

# Georeferencing Fish Collections from the FishNet Network: An Update of Progress and Evaluation of Collaborative Georeferencing Techniques

Nelson E. Rios  
Henry L. Bart Jr.  
Michael H. Doosey



SPNHC 2014  
Cardiff, Wales, UK  
22 – 27 June, 2013



# FishNet



*Centropyge heraldi*, Vanuatu. Photo by Dr. J. T. Williams, © Smithsonian Institution

**Fish Links**  
[FishNet Partners](#)  
[KU Fishes](#)  
[ITIS](#)

Updated 13 Nov 2003

## What is FishNet?

**Funded by:**  
[The National Science Foundation](#)  
[Grant DEB-998573](#)

Fishnet is a "distributed information system" that uses Z39.50 and XML protocols to link together the specimen records of museums and other institutions in a seamless information retrieval system. Using Fishnet

[The National Oceanographic Partnership Program](#)  
[The Office of Naval Research](#)

[Census L](#)  
[CoML](#)  
[CORE](#)  
[NOPP](#)

[Data Link](#)  
[Appendix to V](#)  
[et al. paper submitted to Oceanography](#)

[Desktop GARP](#)

Home Species Analyst

[KU NHM & BRC](#)  
[Informatics](#)  
[LifeMapper](#)  
[Specify](#)  
[SEEK](#)

[Species Analyst](#)

[Search Collections](#)  
[Documentation](#)  
[Darwin Core](#)  
[DiGIR](#)  
[Downloads](#)

[TSA Affiliated Projects](#)

[FishNet](#)  
[MaNIS](#)  
[HerpNet](#)  
[DiGIR](#)  
[CBIF](#)  
[GBIF](#)

© 1998-2004

View document source, Generated on: 20

### Species Analyst

**Author:** Dave Vieglais  
**Revision:** 1.6  
**Date:** 2003-06-30

The Species Analyst is a research project developing standards and software tools for access to the world's natural history collection and observation databases. The Species Analyst project is based at the [University of Kansas Natural History Museum](#)



Powered By  
**DiGIR**

FishNet2 Home : Portal Home

Select type of network query

- ☒ View specimen
- ☐ View taxonomic
- ☐ View geography
- ☐ View taxonomy
- ☐ View gazetteer



[Search](#)  
[News](#)  
[About](#)

[Join FishNet](#)  
[Contact Us](#)  
[Help](#)

### Search FishNet:

[+] Click to minimize Text Search Fields

Taxons:

Location:

Institution Code and/or Catalog Numbers:

Date Range (yyyy-mm-dd):

Other:

[Beta] Search Polygon (in WKT-known Text format):

You may use the map below to draw a polygon. Doing so will populate this text.

[+] 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. 12, 2010

# History

**1999:** Creation of original FishNet Network

Z39.50 protocol for sharing data

Search via Species Analyst (distributed query model)

**2005:** FishNet 2 created

Transition to DiGIR Protocol

Search via DiGIR Portal (distributed query model)

**2010:** FishNet 2 (centralized query model)

Crawls & Indexes DiGIR, DwCA, IPT, TAPIR & text files

Search via FishNet 2 Portal

**2012-2016:** Portal & data expansion and enhancement

# FishNet 2

global network

71 data providers



3.7 million lots

35+ million specimens

57% georeferenced



Taxon:

Location:  >>

Institution Code and/or Catalog Number:  >>

Date Range (yyyy-YYYY):

Other:

[Beta] Search Polygon (Paste [WKT](#) or select from menu):  >>

You may use the map below to draw a polygon.  
Doing so will populate this field.

Continent/Ocean:

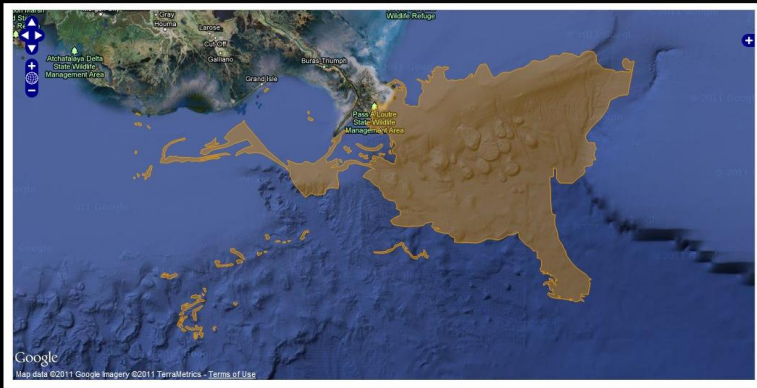
Country:

State/Province:

County:

For a finer-grained location search, fill in any or all of the above fields.

Code	Institution
AM	Australian Museum - OZCAM
ANSP	Academy of Natural Sciences at Philadelphia
BPBM	Bernice Pauahi Bishop Museum, Department of Natural Sciences - Bishop Museum Natural Sciences Data



**Full Text Searches**  
**Common Names**  
**Synonyms**  
**Institutional**  
**Temporal**  
**Geographic**

# FishNet Expansion & Enhancement

**Expand** the number of records within FishNet to approximately 4 million lots representing over 30 million specimens

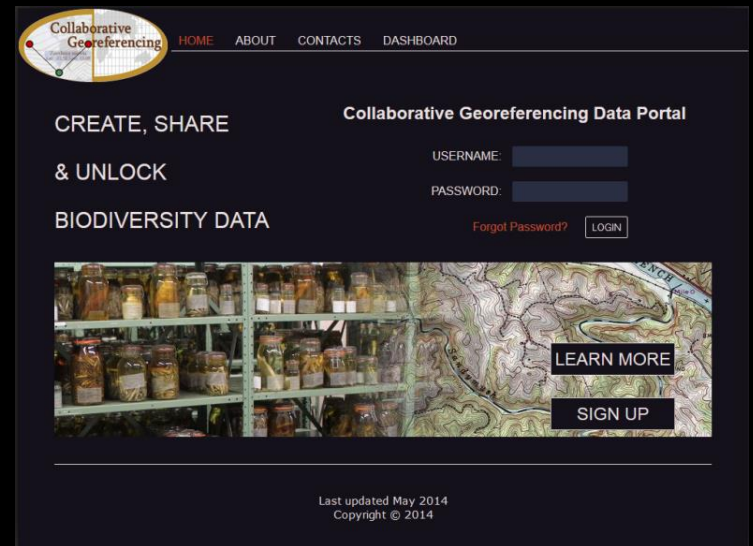
**Georeference** the "georeferencable" records lacking geographic coordinates

**Repatriate** results to source data providers

**Evaluate** volunteer vs technician contributions

# Georeferencing

- 1.2 million lots
- 250,000 collecting events
- 18 months
- 12 full time technicians
- Student volunteers
- Collaborative Georeferencing



# The Dirty Dozen

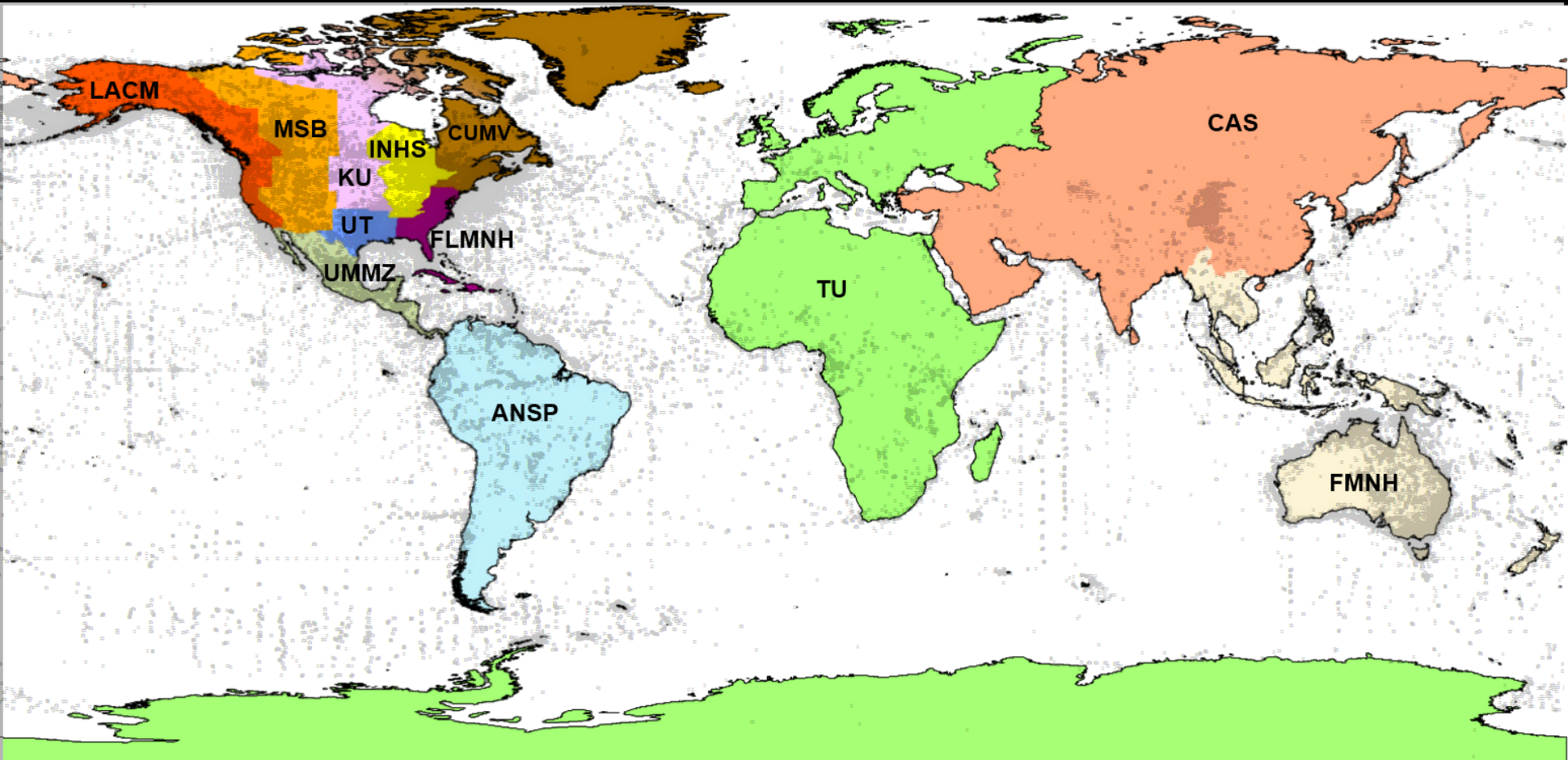


# Workflow

- Harvest data by Institution from FishNet
- Standardize higher geographies, minor data cleaning
- Partition into regional datasets
- Upload to data portal
- Assign datasets to technicians
- GEOLocate
- Review results
- Repatriate



# Preliminary Assignments



1.6 million lots in need of georeferencing  
321,102 locality records (250K proposed)



## FishNet 2

DATA SOURCES

MEMBERS

SNAPSHOT

SETTINGS

### Data source management operations

- Add new community data source via CSV files

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

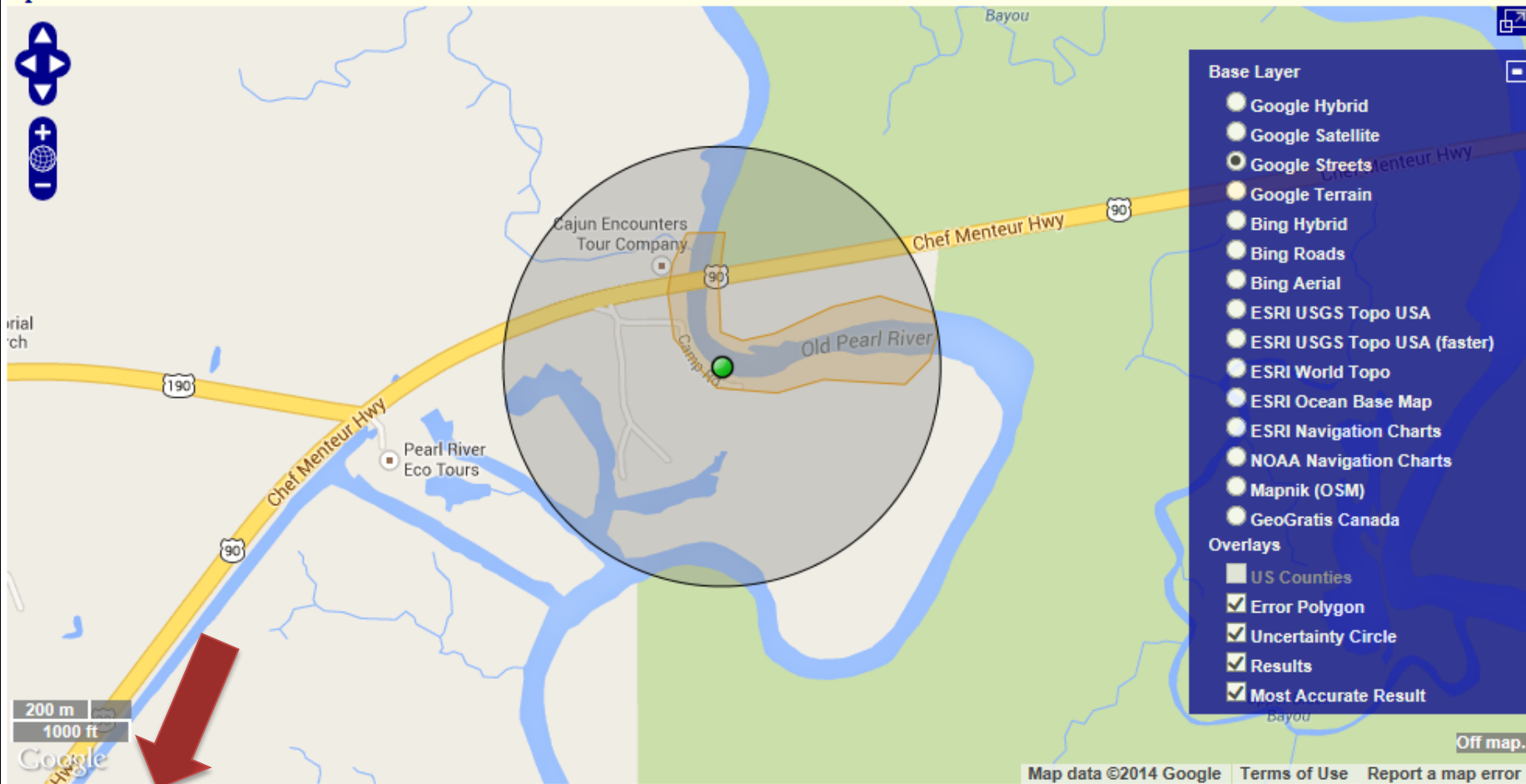
sort by **date** ^

community-wide	
Community Owner:	you
Community description:	Collaborative georeferencing of data from FishNet 2
Number of community data sources:	168
Records statistics:	
<div><div>Specimens: 1,302,853</div><div><div>corrected: 1,122,421</div><div>skipped: 122,175</div><div>total processed: 1,244,596</div></div></div> <div><div>Localities: 289,412</div><div><div>corrected: 244,749</div><div>skipped: 35,118</div><div>total processed: 279,867</div></div></div>	<div>VIEW RECORDS</div> <div>DOWNLOAD RECORDS</div>
✓ iowa_with_county	date added: Monday, January 07, 2013 <div>delete</div>
✓ Maine_with_county	date added: Monday, January 07, 2013 <div>delete</div>
✓ Minnesota_with_county	date added: Monday, January 07, 2013 <div>delete</div>
✓ Montana_with_county	date added: Monday, January 07, 2013 <div>delete</div>
✓ Nevada_with_county	date added: Monday, January 07, 2013 <div>delete</div>

# GEOLocate Collaborative Georeferencing Web Client



1 possible location found.



Workbench

1 possible location found

History

Review

Community: FishNet 2

Clear Polygon

☐ Draw polygon

☐ Place marker

☐ Measure

Next Record(s)

☒ Luggar Landing, West Pearl River, Starlding; United States; Louisiana; ;

Correct

☐ FMNH14004 *Fundulus chrysotus*

Skip Selected

☐ Similar Records(5)

Add Comments

☐ Luggar Landing, West Pearl River near Starlding; United States; Louisiana; ;

Clear Workbench

☐ West Pearl River, Starlding, Luggar Landing, Deer Island; United States; Louisiana; ;

Correction Report

☐ Luggar Landing, West Pearl River, near Starlding; United States; Louisiana; ;

Logout

logged in as nelson

Calculated Coordinates

Lat: 30.229134

Lon: -89.668154

U. Radius: 581 m

Manual Edit

Map data ©2014 Google

Terms of Use

Report a map error

# Similarity Matching

1 possible location found

History

Review

Community: FishNet 2

Clear Polygon

☐ Draw polygon

☐ Place n

Luggar Landing, West Pearl River, Starlding; United States; Louisiana; ;

FMNH14004 *Fundulus chrysotus*

☐ Similar Records(5)

☐ Luggar Landing, West Pearl River near Starlding; United States; Louisiana; ;

☐ West Pearl River, Starlding, Luggar Landing, Deer Island; United States; Louisiana; ;

☐ Luggar Landing, West Pearl River, near Starlding; United States; Louisiana; ;

Luggar Landing, West Pearl River, near Starlding; United States; Louisiana; ;

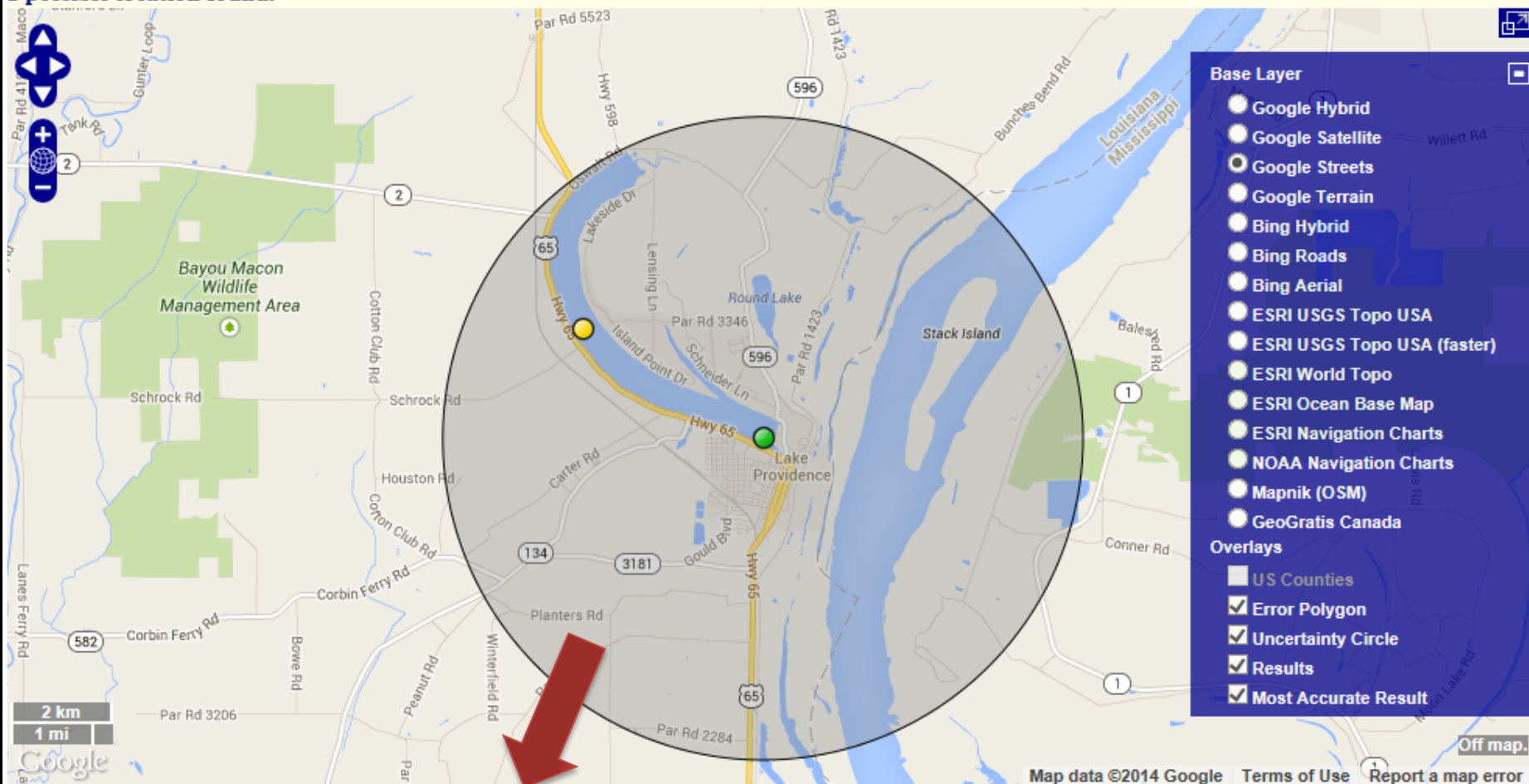
West Pearl River, Starlding, Luggar Landing, Deer Island; United States; Louisiana; ;



# GEOLocate Collaborative Georeferencing Web Client



1 possible location found.



Workbench 1 possible location found History Review

Manage History

show  records

Options

☐ get skipped

☒ get corrected

...get previous set...

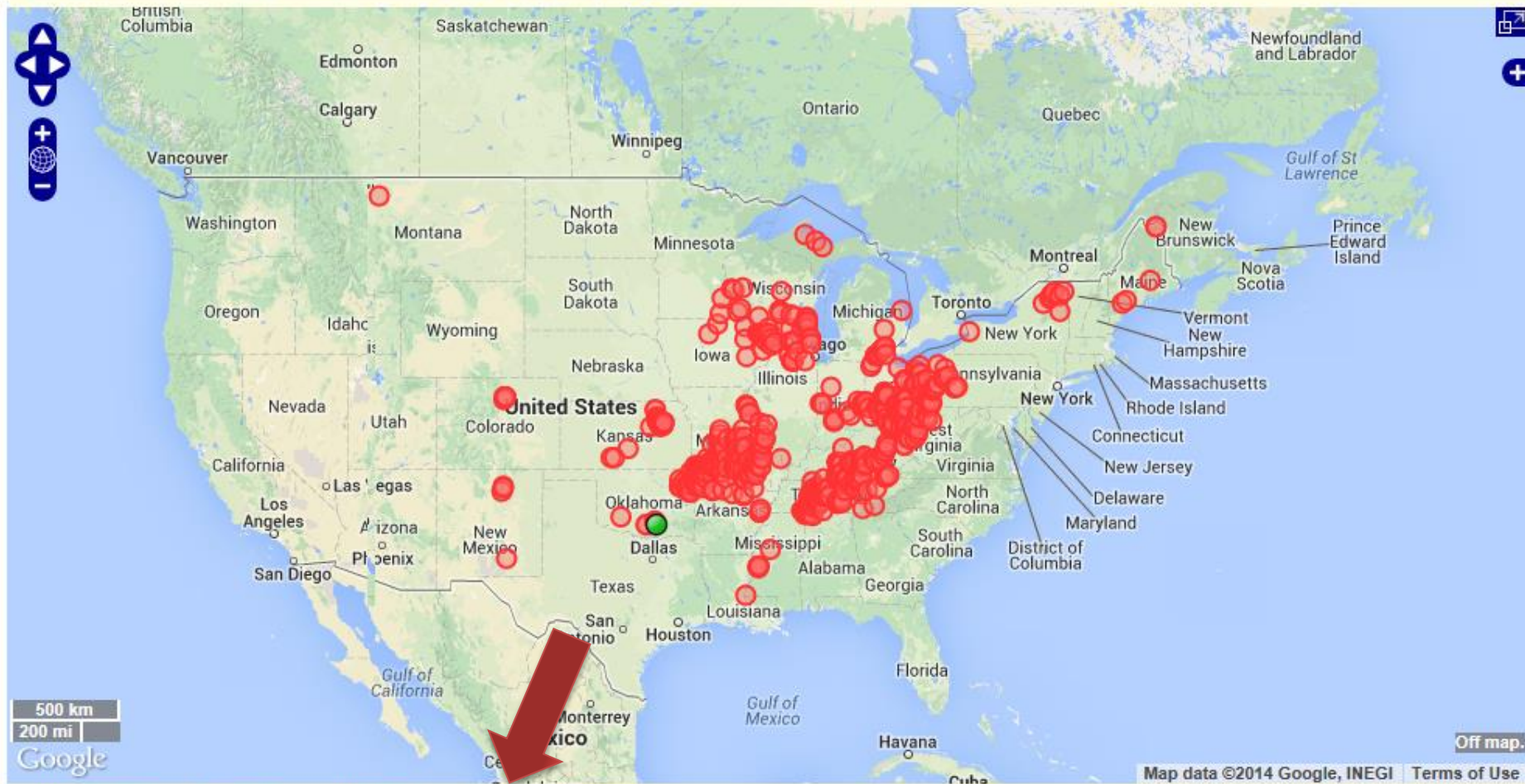
- \*corrected on 9/10/2013 4:17:36 pm\* Avery Island.; United States; Louisiana; Iberia;
- \*corrected on 9/10/2013 4:17:36 pm\* Avery Island; United States; Louisiana; Iberia;
- \*corrected on 9/10/2013 4:14:36 pm\* Lake Providence, South Shore; 6 to 12 inches in depth; sand bottom; United States; Louisiana;
- \*corrected on 9/10/2013 4:13:59 pm\* Lake Providence; United States; Louisiana; East Carroll;**
- \*corrected on 9/10/2013 4:11:19 pm\* Meridian Cr. on LA 348, 1 mi. E of Conway; T22N-R1W-Sec.17; United States; Louisiana;
- \*corrected on 9/10/2013 4:09:59 pm\* Tickfaw R., 0.5 mi. W of Holden on US 190; United States; Louisiana; Livingston;

Options

☒ include localities with matching determination

☐ exclude outdated determinations

# GEOLocate Collaborative Georeferencing Web Client



Off map.

Map data ©2014 Google, INEGI Terms of Use

Workbench

Results

History

Review

Active Related

1 collecting event at that location.

Reviewing records for scientific name 'PHOXINUS

ERYTHROGASTER'. Edit...

Comments:

☒ ☐ Blue River Prosper 1 mi E of St Rte 99 & Connerville., United States; Oklahoma; Johnston



Page 1 of 1

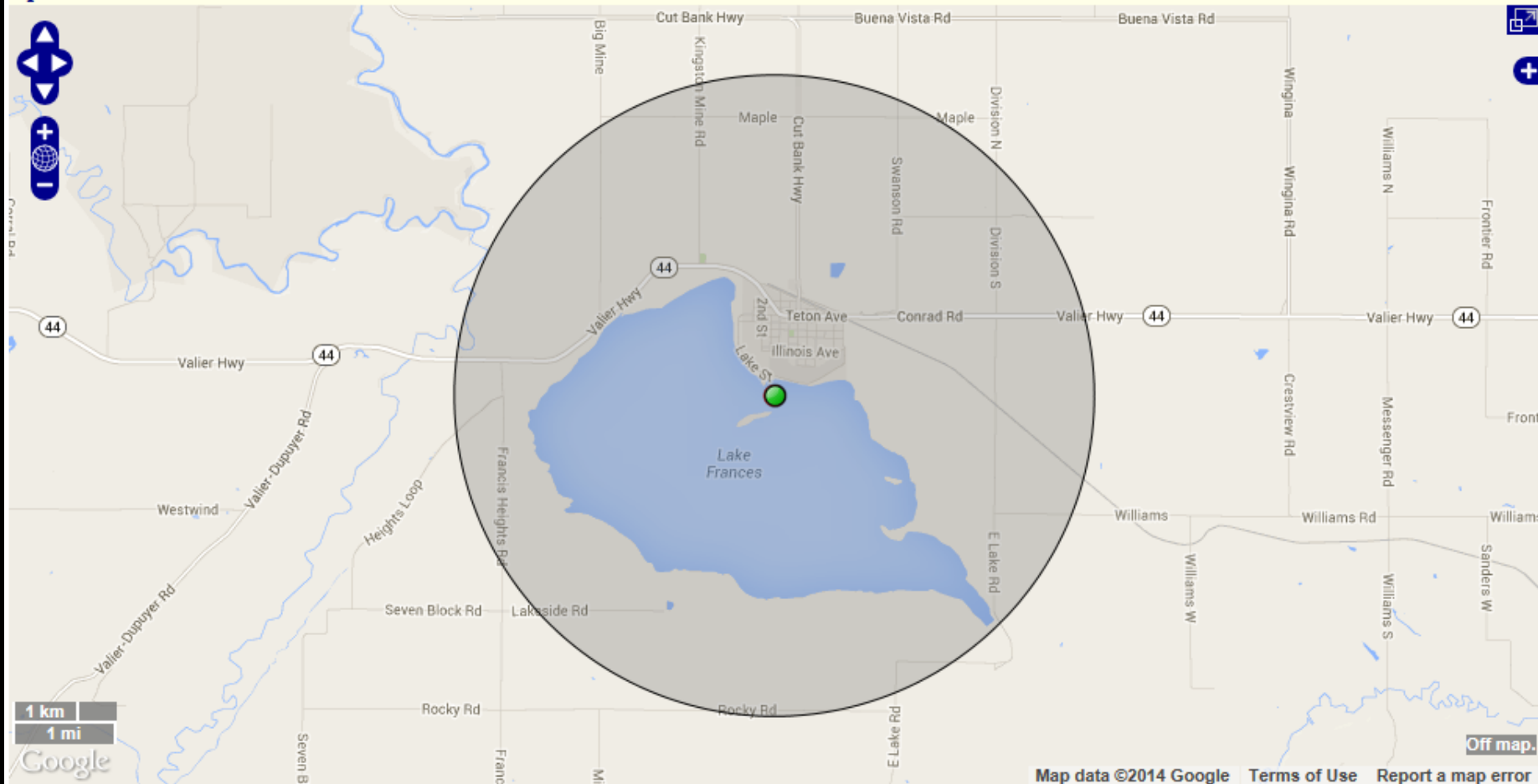


move to workbench

# GEOLocate Collaborative Georeferencing Web Client



1 possible location found.



Workbench

1 possible location found

History

Review

Community: FishNet 2

☐ Draw polygon 
 ☐ Place marker 
 ☐ Measure

Next Record(s)

Correct

Skip Selected

Add Comments

Clear Workbench

Correction Report

**LAKE FRANCES, 5 MI. W OF VALIER, IRRIGATION DITCH FEEDS THE LAKE AND FLOWS OUT OF**

UWFCUW 002716 CATOSTOMUS CATOSTOMUS

UWFCUW 002717 CATOSTOMUS COMMERSONI

UWFCUW 002719 COUESIUS PLUMBEUS

UWFCUW 002715 ONCORHYNCHUS CLARKII

Logout

logged in as nelson

Calculated Coordinates

Lat: 48.296377

Lon: -112.255363

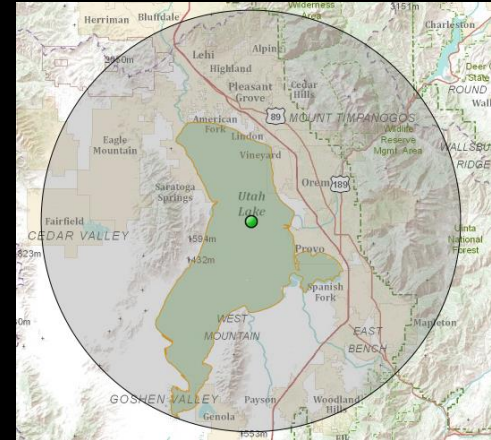
U. Radius: 5214 m

Manual Edit



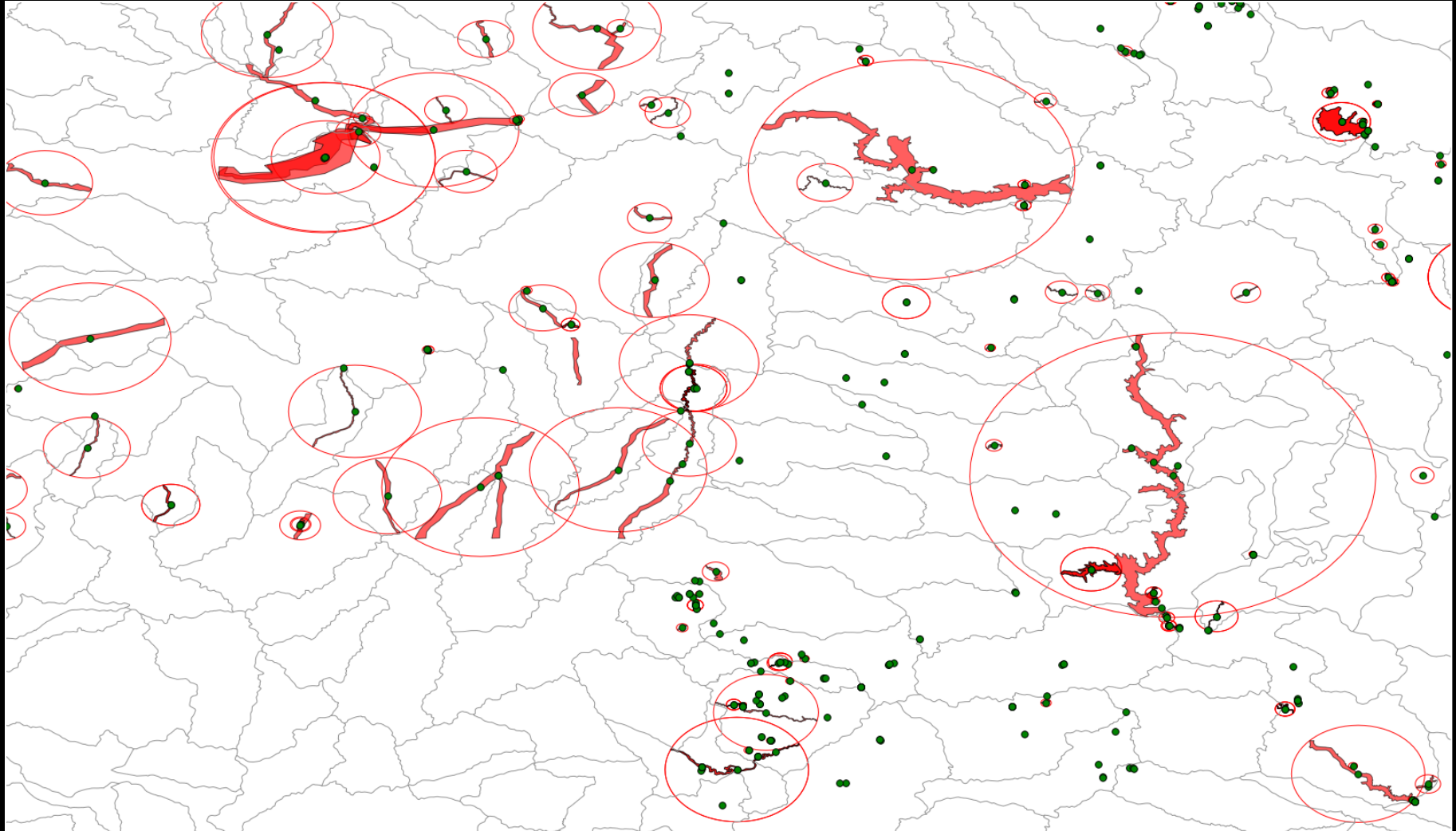
# Representing Uncertainty

- Point-Radius
- Polygons
- Protocols
- Technician Discretion





# Georeferencing Output



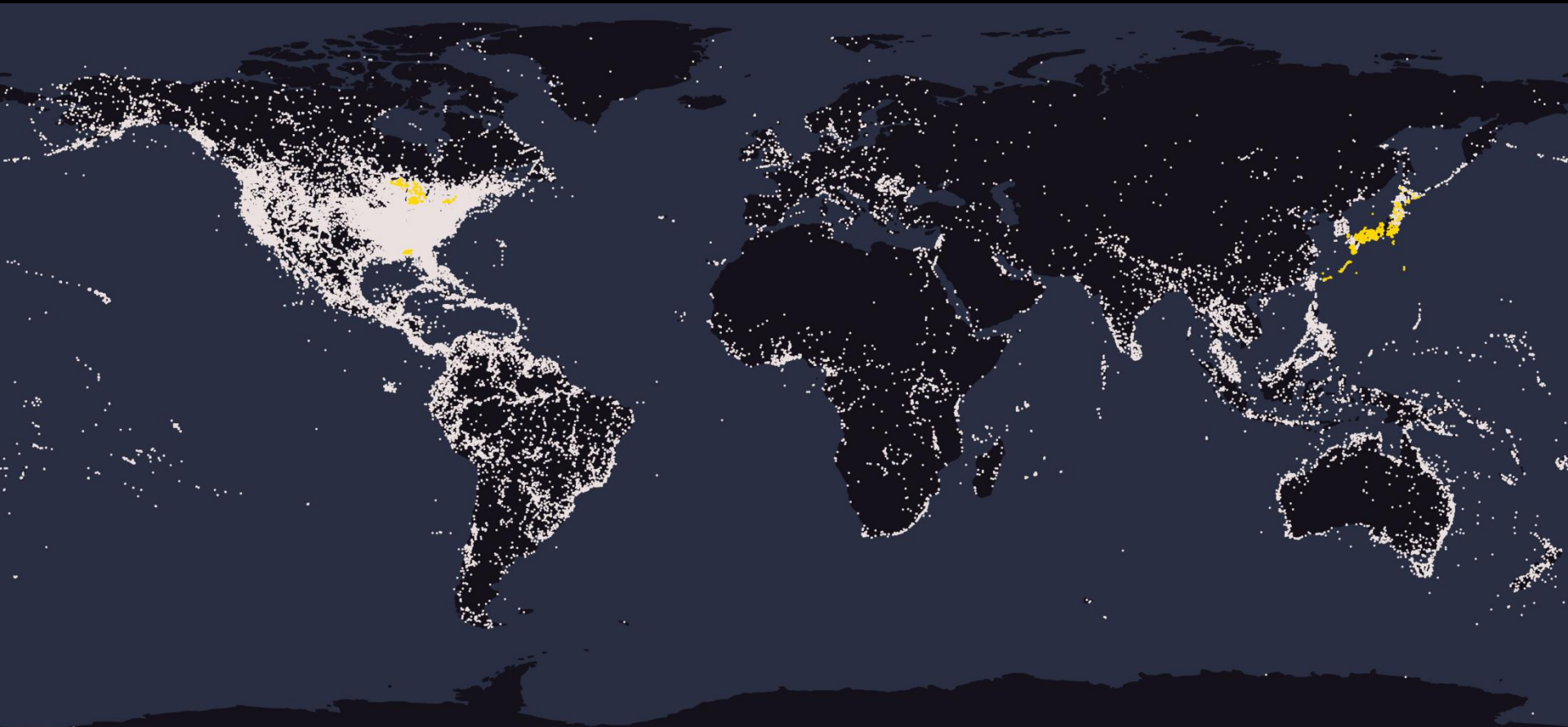
Base Map - 1:2M 8-Digit HUCs

# Georeferencing Status

11 January – 19 Jun 2014

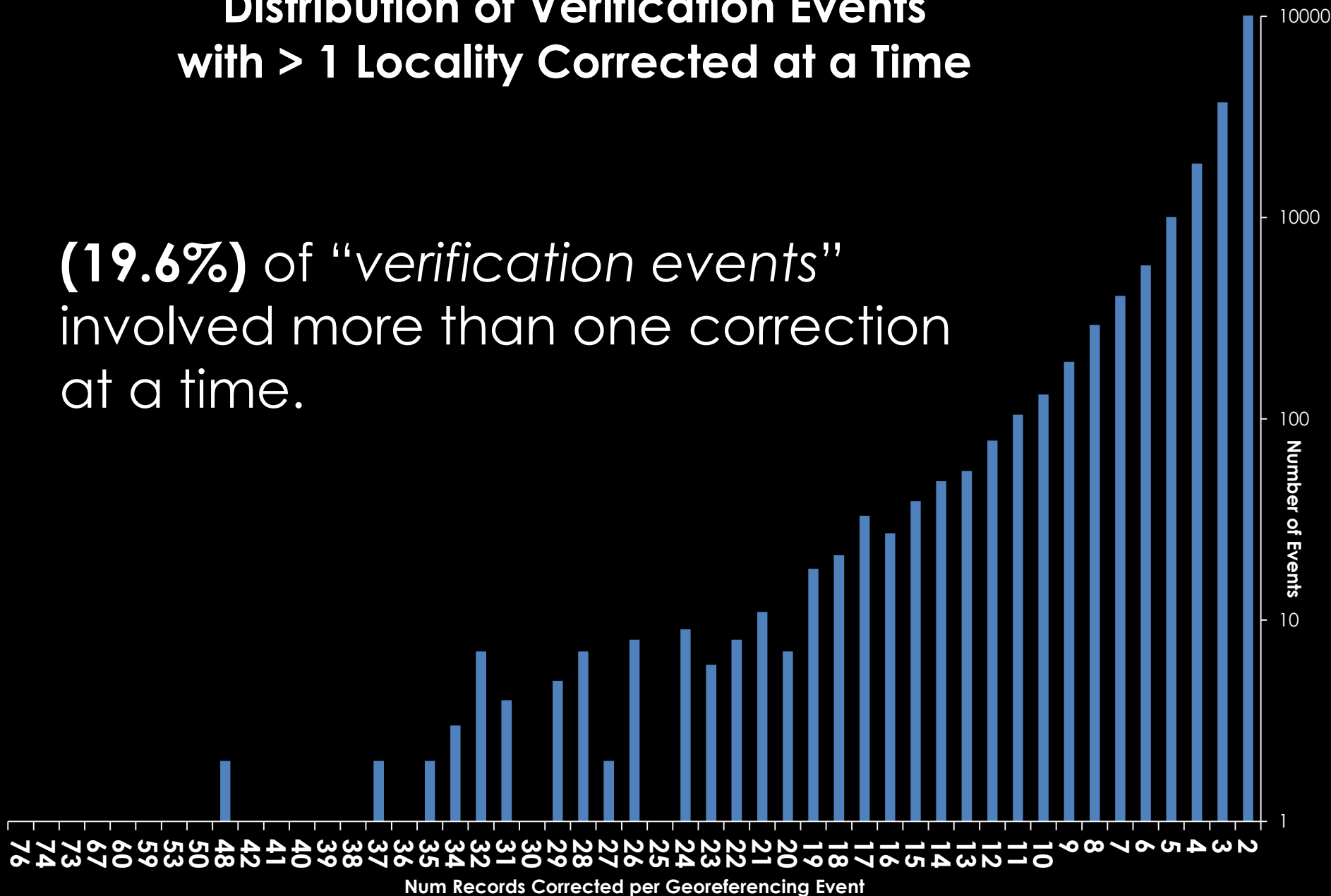
1.3M Specimens

282K Localities



## Distribution of Verification Events with > 1 Locality Corrected at a Time

(19.6%) of “verification events”  
involved more than one correction  
at a time.



# Breakdown of Technician & Volunteer Contributions

## Technicians:

- 279,124 locality verifications
  - 244,093 corrected
  - 35,031 skipped
  - 87% correction ratio
  - Global
  - Extensive training and support

## Volunteers:

- 7,744 locality verifications
  - 6,987 corrected
  - 757 skipped
  - 90% correction ratio
  - Lower 48 states
  - 2 hours of training

3,372 localities were duplicates of other records used for quality control and volunteer evaluation



# Volunteers vs Technicians

- 11 student volunteers compared to 8 technicians
- 3,372 overlapping records
- 295 mean records per volunteer/tech comparison
- 15 volunteer/tech comparisons

# Volunteers vs Technicians

	Volunteer	Technician
% Corrected	89.7 %	93.1%
% Polygon	69 %	85 %
Mean Radius	2,121 m	3,590 m
Mean Radius (5% trim)	1,093 m	2,503 m
Mean Radial Area	14,132,897 m <sup>2</sup>	40,489,160 m <sup>2</sup>
Mean Radial Area (5% trim)	3,753,100 m <sup>2</sup>	19,682,106 m <sup>2</sup>
Mean Polygon Area	2,531,001 m <sup>2</sup>	5,570,622 m <sup>2</sup>
Mean Polygon Area (5% trim)	656,715 m <sup>2</sup>	4,561,648 m <sup>2</sup>
Mean Point Difference	16,297 m	
Mean Point Difference (5% trim)	2,290 m	

12/15 comparisons showed significant (p .05) difference in the length of the radius between tech and volunteer.

8/15 comparisons showed significant (p .05) difference in the area of the polygon between tech and volunteer.

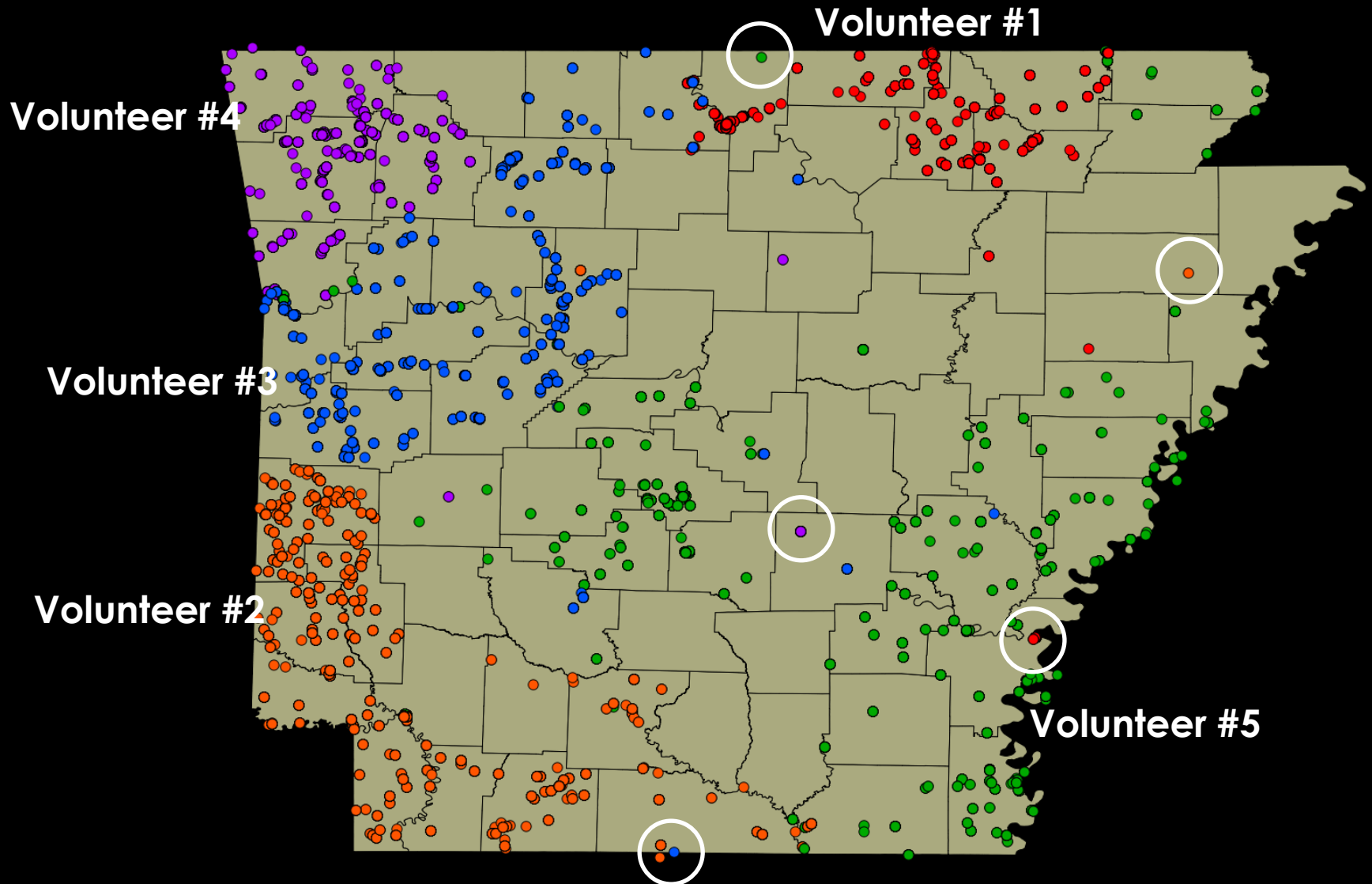


# Volunteers vs GPS

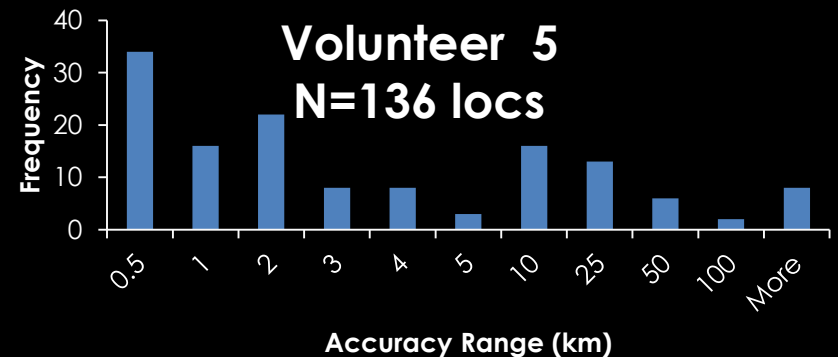
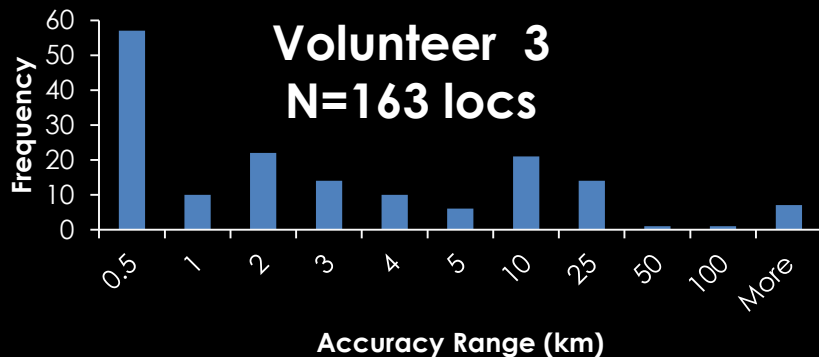
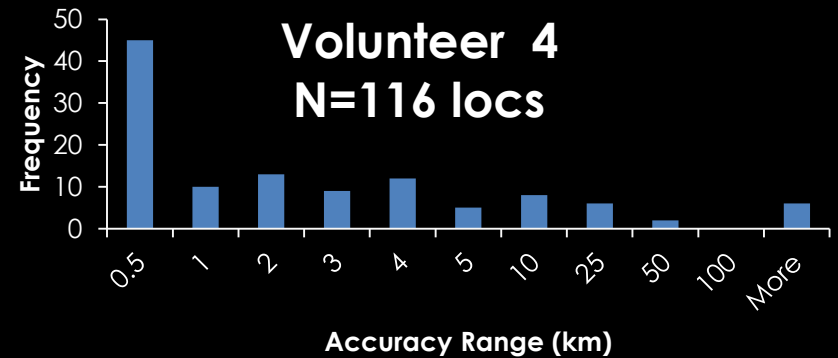
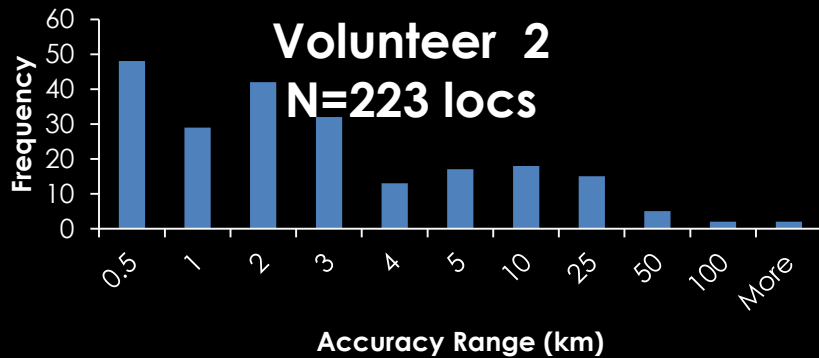
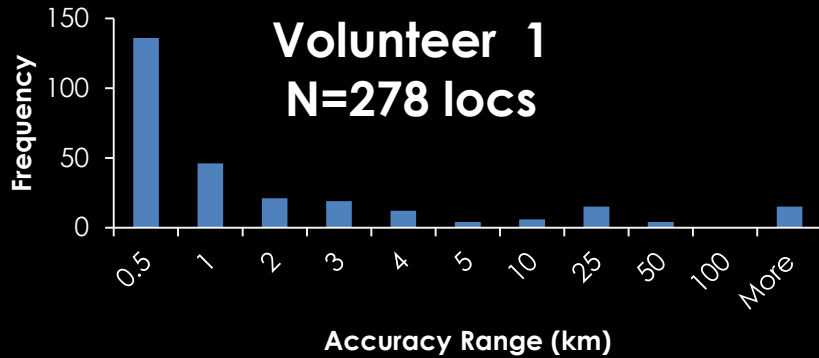
- 7,463 lots (916 localities) with coordinates randomly selected spanning the state of Arkansas.
  - Data provided by KU, MMNS, NCSM, OKMNH, OSUM, ROM, TU, USNM, YPM via FishNet
- Group into 5 regional datasets
- Each region assigned to a volunteer for georeferencing
- Evaluated accuracy of volunteer results



# Volunteer Results



# Georeferencing Profiles



# Contributors of Inaccuracy

- Inexperience in Georeferencing
- Lack of geographic familiarity with regions
- Lack of access to original resources (catalogs, field notes, ship logs etc.)
- Specificity assessments
  - 6 miles west of Dierks
- Errors in original data
  - Original data still need to be double checked for inaccuracies (likely reason for large inaccuracies)
- Student Volunteer motivation over time

# Acknowledgements

## Institutional Collaborators

Andy Bentley	Luiz Rocha
Dave Catania	Rob Robins
Michael Doosey	Mark Sabaj
Rick Feeney	Leo Smith
Bill Fink	Alexandra Snyder
John Friel	Chris Taylor
Dean Hendrickson	Christine Thacker
Amy McCune	Tom Turner
John Lundberg	Mark Westneat
Douglas Nelson	Ed Wiley
Larry Page	

## Georeferencing Technicians

Diego Barroso  
Melissa Casarez  
Paul DeSalles  
Justin Grubich  
Mariangeles Arce Hernandez  
Estella Hernandez  
Benito Lorenzo  
Theresa Lorraine McInnes  
Laura Porturas  
Megan Roberson  
Michelle Vanderwel  
Rachel Vinsel  
Katy Wichman  
INHS & TU Student Volunteers



This material is based in part upon work supported by the National Science Foundation under Grant Numbers DBI-0852141 and DBI-1202953. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.