Georeferencing for Paleo: Refreshing the approach to fossil localities
A virtual workshop, April 2020

Essential Links

Share this document: https://bit.ly/3eEpkag

Tips for using Zoom: https://bit.ly/2wV6j2v

Virtual workshop participant introductions: https://bit.ly/2wXvO3a

Shared workshop content: https://tdwg.github.io/esp/georeferencing/workflows
        content is also linked via this document under "Notes for shared content"

Workshop logistics wiki: http://bit.ly/SLC-geo-paleo

Post-workshop feedback survey: https://fsu.qualtrics.com/jfe/form/SV_5oJ3Wxt3j2RPBn7

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Notes for shared content (prerecorded talks, workflow documents, etc.)

Content link: [*https://tdwg.github.io/esp/georeferencing/workflows*](https://tdwg.github.io/esp/georeferencing/workflows)
Welcome! Please feel free to add comments or questions about any of the prerecorded content or other shared materials as you review them prior to the workshop's live Zoom sessions. We have created subheadings for the materials that were contributed by other workshop participants. If you are an author, please feel free to answer any questions posed here. We may have time to discuss notes in this section during our live Zoom sessions if desired.

Ashley Dineen, UCMP

[Using GeoLocate for collaborative georeferencing](#)

[add questions/answers/comments here]

Bushra Hussaini, AMNH

[AMNH Retrospective Georeferencing - Converting Text Descriptions Example](#)

[add questions/answers/comments here]

Carrie Levitt-Bussian

[UMNH EMu database screenshots](#)

[add questions/answers/comments here]

Daniel Markbreiter, LACMIP

[Using Collector for ArcGIS to manage field collections](#)

[add questions/answers/comments here]

Giles Miller

[NHM London EMu database screenshots](#)

[add questions/answers/comments here]

Greg Liggett, BLM

[Specimen Replication from a BLM Perspective](#)

[add questions/answers/comments here]

[Using the RAPTOR Tool for BLM Permits](#)

[add questions/answers/comments here]

[Protecting Paleontological Locality Data from a BLM Perspective](#)

[add questions/answers/comments here]

[From Public Lands to Museums - Liggett et al 2018](#)

[add questions/answers/comments here]

Holly Little, NMNH

[Establishing a New Framework for Paleontological Data Through an Evolution of Current Data Sharing Practices - Little 2018 (PDF)](#)

[add questions/answers/comments here]

[NMNH EMu database screenshots](#)

[add questions/answers/comments here]

Jacob Van Veldhuizen, CU

[Using ArcGIS Pro to Double Check Georeference Results](#)

[add questions/answers/comments here]

[CU Georeferencing localities](#)

[add questions/answers/comments here]

[CU Mapping localities](#)

[add questions/answers/comments here]

[CU database screenshots](#)

[add questions/answers/comments here]

Janaki Krishna

[Where UMNH files landownership data in EMu](#)

[add questions/answers/comments here]

Jen Bauer, UMMP

[UMMP EMu database screenshots](#)

[add questions/answers/comments here]

Jessica Utrup, YPM

[Implementing Data Standards - Utrup 2020 (PDF)](#)
[add questions/answers/comments here]

CB: Thank you for the links to 6 countries worth of geologic lexicons!
JU: You're welcome! I have a wealth of random links to place names and geologic lexicons and conversion tables as towns went from having German names to French or German to Polish. Feel free to ask if you're ever looking for anything weird - I've spent the last thirteen years gathering links. jessica.utrup@yale.edu
CB: Fantastic! Thank you! The Imperial Gazetteer has been a big help here so far but the proper database format is certainly easier to navigate and search.

[YPM Georeferencing Best Practices](#)

[add questions/answers/comments here]

[YPM EMu database screenshots](#)

[add questions/answers/comments here]

Lindsay Walker, LACMIP

[Introduction to Georeferencing at LACMIP](#)

[add questions/answers/comments here]

[LACMIP EMu database screenshots](#)

[add questions/answers/comments here]

Luis Villanueva, NMNH

[Innovative methods for mass digitization](#)

[add questions/answers/comments here]

Margaret Landis, SNOMNH

[SNOMNH Georeferencing Localities Procedures](#)

[add questions/answers/comments here]

[SNOMNH Collection Information & Data Access/Sharing](#)

[add questions/answers/comments here]

Natalia López Carranza, KU

[KUMIP Georeferencing protocol](#)

[add questions/answers/comments here]

[KUMIP Specify database screenshots](#)

[add questions/answers/comments here]

Nelson Rios, YPM

[Getting Started with the GEOLocate Collaborative Georeferencing Data Portal](#)

[add questions/answers/comments here]

[Georeferencing with the GEOLocate Collaborative Georeferencing Data Portal](#)

[add questions/answers/comments here]

Nicole Neu-Yagle, DMNS

[DMNS EMu database screenshots](#)

[add questions/answers/comments here]

Nicole Volden, NMMNHS

[Georeferencing Public Land Survey System Localities](#)

[add questions/answers/comments here]

Paul Mayer, FMNH

[Georeferencing Fossils from Mazon Creek, Illinois](#)

[add questions/answers/comments here]

[FMNH EMu database screenshots](#)

[add questions/answers/comments here]

Trevor Dalton, LACMIP

[Example of Georeferencing a Specific Locality at LACMIP](#)

[add questions/answers/comments here]

Other

[add questions/answers/comments here]

Notes for Tuesday, April 28, Virtual Workshop Day 1

Zoom link: https://fsu.zoom.us/j/153464919
Welcome! Please feel free to add comments, questions, answers, links, etc. to this document.
Text highlighted in yellow is meant to flag areas of the notes where we really want everyone to chime in, although you are welcome to type notes into any section.

Icebreaker Question!

What is your favorite ice cream flavor?
- Strawberry +1
- Banana walnut
- Bananas Foster
- Vanilla +1+1+1+1+1
- Chocolate+1+1
- Orange chocolate malt
  - oooh I've never seen that before?! Sounds amazing
- Black raspberry
- Cookie Dough +1+1+1+1 +1+1
- Ben and Jerry's Half Baked (vanilla ice cream with chocolate chip cookie dough and fudge brownie) +1 +1
- Ben & Jerry's PB Cookie (Non Dairy)
- Oreo cake batter
- Spumoni
- Butter Pecan
- Ben & Jerry's Mint Chocolate Cookie
- Peanut butter chocolate (31 flavors) +1+1
- Neapolitan
- Pistachio +1+1
- Hazelnut
- Creme brulee
- Strawberry Basil Gelato
- Haagen Daaz, Vanilla Swiss Almond
- Lemon Sorbet

→ ***Zoom Poll***: *What taxonomic discipline do you most identify with?*

1. What taxonomic discipline do you most identify with?

Paleontology, general	(7) 18%
Paleontology, invertebrate	(12) 31%
Paleontology, vertebrate	(10) 26%
Paleobotany	(1) 3%
Botany	(2) 5%
Entomology	(2) 5%
Extant vertebrates (mammals, birds, fish, herps)	(1) 3%
Other	(3) 8%
None	(1) 3%
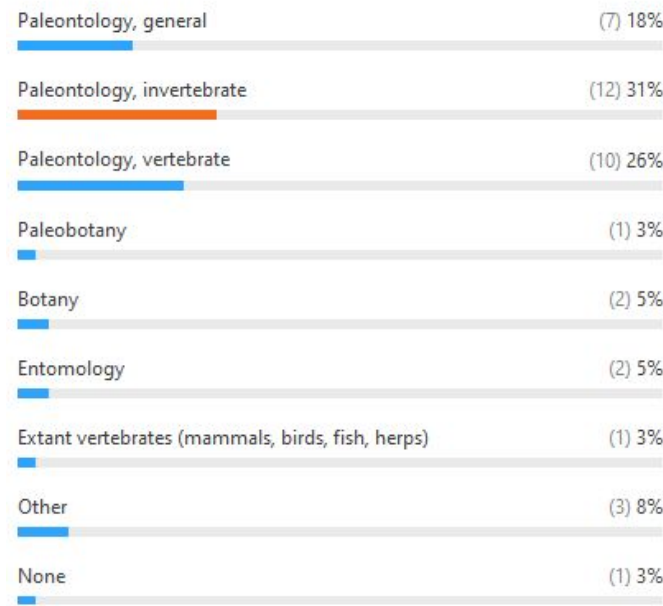
→ ***Zoom Poll***: *What is your familiarity with biodiversity data standards? Check all that apply.*

1. What is your familiarity with biodiversity data standards?
Check all that apply. (Multiple choice)

I am familiar with Darwin Core	(27/40) 68%
I am familiar with ABCD	(13/40) 33%
I've heard of Darwin Core but haven't used it	(10/40) 25%
I've heard of ABCD but haven't used it	(11/40) 28%
I am familiar with other standards	(6/40) 15%
What are biodiversity data standards????	(4/40) 10%
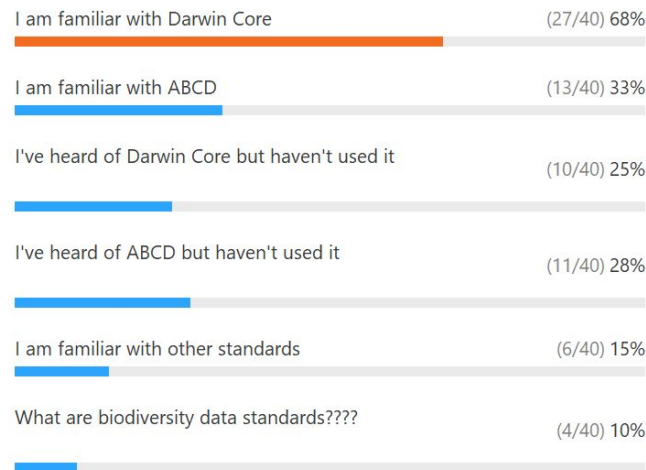
→ *Zoom Poll: Are you familiar with the Biodiversity Information Standard (TDWG) Organization that develops biodiversity data standards?*

2. Are you familiar with the Biodiversity Information Standard (TDWG) Organization that develops biodiversity data standards?

yes	(23) 58%
heard of it but not sure what they do	(11) 28%
no idea this organization existed	(6) 15%
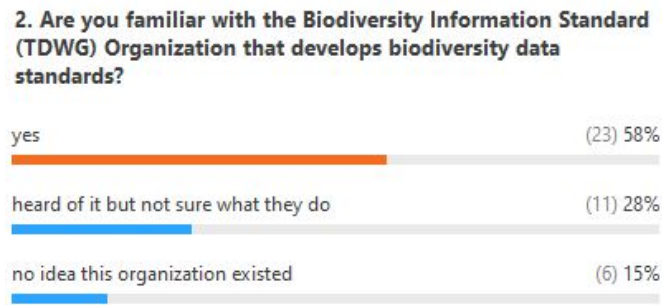
Notes/questions for Holly's presentation

- TDWG members built Darwin Core, ABCD, Audubon Media Core, Global Genomic Biodiversity Network data standards
- TDWG is the Biodiversity Information Standards organization (formerly known as the Taxonomic Databases Working Group)
- Controlled Vocabularies -- Does everyone know what these are?
  - Yes. Is there a place/list of controlled vocabularies somewhere?
    - yes, but we might need to clarify the difference between a "controlled vocabulary" and a "standard vocabulary" They are quite different.
      - Can we get more on how they are different?
    - Some controlled vocabs in known use are here and in that page, you'll find another link where you can add known controlled vocabularies in use.
- ABCD is much more comprehensive than DwC, 840 terms added by EFG!
  - How would we like to use this as a community?
    - This allows the sharing of much richer data.
    - note there's also a nascent activity underway to merge ABCD and DwC.
      - What would it be called: ABDwC? ABCwD? ABCDwC?
- Does ABCD and Darwin Core interact seamlessly?
  - in some systems built in the EU (BioCASe) yes.
  - also GBIF takes ABCD-mapped data as well
    - Does IPT allow ABCD-mapped data? (+1 - *How to implement this?*)
  - Some ABCD terms have DwC equivalents
- What are some of the data that cannot be mapped in Darwin Core?
  - DwC was always designed to be the minimal fields needed to share information to facilitate discovery; it was never meant to be complete up front, but rather a standard to evolve as we go.

- ○ Holly might have time to give us an example of what might be covered in ABCD that is not in DwC. Here's from her slide (where you can see terms already that are not in DwC).


```
PaleontologicalUnit/Preservation
PaleontologicalUnit/Preservation/Completeness
PaleontologicalUnit/Preservation/Form
PaleontologicalUnit/Preservation/Matrix
PaleontologicalUnit/Preservation/Mineralization
PaleontologicalUnit/Preservation/Taphonomy
PaleontologicalUnit/TimeRange
```

- ○ Out of scope for today…but taxonomy remains a big challenge for paleo data. Darwin Core only covers select ranks, which paleo data doesn't always follow. This has a lot of implications as we share our data and how aggregators ingest and possibly alter that data.
  - ■ I agree. I'd be curious to know how Darwin Core and/or ABCD would handle the use of clade names in taxonomy trees, as it appears that most dinosaur researchers are using clade names instead of traditional Linnaean taxonomy names.
- ○ Out of scope for today...but geological concepts of informally named units (like some coal beds or lithologic descriptions of 5 ft below a specific Formation) do not fit the traditionally applied Darwin Core terms of Group, Formation, Member.
- What is EFG? (from ABCD/EFG?)
  - ○ terms and concepts added to the ABCD standard to cover geo/paleo data needs
  - ○ EFG = extension for geosciences
- What are the reference points for the polygon numbers? An image? Coordinates of the vertices?
  - ○ Is there a character size or data size limit that is imposed for this field (e.g. can you only report so many vertices of the polygon before you run out of space?)
- Is there a standard way of noting that your lat/long is uncertain? As in, no datum ever listed in historic records. See dwc:geodeticDatum.
  - ○ yes, you would want to state something like "blanket policy to use WGS84 where none was available because these are legacy data." Note there are other datums you could use for other geographic areas.
  - ○ Also, many old sources won't have coordinates, and so the coordinates that you determine will have a known datum (like WGS84 for GEOLocate or Google Earth). There is also "unknown" which is accepted by Darwin Core when the datum is unknown.
  - ○ What field in DwC do I use to share the policy decision about what datum to use?
    - ■ There's not a set field I know of, but this is the kind of data that we (at YPM) put into the field "georeferenceRemarks." +1

- to Jess, could it be part of a given YPM developed "protocol" to say, "if USA, and no datum" use WGS84" -- in which case you could just refer to what you put in the dwc:georeferenceProtocol?
- Jess' response - I'd hesitate to do that. A number of the older USGS maps are in NAD27, and there could be a several hundred meter difference between coordinates in NAD27 and WGS84 depending on where you are in the country. Fortunately, we have hardly any legacy coordinates, so we don't run into this very often.
- Also an option! Or even a paleo collections community guideline if we were able to have a community consensus on how to handle this type of challenge

Notes/questions for Erica's presentation

- Georeference metadata fields are minimally used - which of these fields do we see as essential to add? Optional?
  - Sounds like this might be a good topic for a recurring Zoom meeting both the continue what we are doing with this virtual workshop and to help others apply what we discuss in the future
- Does anyone know if Collective Access has good georeference field-mapping options? It's gaining in popularity as the program of choice and I know it has an iDigBio sharing function of some sort in it, but not the coverage.
  - CollectiveAccess does have a georeferencing mapping option that you can add to a locality record. It's a bit confusing to learn how to use at first. How exactly that data is then shared on the public side of the database or shared with iDigBio is a good question. I'll share screenshots of our CollectiveAccess database to show you the georeferencing maps that are available.
- Major point brought up is the need for standardized (and reported!) land ownership. Very important in regard to federal lands in particular. (But also of other ownership to it not just the Feds who want reports)
  - Ownership at time of collection, ownership history, and current ownership of land, as well as ownership of specimen, all noted as important
  - Current field options in Specify:
    - Land ownership
      - "Land Status" drop-down field for locality records
      - Property status (pull-down for held-in-trust, permanent collections (pull-down choices also) for object records
  - We also use this: https://www.onxmaps.com/ for land ownership
  - Time plays a part in this—land ownership changes! How do you distinguish this in the database for the individual specimens?
  - Paul Mayer – We have a field in our EMu database called "Jurisdiction" for the area of jurisdiction, e.g., federal, state, local, etc.

- Historical name sources - *ALL LINKS BELOW ARE NOW ON THE* [RESOURCES SITE](#)
  - https://library.stanford.edu/guides/gazetteers
  - https://catalog.hathitrust.org/Record/011441350
  - https://www.usgs.gov/core-science-systems/ngp/board-on-geographic-names
  - UN's Toponomy Training Manual (https://unstats.un.org/unsd/geoinfo/ungegn/docs/Training%20Manual.pdf) by the United Nations Group of Experts on Geographical Names (UNGEGN)
  - https://unstats.un.org/unsd/geoinfo/geonames/ (UNGEGN World Geographical Names Database)
  - https://unstats.un.org/unsd/ungegn/nna/nna-committees/ (UNGEGN List of National Names Authorities and Committees)
  - https://geonames.usgs.gov/apex/f?p=138:1:0::::: (USGS Geographic Names Information System).
  - http://www.fallingrain.com/ (Falling Rain, Worldwide gazetteer for cities and towns)
  - http://www.getty.edu/research/tools/vocabularies/tgn/index.html (Getty Thesaurus of Geographic Names)
  - http://isodp.hof-university.de/fuzzyg/query/ (Fuzzy Gazetteer, useful for bad spelling errors in locality data).
  - https://commons.wikimedia.org/wiki/Atlas (Wikimedia Commons Atlas of the World)

→ **Zoom Poll**: Do you share coordinate data for your georeferenced localities? Check all that apply.

1. Do you share coordinate data for your georeferenced localities? Check all that apply. (Multiple choice)

Yes, fuzzed coordinate data	(8/36)	22%
Yes, non-fuzzed coordinate data	(5/36)	14%
Yes, with researchers upon request	(15/36)	42%
Yes, with aggregators like iDigBio or GBIF	(11/36)	31%
No, but I intend to in the future	(8/36)	22%
No, I haven't started georeferencing yet	(7/36)	19%
No, I would like to but am not sure how	(0/36)	0%
No, I have reservations about sharing this data	(5/36)	14%
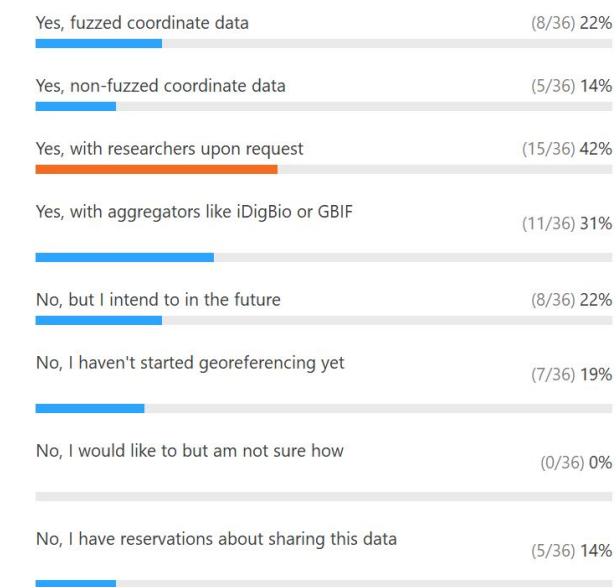
*→ **Zoom Poll**: Around what year did you begin georeferencing in your current collection?*

1. Around what year did your collection begin georeferencing?

Prior to 2000	(5) 18%
Prior to 2010	(3) 11%
Prior to 2012	(0) 0%
Prior to 2014	(1) 4%
Prior to 2016	(4) 14%
Prior to 2018	(3) 11%
2018	(1) 4%
2019	(2) 7%
2020	(1) 4%
Yet to begin!	(8) 29%
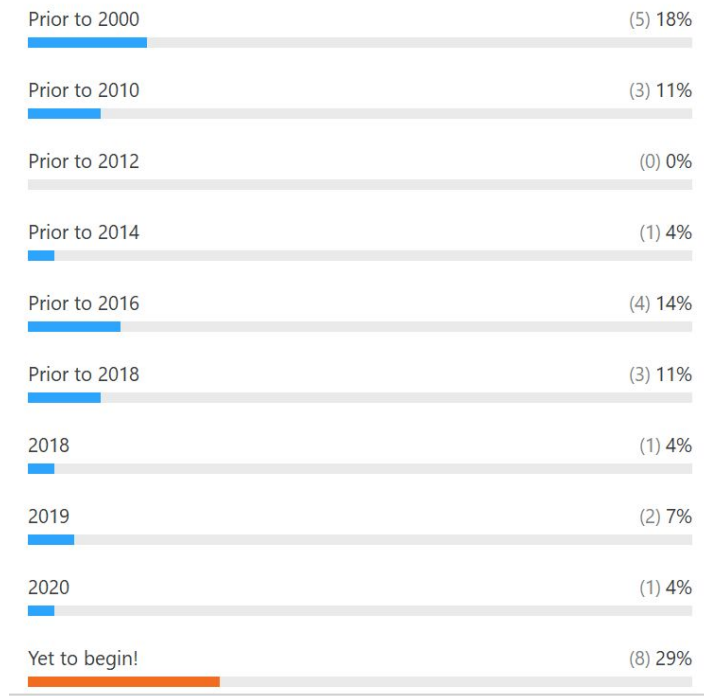
We are sharing only a few core fields

At the recordset level

Data for the figure below were downloaded from GBIF on 2020-04-23 using the query: `basisofrecord` = "fossil" (doi.org/10.15468/dl.7nnj39).
This dataset includes **1,1665,493 specimen records** provided by **>90 collections**.
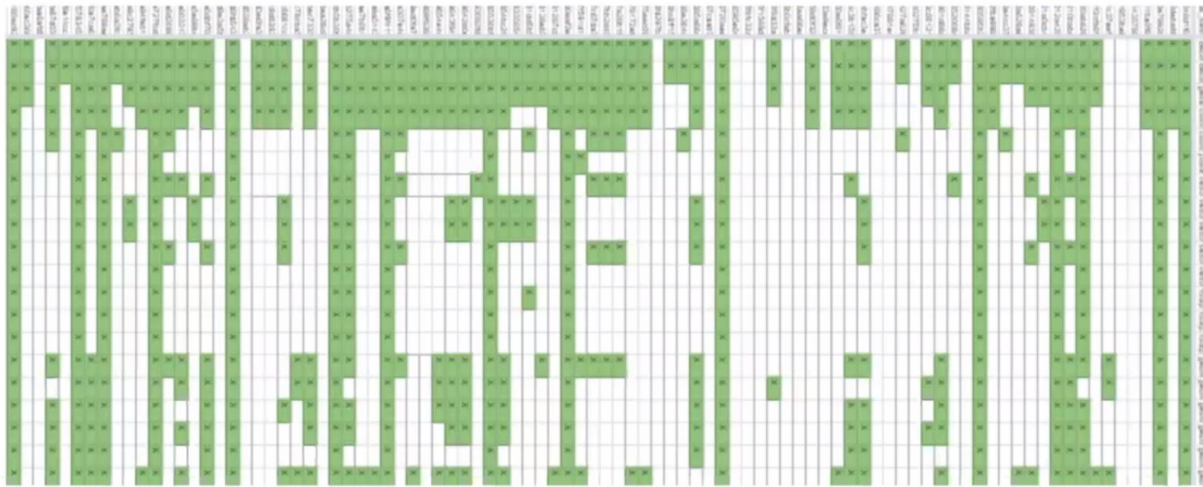
Presence/absence of georeferencing terms in use by paleo collections providing data to GBIF

. **dwc:decimalLatitude** and **dwc:decimalLongitude** (in use by 78% of data providers)
. **dwc:geodeticDatum** (in use by 70% of data providers)
. **dwc:coordinateUncertaintyInMeters** (in use by 57% of data providers)
. **dwc:georeferenceRemarks** (in use by 48% of data providers)
. **dwc:georeferencedBy** (in use by 42% of data providers)

→ ***Question in this document****: How have your georeferencing workflows changed over time?*
(e.g. what are you doing differently?, what lessons have you learned?)
- Went to 0.1 degree latitude/longitude reported online
  - Separate workflows to redact data for IPT and Specify Web Portal
- Started using GeoLocate to help undergraduate georeferencers
- Recording Georeference Date, uncertainty, datum
  - What to do with legacy data that do not have these values?
- Started using disparate sources of information to find actual outcrop sources including historic aerial images and LIDAR data.
- Lesson learned: Develop How-to documentation for your institution
  - Screenshots and examples are critical +1+1+1
- Lesson learned: If having students/interns assist with georeferencing, your how-to document needs to be really specific on what your standards are - saves your data cleaner (probably you?) a lot of time +1+1
- Adding land ownership as a higher priority and part of the process +1 +1 +1
  - Consider also having a field for the original landowner (the landowner at time of collection) field and a current landowner field, as land ownership changes over time.

- ○ YES. Including Federal land status and agency. So you can report specimens from Federal lands in the collection.
  - ■ Greg Liggett was asked about getting reliable information on BLM land management surface data. There are a number of public sources.
  - ■ Landscape Data Portal can be used with an online web map to check land status: https://landscape.blm.gov/geoportal/catalog/BLMNational/BLMNational.page
  - ■ You can also download GIS data from Navigator: https://navigator.blm.gov/data?keyword=BLM%20National%20Surface%20Management%20Agency%20Area%20Polygons%20-%20National%20Geospatial%20Data%20Asset%20(NGDA)&fs_publicRegion=National&sort=score%20desc
  - ■ Also of general use is Public Land Survey System data layers that can be downloaded from those sites.
  - ○ NMMNH tracks land ownership history
  - ○ This is an issue that extends beyond paleo collections
  - ○ Separately track the specimens from the land per Pat
- ● Cross referencing locations with historical documents for place names and information that don't exist in the present. Eg. Demolished towns, changed highways, and others. That's really an important point in old toponymy in Europe. +1+1
  - ○ Toponymy is the study of place names.
  - ○ Changing geopolitical names for countries and their subdivisions is something that can also be a challenge. Eg. USSR or Dakota territories.
  - ○ Geopolitical areas that split into other countries too Eg. Prussia becoming Germany and Poland (here the collecting year could be really important - pre WWI, between WWI and WW2, after WW2)
  - ○ A correspondence kind of Thesaurus will be necessary to bring to modern days the meaning of the old names.
    - ■ Indeed, maintaining historic naming systems but also making it relevant to contemporary users.
- ● Always double check georeferences that are completed by students and/or volunteers.
- ● **From Roger Burkhalter:** We list "old" or "unused" names under an "AliasName" field and keep the current geography in the shared data.

Percentage of records using georeference metadata fields

coordinatePrecision	coordinateUncertaintyInMeters	dataGeneralizations	geodeticDatum

georeferencedBy	georeferencedDate	georeferenceProtocol	georeferenceRemarks

In use?
□ no
■ yes

georeferenceSources	georeferenceVerificationStatus	informationWithheld
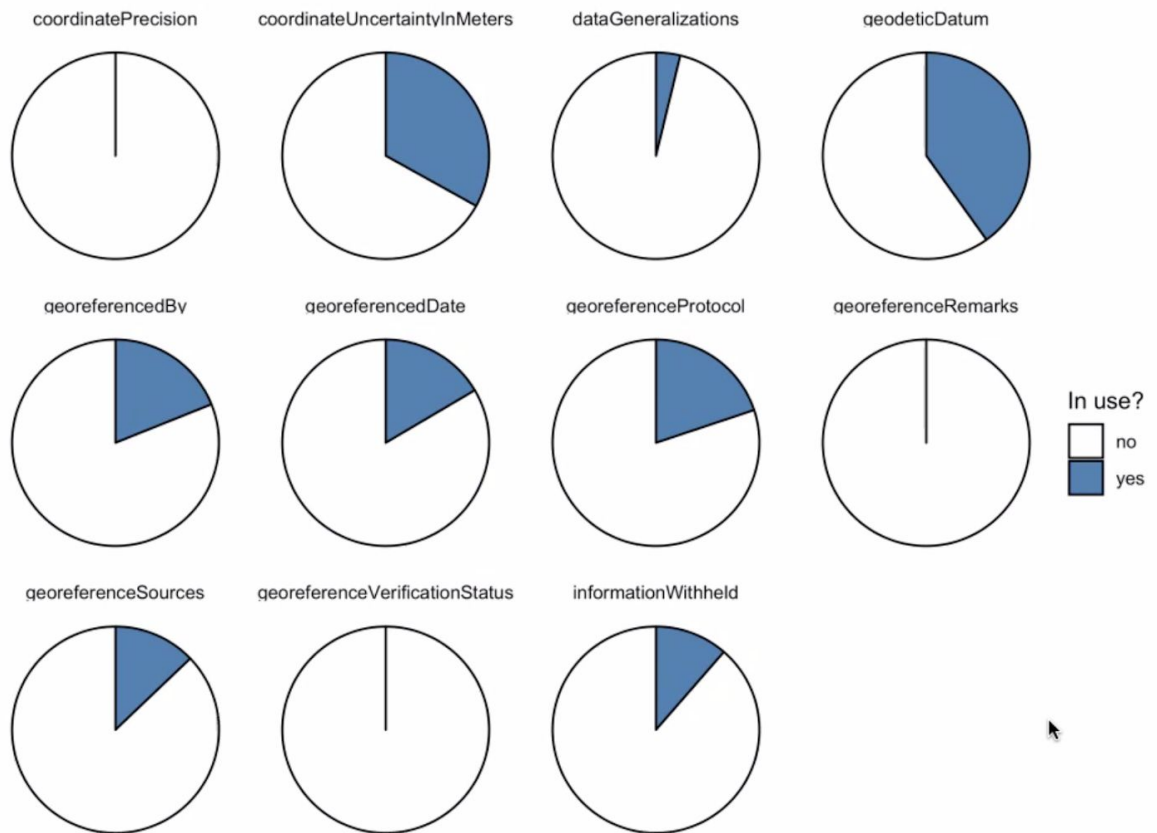
We don't have a great deal of shared information about the georeferences, showing what we might start doing, if deemed valuable for research, EO, Policy, etc...

→ **_Question in this document_**: Do people have GeorefRemarks in their internal database and are just not sharing it?

- We will be asking everyone to look at their database fields - I'm curious how similar the georef fields might be between different instances of the same database (EMu for me). It might be helpful for those with the same structure to help each other with how they use a field and how they map/ingest data.
- We do, but don't share it. (We do but don't share it, however we also have no plans to share it)
- **From Roger Burkhalter:** We do have information but it is not shared but I use a custom-made database that I can customize "on the fly".

→ **_Question in this document_**: Do people have standard expectations that they share with collectors/researchers for incoming Georeference Locality Data coming into their databases?

- there are some existing forms / policies developed
  - could we gather them as examples please?
    - https://tdwg.github.io/esp/georeferencing/workflows/MCZ-Recording-locality-data.pdf

- For those who do not have them already it would be good to create to help with localities collected in the future

Some of the Lat/long info is in our old catalog books so if they did not list that info we don't. +1+1+1+1

Notes/questions from group discussion

Greg L.: Please note if BLM land. Sometimes BLM can find $ to support efforts.

Pat H.: land ownership data field comment, field added, but issue is that current land ownership may not reflect the specimen ownership, as the specimens may be collected prior to current ownership. So we need to track land and specimens separately (fed, state, private land).

Roger B: for areas less than ?640 acres in size, can't find data. Hard to find for say 40 acres -- to figure out who owns it. Some agencies, i.e. USACE, provides survey documents with meets and bounds to precisely locate the boundaries of Government owned lands, including partial acreage. I have several of the 1:100.000 scale BLM maps for Utah/Nevada that just show a "checkerboard" pattern that I assume means "all" lands within those boundaries?

Greg L.: BLM will "sell you a map of the area" to help with this. There is a digital option, but not sure how the public gets access. Any institution that's holding DOI collections can use the DOI CMS, building an online system at the moment; can use for free, called MCMS.
- Greg Liggett was asked about getting reliable information on BLM land management surface data. There are a number of public sources.
- Landscape Data Portal can be used with an online web map to check land status: https://landscape.blm.gov/geoportal/catalog/BLMNational/BLMNational.page
- You can also download GIS data from Navigator: https://navigator.blm.gov/data?keyword=BLM%20National%20Surface%20Management%20Agency%20Area%20Polygons%20-%20National%20Geospatial%20Data%20Asset%20(NGDA)&fs_publicRegion=National&sort=score%20desc
- Also of general use is Public Land Survey System data layers that can be downloaded from those sites.

Land Ownership: https://www.onxmaps.com/ +1

Question in this document: Please put a "+1" next to each georeferencing metadata field below that you would like to know more (e.g. dwc:coordinatePrecision +1 +1 +1).
- dwc:**coordinatePrecision** +1+1+1 +1+1+1
- dwc:**coordinateUncertaintyInMeters**+1
- dwc:**dataGeneralizations** +1
- dwc:**geodeticDatum**+1+1

- dwc:**georeferencedBy**+1
- dwc:**georeferencedDate**+1
- dwc:**geoereferenceProtocol**+1+1+1+1+1 +1+1+1+1
- dwc:**georeferenceRemarks**+1 +1
- dwc:**georeferenceSources**+1+1 +1
- dwc:**georeferenceVerificationStatus** +1+1+1+1+1
- dwc:**informationWithheld**+1 +1+1

Carrie LB to Greg L: more about the RAPTOR project please? **Greg L:** end of year may come out, as soft launch. W/o cell service, still usable, then will upload when you get to WiFi. Uses Survey 123 from ESRI.
- [Not Carrie]: One question I have about RAPTOR is that it shows adding IDs in the field, what about those who do the IDs of species once they are back from the field, our researchers often just as list collections of fossil plants, invert fossils etc. in the field but the real scientific IDs come in the labs
  - Greg L to [Not Carrie]: We understand that field IDs are usually not as refined as they might be back in the lab. That is OK for our purposes. If we get information later about a fossil ID we might go back and update that info. This is particularly true for holotypes. Same is true with curation numbers and such. Those are usually applied long after collection. When I learn the specimen of Triceratops from this locality is MOR 555 I sometimes add that back in.
- Also, the BLM survey tool could be used in coordination with ESRI Collector. Collector would allow users to download tiled maps for detailed maps of their field area. The survey would be used to collect info on localities.
- Accuracy and precision will be automatically collected with this tool.
- For Paleo Permittees.

Daniel M: can use Survey123 with Collector, great when you are using Maps in the field. Supports caching, uploaded to cloud later. **EK** seems broad enough that a botanist could use it too.

QUESTION: need historical place / locality names / layernames?
RP: Toponymy old names modern names? Is there a mapping?
gazetteers in GEOLocate?
From Christina https://catalog.hathitrust.org/Record/011441350

Homework

THINK about how do you want to follow up on topics from today
MLL: I think we need to periodically have a Paleo Collections staff zoom meeting to discuss standards and how we should be using them (+1+1 - and not limited to georef)
SHARE what you capture in your database
- are you sharing them all?

- do you have some known missing? (Example, lumped in the notes! field)
- What fields do you wish you didn't have to put in the notes field/were more searchable?

PLEASE add your photo -- we can better get to know who is who!

CB: cities change names / layer formations-group-age) change names

QUESTION: how is everyone tracking geologic name changes?
JU: strat details field at the YPM, and 'other terms' field (not searched/indexed in their summary data).
HL: USNM tracks verbatim, and then newer names (EMu), but don't really have a great field, use Notes field "Verbatim Chronostratigraphy:" and "Verbatim Lithostratigraphy:"
CB: since no verbatimGeology field, putting it into verbatimLocality field
TK: all start with formation name / age / geo locality in ledgers, that goes into the verbatimLocality?
DP: Please expand this topic on need for sharing layer names / place names in an API (for example) locality services

- ❏ CB: Jessica Utrup's slides for Implementing Data Standards has a list of Geologic Lexicons for a variety of countries. The US one she listed is called Geolex. Geolex does not clearly sort out historic formation names and changes. When you select a formation name, you can click "Significant Publications" and that will provide publication citations and summaries about the publication history of the formation.
    - ❏ Base formation record: https://ngmdb.usgs.gov/Geolex/Units/ArcherCity_6522.html
    - ❏ Significant Publications: https://ngmdb.usgs.gov/Geolex/UnitRefs/ArcherCityRefs_6522.html
        - ❏ It is within the summary of the publications that relationships are noted
    - ● <mark>What fields do you wish you didn't have to put in the notes field/were more searchable</mark>
        - ○ Verbatim geologic context
        - ○ Research area
        - ○ Field Numbers and State numbers (SHPO etc)

Notes for Wednesday, April 29, Virtual Workshop Day 2

Zoom link: https://fsu.zoom.us/j/488074461
Welcome! Please feel free to add comments, questions, answers, links, etc. to this document.

Icebreaker Question!

What is one food you hate that everyone else loves?
- Meat+1
- Sushi+1+1+
- Coconut +1+1+1,
- Avocados+1+1+1
- Bacon (seriously lol)+1
- Chicken+1+1
- Raisins (not sure this counts because anyone who says they love raisins is probably lying—how could someone love raisins??) +1+1 +1+1+1
  - Blasphemy! Raisins are delicious! Craisins too. :D +1 +1 +1
  - You need to meet my grandson.
- Popcorn+1
- Seafood+1 +1+1+1
- Beets
- Eggplant+1 +1
- Onions!+1 +1
- Cilantro +1 +1+1+1
- Mashed Potatoes
- Bananas
- Blue cheese+1+1+1 +1 +1
- Unnecessary cheese (again, with the lactose intolerance)
  - I never met a cheese that was Unnecessary. +1 +1 +1+1 +1+1+1
  - I see you Carrie Levitt ;) In Wisconsin, cheese is put on EVERYTHING to make it "fancy". Ugh.
- Steak other than very rare filet mignon. So freaking tough and tasteless.
- Coffee+1
  - You should try chocolate covered espresso beans. Delicious!
    - No thank you. Coffee flavor makes me nauseous.
    - I love coffee ice cream, for example, but too much caffeine does terrible things to my GI system. TERRIBLE things. Don't go on the missionary trip!

*→ **Zoom Poll**: Did you attend the workshop session yesterday?*
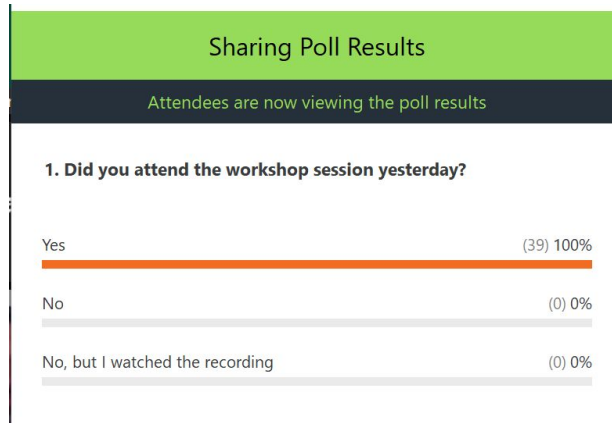
Notes/questions for Holly's presentation

*→ **Zoom Poll**: What collection management system or database do you use in your collection?*
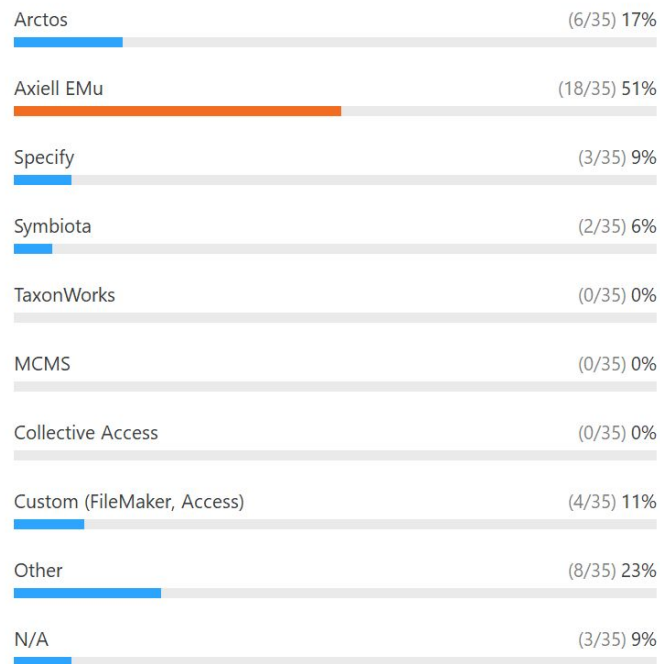
For the Invert Paleo collections at the SNOMNH, we use a custom SQL Server 2019 database with integrated "R" and Python for "in works" AI/ML capability.

For the Paleobotany & Micropaleontology Collection at the Sam Noble Museum (SNOMNH), we are using a custom SQL Server database (as we are accommodating our coal ball collection and palynology fossil pollen and spores with very complex relationships along with the

ostracods that are part of micropaleontology collections) it is a different in-collection database than Invert Paleo, but it can interface with it before going to the web.

For Vert Paleo/Trace Fossil Collection at CU Boulder we use CollectiveAccess and Microsoft Access

At UMNH we use SCAN in entomology.

ANSP IP has no "real" database yet, we have an old non-relational filemaker database that we've moved to Excel. We're hoping to move to Specify soon.

Holly's presentation begins ...

Standards at many levels, focus on guidelines for Paleo Community
Comm Guideline Benefits

> Think dwc:georeferenceProtocol for example.
>
> library of citable guidelines - references you will use / potentially use in your local georeferencing efforts. You use this particular field to say what was used in the georeferencing process
>
> Standardizing across the community

Fitness for Use (for whom? researchers, downstream stakeholders)

> Georeferencing for Research Use Workshop -- what researchers consider to use / not use data. See https://riojournal.com/article/32449/ and
> https://www.idigbio.org/wiki/index.php/Georeferencing_for_Research_Use
>
> - Seltmann K, Lafia S, Paul D, James S, Bloom D, Rios N, Ellis S, Farrell U, Utrup J, Yost M, Davis E, Emery R, Motz G, Kimmig J, Shirey V, Sandall E, Park D, Tyrrell C, Thackurdeen R, Collins M, O'Leary V, Prestridge H, Evelyn C, Nyberg B (2018) Georeferencing for Research Use (GRU): An integrated geospatial training paradigm for biocollections researchers and data providers. Research Ideas and Outcomes 4: e32449. https://doi.org/10.3897/rio.4.e32449
> - GBIF. 2010. GBIF Position Paper on Future Directions and Recommendations for Enhancing Fitness-for- Use Across the GBIF Network, version 1.0. authored by Hill, A. W., Otegui, J., Ariño, A. H., and R. P. Guralnick. 2010 https://www.gbif.org/document/80623/gbif-position-paper-on-future-directions-and -recommendations-for-enhancing-fitness-for-use-across-the-gbif-network

bio/geo-diversity community
Paleo Collections Community

> general guidelines, controlled vocabs, formatting, tools, protocol sharing and development,
>
> By use case: fuzzing coordinates, landowner documentation, historical names

See: https://tdwg.github.io/esp/georeferencing/standards.html

> Where we can collate all this information, if desired.

Questions? Comments?

AxielEmu folks- liaison for a group ask on some of the issues brought up in discussion here
GitHub tutorial- paleodata happy hour session?

      I am interested in participating -Lindsay @NHMLA

Comment: Fitness for Use for the paleocommunity may differ from general biodiversity community, because most research uses require paleolatitude and paleolongitude as an additional layer

Need to keep mitigation folks involved in these discussions for collecting loc data as well.

Need simplified definitions as well as technical definitions so that we can get both more "buy-in" and that more people can understand how to use them appropriately.

Notes/questions for Erica's presentation

See more distinct values for certain DwC terms (presentation has screenshots from the linked doc): https://ekrimmel.github.io/paleo-georeferenced-data/georef4paleo

Concordance with localities: Erica mentions multiple locality numbers might be given to the same locality within or across collections

      PH: the EPICC TCN found shockingly little concordance among our partner localities

          MLL: That doesn't really surprise me as each museum has its own locality numbering system (I know that we give our own locality numbers even if our collectors were at a site with collectors from another museum. However we are trying to add the locality numbers at the other museums to a LocalityAlias field - but we do not always know what they are just that one exists.)

→ *Zoom Poll*: *About how many specimen localities (paleo or non-paleo) have you personally georeferenced?*

1. About how many specimen localities (paleo or non-paleo) have you personally georeferenced?
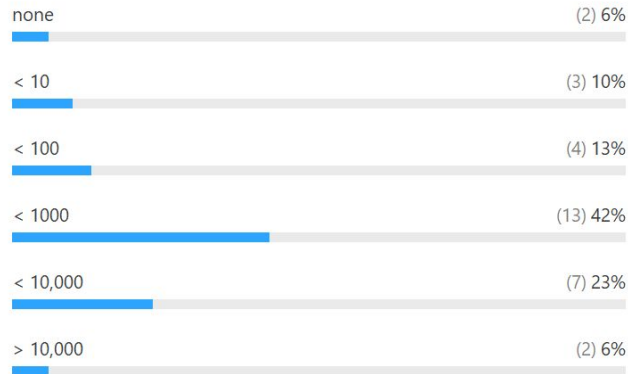
Response	Count	Percent
none	(2)	6%
< 10	(3)	10%
< 100	(4)	13%
< 1000	(13)	42%
< 10,000	(7)	23%
> 10,000	(2)	6%

→ *Zoom Poll*: *About how many specimen localities (paleo or non-paleo) have you supervised the georeferencing of, e.g. that your students or assistants have done?*

2. About how many specimen localities (paleo or non-paleo) have you supervised the georeferencing of, e.g. that your students or assistants have done?

Response	Count	Percent
none	(9)	29%
< 10	(6)	19%
< 100	(5)	16%
< 1000	(4)	13%
< 10,000	(4)	13%
> 10,000	(3)	10%
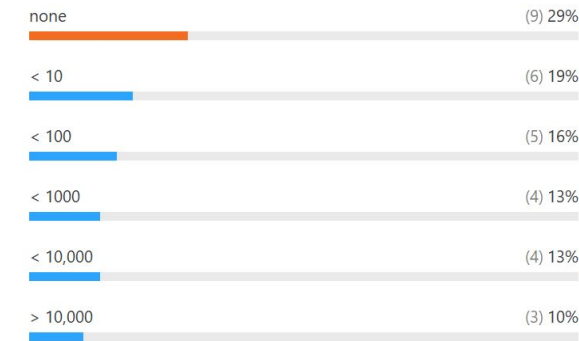
GEOreferencing Ambassadors (e.g. help others get started, share your expertise)
> **[Add your Name Here]**
>> ● Jessica Utrup (Yale Peabody Museum of Natural History) jessica.utrup@yale.edu I'm happy to help people getting started or people who are starting in a new area and struggling to find resources. I've been doing this for 13+ years now, much in the US, but also some globally.
>> ● Margaret Landis (Sam Noble Museum) paleocatstar@ou.edu Happy to help with georeferencing or GIS-related questions and resources. I have been using GIS since 1999 (even got my Masters in GIS).

Pretend we're storing in our own database, this locality - where would you put this information?

Recording verbatim information

DwC - locationID   verbatimLocality   locality

LACMIP 5800
USGS PP 165-C

Gray and green shales and sandstones with interbedded algal bioherms on a firebreak at the crest of the ridge between Pulga Canyon and Santa Ynez Canyon; south face of the Santa Monica Mountains. The locality is about 2000 feet north of the end of Charmel Lane; which is the access road to the firebreak. This locality is probably equivalent to Hoot's locality #43 as shown on the map sheet in USGS PP 165-C. See the map on the back of this card.

what fields will we each populate
determining coordinates
 opportunity for guidelines!
 see various Datums example (From chat: Geolocate always uses WGS84)
documenting confidence in the coordinates
 coordinateUncertaintyInMeters
  a collector may have given you this in miles or feet -- Needs to be in meters
  (I believe most GPS/GNSS receivers will report this in meters/feet as "accuracy", which is expressed as a radius - Daniel Markbreiter, NHMLA)
 coordinate precision
  comes from a GPS unit
 georeferenceVerificationStatus
  "verified by collector" for example. not being used much, but could (see screen shot}

DwC - georeferenceVerificationStatus ⬉
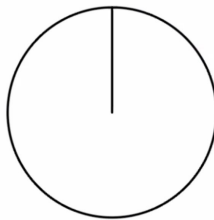
Field isn't in use by the
5.5 million fossil specimen
records in iDigBio

 georeferenceProtocol, georeferenceSources, georeferenceRemarks -- need to read the definitions of these terms to help clarify what is expected in each. *This information needs to be meaningful!*
  protocol (what standard rules/methods being used)
  sources (specific sources like a map)
  remarks: catchall for more information (breadcrumbs) on what you did and why?

---

 opportunities for guidelines -- consider the fitness of what's currently going into them...

DwC - georeferenceProtocol

Top five values for this field in
5.5 million fossil specimen records in iDigBio

value	n
Georeferencing Quick Reference Guide Version 2012-10-02	408844
digital resource	358377
physical resource	105145
GEOLocate	101518
unspecified	23878

DwC - georeferenceSources

Top five values for this field in
5.5 million fossil specimen records in iDigBio

value	n
GEOLocate	278069
GEOLocate batch georeferencing, 2019-06-10	84963
Google Earth	59756
GPS unit	51638
unspecified	51126

Source- GEOLocate is a tool to determine a point from another source, so it's a determination method, not the source?

On fuzzing localities

dwc:informationWithheld (share that you have hidden info, and who to contact for seeing if you can get access to it

dwc:generalizations (where you share specific information about what you've done to coordinates to fuzz them)

could make some adjustments and make some recommendations for those fields above

dwc:decimalLatitude
dwc:decimalLongitude

Reducing precision for DwC - decimalLatitude & decimalLongitude

BLM recommendation

WHAT THE NUMBER OF DIGITS IN YOUR COORDINATES MEANS	
LAT/LON PRECISION	MEANING
28°N, 80°W	YOU'RE PROBABLY DOING SOMETHING SPACE-RELATED
28.5°N, 80.6°W	YOU'RE POINTING OUT A SPECIFIC CITY
28.52°N, 80.68°W	YOU'RE POINTING OUT A NEIGHBORHOOD
28.523°N, 80.683°W	YOU'RE POINTING OUT A SPECIFIC SUBURBAN CUL-DE-SAC
28.5234°N, 80.6830°W	YOU'RE POINTING TO A PARTICULAR CORNER OF A HOUSE
28.52345°N, 80.68309°W	YOU'RE POINTING TO A SPECIFIC PERSON IN A ROOM. BUT SINCE YOU DIDN'T INCLUDE DATUM INFORMATION, WE CAN'T TELL WHO
28.523457°N, 80.683094°W	YOU'RE POINTING TO WALDO ON A PAGE
28.5234571°N, 80.6830941°W	"HEY, CHECK OUT THIS SPECIFIC SAND GRAIN!"
28.52345718°N, 80.68309417°W	EITHER YOU'RE HANDING OUT RAW FLOATING POINT VARIABLES, OR YOU'VE BUILT A DATABASE TO TRACK INDIVIDUAL ATOMS. IN EITHER CASE, PLEASE STOP.

Most common coordinate precision for georeferenced fossil specimen records in iDigBio

precision_lat	precision_lon	count	percent
0.000001	0.000001	705919	30.0
0.01	0.01	569041	24.2
0.00001	0.00001	204761	8.7
0.0001	0.0001	163805	7.0
0.0000001	0.0000001	105205	4.5

notice the false precision at play here.
See https://xkcd.com/2170/ source for graphic

Here's an idea for what these proposed guidelines might look like…

What does proposing guidelines look like?

Standard Term	Paleo Community Guideline
decimalLatitude	May be truncated for paleontological specimens. If an institution truncates these values, they should also serve dataGeneralizations.
informationWithheld	Specific locality information may be restricted for some or all paleontological specimens due to federal regulations as well as the preferences of private landowners. Explanation can be included here. Example: "More data may be available"
dataGeneralizations	Essential term to include if an institution does not serve the most specific decimal latitude/longitude available for a specimen. It is common to redact or fuzz geographic information to protect fossil localities from theft. Example: "Latitude and longitude reported at maximum precision of 0.1 degrees."

We only discussed a few terms

We only discussed a fraction of the Locality terms today
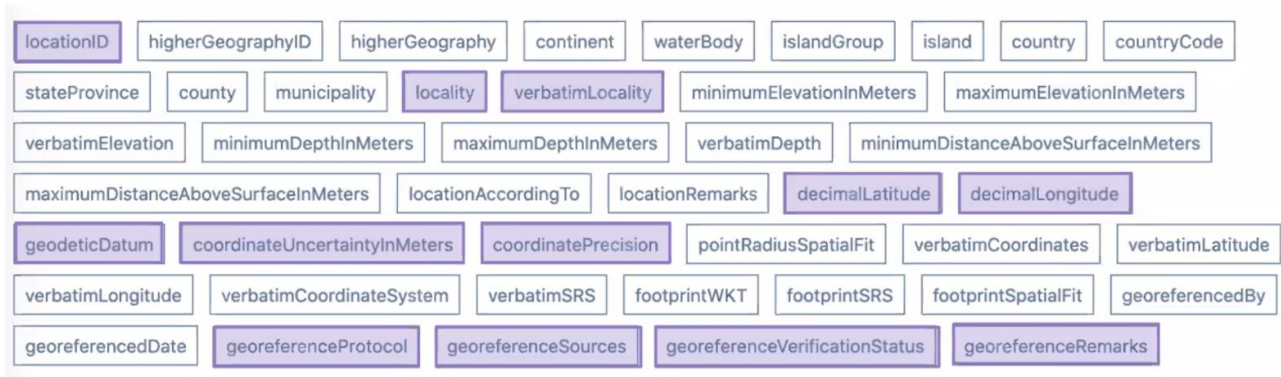
And there are additional terms in other classes (e.g. Geological Context) of the Darwin Core standard that also affect locality data for paleo specimens

Questions
BLM guidelines question -- truncate to a decimal degree, do not round

How does a bill become a law?
How does community practice change?
> (TECHNICAL) standards changes -- work with Biodiversity Information Standards
> (TDWG): interest groups, task groups (standards and best practices-guidelines)
>> TDWG ESP group
>> Darwin Core Hour - Q & A Website
> (SOCIO-TECHNICAL): how do you get these recommendations implemented and adopted
>> TDWG ESP group
>> Darwin Core Hour - Q & A Website

How do we continue the conversations going forward?
What are your questions you want to talk about today?

Notes/questions from group discussion

Add +1 if you'd like a GitHub tutorial or refresher: +1+1 +1+1+1+1+1
> See how LACMIP uses GitHub for documentation (EMu manual and internal issues)
> Example from UW Geology Museum

Margaret L: suggests simpler definitions (they have some) +1+1 by TK: moving students to georef (teaching them remotely) -- would be great to have these.+1
PH: researchers also need these

TK: hints to field researchers Field Locality Handout example
https://www.idigbio.org/sites/default/files/workshop-presentations/ttt2/GoodBadLocalities.doc

Kristen M: Is there a representative here from the mitigation company world? if not we need to include them. Paul Murphey and Georgia come to mind.
Kim and Eric Scott are two others we could include.

Alyson W: Having a shared base might make both community science and internal transcription of legacy data cleaner as well.
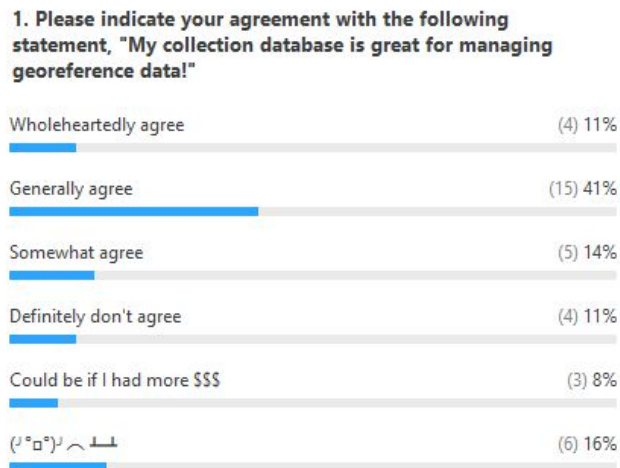
Here is the link to the best practices in paleo mitigation (including georeferencing and data collection in field):
https://www.paleosolutions.com/wp-content/uploads/2019/05/Murphey-et-al.-2019-Best-practices-in-mitigation-paleontology.pdf

→ ***Zoom Poll***: *Do you provide guidelines to collectors on best practices for collecting locality data in the field before depositing in a collection? Check all that apply.*
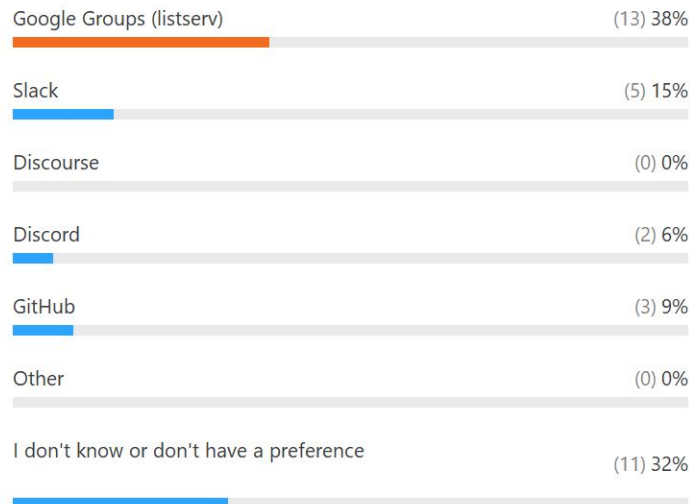[replace with screenshot of poll results] Did NOT do this poll.

→ ***Zoom Poll***: *Please indicate your agreement with the following statement, "My collection database is great for managing georeference data!"*

1. Please indicate your agreement with the following statement, "My collection database is great for managing georeference data!"

Wholeheartedly agree	(4) 11%
Generally agree	(15) 41%
Somewhat agree	(5) 14%
Definitely don't agree	(4) 11%
Could be if I had more $$$	(3) 8%
(╯°□°)╯︵ ┻━┻	(6) 16%

→ *Zoom Poll*: If this group wanted to stay in touch and work together on ongoing projects, what communication platform would you prefer?

1. If this group wanted to stay in touch and work together on ongoing projects, what communication platform would you prefer?

Platform	Votes	Percent
Google Groups (listserv)	(13)	38%
Slack	(5)	15%
Discourse	(0)	0%
Discord	(2)	6%
GitHub	(3)	9%
Other	(0)	0%
I don't know or don't have a preference	(11)	32%

→ *Zoom Poll*: If you have a biodiversity data standards question, do you know where to go to get help and/or offer input?

[replace with screenshot of poll results] Did NOT do this poll.

Topics Areas - What would you be interested in discussing further?

1. *Topic:* **Historic Place Names**
   a. *List your name if this topic interests you*: Katy Estes-Smargiassi (ANSP), Bushra Hussaini (AMNH), Margaret Landis (Sam Noble Museum), Jess Miller-Camp (IU), Jen Bauer (UMMP), Roger Burkhalter (Sam Noble Museum), Curt Breckenridge (NMNH). Giles Miller (NHM London), Natalia Lopez Carranza (KUMIP), Allison Izaksonas (NHMU), Ricardo Paredes (MCUC-Portugal)
   b. *List your name if you'd be willing to be a point person on this discussion topic*: xx
      -Alyson Wilkins (NHMU), Jessica Utrup (YPM)

2. *Topic*: **A Day in the Life of a Locality (georef data lifecycle)**
   a. *List your name if this topic interests you*: xx
   b. *List your name if you'd be willing to be a point person on this discussion topic*: xx

3. *Topic*: **Land Ownership**
    a. *List your name if this topic interests you*: Jacob Van Veldhuizen (CU Boulder), Carrie Eaton (UWGM), Nicole Volden (NMMNHS), Margaret Landis (Sam Noble Museum), Ashley Dineen (UCMP), Jen Bauer (UMMP), Nicole Neu-Yagle (DMNS), Bushra Hussaini (AMNH), Juliet Hook (NHMLA), Roger Burkhalter (Sam Noble Museum), Janaki Krishna (UMNH), Edward Davis (UOMNCH), Lindsay Walker (NHMLA), Allison Izaksonas (NHMU), Natalia Lopez Carranza (KUMIP), Carrie Levitt-Bussian (UMNH), Martha Hayden (UGS)
    b. *List your name if you'd be willing to be a point person on this discussion topic*:
        i. Greg Liggett

4. *Topic*: **Stratigraphy**
    a. *List your name if this topic interests you*: Christina Byrd (MCZ), Cyrus Green (MCZ), Jess Miller-Camp (IU), Nicole Volden (NMMNHS), Ricardo Paredes (MCUC-Portugal), Paul Mayer (FMNH), Jen Bauer (UMMP), Margaret Landis (Sam Noble Museum), Bushra Hussaini (AMNH), Roger Burkhalter (Sam Noble Museum), Nicole Neu-Yagle (DMNS), Giles Miller (NHM London), Natalia Lopez Carranza (KUMIP), Edward Davis (UOMNCH), Curt Breckenridge (NMNH), Katy Estes-Smargiassi, Jessica Utrup (YPM), Carrie Levitt-Bussian (UMNH), Martha Hayden (UGS)
    b. *List your name if you'd be willing to be a point person on this discussion topic*:
        i. Greg Liggett

5. *Topic*: **Taxonomy**
    a. *List your name if this topic interests you*: Jacob Van Veldhuizen (CU Boulder), Jen Bauer (UMMP), Gail Everett, Jess Miller-Camp (IU), Nicole Volden (NMMNHS), Katy PJ Coorough (MPM), Estes-Smargiassi (ANSP), Ricardo Paredes (MCUC-Portugal), Nicole Neu-Yagle (DMNS), Roger Burkhalter (Sam Noble Museum), Margaret Landis (Sam Noble Museum), Bushra Hussaini (AMNH), Ashley Dineen (UCMP), Curt Breckenridge (NMNH), Natalia Lopez Carranza (KUMIP), Cody Bedke (UMNH), Carrie Levitt-Bussian (UMNH)
    b. *List your name if you'd be willing to be a point person on this discussion topic*:
        i. Greg Liggett, Jess Miller-Camp, Christina Byrd (MCZ)

6. *Topic*: **How do I follow Darwin Core Standards and how do I get my data ready?**
    a. *List your name if this topic interests you*: Jacob Van Veldhuizen (CU Boulder), Carrie Eaton (UWGM), Cyrus Green (MCZ), Jess Miller-Camp (IU), Jen Bauer (UMMP), Katy Estes-Smargiassi (ANSP), Margaret Landis (Sam Noble Museum), Juliet Hook (NHMLA), Robin-Elise Call (NHMU), Nicole Neu-Yagle (DMNS), Carrie Levitt-Bussian (UMNH)
    b. *List your name if you'd be willing to be a point person on this discussion topic*: xx

7. *Topic*: **Standardizing Anatomical Elements terms**
   a. *List your name if this topic interests you*: Jacob Van Veldhuizen (CU Boulder), Gail Everett, Jen Bauer (UMMP), Nicole Neu-Yagle (DMNS), Nicole Volden (NMMNHS), Jess Miller-Camp (IU), Roger Burkhalter (Sam Noble Museum), Margaret Landis (Sam Noble Museum), Edward Davis (UOMNCH), Carrie Levitt-Bussian (UMNH)
   b. *List your name if you'd be willing to be a point person on this discussion topic*: Christina Byrd (MCZ), Amanda Millhouse (NMNH)

8. *Topic*: **"Controlled vocabulary" vs. "standard vocabulary"**
   a. *List your name if this topic interests you*: Jacob Van Veldhuizen (CU Boulder), Jen Bauer (UMMP), Robin-Elise Call (NHMU), Margaret Landis (Sam Noble Museum), Roger Burkhalter (Sam Noble Museum), Bushra Hussaini (AMNH), Juliet Hook (NHMLA), Nicole Volden (NMMNHS), Carrie Levitt-Bussian (UMNH)
   b. *List your name if you'd be willing to be a point person on this discussion topic*: Christina Byrd (MCZ)

9. *Topic*: **Paleobiology Database (PBDB) and how it relates to our shared datasets**
   a. *List your name if this topic interests you*: Kristen MacKenzie-DMNS, Christina Byrd (MCZ), Jacob Van Veldhuizen (CU Boulder), Alyson Wilkins (NHMU), Nicole Volden (NMMNHS), Jen Bauer (UMMP), Carrie Eaton (UWGM), PJ Coorough (MPM), Giles Miller (NHM London), Alyson Wilkins (NHMU), Lindsay Walker (NHMLA), Daniel Markbreiter (NHMLA), Pat Holroyd (UCMP), Janaki Krishna (UMNH), Margaret Landis (Sam Noble Museum), Ricardo Paredes (MCUC-Portugal)
   b. *List your name if you'd be willing to be a point person on this discussion topic*:
      i. Greg Liggett, Pat Holroyd (I am on PBDB ExComm)

10. *Topic*: **Sharing Archival Materials/Resources that provide more information**
   a. *List your name if this topic interests you*: Katy Estes-Smargiassi (ANSP), Curt Breckenridge (NMNH), Jen Bauer (UMMP), Roger Burkhalter (Sam Noble Museum), Ricardo Paredes (MCUC-Portugal), Margaret Landis (Sam Noble Museum), Jessica Utrup (YPM), Janaki Krishna(UMNH), Carrie Levitt-Bussian (UMNH), Christina Byrd (MCZ)
   b. *List your name if you'd be willing to be a point person on this discussion topic*: xx

11. *Topic*: **Same locality with different numbers between multiple institutions**
   a. *List your name if this topic interests you*: Edward Davis (UOMNCH); Jen Bauer (UMMP), Ashley Dineen (UCMP), Kristen MacKenzie (DMNS) Ricardo Paredes (MCUC-Portugal), Nicole Volden (NMMNHS), Greg Liggett, Roger Burkhalter (Sam Noble Museum), Margaret Landis (Sam Noble Museum), Bushra Hussaini (AMNH), Nicole Neu-Yagle (DMNS), Daniel Markbreiter (NHMLA), Lindsay Walker (NHMLA), Jessica Utrup (YPM), Janaki Krishna (UMNH), Cyrus Green (MCZ), Carrie Levitt-Bussian (UMNH), Martha Hayden (UGS)
   b. *List your name if you'd be willing to be a point person on this discussion topic*: xx

12. *Topic*: **Grants out there for data cleanup? Really looking for federal funding here.**
    a. *List your name if this topic interests you*: Kristen MacKenzie-DMNS, Jacob Van Veldhuizen (CU Boulder), Edward Davis (UO MNCH), Jen Bauer (UMMP), Jess Miller-Camp (IU), Paul Mayer (FMNH), Ricardo Paredes (MCUC-Portugal), Juliet Hook (NHMLA), Bushra Hussaini (AMNH), Margaret Landis (Sam Noble Museum), Roger Burkhalter (Sam Noble Museum), Daniel Markbreiter (NHMLA), Lindsay Walker (NHMLA), Katy Estes-Smargiassi (ANSP), Pat Holroyd (UCMP)
    b. *List your name if you'd be willing to be a point person on this discussion topic*:
        i. Greg Liggett

13. *Topic*: **Measuring/estimating locality uncertainty**
    a. *List your name if this topic interests you*: Curt Breckenridge (NMNH) Bushra Hussaini (AMNH), Katy Estes-Smargiassi (ANSP), Jacob Van Veldhuizen (CU Boulder), Margaret Landis (Sam Noble Museum), Roger Burkhalter (Sam Noble Museum), Carrie Levitt-Bussian (UMNH), Cody Bedke (UMNH)
    b. *List your name if you'd be willing to be a point person on this discussion topic*: xx

Question in this document: What is one thing you learned during this virtual workshop? Feel free to put a "+1" next to someone else's response if you agree.
- I was not previously aware of the extent to which ABCD EFG expands on the DwC terms. +1
- I was not previously aware of the BLM's preferences for how we share coordinates (truncated to one decimal place).+1
- I learned that I could be capturing a lot more locality/georeferencing data that can then be used in a DwC field.
- I learned that the types and amounts of locality/georeferencing data collected by different institutions is vast, and that a document outlining standards and methods is needed for the paleo community.

Question in this document: What is one thing you would like to learn more about? Feel free to put a "+1" next to someone else's response if you agree.
- I would like to learn the various methods used by other institutions to georeference their localities, as it appears there is more than one way to do this. For instance, the Georeferencing Best Practices Guide (2020 version) outlines the use of the georeferencing calculator. However, I get the feeling a lot of folks strictly use GEOLocate as a means to get their georeference. Is one method "better" or " more useful" than the other in terms of getting an accurate result? Does it matter?

- Alyson Wilkins (NHMU)
- Jacob Van Veldhuizen (CU Boulder)
- Christina Byrd (MCZ)
- Carrie Levitt-Bussian (UMNH)
- Jen Bauer (UMMP)
- Lindsay Walker (NHMLA)
- Ricardo Paredes (MCUC-Portugal)
- Margaret Landis (Sam Noble Museum)

Take SURVEY Please: https://fsu.qualtrics.com/jfe/form/SV_5oJ3Wxt3j2RPBn7

Upcoming activities of interest

April 30 - Paleobiology Database Q&A webinar

May 4 - Darwin Core Hour: Imagining a global gazetteer of georeferences

May 13 - Open Office Hours hosted by the iDigBio API User Group (R-based), demo this day will be on identifying specimen records with suspicious coordinate data

June 1-3 - Digital Data Conference, where the planning team for this workshop is hosting a virtual discussion session (time slot TBD)