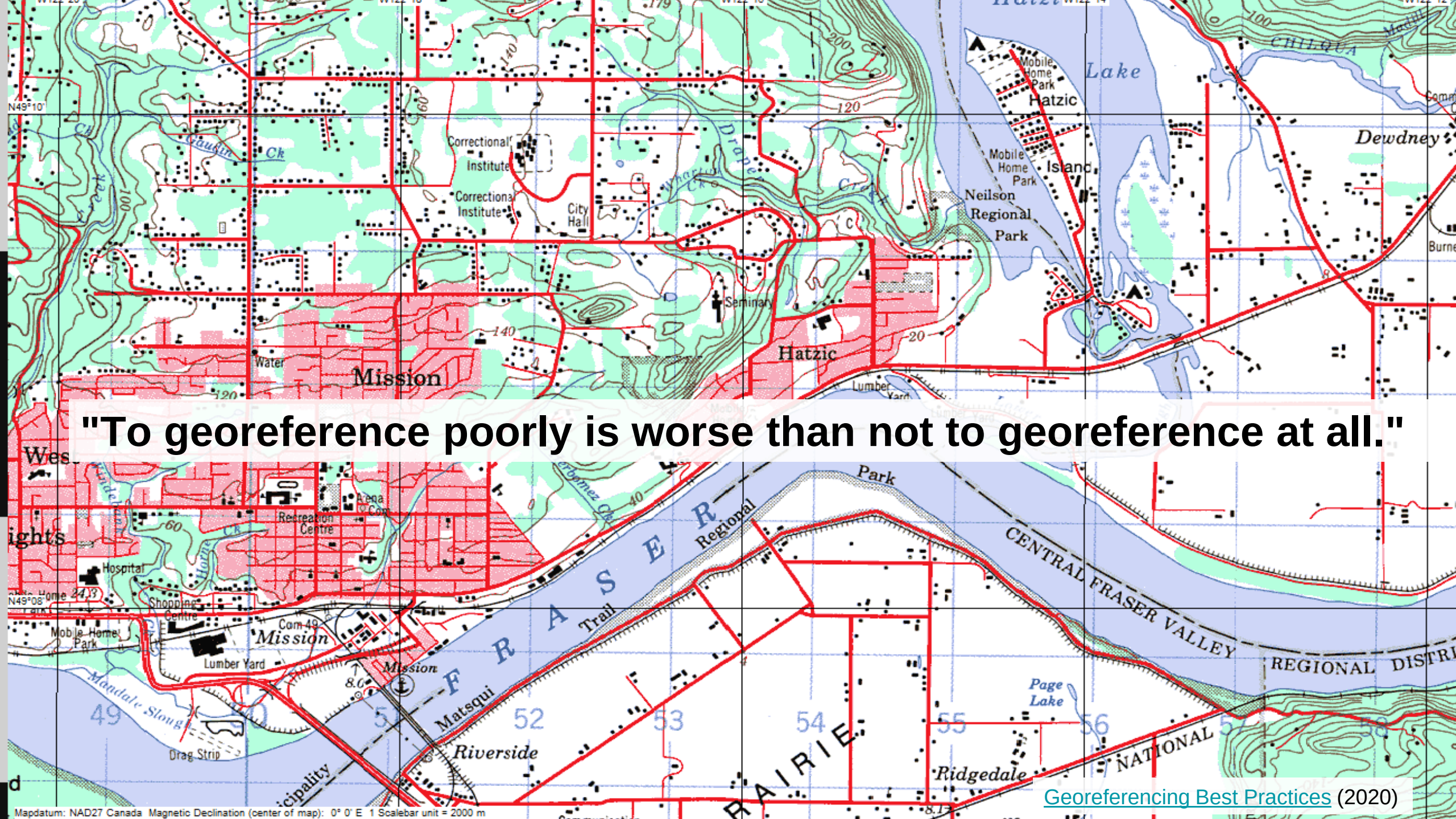
PART 2: METHODS & PROTOCOLS


"To georeference poorly is worse than not to georeference at all."
Georeferencing Best Practices (2020)
Mapdatum: NAD27 Canada Magnetic Declination (center of map): 0° 0' E 1 Scalebar unit = 2000 m

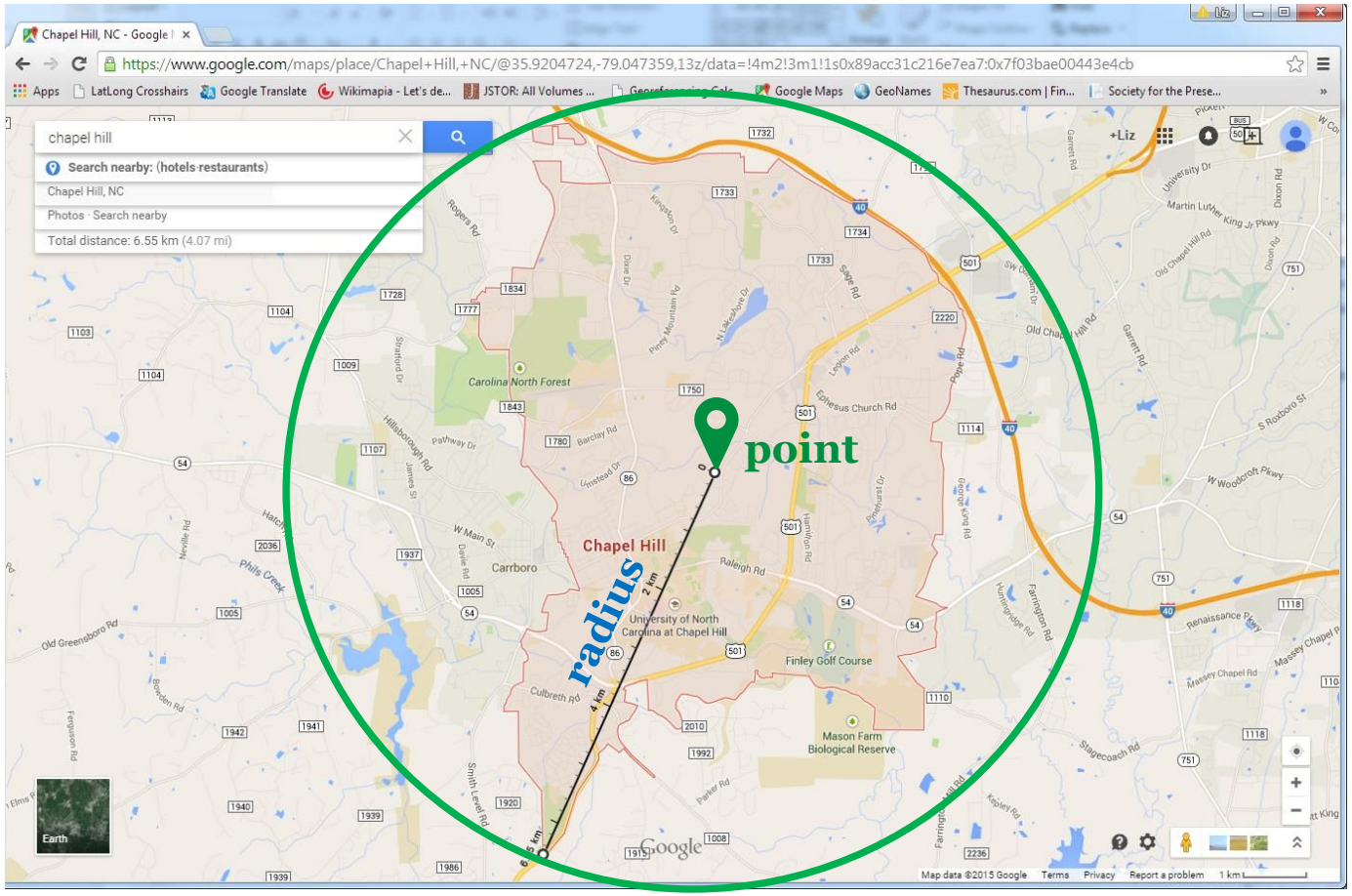
Point-Radius Method

Goal: Locate accurate coordinates and **calculate a radius** *that encapsulates the smallest possible area described in the collection locality string.*

Point = Lat. / Long. Coordinates

Radius = Area where collection may have occurred

- Stay **consistent** in your methods and assumptions by following the guide
- **Document** your georeference so that it is repeatable, being as clear an concise as possible in your assumptions



Wieczorek, John, et al. 2004. The Point-Radius method for georeferencing locality descriptions and calculating associated uncertainty. International Journal of Geographical Information Science. 18. 745-767. 10.1080/13658810412331280211.

For more information

Corrected Center

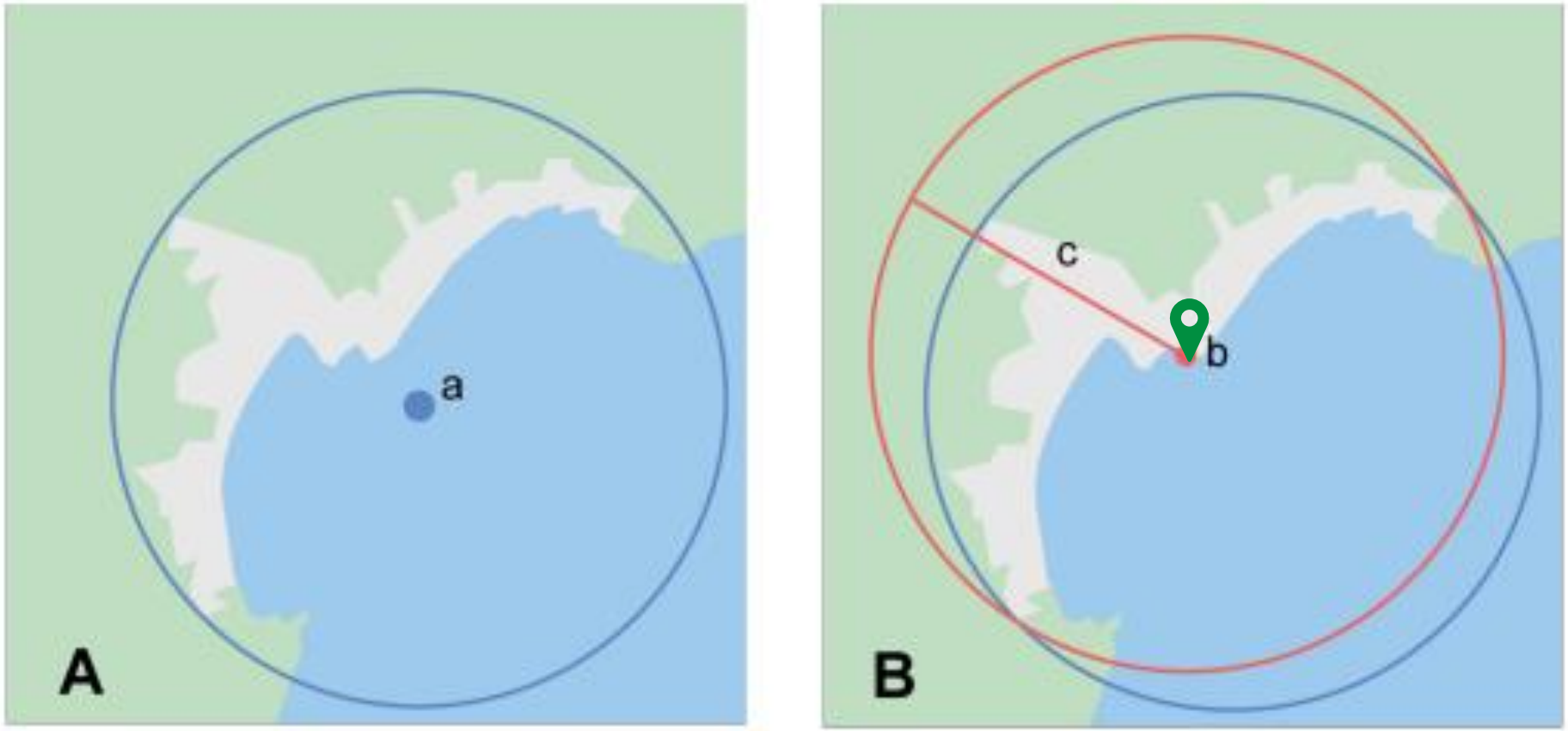
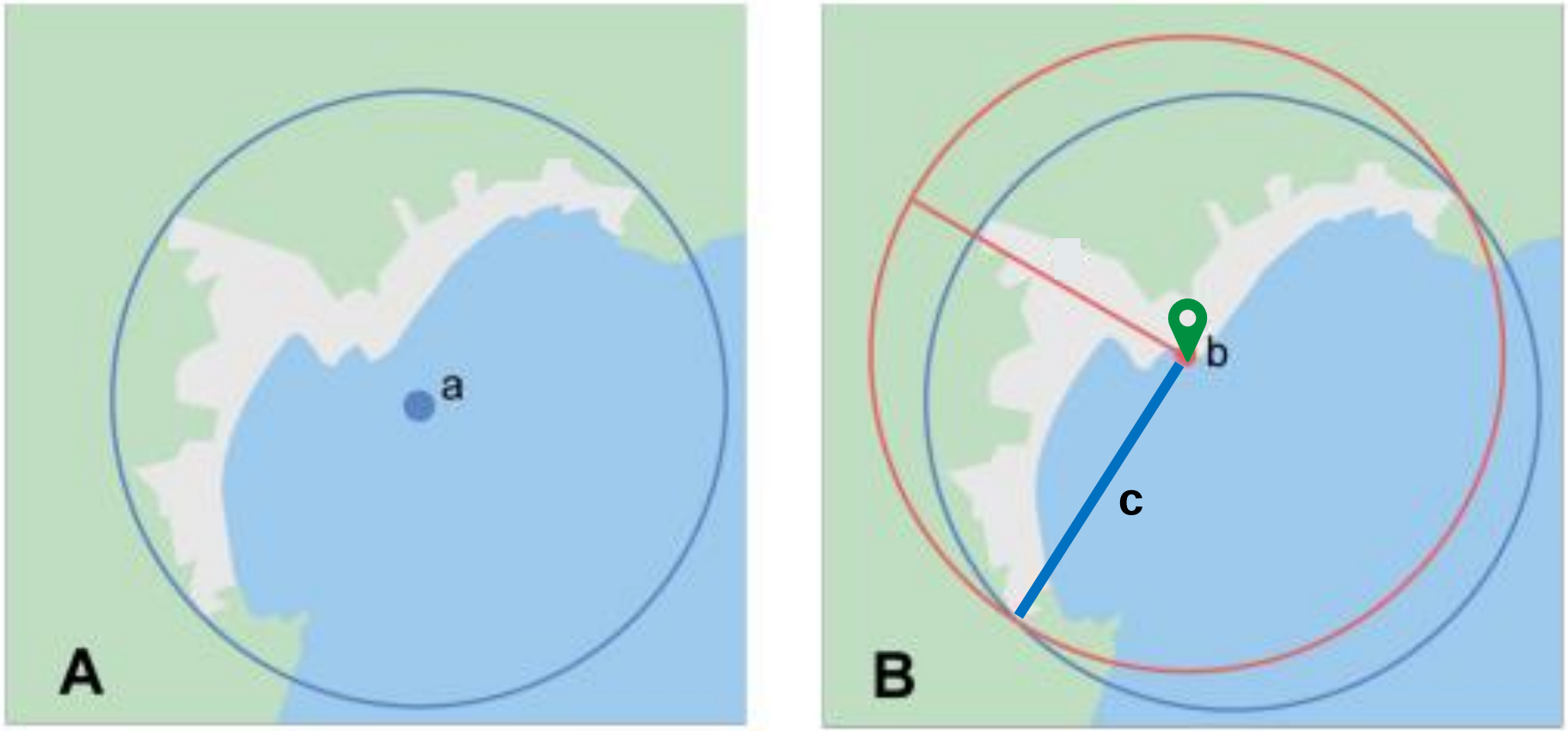


Figure 1. A: The center **a** *of the smallest enclosing circle of a feature (polygon highlighted in light grey). Note that the center does not fall within the boundary of the feature. B: The corrected center* **b**, *which is on the boundary of the feature, and the corresponding geographic radial* **c**.

Zermoglio PF, et. al (2020) Georeferencing Quick Reference Guide. Copenhagen: GBIF Secretariat. https://doi.org/10.35035/e09p-h128

Radial



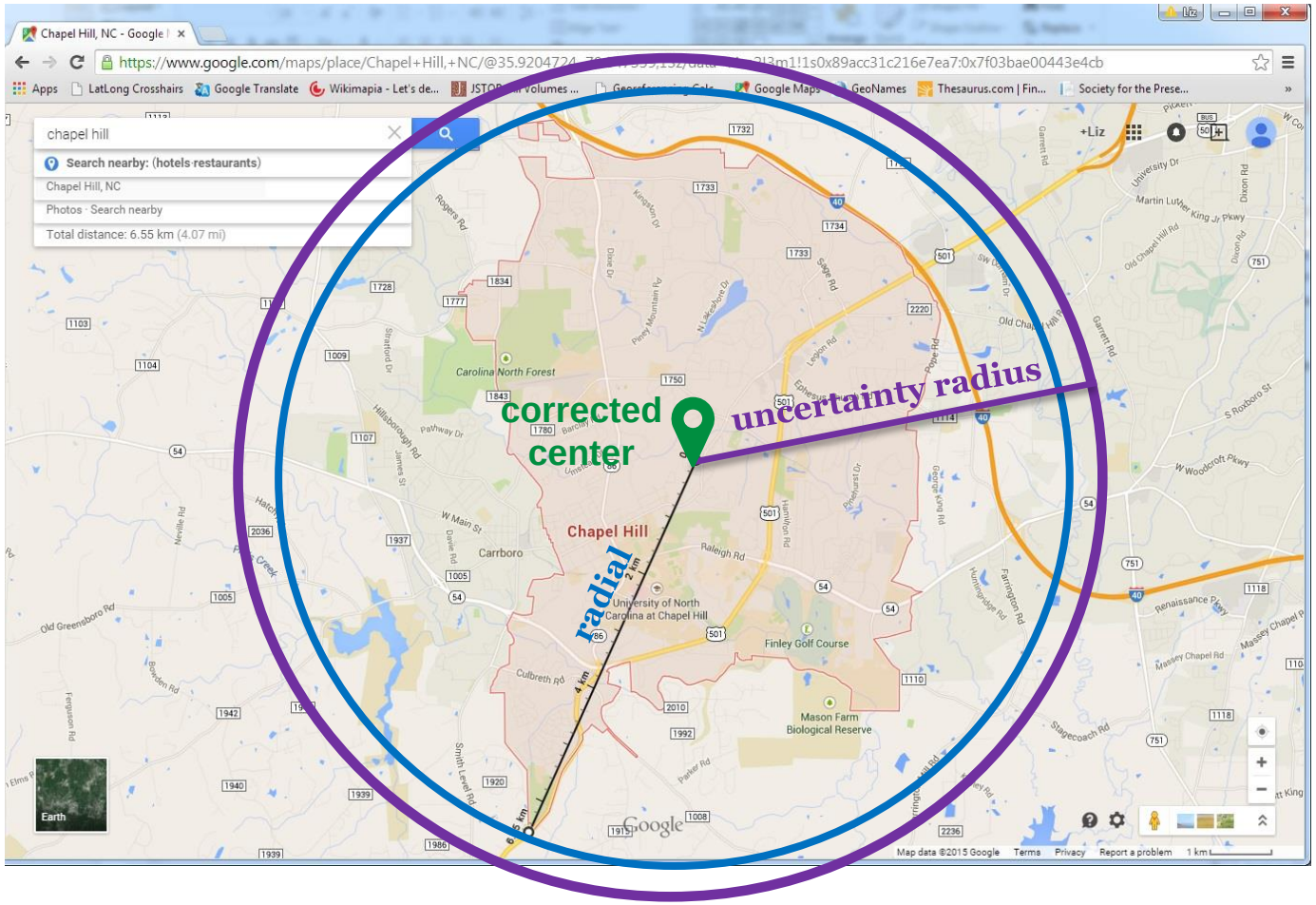
Definition: Measurement of DISTANCE from the **corrected center (b)** of the feature that defines the feature to *the* ***farthest extremity*** of that shape **(c)**.

Zermoglio PF, et. al (2020) Georeferencing Quick Reference Guide. Copenhagen: GBIF Secretariat. https://doi.org/10.35035/e09p-h128

Uncertainty

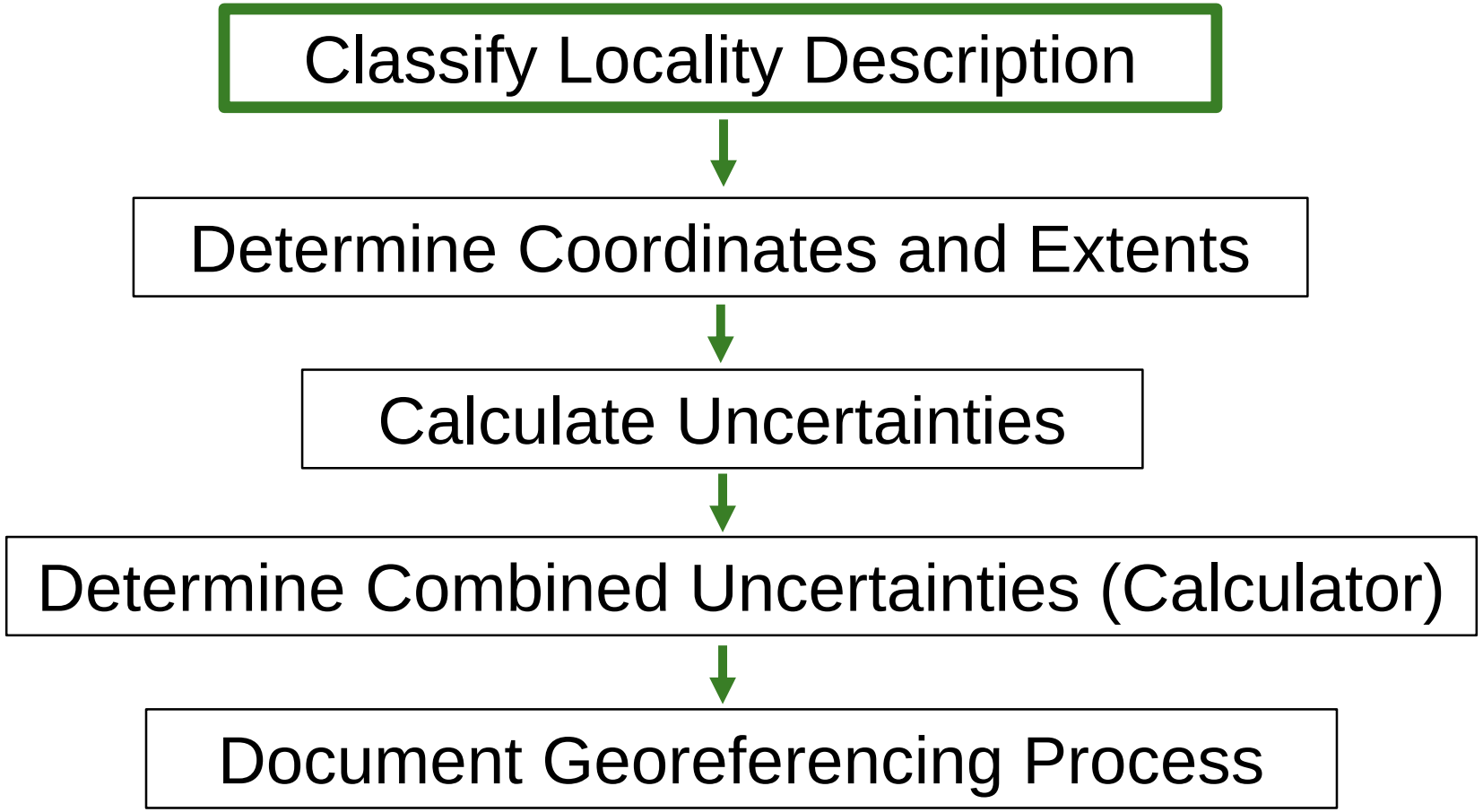
Uncertainty radius encapsulates the total area from which the collection may have occurred

- **Radial of the locality (majority)**
- Unknown datum
- Imprecision in distance measurement (user error)
- Imprecision in coordinate measurement (user error)
- Imprecision in direction measurement (from description)



Google Maps method: uncertainty radius found using MaNIS Calculator
GEOLocate method: provided radial = uncertainty radius (Calc. not needed)

General Workflow



BioGeomancer Guide To Best Practices for Georeferencing (2006)

Categorizing Locality

- There are a limited number of categories that locality descriptions can be placed into
- Category determines the **best method** of calculating coordinates and uncertainties
- Crucial first step in attempting a georeference
- Most specific part of the locality description should be used

Example: “Bridge over the St. Croix River, 4 km N of Somerset”

Georeference based on the bridge (Feature – with Obvious Spatial Extent) rather than Somerset (Offset – Distance at a Heading)

Locality Types

Simple Localities:

- Feature – With Obvious Spatial Extent (Defined Area)
- Feature – Without Obvious Spatial Extent (Undefined)
- Feature – Near a Feature
- Feature – Between Two Features
- Feature – Paths (River, stream, road, path)

Offsets:

- Offset – Distance only
- Offset – Heading only
- Offset – Distance along a path
- Offset – Distance along Orthogonal Directions
- Offset – Distance at a Heading

Coordinates Exist:

- Lat /Long Coordinates (leave alone)
- TRS Coordinates
- UTM Coordinates

Do not georeference:

- Dubious
- Can not be located
- Demonstrably Inaccurate
- More than One Matching Feature
- Cultivated

Google Maps

GEOLocate

Quick Guide: Appendix A - Key to Locality Types of the Georeferencing Quick Reference Guide

Zermoglio PF, et. al (2020) Georeferencing Quick Reference Guide. Copenhagen: GBIF Secretariat. https://doi.org/10.35035/e09p-h128

LOCALITY TYPE

Named Place

Bounded Area: Locality refers to a geographic feature with discernible spatial boundaries

Examples: "Las Vegas", "Puerto Madryn", "San Fernando", "Verónica"

Feature – with Obvious Spatial Extent

Previously called: Named Place: Bounded Area (2012)

Feature categories include:

- ❑ city, town, county, suburb, populated place, or homestead
- ❑ spring, bore, tank, well, or waterhole
- ❑ island, reef, or cay
- ❑ port, bay, gulf, or harbor
- ❑ airport, buoy, dock, or jetty
- ❑ point, cape, or peninsula
- ❑ cave
- ❑ dam, or lock
- ❑ hill, peak, pass, or mountain
- ❑ trig point
- ❑ park, reserve, or forestry zone
- ❑ junction of two paths (roads, rivers, contour lines, boundaries, etc.)

Zermoglio PF, et. al (2020) Georeferencing Quick Reference Guide. Copenhagen: GBIF Secretariat. https://doi.org/10.35035/e09p-h128
Wieczorek J, Bloom D, Constable H, Fang J, Koo M, Spencer C & Yamamo K (2012) Georeferencing Quick Reference Guide, version 2012-10-08 https://www.idigbio.org/wiki/images/1/1e/GeoreferencingQuickReferenceGuide.pdf

LOCALITY TYPE

Named Place

Bounded Area: Locality refers to a geographic feature with discernible spatial boundaries

Examples: "Las Vegas", "Puerto Madryn", "San Fernando", "Verónica"

Feature – with Obvious Spatial Extent

Previously called: Named Place: Bounded Area (2012)

Examples:

1. "Bakersfield, Kern Co., CA”
2. “Point Lookout, Nassau, NY”
3. “Bennetts Waterhole, Australia”
4. “Uruçuca, Bahia, Brazil”
5. “Isla Tiburon, Mexico”
6. “Lorne Reef”
7. “Yosemite National Park”
8. “Mt Hypipamee”
9. “34th Street & 5th Ave & , NY, NY”
10. “State Forest Reserve 607, Queensland”
11. “Where Dalby Road crosses Bunya Mountains National Park Boundary”
12. “confluence of Labarge Creek and South Labarge Creek, […]”
13. “At 100 m contour line on Black street, […]”
14. “Victoria River Station” [Northern Territory, Australia]

NOTE: You may NOT be able to discern from the locality which level of geography is being referring to by the name (neighborhood, city, county, etc.). In these cases: ***choose the larger entity***

Feature – With Obvious Spatial Extent

Georeferencing Procedure:

A) Features **with** an ***obvious*** spatial extent

Coordinates: Find the ***corrected center***, or the point within a location that minimizes the geographic radial, obtained by finding the smallest enclosing circle that contains the entire feature and then locating the center of that circle.

Radial: Measure the ***distance from the selected coordinates to the farthest point within the named place***

Example 1:*"Isla Tiburon, Mexico"*

Feature – With Obvious Spatial Extent

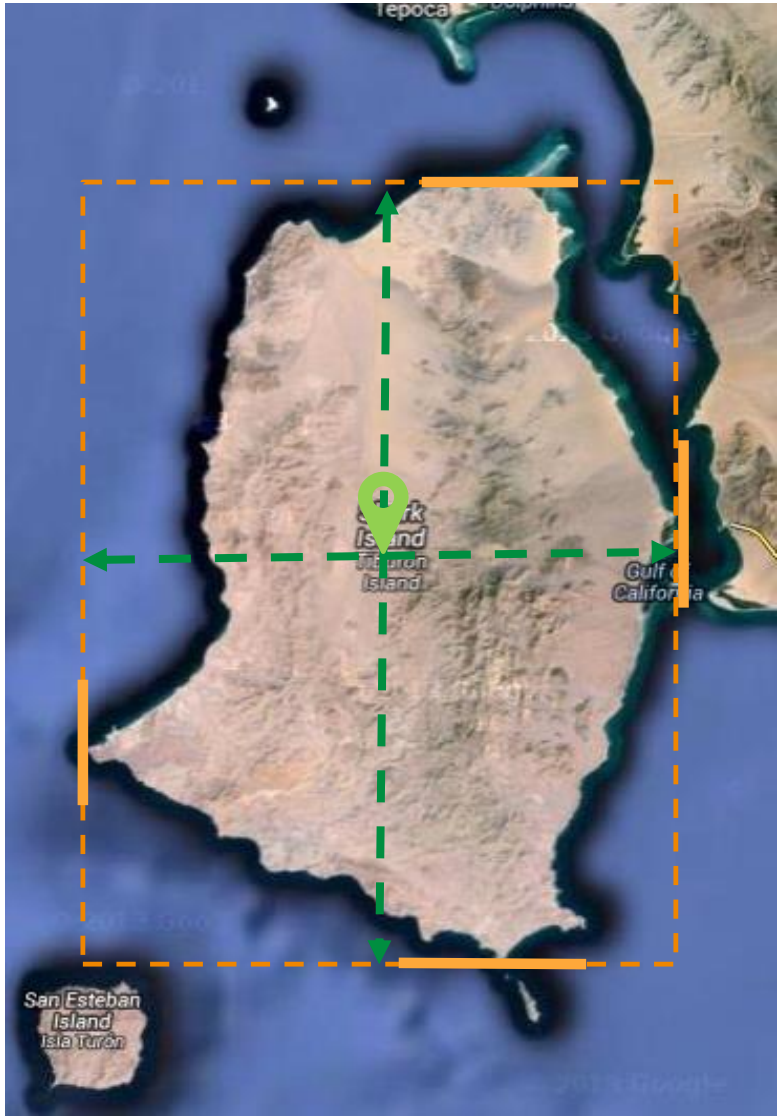
Georeferencing Procedure:

A) Features **with** an ***obvious*** spatial extent

Coordinates: Find the ***corrected center***, or the point within a location that minimizes the geographic radial, obtained by finding the smallest enclosing circle that contains the entire feature and then locating the center of that circle.

Imagine a box around the feature by finding the most northern/southern/western/eastern limits to help you visualize the corrected center

Radial: Measure the ***distance from the selected coordinates to the farthest point within the named place***



Example 1:*"Isla Tiburon, Mexico"*

Feature – With Obvious Spatial Extent

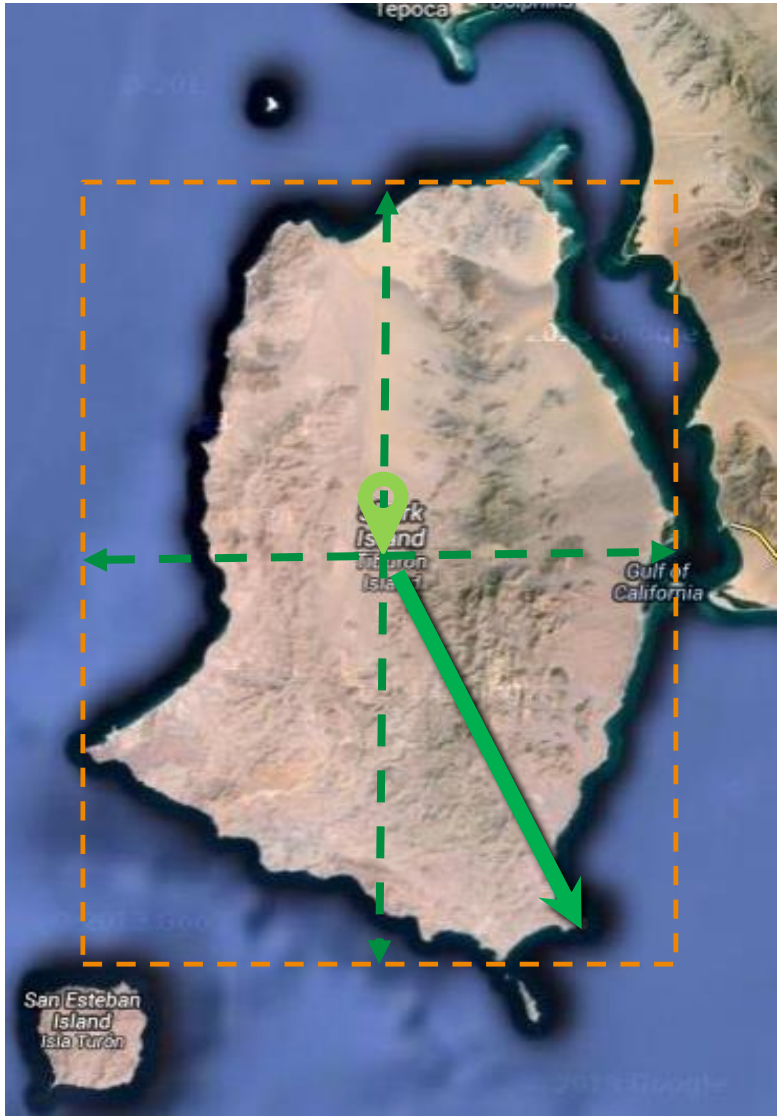
Georeferencing Procedure:

A) Features **with** an ***obvious*** spatial extent

Coordinates: Find the ***corrected center***, or the point within a location that minimizes the geographic radial, obtained by finding the smallest enclosing circle that contains the entire feature and then locating the center of that circle.

Imagine a box around the feature by finding the most northern/southern/western/eastern limits to help you visualize the corrected center

Radial: Measure the ***distance from the selected coordinates to the farthest point within the named place***



Example 1:*"Isla Tiburon, Mexico"*

Feature – With Obvious Spatial Extent

Georeferencing Procedure:

A) Features **with** an ***obvious*** spatial extent

Coordinates: Find the ***corrected center*** (i.e., the midpoint of the extremes of latitude and longitude)

Radial: Measure the ***distance from the selected coordinates to the farthest point within the named place***

Example 2:*"Nantucket, MA"*

Feature – With Obvious Spatial Extent

Georeferencing Procedure:

A) Features **with** an ***obvious*** spatial extent

Coordinates: Find the ***corrected center*** (i.e., the midpoint of the extremes of latitude and longitude)

Radial: Measure the ***distance from the selected coordinates to the farthest point within the named place***

Example 2:*"Nantucket, MA"*

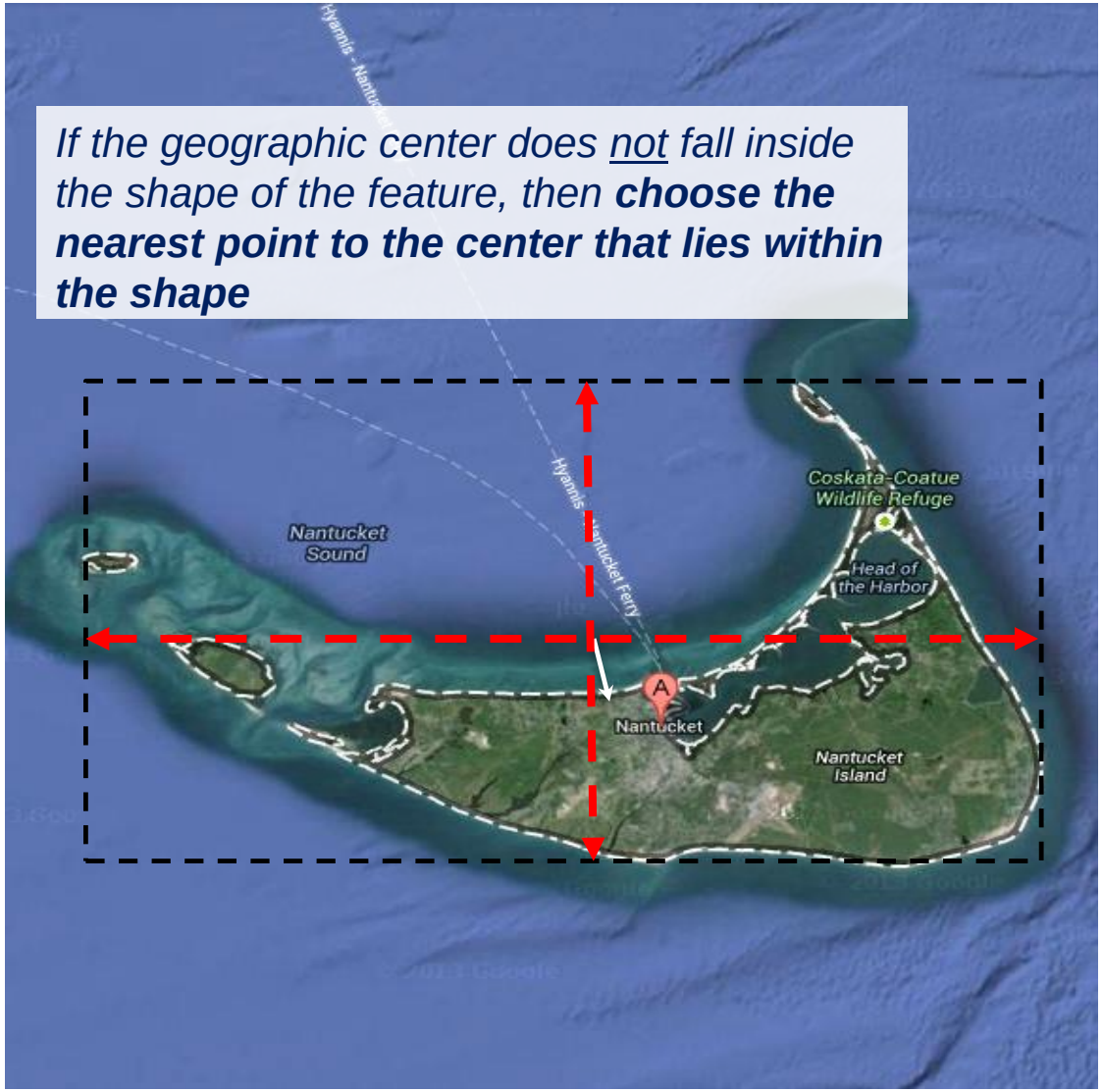
Feature – With Obvious Spatial Extent

Georeferencing Procedure:

A) Features **with** an ***obvious*** spatial extent

Coordinates: Find the ***corrected center*** (i.e., the midpoint of the extremes of latitude and longitude)

Radial: Measure the ***distance from the selected coordinates to the farthest point within the named place***



Example 2:*"Nantucket, MA"*

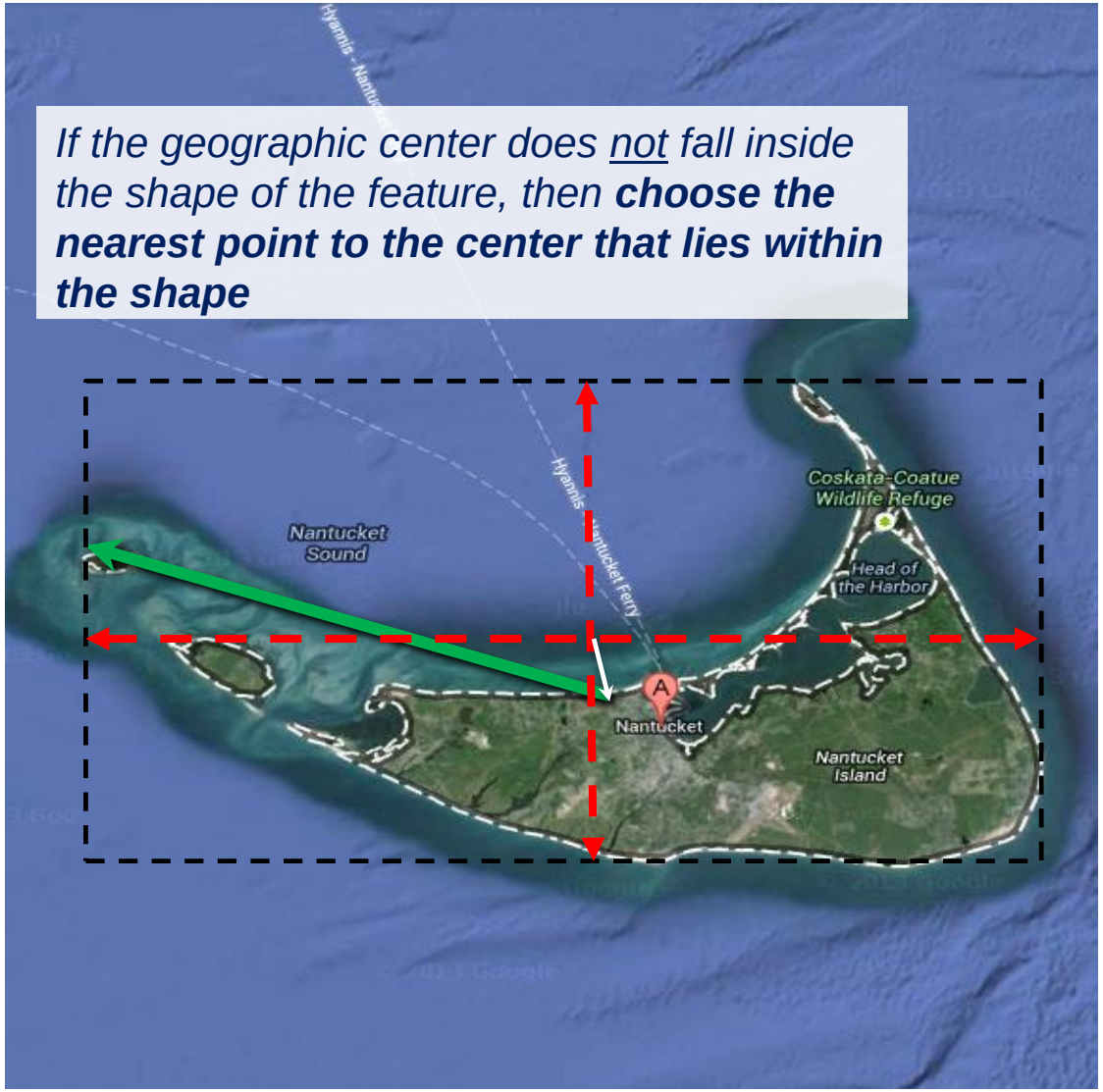
Feature – With Obvious Spatial Extent

Georeferencing Procedure:

A) Features **with** an ***obvious*** spatial extent

Coordinates: Find the ***corrected center*** (i.e., the midpoint of the extremes of latitude and longitude)

Radial: Measure the ***distance from the selected coordinates to the farthest point within the named place***



Example 2:*"Nantucket, MA"*

Feature – Without Obvious Spatial Extent

Previously called: Named Place: Undefined Area (2012)

LOCALITY TYPE

Named place

Undefined Area: Locality refers to a geographic feature that does not have a clear spatial boundary

Example: "Pampa Grande" (the extent is 4.7 km given that the center of the nearest named place, "Colonia Mariano Sarratea" is 9.4 km distant)

Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates:

?

Linear Extent:

?

- ***Populated places*** *without* ***polygon*** *when searched for in Google maps and boundaries that* ***cannot be reliably delineated*** *from other sources or using visual cues*
- *Complex or amorphous* ***landscape features*** *with boundaries that are difficult to discern*
- *Named Places or Features which are* ***contiguous*** *with other nearby or subsidiary named places*
- *Named Places or Features which* ***appear*** *when searched on Google maps, but* ***no clearly defined settlement*** *is visible* ***nearby***
- *Names given to* ***small*** *and/or* ***remote*** *settlements which can be assumed to reflect larger, and more poorly defined territories*

Feature – Without Obvious Spatial Extent

Previously called: Named Place: Undefined Area (2012)

Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates: *Approximate* the ***corrected center***

Radial:

Updated Quick Reference Guide (Zermoglio 2020): approximate boundary based on visible clues, and document rationale. This is ***not straight forward*** and is ***not easily repeatable***.
Also suggested: when there are no indicators for boundary, ***use midpoint between the feature and nearest feature*** **of similar type, size, or importance to make a rough boundary (= halved distance between feature and nearest feature, as noted in the previous Georeferencing Quick Reference Guide, 2012).** "Though this boundary may not represent the actual feature very well, it will represent the uncertainty of where the locality is, and that is the major goal of the georeference."

Example 4:*"Bodalangi, Democratic Republic of the Congo"*

Feature – Without Obvious Spatial Extent

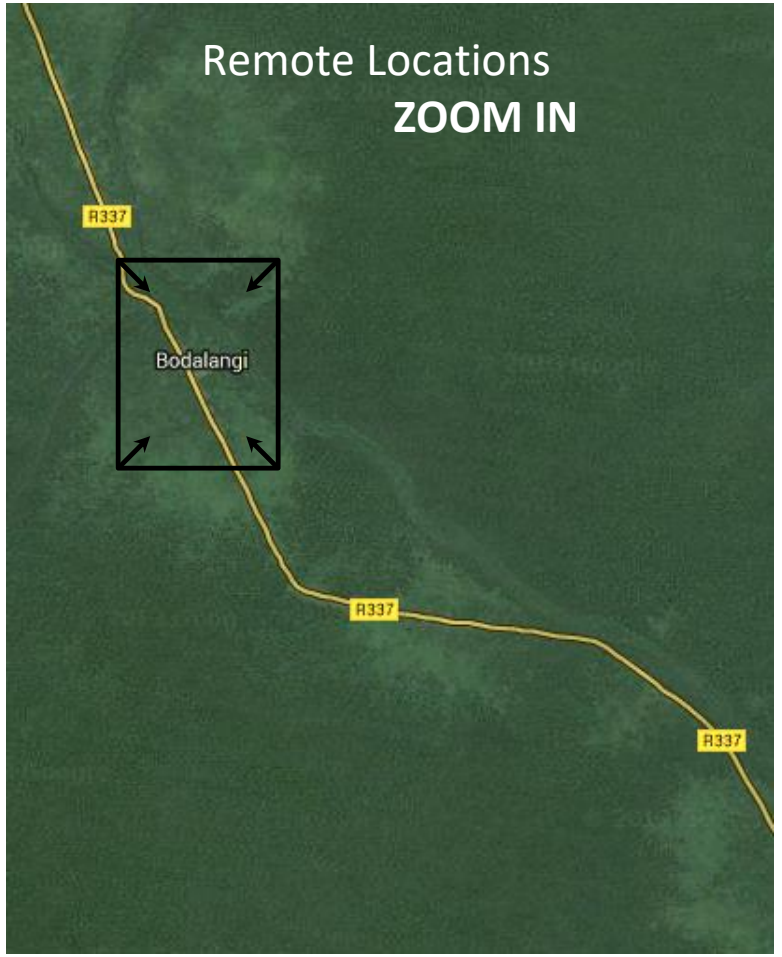
Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates: *Approximate* the ***corrected center***

Radial:

When there are no indicators for boundary, ***use midpoint between the feature and nearest feature*** **of similar type, size, or importance to make a rough boundary (= halved distance between feature and nearest feature, as noted in the previous Georeferencing Quick Reference Guide, 2012).**



Example 4:*"Bodalangi, Democratic Republic of the Congo"*

Feature – Without Obvious Spatial Extent

Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates: *Approximate* the ***corrected center***

Radial:

When there are no indicators for boundary, ***use midpoint between the feature and nearest feature*** **of similar type, size, or importance to make a rough boundary (= halved distance between feature and nearest feature, as noted in the previous Georeferencing Quick Reference Guide, 2012).**

Example 4:*"Bodalangi, Democratic Republic of the Congo"*

Feature – Without Obvious Spatial Extent

Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates: *Approximate* the ***corrected center***

Radial:

When there are no indicators for boundary, ***use midpoint between the feature and nearest feature*** **of similar type, size, or importance to make a rough boundary (= halved distance between feature and nearest feature, as noted in the previous Georeferencing Quick Reference Guide, 2012).**

Example 4:*"Bodalangi, Democratic Republic of the Congo"*

Feature – Without Obvious Spatial Extent

Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates: *Approximate* the ***corrected center***

Radial: **1/2 of the distance** from the selected coordinates **to the nearest named feature. This method is from the previous version of the guide (Wieczorek 2012) but is in agreement with the updated guide (Zermoglio 2020)**

Example 4:*"Bodalangi, Democratic Republic of the Congo"*

Feature – Without Obvious Spatial Extent

Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates: *Approximate* the ***corrected center***

Radial: **1/2 of the distance** from the selected coordinates **to the nearest named feature**

Example 4:*"Bodalangi, Democratic Republic of the Congo"*

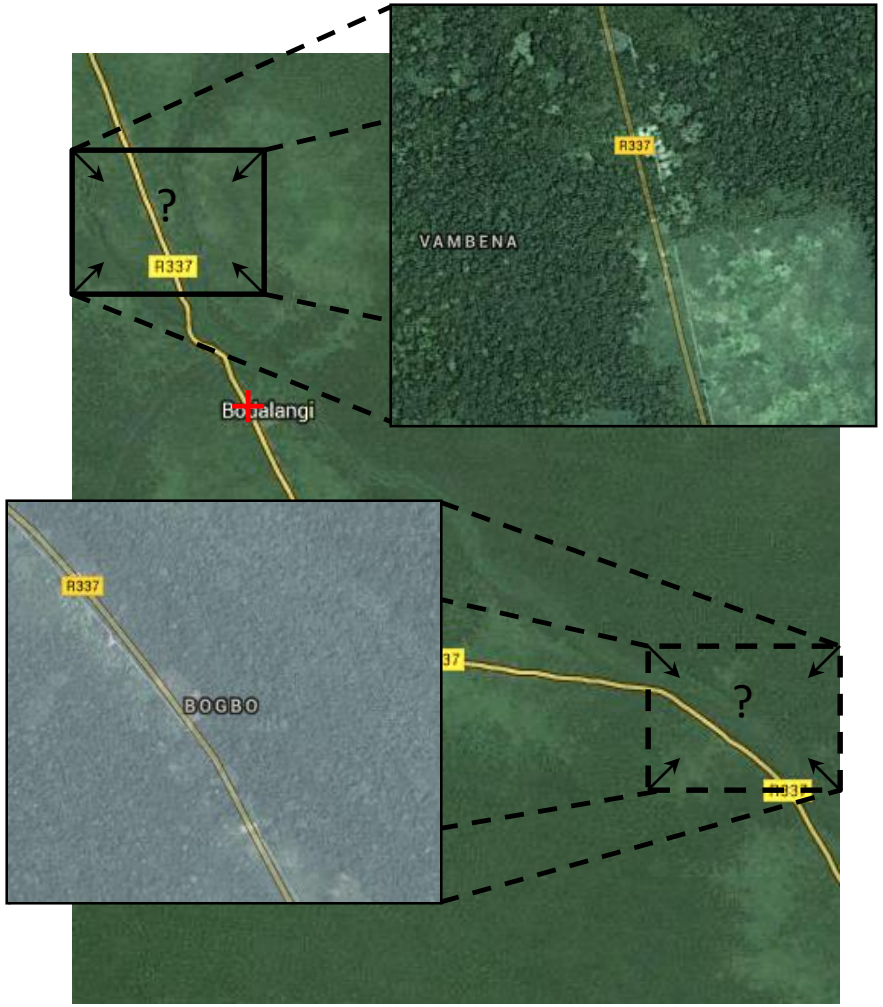
Feature – Without Obvious Spatial Extent

Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates: *Approximate* the ***corrected center***

Radial: **1/2 of the distance** from the selected coordinates **to the nearest named feature**



Example 4:*"Bodalangi, Democratic Republic of the Congo"*

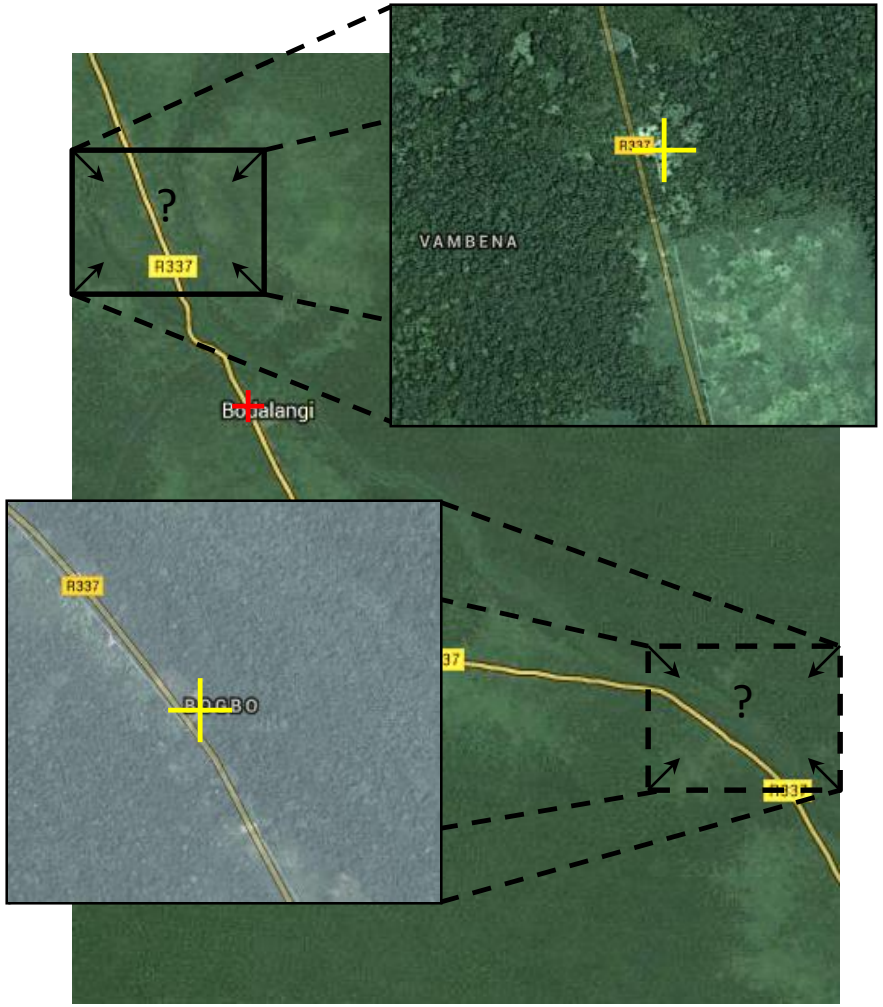
Feature – Without Obvious Spatial Extent

Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates: *Approximate* the ***corrected center***

Radial: **1/2 of the distance** from the selected coordinates **to the nearest named feature**



Example 4:*"Bodalangi, Democratic Republic of the Congo"*

Feature – Without Obvious Spatial Extent

Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates: *Approximate* the ***corrected center***

Radial: **1/2 of the distance** from the selected coordinates **to the nearest named feature**

Example 4:*"Bodalangi, Democratic Republic of the Congo"*

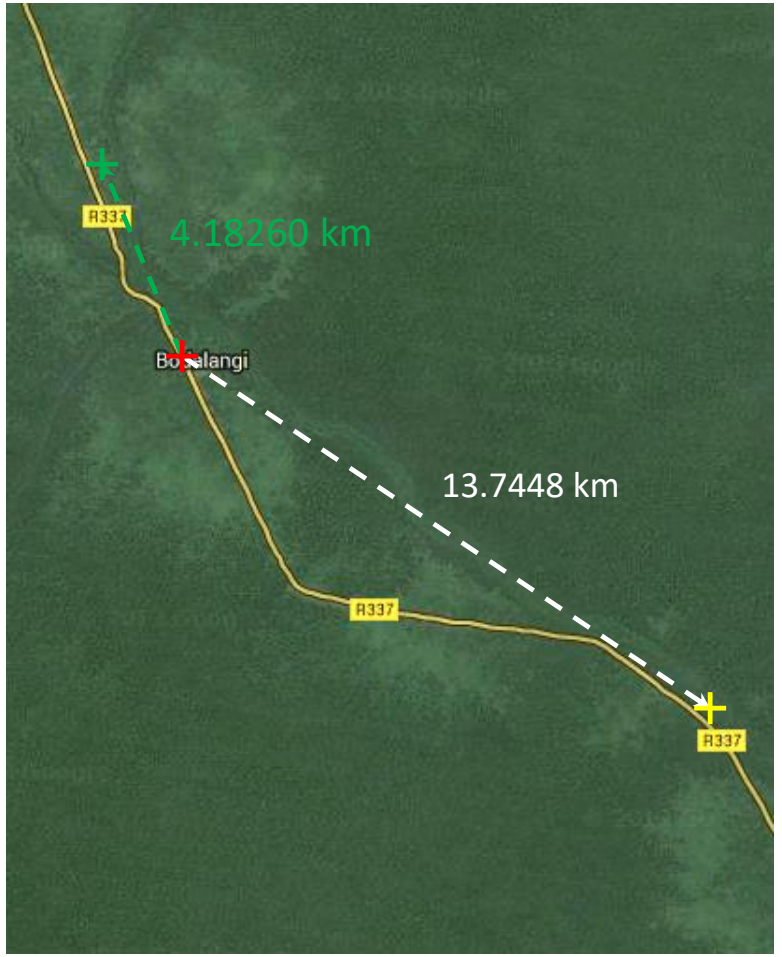
Feature – Without Obvious Spatial Extent

Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates: *Approximate* the ***corrected center***

Radial: **1/2 of the distance** from the selected coordinates **to the nearest named feature**



Example 4:*"Bodalangi, Democratic Republic of the Congo"*

Feature – Without Obvious Spatial Extent

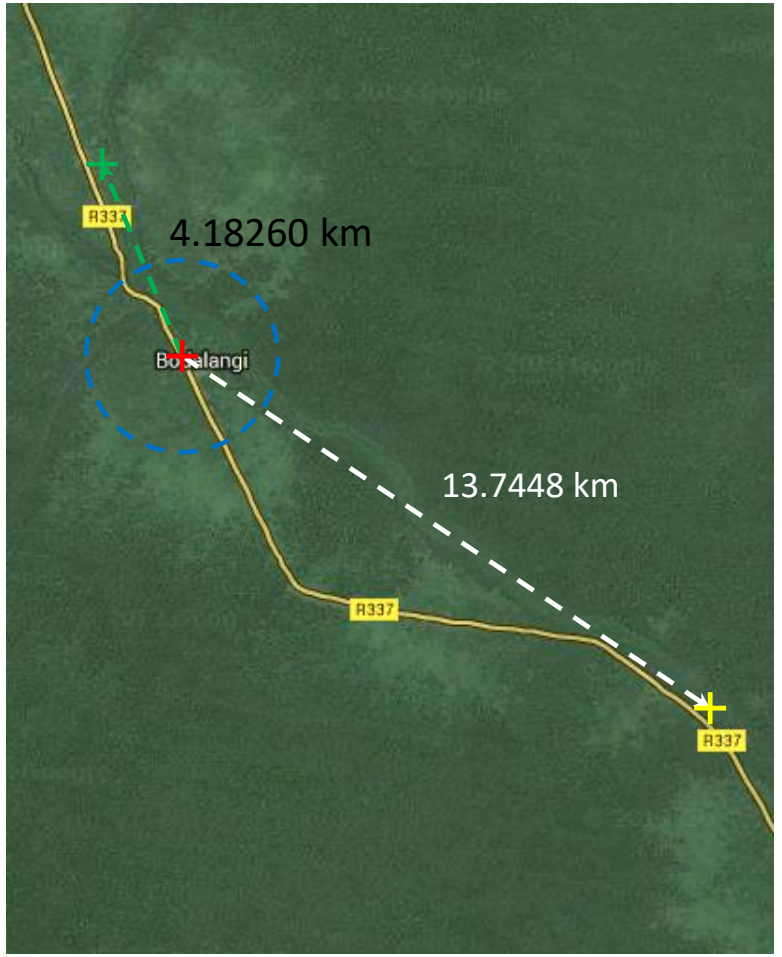
Georeferencing Procedure:

B) Features ***without*** an obvious spatial extent

Coordinates: *Approximate* the ***corrected center***

Radial: **1/2 of the distance** from the selected coordinates **to the nearest named feature**

$$\frac{4.18260\ \text{km}}{2} = \textbf{2.0913 km}$$



Example 4:*"Bodalangi, Democratic Republic of the Congo"*

Mountain

- If able to discern the mountain's boundary, treat as a **Feature – with Obvious Spatial Extent**

- If unable to delineate mountain's extent, treat as a **Feature – without Obvious Spatial Extent**, and measure to nearest mountain (if possible)

- Incorporate elevation information if provided; locate coordinates at the elevation specified nearest to corrected center of mountain

The boundaries between mountains can be determined by using the terrain (valleys, saddles, and plains) that separate one mountain from others around it (Figure 5).

Always use `georeferenceRemarks` to document the decisions made and the reasons for them as well as possible, including the neighbouring features used for reference.

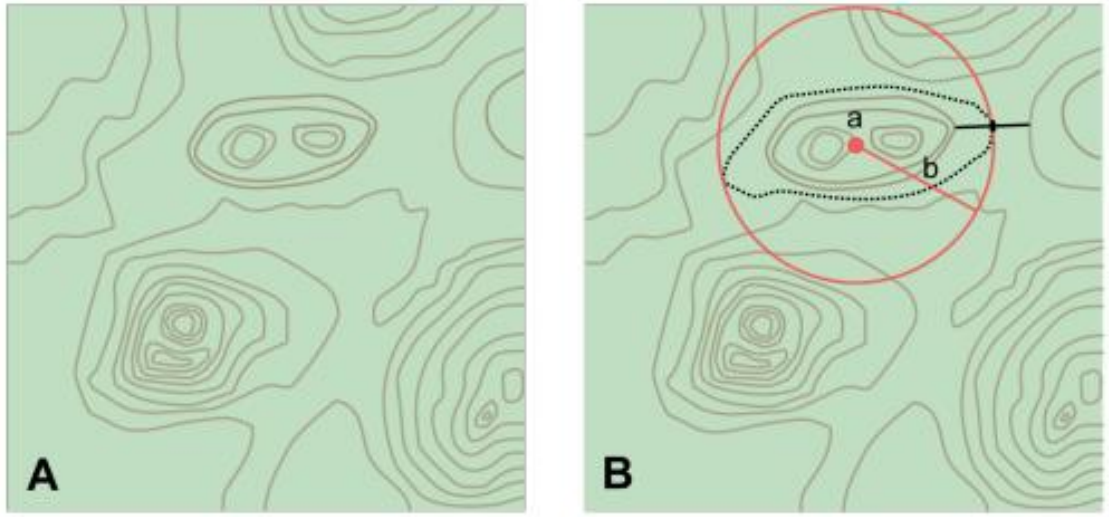


Figure 5. A. Topographic contours of a group of nearby mountains. B. Rough boundary, corrected center **a** *and geographic radial* **b** *of a mountain determined by the surrounding valleys, saddles, and plains.*

Georeferencing Quick Reference Guide, 2.1.2 Feature – without Obvious Spatial Extent

LOCALITY TYPE

Named Place

Near a Named Place

Examples: "vicinity of General Conesa", "before Ceibas", "near Dina Huapi"

Feature – Near a Feature

Previously called: Named Place: Near a Named Place (2012)

Definition: A locality given without an exact position, but with ***"near"***, ***"in the vicinity of"***, ***"adjacent to"***, or some similar relation to a feature cited.

These locality descriptions imply an offset from a named place without definitive directions or distances.

Examples:

1. *"Near Las Vegas, NV"*
2. *"In the vicinity of Brooklyn, IA"*
3. *"Near bridge over Condamine River on Leichhardt Hwy, Australia"*
4. *"General area of confluence of Black and Oshetna Rivers"*

Feature – Near a Feature (2020)

Georeferencing Procedure:

Determine boundary of feature (bounded or unbounded method). To account for the proximity indicator, **extend that boundary outward for a fixed distance in all directions.** Call this the "extended feature."

The buffer distance for the extension is **arbitrary** – it is hard to defend any given value as a default. **Make a judgement and imagine what the person who recorded the locality meant. Document the rationale and decisions made.**

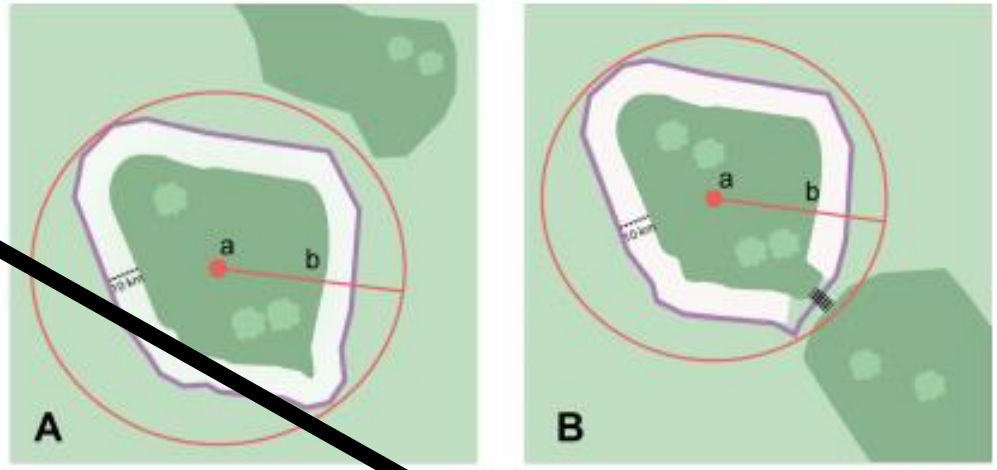


Figure 14. Boundary, corrected center **a** *and geographic radial* **b** *of an interpretation of locality type "near a Feature" with a boundary extended a fixed distance in all directions, in this case 10 km.* **A***: Boundary extended a fixed distance in all directions with no neighbouring conflicts.* **B***: Boundary extended a fixed distance in all directions except in the area overlapping a similar feature, where it extends half the distance to the neighbouring feature.*

Zermoglio PF, et. al (2020) Georeferencing Quick Reference Guide. Copenhagen: GBIF Secretariat. https://doi.org/10.35035/e09p-h128

Feature – Near a Feature (2012)

Previously called: Named Place: Near a Named Place (2012)

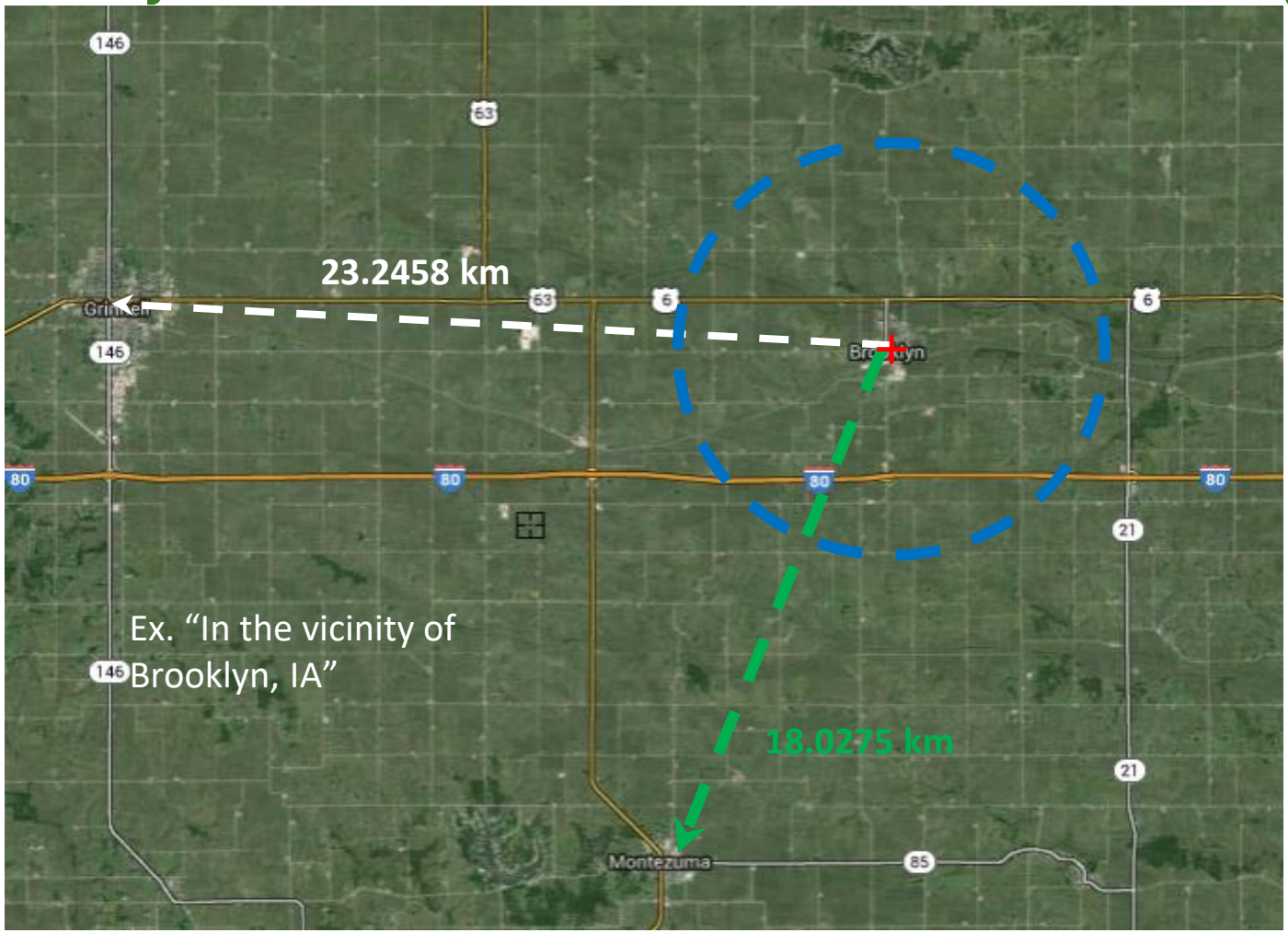
Procedure:

Coordinates:

Approximate the ***center***

Linear Extent:

1/2 of the distance from the selected coordinates **to center of the nearest named place**



= 9.01375 km

*It is assumed that **if** a locality was **further away** than that distance, it would be said to be **near a different named place***

Feature – Near a Feature (BioGeomancer)

Geological/natural and unevenly spaced features

Procedure:

Coordinates:

Approximate the ***center***

Radial:

Which ever is greater: 1) ***2 km*** or 2) ***200% of the radial* of the Feature (from Biogeomancer Guide to Best Practices for Georeferencing)**

Ex2. Near Bosque Estatal de Ceiba Natural Reserve, Puerto Rico

Chapman AD & J Wieczorek, eds. (2006) Guide to Best Practices for Georeferencing. Copenhagen: GBIF Secretariat. https://doi.org/10.15468/doc-2zpf-zf42

Feature – Near a Feature (BioGeomancer)

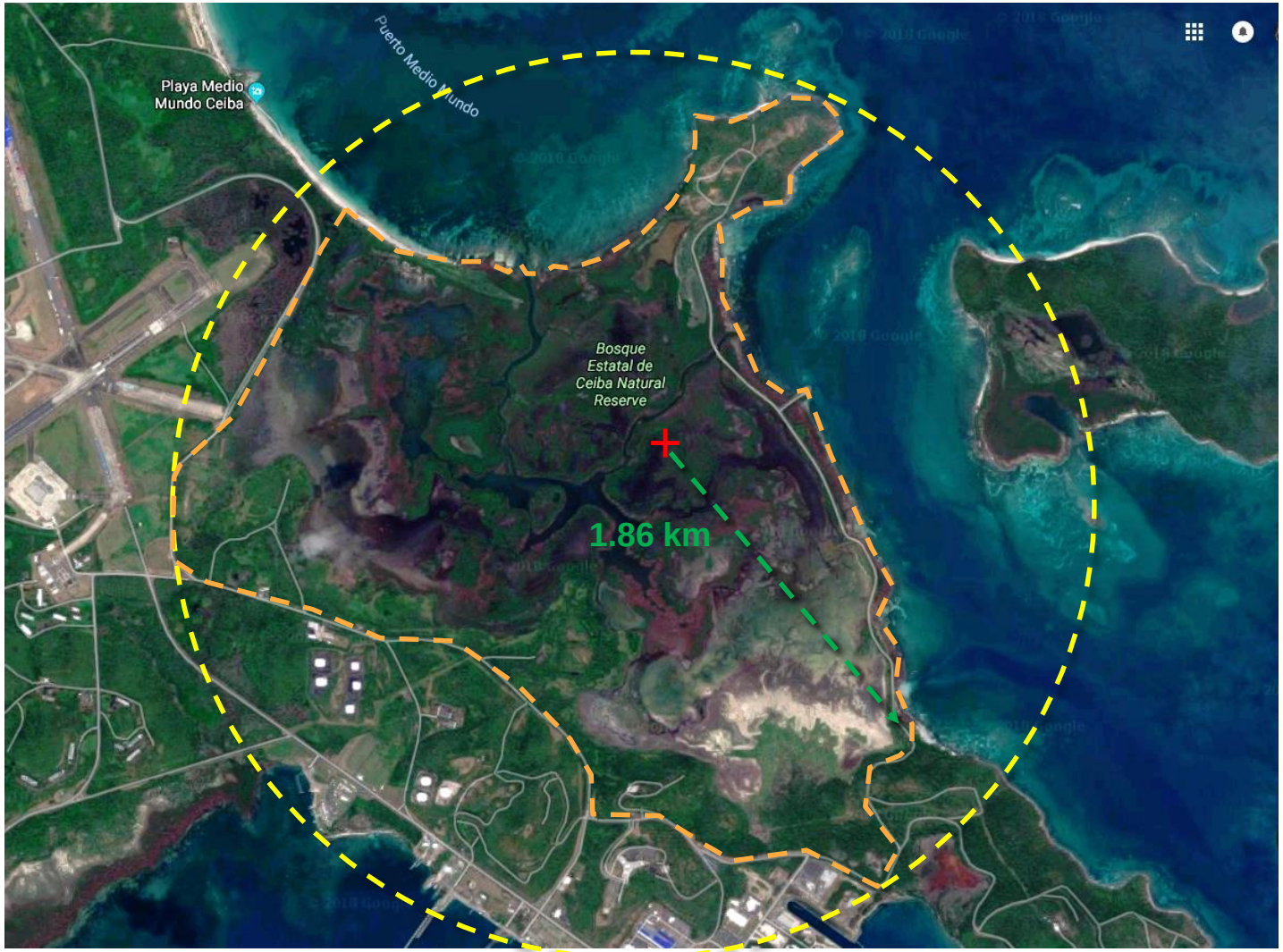
Procedure:

Coordinates:

Approximate the ***center***

Radial:

Which ever is greater: 1) ***2 km*** or 2) ***200% of the radial* of the Feature** **(from Biogeomancer Guide to Best Practices for Georeferencing)**



Ex2. Near Bosque Estatal de Ceiba Natural Reserve, Puerto Rico

Chapman AD & J Wieczorek, eds. (2006) Guide to Best Practices for Georeferencing. Copenhagen: GBIF Secretariat. https://doi.org/10.15468/doc-2zpf-zf42

Feature – Near a Feature (BioGeomancer)

Procedure:

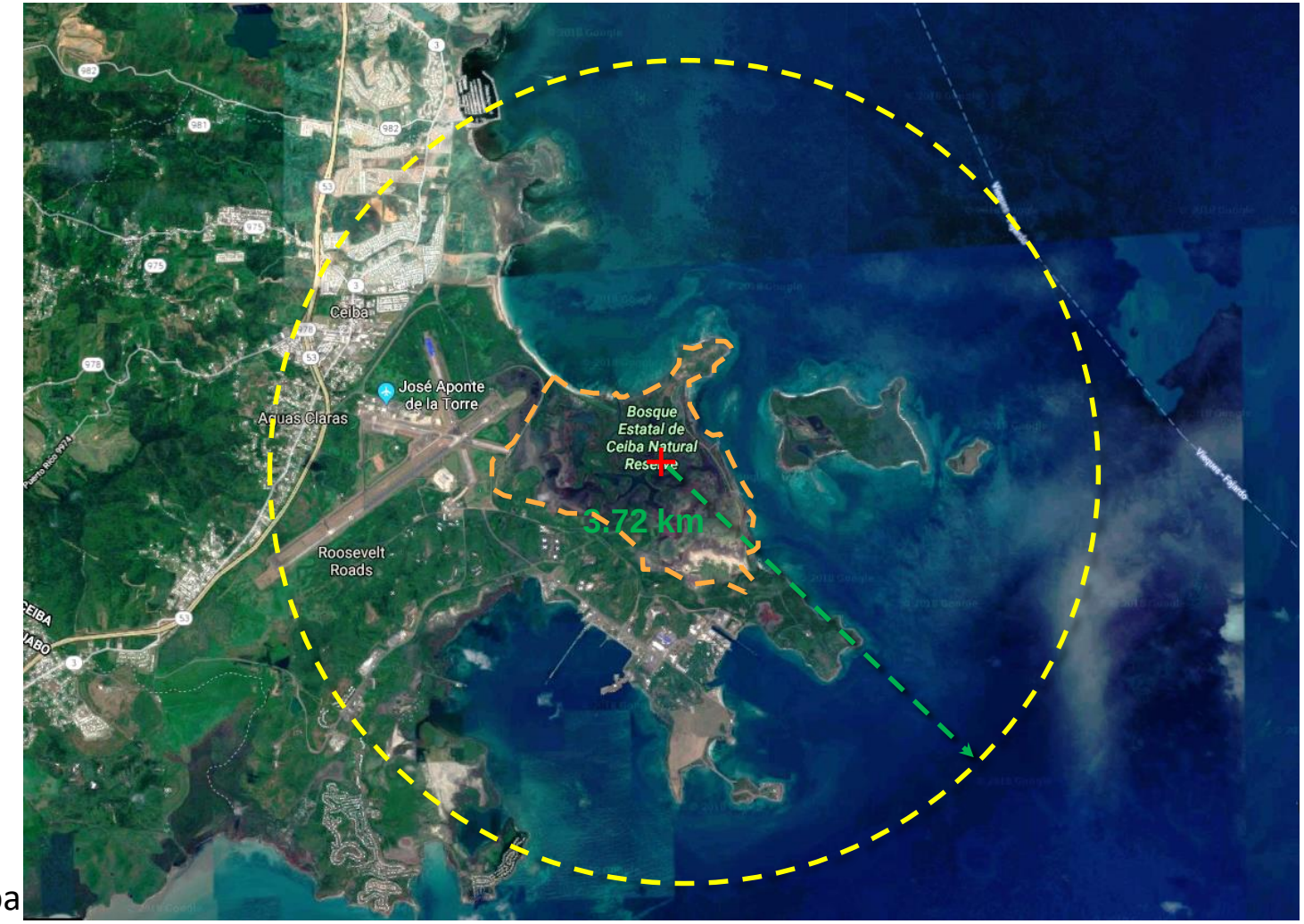
Coordinates:

Approximate the ***center***

Radial:

Which ever is greater: 1) ***2 km*** or 2) ***200% of the radial*** **of the Feature** **(from Biogeomancer Guide to Best Practices for Georeferencing)**

Use 200% of the linear extent in this case



Ex2. Near Bosque Estatal de Ceiba Natural Reserve, Puerto Rico

LOCALITY TYPE

Named Place

Between two Places

Examples: "between Missoula and Florence, Montana", "Entre Pampa Blanca y Pampa Vieja, Jujuy"

Feature – Between Two Features

Previously called: Named Place: Between Two Named Places (2012)

Definition: A locality cited as '*between*' two features or named places.

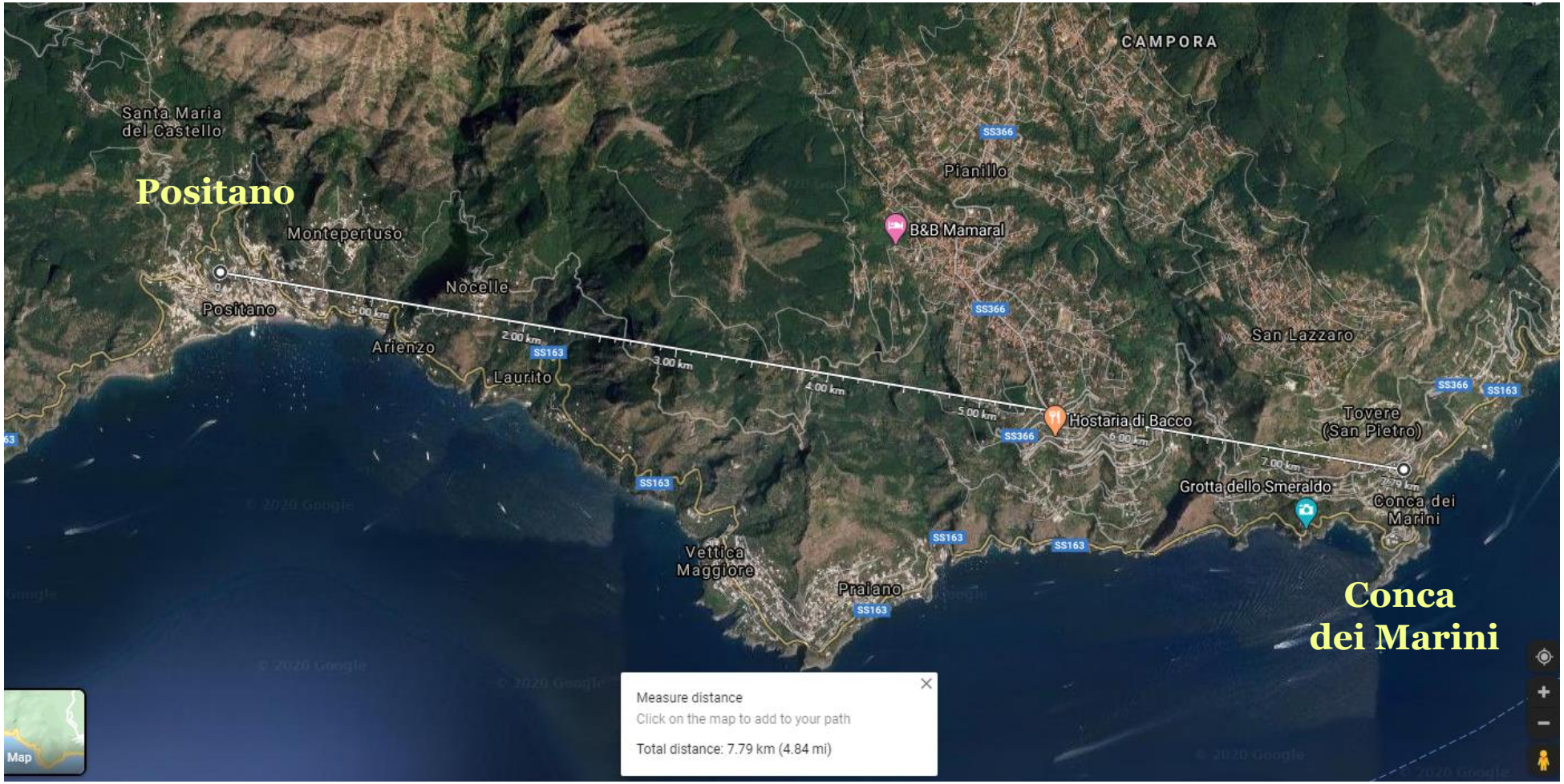
Georeferencing Procedure:

1. ***Find coordinates for the approximate corrected centers*** *of the* <u>*two*</u> ***named places*** *or* ***features*** *that the locality is said to be located between*
2. ***Measure a straight line between the two coordinates***
3. ***Determine the MIDPOINT*** *of this this line. The lat/long coordinates for this point will be the* ***coordinates*** *for your final georeference*
4. *Use the* ***distance from the midpoint to each of the two endpoints*** *(at the geographic centers of the two bracketing named places/features) as the* ***radial***

Feature – Between Two Features

Previously called: Named Place: Between Two Named Places (2012)

Definition: A locality cited as '*between*' two features or named places.



Find the total measurement between the geographic centers of both features (**7.79km**)

Description: "Between Positano and Conca dei Marini, Italy"

Feature – Between Two Features

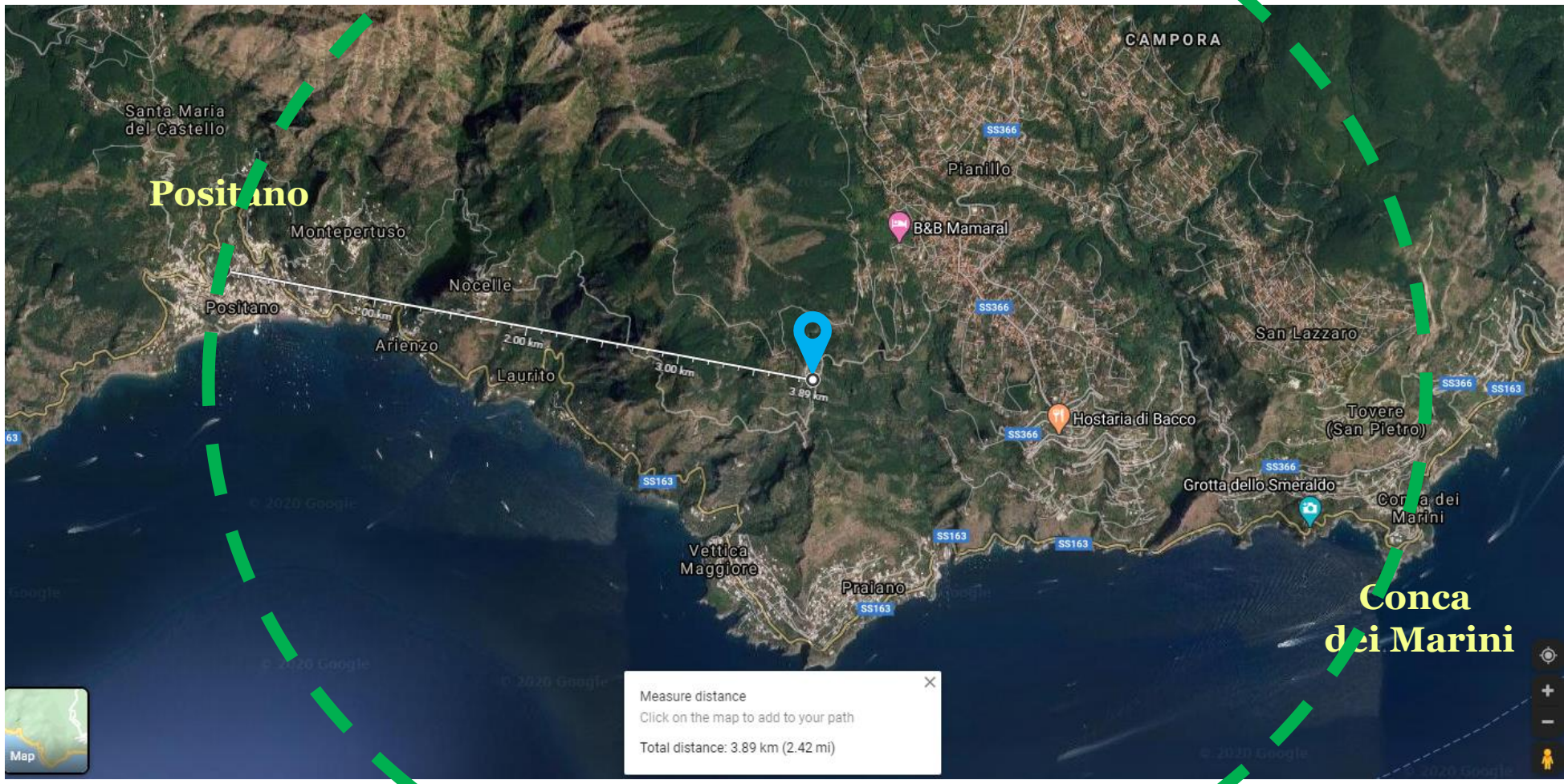
Definition: A locality cited as '*between*' two features or named places.

Click & hold the end node of the measurement tool to measure back to the ½ distance **(3.89km)** to find the midpoint

Description: "Between Positano and Conca dei Marini, Italy"

Feature – Between Two Features

Definition: A locality cited as '*between*' two features or named places.



Linear extent is the halved distance between the two localities **(3.89km)**

Description: "Between Positano and Conca dei Marini, Italy"

LOCALITY TYPE

Named Place

River, stream, road, path

Examples: "Sacramento River", "Jones Road", "Río Paraná", "Arroyo Urugua-í"

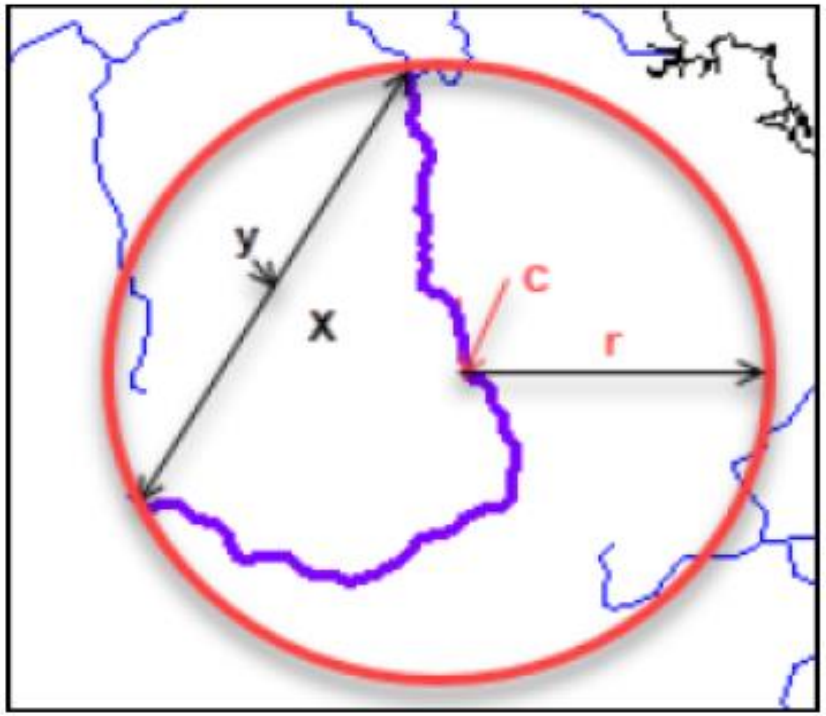
Feature - Path

Named Place: River, stream, road, path (2012)

Definition: The locality is a **linear feature** such as a *road*, *trail*, *boundary*, *river*, or *contour line;* or a specific ***subdivision of a linear feature*** that is bounded by other named places or features.

Georeferencing Procedure:

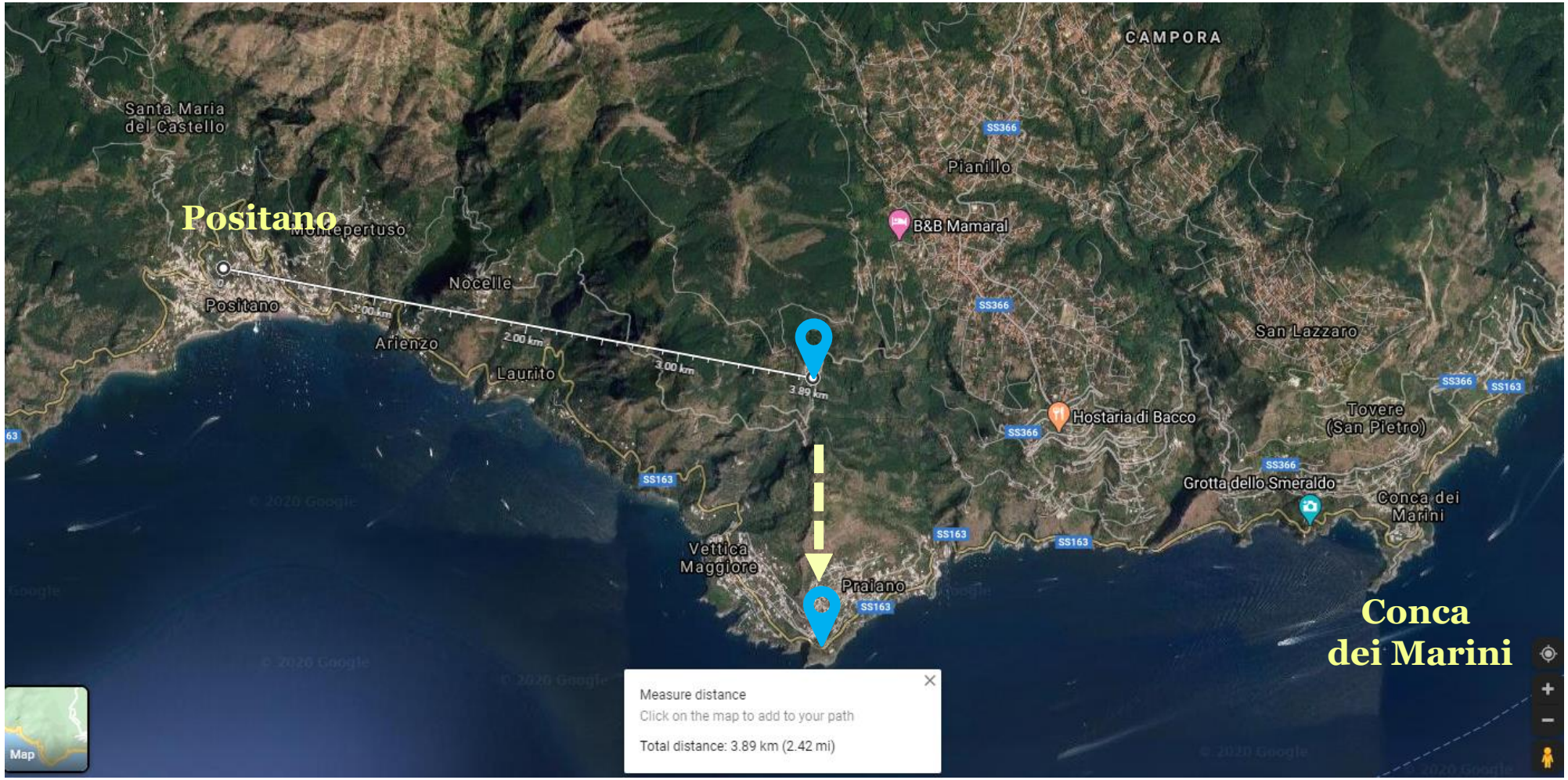
1. ***Find coordinates for the endpoints*** *of the linear feature*
2. ***Measure a straight line between the two coordinates***
3. ***Determine the MIDPOINT*** *of this this line.*
4. ***Find the closest point along the linear feature*** *to this midpoint →* ***Coordinates***
5. *Measure the* ***distance from these coordinates to the*** *farther of the* ***two endpoints →*** ***radial***



A path (river) showing the center of the smallest enclosing circle, ‘x’, the mid point between the ends of the river ‘y’, the corrected center ‘c’ and the radial ‘r’

Feature – Path

Definition: The locality is a **linear feature** such as a *road*, *trail*, *boundary*, *river*, or *contour line;* or a specific ***subdivision of a linear feature*** that is bounded by other named places or features.

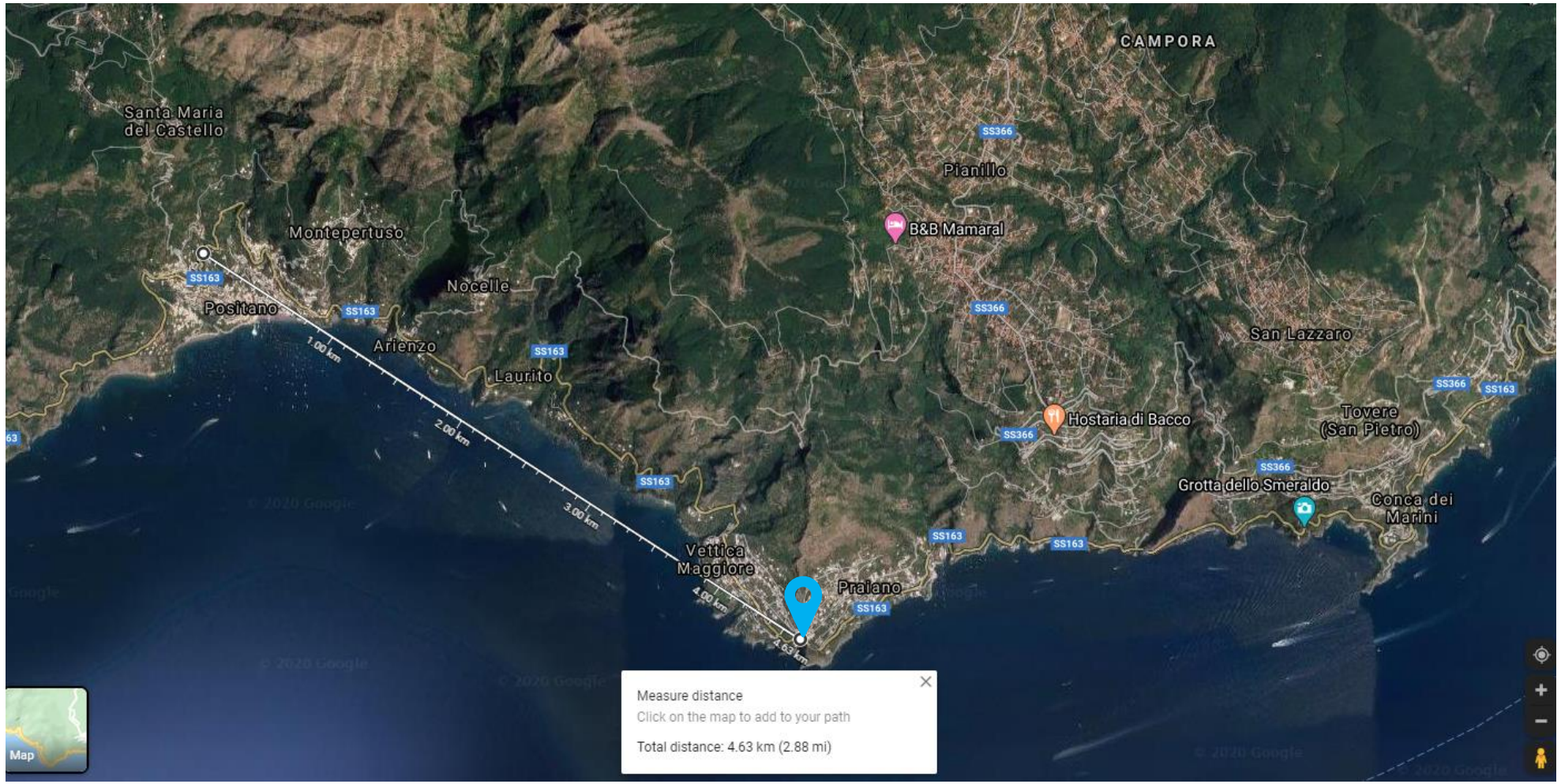


Measure a straight line between the location where the road comes closest to the centers of both cities, and half this distance (similar to previous example)

Description: "Along SS163 between Positano and Conca dei Marini, Italy"

Feature – Path

Definition: The locality is a **linear feature** such as a *road*, *trail*, *boundary*, *river*, or *contour line;* or a specific ***subdivision of a linear feature*** that is bounded by other named places or features.



Move the midpoint location to the road. Measure again from the new coordinates on the road to the farther of the cities to find linear extent **(4.63km)**

Description: "Along SS163 between Positano and Conca dei Marini, Italy"

Feature – Path

Definition: The locality is a **linear feature** such as a *road*, *trail*, *boundary*, *river*, or *contour line;* or a specific ***subdivision of a linear feature*** that is bounded by other named places or features.

Description: "Along SS163 between Positano and Conca dei Marini, Italy"

Re-measure from new midpoint (on road) to the farther of the two end points (either city), as moving the point will change initial halved distance measurement and we want the larger of the two distances for linear extent

Feature – Path

Definition: The locality is a **linear feature** such as a *road*, *trail*, *boundary*, *river*, or *contour line;* or a specific ***subdivision of a linear feature*** that is bounded by other named places or features.

No specified boundaries??

Georeference the **entire** linear feature!!

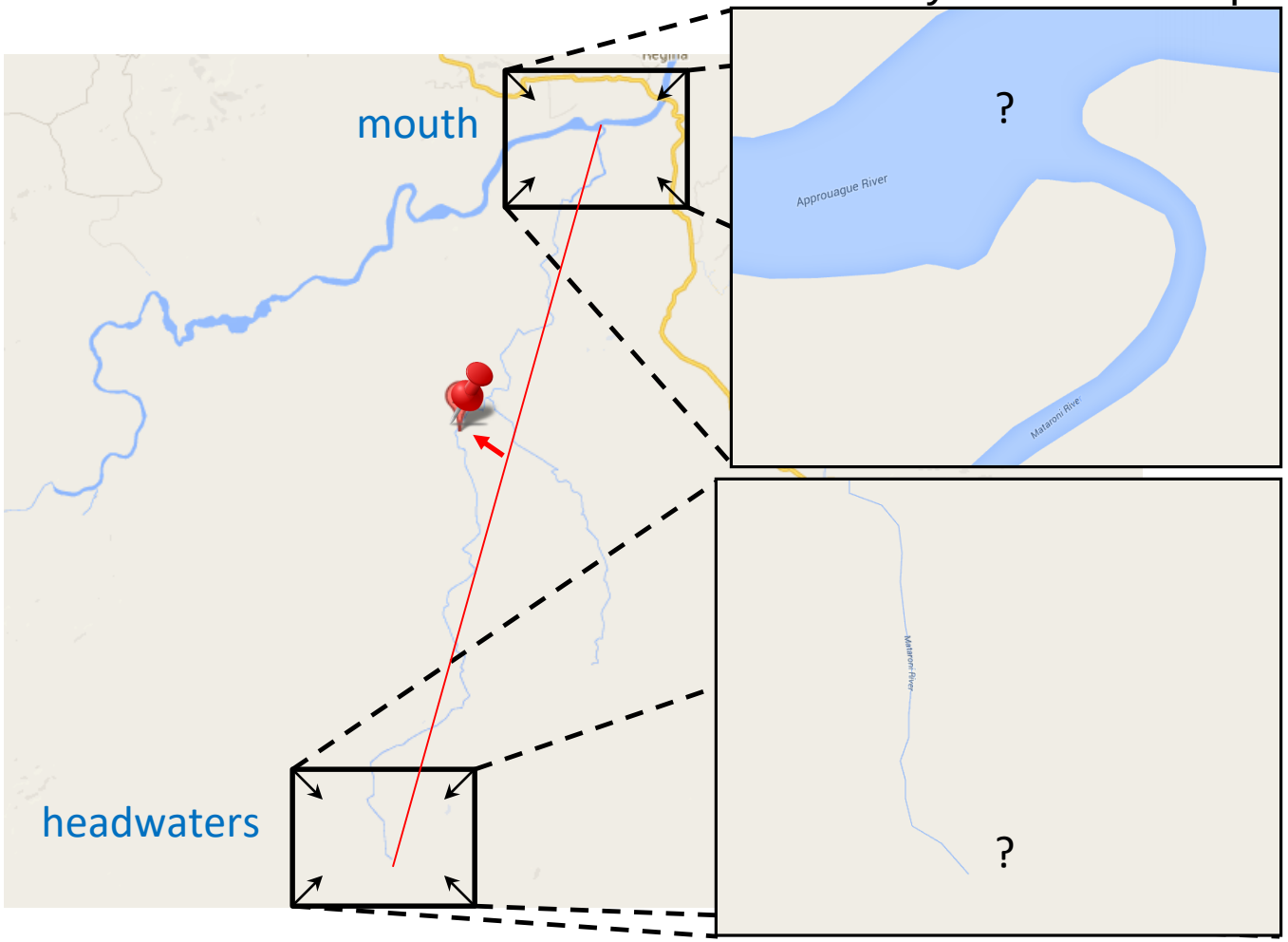
EX.2 "Mataroni River, *Cayenne, French Guiana"*

Feature – Path

Definition: The locality is a **linear feature** such as a *road*, *trail*, *boundary*, *river*, or *contour line;* or a specific ***subdivision of a linear feature*** that is bounded by other named places or features.

No specified boundaries??

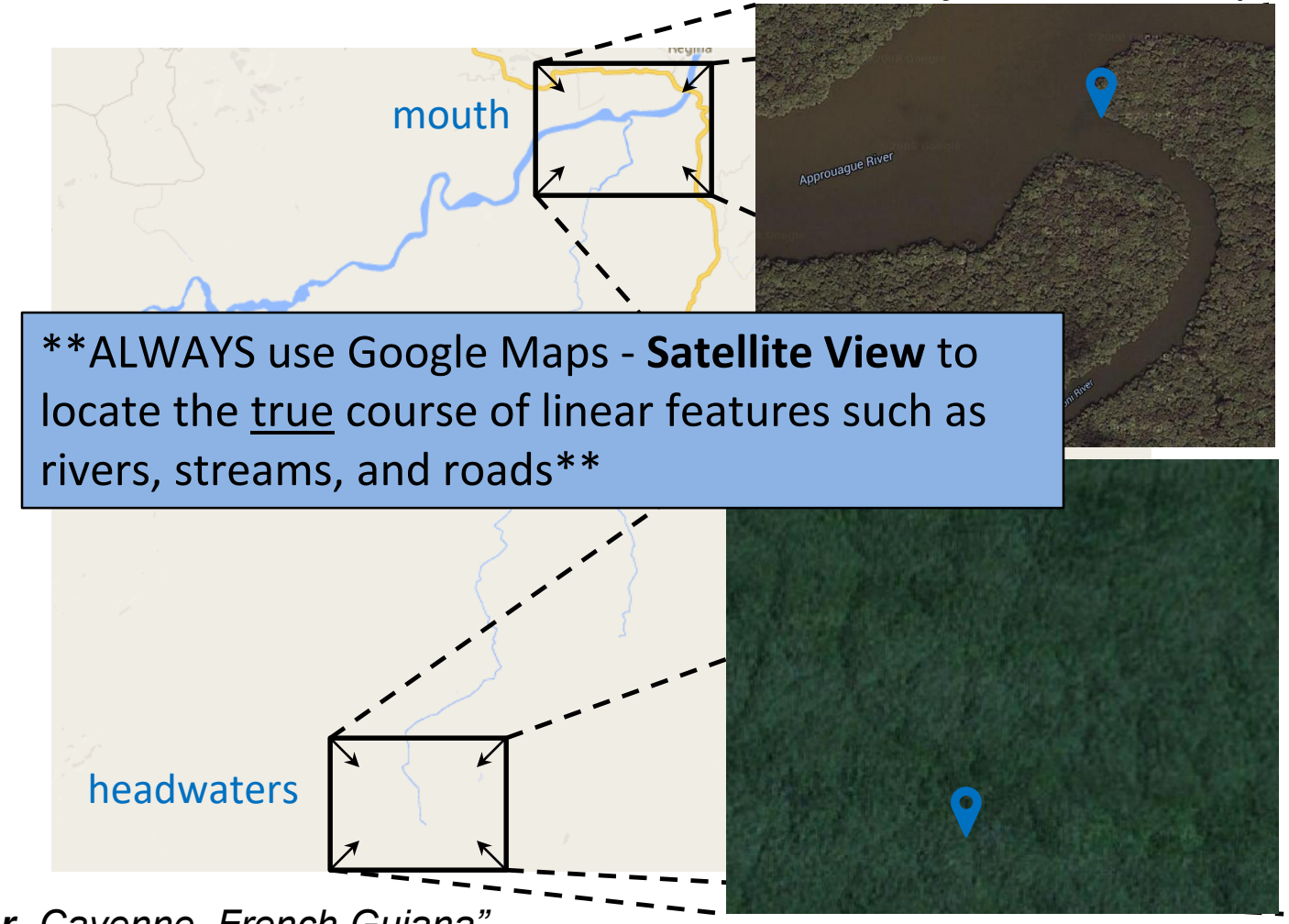
Georeference the **entire** linear feature!!



EX.2 "Mataroni River, *Cayenne, French Guiana"*

Feature – Path

Definition: The locality is a **linear feature** such as a *road*, *trail*, *boundary*, *river*, or *contour line;* or a specific ***subdivision of a linear feature*** that is bounded by other named places or features.



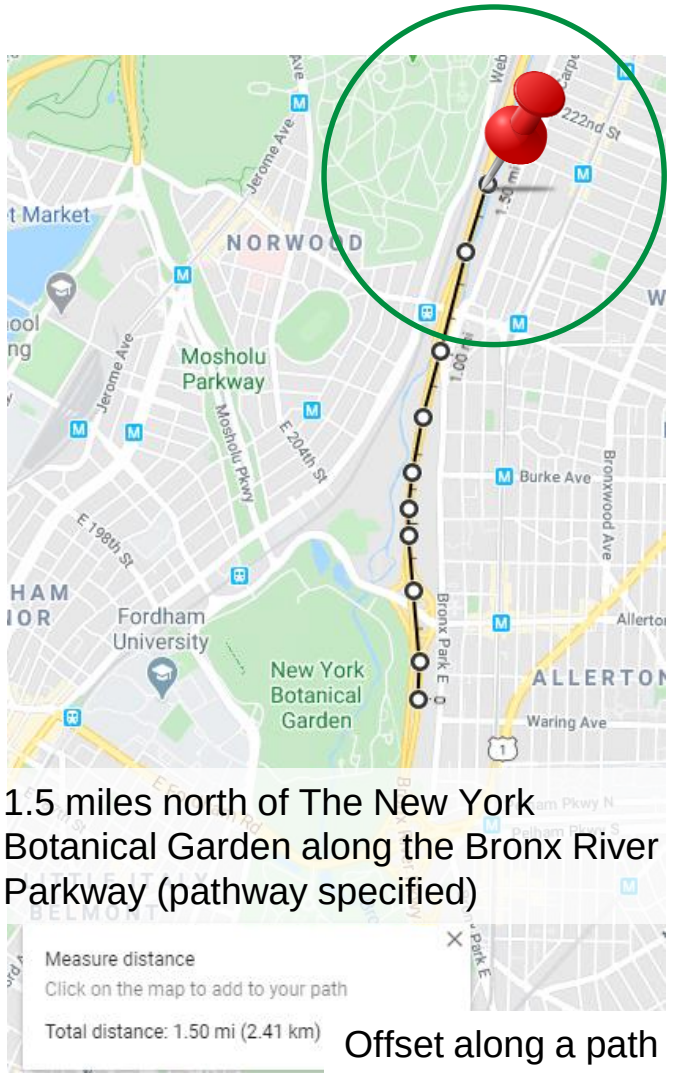
EX.2 "Mataroni River, *Cayenne, French Guiana"*

Offsets

An offset is a **displacement from a reference point**, and is generally accompanied by a direction

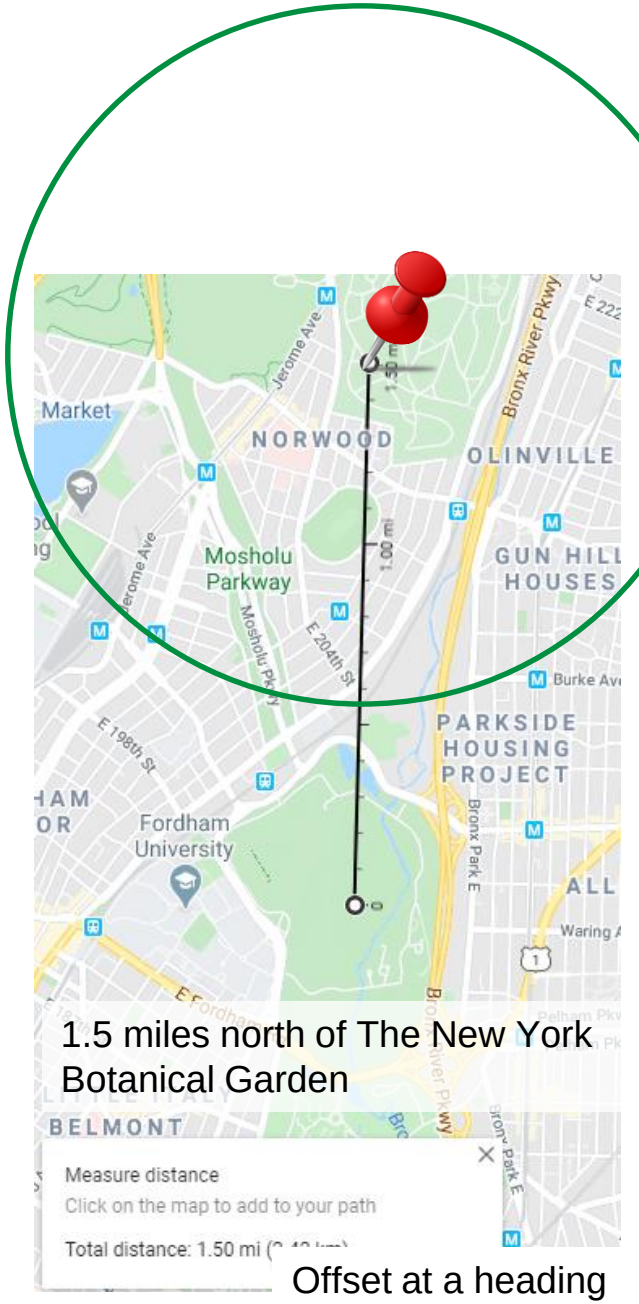
- Some locality descriptions give a method for determining the offset (‘by road’, ‘by river’, etc.). In such cases, **follow the path designated** as best as possible.

- It is sometimes **impossible to infer the offset path** from evidence in the locality description, in these cases **assume offset by air** (“offset at a heading” locality type).



1.5 miles north of The New York Botanical Garden along the Bronx River Parkway (pathway specified)

Offset along a path



1.5 miles north of The New York Botanical Garden

Offset at a heading

LOCALITY TYPE

Offset

Offset along a path

Examples: "7.9 mi N Beatty, on US 95", "3 km en el Rio Jimenez arriba de Anita Grande", "left bank of the Mississippi River, 16 mi downstream from St. Louis", "Ruta Nacional 81, 8 km W de Ingeniero Guillermo Nicasio Juárez"

Offset – Distance along a Path

Previously called: Offset: Offset along a path (2012)

Definition: The locality consists of a **specified <u>distance</u>,** and a **specified <u>route</u>** from a single named place; For example along a *road*, *river*, *path*, *stream*, etc.

Georeferencing Procedure:

1) **Determine the starting point** for the offset, begin measurement here.

2) **<u>Manually</u> Measure Distance** along the route from the starting point using Google MAPS – Distance measurement tool → *Final* ***<u>Coordinates</u>***

3) **Return to starting location and determine the radial** for the chosen **starting point** as you would for a Feature – with Obvious Spatial Extent → *BIG PART* of final **<u>Uncertainty</u>**!!

LOCALITY TYPE

Offset

Offset at a heading

Examples: "50 miles W of Las Vegas", "10 km E de Amamá"

Offset - Distance at a Heading

Previously called: Offset: Offset at a heading (2012)

Definition: The locality consists of a **specified <u>distance</u>**, and a **specified <u>direction</u>** (Ex. "***N", "east", "SW***", etc.) from a single named place.

Georeferencing Procedure:

1) **Determine the starting point** for the offset and find coordinates for the geographic center

2) **Determine the linear extent** for this chosen **starting point** as you would for a FEATURE (Named Place)

3) **MANIS CALCULATOR** → *Final* ***Coordinates*** & *Final* ***Uncertainty***

Can be automated by using GEOLocate (for U.S.A., Canada, and Europe)

LOCALITY TYPE

Offset

Offset in orthogonal directions

Examples: "6 km N and 4 km W of Welna"

Offset – Distance along Orthogonal Directions

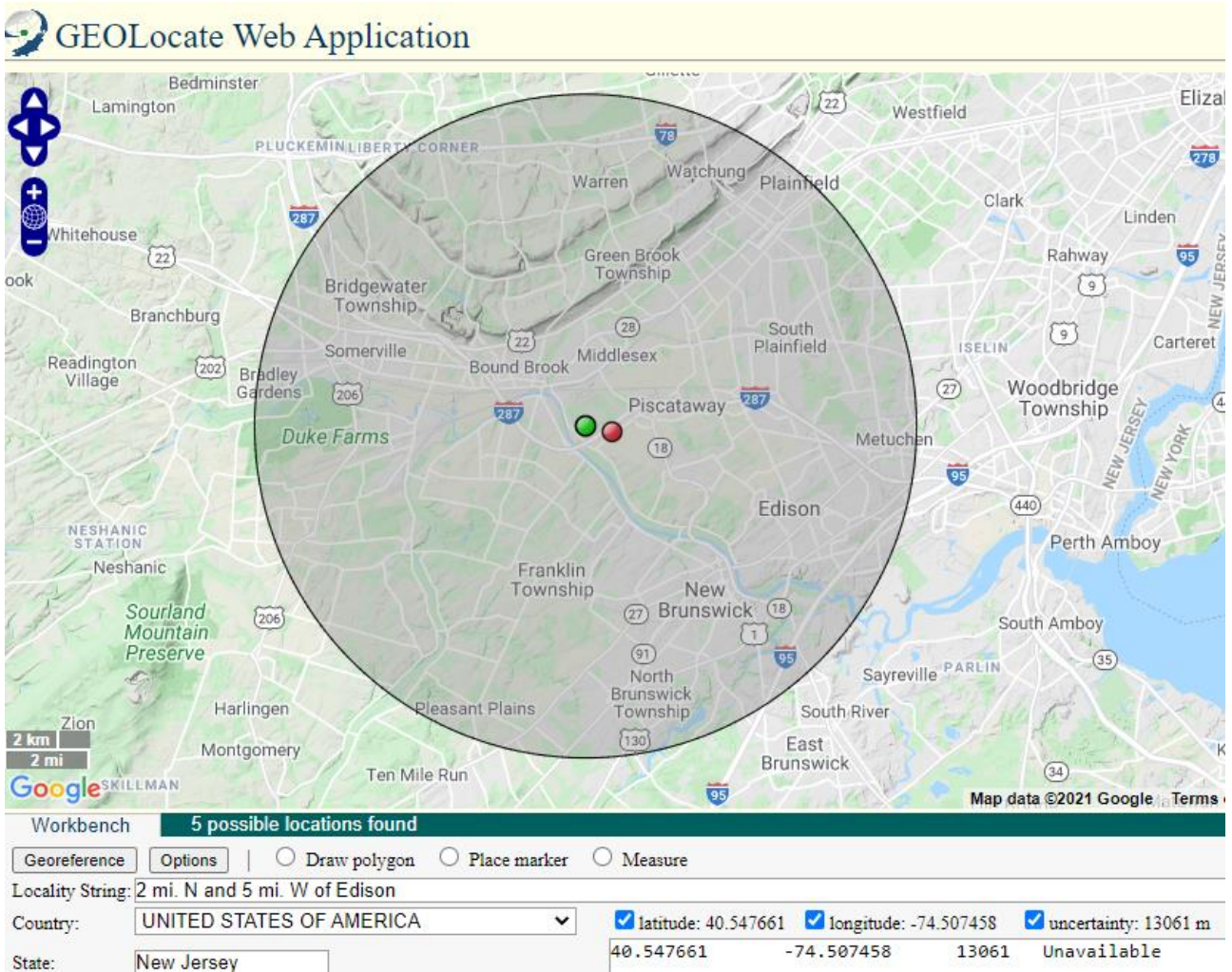
Offset: Offset in orthogonal directions (2012)

Definition: The locality consists of a linear distance in each of two orthogonal directions from a feature.

Georeferencing Procedure:

Best and easiest method to approach these localities (for U.S.A., Canada, and Europe) is by using GEOLocate

Otherwise consult the Georeferencing Quick Reference Guide



LOCALITY TYPE

Offset

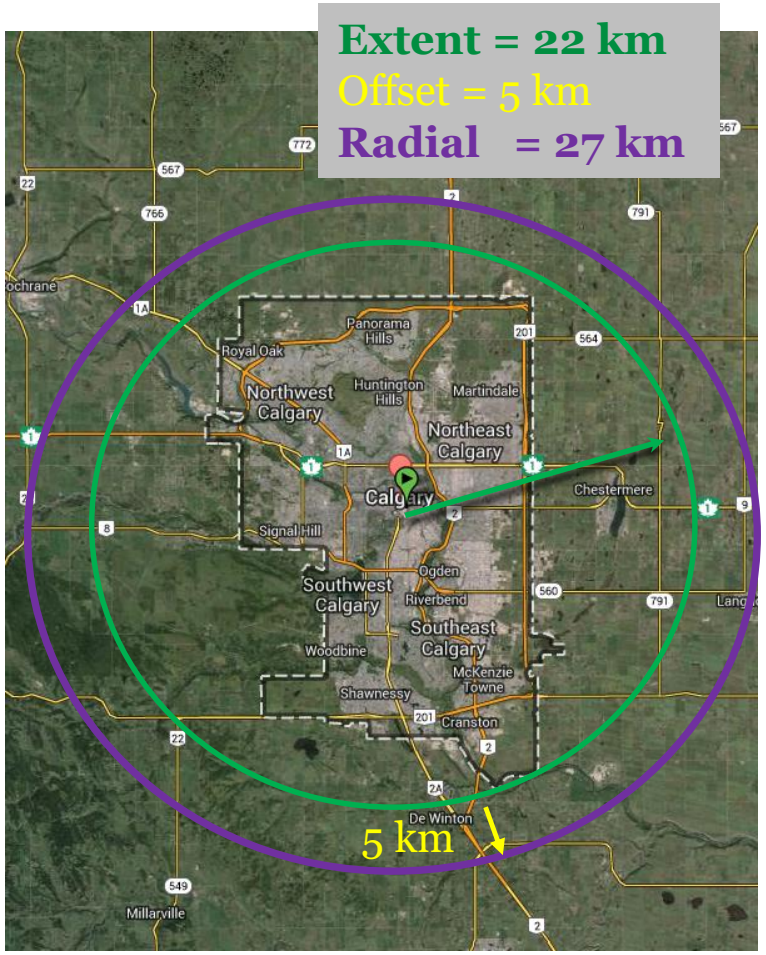
Offset only, no direction

Examples: "5 km outside Calgary", "12 km fuera de Purmamarca"

Offset - Distance Only

Previously called: Offset: Offset only, no direction (2012)

Definition: Locality consists of an offset from a feature without any direction specified.



Georeferencing Procedure:

1) **Determine the starting point** for the offset and find coordinates for the corrected center → *Final* ***Coordinates***

2) Determine the boundary of the feature as you would for Near a Named Feature, except that the distance to use for the buffer is the distance given in the locality description **(*add* the buffer distance to the radial of the feature)**

3) **MANIS CALCULATOR** → *Final* ***Uncertainty***

LOCALITY TYPE

Offset

Direction only, no distance

Examples: "N Palmetto", "N of Berkeley", "Saladillo N", "Al N de Saladillo"

Offset – Heading Only

Previously called: Offset: Direction only, no distance (2012)

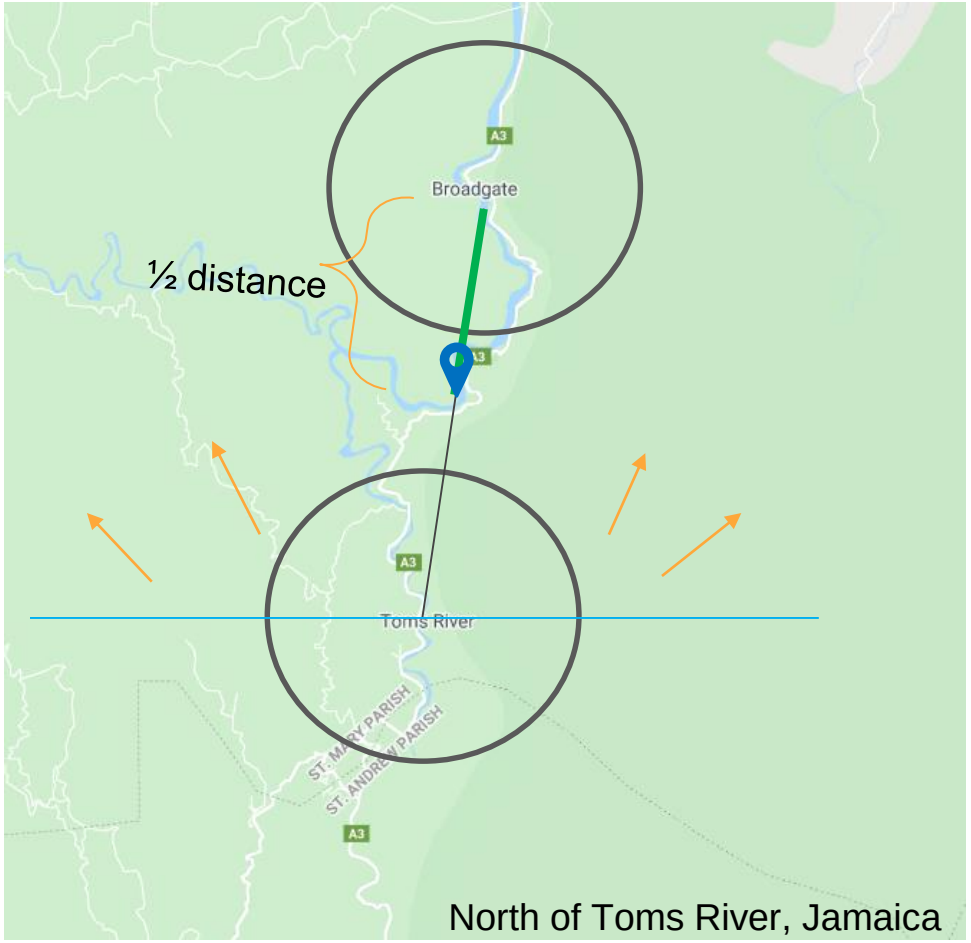
Definition: The locality consists of a direction from a feature without any distance specified.

Georeferencing Procedure:

1. ***Find coordinates for*** *the approximate center of:* ***the focal named feature*** *and* ***the nearest named feature in the direction specified***

2. ***Determine the MIDPOINT*** *between the two centers. The lat/long coordinates for this point will be the* ***coordinates*** *for your final georeference*

3. *Use the distance from the coordinates to the center of either locality as the* ***radial***

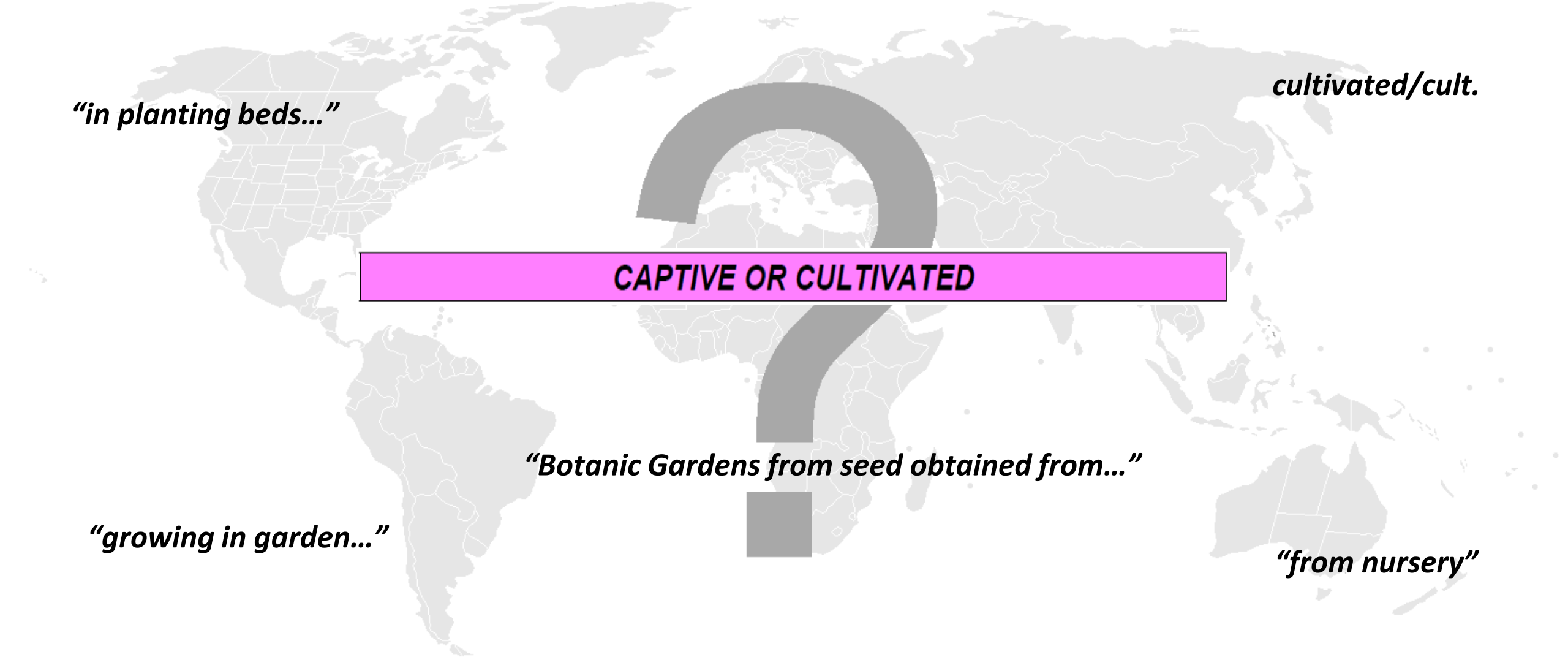


North of Toms River, Jamaica

Wieczorek J, et. al. 2012. Georeferencing Quick Reference Guide, version 2012-10-08. https://www.idigbio.org/wiki/images/1/1e/GeoreferencingQuickReferenceGuide.pdf

SITES WHICH YOU SHOULD **NOT** GEOREFERENCE

SITES WHICH YOU SHOULD **NOT** GEOREFERENCE



cultivated/cult.

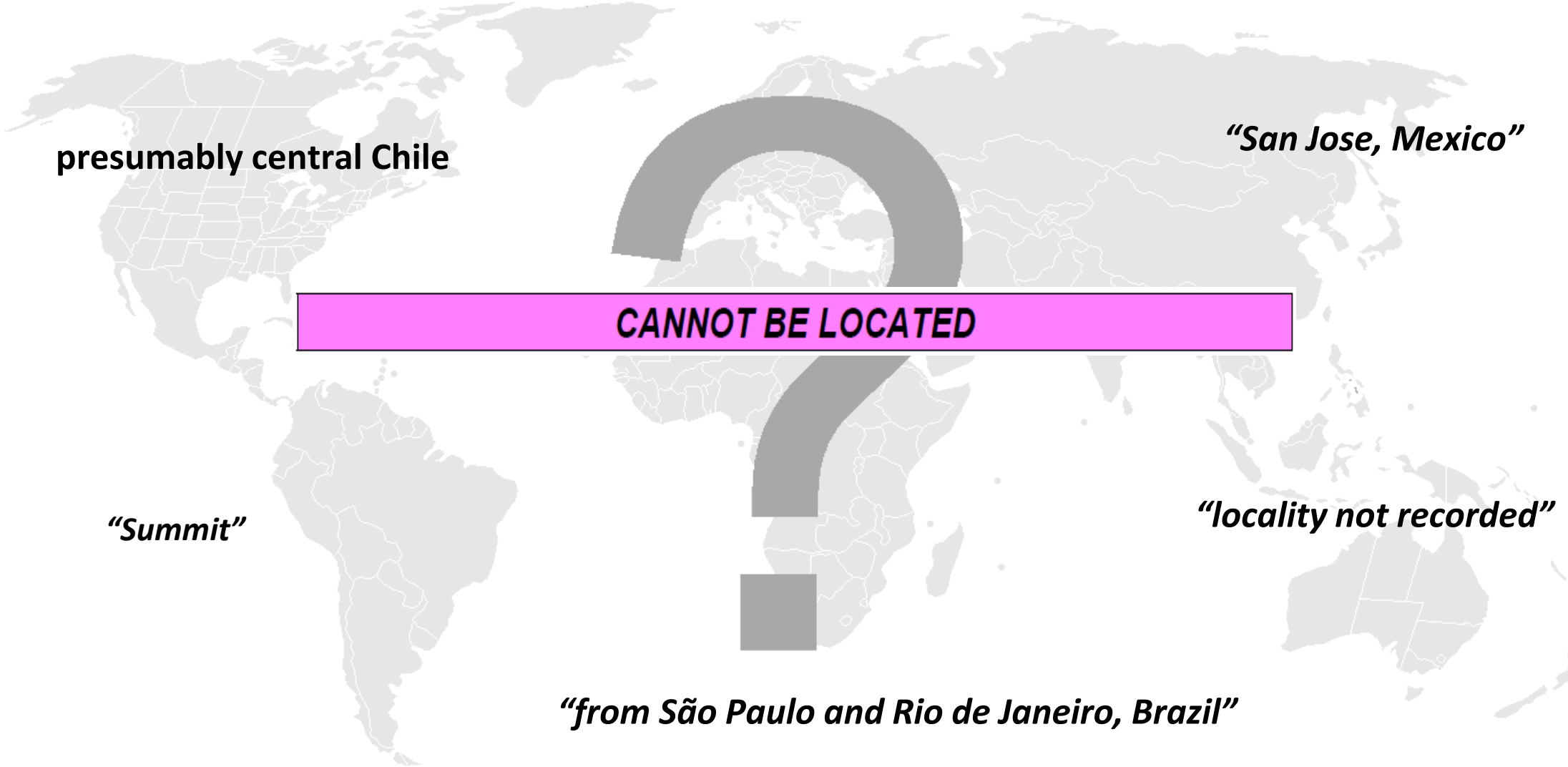
"in planting beds…"

"Botanic Gardens from seed obtained from…"

"growing in garden…"

"from nursery"

SITES WHICH YOU SHOULD **NOT** GEOREFERENCE



SITES WHICH YOU SHOULD **NOT** GEOREFERENCE

"Delano, Tulare Co." **[Delano is in Kern Co.]**

"10 mi W of Bakersfield, 6000 ft" **[No place in area at that elevation]**

MaNIS Calculator

To be used in conjunction with Google Maps

Specialized calculator used to determine the final uncertainty radial captured for our georeference when using Google Maps (not applicable when using GEOLocate)

- Incorporates measurement of locality's **radial** in addition to **all other sources** of error
- Also used to calculate final **coordinates** for "Offset at a Heading" localities

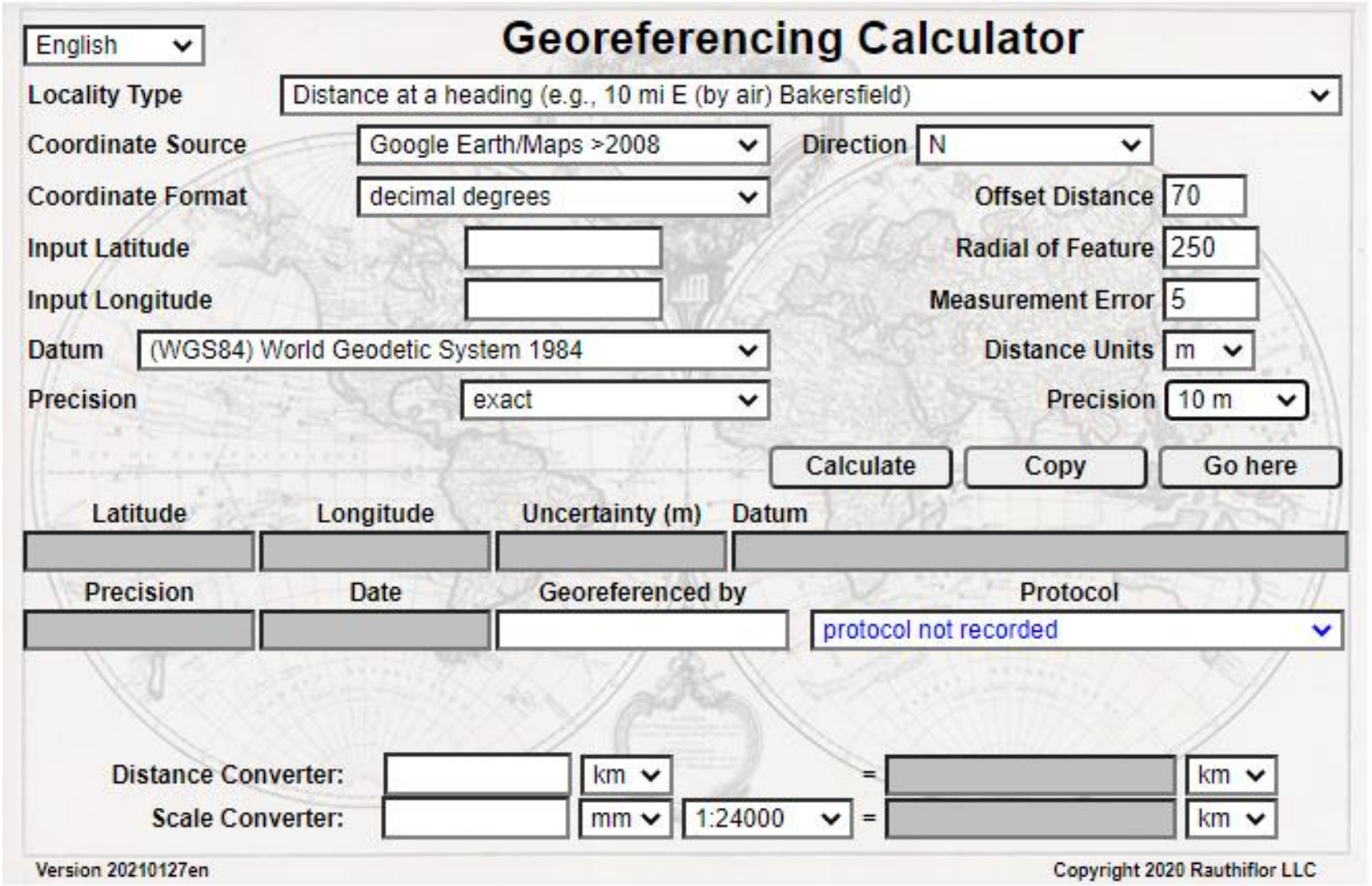
Work Flow:

- Select the **Locality Type** that best matches the description of the feature that you are georeferencing
- Enter all of the **error parameters** needed to make the calculation
- **Calculate –output provided in meters**

workflow for each locality type is concisely outlined in Georeferencing Quick Reference Guide (2012 edition)

Parameters

http://georeferencing.org/georefcalculator/gc.html



Fields display depending on locality type:

Locality Type: Choose from the 6 choices provided; mainly: Coordinates and error, Error only, Coordinates only.

Coordinate Source: **Google Maps > 2008**

Coordinate Format: **Decimal degrees**

Datum: **WGS84**

Coordinate Precision: **exact**

Direction: (offset at a heading only) Dependent on locality description

North/South Offset & East/West Offset Distance: (orthogonal directions only)

Offset Distance: As stated in locality description, record and calculate in units provided

Measurement Error: Determine (or estimate) the smallest distance that you can reliably (reproducibly) measure on the map **(we use 10 m)**

Distance Units: **Meters**, unless offset provided in another unit (MUST convert to meters before entering into EMu – Calc. does this automatically)

Distance Precision: (for offset locality types) Dependent on precision of the offset distance (i.e. an offset of 2 km would have a distance precision of 1 km, 10 km would have a distance precision of 10 km, 11 km would have a distance precision of 1 km).

Georeferencing Remarks

Notes or comments out of the ordinary about the georeference, explaining assumptions made in addition/opposition to the method referred to in the protocols followed. We aim to keep notes to **255 characters and under**.

Dr. Davies Farm, Clarkstown, NY

Situation: Cannot find farm referenced. Moving up the geographical hierarchy.

Sample notes: Unable to locate Dr. Davie's farm. Georeferenced to the corrected center of Clarkstown.

10 miles from Yonkers along the Saw Mill River Parkway

Situation: Cannot determine direction along the road in which to measure offset, defaulted to the locality type in which the area of the collection would be captured (larger radius).

Sample notes: Unable to determine direction of offset along road. Followed protocol for distance only locality type.

Capturing Metadata

The Darwin Core standard defines all of the fields recommended for the capture of reproducible georeferences

- **decimalLatitude, decimalLongitude, geodeticDatum (EMu: Latitude, Longitude, Datum)** : these fields provide the reference for the center of the point-radius representation of the georeference
- **coordinateUncertaintyInMeters (Radius (Numeric))**: the distance from the given coordinates that describes the smallest enclosing circle that contains the whole of the location
- **georeferencedBy, georeferencedDate (Determined By, Determination Date)**: the individual(s) who last modified the georeference. These correspond to the final authority on the georeference in the current state.
- **georeferenceProtocol (Determination Method)**: Reference to the methods used to determine the coordinates and uncertainty of the georeference
- **georeferenceSources (Determination Source)**: A list (concatenated and separated) of maps, gazetteers, or other resources used to georeference the location
- **georeferenceRemarks (Notes)**: Notes or comments out of the ordinary about the georeference, explaining assumptions made in addition or opposition to those formalized in the guide followed

Best Practices/Guides

- Georeferencing Quick Reference Guide (2020)
- Georeferencing Quick Reference Guide (2012)
- Georeferencing Best Practices (2020)
- Georeferencing Calculator Manual (2020)
- BioGeomancer Guide to Best Practices in Georeferencing
- MaNIS/HerpNET/ORNIS Georeferencing Guidelines