NYBG

NEW YORK BOTANICAL GARDEN

GEOREFERENCING:

TOOLS AND METHODS USED IN OBTAINING HIGH-QUALITY GEOREFERENCED DATA

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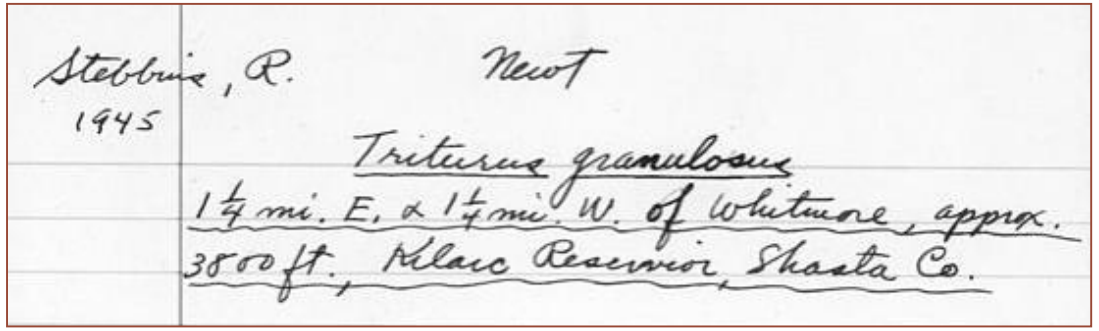
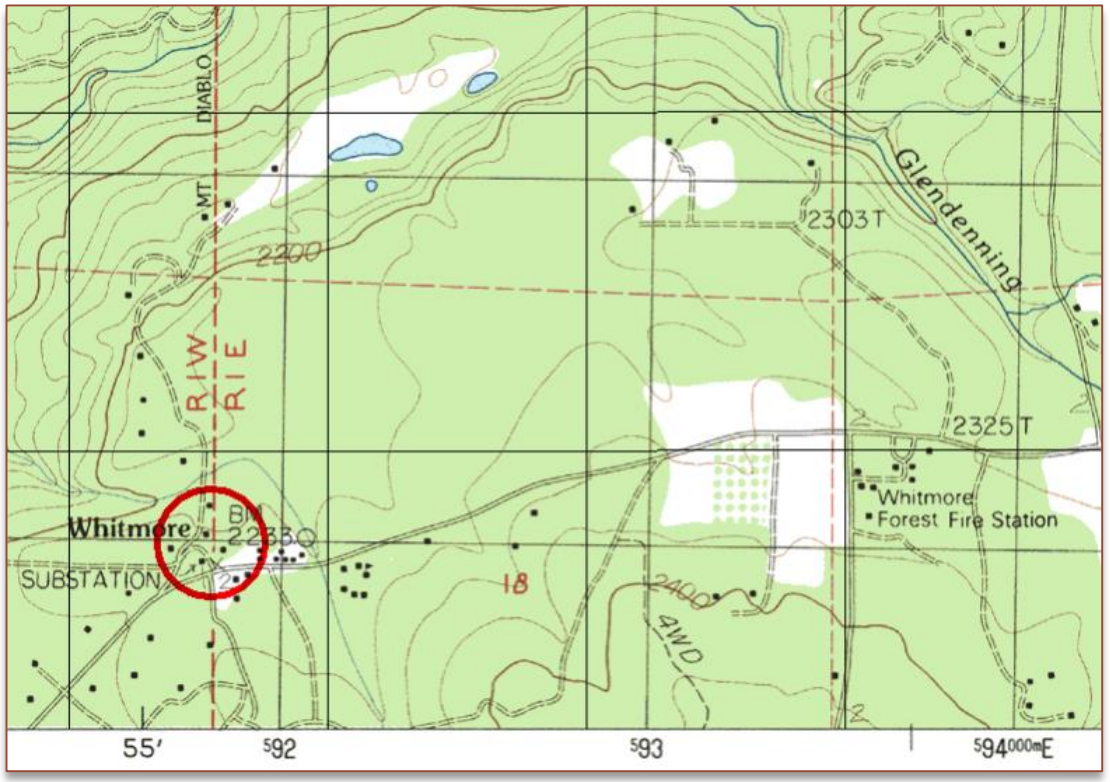
PART 1: INTRODUCTION & MAPPING TOOLS

What is Georeferencing?

- Interpreting a written description of a locality to locate coordinates and an uncertainty radius
- Standardized methods and tools to determine collection location
- **Accuracy:** Goal of finding accurate coordinates and minimizing error radius
- **Precision:** Capturing metadata so that the process is repeatable (reliability)





Guides

- Recommended georeferencing procedures for the most commonly encountered type of localities
- Step-by-step instructions
- How to use the MaNIS Georeferencing Calculator

- Georeferencing Quick Reference Guide (2020)
- Georeferencing Quick Reference Guide (2012)
- Best Practices Guide (2020)

Locality Type: *Geographic feature only*

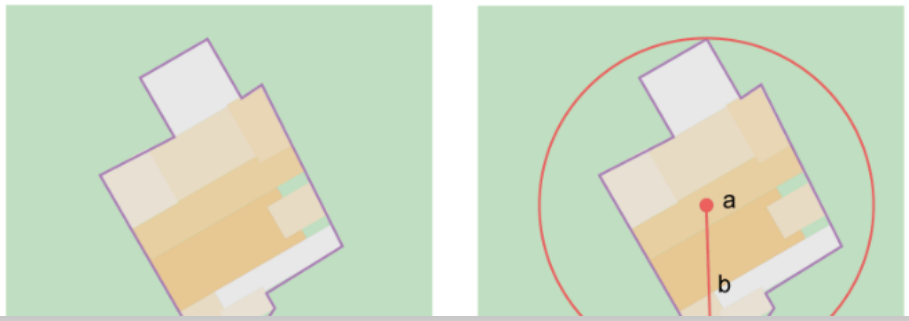
Step 1 – Determine the feature boundaries: This step is to determine the shape that contains the feature. This is typically done by drawing a polygon around the feature (Figure 2A), but some features may require more complex geometries, such as multiple polygons.

Record the source (including date) used to determine the boundaries (see `georeferenceSources`).

Step 2 – Determine the coordinates: Use the coordinates of the corrected center of the feature ("**a**" in Figure 2B) as the *Input Latitude* and *Longitude*.

Step 3 – Measure the geographic radial: Measure the distance from the corrected center to the furthest point on the boundary of the feature ("**b**" in Figure 2B) as the *Radial of Feature*.

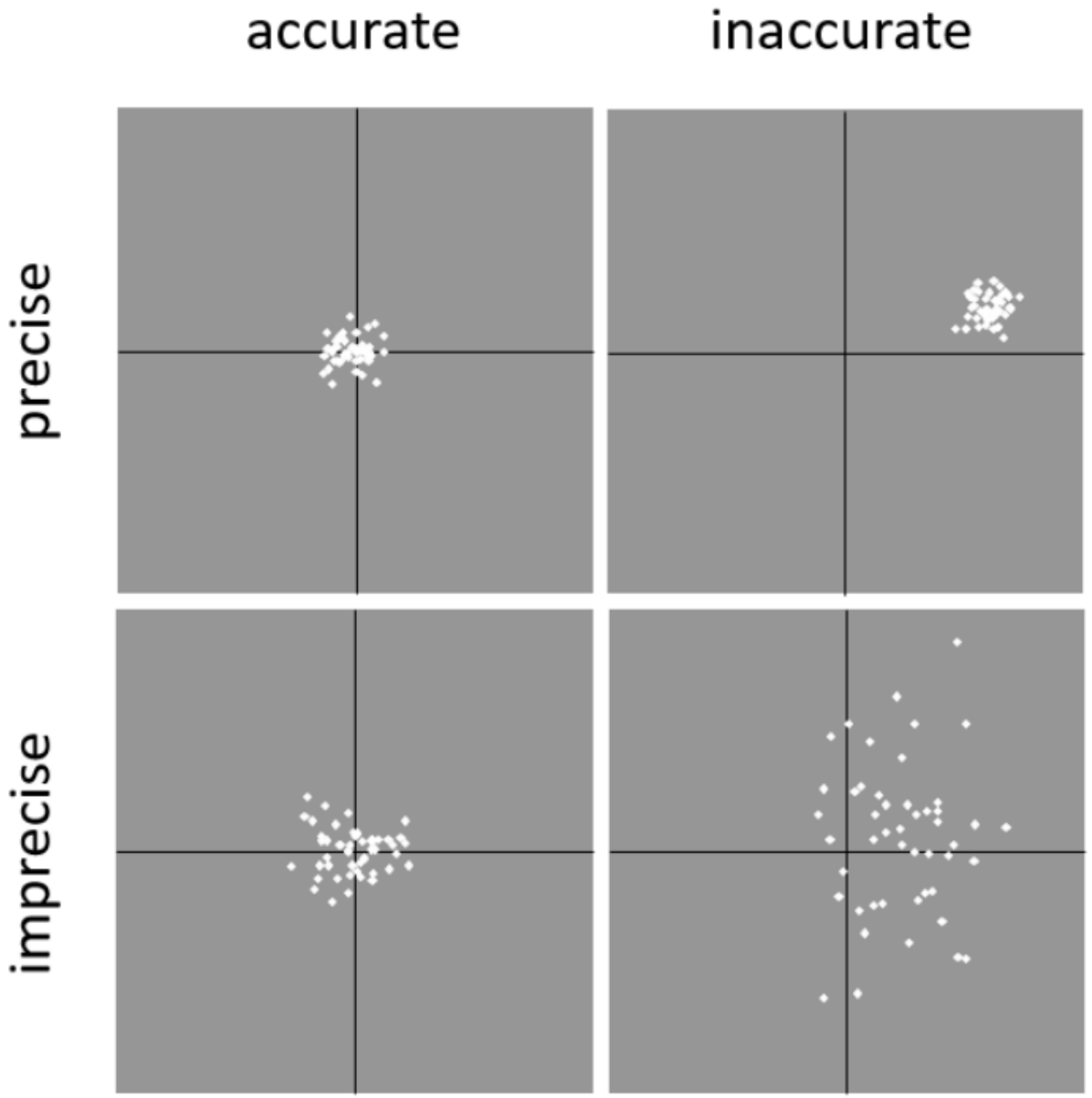
Step 4 – Calculate using the following additional parameters in the Georeferencing Calculator: *Coordinate Source*, *Coordinate Format*, *Datum*, *Coordinate Precision*, *GPS Accuracy*/*Measurement Error*, and *Distance Units* (see §1.6).



Georeferencing Quick Reference Guide

Accuracy and Precision

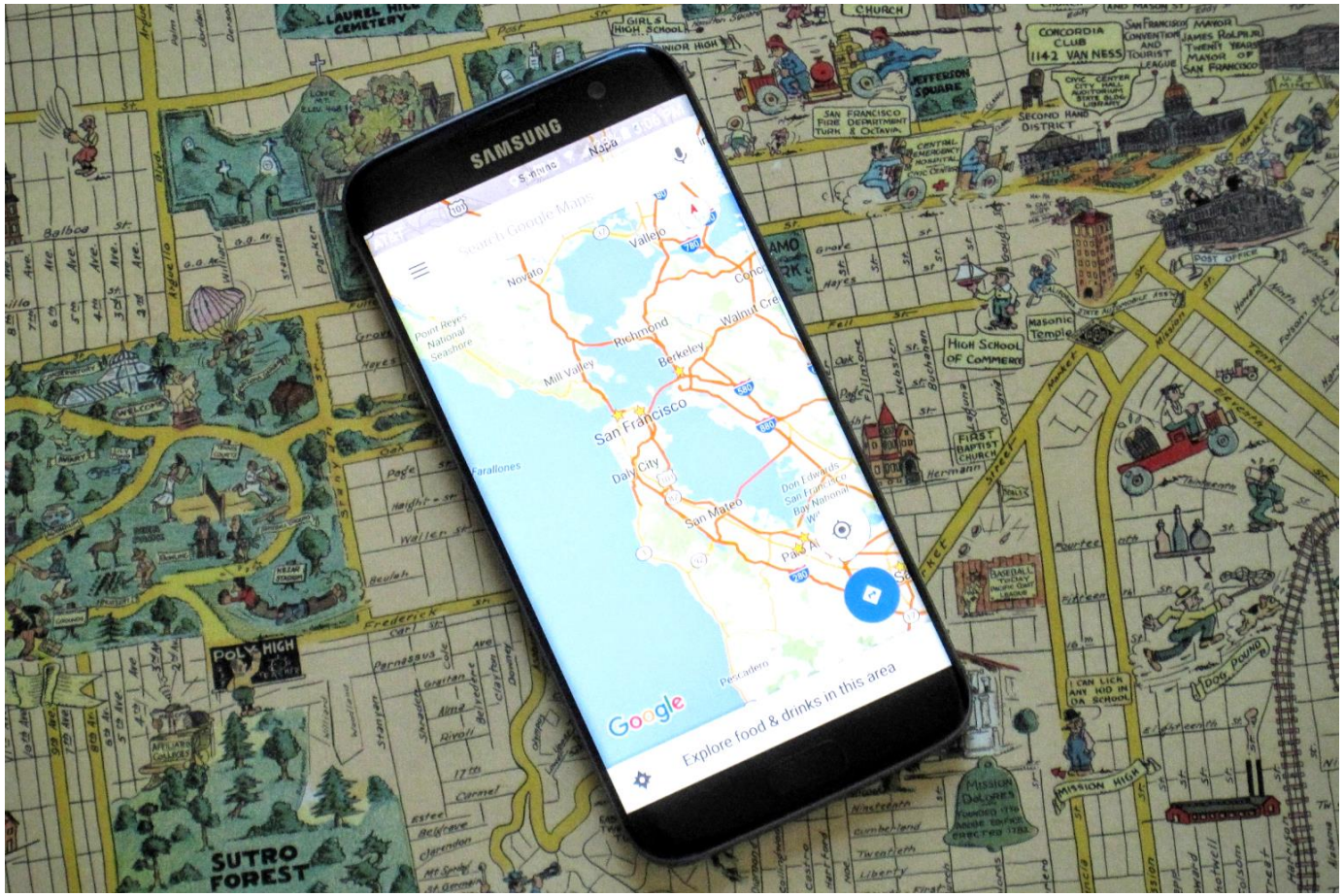
Precision is a measurement of the consistency of repeated measurements to each other



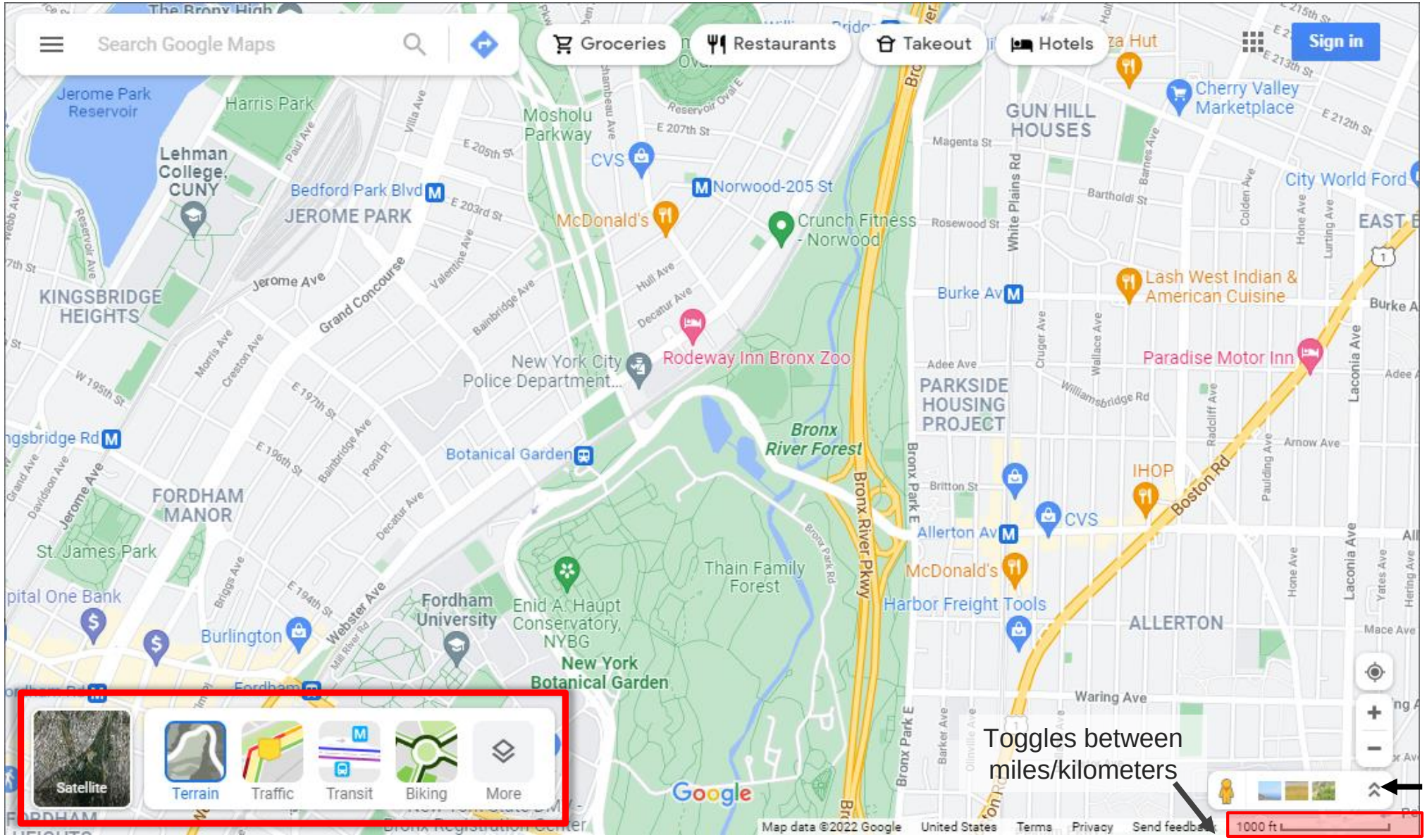
Best Practices Guide (2020)

Mapping Applications

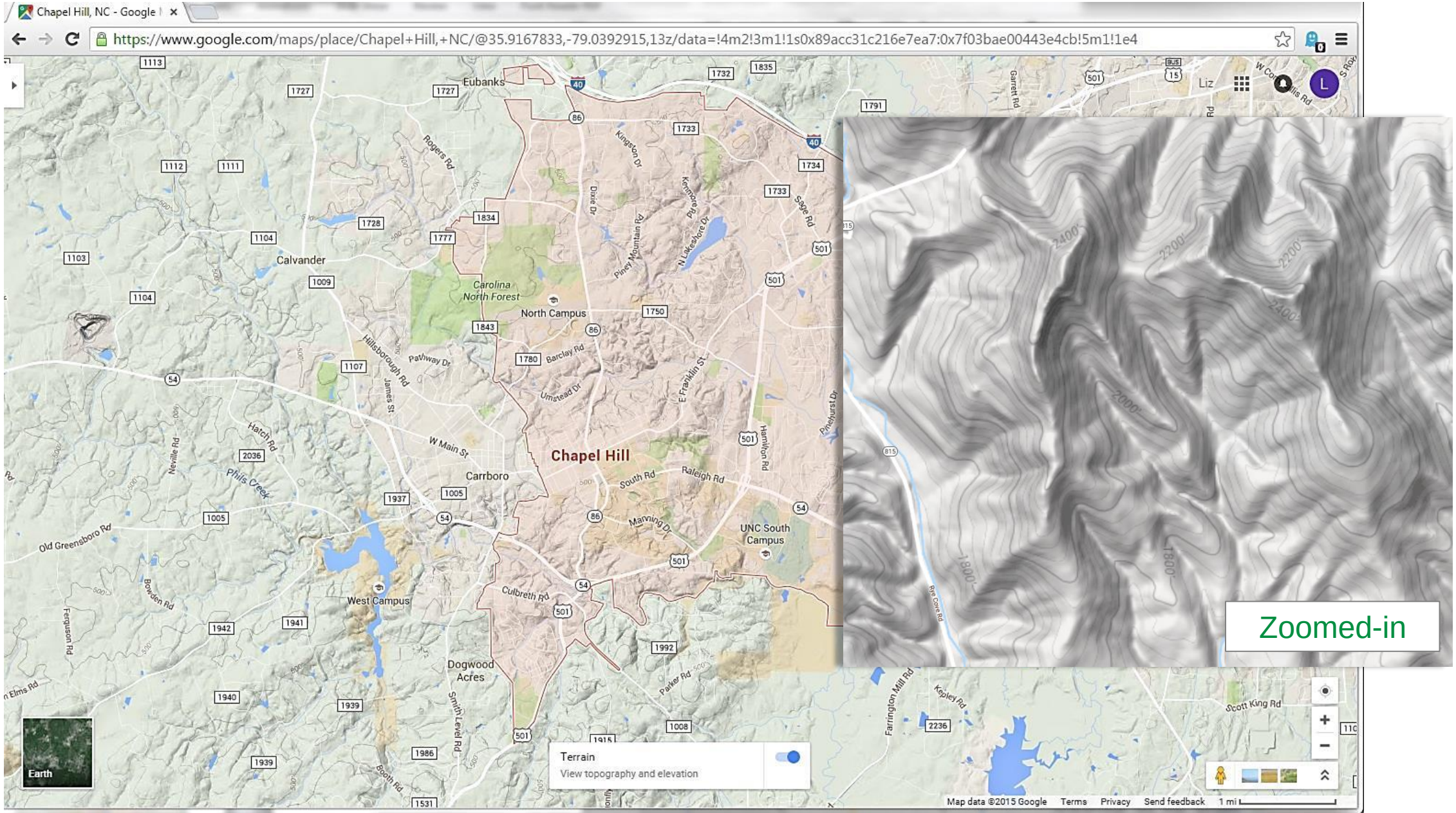
- Google Maps
- GEOLocate



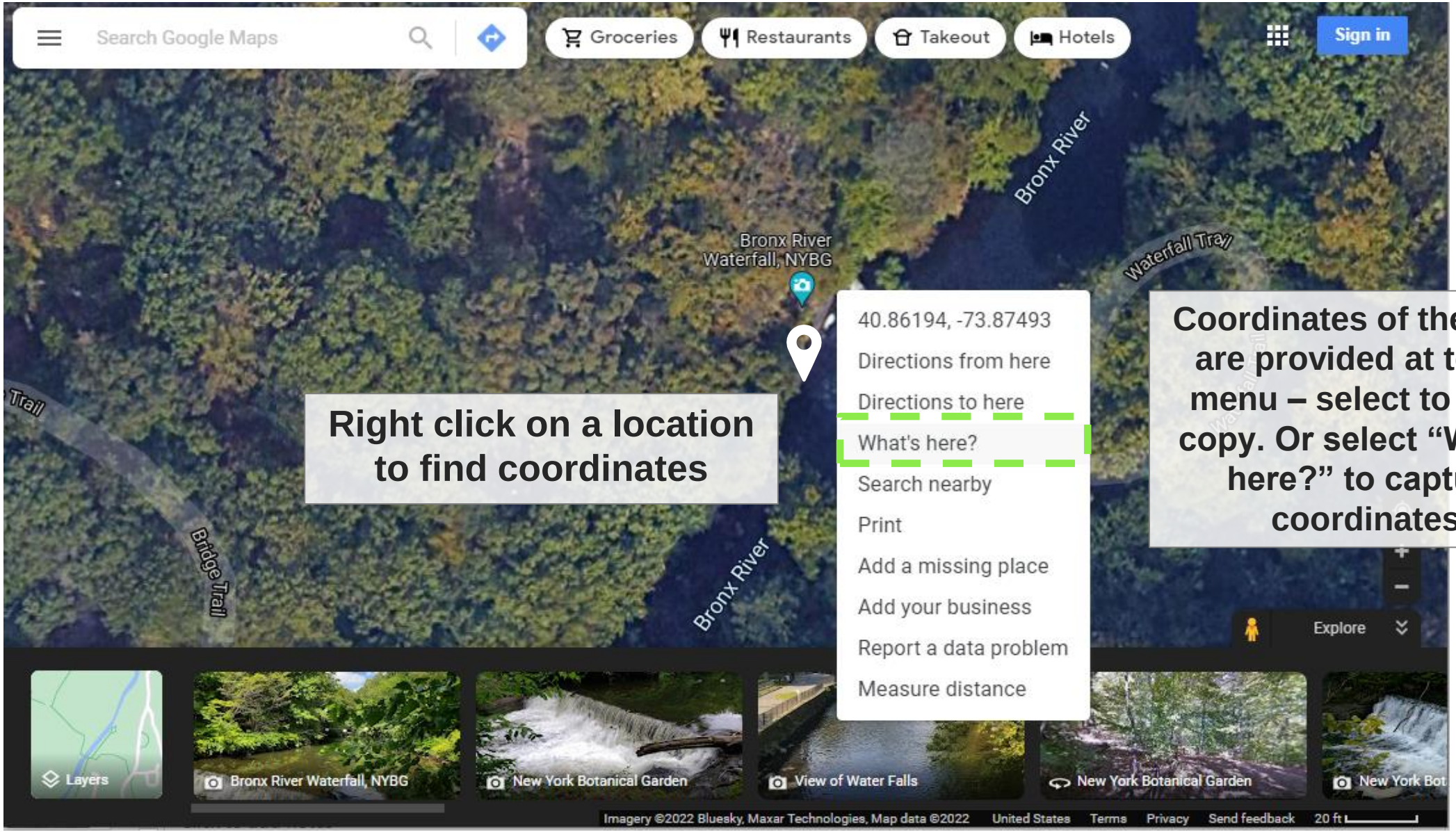
Google Maps: Map Layers



Terrain View



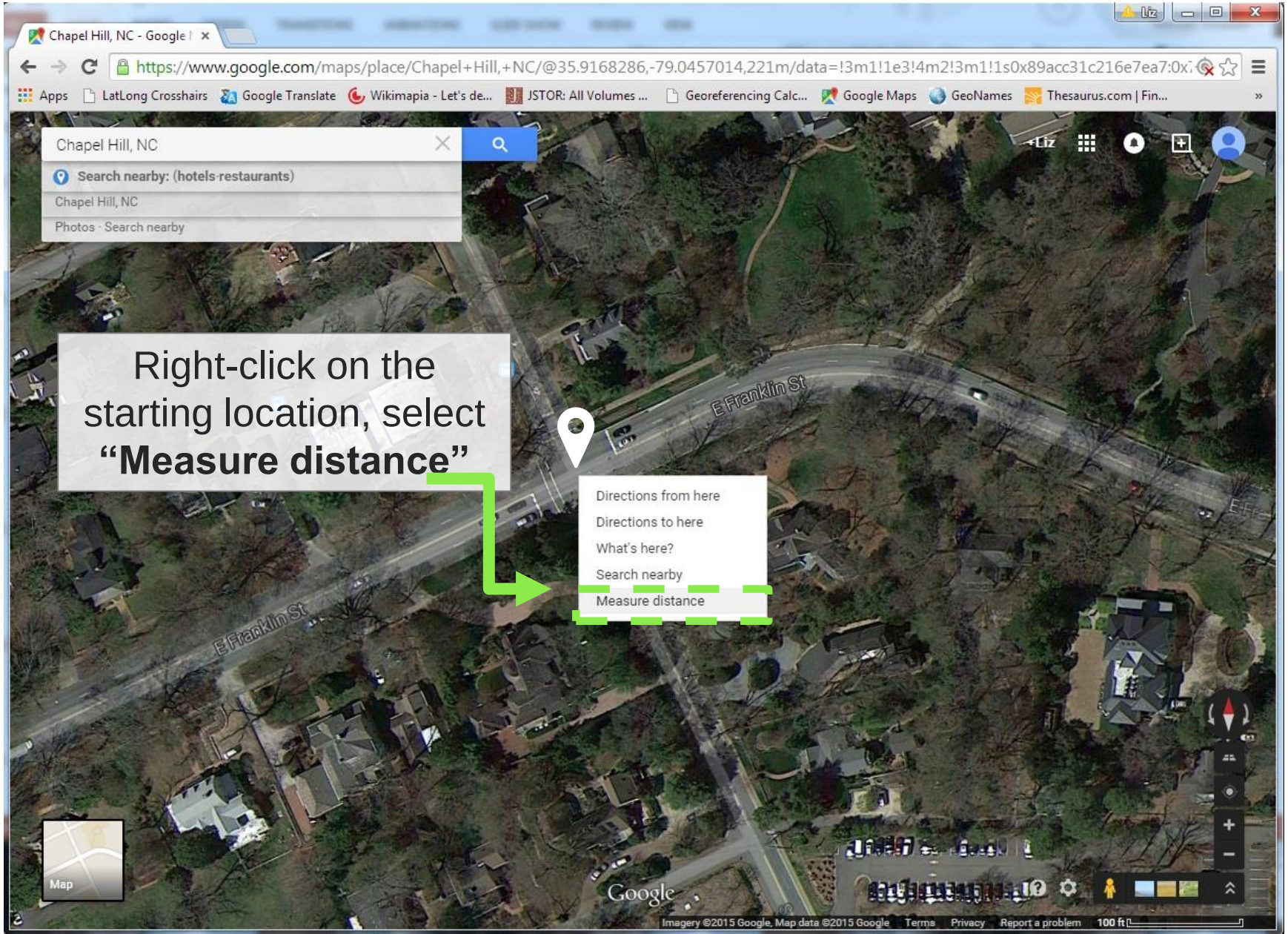
Capturing Coordinates



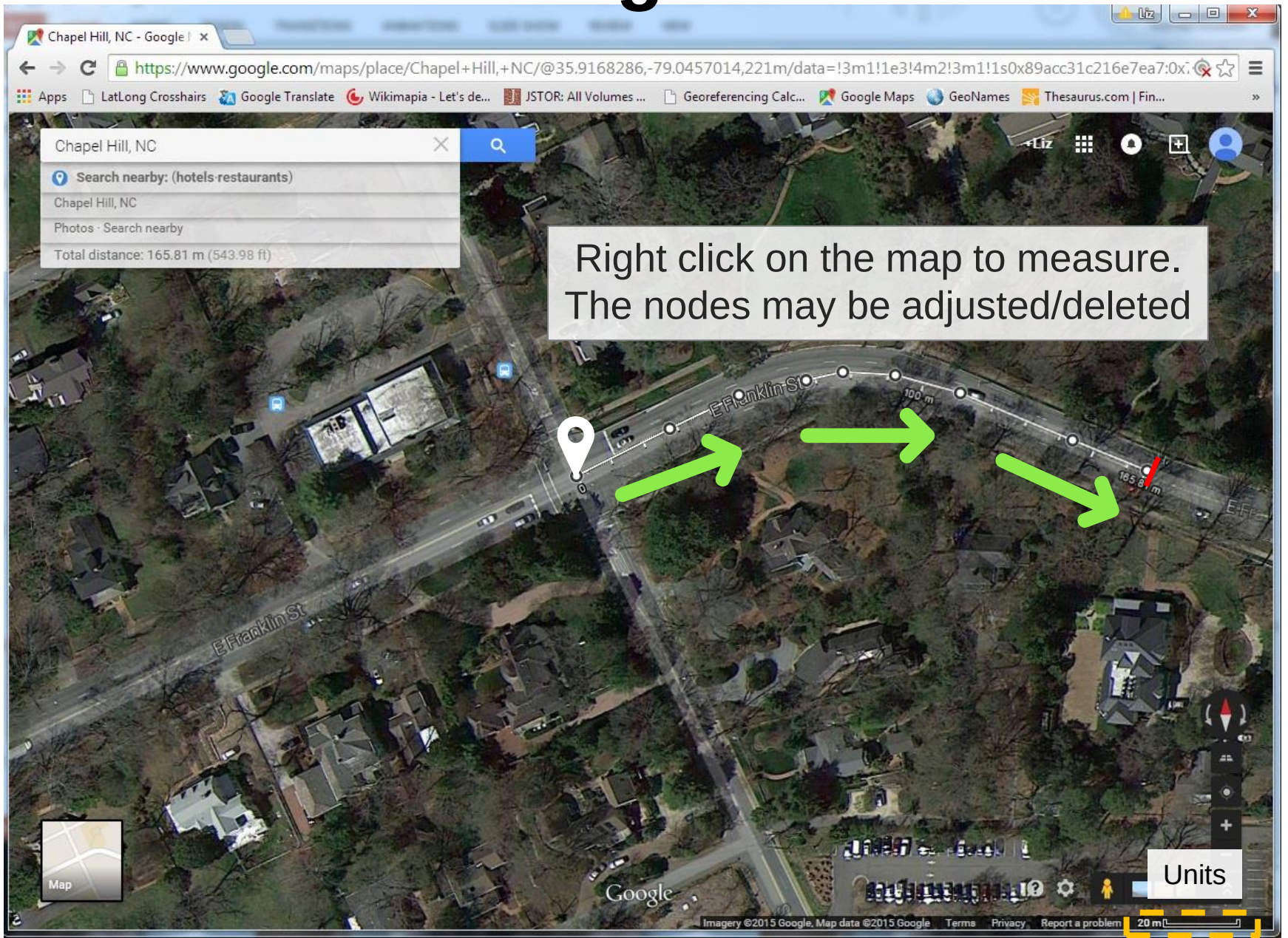
Right click on a location to find coordinates

Coordinates of the point are provided at top of menu – select to auto-copy. Or select "What's here?" to capture coordinates

Measure Distance

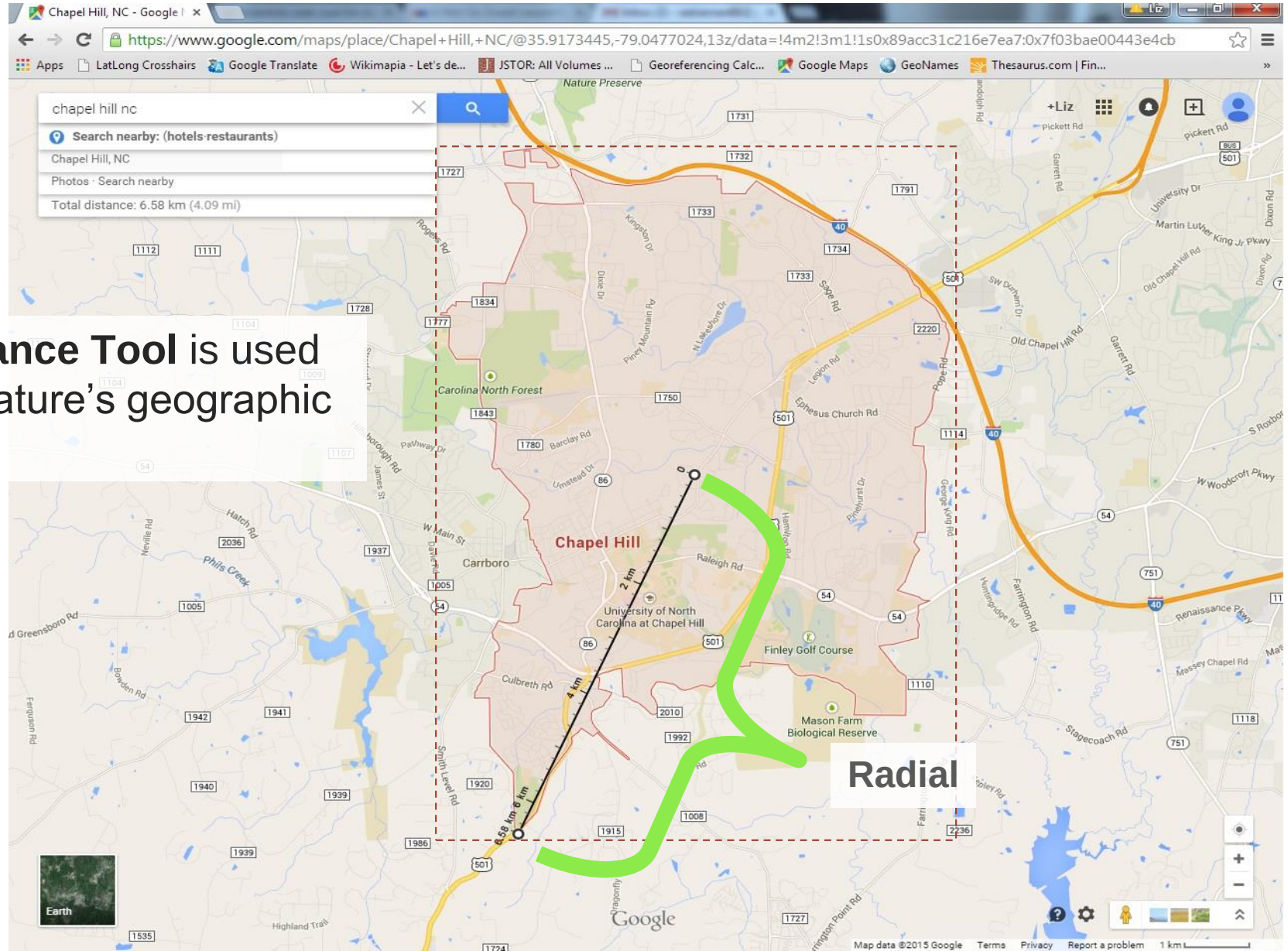


Measuring Distance



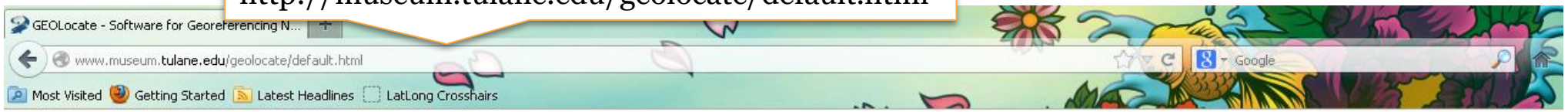
Radial

Measure Distance Tool is used to capture a feature's geographic radial



GEOLocate

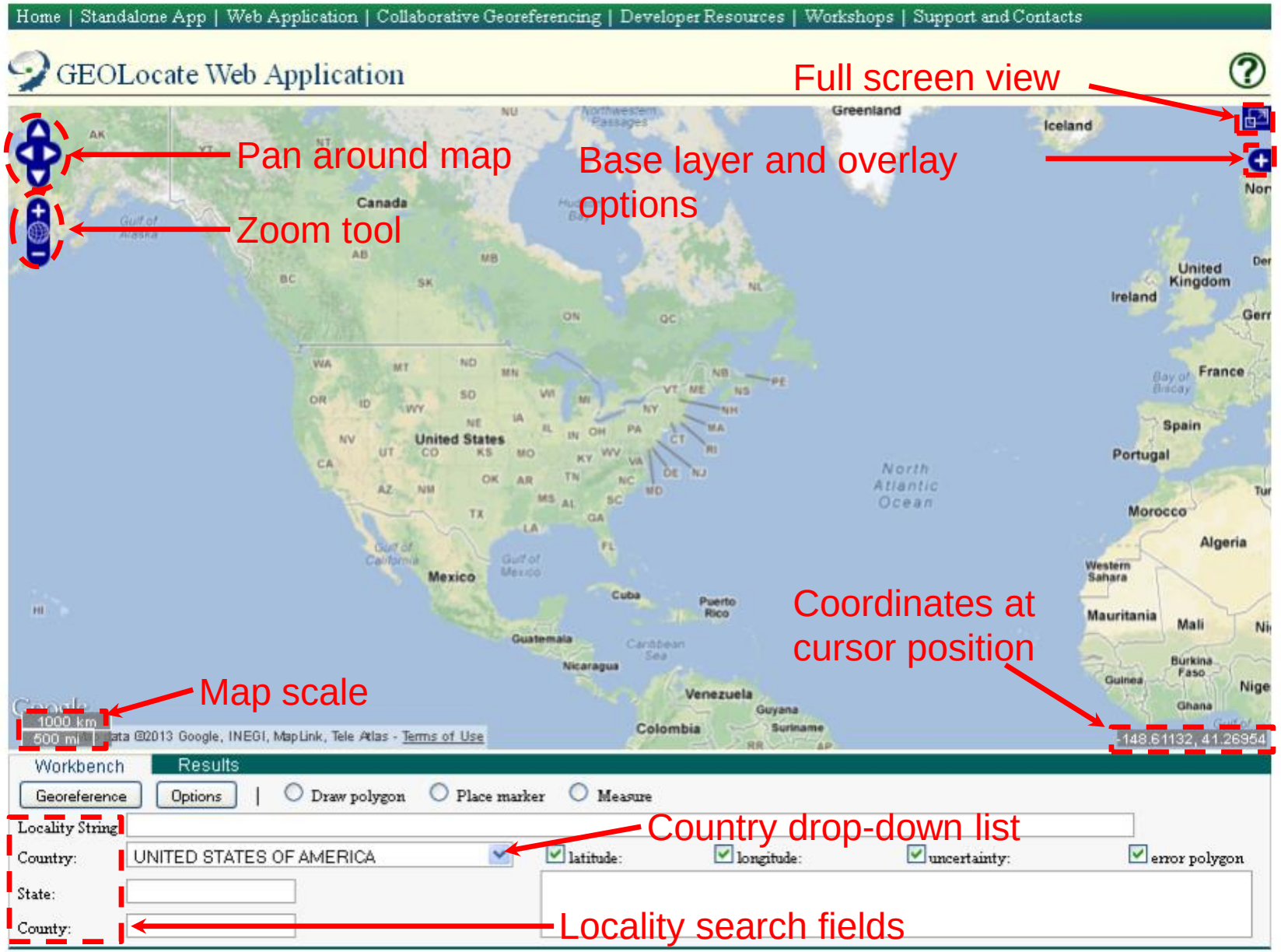
http://museum.tulane.edu/geolocate/default.html



Works best for U.S., Canada, and Europe

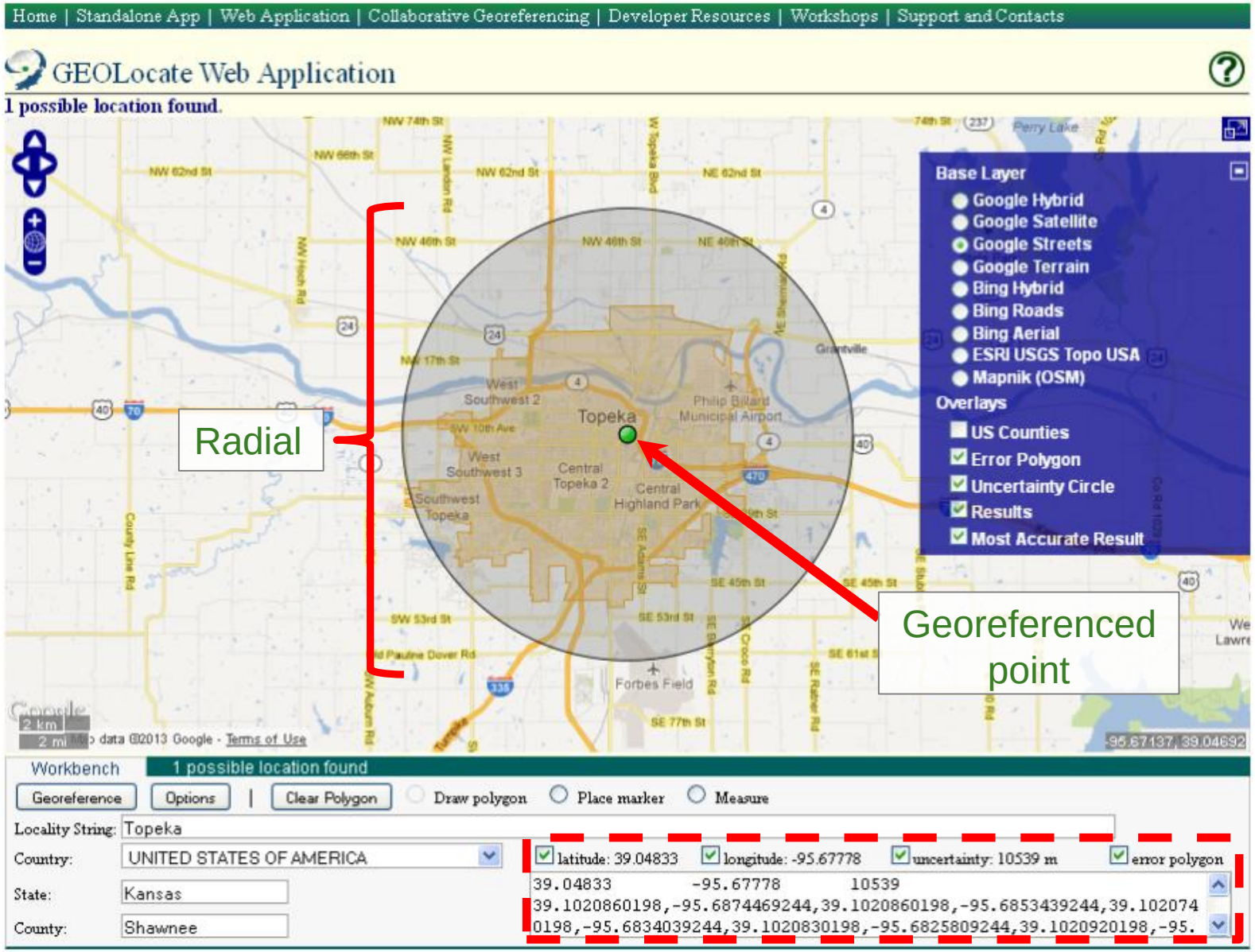
Automates georeferencing!

GEOLocate Web Application



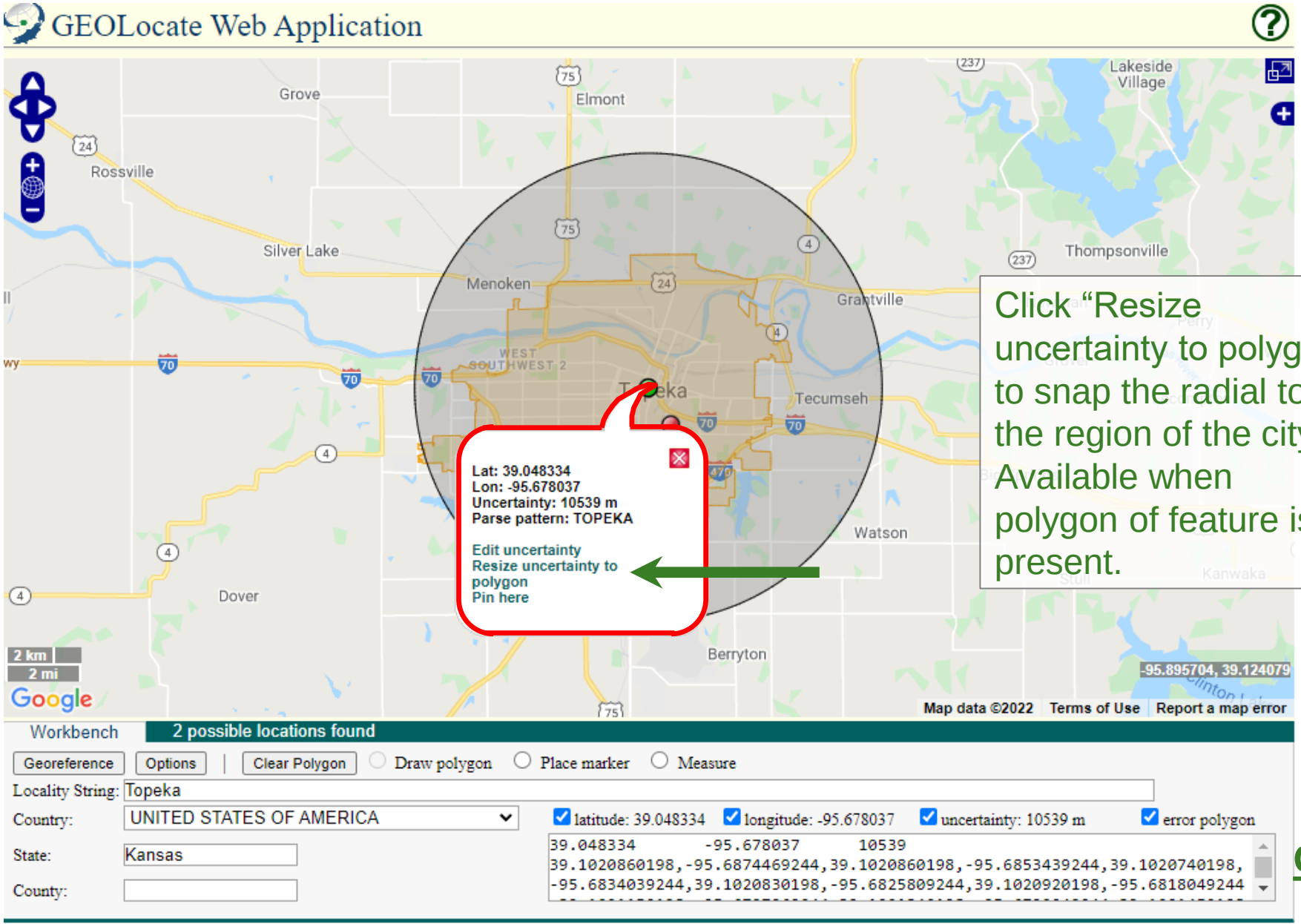
GEOLocate

GEOLocate Web Application



GEOLocate

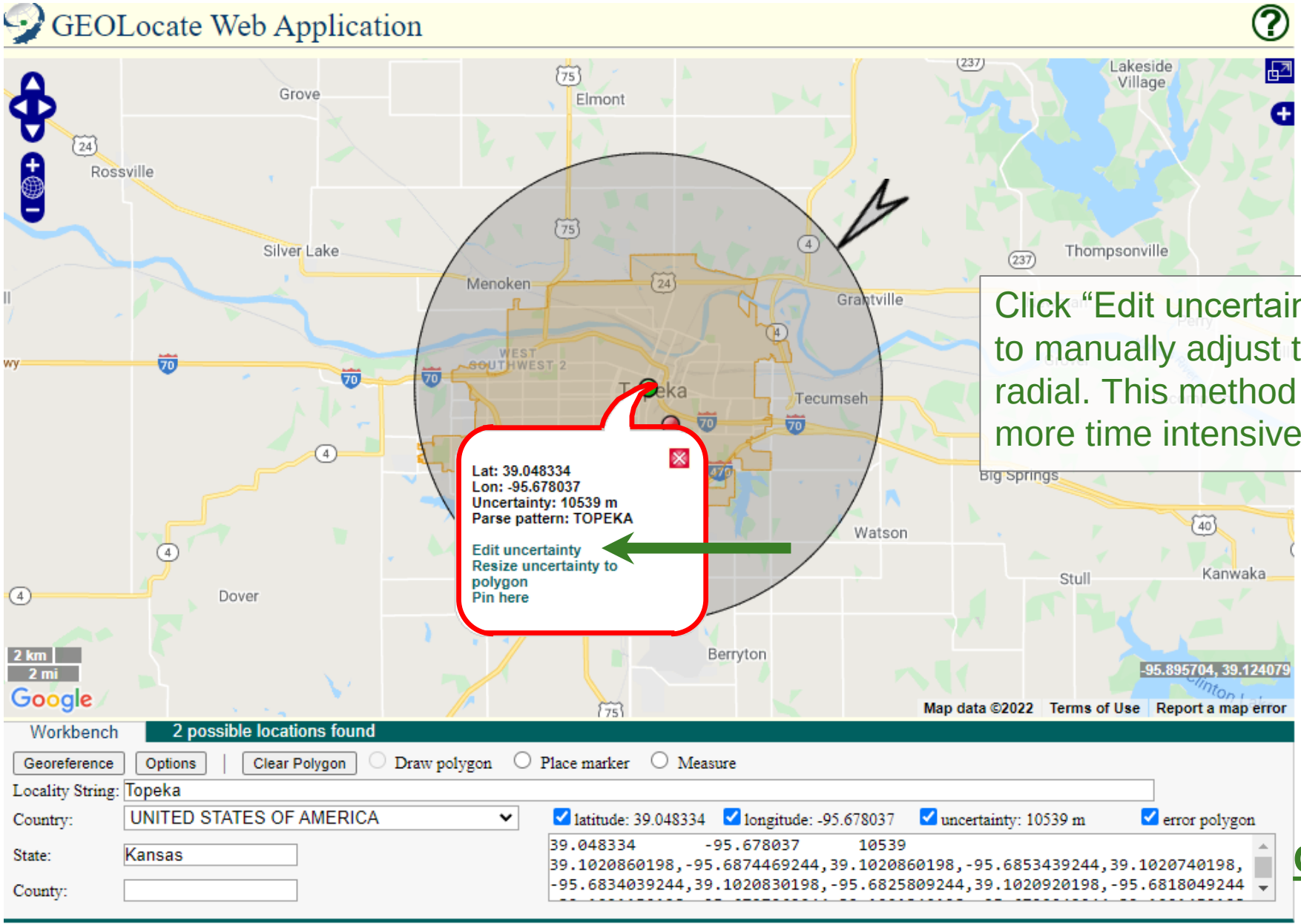
Uncertainty: Automated



Click “Resize uncertainty to polygon” to snap the radial to the region of the city. Available when polygon of feature is present.

GEOLocate

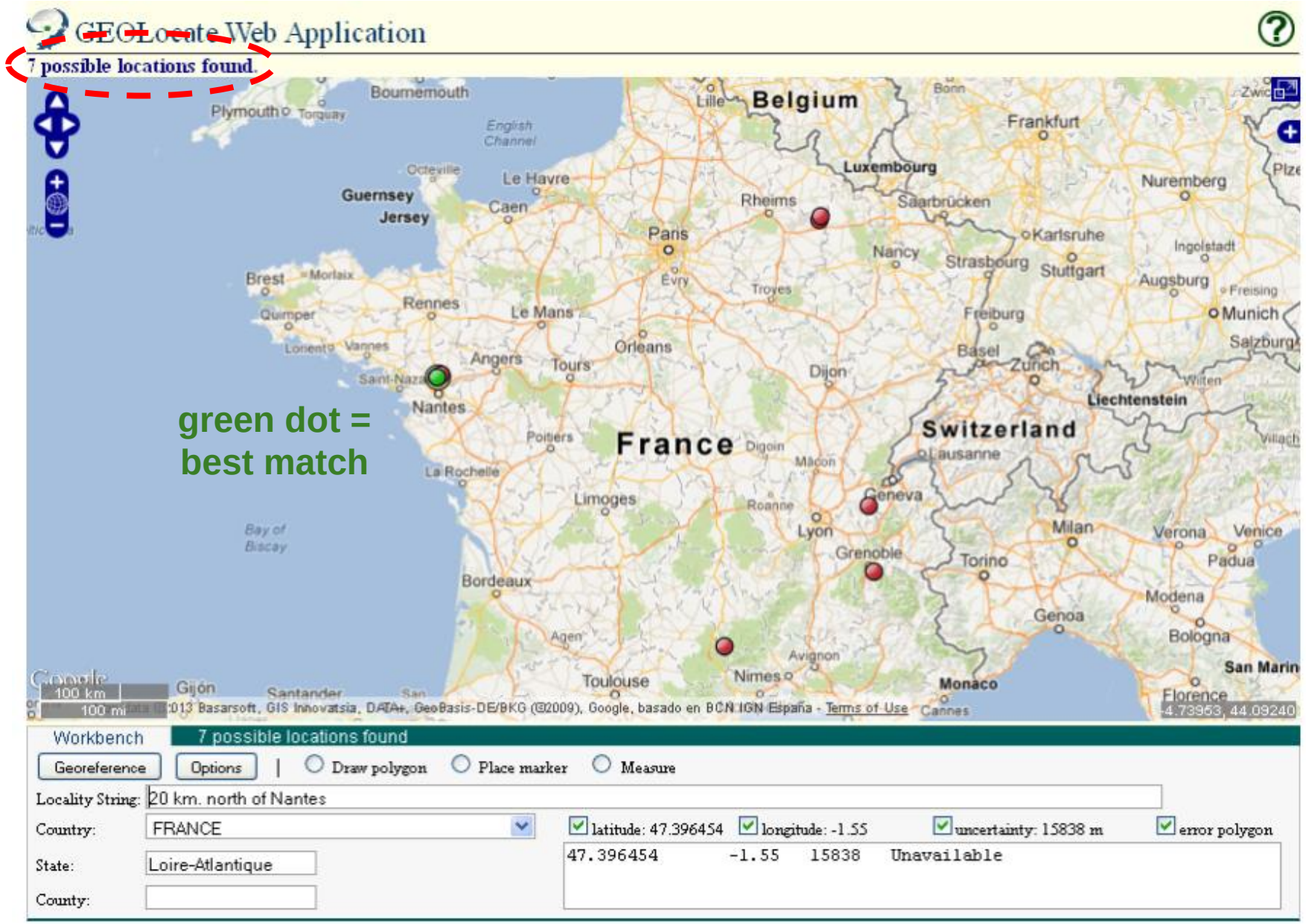
Uncertainty: Manual



GEOLocate

Offset at a Heading

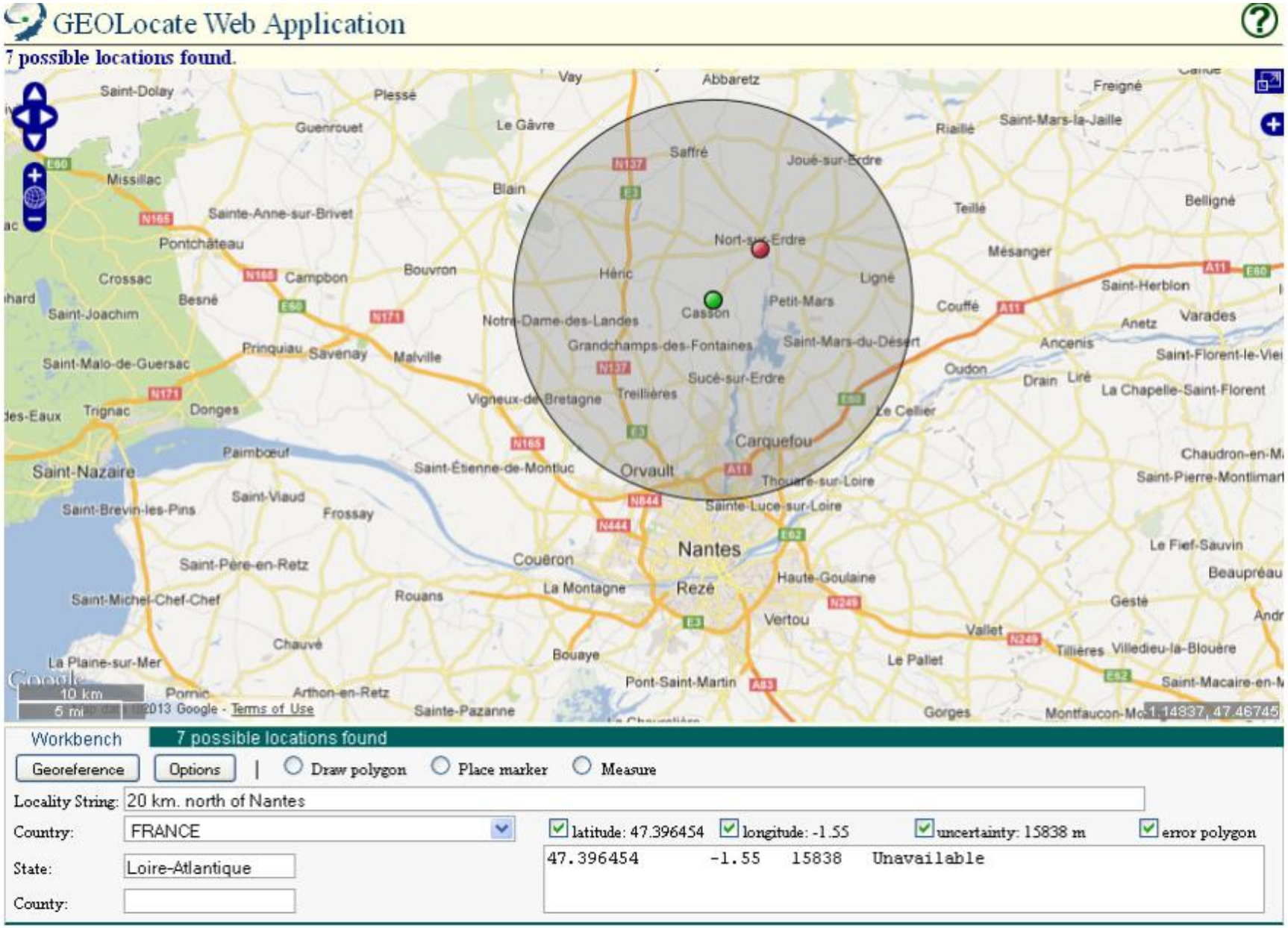
20 km N of Nantes, France



GEOLocate

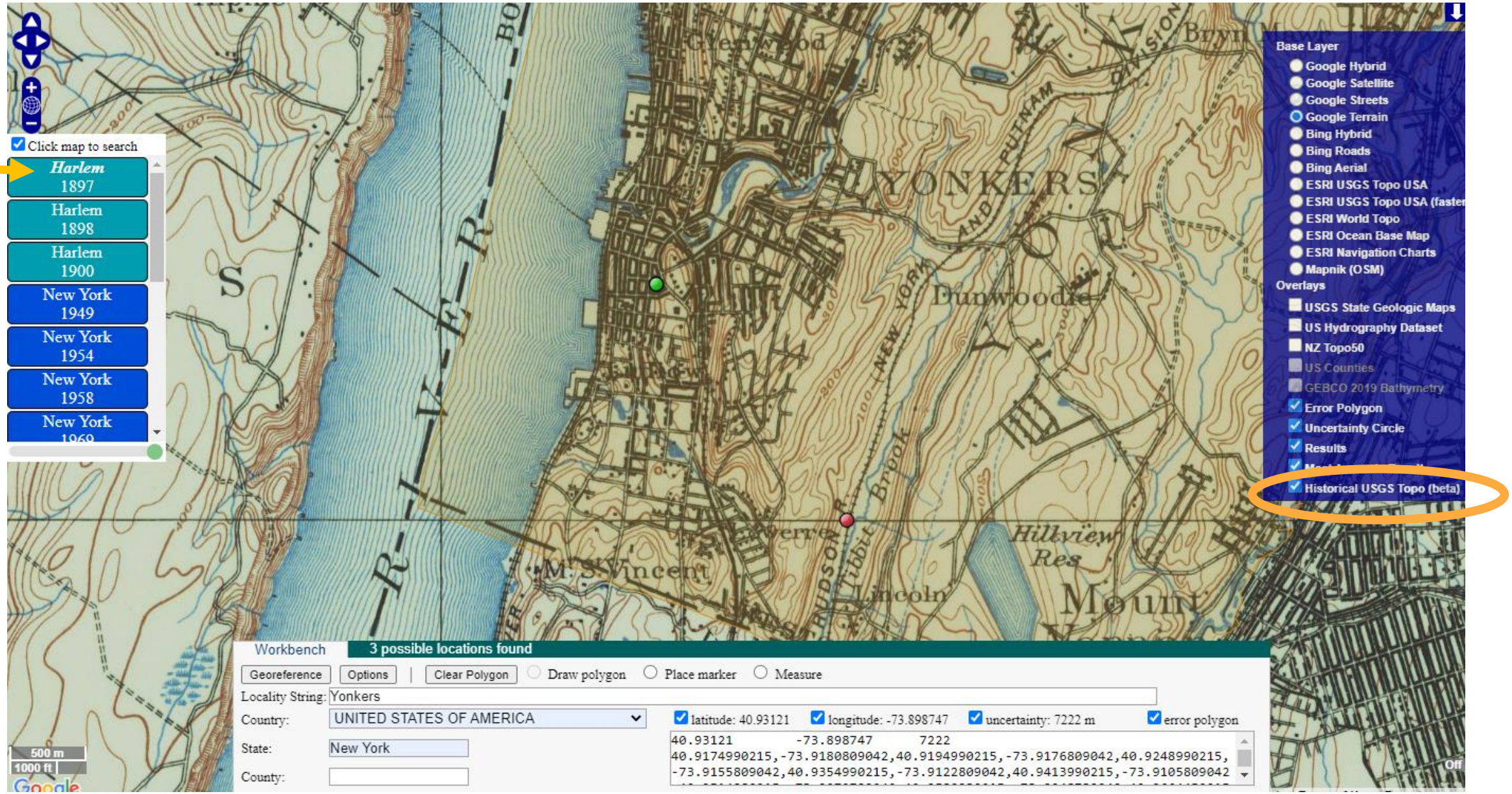
Offset at a Heading

20 km N of Nantes, France



GEOLocate

Reference Map Layers



Translating Coordinate Systems

- Geographic coordinates can be provided in a number of different coordinate systems
- Decimal degrees provides the most convenient coordinates to use and is what we aim to obtain (example: 40.866680, -73.878735)
- Conversions can be made readily between coordinate systems (to decimal degrees)

Township, Range, and Section (PLSS)
UTM coordinates

Public Land Survey System (TRS)

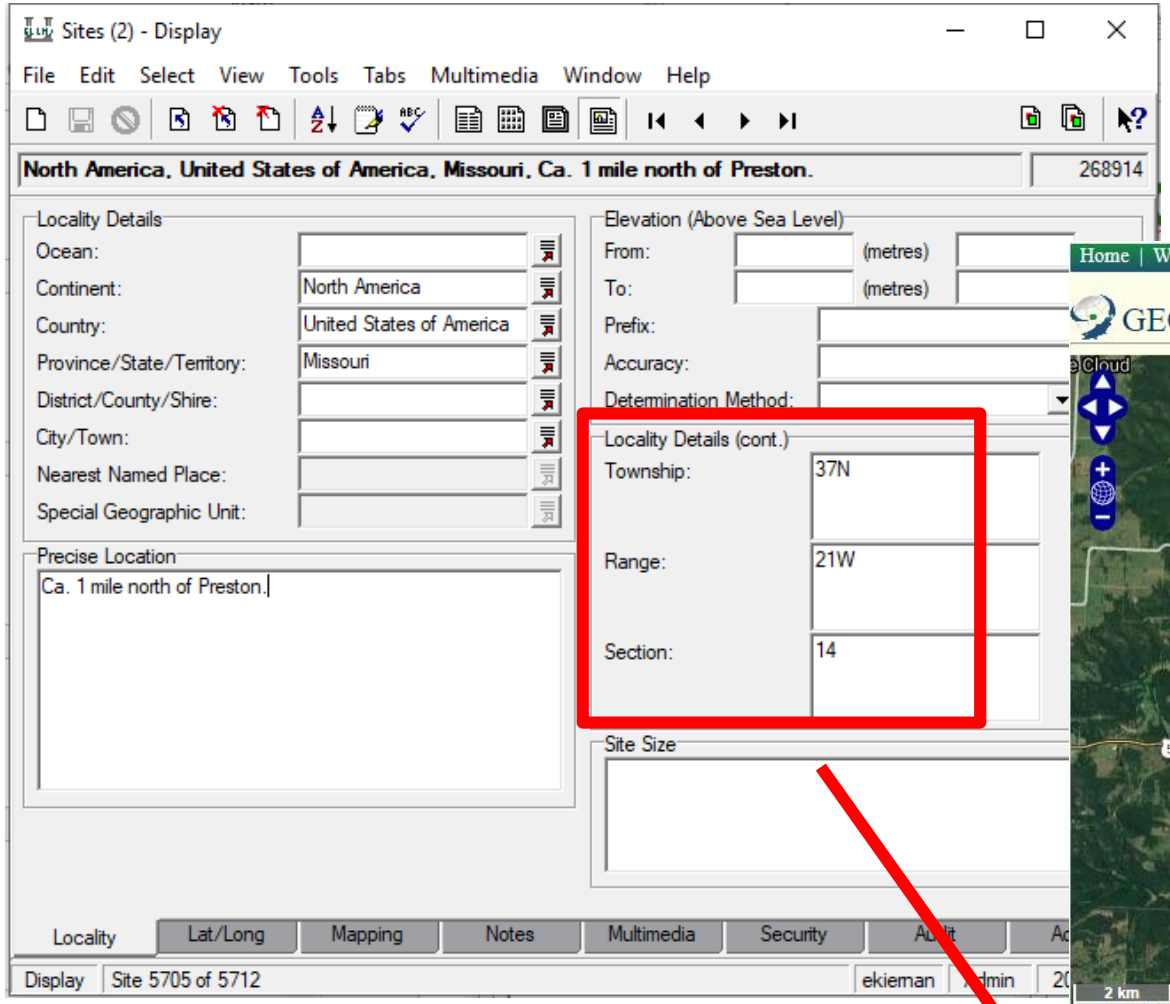
- **United States** ONLY
  - *Mainly in the **West**, **Midwest**, and some **Southern** states*

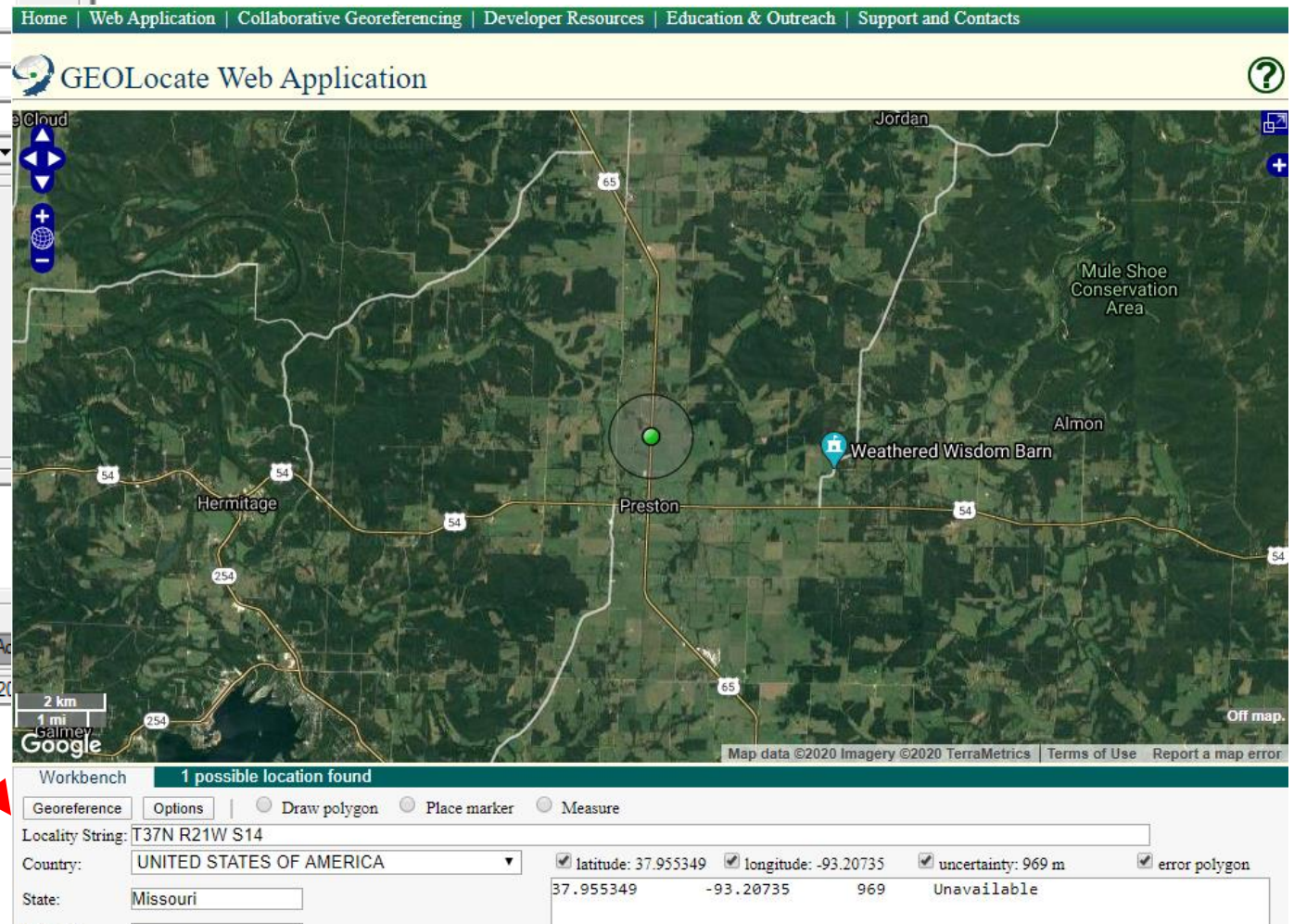
- Uses **Township-Range-Section** Coordinate System (TRS)
  - Ex. **T21N**, **R1W**, **S5 =** Township 21 North / Range 1 West / Section 5
  - MUST *specify* **State** (and sometimes “Meridian”, if a state has more than one!)
  - Datum: **NAD27**

- *Useful tools*: **GEOLocate or TRS Conversion Calculator**
  - For obtaining Lat/Long coordinates and other geographical information

GEOLocate to Convert TRS

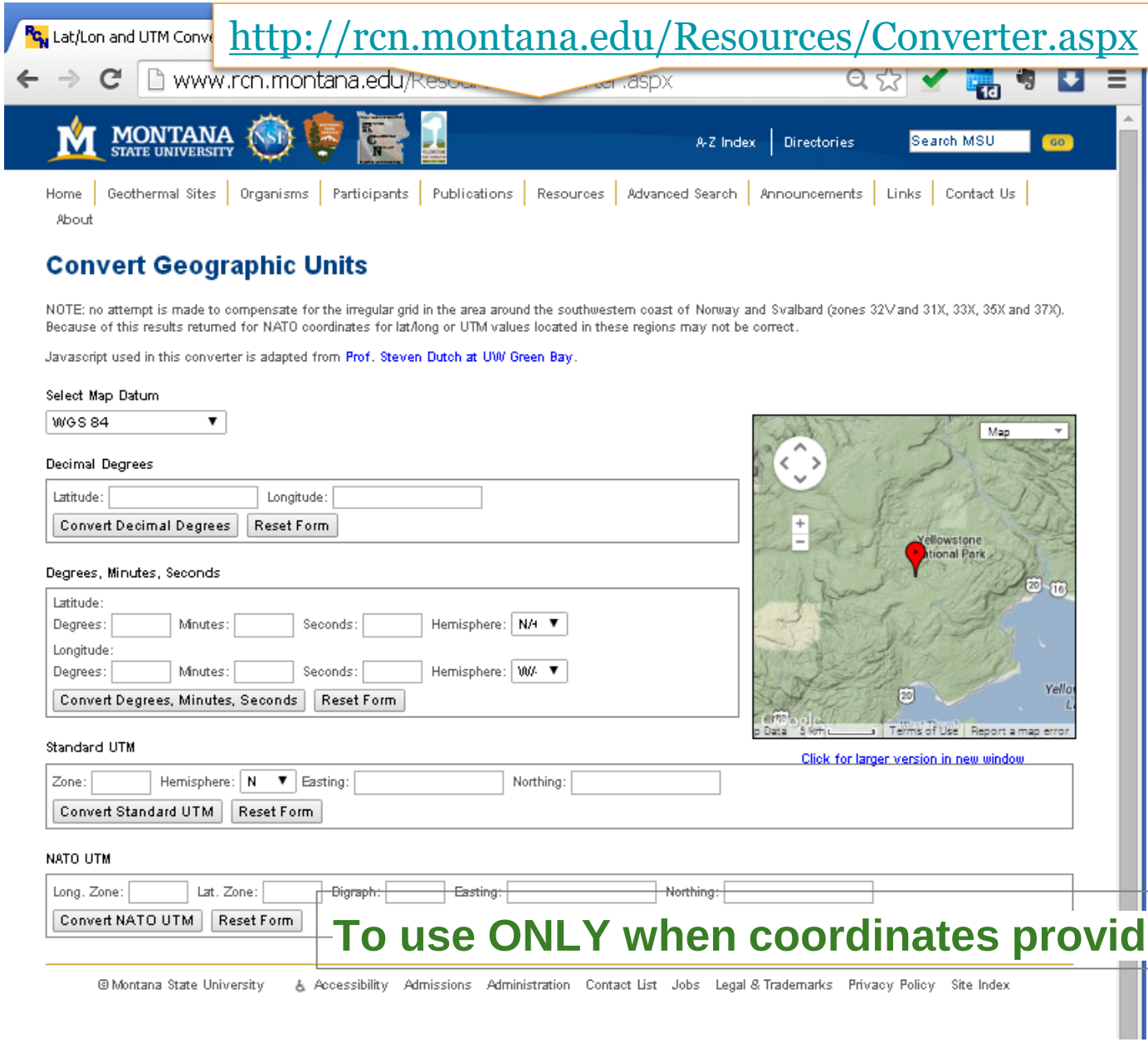
GEOLocate can translate TRS into decimal degrees if entered as: T(value and direction) R(value and direction) S(value), example: T37N R21W S14





UTM Calculator

http://rcn.montana.edu/Resources/Converter.aspx

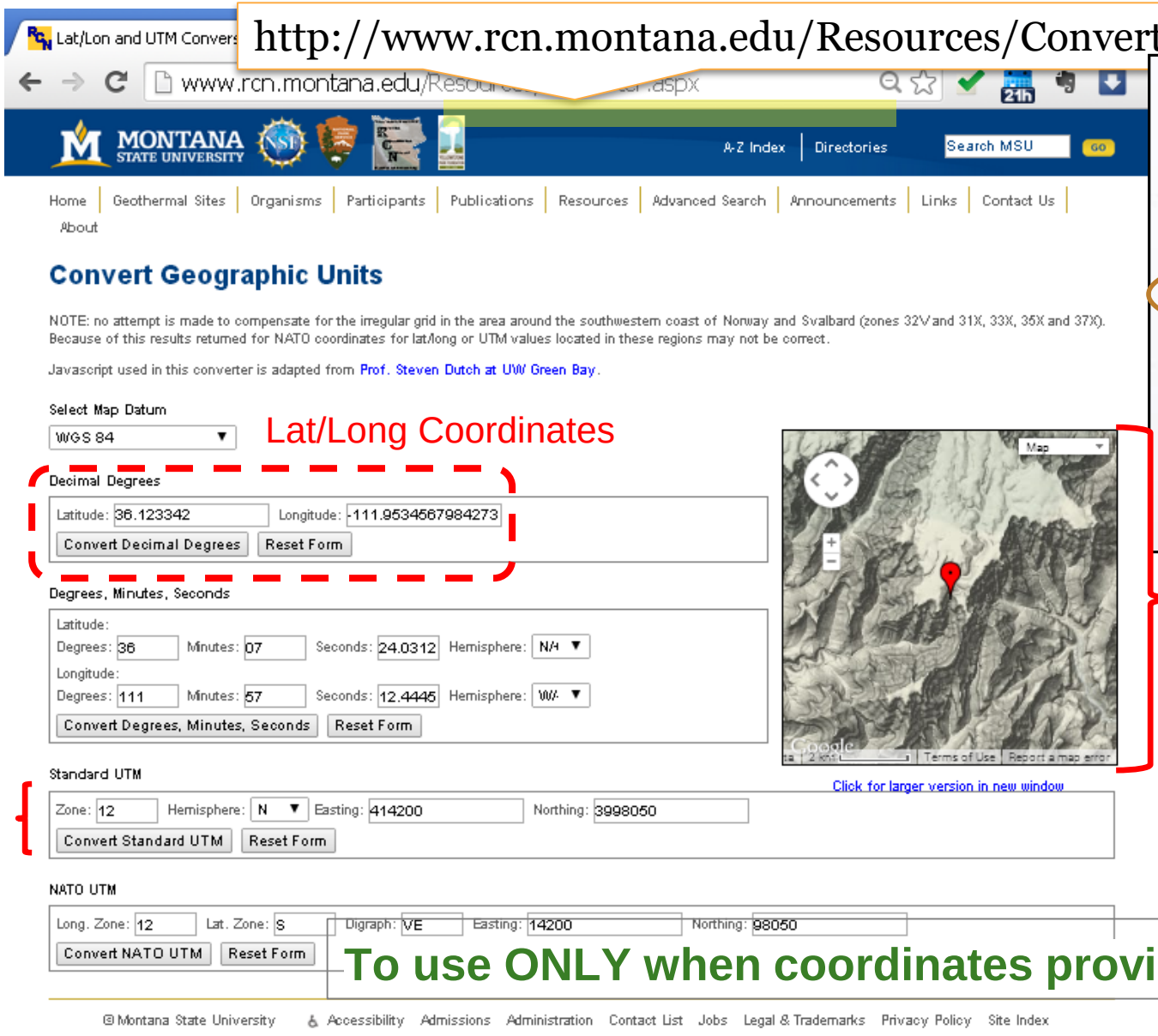


What is UTM?
Universal Transverse Mercator coordinate reference system

To use ONLY when coordinates provided on label in UTM format

UTM Calculator

http://www.rcn.montana.edu/Resources/Converter.aspx



PLANTS OF ARIZONA

Flora of Grand Canyon NP, North Kaibab

Solanaceae

Physalis hederifolia Gray
var. *fendleri* (Gray) Cronq.

USA. ARIZONA. Coconino
Vicinity of Cliff Spring near Cape Royal.
UTM: 12S 414200E 3998050N NAD27
Elevation: 7600 ft

Associated species: *Pinus ponderosa, P. edulis, Ericameria nauseosa, Salix exigua, Ivesia arizonica, Quercus gambelii, Rosa woodsii, Abies concolor*

G. Rink 6542 9 August 2007
with: W. Hodgson, B. Phillips

Northern Arizona University (ASC)

Zoom-able map

Search fields

Note: This information is captured in the Mapping Tab of the Sites Module in EMu

To use ONLY when coordinates provided on label in UTM format

Online Resources

It may be necessary to reference gazetteers or other sources

- Historical places
- Ghost towns
- Remote villages/regions
- Natural/geological features
- Spelling/translation variations or misspellings

Example: Merced Falls, California, was an industrial center served by the Yosemite Valley R.R. until the 1940s, after which the town faded (Merced Falls - California Ghost Town (ghosttowns.com)

present day

c.1900

Resources/Gazetteers

Please refer to these resources for help in finding more difficult localities:

- **GeoNames** (crowd/open source*) crowdsourced gazetteer
- **Statoids**: administrative subdivisions by country
- **GEOnet Names Server**: Worldwide data from the National Geospatial-Intelligence Agency & U.S. Board on Geogr. Names
- **Wikimapia** (crowd/open source*) helpful if you have approx. coordinates
- **OpenStreetMap** (crowd/open source*) open geographic database
- **Digitized Perry-Castañeda Library (PCL) Map Collection** digitized paper map collection
- **Falling Rain Global Gazetteer** global gazetteer
- Google **Web and Image Search**
- **Paper maps/ atlases**

Crowdsourced information should be cross-referenced with other sources