

Georeferencing Natural History Collections Data: The GEOLocate Project


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Tulane
University

iDigBio
Wet Collections Workshop
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What is Georeferencing

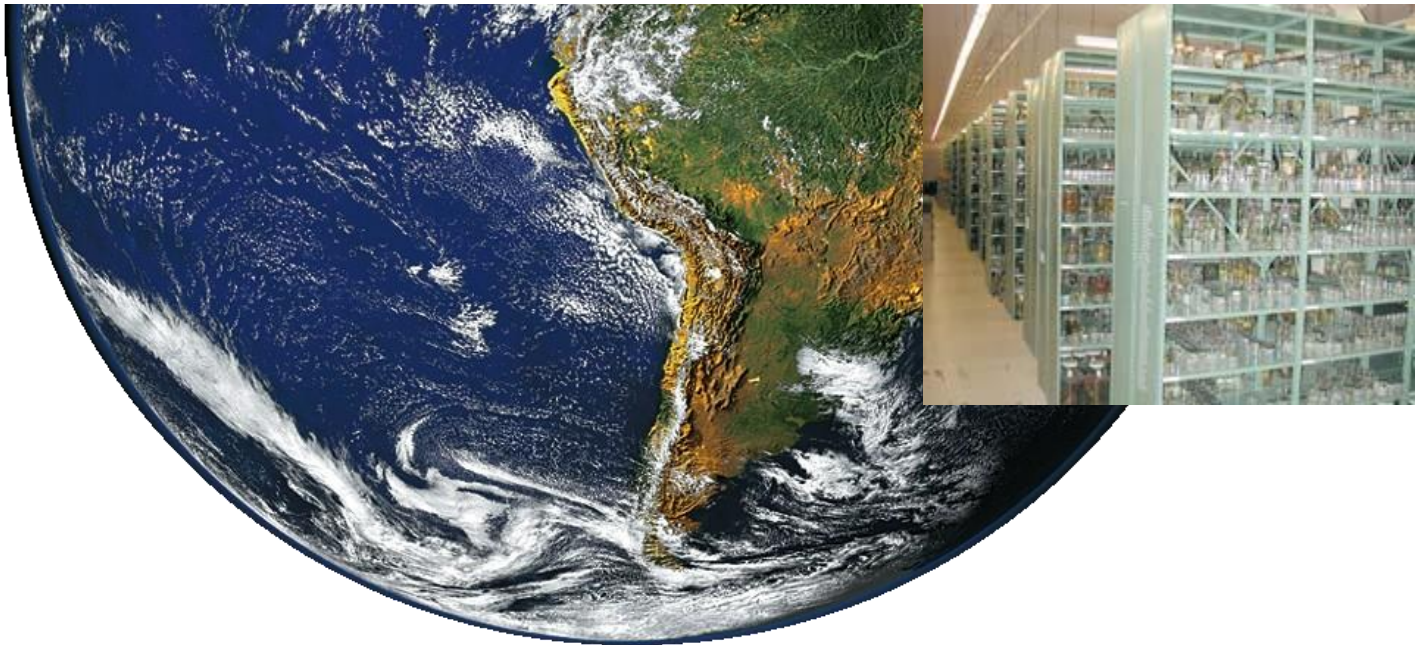


pushepatapa creek, trib. to pearl river, 7.8 miles north of bogalusa at hwy 21; Washington; LA; USA

latitude: **30.88797**
longitude: **-89.83601**
uncertainty radius: **48m**
uncertainty polygon:
30.88823,-89.83641,
30.88815,-89.83634,
30.88808,-89.83622...

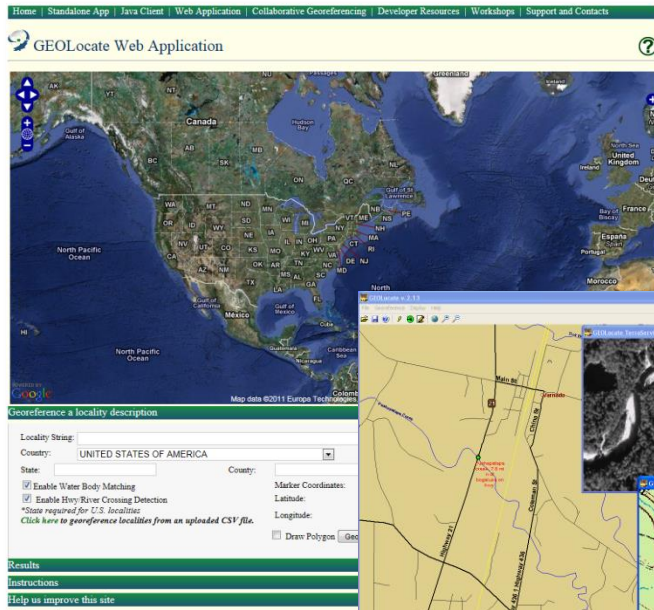


3 billion specimens with $\frac{1}{2}$ billion collecting events



Traditional Methods





Software & services for
georeferencing of natural history
collections data

automated georeferencing

verification & correction

multi-lingual

interoperability

soap & rest api

training

uncertainty determination

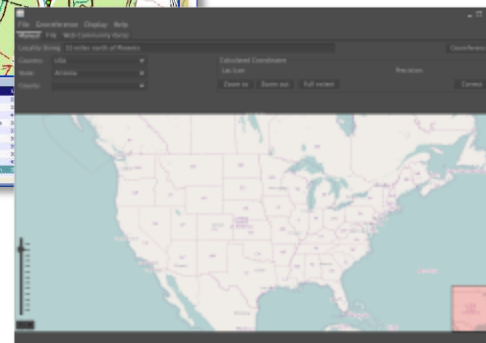
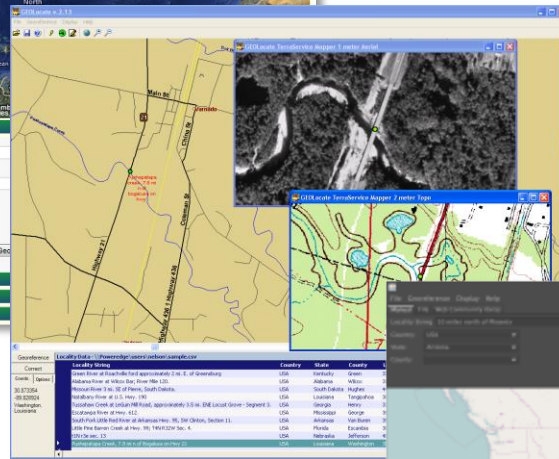
collaborative georeferencing

kml export

batch processing

geographic visualization

google, bing, openstreet, wms



Typical GEOLocate Workflow

1 Data Entry & Preparation

*pushepatapa creek, trib. to pearl river,
7.8 miles north of bogalusa at hwy 21;
Washington; LA; USA*

2 Automated Processing

Georeferencing Algorithm

3 Manual Verification

*Visualize, verify & adjust output
coordinates & uncertainties*



*latitude: 30.88797
longitude: -89.83601*

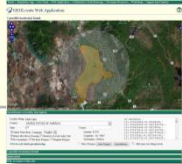
uncertainty radius: 48m

*uncertainty polygon:
30.88823,-89.83641,
30.88815,-89.83634,
30.88808,-89.83622...*

Options: Web vs. Desktop?



Web Based Clients

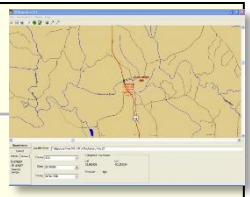


The following web based clients based web clients are available to allow you to georeference data directly from your web browser:

- **User input georeferencing client**
 - Simply type in your locality description and get back georeferenced results. Start here if you are new to GEOLocate.
- **File based input (batch) georeferencing client**
 - Allows you to upload a .csv file and batch process it.
- **Collaborative georeferencing client**
 - Utilizes the collaborative georeferencing framework. Ideal for largescale multi-institution projects projects.
- **Embeddable client**
 - A streamlined web client for the purpose of embedding in other web applications.
[Sample link](#) of how an external application on another domain might use this client.
[Documentation link](#) on how to craft URLs for this client.




GEOLocate Standalone Desktop Application (version 3.xx)



[Features](#) | [Frequently Asked Questions](#) | [Updates](#) | [Downloads](#)

Georeferencing Example: Desktop App

GEOLocate v.2.1
File Georeference Display Help



Georeference
Correct

Locality String: Tallapoosa River 5.0 mi N of Buchanan, Hwy 27

Coords: Options
33.876607
-85.168067
Haralson, Georgia

Country: USA
State: GEORGIA
County: HARALSON

Calculated Coordinates
Lat: 33.863438 Lon: -85.213334
Precision: High

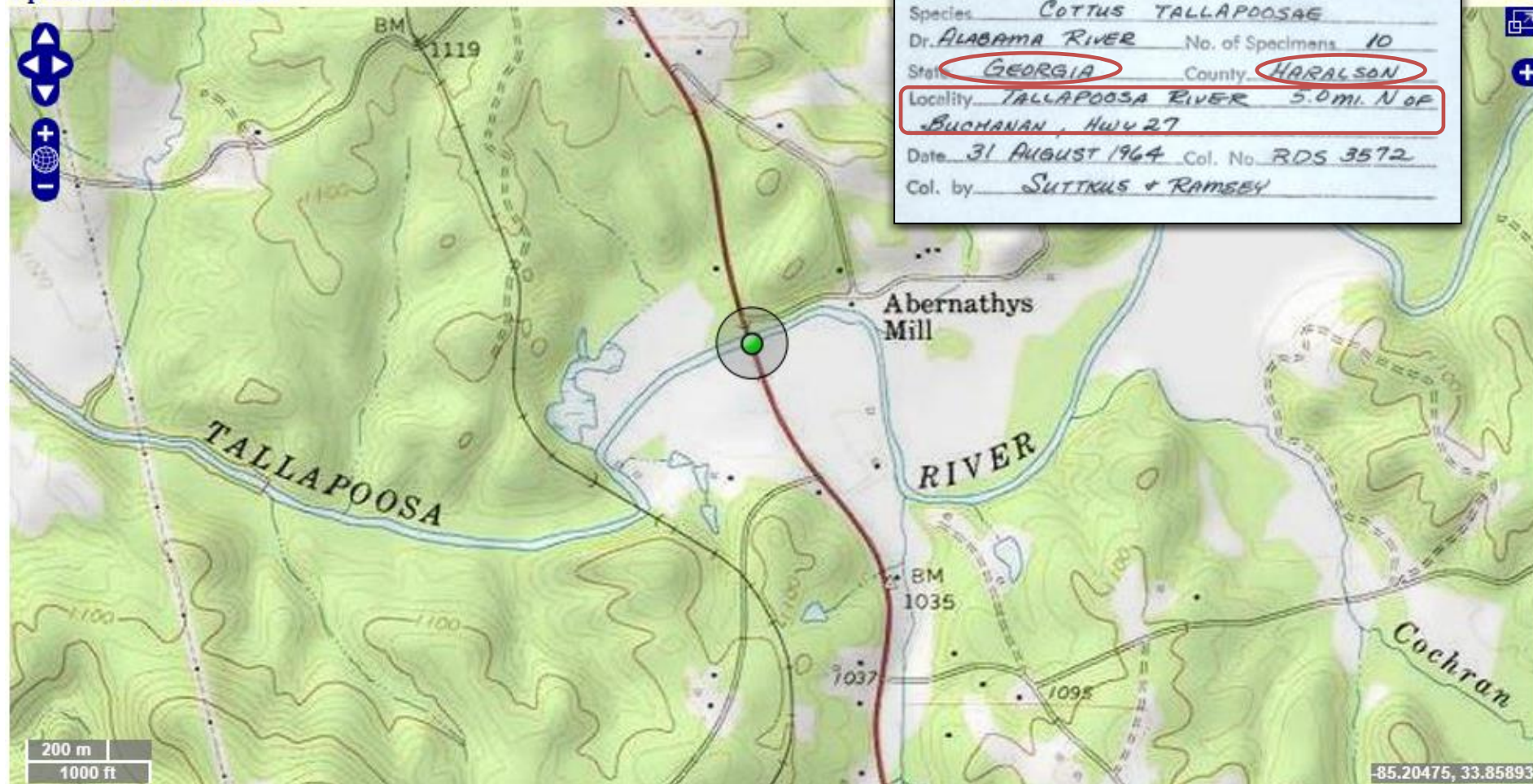
PARATYPES
TULANE UNIVERSITY COLLECTIONS

Family No. 385 Cat. No. 34409
Species: COTTUS TALLAPOOSAE
Dr. ALABAMA RIVER No. of Specimens 10
State: GEORGIA County: HARALSON
Locality: TALLAPOOSA RIVER 5.0 MI. N OF
BUCHANAN, HWY 27
Date: 31 AUGUST 1964 Col. No. RDS 3572
Col. by: SUTTKUS + RAMSEY



GEOLocate Web Application

1 possible location found.



Workbench

1 possible location found

Georeference | Options | ☐ Draw polygon ☐ Place marker ☐ Measure

Locality String:

Country:

State:

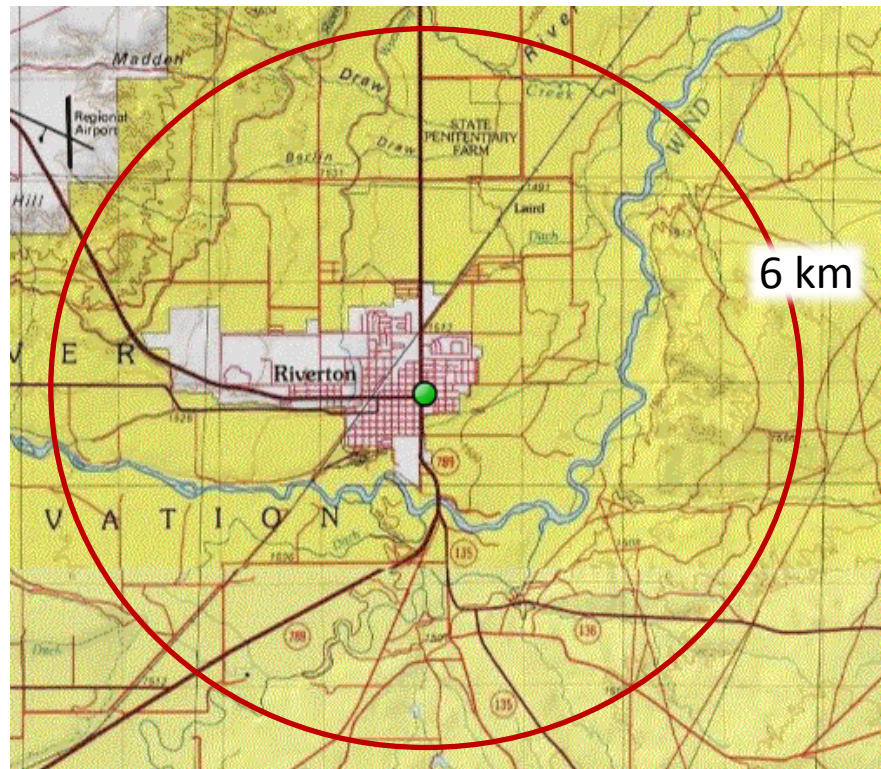
County:

☒ latitude: 33.863438 ☒ longitude: -85.213334 ☒ uncertainty: 90 m ☒ error polygon

33.863438 -85.213334 90 Unavailable

Algorithm Performance

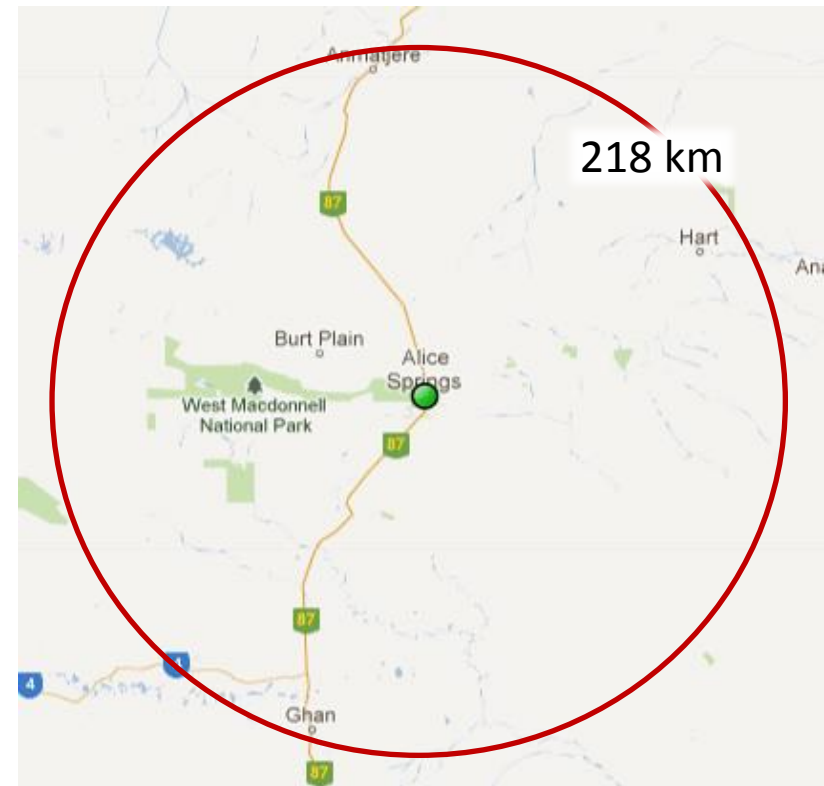
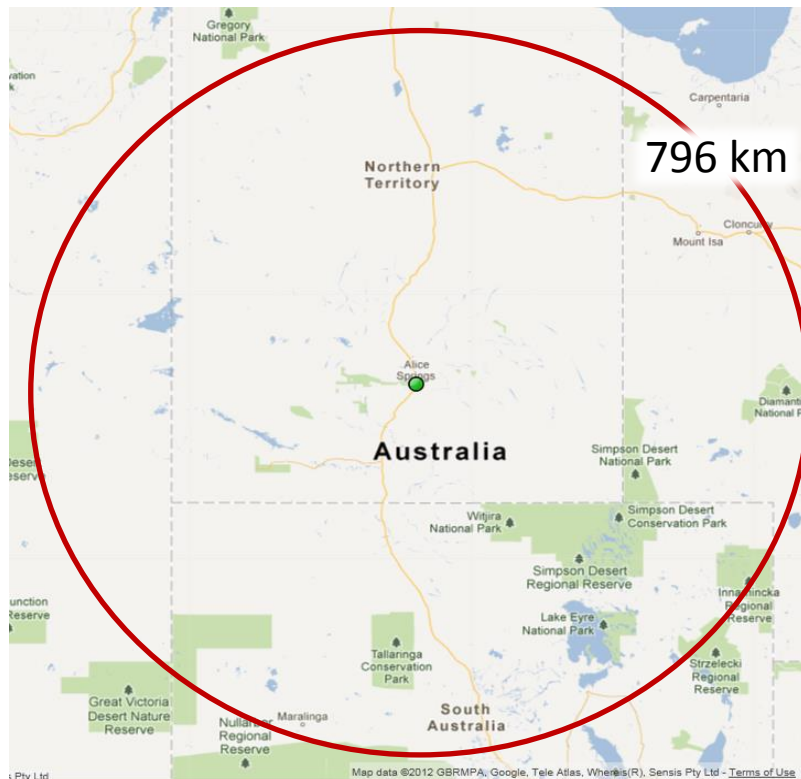
Versus Known U. S. Localities			
	% Found	Mean Dist. Off	Standard Error
GEOLocate	95%	6.1 km	2.1 km



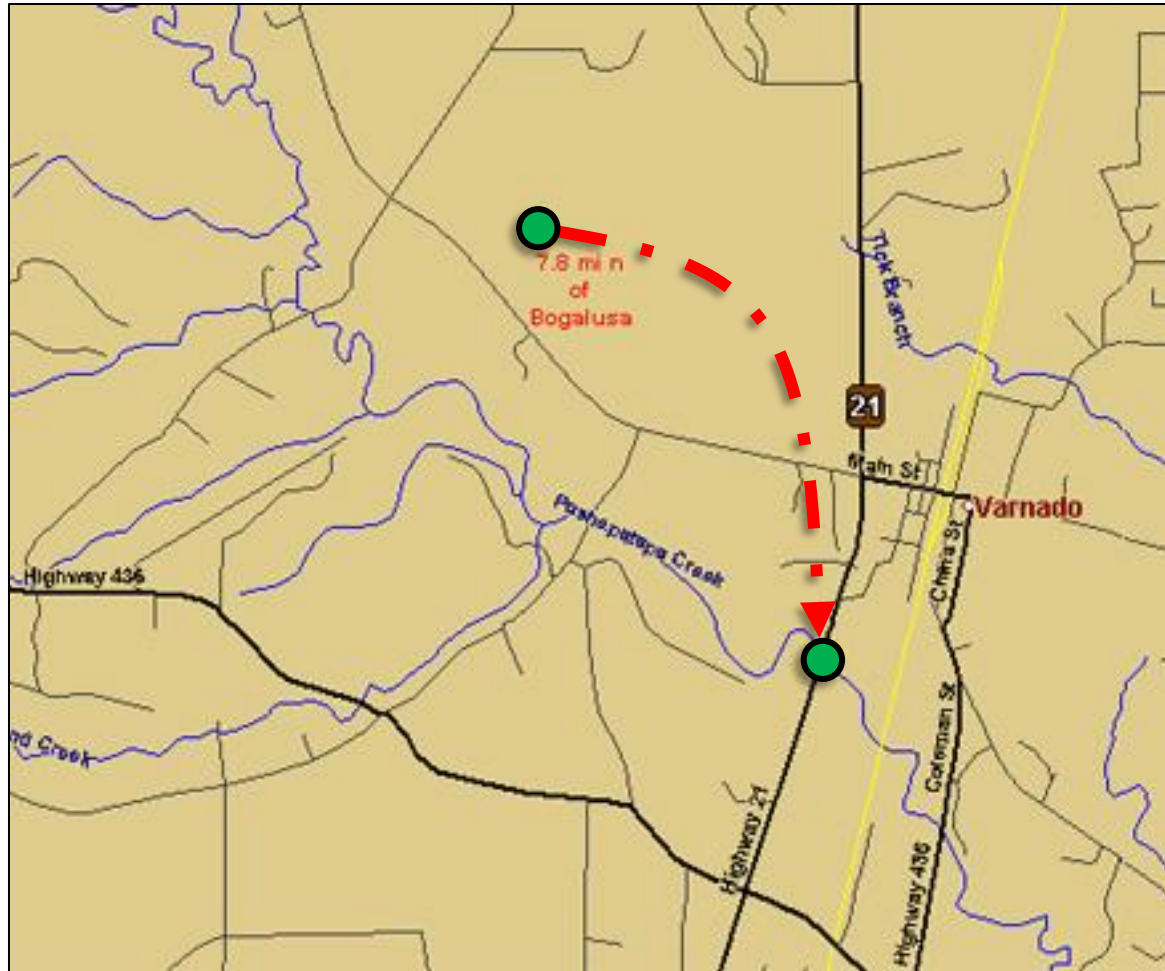
Algorithm Performance

Versus Known Australian Localities

	% Found	Mean Dist. Off	Standard Error
GEOlocate	86 ➡ 97%	796 ➡ 218 km	154 ➡ 48 km



Verification & Adjustment of Automated Outputs

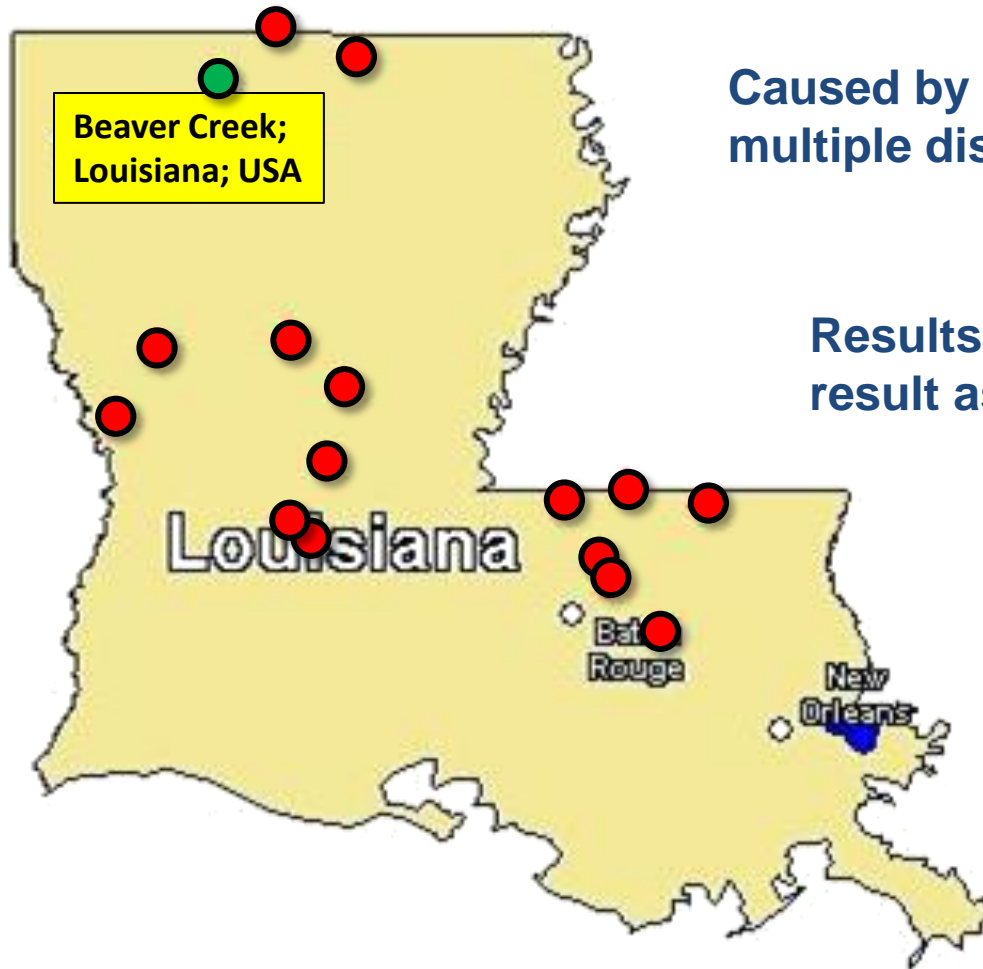


**Computed coordinates
are displayed on digital
maps**

**Manual verification of
each record**

**Drag and drop
correction of records**

Multiple Result Handling



Caused by duplicate names, multiple names & multiple displacements

Results are scored and most “accurate” result assigned to active marker (green)

All results are recorded and displayed as static markers (red)

Measuring Uncertainty



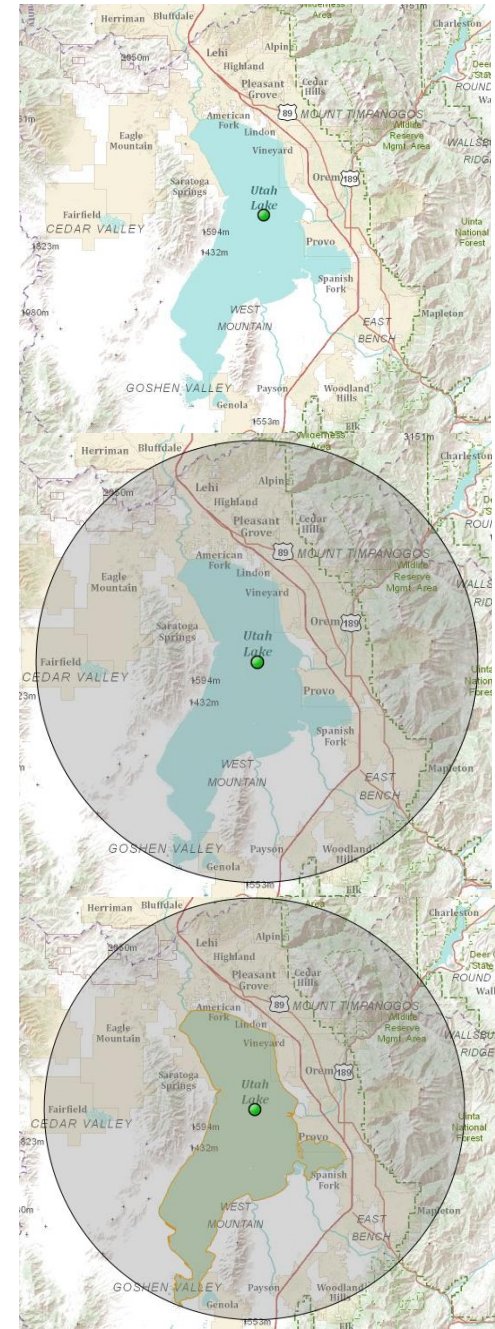
Point



Point & Radius



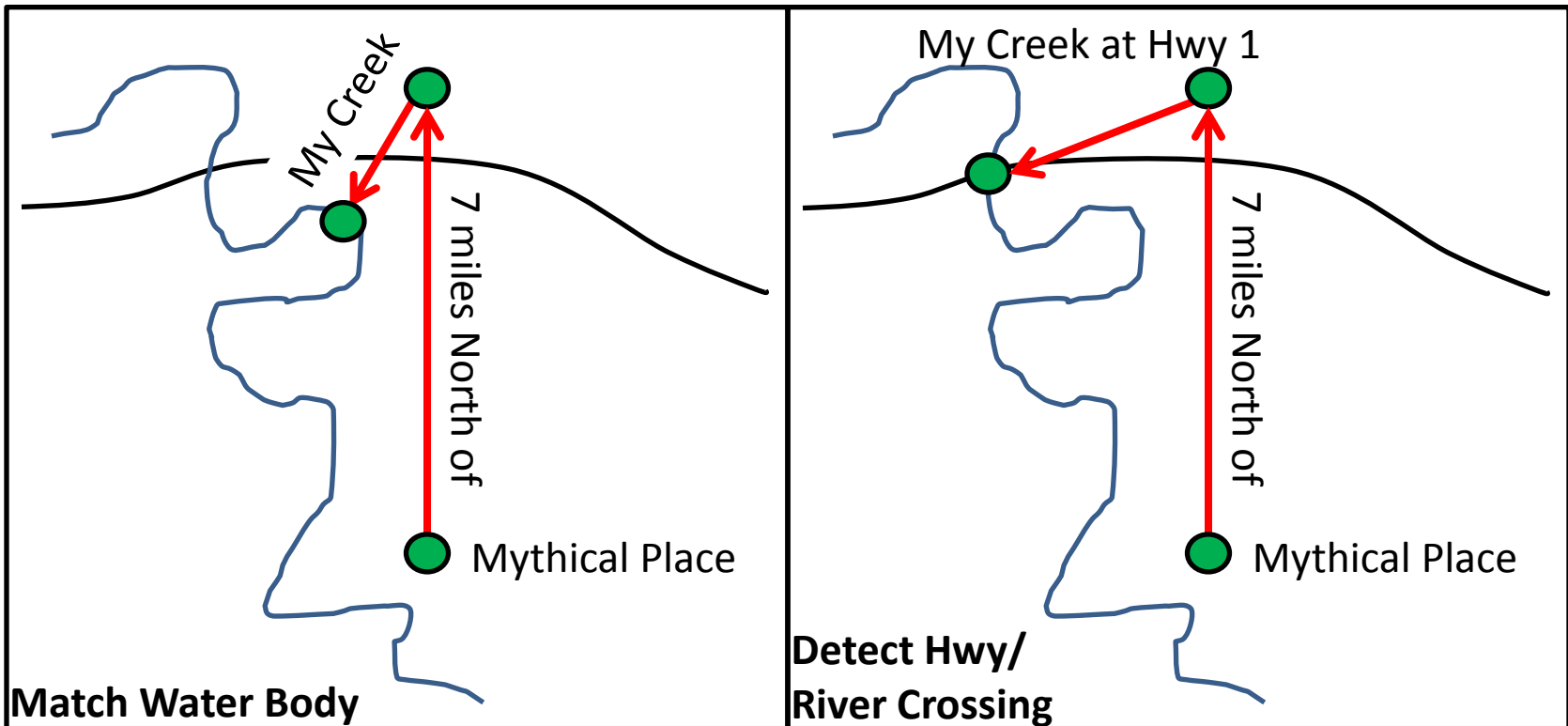
Point, Radius & Polygon



Georeferencing options

- ☒ Match Water Body | ☒ Detect Hwy/River Crossing | ☒ Do Uncertainty
☒ Do Error Polygon | ☐ Displace Polygon | ☐ Restrict to Lowest Adm. Unit

Language: English ▼



Generating Polygons:

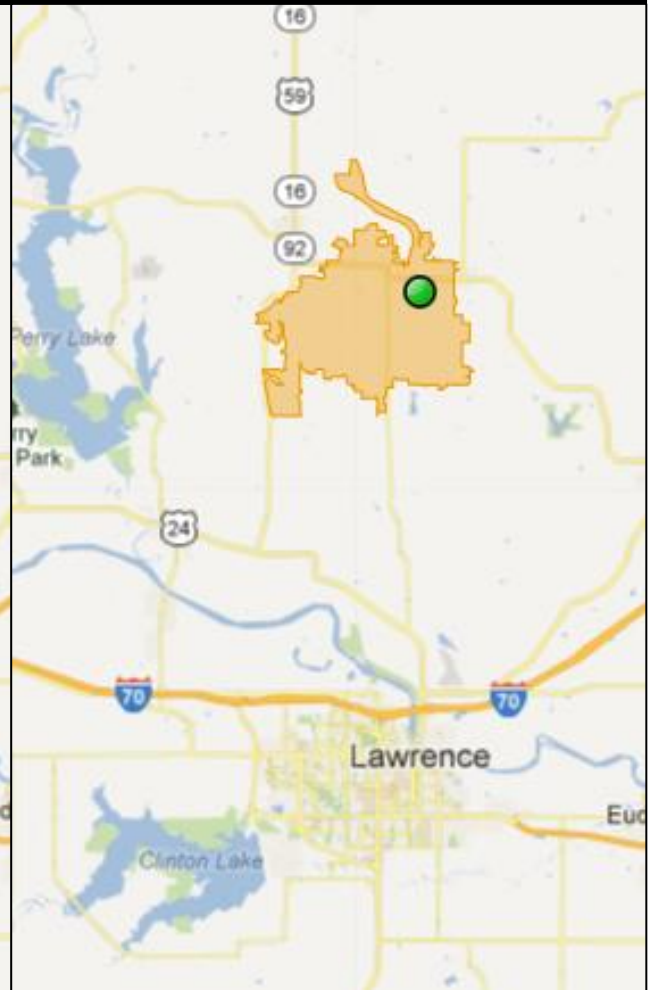
Lawrence, KS



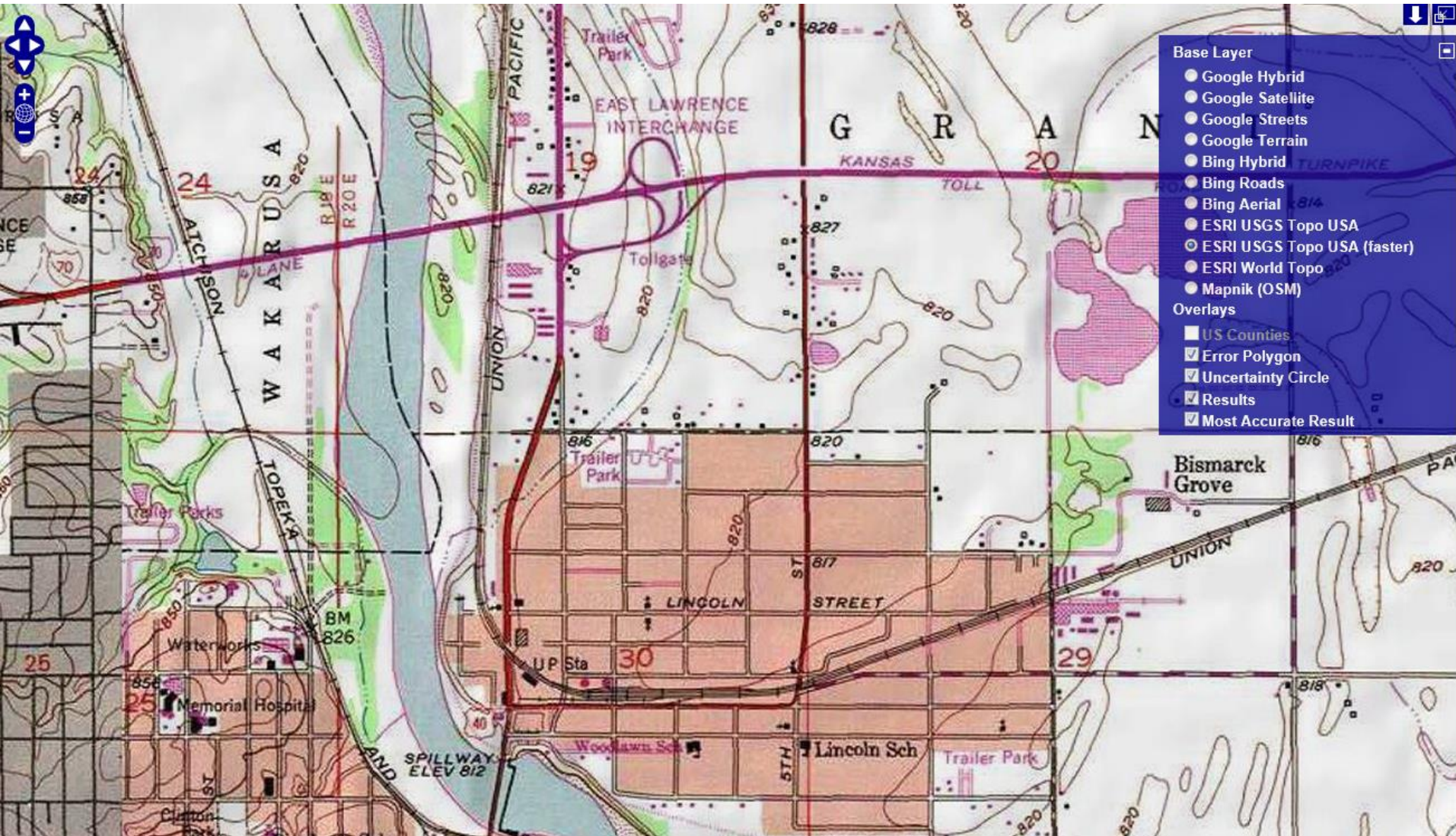
15 mi N of Lawrence, KS
no displacement



15 mi N of Lawrence, KS
displaced polygon



Visualization: Base Layers



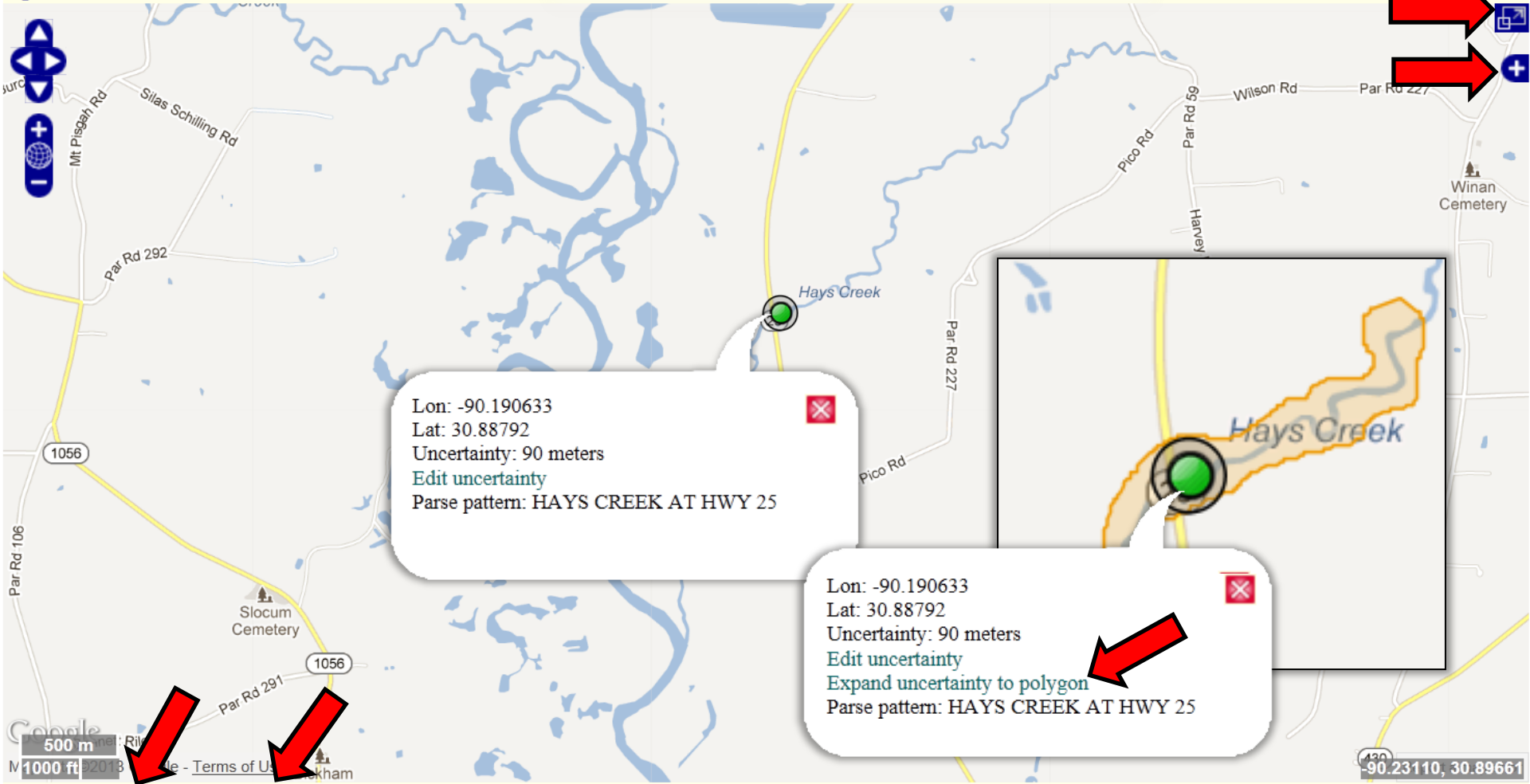
Google

bing





1 possible location found.



Workbench 1 possible location found

Georeference | Options | **Draw polygon** | Place marker | Measure

Locality String:

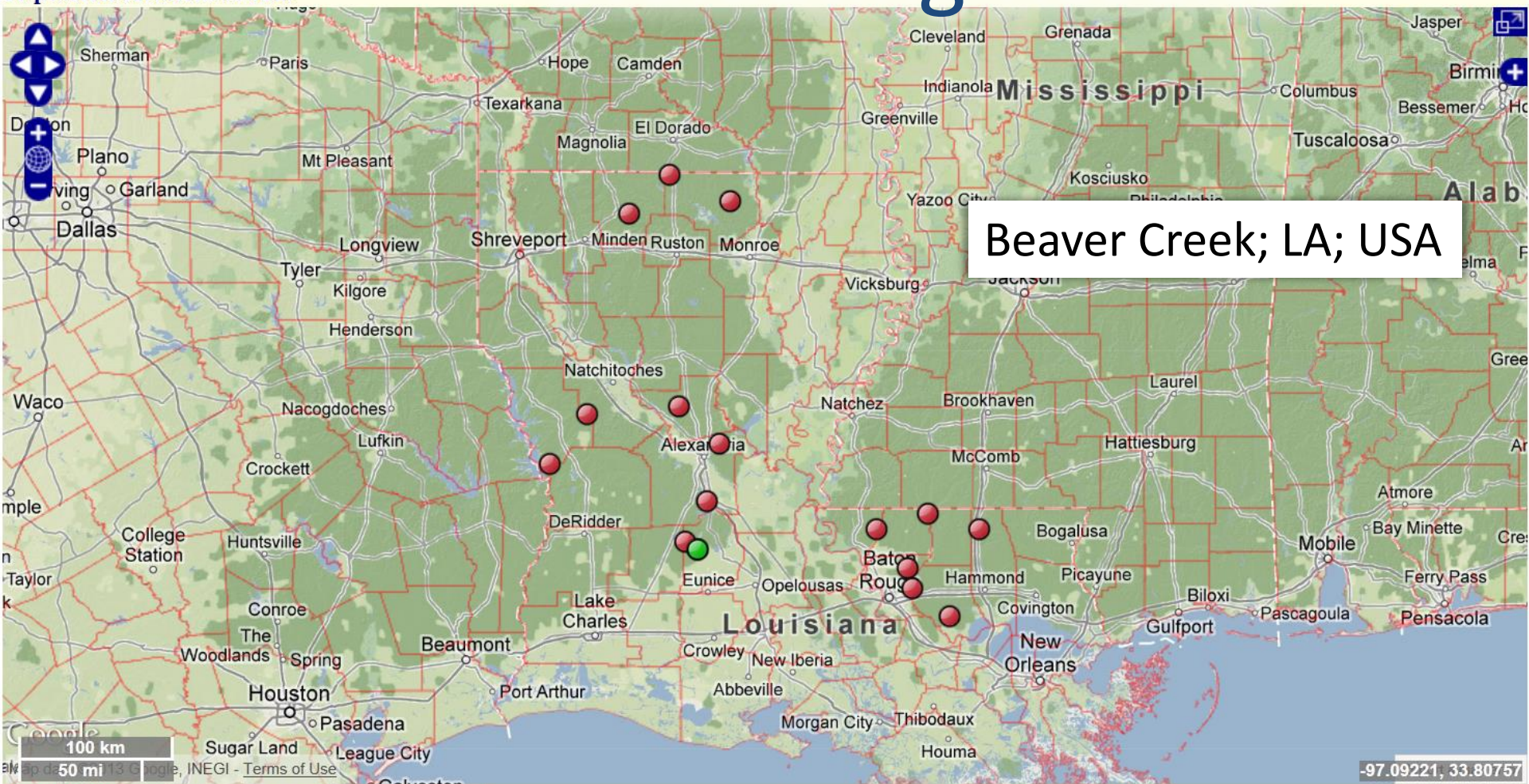
Country:

State:

County:

Latitude	Longitude	Uncertainty	Error Polygon
<input checked="" type="checkbox"/> latitude: 30.88792	<input checked="" type="checkbox"/> longitude: -90.190633	<input checked="" type="checkbox"/> uncertainty: 90 m	<input checked="" type="checkbox"/> error polygon
30.88792	-90.190633	90	Unavailable

16 possible locations found.



Workbench	16 possible locations found
⊗	lat: 30.75611, lon: -92.49056, pattern: BEAVER CREEK, error polygon: Unavailable, uncertainty: 210 m, precision: Low(27)
⊗	lat: 31.61778, lon: -92.61583, pattern: BEAVER CREEK, error polygon: Unavailable, uncertainty: 210 m, precision: Low(27)
⊗	lat: 30.34528, lon: -90.71333, pattern: BEAVER CREEK, error polygon: Unavailable, uncertainty: 210 m, precision: Low(27)
⊗	lat: 30.9675, lon: -90.86361, pattern: BEAVER CREEK, error polygon: Unavailable, uncertainty: 210 m, precision: Low(27)
⊗	lat: 32.76556, lon: -92.97306, pattern: BEAVER CREEK, error polygon: Unavailable, uncertainty: 210 m, precision: Low(27)
⊗	lat: 30.63722, lon: -91.00306, pattern: BEAVER CREEK, error polygon: Unavailable, uncertainty: 210 m, precision: Low(27)

Remove Secondary Points

Batch Georeferencing

Workbench

2 possible locations found

Show 8 records

Page Georeference

Georeference

Options

Correct

☐ Draw polygon

☐ Place marker

☐ Measure

Locality	Country	StateProvince	County	Latitude	Longitude	Corrected	precision
Chambers Spring Road 2.5 km S of Hwy 412, 8.0 km E of Siloam Springs, T17N, R33W,	USA	Arkansas	Benton	36.188027	-94.451005	no	High(89)
Osage Creek, 1.0 mile N on gravel road to bridge crossing; gravel road jcts with	USA	Arkansas	Benton	36.189077	-94.395375	no	High(97)
Yocum Creek, near Oak Grove (Pass 11a), Sec. 30	USA	Arkansas	Carroll	36.454986	-93.322008	no	Low(35)
Village Creek State Park, S of driving range, Sec. 6	USA	Arkansas	Cross	35.16111	-90.70833	no	Low(39)
Sugar Creek, Hwy 163 at Bay Village, Sec. 4	USA	Arkansas	Cross	35.44909	-90.67533	no	High(100)
Buck Creek, 8.0 miles SE Corydon	USA	Indiana	Harrison	38.155118	-86.014724	no	High(88)
E Branch Mill Creek, Hessdale Road, 4.0 km S of Allendorph, Sec. 36	USA	Kansas	Wabaunsee	39.003564	-96.277745	no	High(88)
Blissdale Creek, Hillside National Wildlife Refuge, 500 m SW of Blissdale on Blis	USA	Mississippi	Holmes	33.083754	-90.224633	no	High(84)

Search:

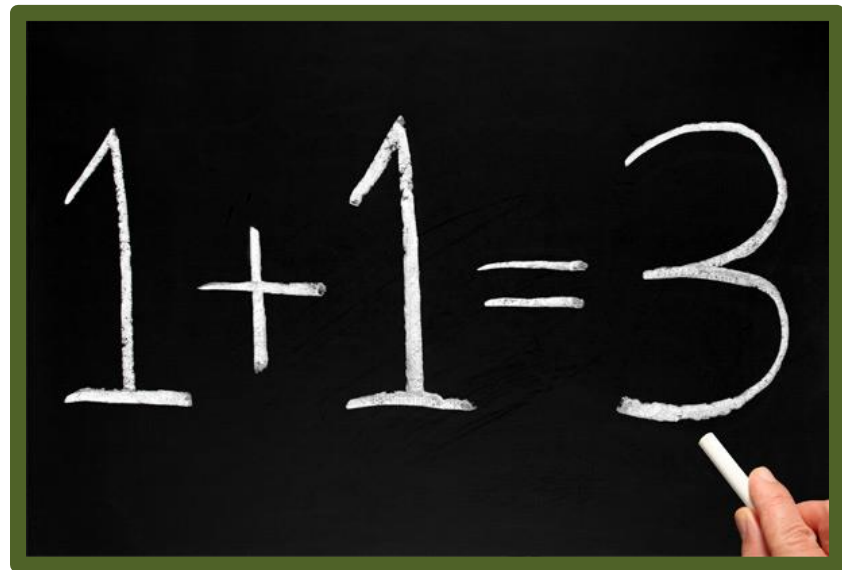
File management

Phoxinus_erythrogaster_Locations_MMN...

Showing 1 to 8 of 44 records

Collaborative georeferencing

- Increased output by take advantages similarities across collections
- Distribution of workloads to appropriate expertise



Collaborative Georeferencing: Sharing Data

Homochitto River, 4.9 mi. E Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1960	11
Homochitto River 5 mi. E of Union Church, MS Hwy. 550.	USA	Mississippi	Lincoln	1968	11
Homochitto River at Route 550 bridge, 5.0 mi. E of Union Church.	USA	Mississippi	Lincoln	1970	10

Homochitto River at MS Hwy. 550 bridge 5.0 mi. E of Union Church.	USA	Mississippi	Lincoln	1971	2
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Homochitto River at Hwy. 550 bridge 5.0 mi. E of Union Church.	USA	Mississippi	Lincoln	1971	1
Homochitto River 5 mi. E of Union Church.	USA	Mississippi	Lincoln	1971	1
Homochitto River 5 mi. E of Union Church.	USA	Mississippi	Lincoln	1971	1
Homochitto River 5 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1972	1
Homochitto River 5 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1972	1
Homochitto River 5 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1972	1
Homochitto River 4.7 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1972	1
Homochitto River 5 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1972	1
Homochitto River 5 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1970	1
Homochitto River 4.7 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1972	1
Homochitto River 4.7 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1972	1
Homochitto River 5 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1973	1

Homochitto River 5 mi. SE of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1978	1
Homochitto River 5 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1971	8



Homochitto River 5 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1971	6
Homochitto River 5 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1972	8
Homochitto River 5 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1972	7
Homochitto River 4.7 mi. E of Union Church, Hwy. 550.	USA	Mississippi	Lincoln	1972	6

**Corrected 22 collecting events,
approx. 200 specimen records**

Collaborative Georeferencing Performance

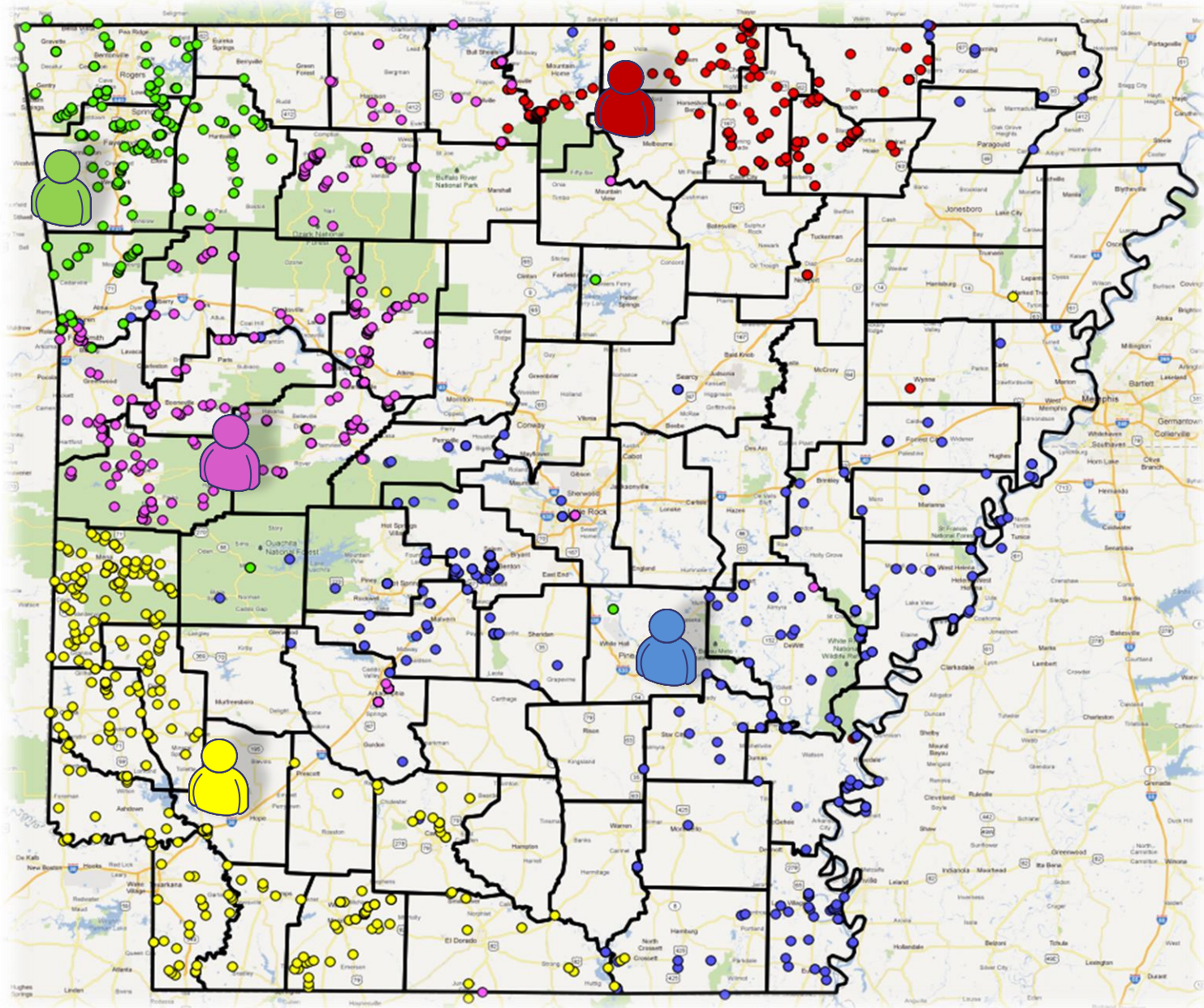


- 2100 randomly selected collecting events from the Tulane University fish collection were imported and georeferenced using the collaborative georeferencing framework
- 33% were duplicates
- 30% more related by similarity index

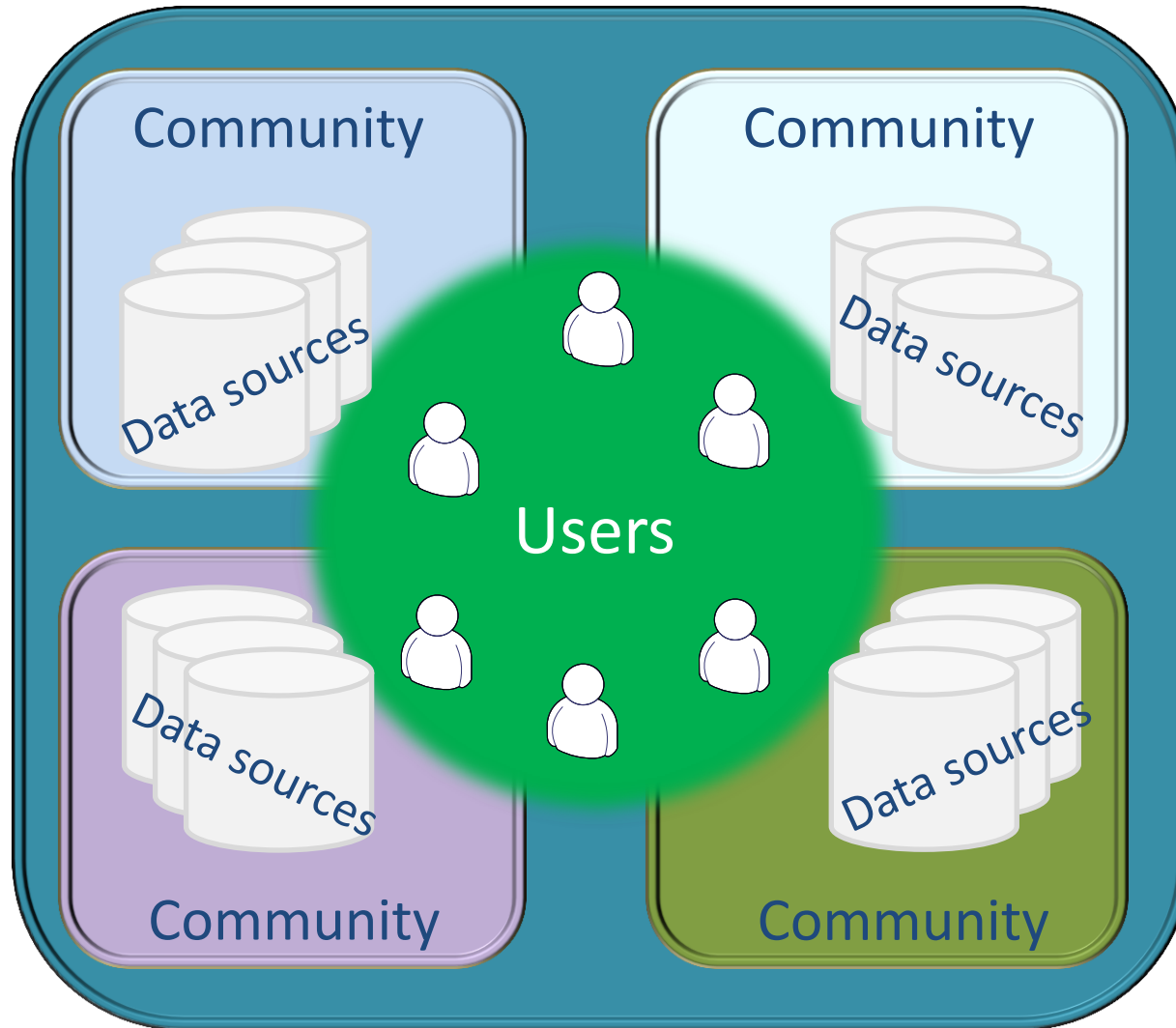
2100  782

★ 63% reduction in effort overall

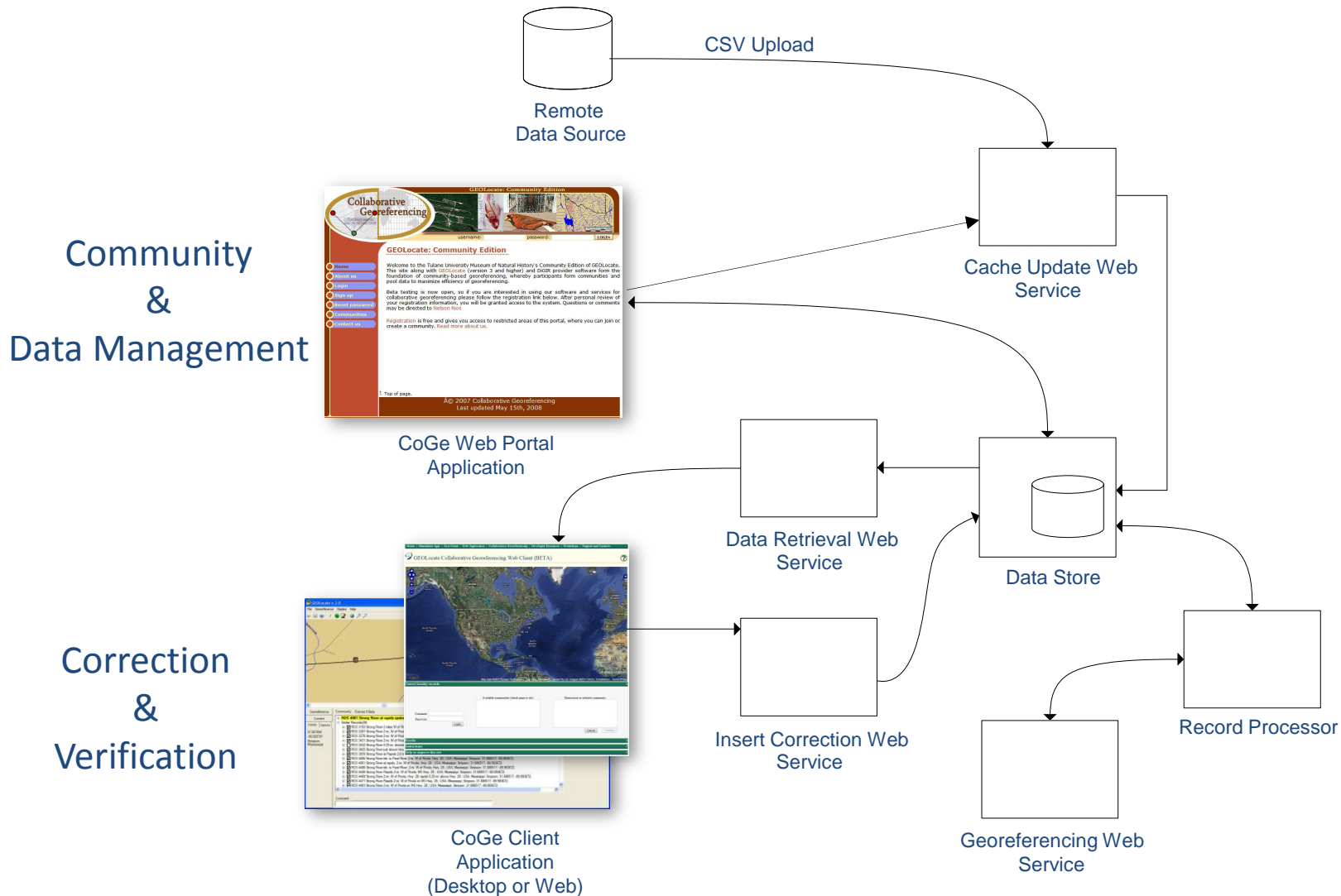
Distributing Workloads



Organizational Units



Collaborative Georeferencing within GEOLocate



Collaborative Georeferencing Management Portal



GEOLocate: Community Edition

Welcome to the Tulane University Museum of Natural History's Community Edition of GEOLocate. This site along with [GEOLocate](#) (version 3 and higher) and DiGIR provider software form the foundation of community-based georeferencing, whereby participants form communities and pool data to maximize efficiency of georeferencing.

Beta testing is now open, so if you are interested in using our software and services for collaborative georeferencing please follow the registration link below. After personal review of your registration information, you will be granted access to the system. Questions or comments may be directed to [Nelson Rios](#)

[Registration](#) is free and gives you access to restricted areas of this portal, where you can join or create a community. [Read more about us.](#)

[Home](#)[About us](#)[Login](#)[Sign up](#)[Reset password](#)[Communities](#)[Contact us](#)

↑ Top of page.

Georeferencing Communities

Create Communities

[Communities List](#) [Create Communities](#) [Join Communities](#) [Account Settings](#)

Fill out the form below to create a new community.

Fields marked * are required.

Community name:

Description:

Georeferencing options: ☒ Water body matching ☒ Look for hwy/river crossing

Privacy setting:

- ☒ public: any user can join your community.
- ☐ restricted: users send you requests to join your community.
- ☐ private: only users you invite can join your community.

[RESET](#) [CREATE COMMUNITY](#)

Data Sources

[Data Sources](#) [Members](#) [Com Center](#) [Settings](#)

Data source management operations

- ☐ Add new community data source via DiGIR
- ☐ Add new community data source via CSV files

Use this easy signup link to send a auto-join invite to users:

[GENERATE EASY SIGNUP LINK](#)

Enable hyperlinks on data source records:
base link format: "http://domain.com?<key>=" where <key> is a parameter key of your choice.

[ADD SPECIMEN HYPERLINK](#)

[RESET](#) [SAVE](#)

Add New Users & Link Out

Data Sources
Members
Com Center
Settings

User management operations:

- Define users working dataset
- Change users community access levels
- Invite users to this community

To define a working dataset, select the search parameters and users below, then click "SUBMIT CHANGES".

Use [CTRL]+click to select multiple.

Community data sources:

--ALL--
Birds
BirdsDwC2
CMNFI
csvTest
f2sr

Search Criteria

Countries:

Java (Dutch East India)
Kazakhstan
Kenya
Kenya or Uganda
Kenya?
Kolwezi (Congo)
Korea
Labrador

States/Provinces:

--ALL--
Campeche
Queensland
"Sara, D. S. C." (Georgia)

Countries:

--ALL--
Cochise
Mojave
"Adams, Arapahoe" (Saint Martin)

Community members:

peter.desmet (Peter Desmet)
robgur (Robert P Guralnick)
rodriguez.zuluaga (Javier A)
snomelf (Paul Fiemons)
sun123 (Dr.Sunil Wamanrao)
swang5 (Shengzhi Wang)
test1234 (test test)

Selected members queries, consolidated:

'snomelf', 'sun123' and 'swang5' are allowed to search community-wide and only allowed to search by country like 'Kenya' or 'Kenya?'.

snomelf, sun123 and swang5 can search community-wide by country like 'Kenya' or 'Kenya?'.

Number of locality records matching this query: 169.
Number of corrections for locality records matching this query: 0.

Sample matching records for this query:

FieldNumber	YearCollected	MonthCollected	DayCollected	TimeOfDay	ContinentOcean	Country	State
0	0	0	0	0		Kenya	Rift V
1895	4	7		0		Kenya	
1895	2	2		0		Kenya	
34	0	6		0		Kenya	Rift V
0	0	0		0		Kenya	Coast
0	0	0		0		Kenya	Rift V
0	0	0		0		Kenya	
0	0	0		0		Kenya	Coast
0	0	0		0		Kenya	Coast
0	0	0		0		Kenya	East
0	0	0		0		Kenya	West

Selected Members Queries: showing 1 to 3 of 3.

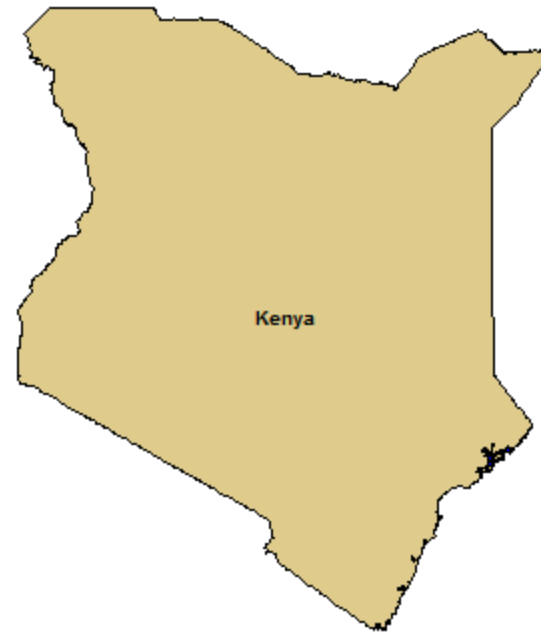
Members	Data sources	Countries	States/Provinces	Counties
snomelf	all	'Kenya' or 'Kenya?'	all	all
sun123	all	'Kenya' or 'Kenya?'	all	all
swang5	all	'Kenya' or 'Kenya?'	all	all

HIDE FORM
CLEAR FORM
SUBMIT CHANGES

Click on an item's header to expand/collapse its content.

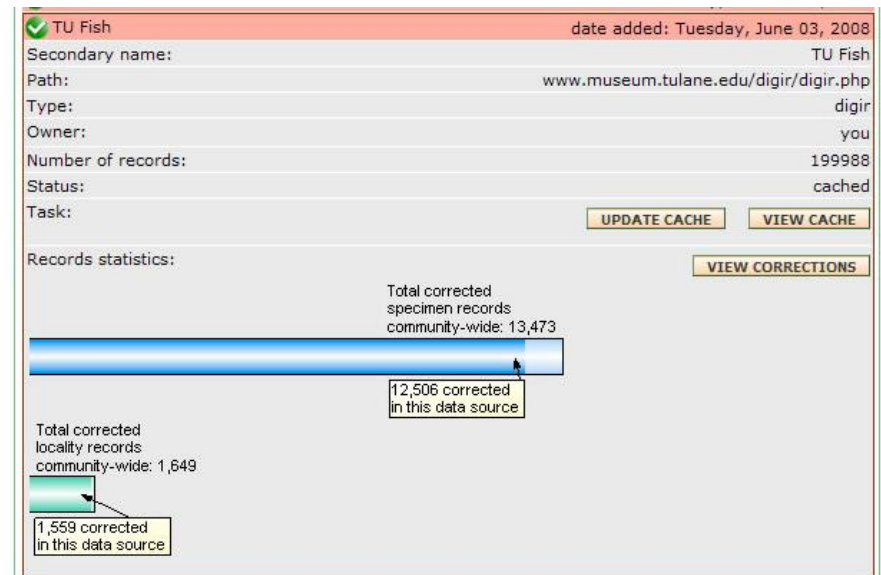
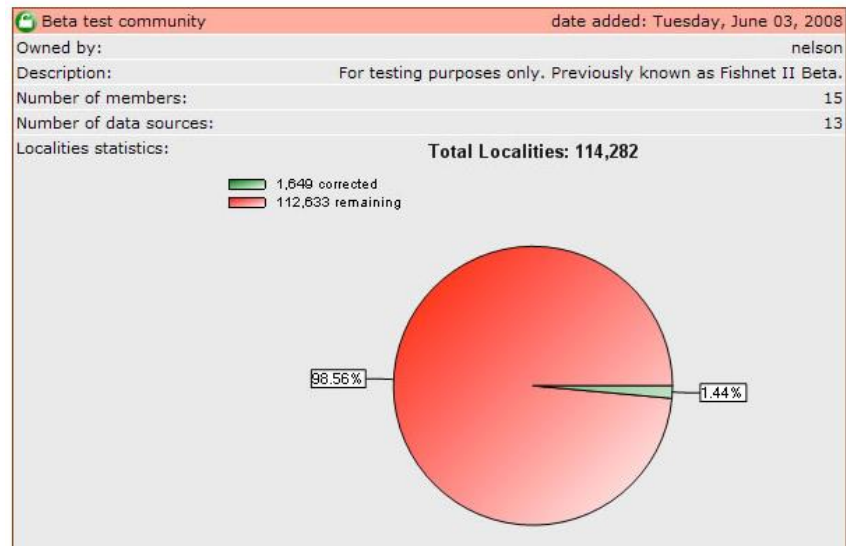
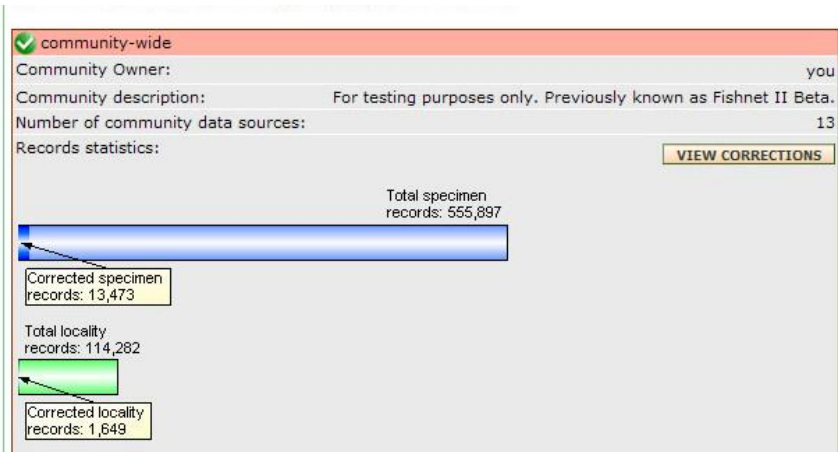
- community-wide
- abentley member since: Thursday, October 23, 2008
- ddraper member since: Wednesday, February 04, 2009
- denareg member since: Saturday, November 14, 2009
- ecolife member since: Thursday, December 11, 2008

User Management: Task Assignment



Assign all records from Kenya to experts on East African regions

Monitoring & Managing Progress



Data Repatriation

☒ TU Fish date added: Tuesday, June 03, 2008
 Secondary name: TU Fish
 Path: www.museum.tulane.edu/digir/digir.php
 Type: digir
 Owner: you
 Number of records: 199988
 Status: cached
 Task:
 Records statistics:

CoGe: Corrections details for the "TU Fish" data source - Mozilla Firefox

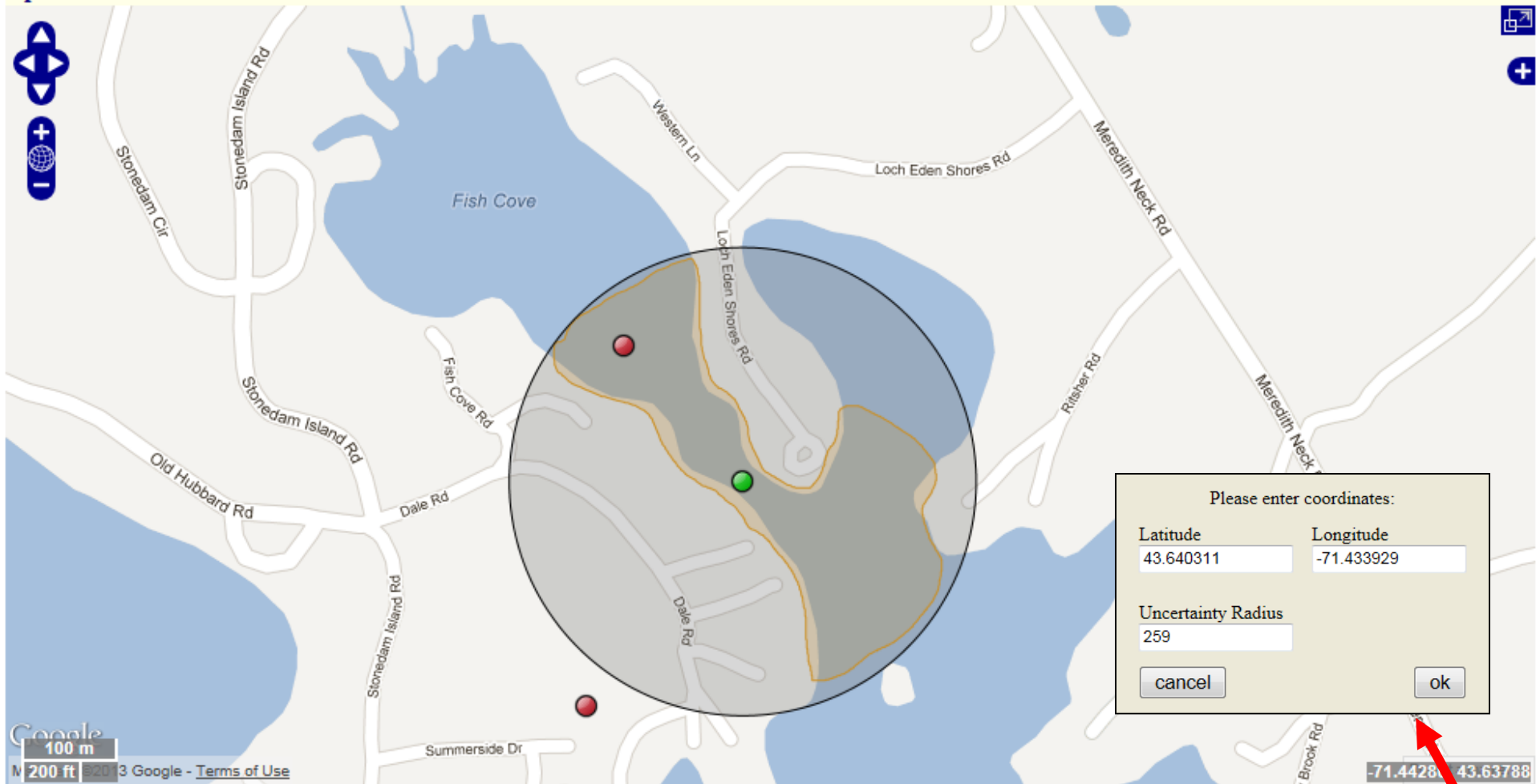
http://www.museum.tulane.edu/coge/protected/ShowDetails.aspx?.wid=3909f73d&total=1559&show=135&obj=ds

Showing 1 to 50 of 1559.

Data source	Continent	Ocean	Country	State/Province	County	Locality
- TU Fish	North America		USA	Utah	Washington	Santa Clara River, 2.75 mi. above Gunlock.
Correction order (most recent first)	Corrected by	Corrected longitude	Corrected latitude	Correction remarks	Date corrected	
1	abentley	-113.748037	37.299871		10/27/2008 9:48:20 PM	
+ TU Fish	North America		USA	Mississippi	Copiah	Trib. to Homochitto River, 4.6 mi. NE Caseyville.
+ TU Fish	North America		USA	Mississippi	Lawrence	Pearl River at mouth of Fair River.
- TU Fish	North America		USA	Florida	Lake	Lake Harris near Leesburg.
Correction order (most recent first)	Corrected by	Corrected longitude	Corrected latitude	Correction remarks	Date corrected	
1	abentley	-81.85438	28.783233		10/27/2008 9:49:33 PM	
2	abentley	-81.87806	28.81056		10/27/2008 9:49:00 PM	
+ TU Fish	North America		USA	Mississippi	Copiah	Bayou Pierre, 1.7 mi. W of Carpenter or 5.8 mi. E of Carlisle.
+ TU Fish	North America		USA	Louisiana	Orleans	South shore of Lake Pontchartrain near I-10 bridge.
+ TU Fish	North America		USA	Mississippi	Simpson	Strong River at rapids upstream from Hwy. 28 bridge, 2 mi. W of Pinola.
+ TU Fish	North America		USA	North Carolina	Macon	Little Tennessee River, 5 mi. NW Franklin, Hwy. 28.
+ TU Fish	North America		USA	Louisiana	Orleans	Lake Pontchartrain at south end of causeway on Rt. 11
+ TU Fish	North America		USA	Louisiana	La Fourche	Ditch near canal, 5.7 mi. south of Golden Meadows on Rt. 78
+ TU Fish	North America		USA	Mississippi	Marion	Upper Little River tributary of Pearl River, 4.8 mi. SE of Columbia, MS on I
+ TU Fish	North America		USA	Mississippi	Marion	Trib. of Pearl R. 4.8 N of Sandy Hook on Rt. 35
+ TU Fish	North America		USA	Alabama	Mobile	Trib. of Escatawpa River 6.8 mi. E of Hurley, MS
+ TU Fish	North America		USA	Mississippi	Marion	Trib. of Pearl River 6/10 mi. N of LA state line on Rt. 35
+ TU Fish	North America		USA	Florida	Bay	Trib. of Econfina River at Youngstown on Rt. 231
+ TU Fish	North America		USA	Mississippi	Marion	Trib. of Pearl River 1.2 mi. N of MS state line on Rt. 35
+ TU Fish	North America		USA	Louisiana	St. Tammany	Trib. of Pearl River 12.7 mi. NW of town of Pearl River on Rt. 58.
+ TU Fish	North America		USA	Mississippi	Marion	Trib. of Pearl River 2.7 mi. N of Sandy Hook on Rt. 35.
+ TU Fish	North America		USA	Mississippi	Hancock	Long Bay, trib. to Turtlekin Cr. 11.2 mi. E of Picayune or 2 mi. W of turn
+ TU Fish	North America		USA	Florida	Jackson	Chipola River 1.5 mi. N of Marianna
+ TU Fish	North America		USA	Louisiana	T Jefferson	Trib. of Pearl River 1.5 mi. N of Sandy Hook on Rt. 35



6 possible locations found.



Workbench

Community: FishNet 2

☐ Draw polygon
 ☐ Place marker
 ☐ Measure

Next Record(s)

Correct

Skip Selected

Add Comments

Correction Report

Logout

6 possible locations found

History

☒ Lake Winnepesaukee, Fish Cove near mouth of T 108, 3.5 mi ESE of Meredith, Merrimack Watershed, elev. 504 ft
☐ Similar Records(2)
☐ Lake Winnepesaukee, Smalls Cove, Merrimack system, 5.5 mi E of Gilford, elev. 504 ft; United States; New Ha
 UMMZ140837 *Catostomus commersonii commersoni*
 UMMZ140838 *Esox niger*

logged in as: nelson

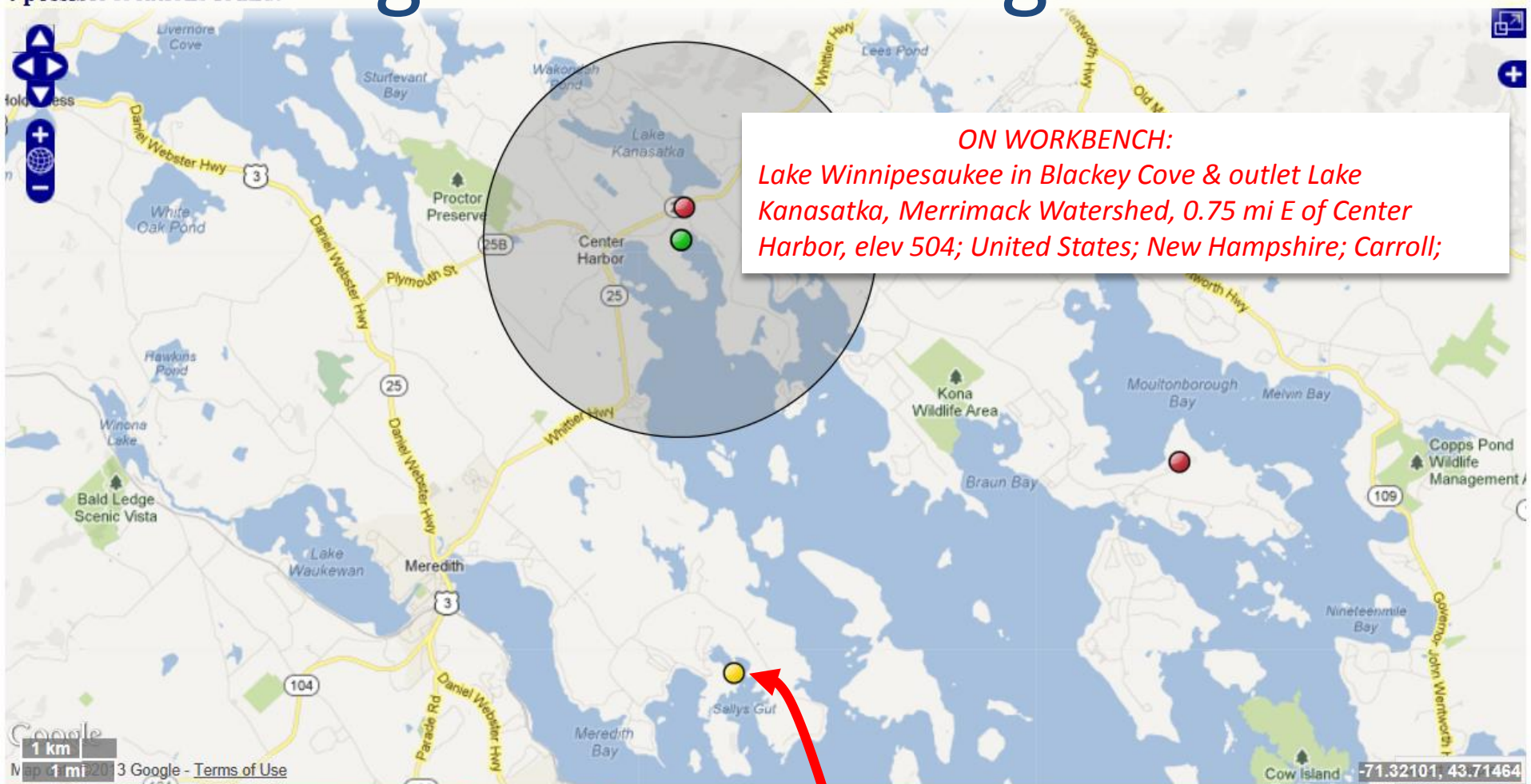
Calculated Coordinates

Lon: -71.433929

Lat: 43.640311

U. Radius: 259 m

Utilizing and Reviewing Past Work



ON WORKBENCH:
*Lake Winnepesaukee in Blackey Cove & outlet Lake
 Kanasatka, Merrimack Watershed, 0.75 mi E of Center
 Harbor, elev 504; United States; New Hampshire; Carroll;*

corrected on 3/2/2013 10:33:16 am Lake Winnepesaukee, Fish Cove near mouth of T 108, 3.5 mi ESE of Meredith, Merrimack
 corrected on 3/1/2013 2:02:10 pm Calcasieu River, 6.3 miles W of Jct of LA Hwy 113 and US 165.; United States; Louisiana; Rap
 corrected on 3/1/2013 2:02:10 pm Calcasieu River, 6.3 mi. W. of Jct. of LA Hwy 113 & US 165; United States; Louisiana; Rap
 corrected on 3/1/2013 1:48:30 pm Calcasieu River on La 113; United States; Louisiana; Rapides;
 corrected on 3/1/2013 1:48:30 pm Calcasieu River on LA 113; United States; Louisiana; Rapides;
 corrected on 3/1/2013 1:48:30 pm Calcasieu River, on LA 113; United States; Louisiana; Rapides;
 corrected on 3/1/2013 1:29:16 pm Soucook River, Merrimack system, 3 mi SSE of Concord, elev. 230 ft; United States; New H

move to workbench

Options

- ☒ include localities with matching determination
- ☐ exclude outdated determinations

HTTP/1.1 200 OK
Content-Type: text/xml; charset=utf-8
Content-Length: length

Interoperability

<?xml version="1.0" encoding="utf-8"?>
<Georef_Result_Set xmlns="http://www.museum.tulane.edu/webservices/">

- **Webservices**

<EngineVersion>string</EngineVersion>
<NumResults>int</NumResults>
<ExecutionTimems>double</ExecutionTimems>
<ResultSet>

– SOAP

– JSON

– GeoJSON



- **Web Client**

<Precision>string</Precision>
<Score>int</Score>
<UncertaintyRadiusMeters>string</UncertaintyRadiusMeters>
<UncertaintyPolygon>string</UncertaintyPolygon>
<ReferenceLocation>string</ReferenceLocation>
<DisplacedDistanceMiles>double</DisplacedDistanceMiles>
<DisplacedHeadingDegrees>double</DisplacedHeadingDegrees>
<Debug>string</Debug>
</ResultSet>
<ResultSet>
.
.
.
</ResultSet>



Arctos

</Georef_Result_Set>

Specify 6 + GEOLocate

Specify 6.4.08 (EZDB)

File Edit Data System Tabs Help

Welcome Data Trees Reports Interactions Statistics Query Workbench SGR Lifemapper

Search

Actions

- Import Data
- Import Images
- New Data Set
- Export Data Set
- Export MS Excel Template
- Create Data Set from Record Set

Reports

- Basic Label
- Data Set Summary
- Chart
- Top 10

Data Sets

- Sample2

Loc	LocalityString	Geo	Country	Geo	State	Geo	County	Loc	Lat	Loc	Lon	GcD	uncertainty
1	Cable Station at Cape York		Australia		Queensland			-10.68850		142.53167			
2	Aberdeen Lake		Canada					64.46667		-99.00000			
3	Pioneer Park near Davis		USA		CA		Yolo						
4	Conroe		USA		TX								
5	Twin Creek at US Hwy 24		USA		CO		Teller						
6	Turkey Creek at Goodwin Road.		USA		AL		Jefferson						
7	Borden Creek at Forest Road 244, Sipsey Wilderness; 13.1 mi SSW M...		USA		AL		Lawrence						
8	Moon Lake		USA		MS		Coahoma						
9	Red River along right bank at River Mile 105; Station 1.		USA		LA		Rapides						
10	Bienville National Forest on US Hwy 20		USA		MS								
11	Zion National Park		USA		UT								
12	Whitetail state wildlife management area		USA		NE								
13	Lincoln Beach		USA		OR		Lincoln						
14	Green River near neatsville		USA		KY		Adair						
15	New Milan Reservoir, 1.75 miles north of milan		USA		MO								
16	Homochitto River, 1.5 mi. S of Bude, Hwy. 98.		USA		MS		Franklin						
17	Homochitto River 5 mi. E of Union Church, MS Hwy. 550.		USA		MS		Lincoln						
18	Mamala Bay		USA		HI								
19	Bay of bengal		India										
20	Henley On Thames		United Kingdom		Oxfordshire								

GEOLocate Progress

Process: 19 / 20

Cancel

Highlight Invalid Cells: 0 | Highlight New Records

Save Form

Trash

Ichthyology | DJ's Specify Test Collection | djihbril

Specify 6 + GEOLocate

GEOLocate Results Chooser - 3 of 20

Locality Information

Description: Pioneer Park near Davis

County: Yolo

State: CA

Country: USA

Correction (Green) Marker Properties

Position Latitude: 38.545 Longitude: -121.73944

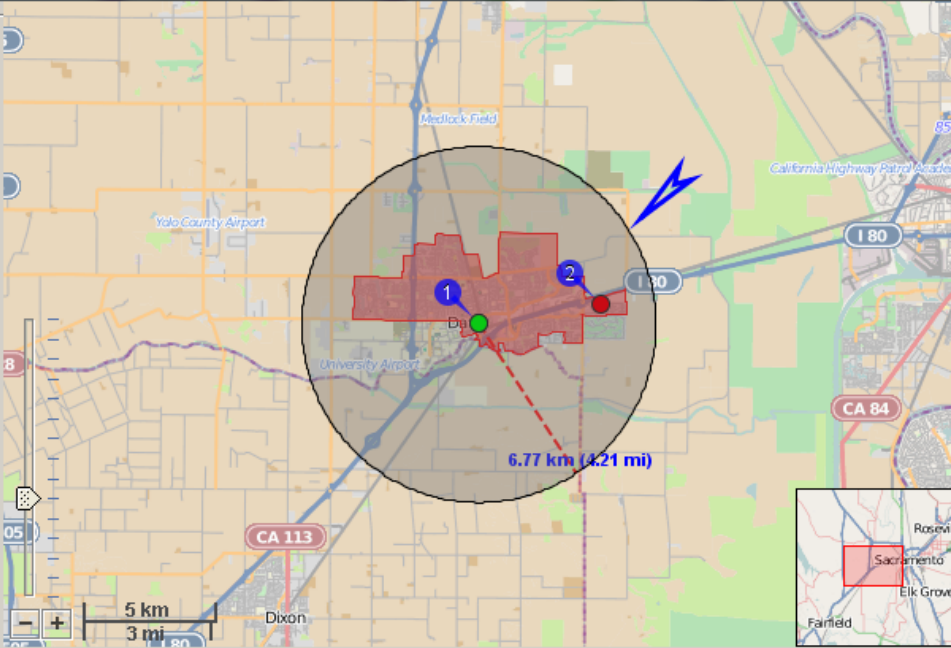
Uncertainty Radius In meters: 6688

Error Polygon -121.754239949, 38.5754950193, -121.753548949

Apply Apply Clear Polygon

GEOLocate Results

Number	Latitude	Longitude	Pattern	Precision	Error Polygon	Uncertainty
1	38.545	-121.739	Near DAVIS (Adm: YOLO)	Medium (50)	present	6254
2	38.551	-121.686	PIONEER PARK (Adm: YOLO)	Low (27)	unavailable	2289



Get Elevation 16.13m U. Radius: 6688m Measure Clear Ruler Lat: 38.492294, Lon: -121.571274
NED 1/3rd arc-second: Western United States

[GEOLocate Web](#) Quit Skip Accept Help



```
library(RJSONIO)
library(RCurl)

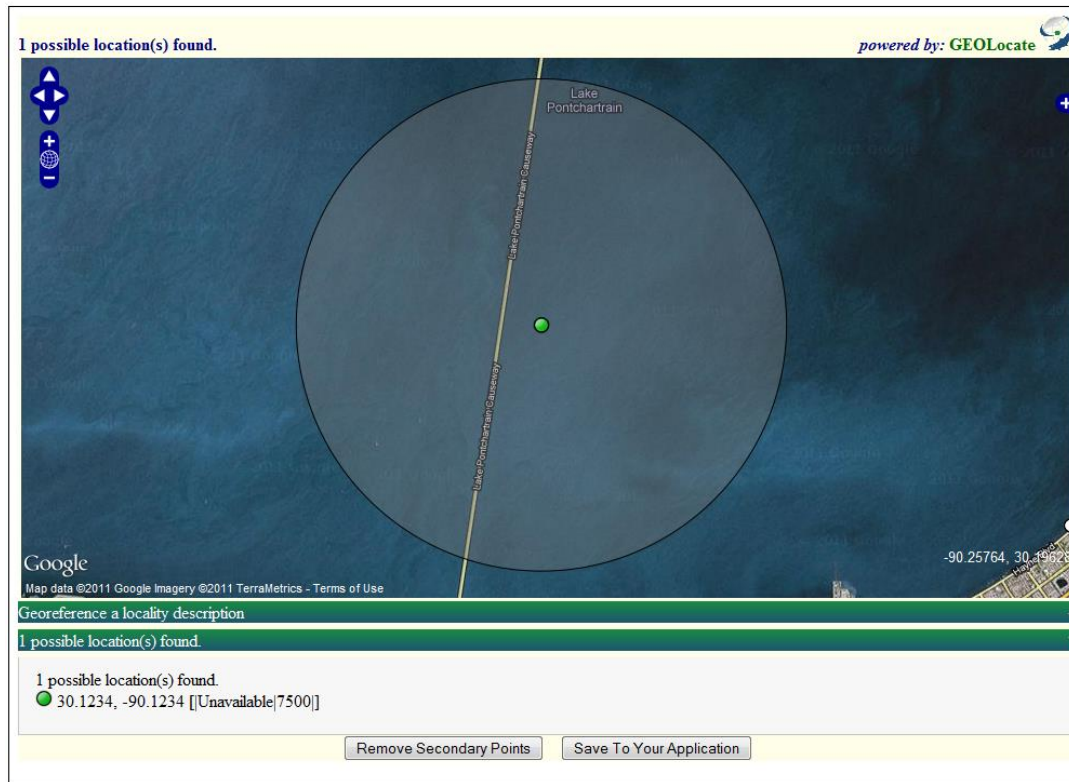
setwd("E:/FishNet2GeoRef")

INPUTFILENAME="t_localities4GLC2.csv"
OUTPUTFILENAME="t_localities4GLC_out.csv"
OUTPUTFILENAMEFIRSTRESULT="t_localities4GLC_out_first_result.csv"

OPTIONS="&doduncert=true&dopoly=false&displacepoly=false"
glcIn= read.csv(INPUTFILENAME)
numGLCRuns = 0
recordCounter = 0
for (k in 1:nrow(glcIn)){
  print(k)
  Sys.sleep(3) #be nice and pause a few seconds between requests
  Country=glcIn[k,]$Country
  Locality=glcIn[k,]$Locality
  StateProvince=glcIn[k,]$StateProvince
  County=glcIn[k,]$County
  q=paste("http://www.museum.tulane.edu/webservices/geolocate/v2/glcwrap.aspx?country=",Country)
  q=gsub(' ','%20',q)

  tryCatch({
    JSONresponse = basicTextGatherer()
    curlPerform(url = q, writefunction = JSONresponse$update)
    glcRecNum = k
    glc = fromJSON(JSONresponse$value())
    numresults = glc$numResults
    if (numresults > 0){
      for (i in 1:numresults) {
        glcRank = i
        glcLongitude = glc$resultSet$features[[i]]$geometry$coordinates[1]
        glcLatitude = glc$resultSet$features[[i]]$geometry$coordinates[2]
        glcPrecision = glc$resultSet$features[[i]]$properties$precision
        glcScore = glc$resultSet$features[[i]]$properties$score
        glcParsepattern = glc$resultSet$features[[i]]$properties$parsePattern
        glcUncert = glc$resultSet$features[[i]]$properties$uncertaintyRadiusMeters
        glcPoly = glc$resultSet$features[[i]]$properties$uncertaintyPolygon
        #if a polygon is present reformat coordinates to geolocate format-a comma delimited array
        if ("coordinates"%in%names(glcPoly)){
          sPoly = ''
```

Application Services: Web Client APIs



Listening for a message from GEOLocate.

- URL API for user input & lightweight web clients
- Lightweight client, specifically designed for embedding into other web applications.
 - Two way communication between web sites uses JavaScript `postMessage()`
 - Compatible with all modern browsers:

IE 8.0+

Firefox 3.0+

Safari 4.0+

Chrome 1.0+

Opera 9.5+





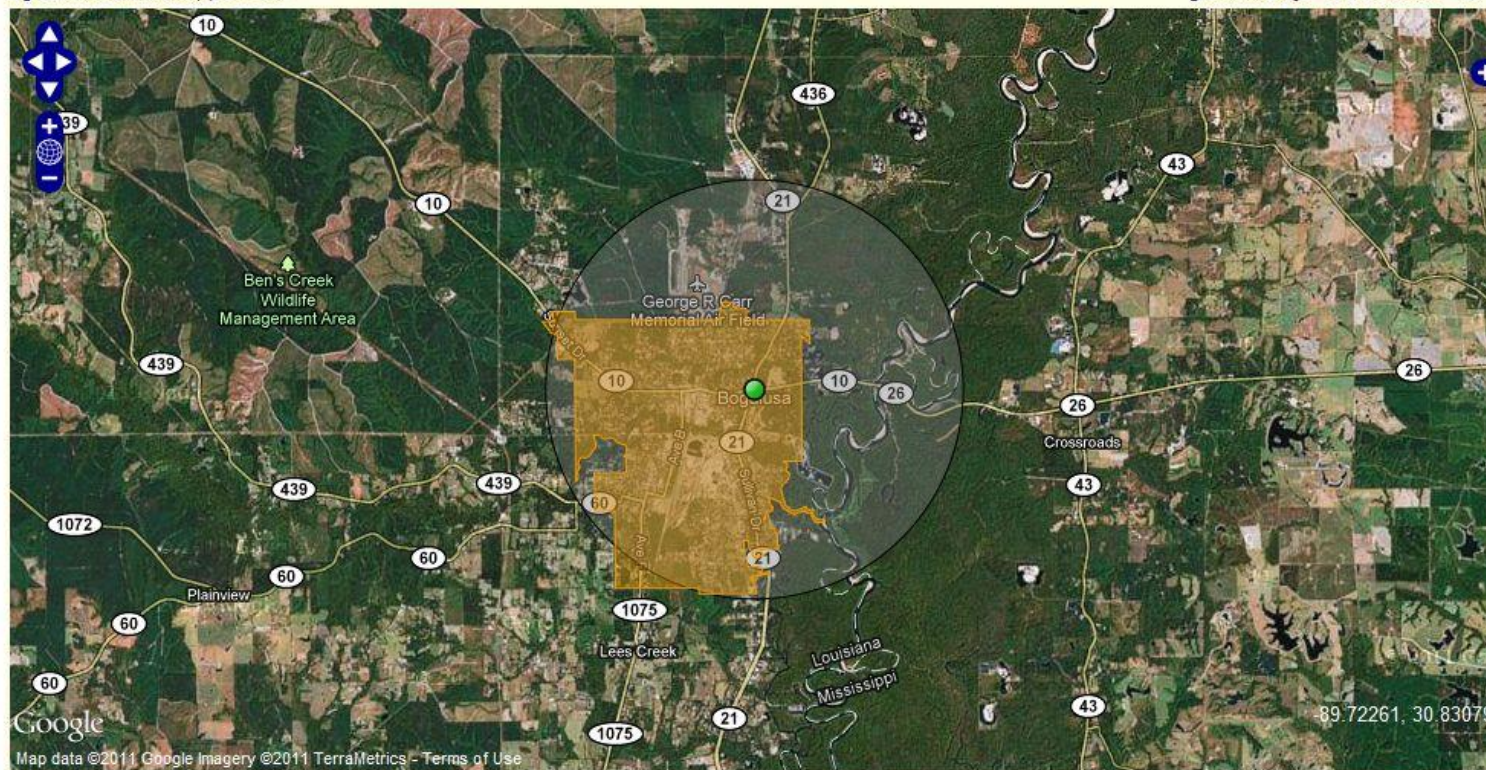
- 



GEOLocate



1 possible location(s) found.

powered by: **GEOLocate**

Georeference a locality description

1 possible location(s) found.

1 possible location(s) found.

● 30.79083, -89.84861 [BOGALUSA|30.801736012,-89.8943429191...|4490|Low(23)]

Remove Secondary Points

Save To Your Application

Symbiota



GEOLocate



Arizona State University Vascular Plant Herbarium

Query Form

Country: USA

State: Arizona

County: All Counties

Locality Term: Tumamoc

Generate List

Return Count: 39

Pima County: Growing on sanitary landfill, Tumamoc Hill, Tucson [1]

Pima County: N slope above laboratory ground, Tumamoc Hill [1]

Pima County: North slope above laboratory grounds, Tumamoc Hill, Tucson [1]

Pima County: North slope above laboratory grounds, Tumamoc Hill, Tucson [1]

Pima County: S side of Tumamoc Hill on Desert Laboratory property, TRS: T14S R13E S15 [1]

Pima County: South side of Tumamoc Hill along 22nd Street, TRS: T14S R13E S15 SW1/4 [1]

Pima County: South side of Tumamoc Hills along 22nd Street, TRS: T14S R13E S15 [1]

Pima County: SW base of Tumamoc Hill on Desert Laboratory property, TRS: T14S R13E S15 SW1/4 SW1/4 [1]

Pima County: Tucson Mountains, Tumamoc Hill just below (west of) the University of Arizona Geochronology Lab, TRS: T14S R13E S15 NW1/4 [1]

Pima County: Tucson Mountains, Tumamoc Hill, Tucson [1]

Pima County: Tucson Mountains, Tumamoc Hill [1]

Pima County: Tucson Mountains, Tumamoc Hill just below (W of) the University of Arizona Geochronology Lab, TRS: T14S R13E S15 [1]

Pima County: Tucson Mountains, Tumamoc Hill, AZ [1]

Pima: Tucson, south slope of Tumamoc Hill, TRS: T14S R13E sec 6 G-AZ; TRS: T14S R13E sec 15 G-AZ [3]

Pima: Tucson, south slope of Tumamoc Hill, TRS: T14S R13E sec 6 SW1/4 SW1/4 G-AZ; TRS: T12S R13E sec 36 NE1/4 NE1/4 G-AZ; TRS: T14S R13E sec 6 G-AZ; TRS: T14S R13E sec 6 G-AZ; TRS: T14S R13E sec 15 SE1/4 [1]



Geolocate local

Latitude: Deg. Min. Sec. N Decimal

Longitude: W

Error (in meters): meters Datum:

Sources: egbot 2012-04-01

Remarks:

Verification Status: reviewed - high confidence

Elevation: to meters

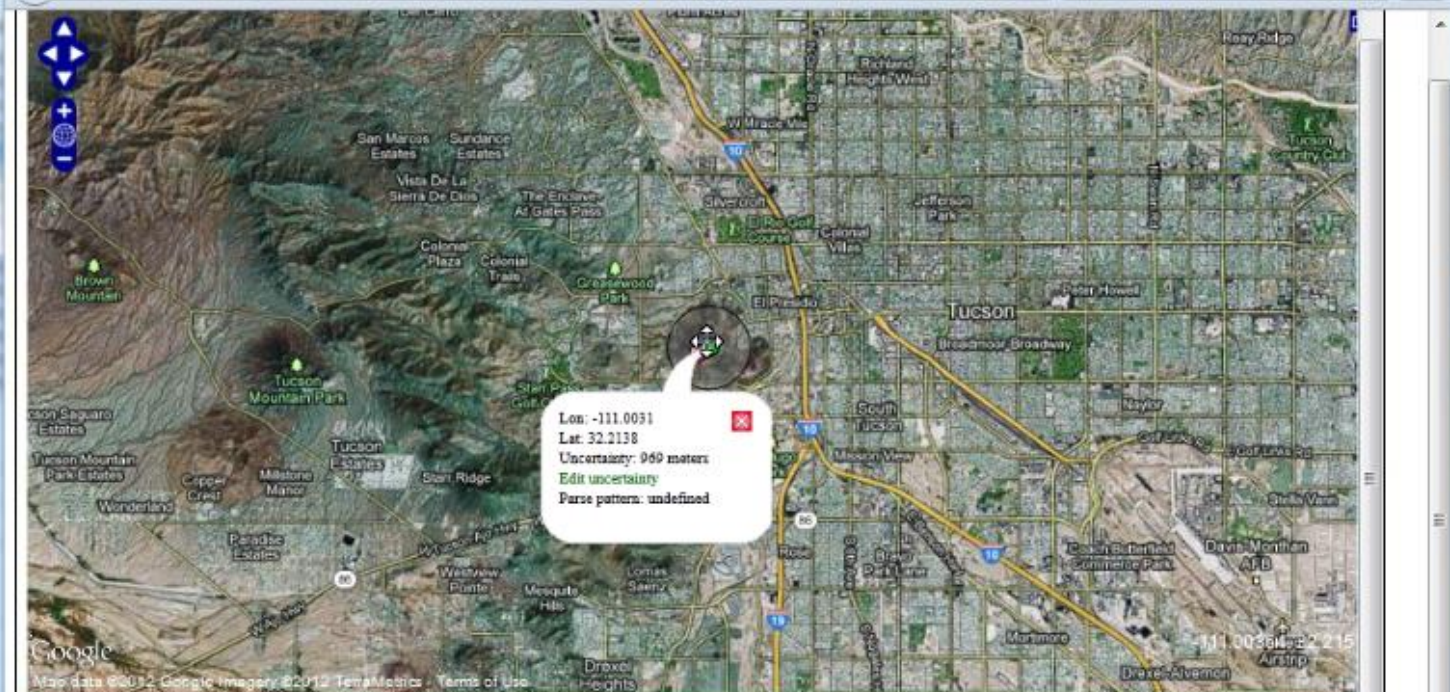
Statistics

Records to be Georeferenced

Arizona: 6317

Total Number: 39723

Total Percentage: 21.6%



Georeference a locality description

2 possible location(s) found.

2 possible location(s) found.

- 32.2138, -111.0031 [TRS/Unavailable/969/High(85)]
- 32.21278, -111.00556 [TUMAMOC HILL/Unavailable/1807/Low(27)]

Remove Secondary Points Save To Your Application

County	Records
All Counties	39723

Statistics

Records to be Georeferenced

Arizona: 6317

Total Number: 39723

Total Percentage: 21.6%



Excel + GEOLocate



	A	B	C	D	E	F
1	Locality	Country	State	County	Link to GEOLocate Web App	
2	Bogalusa	USA	LA	Washington	Georeference Me!	
3						
4						
5						

Referencing | Developer Resources | Workshops | Support and Contacts

?

Georeference a locality description

Locality String:

Country:

State: County:

☒ Match Water Body | Language:

☒ Detect Hwy/River Crossing | ☐ Restrict to Lowest Adm. Unit

☒ Do Uncertainty | ☒ Do Error Polygon | ☐ Displace Polygon

Latitude: 30.79083
Longitude: -89.84861
Uncertainty: 4490 m

☐ +BG (may slow things down) ☐ Draw polygon ☐ Measure

[Click here for batch georeferencing.](#)

```
30.801736012,-  
89.8943429191,30.803885012,-  
89.8962909191,30.803941012,-  
89.8960619191,30.803941012,-  
89.8937979191,30.803960012,-  
89.8933499191,30.805185012,-
```

1 possible location(s) found.

<http://www.museum.tulane.edu/geolocate/web/WebGeoref.aspx?v=1&Country=USA&State=LA&County=Washington&Locality=Bogalusa&georef=run>

Georeferencing Wet Collections:

The FishNet 2 Project



Global network of fish collections

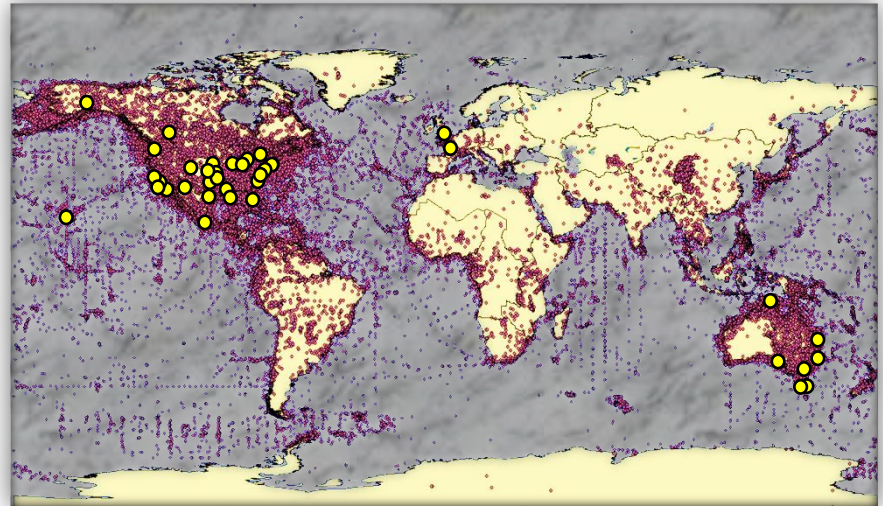
53 data providers

3.3 million lots

30+ million specimens

57% georeferenced

4+ million lots
100% georeferenced



FishNet 2

[Search](#) [Join FishNet](#)
[News](#) [Contact Us](#)
[About](#) [Help](#)

Search FishNet:
[-] Click to minimize Text Search Fields

Taxon:	<input type="text"/>	Date Range (yyyy-yyyy):	<input type="text"/>
Location:	<input type="text"/>	Other:	<input type="text"/>
Institution Code and/or Catalog Numbers:	<input type="text"/> >>	[Beta] Search Polygon (in Well-Known Text format): <input type="text"/> <small>You may use the map below to draw a polygon. Doing so will populate this field.</small>	

[+] Click to expand Map for drawing

Looking for the older search pages? Click here.

Join us on [facebook](#)

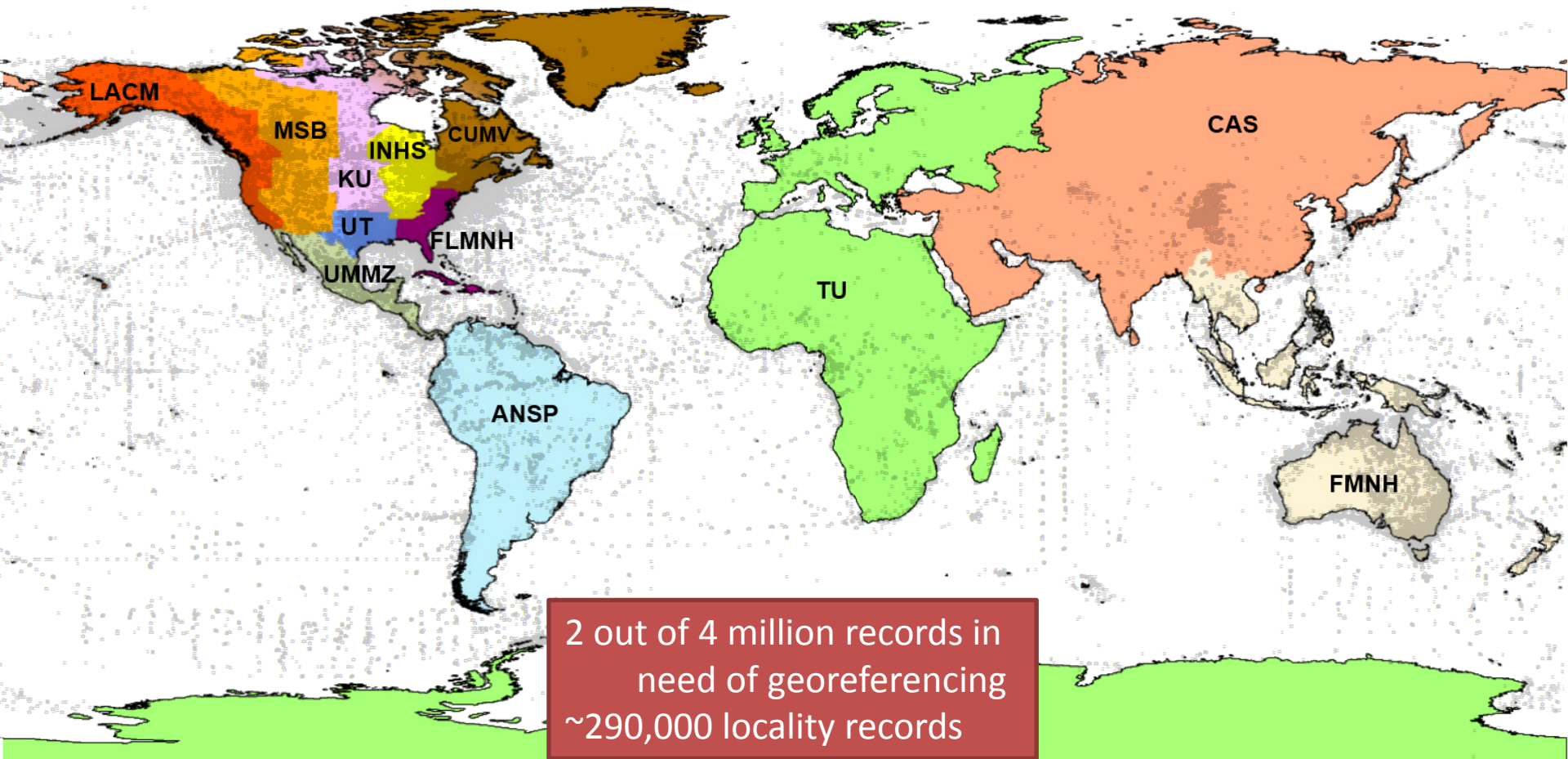
Development funding provided by:
National Science Foundation | National Biological Information Infrastructure
© 2010 FishNet 2 - All Rights Reserved
Updated Aug. 13, 2010

Distributed Georeferencing

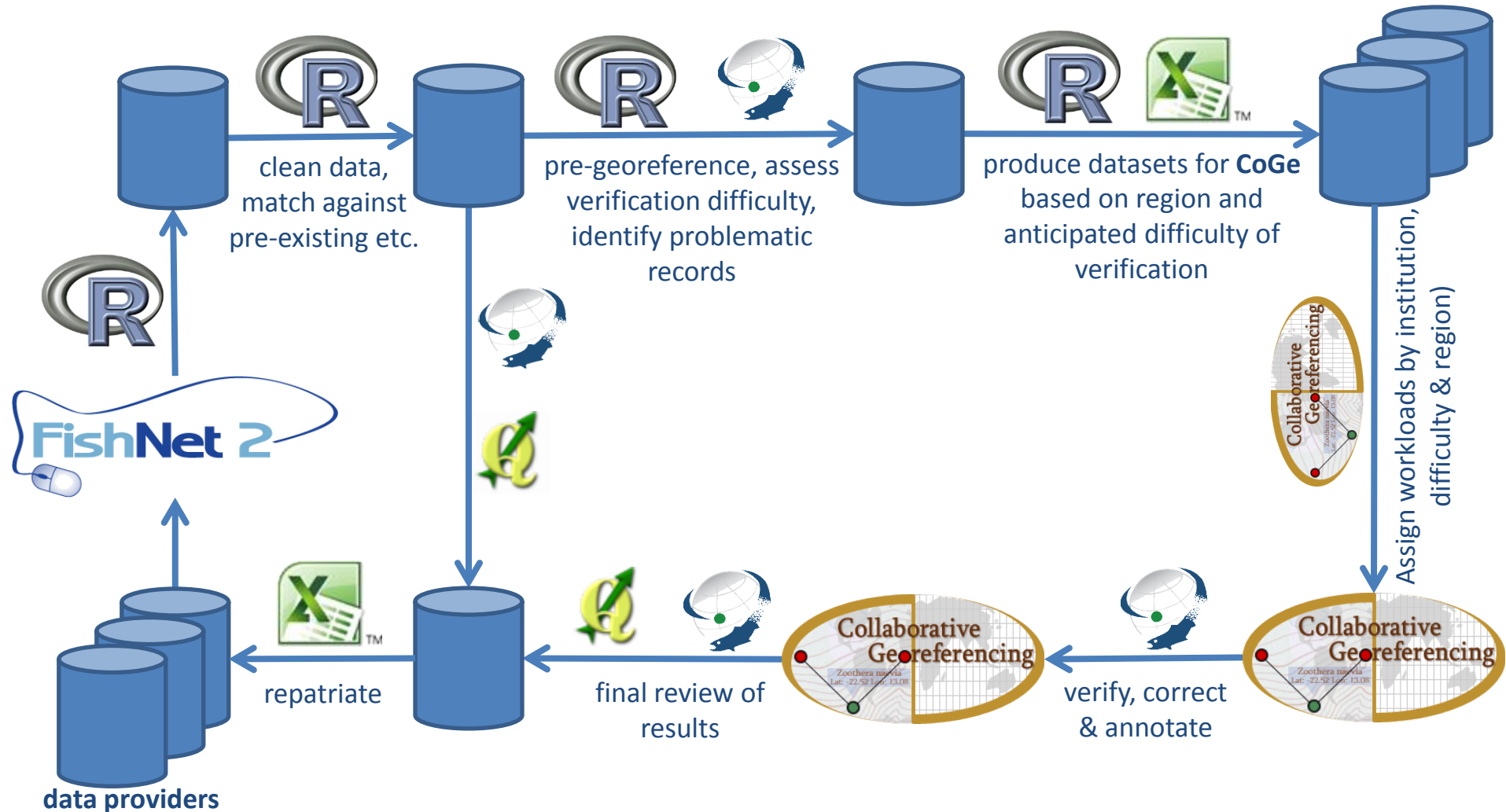




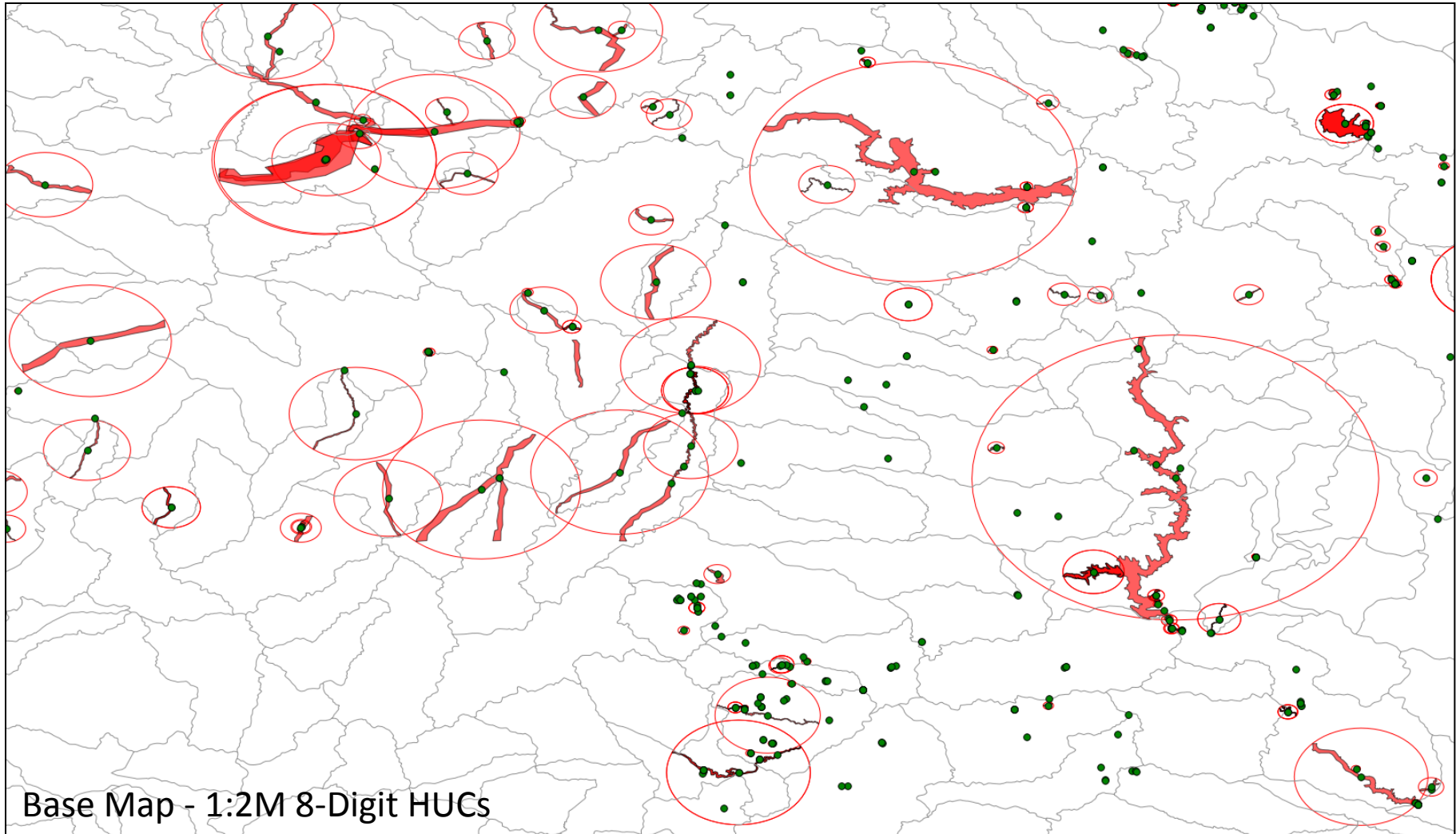
“Preliminary” Assignments



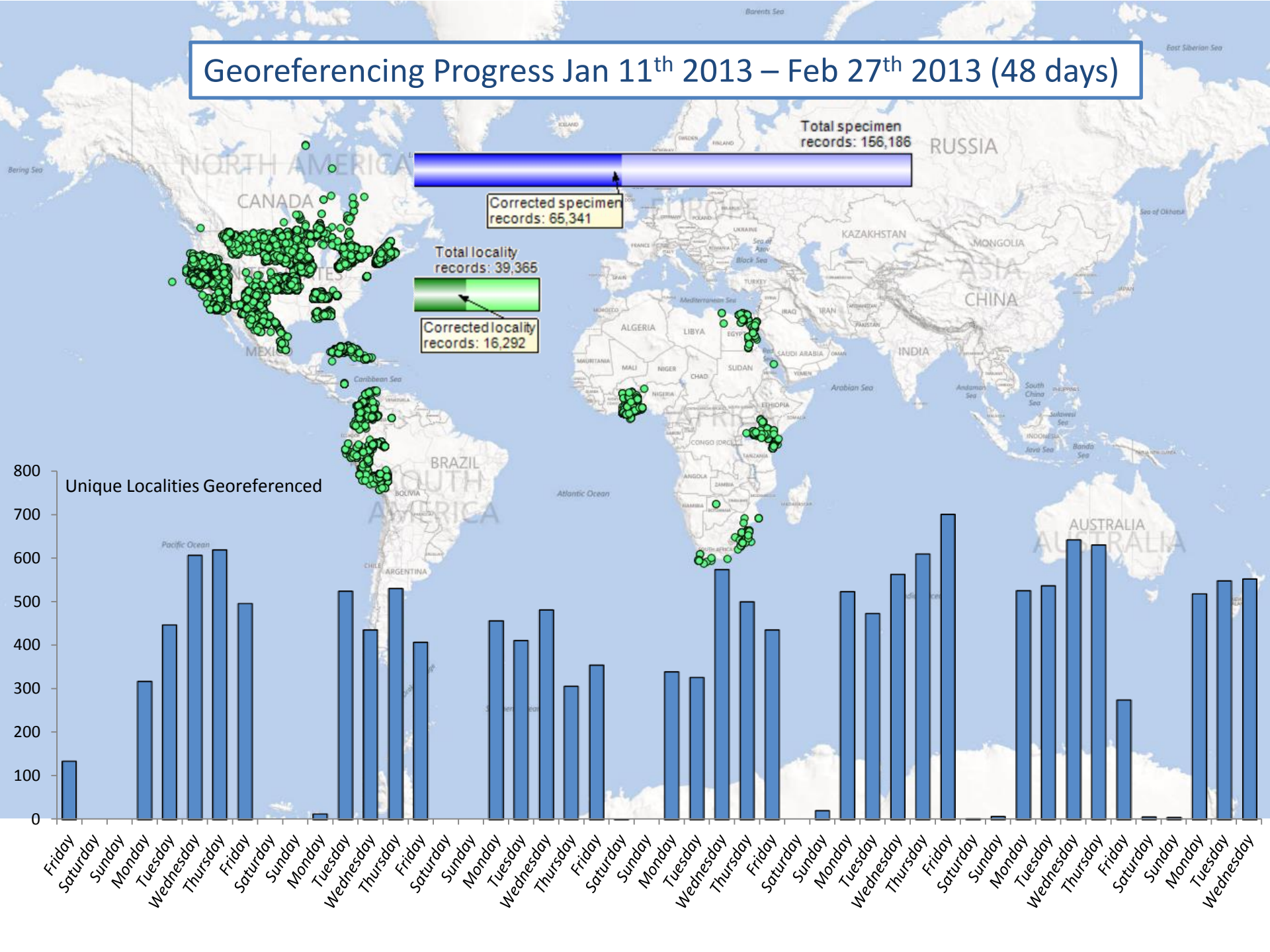
Workflow: Integrating API's



Representing Uncertainty



Georeferencing Progress Jan 11th 2013 – Feb 27th 2013 (48 days)



Acknowledgements

Djihbrihou Abibou

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Bill Fink

John Friel

Ed Gilbert

Justin Grubich

Dean Hendrickson

Mariangeles Arce Hernandez

Benito Lorenzo

Theresa Lorraine McInnes

Amy McCune

John Lundberg

Dusty McDonald

Douglas Nelson

Gil Nelson

Larry Page

Luiz Rocha

Megan Roberson

Rob Robins

Mark Sabaj

Leo Smith

Norine Spears

Rod Spears

Alexandra Snyder

Chris Taylor

Christine Thacker

Tom Turner

Michelle Vanderwel

Rachel Vinsel

Mark Westneat

Katy Wichman

Ed Wiley

