Retrospective Georeferencing

Guidelines for converting Text based descriptions into geospatial coordinates

by

Bushra Hussaini

17a: Original labels with locality info.

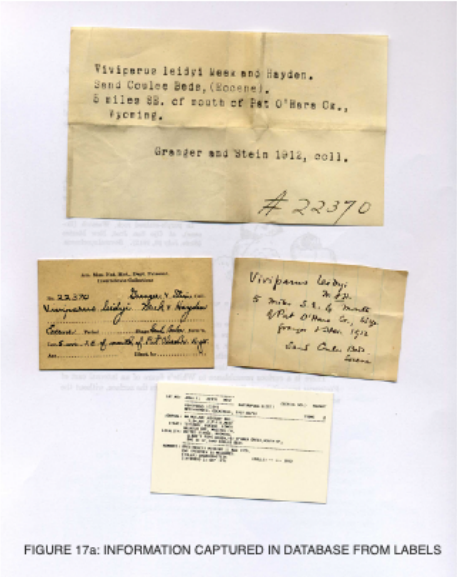

FIGURE 17a: INFORMATION CAPTURED IN DATABASE FROM LABELS

Here note on the label locality is 5 miles SE of south of Pat O Hara creek, WY

17b: Specimen label with locality info

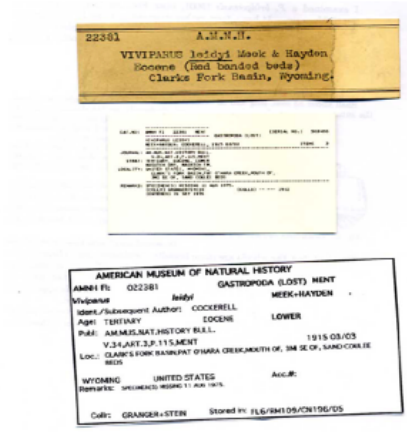

FIGURE 17b: SPECIMEN LABELS WITH SPECIMEN DATA

Here it is 3 miles SE of Pat O Hara creek

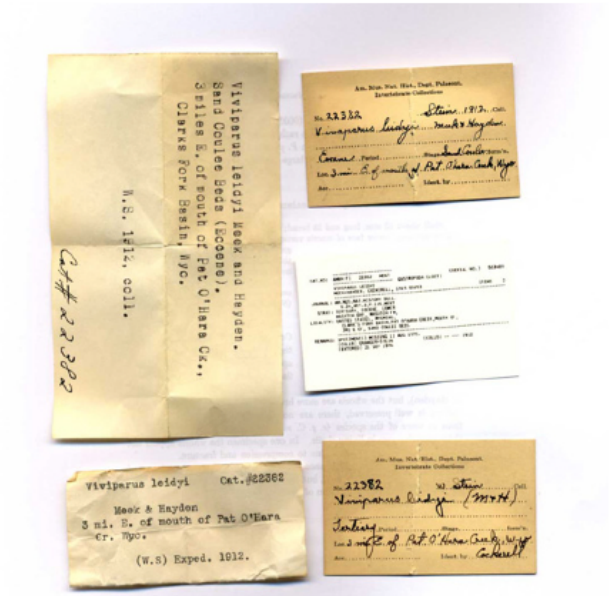

FIGURE 17c: DATA CAPTURED FROM VARIOUS GENERATIONS OF LABELS

Data capture from various generations of labels

Here it is 3 miles East of Pat O Hara Creek.

We defined Georeferencing as taking a locality and finding a spot on the earth that gives its latitude and longitude. When the information is good georeferencing poses no problems, but when the information is vague or confusing, the error bar grows. Notice the labels, the information described here is minimal but usable

To georeference, first research locality information from all sources….here are the several generations of labels for the same specimen over time

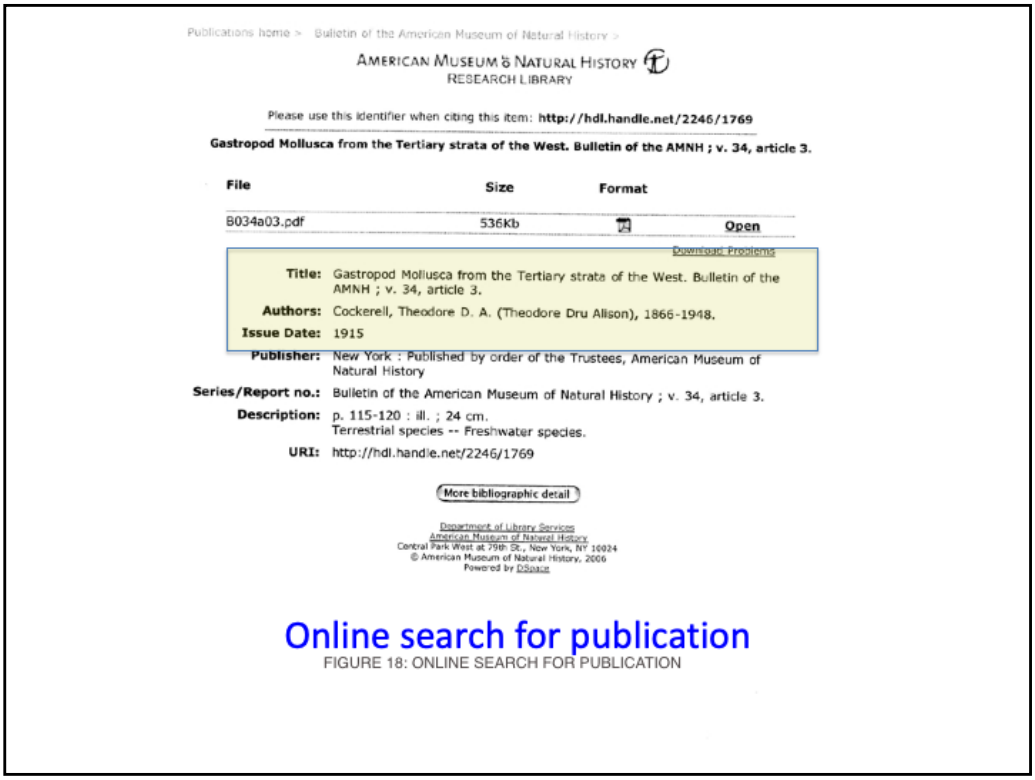

FIGURE 18: ONLINE SEARCH FOR PUBLICATION

To verify this locality information we went back to the original publication where the specimen is first described. In this case a paper by Cockerell published in 1915

Information captured from publication

BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY
COCKERELL, 1915. VOLUME 34. P.115.

56.63(118.73W)

Article III.—GASTROPOD MOLLUSCA FROM THE TERTIARY STRATA OF THE WEST.

By T. D. A. Cockerell.

A study of the Land and Freshwater Mollusca of the Rocky Mountain Tertiary strata leads to the expected conclusion that freshwater species have a greater range in time than terrestrial ones. More careful analysis of the evidence, however, indicates that this opinion is not so well supported as it at first seems to be. Successive groups of strata will contain representatives of the same genera of freshwater shells, while the land shell fauna found will usually show much generic diversity from period to period, in spite of the fact that most of the genera concerned have persisted down to the present day. This means, of course, that the terrestrial forms, though probably more numerous and diversified than the aquatic, are not so likely to be preserved. Thus we have in many cases a fairly representative showing of the freshwater genera, but only odds and ends of the terrestrial series.

It must also be noted that freshwater forms often fail to show very marked external features distinguishing allied species, and it is always possible that apparently long-lived types may in reality be composite, although we are not able to divide the material before us.

Three species of *Viviparus*, represented in the material before me, appear to extend from the Paleocene (whence they were described) well into the Eocene.

(1.) *V. trochiformis* (Meek & Hayden). Torrejon Formation, East Fork Torrejon Arroyo, New Mexico (Am. Mus. Nat. Hist., Exp. 1913); and also from the Wasatch at Ojo San José, New Mexico, many specimens (*Stein*, July 11, 1912).

(2.) *V. leidyi* (Meek & Hayden). Three lots from Clark's Fork Basin, Wyo., in the Sand Coulee Beds, collected by Granger and Stein. Three miles east, three miles southeast, and five miles southeast of the mouth of Pat O'Hara Creek.

One of the last lot is large, with aperture preserved; it is remarkable for the long aperture, which at once distinguishes it from *V. wyomingensis*. Aperture 23.5 mm. long; top of aperture to apex of spire 17.5 mm.; same length of spire on central axis 14.5 mm. Upper whorls only slightly convex.

(3.) *V. retusus* (Meek & Hayden). Many specimens, not very well preserved, from San Coulee Beds, head of Big Sand Coulee, Wyo. (*Granger and Stein*, Sept. 9, 1912).

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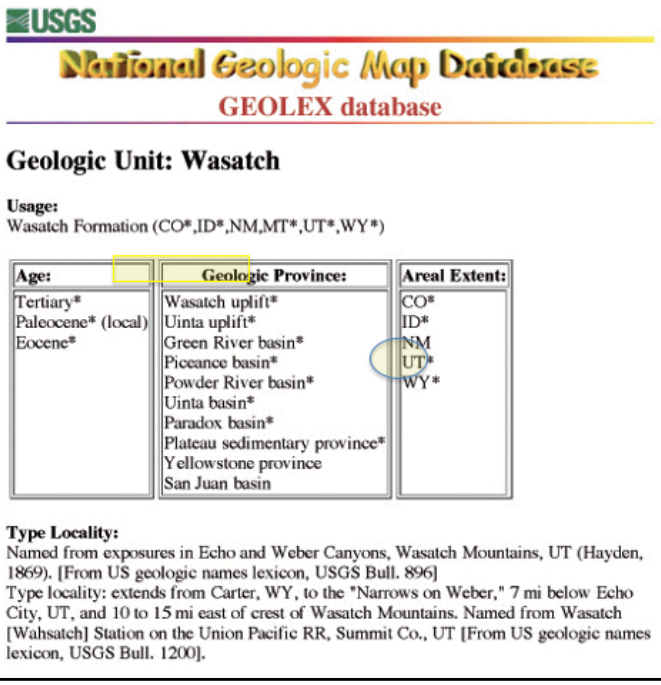
This paper describes three lots that were collected from the Clark's Fork basin, in the Sand Coulee beds, 3 miles east, 3 miles southeast and 5 miles SE of the mouth of Pat O Hara Creek.

Figure 20: Geolex search for Stratigraphic unit



USGS

National Geologic Map Database

GEOLEX database

Geologic Unit: Wasatch

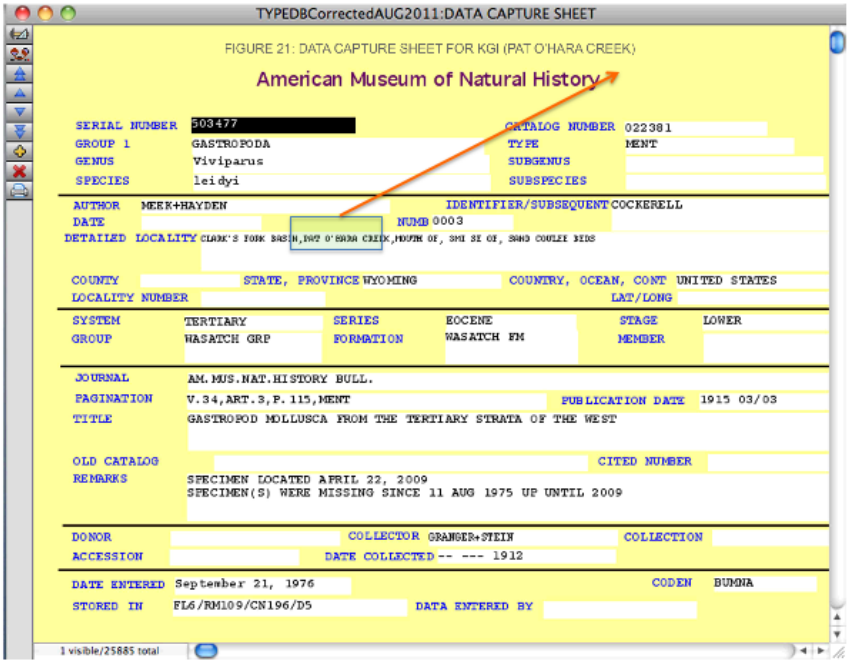
Usage:
Wasatch Formation (CO*,ID*,NM,MT*,UT*,WY*)

Age:	Geologic Province:	Areal Extent:
Tertiary* Paleocene* (local) Eocene*	Wasatch uplift* Uinta uplift* Green River basin* Piceance basin* Powder River basin* Uinta basin* Paradox basin* Plateau sedimentary province* Yellowstone province San Juan basin	CO* ID* NM UT* WY*

Type Locality:
Named from exposures in Echo and Weber Canyons, Wasatch Mountains, UT (Hayden, 1869). [From US geologic names lexicon, USGS Bull. 896]
Type locality: extends from Carter, WY, to the "Narrows on Weber," 7 mi below Echo City, UT, and 10 to 15 mi east of crest of Wasatch Mountains. Named from Wasatch [Wahsatch] Station on the Union Pacific RR, Summit Co., UT [From US geologic names lexicon, USGS Bull. 1200].

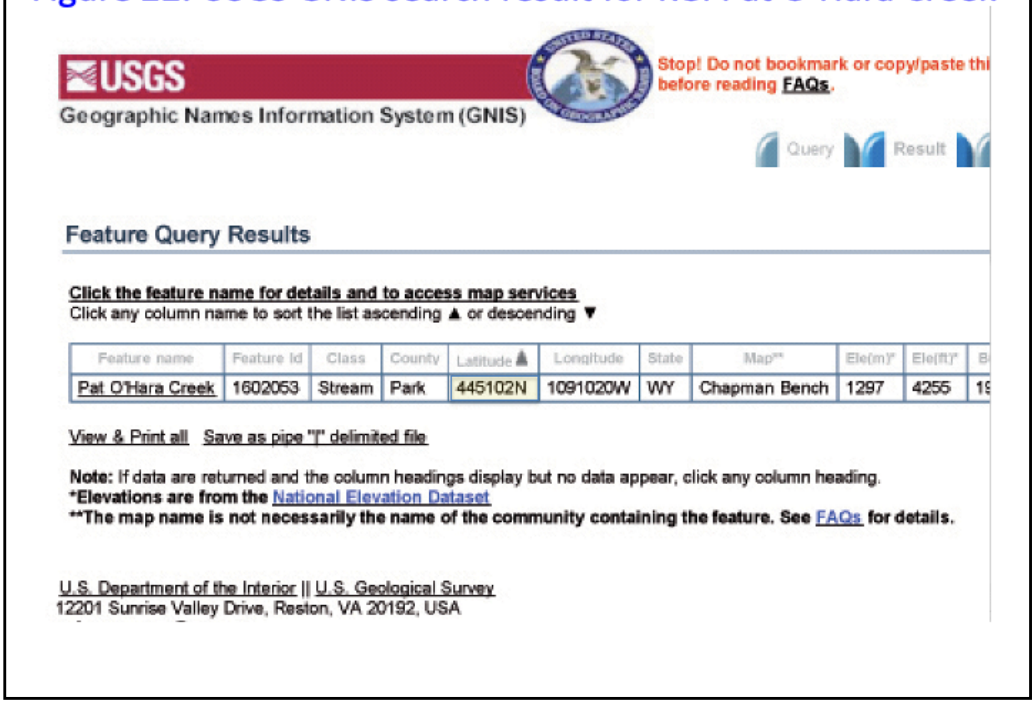
Verify the geologic information using online resources like Geolex.

Figure 21: Data capture sheet for KGI (Pat O'Hara Creek)



We standardize the locality description into a common term that will serve as the key geographic identifier (KGI) such as Pat O Hara Creek in this case. The data captured from the publication also shows that these specimens were collected from the lower Eocene of the Wasatch formation.

Figure 22: USGS GNIS search result for KGI Pat O'Hara Creek



USGS
Geographic Names Information System (GNIS)

Stop! Do not bookmark or copy/paste thi
before reading FAQs.

Query Result

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	Feature Id	Class	County	Latitude ▲	Longitude	State	Map**	Ele(m)*	Ele(ft)*	B
Pat O'Hara Creek	1602053	Stream	Park	445102N	1091020W	WY	Chapman Bench	1297	4255	19

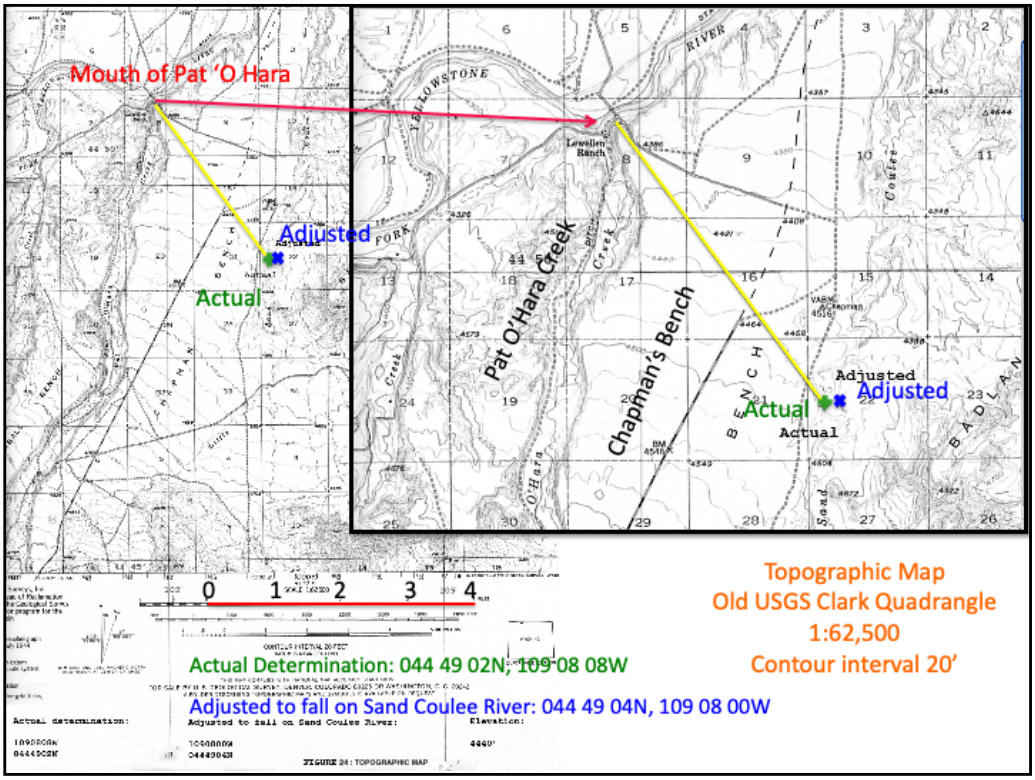
View & Print all Save as pipe "|" delimited file

Note: If data are returned and the column headings display but no data appear, click any column heading.
***Elevations are from the** National Elevation Dataset
****The map name is not necessarily the name of the community containing the feature. See** FAQs **for details.**

U.S. Department of the Interior || U.S. Geological Survey
12201 Sunrise Valley Drive, Reston, VA 20192, USA

Using the KGI we look up a name occurrence in databases like USGS's GNIS, Terraserver-USA, Geolocate, Geomancer etc.

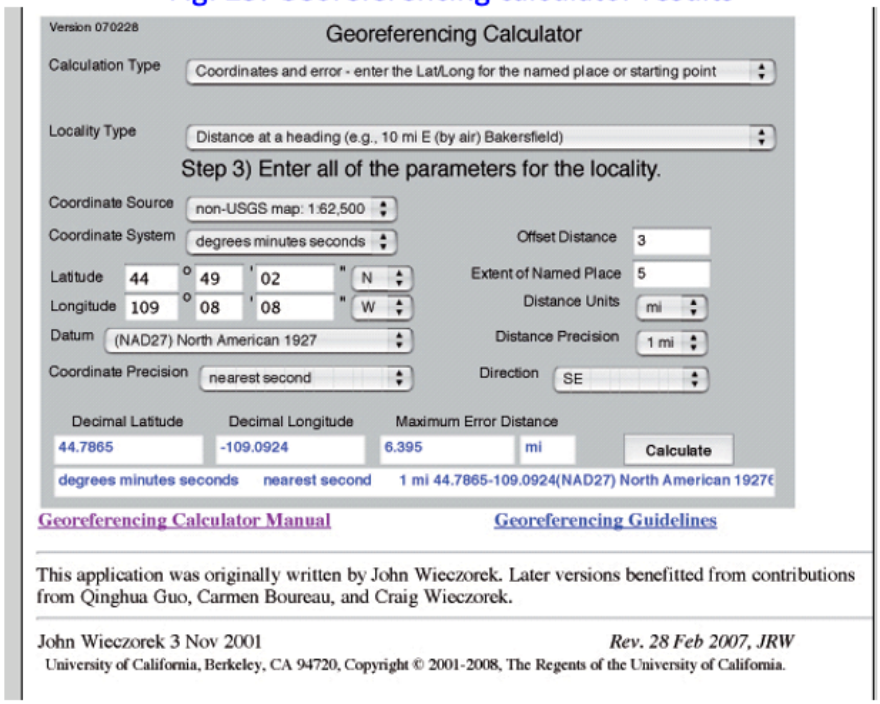
'Pat O' Hara Creek', the KGI for the locality is used as an example throughout these guidelines. Searching for Pat O' Hara Creek brings up the coordinates in the USGS GNIS database. The topo map information is also given, Chapman's Bench Map in this case



Also we then look up the geology of the area, and if stratigraphic information exists, identify where strata of the appropriate age will occur, so that you can ensure that the locality plots in the correct stratigraphic position. Next we find the topographic map for the selected locality using a Gazetteer. For example, the grid number for Pat O' Hara Creek locality in the Wyoming Atlas and Gazetteer falls in the general area of grid 60 that continues on page 68 inset 2. The Scale of the land locater map is 1:1,250,000 or 1 inch represents 20 miles.

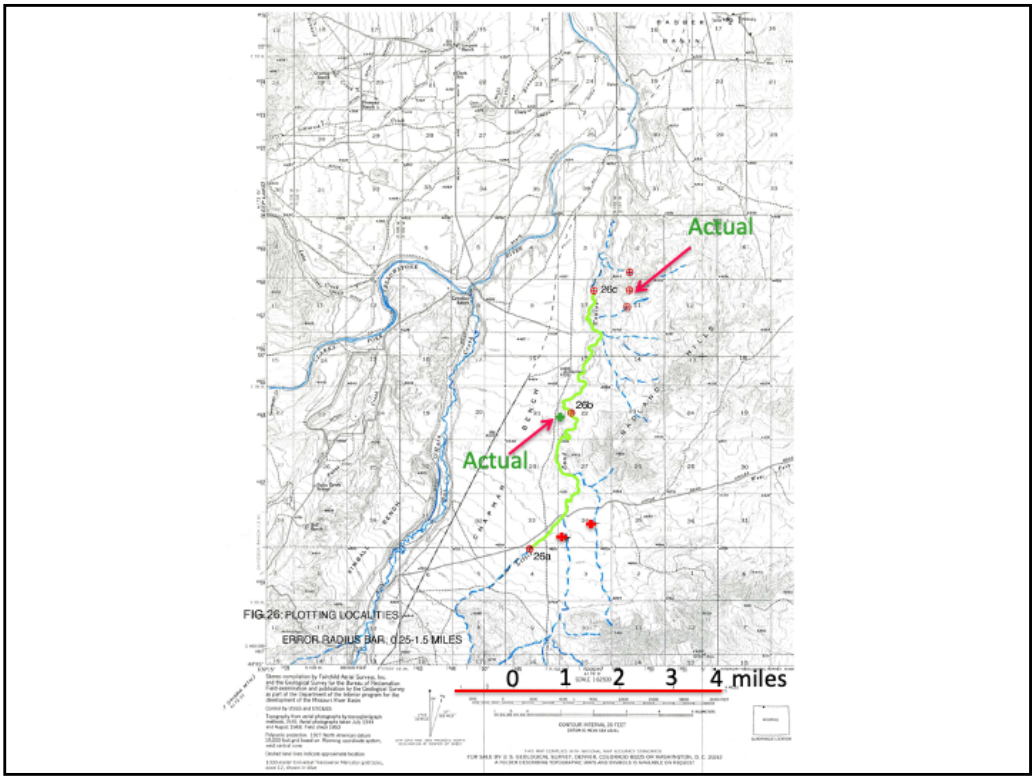
We selected the old USGS Clark Quadrangle, 15 minute series, Scale 1:62,500 or one inch equals one mile, contour interval of 20 feet. Datum is mean sea level, Polyconic projection. 1927 North American datum. Field check 1950.

Fig. 25: Georeferencing calculator results



We can enter the given information such as 3 miles east or SE of the mouth of Pat O'Hara Creek in the Georeferencing calculator and obtain the latitude and longitude for each locality.

The fossil locality is located on a topographic map using the verbal description as a guide. This involves manual and computer assisted georeferencing tools such as topocompanion scale and georeferencing calculator (Manisnet.org) to assign a degree of error or confidence level for any given data. The designated confidence level can be categorized as good, acceptable or poor.



In this example we found the geographical coordinates are at a place approximately three miles southeast of the mouth of Pat O'Hara Creek. The elevation is 4440 feet.

In georeferencing, problems can arise because in practice, the term "locality" has been used to refer to everything from a precise point to a vaguely defined, extensive area (and the size of the "locality" is rarely explicitly stated). When an important site or area has been visited by successive parties over decades, it is essential to try to find out from original records or field maps exactly how many collection sites were involved and their precise distribution. In this case, we plotted each of the localities found in the publication on the topo map. It is clear that the specimens were collected along a traverse extending from points 26 a to 26c with a radius error bar of 0.25 to 3 miles.