

GEOREFERENCING AT THE NON-VERTEBRATE LAB

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Goal

The UT Non-vertebrate Paleontology Lab has been updating location data in its database, converting verbal descriptions of collecting locations into GPS latitude & longitude.



This presentation will provide an overview of this effort, primarily focused on the tools and other resources we use, especially for Texas.

Why would this ever matter to you?

These resources will help you with your collection.

- If you are reading old publications trying to locate likely collecting spots, it could be vital.
- You can use known GPS coordinates to confirm the identity of the formations at a given location.
- You may want to add GPS coordinates to your locations that don't already have them.

The NPL Collection

The Non-vertebrate Paleontology Laboratory (NPL) is known for its rare and important specimens

- A type and figured collection of over 22,000 specimens.
- With a total repository > 4 million specimens, it is the fifth largest collection in the US.

NPL represents the merge of numerous collections:

- historical ones from the earliest geological surveys of Texas in the 19th century and from work by the WPA during the Depression.
- departmental ones based on work by members of the UT Geology Dept.
- individual collections that found their way to UT from oil companies and outside individuals
- orphaned collections from various other institutions

This data is captured in **Specify**, a database designed for natural history collections, in use in production by over 230 organization in the US and 160 internationally . Numerous uses include botany, mineralogy, entomology, ichthyology, as well as vertebrate and invertebrate Paleontology

NPL Geographical Range

The geographic spread of these specimens is global, with about 60% of the collection deriving from Texas. Substantial holdings come from Mexico, Europe and Australia.

Recent developments in paleontology stress the accessibility of specimens and their related data from a robust relational database. (iDibBio.org)

The Specify database contains all of the NPL's cataloged records. For this data to be broadly useful to the scientific community it is enormously valuable to have detailed GPS coordinates associated with specimens.

Clearly the First Geological Survey of Texas in 1858 was not recording GPS coordinates.

Why can this be hard?

Google does something similar every day. But, consider the following:

1. Places that no longer exist - Lohmann's Crossing, Terry's Church
2. Ranch names subject to 100 years of ownership changes.
3. Geography or road changes. For example due to reservoirs built after the collection date.
4. Numbering systems unique to the collector, e.g. "PGC(B) 15.5"
5. Outdated or locally unique names – "Nelin", in McCulloch Co., seems to have been Plummer's name for East Sweden.
6. More obscure, but present - changes to county boundaries in west Texas. I even had one that predated Oklahoma statehood that said it was found in 'Texas, Indian Territory'.

Knowing the date the specimens were collected can be critical to zeroing in on the right map.

Examples

1. Austin, along Shoal Ck., from 20th St. to 33rd St. Travis County, Texas
2. 1.5 miles N-NW of Mitchel Crossing at S. end of Parks Mountain, Coleman, Texas
3. 0.5 mi NW of Round Rock in stream, Travis County, Texas
4. half block SE of end of Trvis Hgts car line, Travis County, Texas
5. Country Club, Austin
6. Bull Ck. Rd, after leaving Georgetown Rd & crossing the I&GN, 5 mi. NW of Austin, Travis Co.
7. 11-T-3 Soloman's Branch, S of Elgin., Bastrop Co., Texas
8. 2.75 mi. N of Decie's Ranch. Brewster Co., Texas
9. near Terry's Church, Culberson Co., Texas

These range from easy and reasonably invariant over time (1), to old but doable (4), to requiring a time period (5,6), to nearly impossible (9).

Uncertainty

We don't only come up with a GPS coordinate. It is important to have some measure of precision.

We need to determine a *radius of uncertainty*.

Given a location like '10 mi. N of Mineral Wells' we can't assume that the mileage is precise – it usually is based on someone looking at their odometer or guesstimating from a map. And north can be as the crow flies or by the main road heading north-ish out of Mineral Wells.

There is a whole science to making consistent estimates of uncertainty. See details in

- https://tdwg.github.io/esp/georeferencing/standards/Point-Radius-Method_Wieczorek-et-al-2004.pdf
- <http://georeferencing.org/georefcalculator/docs/GeorefGuide.html>

NAD27 vs. NAD83 / WGS84

One other critical piece of information that goes with the GPS coordinates is the *horizontal datum* which is the model used to measure positions on the Earth. A GPS location can map to somewhat different points on the Earth, depending on the datum used to make the measurement - different datums model the shape of the earth differently.

In cartography, two North American Datums are in use: the North American Datum of 1927 (NAD 27) and the North American Datum of 1983 (NAD 83). Many currently available maps of North America are based on the NAD 27, but the NAD 83 is used for newer maps.

NAD 83 is a more accurate representation and is essentially the same as the World Geodetic System of 1984 datum (WGS84), a standard reference datum for the Global Positioning Systems.

We default to WGS84 in Specify – it covers the world.

In the contiguous USA, the difference between using NAD27 and NAD83/WGS84 can result in a calculated location varying by 0 to 104 meters, with the error increasing as you go west.

Status

When I began as a volunteer, the lab had funding to georeference all specimens from the Western Interior Seaway during the Cretaceous. This was part of a multi-institution effort, with the resulting cleaned data uploaded into the iDigBio repository.

We began this by attacking the 3,000+ collecting events/locations in Texas from the Cretaceous that had not been given GPS coordinates.

We have completed that and are now working on other states and time periods.

SPECIFY

NPL

Initial Data from the Locality in Specify

The basic data we start with can be some or all of the following.

Locality information in a Specify collecting event:

- Locality name (and maybe Location #)
- ***Verbatim description of the locality***
- Chronology (Permian, Cretaceous, ...)
- Stratigraphy (Walnut formation, Washita group,)
- Date (sometimes given, more often inferred from collector)
- Specimen numbers

Specimen data in Specify

- Storage
- Collector
- Publication (particularly if specimen is a type). Where these exist it can be worth tracking them down – often contains maps or much more precise data. We assume this published information is the most accurate.

Physical paperwork may be associated with the specimens themselves and sometimes needs to be compared to what has been entered in Specify. Though I normally only check types or specimens in PRC 122 vs. heading over to the warehouse (PRC 33).

We begin with Collecting Event

Collecting Information new 1/2964 previous next

Locality 

Verbatim locality

Collecting remarks

Field number

Collecting method

Verbatim date Start date End date

Paleo Context [Delete](#)

Chronostrat **Biostrat**

Lithostrat **Horizon** **Local series**

Remarks

Collectors [Add](#)

No Data.

Collection Objects (1) [Visit](#)

Catalog number Alt Catalog Number Collection name Project number

Edit the Locality Form

The locality name may or may not have all of the information that the Verbatim Locality had - but we use both. We also add an uncertainty radius which can vary from a few meters to kilometers.

Fill in:

- County

- Lat/Long method default is Geolocate

- Lat / Long

Map datum

For new maps WGS 1984

- Uncertainty

📍 Locality: R-103, San Saba Co, San Saba, Texas, United States 31.2127050000 -99.0819480000

Locality name

Locality remarks

Locality number Source of number  0

Geography   Jurisdiction

Geographic Coordinates

Point	Source	Latitude	Longitude	Parsed
Coords		<input type="text" value="31.212705° N"/>	<input type="text" value="99.081948° W"/>	31.212705° N, 99.081948° W

Lat/Long method Lat/Long accuracy Map datum

Verbatim Latitude Verbatim Longitude

Min elevation Max elevation

Elevation method Elevation accuracy

Georeferencing Details [Delete](#)

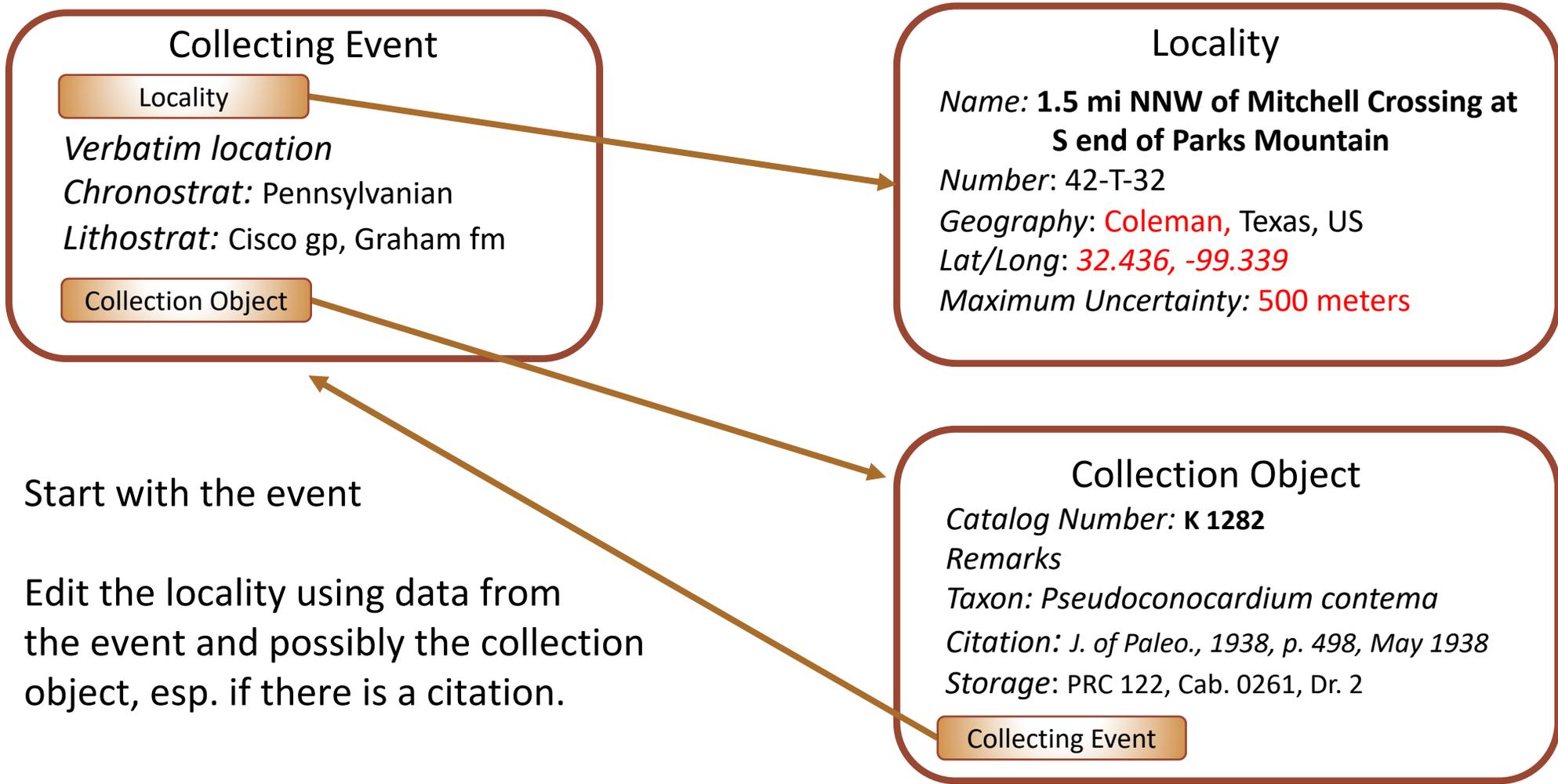
Create a separate record for each georeferencer and date

Georeferencer   Georef Date Verified

Max uncertainty est

Georef Remarks

Relationships between Tables



Start with the event

Edit the locality using data from the event and possibly the collection object, esp. if there is a citation.

TOOLS

NPL

Lots of Tools & Resources

I am going to focus on the 4 tools that I rely on and have found most useful.

Links to all of the resources that I am going to talk about can be found at the NPL Wiki. The entry point to the Wiki is here:

<https://wikis.utexas.edu/display/specify6/Specify+Database%3A+Geo-reference+localities>

Or search in Google: *ut non-vertebrate lab wiki georeference*

The detailed links to resources are here:

<https://wikis.utexas.edu/display/specify6/Geo-referencing+Resources>

This last includes many more sites than I can take time to discuss here. A lot of those are only useful in rare cases - like when you need to know where all the fire lookouts or abandoned airfields in Texas are located.

You will find 'Resources' the most useful.

Also, when a particularly tricky location is found, say an old ranch, we enter that data in 'Found Places'

The screenshot shows the top navigation bar of The University of Texas at Austin with options for Spaces, People, Create, and Search. The breadcrumb trail is / NPL Protocol and Procedures / NPL projects. The page title is 'Specify Database: Geo-reference localities', created by Angella C Thompson and last modified by Michael K Smith on Feb 18, 2020. The main content includes a paragraph about training, followed by several sections: 'Georeferencing Tasks' (How-to), 'Georeferencing Resources' (links to online resources), 'Found Places' (trickier locations), 'Collecting by Decade' (active decades), and 'Dissertations and theses' (UT publications). A sidebar on the right contains links for 'NPL Home', 'Projects home', and 'Specify Database home'. Two red arrows point from the text on the left to the 'Georeferencing Resources' and 'Found Places' sections.

This resources page lists over 80 links covering:

- Name search
- Historical topos
- TX Geology
- US Geology
- TX Land Surveys
- Oil Wells
- TX History
- TX County maps
- Other NPL/UT
- Township/Range conversion
- Other

The screenshot shows a web browser interface for a NPL Wiki page. The header includes 'The University of Texas at Austin' logo and navigation links for 'Spaces', 'People', 'Create', and 'Search'. Below the header, the page title is 'Geo-referencing Resources', created by Michael K Smith. The main content area lists several resources, with the first one being 'Essential Tool for Locations and Radius of Uncertainty'. This resource includes a sub-item 'Geolocate' which is marked as an 'Essential Tool' (indicated by a diamond symbol). The text describes the tool's functionality, including its use for drawing a radius of uncertainty and its ability to search for locations by county, township, range, and sections. Other resources listed include 'USGS Geographic Names Information System', 'Handbook of Texas History', 'Texas Historical Sites Atlas', 'Geonames', 'USGS Current & Historical Topos', and 'USGS Topview'.

Geolocate – Our Primary Tool

“A Platform for Georeferencing Natural History Collections Data”

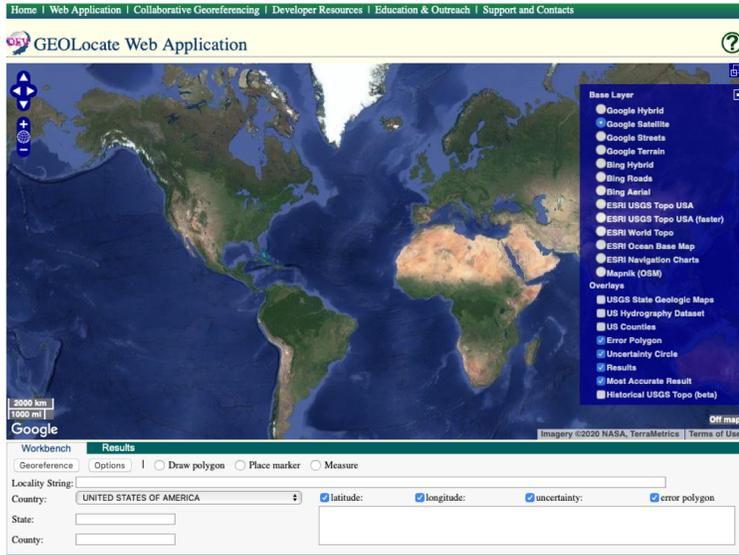
Nelson Rios is the primary developer. The project began in 2002 at Tulane University. He is now at Yale.

<https://www.geo-locate.org/web/WebGeoref.aspx>

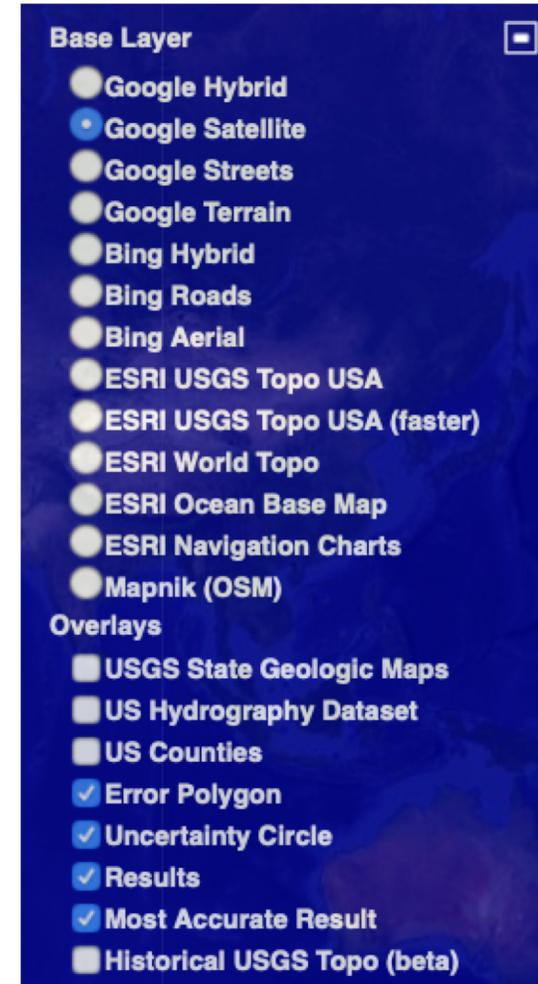
This YouTube video provides an introduction to the tool

<https://www.youtube.com/watch?v=v-gx-2xXBLM&feature=youtu.be&hd=1>

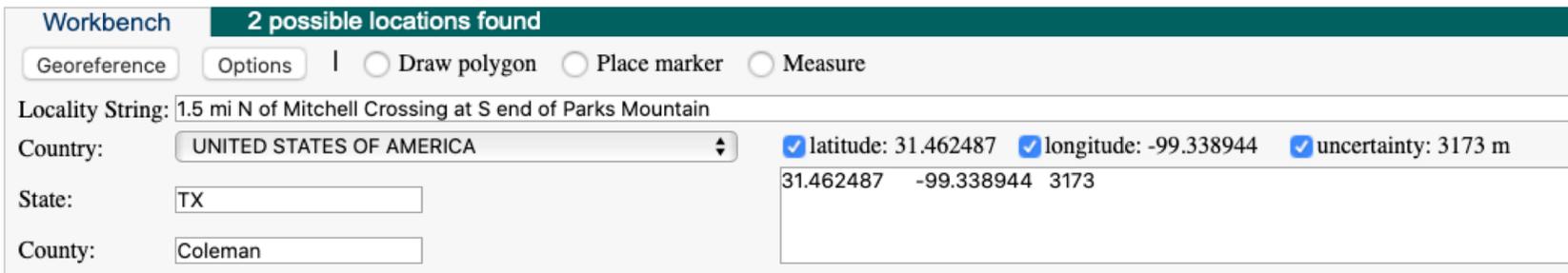
Geolocate Screen



Multiple base maps and overlays are available.



Enter search criteria, click 'Georeference' and view the map. Lat, long, and uncertainty are written to the lower right text box.



Geolocate with Location & County

We have told Geolocate that we are in Texas, in Coleman County

Note that the original verbatim location

1.5 mi N of Mitchell Crossing at S end of Parks Mountain

fails. Geolocate can only handle limited parsing. It does find

parcs mountain

NPL

The screenshot displays the GEOLocate Web Application interface. At the top, a navigation bar includes links for Home, Web Application, Collaborative Georeferencing, Developer Resources, Education & Outreach, and Support and Contacts. The main header features the application logo and a search icon. The central part of the interface is a topographic map showing contour lines, roads, and geographical features. A large black circle highlights a specific area on the map, and a green dot marks the location of 'Parks Mountain'. Below the map, a control panel includes a 'Workbench' section with a '1 possible location found' notification. It contains buttons for 'Georeference', 'Options', 'Draw polygon', 'Place marker', and 'Measure'. The 'Locality String' is set to 'parcs mountain'. The 'Country' is 'UNITED STATES OF AMERICA', and the 'State' is 'texas'. The 'County' is 'coleman'. On the right side of the control panel, there are checkboxes for 'latitude: 31.440716', 'longitude: -99.338944', 'uncertainty: 1807 m', and 'error polygon'. The 'latitude' and 'longitude' checkboxes are checked, and the 'uncertainty' checkbox is also checked. The 'error polygon' checkbox is unchecked. Below these checkboxes, the coordinates '31.440716 -99.338944 1807' are displayed. A scale bar at the bottom left of the map shows 500 m and 1000 ft. An 'Off map.' button is located at the bottom right of the map area.

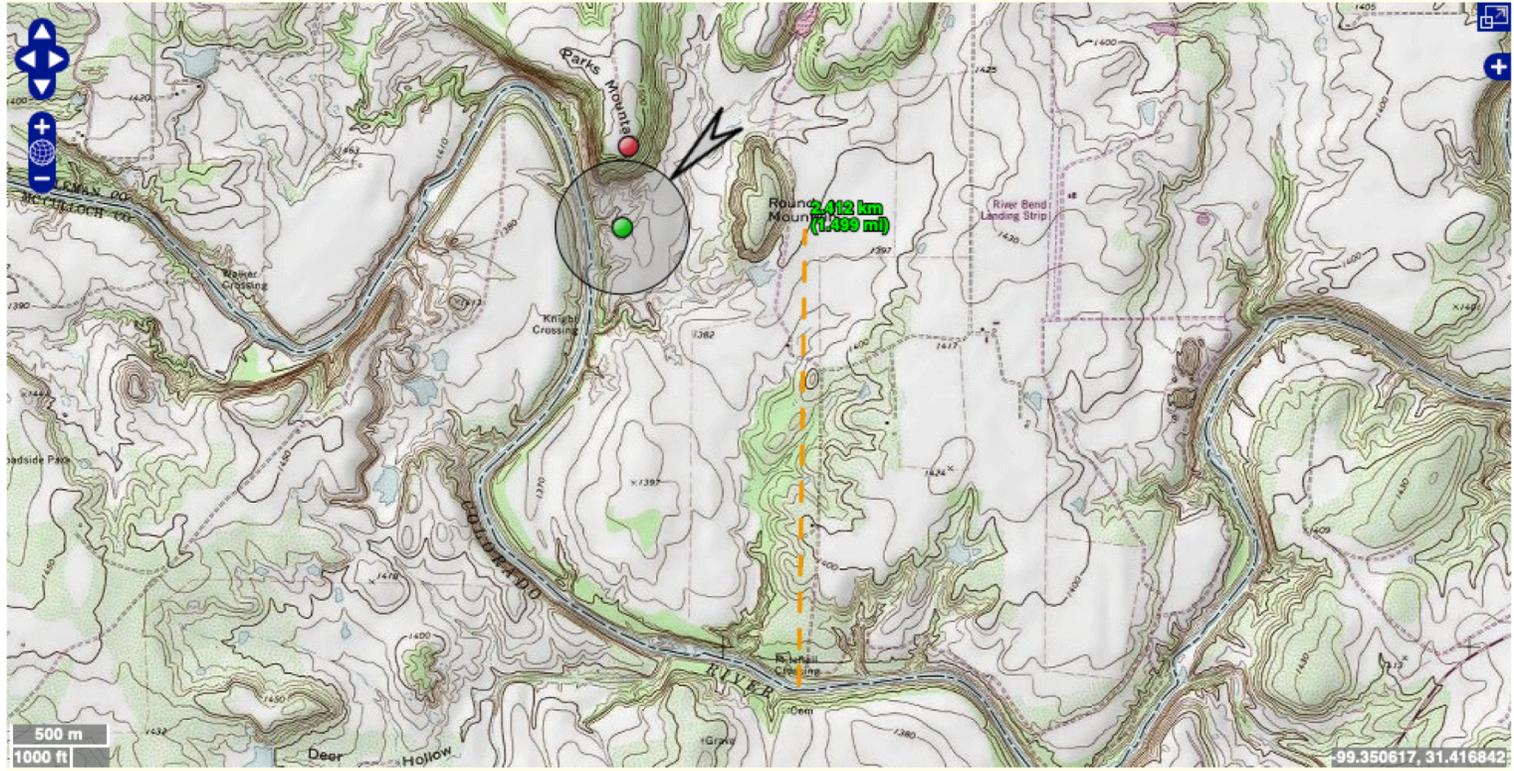
Geolocate – Adjust with other data – “south end”

1.5 mi N of Mitchell Crossing
at S end of Parks Mountain

In Coleman County

Home | Web Application | Collaborative Georeferencing | Developer Resources | Education & Outreach | Support and Contacts

 GEOLocate Web Application 



Workbench **1 possible location found**

Georeference Options | Draw polygon Place marker Measure

Locality String: parks mountain

Country: UNITED STATES OF AMERICA latitude: 31.436835 longitude: -99.339287 uncertainty: 355 m error polygon

State: texas 31.436835 -99.339287 355

County: coleman

Geolocate

But, where is Mitchell Crossing?

The base maps can be overlaid with additional mapping data.
Most importantly **Counties**, **Historical Topos**, and **Geology**.

Base Maps

Google Hybrid, Satellite, Streets, Terrain
Bing Hybrid, Roads, Aerial
ESRI USGS Topos, Ocean Base Map, Navigation Charts
Mapnik Open Street Maps

Overlays

US Counties
Historical USGS Topo
USGS State Geologic Maps
US Hydrography Dataset

Geolocate – Overlay with Historical USGS Topo

1.5 mi N of Mitchell Crossing
at S end of Parks Mountain

In Coleman County

Overlay the Brady 2-a map
from 1924 and we find
Mitchel Crossing.

We use the measure tool to
draw a line 1.5 miles north of
Mitchell Crossing.

The screenshot displays the GEOLocate Web Application interface. At the top, there is a navigation bar with links: Home | Web Application | Collaborative Georeferencing | Developer Resources | Education & Outreach | Support and Contacts. The main header reads "GEOLocate Web Application" with a help icon on the right. The map area shows a topographic map of the region around Parks Mountain and Mitchell Crossing. A search bar on the left contains "parks mountain" and lists several map overlays, with "Brady 2-a 1924" selected. A green dot on the map indicates the search result. A dashed orange line is drawn north from a red circle around "Mitchell Crossing" on the map, with a measurement of 2.412 km (1.499 mi) shown. A red circle highlights the "Mitchell Crossing" label on the map. On the right, a "Base Layer" menu is open, showing options like Google Hybrid, Google Satellite, and ESRI USGS Topo USA (selected). Below the map, a "Workbench" section shows "1 possible location found" and various tool options: Georeference, Options, Draw polygon, Place marker, and Measure. The "Locality String" is "parks mountain", the "Country" is "UNITED STATES OF AMERICA", and the "State" is "texas". The "County" is "coleman". The "Measure" tool is active, showing coordinates: latitude: 31.436835, longitude: -99.339287, and uncertainty: 355 m. The "Error Polygon" option is unchecked. A scale bar at the bottom left shows 500 m and 1000 ft. The bottom right corner of the map area says "Off map."

GNIS - USGS Geographic Names Information System

USGS
science for a changing world

Query Form For The United States And Its Territories

Feature Name: Feature ID:

Exact Match Exclude Variants

State:

County:

Feature Class:
[Press Ctrl to select more than one.](#) [Definitions](#)

Arch
Area
Arroyo

Elevation*:

Feet Meters

Sometimes less is more. Here I just put in 'crossing' to get all places containing that in Coleman County. Normally I would include the name part, in this case Mitchell, to find all places with that in their name.

We get back the feature name & its location. For streams we get at least source & mouth. We can get more detail by clicking on the feature name.

Feature Query Results

Click the feature name for details and to access map services

Click any column name to sort the list ascending ▲ or descending ▼

Feature Name	ID	Class	County	State	Latitude ▲	Longitude	Ele(ft)	Map	BGN Date	Entry Date
Mitchell Crossing	1380202	Populated Place	McCulloch	TX	312457N	0991952W	1329	Whon	-	30-NOV-1979
Knight Crossing	1380034	Populated Place	McCulloch	TX	312556N	0992027W	1332	Whon	-	30-NOV-1979
Walker Crossing	1380735	Populated Place	McCulloch	TX	312605N	0992144W	1332	Whon	-	30-NOV-1979
Military Crossing	1380198	Populated Place	McCulloch	TX	312651N	0991654W	1299	Whon	-	30-NOV-1979
Chaffin Crossing	1379525	Populated Place	Coleman	TX	312722N	0992356W	1352	Fife	-	30-NOV-1979
Hays Crossing	1379910	Populated Place	Coleman	TX	312813N	0992601W	1358	Fife	-	30-NOV-1979

[View & Print all](#) [Save as pipe "|" delimited file](#)

I took a chance and searched for Elm Creek in Coleman Co. This is a very common name and may turn up multiple instances even in a single county.

In this case we got just one creek, with source, mouth, and a set of various coordinates.

This Elm creek exists in both Coleman and Concho Counties.

The list at the bottom shows the 5 maps it is on.

NPL

Feature Detail Report for: Elm Creek

ID: 1373640
 Name: Elm Creek
 Class: Stream ([Definitions](#))
 Description: Flows southward for 26 miles into Colorado River.
 Citation: U.S. Geological Survey. Geographic Names Phase I data compilation (1976-1981). 31-Dec-1981. Primarily from U.S. Geological Survey 1:24,000-scale topographic maps (or 1:25K, Puerto Rico 1:20K) and from U.S. Board on Geographic Names files. In some instances, from 1:62,500 scale or 1:250,000 scale maps.
 Entry Date: 30-Nov-1979
 *Elevation: 1450/442

*Elevations in feet/meters from the [National Elevation Dataset](#)

Counties

Sequence	County	Code	State	Code	Country
1	Coleman	083	Texas	48	US
2	Concho	095	Texas	48	US

Linear Feature (Stream, Valley, Arroyo) Mouth

Sequence	Latitude(DEC)	Longitude(DEC)	Latitude(DMS)	Longitude(DMS)	Map Name
1	31.5290453	-99.6528466	313145N	0993910W	O.H. Ivie Reservoir

Linear Feature (Stream, Valley, Arroyo) Source

Sequence	Latitude(DEC)	Longitude(DEC)	Latitude(DMS)	Longitude(DMS)	Map Name
5	31.82848	-99.6697985	314943N	0994011W	Talpa

Coordinates (One point per USGS topographic map containing the feature, NAD83)

Sequence	Latitude(DEC)	Longitude(DEC)	Latitude(DMS)	Longitude(DMS)	Map Name
1	31.5290453	-99.6528466	313145N	0993910W	O.H. Ivie Reservoir
2	31.5523777	-99.6253459	313309N	0993731W	Voss
3	31.6251527	-99.6220143	313731N	0993719W	Bead Mountain
4	31.6398744	-99.6253481	313824N	0993731W	Little Grape Creek
5	31.8284800	-99.6697985	314943N	0994011W	Talpa

GNIS – You can search all of Texas (or the US)

Here, I left the county blank.

“Post Oak Creek” returns 26 features. Note that if you click on Cashes Creek or Deep Creek you would see that they have Post Oak Creek as a variant name.

Feature Query Results

Click the feature name for details and to access map services

Click any column name to sort the list ascending ▲ or descending ▼

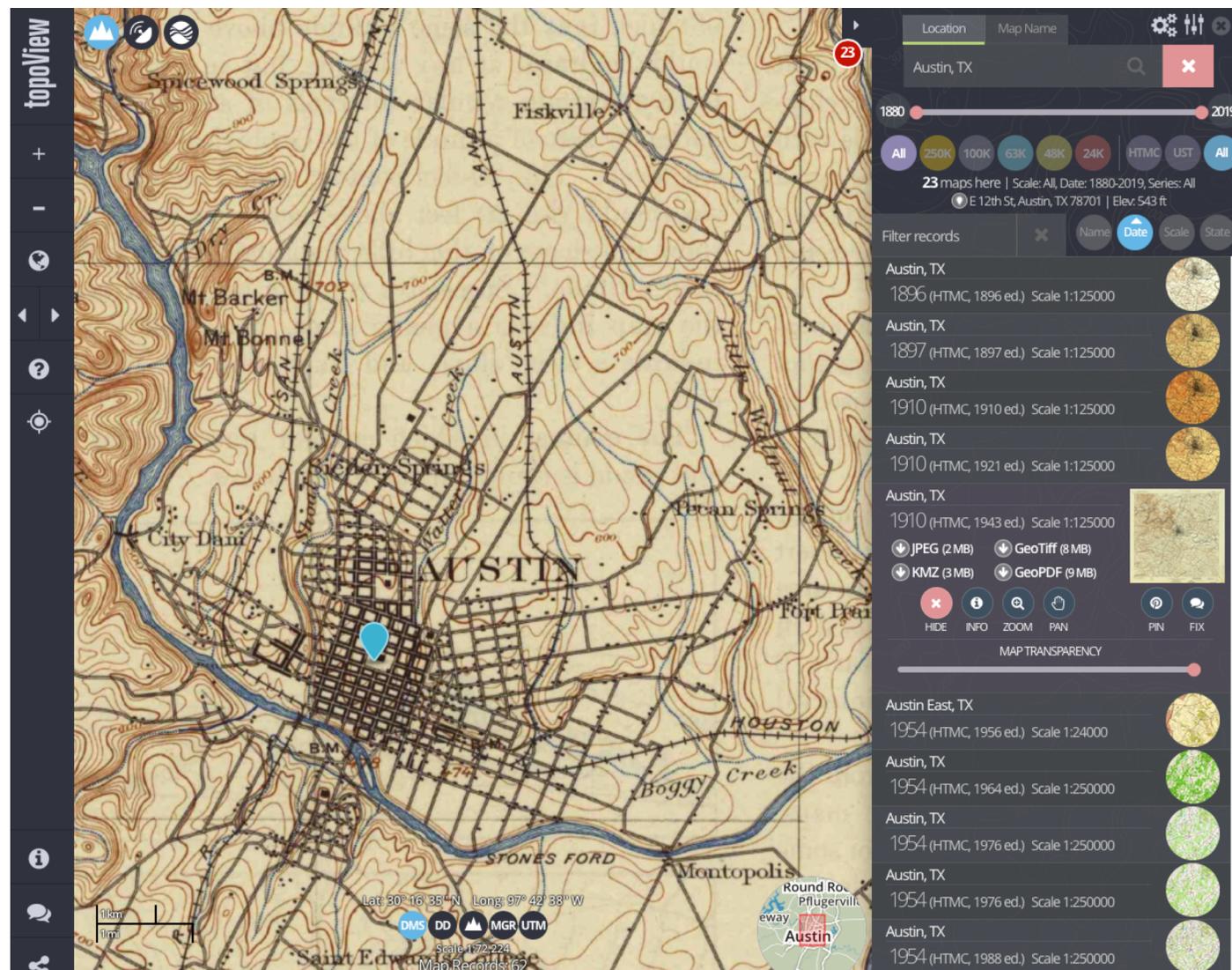
Feature Name ▲	ID	Class	County	State	Latitude	Longitude	Elev(ft)	Map	BGN Date	Entry Date
Cashes Creek	1353923	Stream	Matagorda	TX	284531N	0961049W	0	Blessing	-	30-NOV-1979
Deep Creek	1334190	Stream	Shackelford	TX	324015N	0991036W	1234	McCathrine Mountain	-	30-NOV-1979
East Little Post Oak Creek	1356665	Stream	Clay	TX	333958N	0982456W	915	Scotland	01-JAN-1964	30-NOV-1979
Little Post Oak Creek	1361434	Stream	Clay	TX	334047N	0982428W	915	Scotland	01-JAN-1964	30-NOV-1979
Little Post Oak Creek Park	2028955	Park	Clay	TX	333951N	0982408W	955	Scotland	-	11-FEB-2004
Post Oak Creek	1344405	Stream	Blanco	TX	301610N	0983140W	1283	Rocky Creek	-	30-NOV-1979
Post Oak Creek	1344406	Stream	Hill	TX	315333N	0965049W	449	Irene	-	30-NOV-1979
Post Oak Creek	1344407	Stream	Navarro	TX	315548N	0963853W	361	Dawson	-	30-NOV-1979
Post Oak Creek	1344408	Stream	Navarro	TX	320448N	0962027W	289	Powell	-	30-NOV-1979
Post Oak Creek	1344409	Stream	Shackelford	TX	323455N	0990926W	1283	Moran	-	30-NOV-1979
Post Oak Creek	1344410	Stream	Jones	TX	324836N	0993617W	1473	Lueders East	-	30-NOV-1979
Post Oak Creek	1365644	Stream	Atascosa	TX	290255N	0984540W	499	Bigfoot	-	30-NOV-1979
Post Oak Creek	1365645	Stream	Bexar	TX	291503N	0983740W	545	Macdona	-	30-NOV-1979
Post Oak Creek	1365646	Stream	Williamson	TX	303210N	0974737W	840	Leander	-	30-NOV-1979
Post Oak Creek	1365647	Stream	McLennan	TX	313935N	0970354W	430	Elm Mott	-	30-NOV-1979

row(s) 1 - 15 of 26  

Topoview – Historical US Topo Maps

I enjoy this tool. Geolocate will show you these maps as well, but I prefer this interface.

You can type in a location name or GPS in the search box and see all of the historical and current topo maps that cover that location.



Topoview – Historical US Topo Maps

You can search by

- location
- map name, if you happen to know it.

You can limit the time period.

You can restrict scale. 'All' seems best while searching, but we usually end up using the 7.5 minute maps (24k).

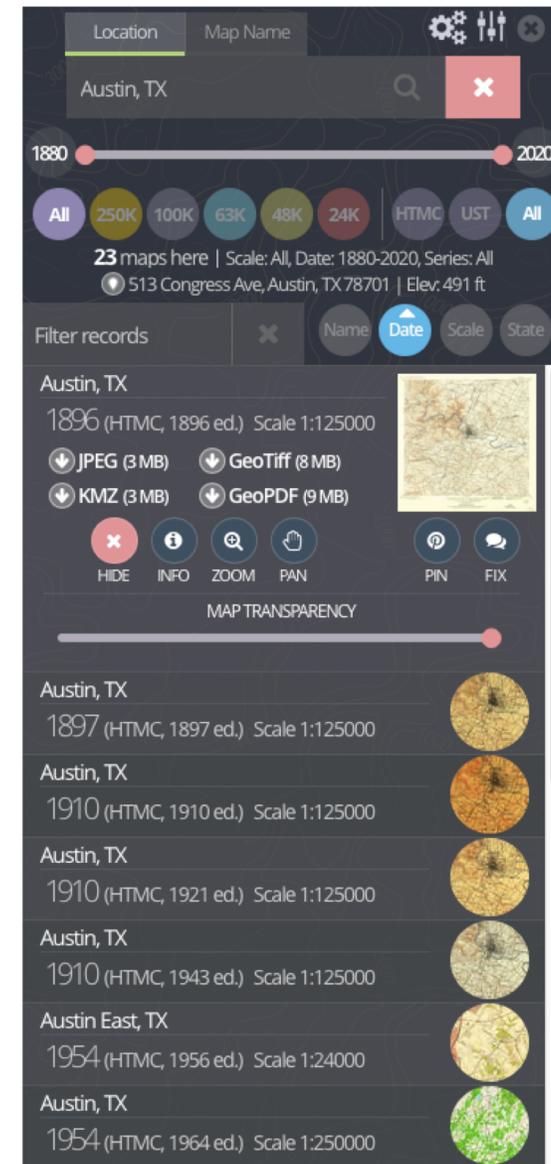
Results include

- Map names and dates with scale & thumbnail
- Potential downloads in various formats

Commands (e.g. Show/Hide)

And you can scroll through the results.

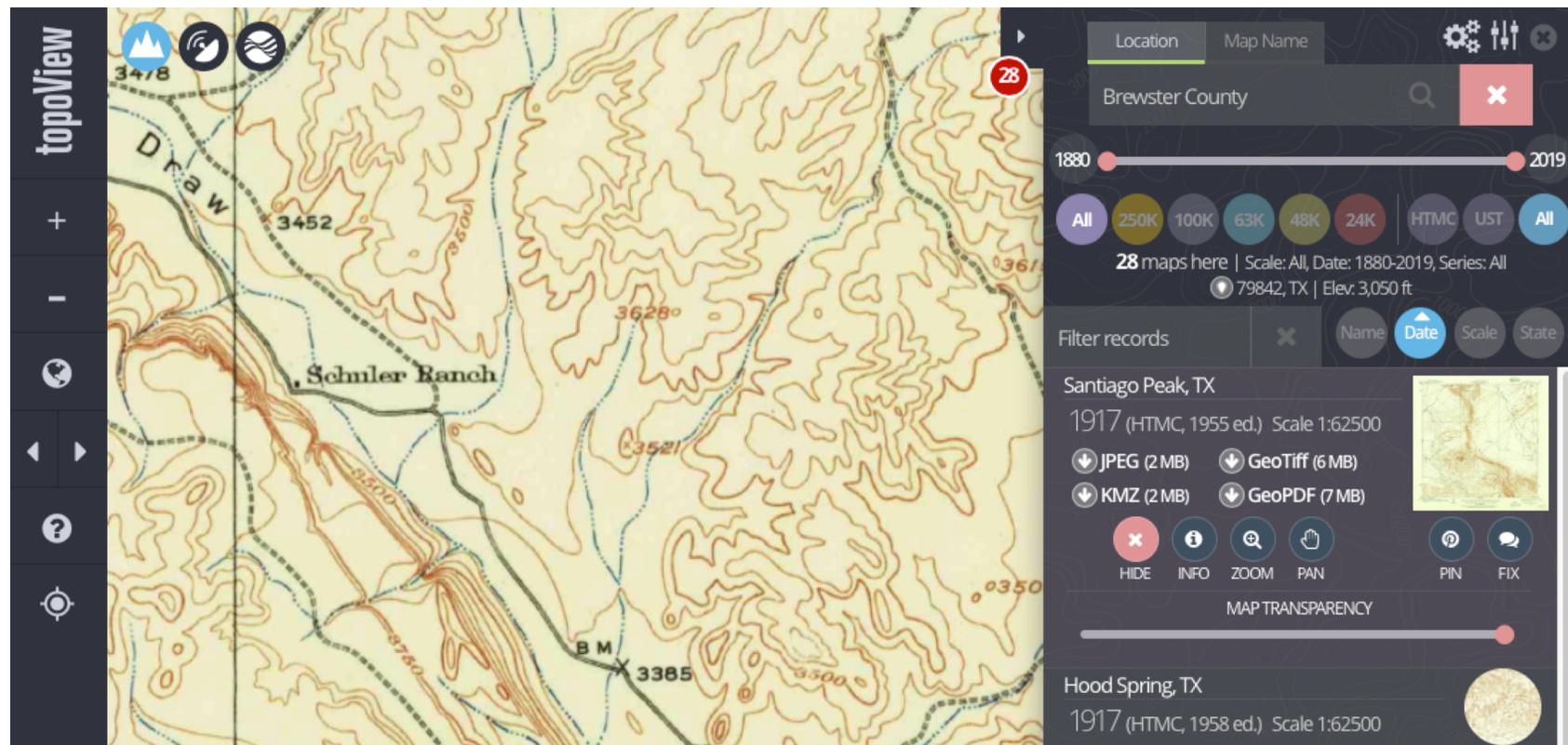
NPL



Topoview – Historical US Place Names

As an example, Schuler Ranch does not show up in GNIS. But it does on an old map in Topoview.

However, unless you had a rough idea where it was, this can require a lot of staring at old maps and is often fruitless.



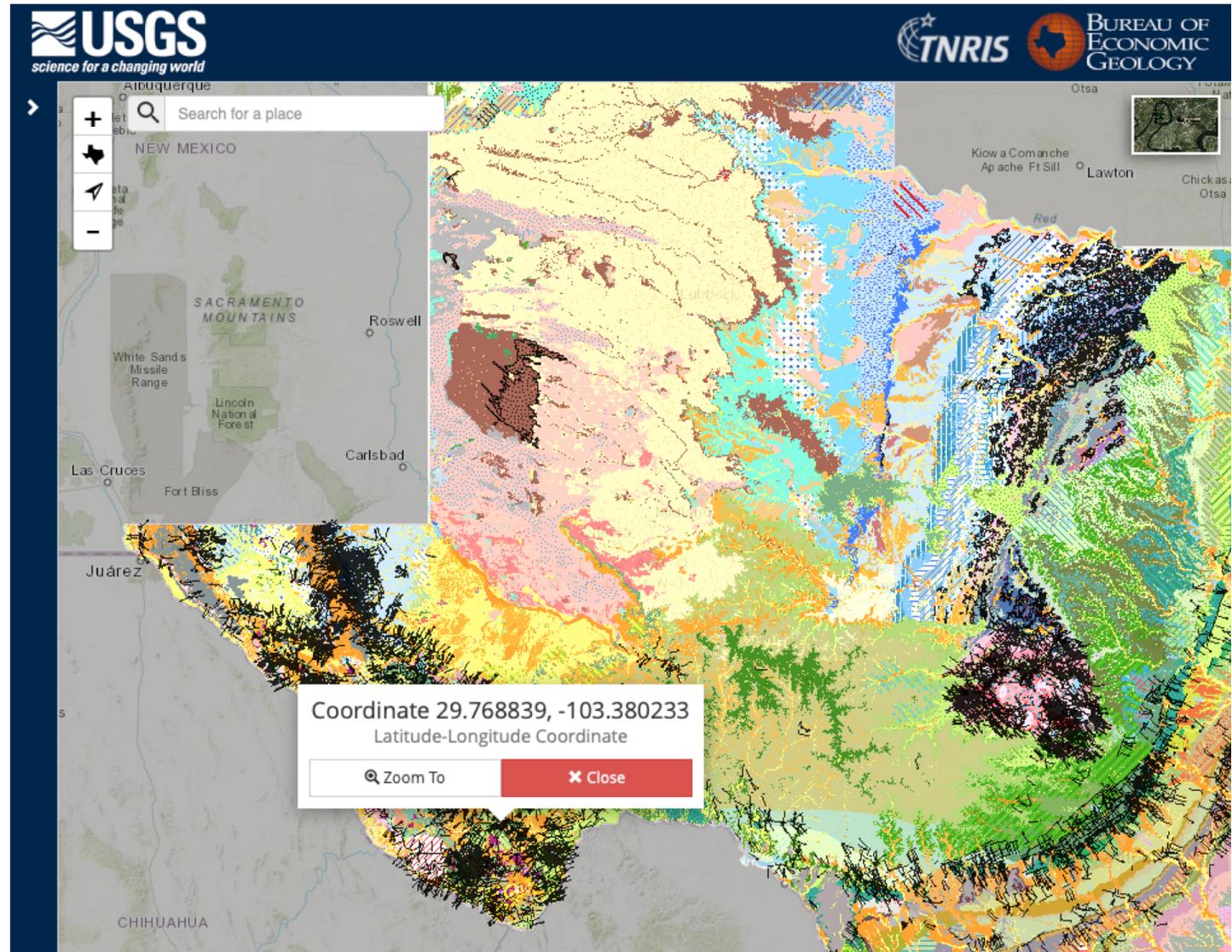
USGS Texas Geology

Suppose we want to confirm that the geology 2 miles east of Schuler Ranch is the Boquillas formation, which would match the data associated with the specimen in Specify.

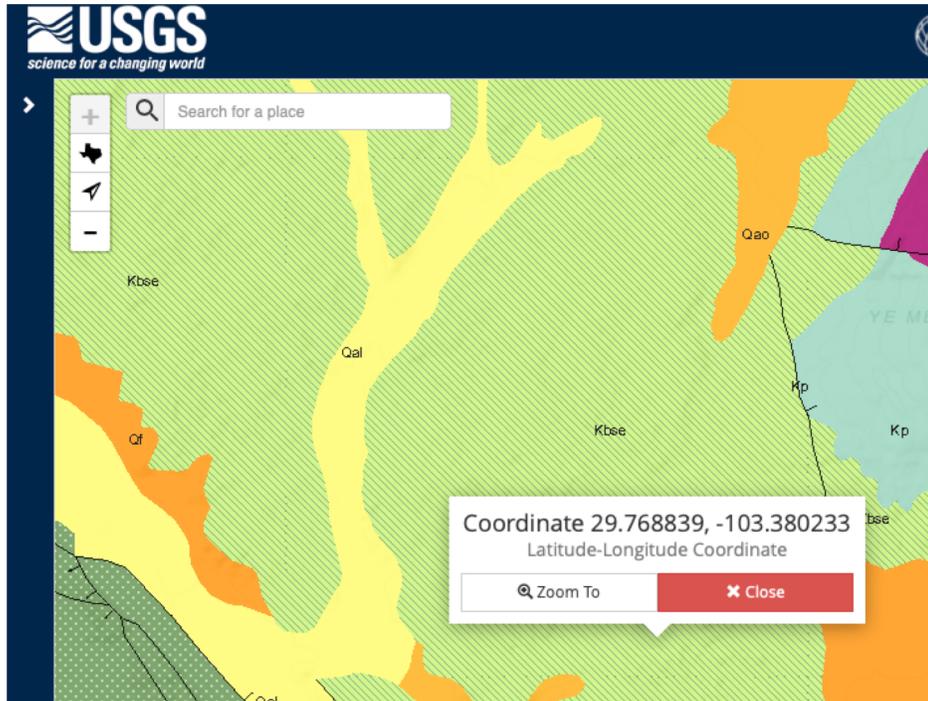
We know Schuler Ranch is at 29.768839,-103.380233

So we plug that in to the USGS site that contains all the data from the BEG geology maps and then click on *Zoom To ...*

NPL

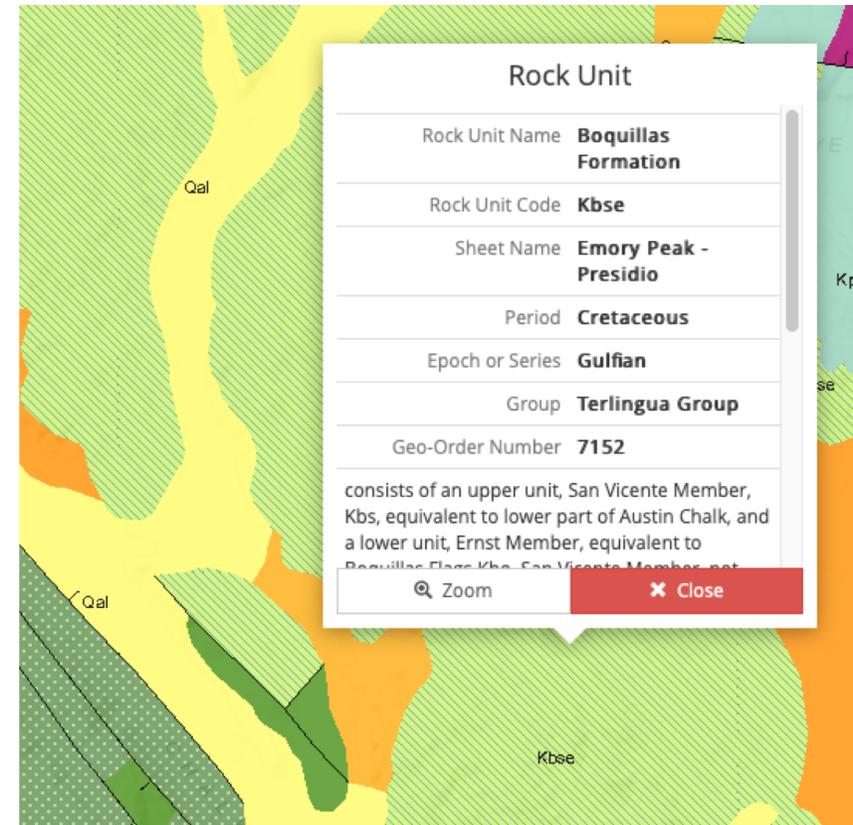


USGS Texas Geology



We can now click on the green formation labeled Kbse and we get detail on the formation.

This gives the unit name, the BEG sheet its on, the period, series and group. Plus there is a reasonable formation description you can scroll through. You do not get this additional data using Geolocate



FORMATION NAMES

Geolex

If you have a geological name that is unfamiliar Geolex can be valuable.

<https://ngmdb.usgs.gov/Geolex/search>

Type in a unit name, click on Texas, and then on search. You can also restrict by geologic age.

Sometimes you have a formation that is not currently in use. Geolex will normally tell you that and often what it has been renamed to.

Home Catalog Lexicon MapView New Mapping Standards Comments

National Geologic Map Database

Geolex Search

Search Count Units Search Reset

Welcome

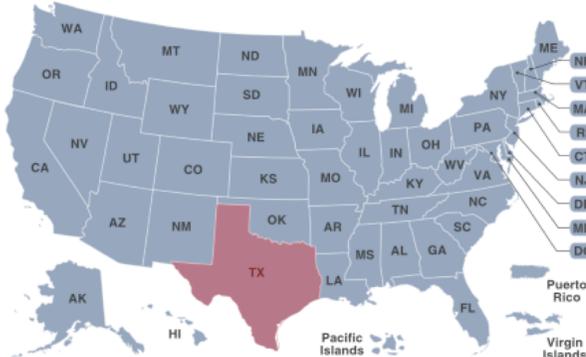
The U.S. Geologic Names Lexicon ("Geolex"), a National compilation of names and descriptions of geologic units.

 Find additional Stratigraphic Resources

 Search NGMDB for publications cited in Geolex

Unit Name Search by unit name, or skip to search all

State or Territory Click State/Territory to search, or skip to search all



Canada Lexicon Mexico Lexicon

Search Reset

Geologic Age Range

Search by geologic age

ERA	PERIOD	EPOCH	
Cenozoic	Quaternary	Holocene	
		Pleistocene	
	Tertiary	late (Neogene)	Pliocene
			Miocene
		early (Paleogene)	Oligocene
			Eocene
			Paleocene
Mesozoic	Cretaceous	Late	
		Early	
	Jurassic	Late	
		Middle	
	Triassic	Early	
		Middle	
Paleozoic	Permian	Late	
		Middle	
		Early	
	Carbonif.	Penn.	Late
			Middle
	Miss.	Early	
		Devonian	Late
	Middle		
	Early		
	Silurian	Late	
		Early	
Ordovician	Late		
	Middle		
Cambrian	Early		
	Late		
	Middle		
Precamb.**	Proterozoic**	Late*	
		Middle*	
		Early*	
	Archean**		

** Eon. * Era. [Learn more](#)

Geolex Result

- Home
- Catalog
- Lexicon
- MapView
- New Mapping
- Standards
- Comments

National Geologic Map Database

Geolex Search Results



Records 1 - 4 (of 4)

Unit names starting with "Walnut":

Walnut

- Walnut Clay of Fredericksburg Group (AR*,OK*,TX*, and LA*-subsurface)
- Walnut Formation of Fredericksburg Group (NM,TX*)
- Walnut Marl of Fredericksburg Group (OK,TX)
- Walnut Member of Goodland Limestone of Fredericksburg Group (recognized locally in northeast TX* and southeast OK)

Geolex records where "walnut" appears in "Usage" field:

(Note -- this list may include more, or fewer, geologic names than are actually related to the name you requested.)

Bee Cave

Bee Cave Member of Walnut Formation (TX)

Cedar Park

Cedar Park Member of Walnut Clay of Fredericksburg Group (TX)

Keys Valley

Keys Valley Marl Member of Walnut Formation (TX)

Records 1 - 4 (of 4)

Search Criteria — Unit Name: Walnut • Location(s): Texas • Geologic Age Range: Archean – Holocene

You get an overview of matching units and can then dive down and get more detail.

- Home
- Catalog
- Lexicon
- MapView
- New Mapping
- Standards
- Comments

National Geologic Map Database

Geolex — Unit Summary

Geologic Unit: Walnut



Usage:

- Walnut Clay of Fredericksburg Group (AR*,OK*,TX*, and LA*-subsurface)
- Walnut Formation of Fredericksburg Group (NM,TX*)
- Walnut Marl of Fredericksburg Group (OK,TX)
- Walnut Member of Goodland Limestone of Fredericksburg Group (recognized locally in northeast TX* and southeast OK)

- Correlation charts
- GNC Archives
- N.A. Stratigraphic Code
- More Resources

Subunits:

(alphabetical): Bee Cave Member, Cedar Park Member, Keys Valley Marl Member.

Geologic age:

late Early Cretaceous (Albian)*

Type section, locality, area and/or origin of name:

Not designated. Named from their characteristic occurrence at Walnut [Walnut Springs], Bosque Co., TX (Hill, 1891).

SHORTHAND ENTRIES AND THE VALUE OF PAPERS

Example: Collector Shorthand

Some locations can be opaque. E.g. we had a collection event with

Locality: PGC(B) 15.5

Verbatim Locality: R-103, San Saba Co, San Saba, Texas

Associated with events are specimens. In this case, UT-12342.00B

Looking that up in the database, we find it associated with a publication:

Carboniferous Stratigraphy of the Leonard Ranch Area, Sana Saba County, Texas.

Oden, 1958, Masters Thesis. pl. 6, fig. 10

Looking in Oden 1958 (downloaded as a PDF from the UT library) we find that PGC is a measured section:

Pecan Grove Cloverleaf

and that R-103 has a detailed location description:

White Ranch; immediately south of ranch road between White's Antelope Windmill and the Joe Lyles Windmill about 0.5 mile east of the Lyles' mill. J-2.

Even better, J-2 is a map coordinate for a map in the back of the thesis.

UT Location Numbering Scheme

UT has a system of locality coding that looks like '42-T-32', where the first number indicates the county, the 'T' is for Texas, and the second number is the unique location within that county.

Other states are included in this system, but the vast number of these are in TX.

If we have a locality number but incomplete *verbatim locality* and *locality name* data, we can go look up that locality number in the curator's office.

Also, if the county information is not already contained in the database, we can enter that based on the first part of locality code. 42 = Coleman.

In addition, there are many location-number systems unique to particular collectors and/or publications. We have captured many of these in the Wiki as we figure them out.

Location Prefixes Captured in the Wiki

Location Prefixes	County	GPS	Source	Notes
1-301 King Locations Includes ranches, hills of the form 'Hill 4806', ...	Brewster, Culberson, Hudspeth, & Pecos		<i>Permian Brachiopods of West Texas</i> , Cooper & Grant, Smithsonian Inst. Press, 1972	The publication lists numerous King localities in West Texas. Includes significant help identifying benchmarks, peaks not named on the maps, and ranches. Most of these names are old, circa 1920-40. West Texas Brachiopod Location Names . Describes location naming conventions for ranches, tanks, hills, etc. King Brachiopod Locations includes Cooper and Grant's augmented version of King's locations with modern formation names in brackets.
134-T, 141-T, 153-T, 159-T, 16-T, 27-T	Various		Plate 1 in Bull. 4329	For these county locations, many are captured on the map associated with the entry for 250-T
250-T	San Saba		Plate 1 n Bull. 4329	Map is in the back of <i>The Carboniferous Rocks of the Llano Region of Central Texas</i> , F. B. Plummer, UT BEG Publication No. 4329, August 1, 1943.
48-1 to 53-5, etc. Young Localities	Various, often Travis & Williamson			Young used a location notation of the form 'year-sequentialNumber'. These are recorded in the notebooks in the box in the PRC 122 hall on the right hand side labeled "Historic Notebooks, Field Localities, Adkins & Young".
44.1 to 152.2 Plummer Localities	Various		UT Bull. 2132	See <i>1921-Plummer-Pennsylvanian-Locs-54.n.pdf</i> on the Z drive in <i>Doclib/GeoReferencing/FoundPlaces</i> for detailed location descriptions.

PUBLIC LAND SURVEY SYSTEM & TEXAS SURVEYS

Public Land Survey System (PLSS)

The PLSS is the surveying method developed and used in the United States to plat property for sale and settling.

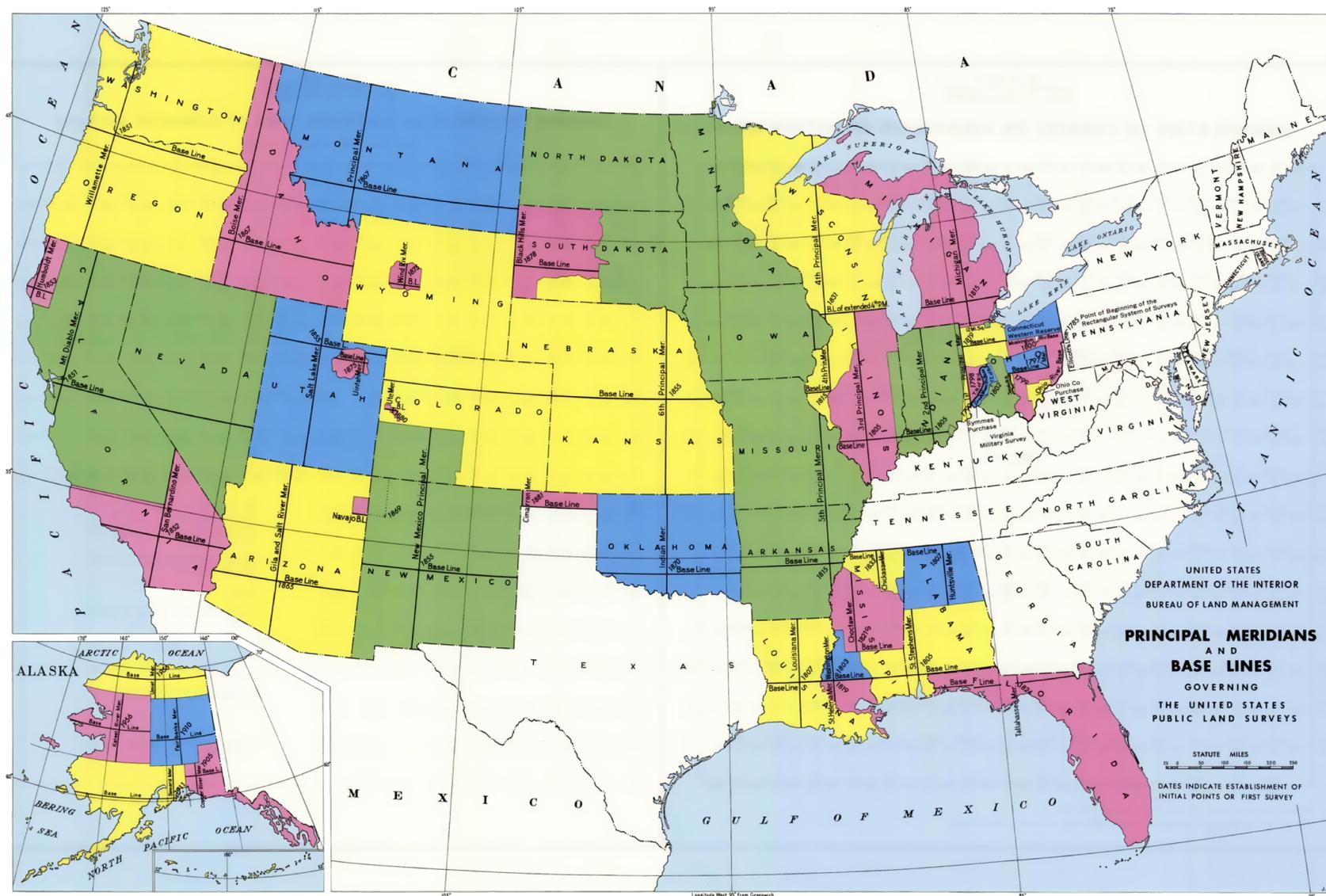
Also known as the Rectangular Survey System, it was created by the Land Ordinance of 1785 to survey land ceded to the United States by the Treaty of Paris in 1783

Most states, particularly in the mid-west and west use this system to describe property and, thus, locations. If you see *township* and *range*, you are most likely looking at PLSS coordinates. Oklahoma uses PLSS.

Texas uses a hybrid of its own early system, based on Spanish land grants, and a variation of the PLSS.

Other major exceptions to PLSS (in whole or in part) include the 13 original colonies, old Cherokee lands in Georgia, Hawaii, Louisiana, and New Mexico.

Meridians & Baselines



Township & Range in Geolocate

In Geolocate you can use township, range and sections to get to a section on USGS topo maps. Consider

“center NE 1/4 SW 1/4 sec. 10, T. 2 N., R. 6 E., 8 miles south of Ada”

This is Amsden's location for Yellow Bluff.

For Geolocate we format the location as follows:

t2n r6e section 10

That's Township 2 North, Range 6 East, Section 10.

You may get multiple results given that I don't see any way to specify the meridian. But if you know the county, you will get one answer.

Township & Range in Geolocate

The locality string in Geolocate is

t2n r6e section 10

The radius of uncertainty covers section 10.

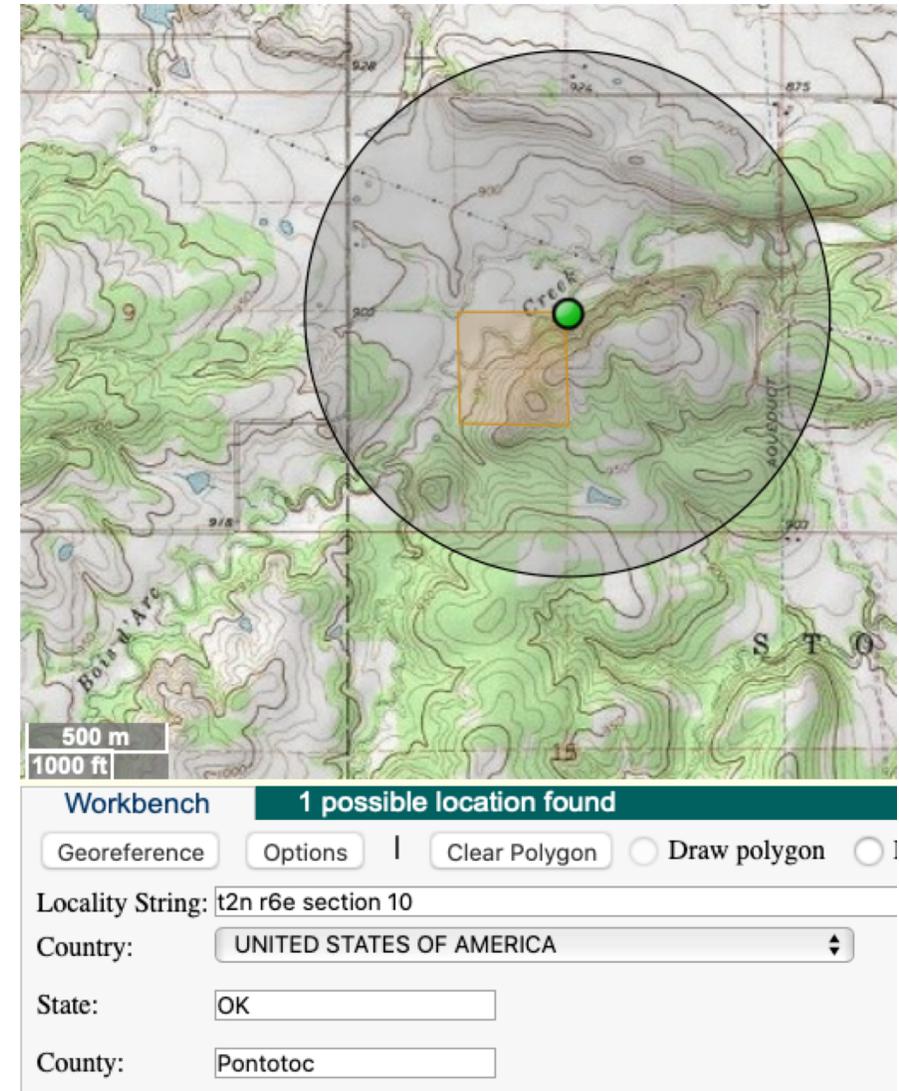
Note the '9' in the adjacent section. There is a '10' underneath the green dot.

I used the 'Draw polygon' tool to draw a square around

NE $\frac{1}{4}$ SW $\frac{1}{4}$

And 'Center' would be in the middle of this.

Center SW $\frac{1}{4}$ NW $\frac{1}{4}$ Section 14 Township 2 South Range 3 West



Switch to Google Satellite Base Layer

The green dot is the center of the previous polygon and the uncertainty circle encompasses the polygon we drew.

For those of you familiar with Yellow Bluff, you can see that this puts us in the right place.



Workbench **1 possible location found**

| Draw polygon Place marker

Locality String: t2n r6e section 10

Country: UNITED STATES OF AMERICA

State: OK

County: Pontotoc

Texas Surveys - Texas General Land Office Land/Lease Viewer

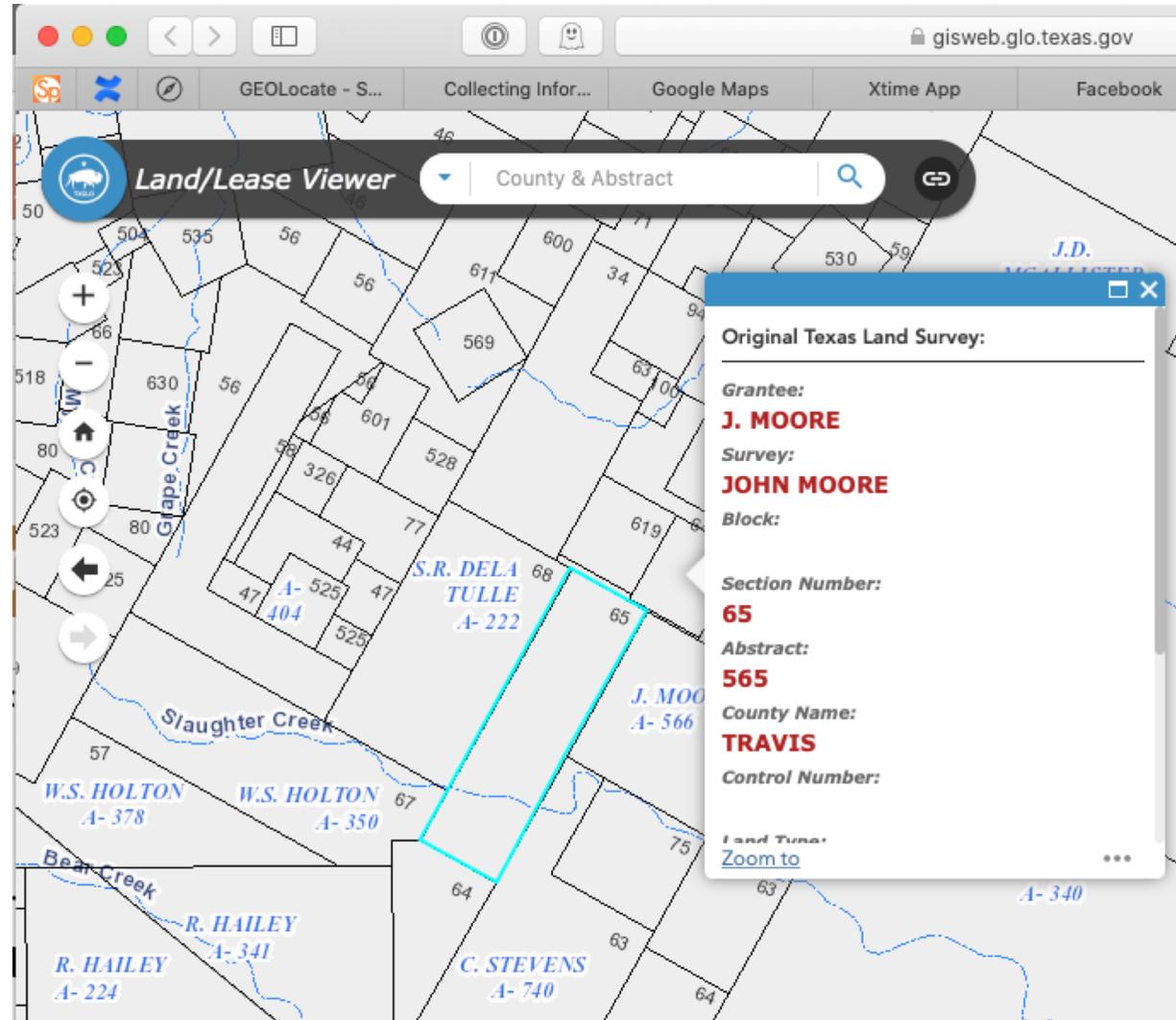
For Texas surveys, you need to go to

gisweb.glo.texas.gov

These can be tough, but fun, to track down, depending on your initial data.

Various values may be filled in depending on the original survey. Some of the more useful are survey name, grantee, block and section. Often things are abbreviated, especially first and middle names.

Which means less is often more in these searches.



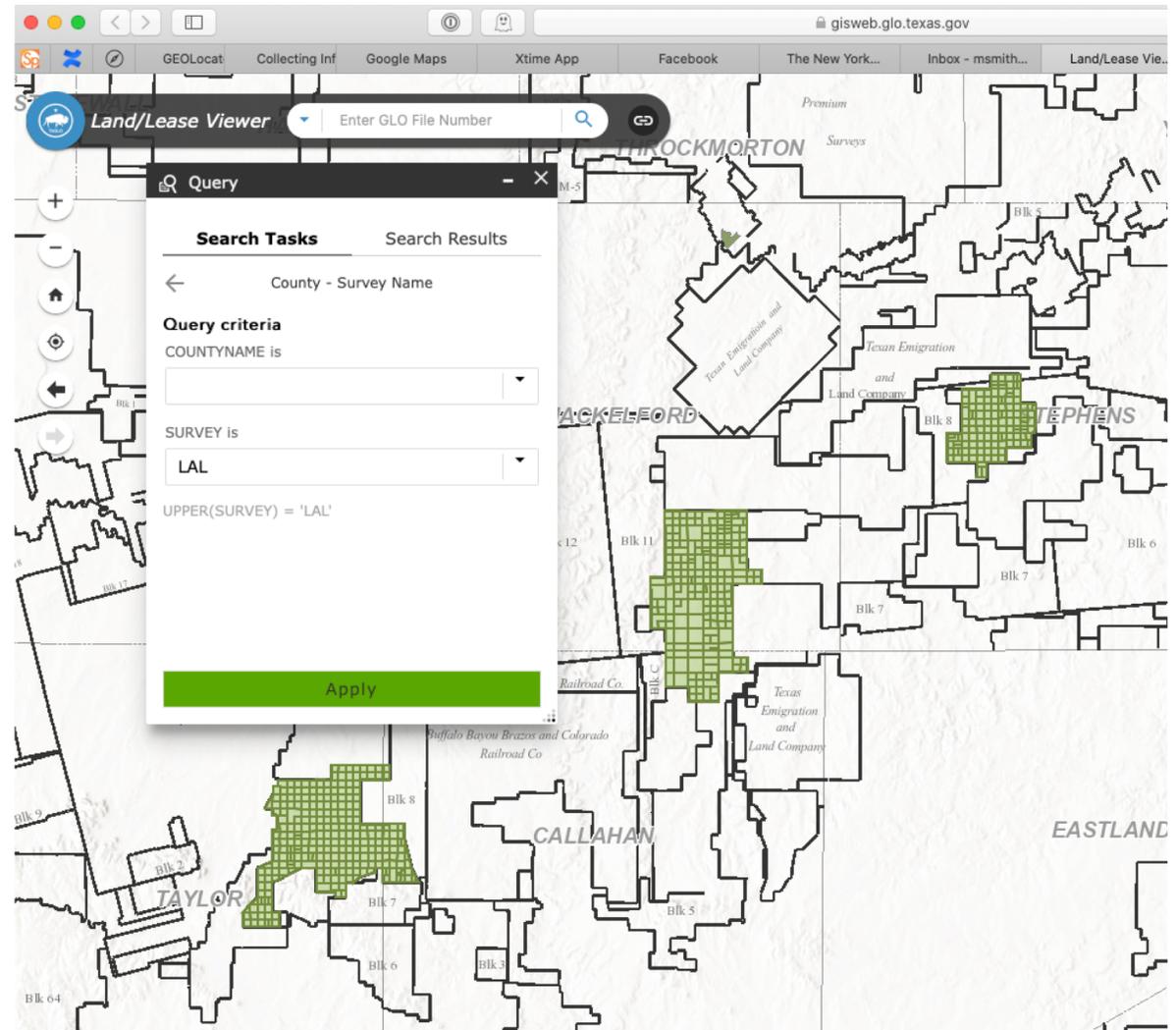
Government Land Office Viewer

My favorite find was 'Lunatic Asylum Lands'. I found an old map, but had trouble aligning it to current maps. It turns out that in the GLO site, Lunatic Asylum Lands is 'LAL' and 'Blind Asylum Lands' is BAL.

Once I had figured out that Lunatic Asylum Lands was abbreviated LAL, I entered this, leaving off the county and got the following three hits in Taylor Shackleford, and Stephens counties.

Zooming in, these have section numbers, so if you know the county, survey and section number you can get within a radius of a mile or so.

NPL



MISCELLANEOUS

NPL

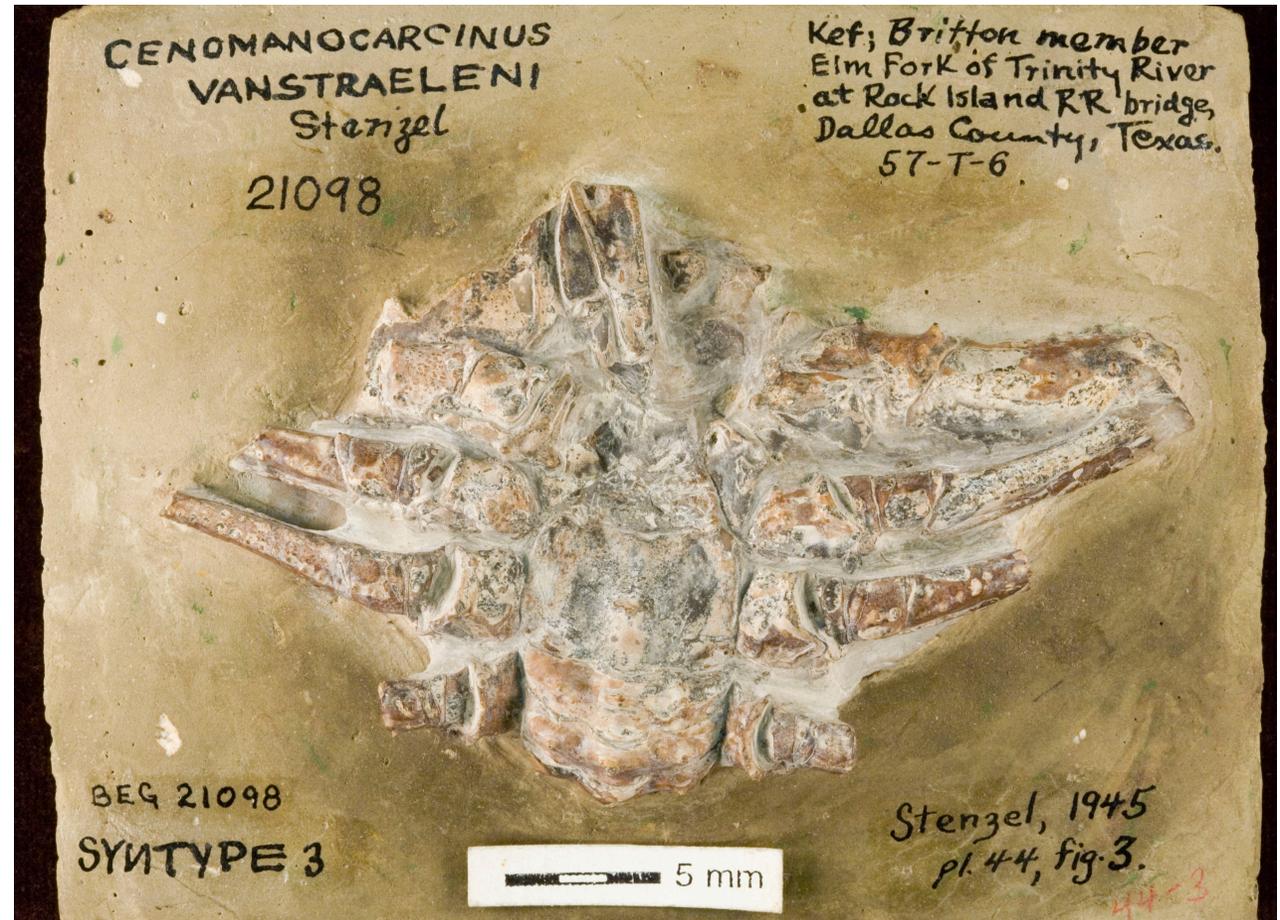
Transcription errors

It can sometimes make sense to check the original catalog entry or notes associated with the specimen. Though this definitely slows your throughput.

Field labels were hand copied or typed into catalogs, which were scanned. That data was read and entered into the database. Each transcription step may have introduced errors based simply on typos.

Many original labels were hand written and can be difficult to make out. Many old paper labels may have been partially eaten by silverfish.

NPL



Transcription errors

Sometime people shorten or expand the original text. This can lead to a variety of mistakes, though not in this case.

It helps to know some Texas geology. For example, you can catch when someone has mistaken a formation name for a location.

You know that a Pennsylvanian age location cannot be on the Texas coast...

- 21098 Cenomanocarcinus venstraeleni Stenzel River
BEG loc. no. 57-T-6 Loc. descrip. Elm Fork of Trinity R. at Rock Island
R. R. bridge, Dallas Co., Texas
Pub.: Stenzel (1945) U. T. Pub. 4401, p. 447, pl. 44, fig. 3
Type: Syntype 3 Age: Cretaceous Fm.: Eagle Ford, Britton Specimens: 1
KEF fm.
- 21099 Enoploclytia wintoni Stenzel
BEG loc. no. Loc. descrip. Near Crowley, Tarrant Co., Texas
(T. C. U. coll. no. N302)
Pub.: Stenzel (1945) U. T. Pub. 4401, p. 421, pl. 43, figs. 1, 2
Type: Monotype Age: Cretaceous Fm.: Weno Specimens: 2
Coll.: N. E. Nelson
- 21100 Homarus travisensis Stenzel
BEG loc. no. 226-T-58 Loc. descrip. Bull Creek Road, between Bull Creek
and Dry Creek, Travis Co., Texas.
Pub.: Stenzel (1945) U. T. Pub. 4401, p. 423, pl. 41, figs. 14-16, text fig. 10
Type: Monotype Age: Cretaceous Fm.: Walnut Specimens: 1
Coll.: R. H. King and C. Harris Date 9-16-34

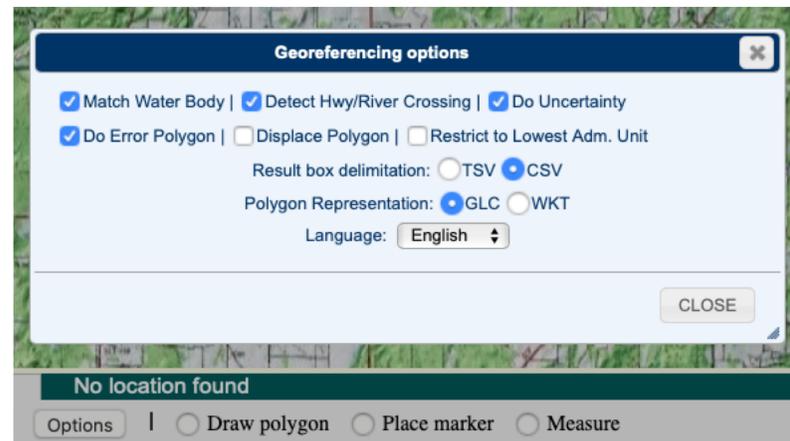
Copying coordinates between tools

This is minor, but different tools expect different formats for GPS. Google maps, when you click on “What’s here” displays both

- 33.186434, -94.181820 and
- 33°11'11.2"N 94°10'54.6"W

Most tools are happy with the first, not so much the second. Geolocate defaults to tab-separated data when it reports latitude, longitude & uncertainty in its text box. Most tools, including Geolocate, won't accept this as input.

Fortunately, you can get comma separated results by selecting the **CSV result box delimitation** option to simplify cutting and pasting between tools.



latitude: 31.441559 longitude: -99.339397

31.441559,-99.339397

See the Geo-referencing Solutions page in the Wiki:

<https://wikis.utexas.edu/display/specify6/Geo-referencing+Solutions>

for additional details on the following

- County Numbers
- Place Names
- Locality Numbers
- GPS Syntax
- Blocks and Sections in Texas
- Wells and Leases
- Depot and Station
- Benchmarks
- Apparent West Texas County Errors
- Uncertainty
- Converting from Universal Transverse Mercator (UTM) to decimal degrees.

POSTSCRIPT

This presentation was given via Zoom at the June, 2020 virtual meeting of the Paleontological Society of Austin.

Members added useful information and asked questions in the chat. And at the end we had a Q&A. Rather than edit that audio, I have organized and summarized it here.

Zoom Chat: Organizations that provide local help

There are some places and organizations in Austin to help with historical locations in this vicinity.

Jim Sprinkle - One time the Travis County Historical Commission helped me track down an old school that was used as a reference mark in a locality description. They meet every month or two, and the meetings are open to everyone. They were very friendly

<https://www.traviscountytexas.gov/historical-commission>

Mike Smith - I have used the Austin History Center to get aerial photos of Austin in the 50's. And they have lots of other collateral and are very helpful.

<https://library.austintexas.gov/location/austin-history-center>

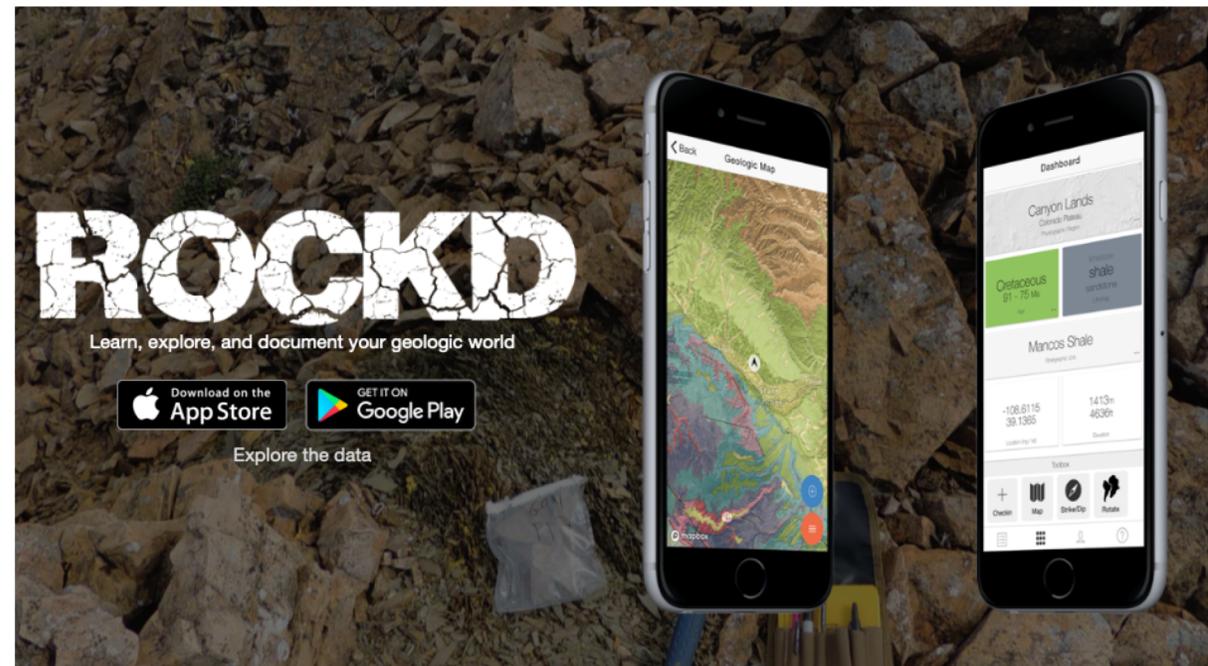
Chat: Macrostrat

Jim Sprinkle - Macrostrat is pretty great for bedrock maps (US and world wide). They produce some mobile apps as well

<https://macrostrat.org/map/>
<https://macrostrat.org/#apps>

Their mobile apps include RockD for IOS and Android.

RockD uses your GPS to tell you what formation you are standing on, as well as a lot of other data.



Q&A: How do you determine formations in creeks?

Would bedrock maps be best for determining "formations" in creeks? The Texas geology maps mostly just say Quaternary so it's hard to determine the formation for finds in a creek.

Essentially, given that there is usually eroded material that's filled in the creek, you have to look at the surrounding geology, and guesstimate.

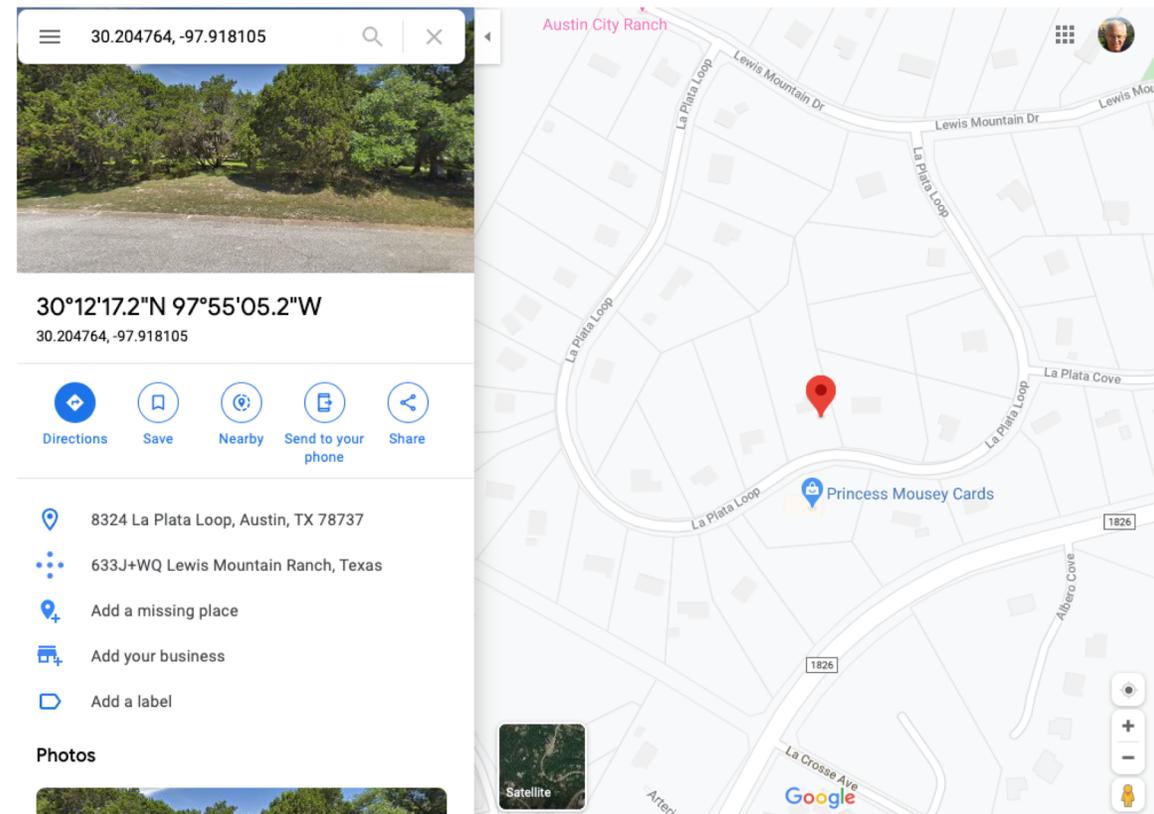
For tools in the field, see the previous slide re RockD.

Q&A: How do you use Google Maps to get GPS coordinates?

Online, its easy. Right clicking brings up a menu that includes 'What's here'. Select that and coordinates appear at the bottom of the page. If you click on the gps link there, the upper left of the screen will show location in decimal and degrees/minutes/seconds.

On your phone, both Google Maps and Apple Maps allow you to set a pin with your finger. Then you can scroll up and they show GPS coordinates.

However, there are better solutions. We've already talked about Geolocate for online determination of coordinates.



Q&A: Apps for GPS coordinates

Theodolite is the iPhone app I use to record a location. You take a picture of the outcrop and it overlays a timestamp, GPS coordinates, elevation, and the direction you are facing.

<https://apps.apple.com/us/app/theodolite/id339393884>

Equivalent apps on Androids seem to be Dioptra and GeoCam. I have no experience with either.

https://play.google.com/store/apps/details?id=com.glidelinesystems.dioptra&hl=en_US

https://play.google.com/store/apps/details?id=com.myway&hl=en_US

Phone apps can fail - e.g. your battery goes dead, the phone can't pick up satellites, etc. Ultimately, a handheld GPS will be most dependable.

And, per Erich Rose, nothing ever replaces paper and pencil.

Q&A: Have you ever been completely stumped

Absolutely.

- Some things can't be found. We talked about old ranches.
- Some descriptions are internally inconsistent. One example is when someone mis-transcribes a direction and there is no backup.

This failure would normally get reflected in the uncertainty measure.

- Uncertainty can end up being the entire county.
- Or in the worst cases, the entire state.

Coda - if you are going to donate specimens to any collection, make sure your locations are pinned down. Otherwise the material is likely to end up in the give-away box.