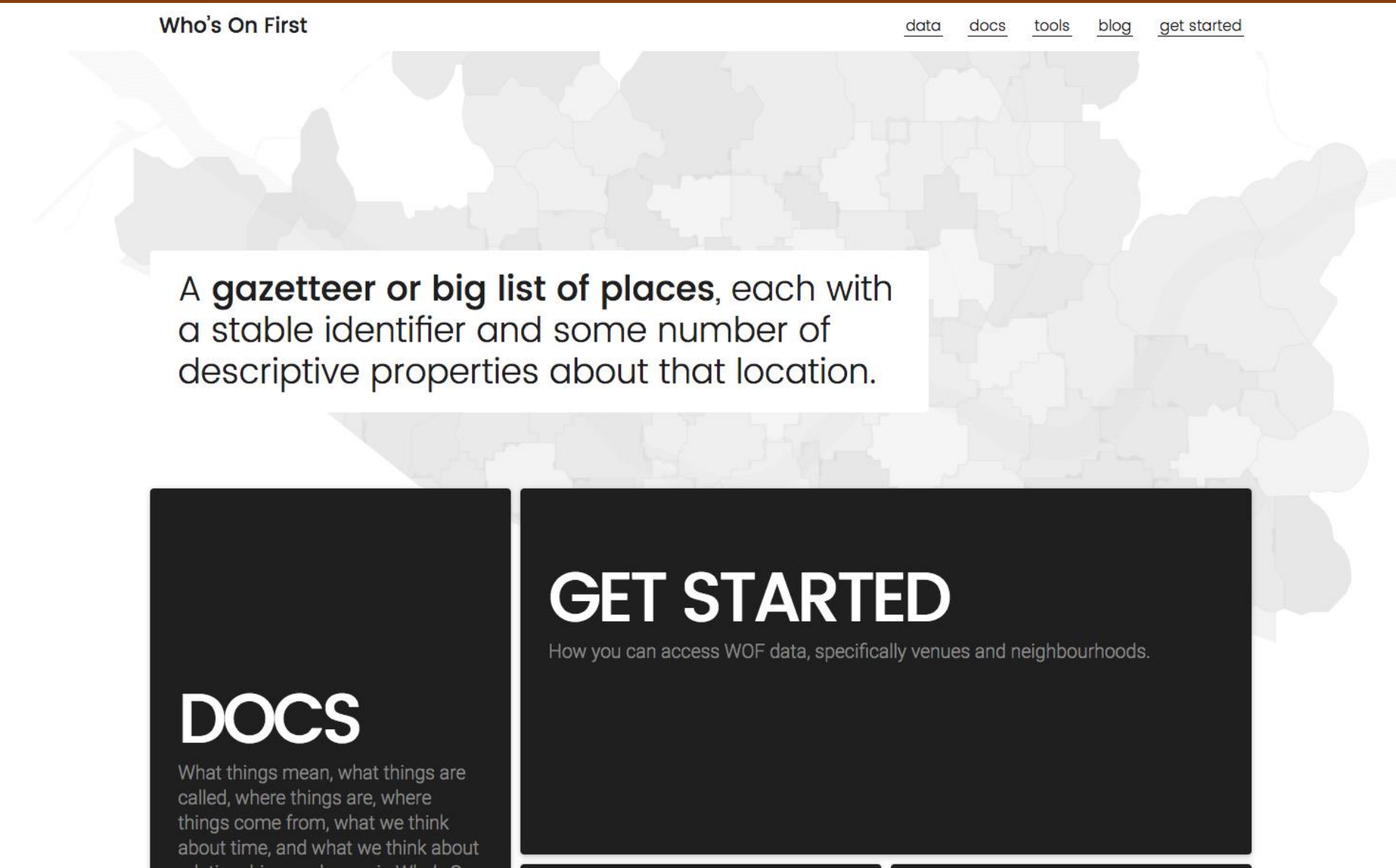
Benefits

- Computationally Fast
- Geospatial or Text Search
- Live Geoprocessing

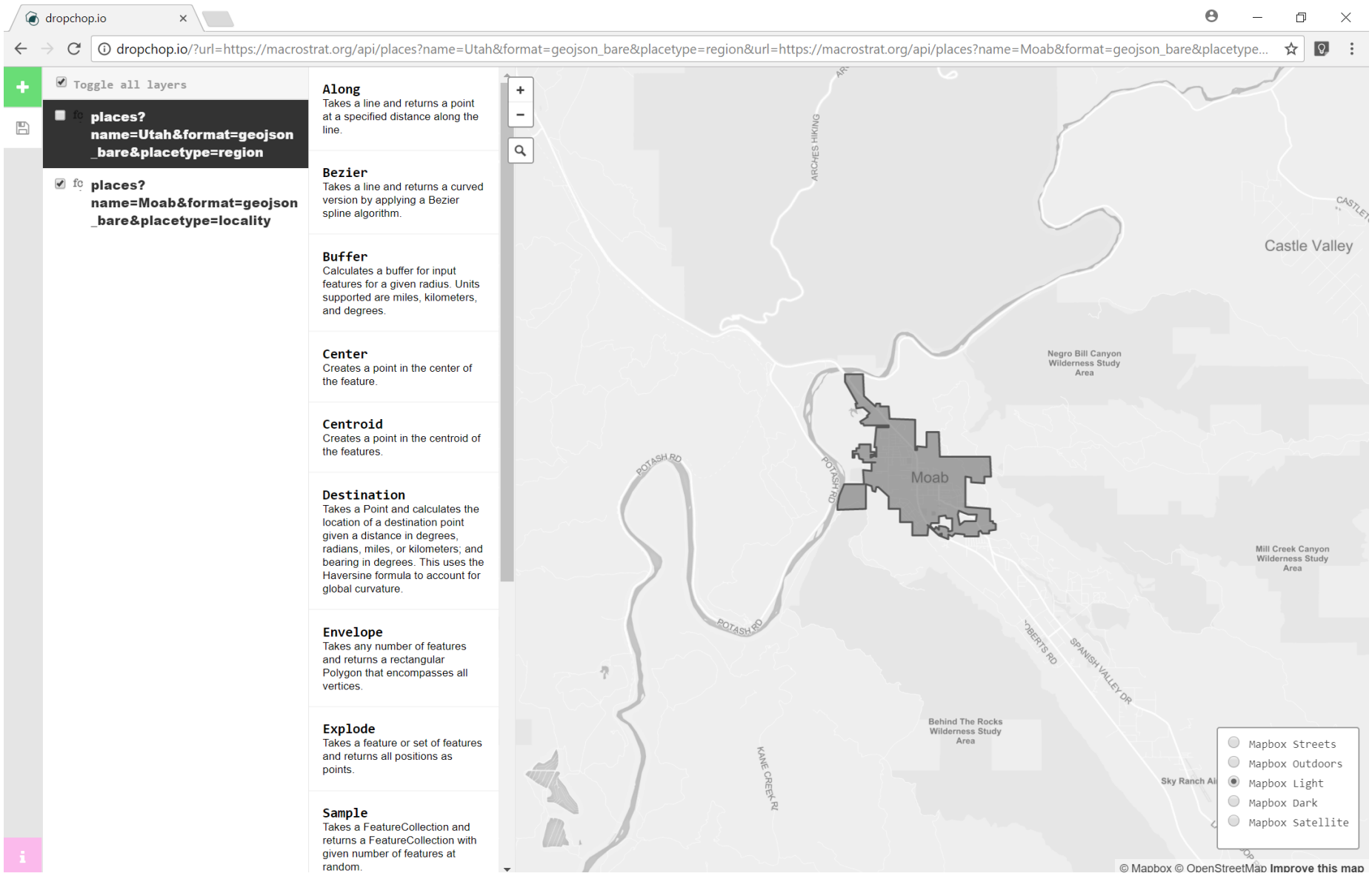
Challenges

- PascalCase and camelCase

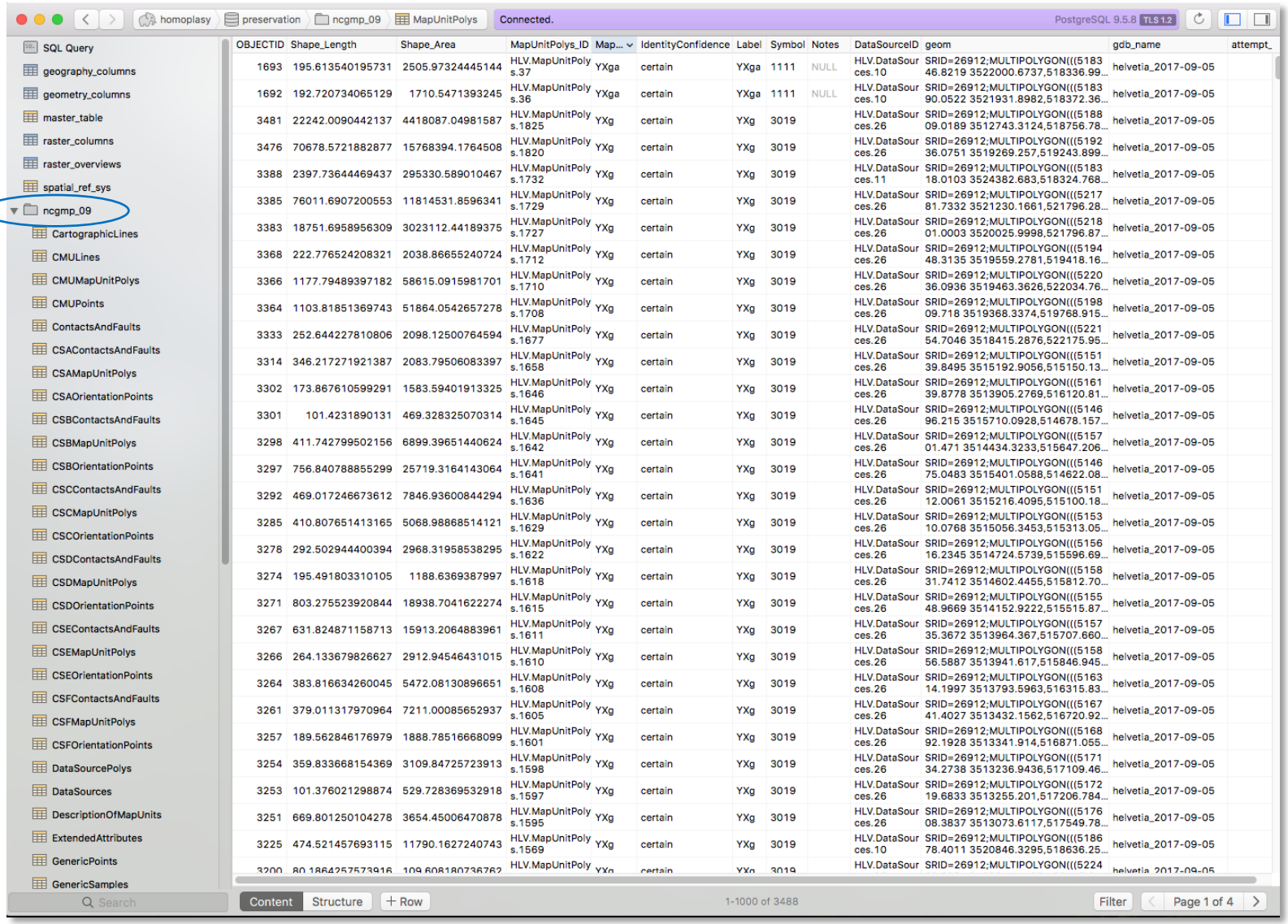
Preservation: Geoprocessing



Preservation: Geoprocessing



Preservation: Conversion



OBJECTID	Shape_Length	Shape_Area	MapUnitPolys_ID	Map...	IdentityConfidence	Label	Symbol	Notes	DataSourceID	geom	gdb_name	attempt_
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1692	192.720734065129	1710.5471393245	HLV.MapUnitPolys.36	YXga	certain	YXga	1111	NULL	HLV.DataSources.10	SRID=26912;MULTIPOLYGON(((518390.0522 3521931.8982,518372.36...	helvetia_2017-09-05	
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Cutter Quarries

This location is part of the Arizona Mineral Industry Location System (AzMILS), an inventory of mineral occurences, prospects and mine locations in Arizona. Gila62 is located in T2S R16E Sec 3 E2 in the Cutter - 7.5 Min quad. This collection consists of various reports, maps, records and related materials acquired by the Arizona Department of Mines and Mineral Resources regarding mining properties in Arizona. Information was obtained by various means, including the property owners, exploration companies, consultants, verbal interviews, field visits, newspapers and publications. Some sections may be redacted for copyright. Please see the access statement.

Resource URL: http://docs.azgs.az.gov/OnlineAccessMineFiles/C-F/CutterQuarriesGilaT2SR16ESec4.pdf

Resource ID:
2011-01-1057
Resource Type:
Document: Text
Theme Keywords:
building stone resources
economic geology
maps and atlases
mineral resources
reports
rocks and deposits
subsurface maps
topographic maps
Calcium, Limestone
Place Keywords:
United States
Arizona
Gila County
Cutter - 7.5 Min
T2S R16E Sec 3 E2

Coordinates:

Publication Date:
2013-07-31
Contributor:
Collection:
ADMMR

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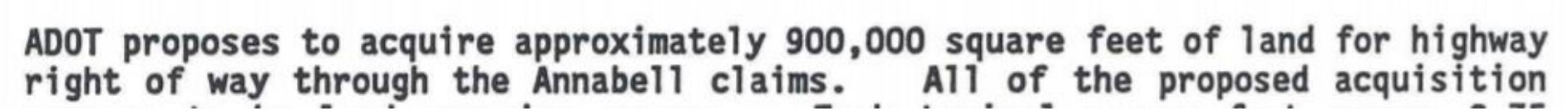
ADOT proposes to acquire approximately 900,000 square feet of land for highway
right of way through the Annabell claims. All of the proposed acquisition

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Evenness through time

Both indexes, *J* and *Essmin*, indicate an increase in evenness through time, mostly concentrated at Tr2. This shift in sample evenness between Furongian–Tr1 and Tr2–Fl2 is statistically significant for both indexes (Table 2). Such an increase in evenness is much more pronounced in deep environments (shelf) than in shallower ones (deep subtidal). As a consequence, the difference in evenness between environments decreases through time. During the Furongian and Tr1, deep subtidal samples were significantly more even than shelf samples, while from the Tr2 onwards, both environments record similar evenness (Fig 8). The higher evenness in shelf samples relative to deep subtidal ones during the Tr3 is most probably an artefact caused by the small sample size.

The rise in evenness during the Tr2 supports the trend observed in diversity, indicating that the number of intermediately abundant genera increased before the total number of genera.

Biotic controls on evenness. In addition to environmental constraints, there might be biotic factors controlling evenness. Indeed, many contributions have highlighted the importance of biotic factors, mostly functional diversity, on evenness. Because each functional group (= guild) exploits either different resources or the same resource in different ways (Simberloff and Dayan 1991), competition should be lowered between guilds, and species belonging to different guilds could coexist with similar abundances. Hence, communities with higher number of guilds present (i.e. functional diversity) should have higher evenness than those communities where species belong to fewer guilds. To test this possibility, we analyse the relationship between the number of families present in each sample and evenness measured as Pielou's *J*. As the change in evenness was concentrated in the intermediate abundant species, we analysed the familial richness of the first four top-ranked species in each sample.

A comprehensive analysis of functional groups in Trilobita is still lacking despite some important insights in their understanding (Fortey and Owens 1990, 1999; Hughes 2001). Different trilobite families account for major morphological differences that represent a range of functional attributes, mainly related to lifestyles and feeding behaviours. Although the specific habits involved are unresolved or a matter of discussion, familial diversity is here considered as a gross proxy for resource partitioning.

TABLE 1. Evenness among environments.

Index	Kruskal Wallis χ^2	Degrees of freedom	p-Value
^0D (=richness)	21.28	2	2×10^{-05}
^1D	13.96	2	*0.0009*
^2D	10.82	2	*0.004*
J	5.93	2	0.05
Essmin	10.27	2	*0.006*

p-Values in italics indicate significant differences between environments.

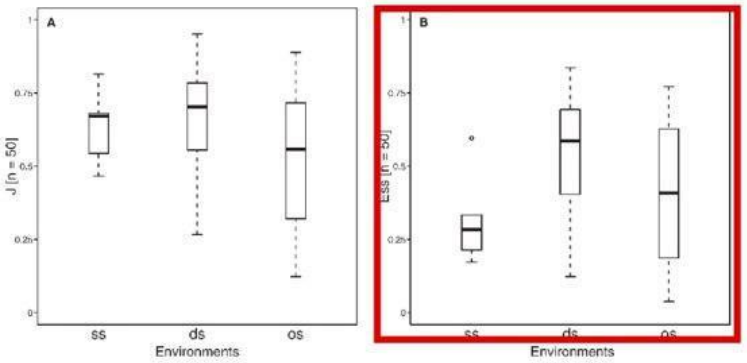
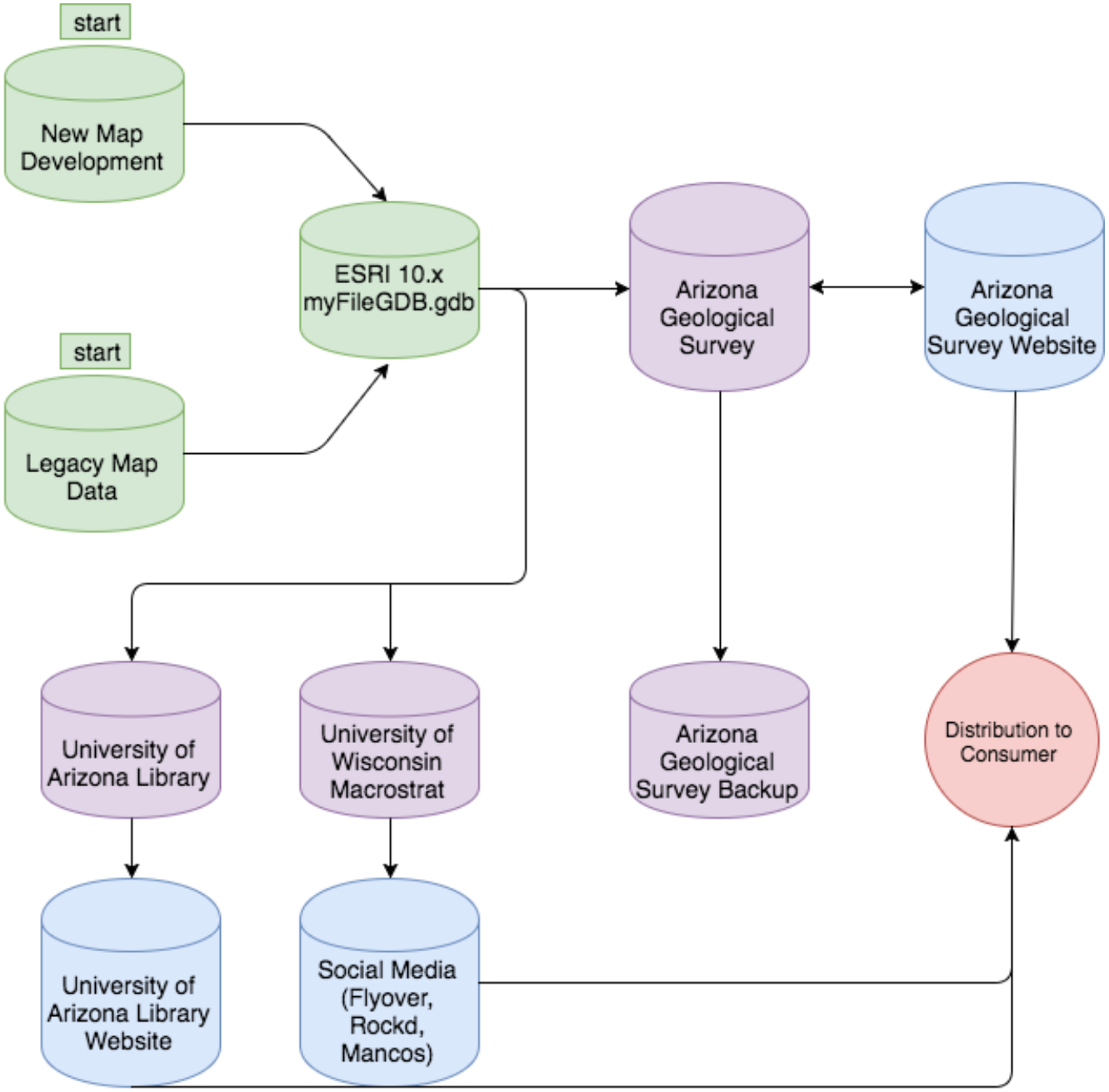


FIG. 5. Boxplots showing environmental trends in evenness. A, Pielou's *J*. B, Peters' *Essmin*. Abbreviations as in Figure 4.



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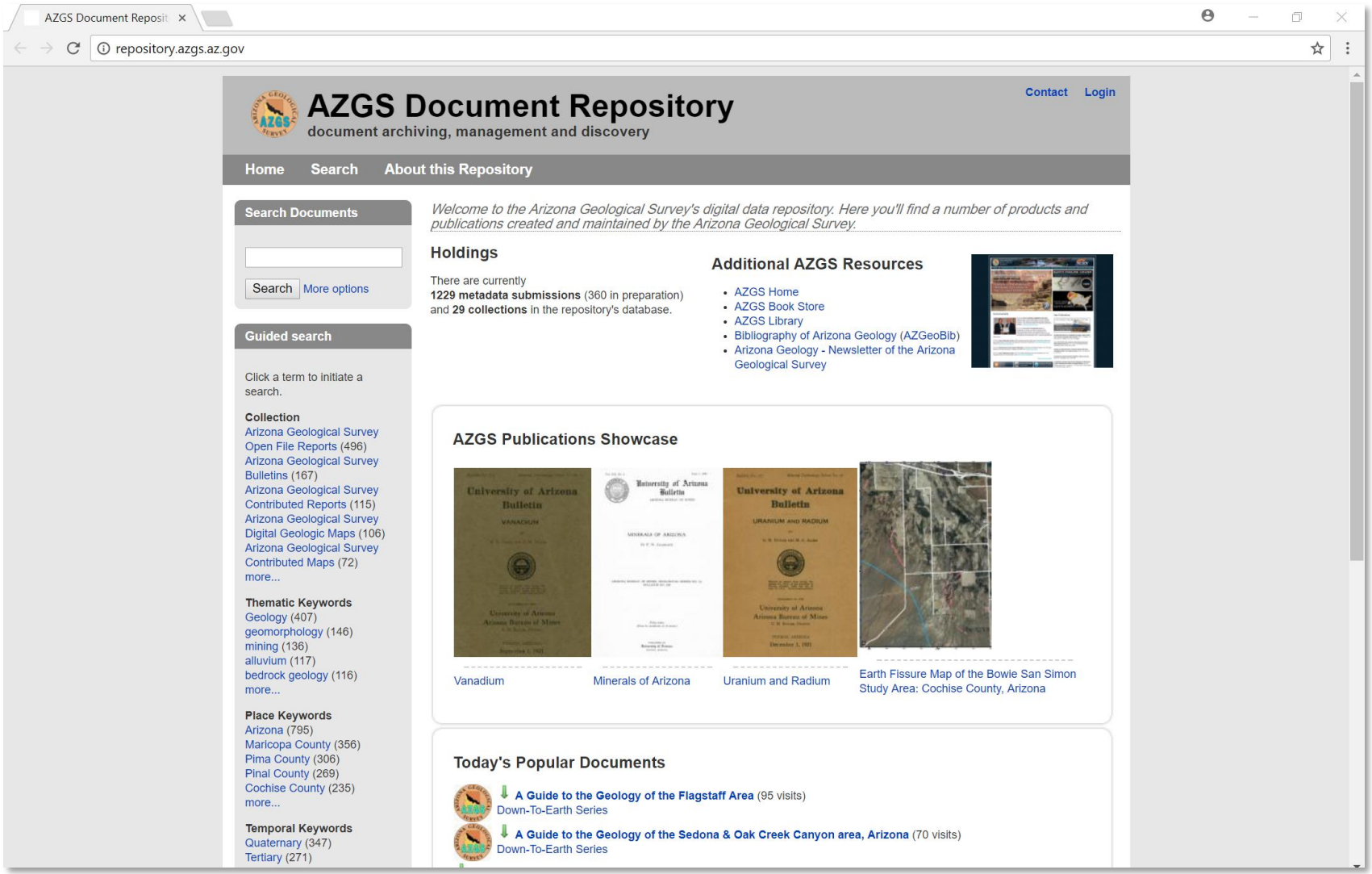
- Automation
- Conversion

Distribution
- Multi-path
- Multi-format

Distribution: Multi-Path



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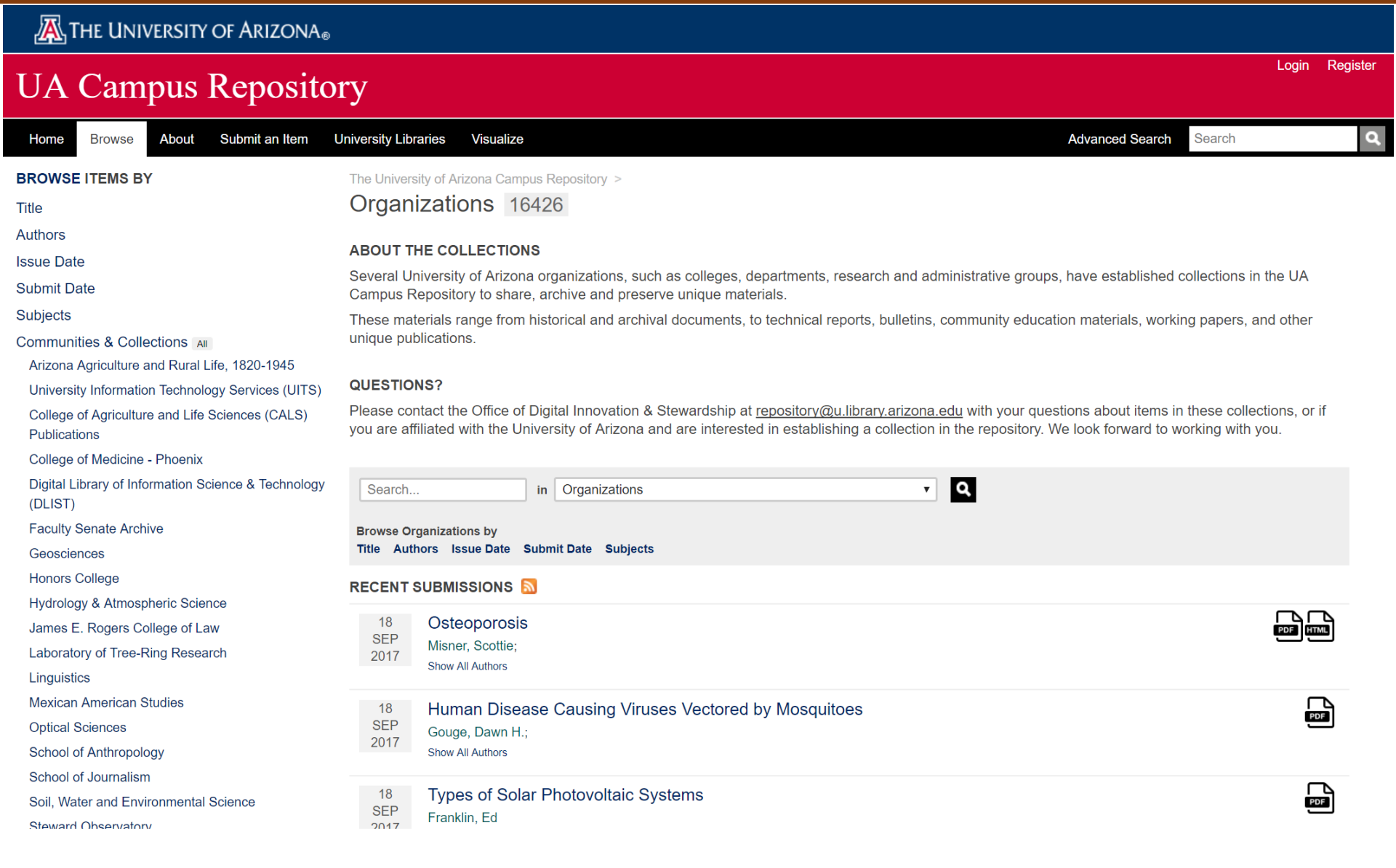

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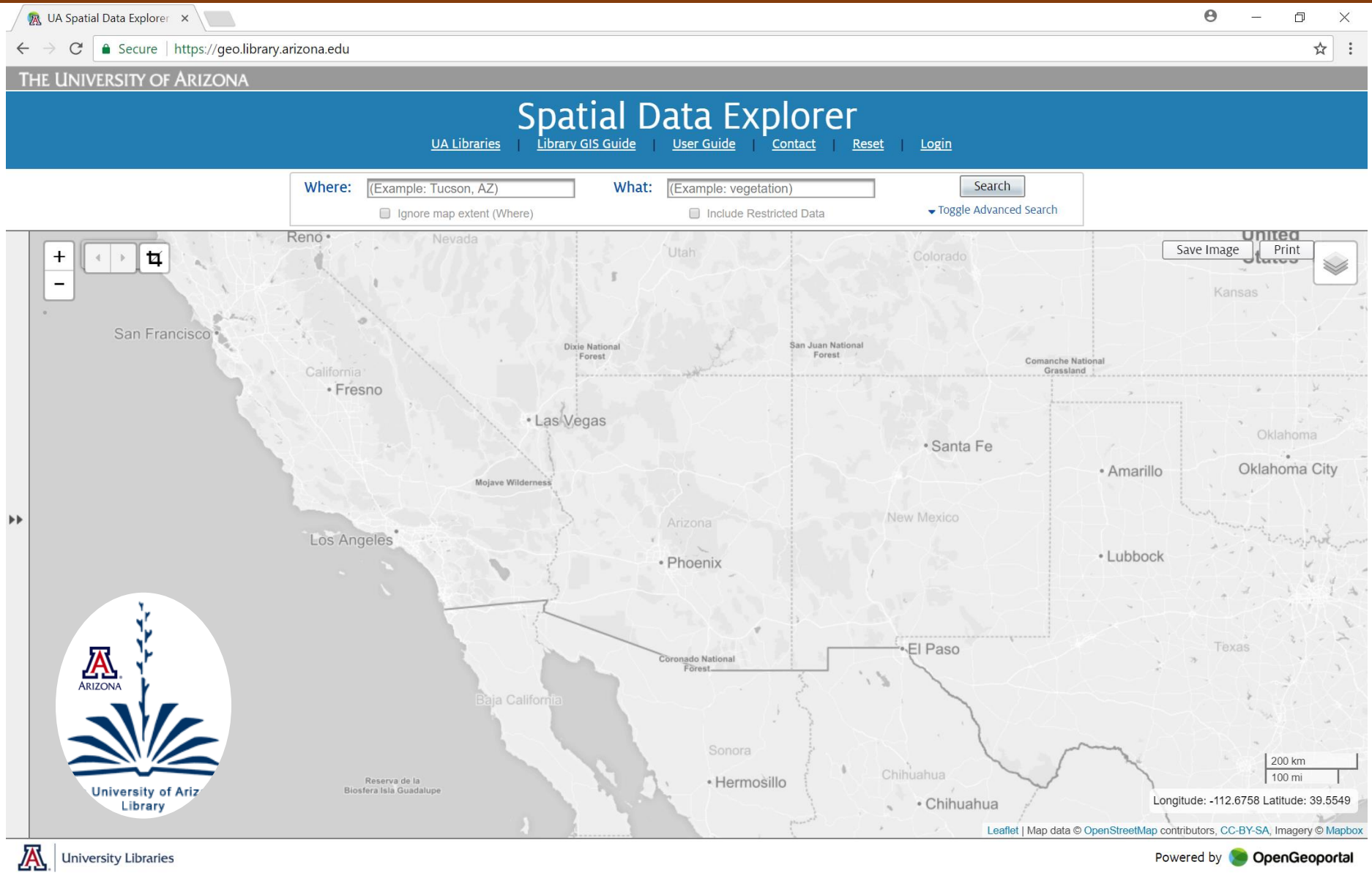

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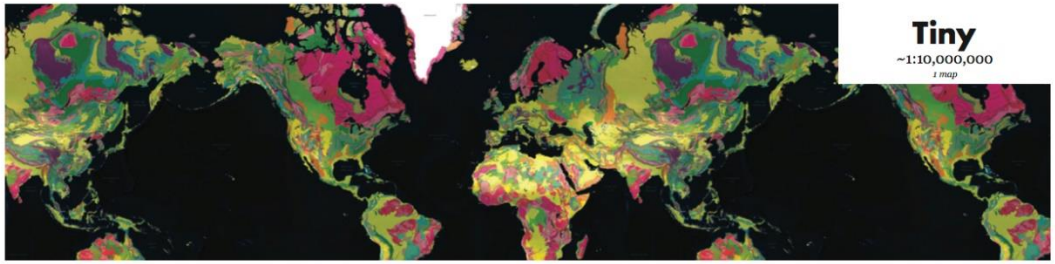
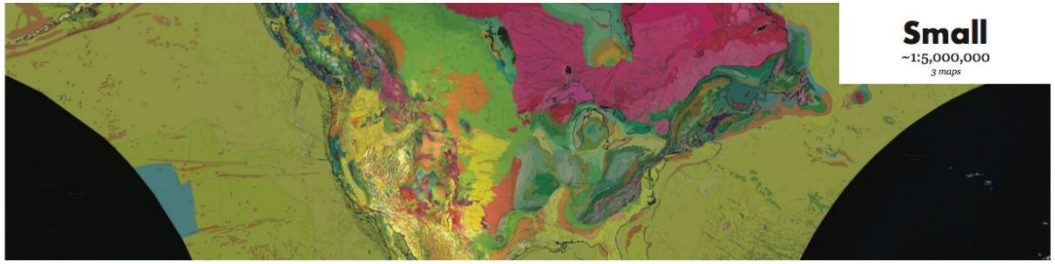


Tiny
~1:10,000,000
1 map



Small
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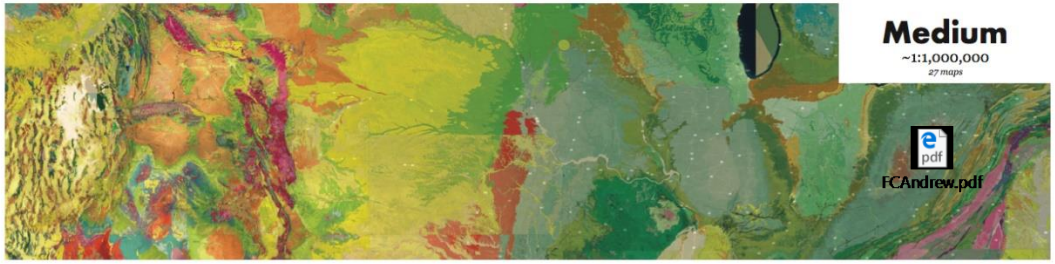
3 maps



Medium
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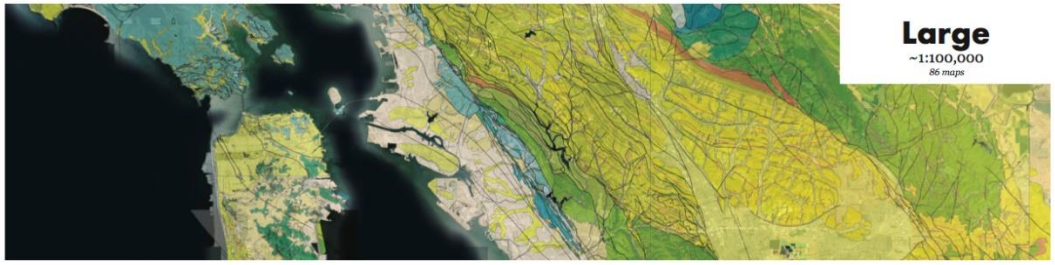
27 maps



Large
~1:100,000
86 maps

https://macrostrat.org/map

Example: Rockd

Download for iOS and Android
https://rockd.org

The dashboard presents the age, lithology, and name of the rock the user is currently standing on.

Data are dynamically assembled by querying and summarizing map and linked data.

Map view gives local and regional context and exposes nearby user-contributed observations.

User interaction reveals detailed information and allows dynamic access to globally-distributed data at multiple scales.

Example: Flyover Country

Download for iOS and Android
fc.umn.edu

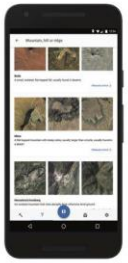
Choose a path or region of interest anywhere in the world.

Visualize geologic maps, fossil locations, physiogrpahic points of interest, core samples, and more.

Save this information to your device for offline access, from 30,000 feet or a remote field area.

Identify and understand different landform types and the geologic processes behind them.

Explore field guides using an interactive map interface, supplemented by data from many sources.

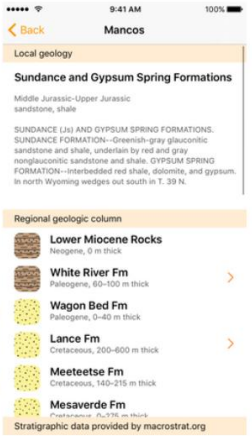


Example: Mancos

Download for iOS

The home screen displays a geologic map and the geology at the current location…

… tapping on it shows the details of the geology, plus the local stratigraphic column



Preservation: Multi-Format

RDocumentation
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R package
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ST_read

From sf v0.1-1
by Edzer Pebesma

88th Percentile

Read Simple Features From File Or Database

read simple features from file or database

read PostGIS table directly through DBI and RPostgreSQL interface, converting wkb

Usage

```
st_read(dsn, layer, ...)

st_write(sf, dsn = ".", layer, driver = "ESRI Shapefile", opts = character(), ...)

st_read_pg(cn = NULL, query, dbname, geom_column = NULL, ...)
```

Arguments

dsn	data source name (interpretation varies by driver - for some drivers, dsn is a file name, but may also be a folder)
layer	layer name (varies by driver, may be a file name without extension)
...	parameter(s) passed on to st_as_sf
sf	object of class `sf`
driver	driver name
opts	options to pass on to driver
cn	open database connection
query	SQL query to select records
dbname	character; database name, only used if cn is `NULL`
geom_column	character or integer: indicator of name or position of the geometry column; if not provided, the last column of type character is chosen

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Complaints

- lbookman@email.arizona.edu

Compliments

- azaffos@email.arizona.edu

External Resources

- macrostrat.org
- postgis.org
- paleobiodb.org
- github.org/azgs
- geodeepdive.org
- mapzen.com