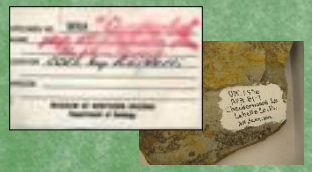
Digitization Challenges:
A Paleobotany & Micropaleontology Perspective

Margaret Landis

Digitization

- Converting Data to Digital Format

Specimens



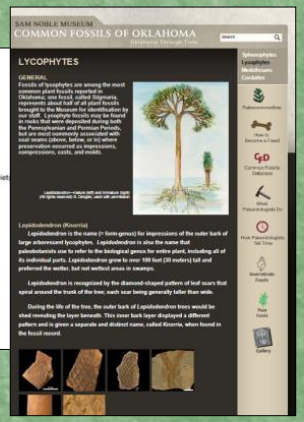
Old Labels

Field Notebooks

Catalog Cards

Annotated Maps

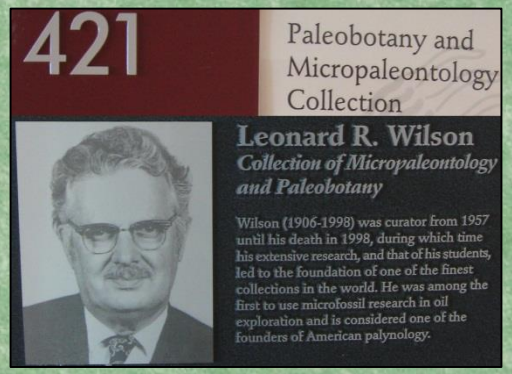
Web Database



Common Oklahoma Fossils Webpage

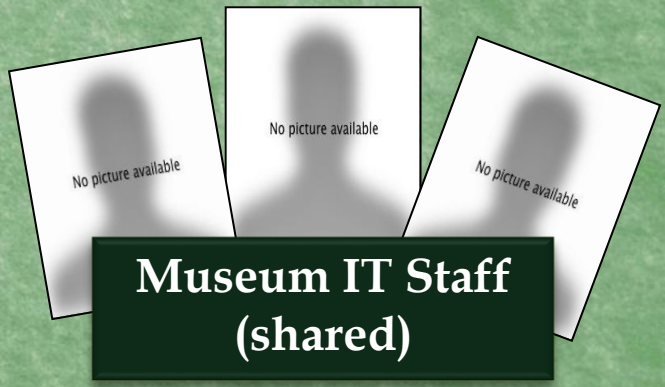
Who Are "We"?

Collection Staff



Students

Volunteers

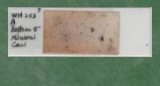


Museum IT Staff (shared)

What Are We "Digitizing"?

Specimens & Objects


Macrofossils


Slides


Oversize Specimens


Pollen


Spores

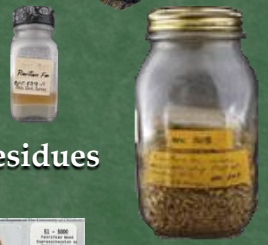

Microfossils


Peels


Microfossil Slides

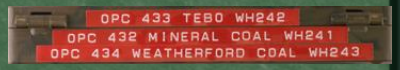

Thin Sections


Residues


Reserves

Localities

Labels



Old Slide Box Labels


Old Labels

Documents


Field Notebooks


Annotated Maps


Un-resized Plates


Catalog Cards

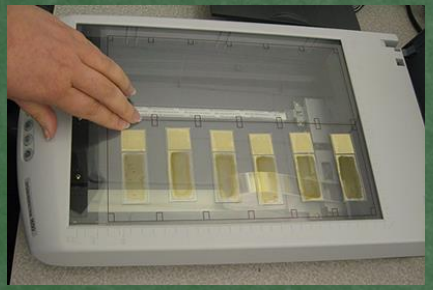

Publications

What Is Involved?

Entering Data

Digital Photography

Scanning



Adding Ancillary Data

However It Also Involves…

Preparation

Training

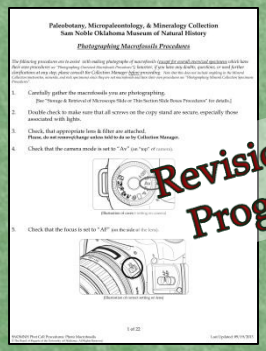
Macrofossil Photography Training

On Computer Monitor

On Copy Stand

Procedure Depends on Kind of Specimen

Macrofossils


Paleobotany, Micropaleontology, & Mineralogy Collection
Sam Noble Oklahoma Museum of Natural History

Photographing Macrofossils Procedures

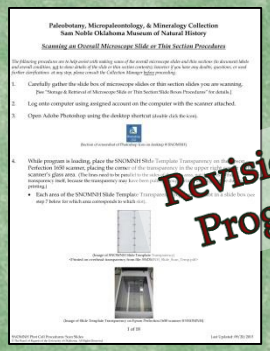
Revision In Progress


Paleobotany, Micropaleontology, & Mineralogy Collection
Sam Noble Oklahoma Museum of Natural History

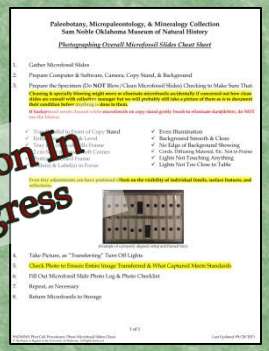
Photographing Macrofossils Cheat Sheet

Revision In Progress

Overall Slides


Paleobotany, Micropaleontology, & Mineralogy Collection
Sam Noble Oklahoma Museum of Natural History

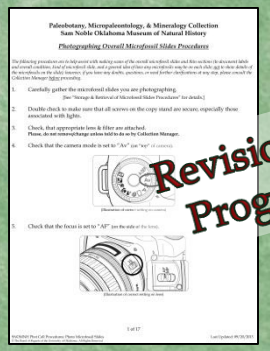
Scanning an Overall Microscope Slide or Thin Section Procedures


Paleobotany, Micropaleontology, & Mineralogy Collection
Sam Noble Oklahoma Museum of Natural History

Photographing Overall Microfossil Slides Cheat Sheet

Revision In Progress

Overall Microfossil Slides


Paleobotany, Micropaleontology, & Mineralogy Collection
Sam Noble Oklahoma Museum of Natural History

Photographing Overall Microfossil Slides Procedures


Paleobotany, Micropaleontology, & Mineralogy Collection
Sam Noble Oklahoma Museum of Natural History

Scanning an Overall Microscope Slide or Thin Section Cheat Sheet

Revision In Progress

Oversized Specimens

Under Revision

Palynology Specimens Pollen & Spores

Researcher Procedures Currently

Microfossils (e.g., Ostracods)

To Be Determined

Minerals, Rocks, & Meteorites

Developed But Needs Written Up (lower priority)

Digitization "Reality Check"?

- Collection Specific Challenges
  - Unique Numbering Systems/Past Record Keeping
- Museum Specific Challenges
  - Past Museum Events Effect on Data (*e.g.*, fires, storage locations)
  - Technology Support/Programs Allowed
- Challenges Arising From Bridging Disciplines
  - Changes in Data Recorded/Needed
  - Field Formatting/Database Schema Often Not Adequate
  - Less Standardization in Legacy Geology & Paleontology

Specimen "Challenges"

- What Is a Specimen & How Is it Numbered?
  - Has Database Design & Functionality Implications
    - Better ?: Is a Specimen a Loanable Object or an Identifiable Object?
- How Do You Handle Multiple Identifications?
- What About Multiple Hierarchies?
  (Plants & Animals In Same Collection)

Specimen "Challenges"

- Assigning/Managing Specimen Number
  - Legacy Specimen Numbering
  - Database Schema & Capabilities
    - Recording & Formatting Specimen Number
    - Handling Multiple Numbers per Block & Tracking Movement (*e.g.*, loan, exhibition)

- Assigning/Managing Specimen IDs
  - ICBN, ICZN, & Standards of Usage
    - Allowing Entry of Uncertainty (*e.g.*, cf., aff.)
    - Handling of Multiple IDs per Block

Specimen "Challenges"- Loanability Effects

Individually Loanable

Single Number applied

(e.g., 1000)

Specimen Number with letter appended

(e.g., 2000A, 2000B, ...)

Jointly Loanable

Multiple Numbers?

Single Number?

Specimen "Challenges" – Numbering Effects

Single Identification

Single Number applied

(e.g., 1000)

Specimen Number with letter appended

(e.g., 2000A, 2000B, ...)

Multiple Identifications

Multiple Numbers?

Single Number?

Specimen "Challenges" - Coalball "Fun"

Single Cut to Coal Ball

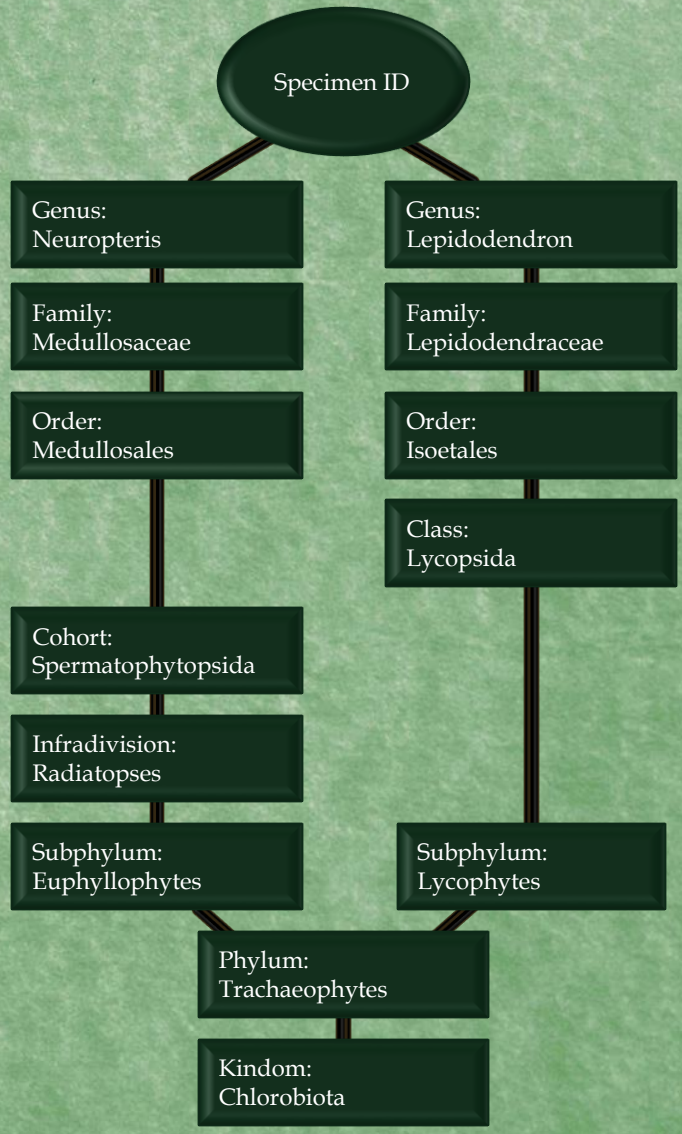
Multiple Cuts to Coal Ball

Single Cut Out Portion of Coal Ball Section Peel

Cut Out Seed from Serial Coal Ball Section Peels

Identification "Challenges"

- Not All Specimens IDed
- Not All IDs Current
  (*i.e.*, synonymies, reassigned types)
- Not All Ranks Complete
- Not All Ranks Applicable

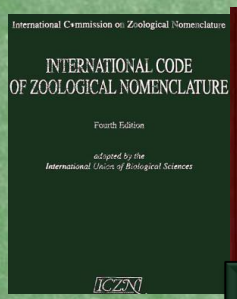


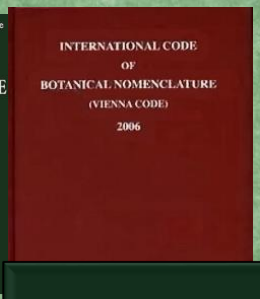
Assigning/Managing Specimen ID

Division

Phylum

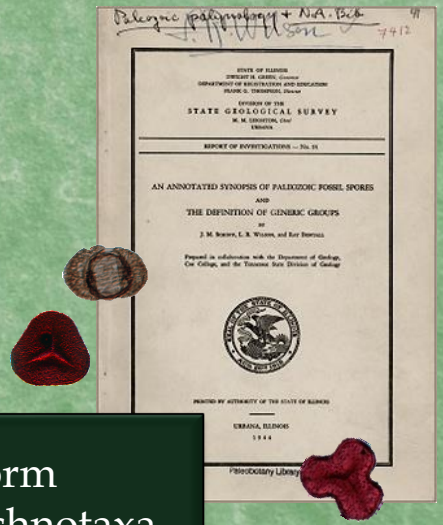
Spermatopsida indeterminate





Differing Hierarchical Ranks

Unplaced Taxa



Codes & Standards of Usage

Form Taxa/Ichnotaxa

Database Schema & Capabilities

Assigned Specimen ID

Lithological Samples

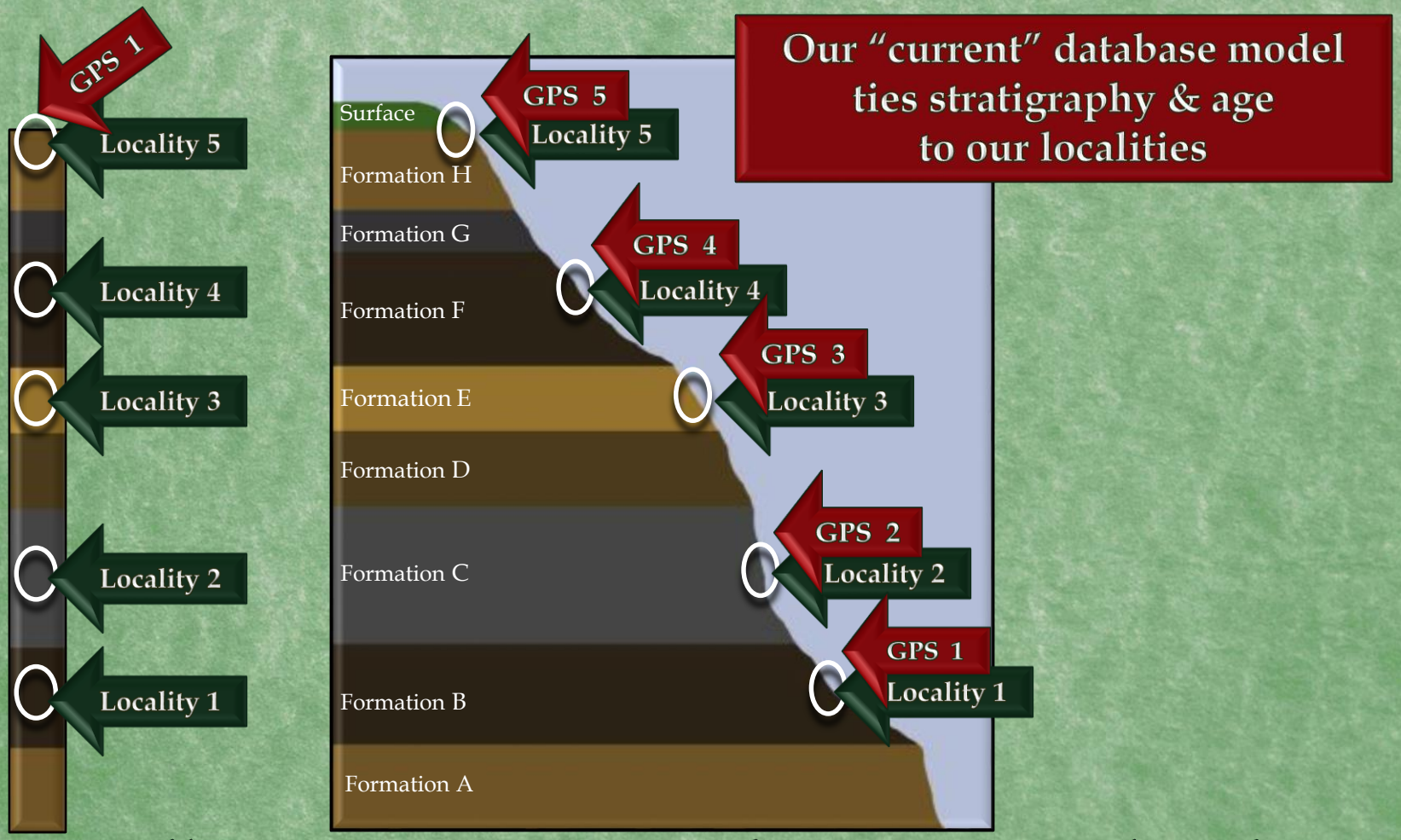
Locality "Challenges"

- Is It a Point on a Map?
  - Treating as 2-D with associated info
  - 1400A, 1400B, 1400C

OR

- Is It a Point on a Map with Depth (Point in Space)?
  - Treating as 3-D that still could have associated info
  - 1400 (1400A), 1900 (1400B), 1901 (1400C)

Defining a Paleontological "Locality"



- Historically, Age & Stratigraphy Associated with Locality (Paleontological Context)

Importance of Defining a Paleo "Locality"

- Some Specimens are more sensitive to slight changes than others for varying reasons:
  - Size of Specimen vs. Thickness of Strata

  - Condensed & Expanded Intervals

Geological Formations & Localities

Geological Formations

Geological Formation Hierarchy

- Group, Formation, Member
- Rank promotion/demotion
- "State-line faults"

Geological Formation Names

- Surface Name
- Subsurface Name
- Unofficial/Local Name (e.g., coals)

Geological Formation Logging

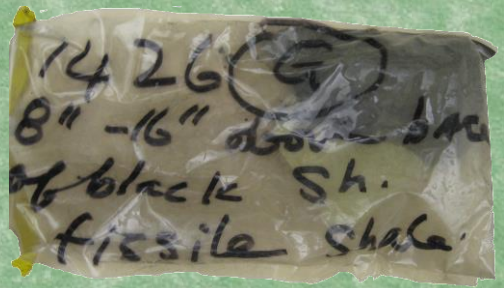
- Units (e.g., feet or meters)
- Direction
  - Outcrop (base up)
  - Core (top down)

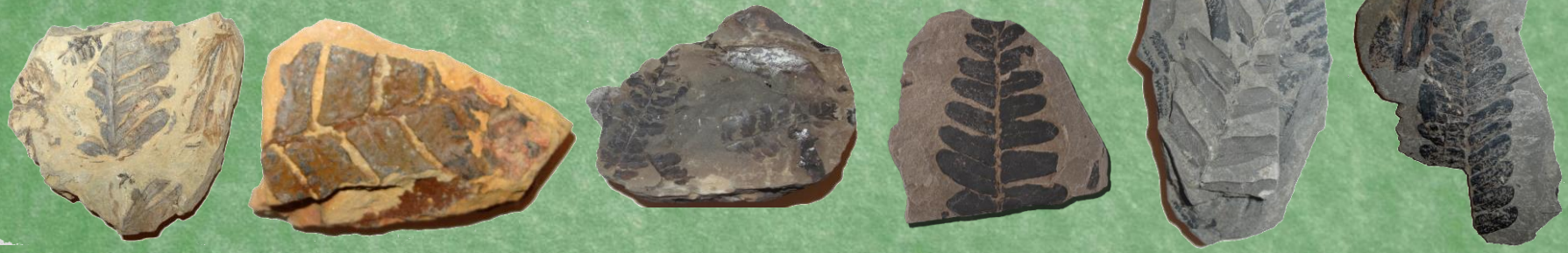
"Dakota Formation" Abridged Nomenclatural History

- "yellow, soft sandstone" — Lewis & Clark, 1804-1806
- "Formation Number 1" — Meek & Hayden, 1857
- Dakota Group — Meek & Hayden, 1862
- Dakota sandstone — Powell, 1891
- Dakota Sandstone — Rubey & Bass, 1925
- Dakota Formation — Plummer & Romary, 1942
- Dakota Group — Condra & Reed, 1943
- Dakota Formation — Witzke & Ludvigson, 1994

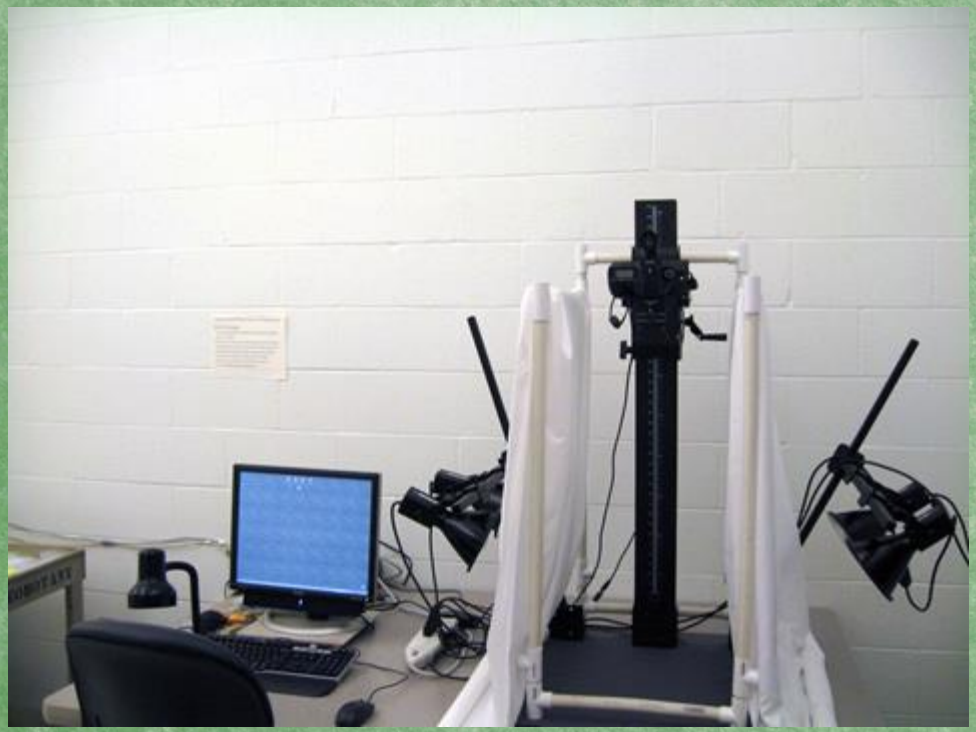
Locality "Challenges" – Conflicting Info.

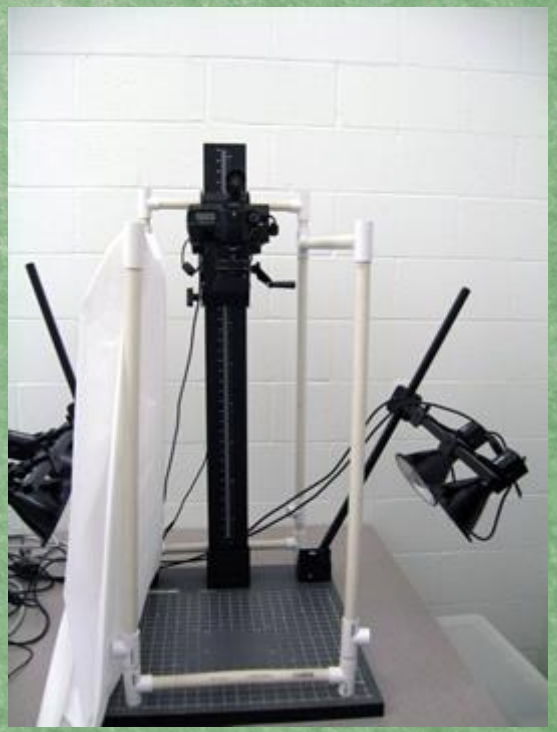
- Which to Use for:
  - Location
    - Field Notes
    - Locality Card
    - Specimen Label
  - Paleontological Context
    - Where Collection Came From
    - What Collector Specified
    - What Agreed On Today?





Photography "Challenges" - Setup





Ensure Using Standards/Calibrations

Non-Color Corrected Bulb

Non-Standard Scale Bar & No Sp #

Color Corrected Bulb

Standard Scale Bar & Cardstock Sp #

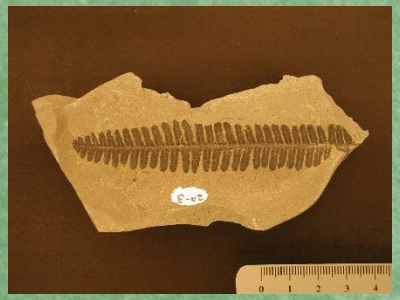
Not Only Lighting But Background

Light Gray Fabric

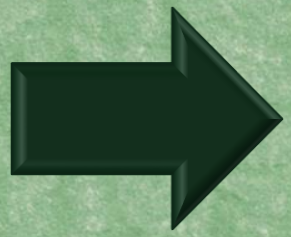
Dark Gray Fabric

Black Fabric

Orientation Matters



Review Procedures & Look for Improvements

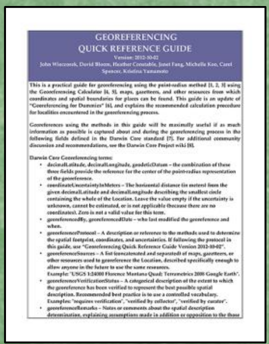


24-70mm Lens

Know Your Slowest Step & Look For Solutions

Georeferencing "Challenges"

Published/Accepted Standards


GEOREFERENCING
QUICK REFERENCE GUIDE

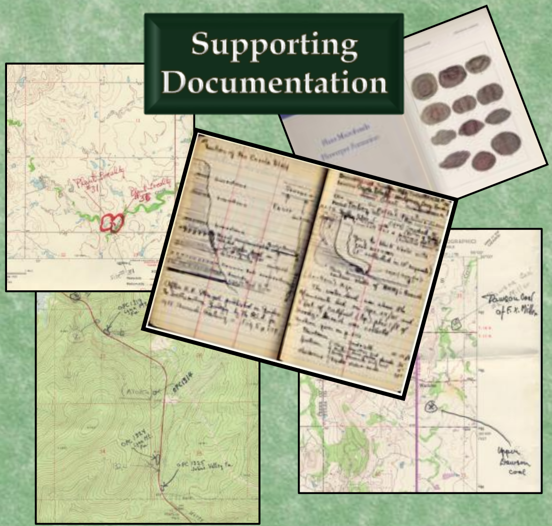
This is a practical guide for georeferencing using the point-radius method [1, 2, 3] using the Georeferencing Calculator [4, 5], maps, gazetteers, and other resources from which coordinates and spatial boundaries for places can be found. This guide is an update of "Georeferencing for Dummies" [6], and explains the recommended calculation procedure for localities encountered in the georeferencing process.

Georeferences using the methods in this guide will be maximally useful if as much information as possible is captured about and during the georeferencing process in the following fields defined in the Darwin Core standard [7]. For additional community discussion and recommendations, see the Darwin Core Project wiki [8].

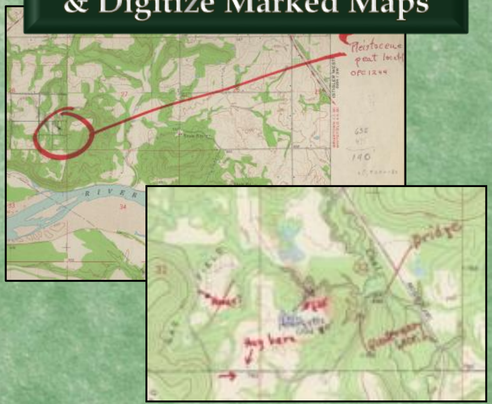
Darwin Core Georeferencing terms:

- decimalLatitude, decimalLongitude, geodeticDatum – the combination of these three fields provide the reference for the center of the point-radius representation of the georeference.
- coordinateUncertaintyInMeters – The horizontal distance (in meters) from the given decimalLatitude and decimalLongitude describing the smallest circle containing the whole of the Location. Leave the value empty if the uncertainty is unknown, cannot be estimated, or is not applicable (because there are no coordinates). Zero is not a valid value for this term.
- georeferencedBy, georeferencedDate – who last modified the georeference and when.

Supporting Documentation



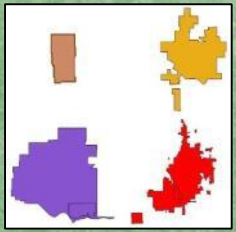
Using ArcGIS to Georectify & Digitize Marked Maps



Collection Specific Procedures

Mainly Developed Being Written Up

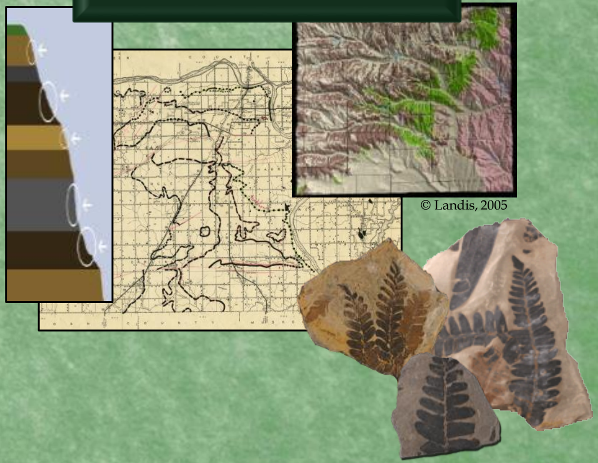
Using City Boundaries/Outlines at Time When Collected



Using Measurements from City's Perceived Measuring Point at Time of Collection

(*e.g.*, from post office, from courthouse)

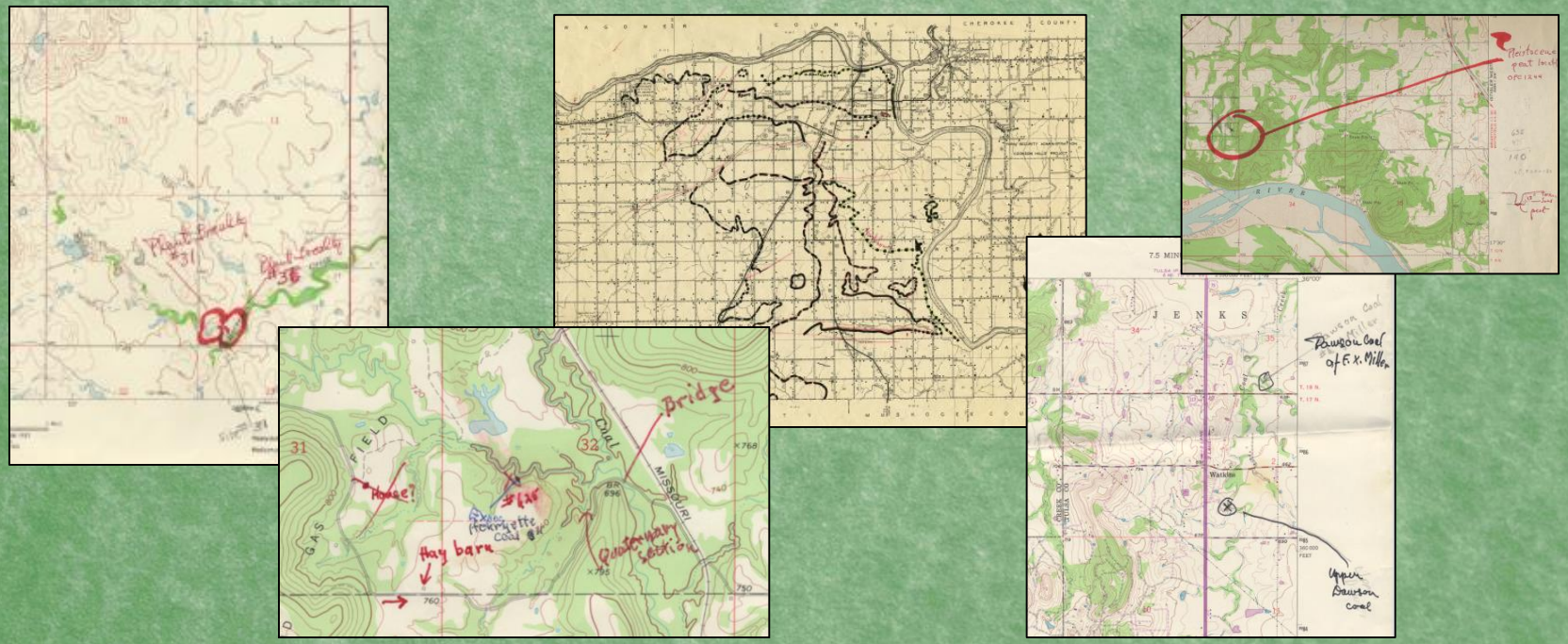
Using Geology to Limit



© Landis, 2005

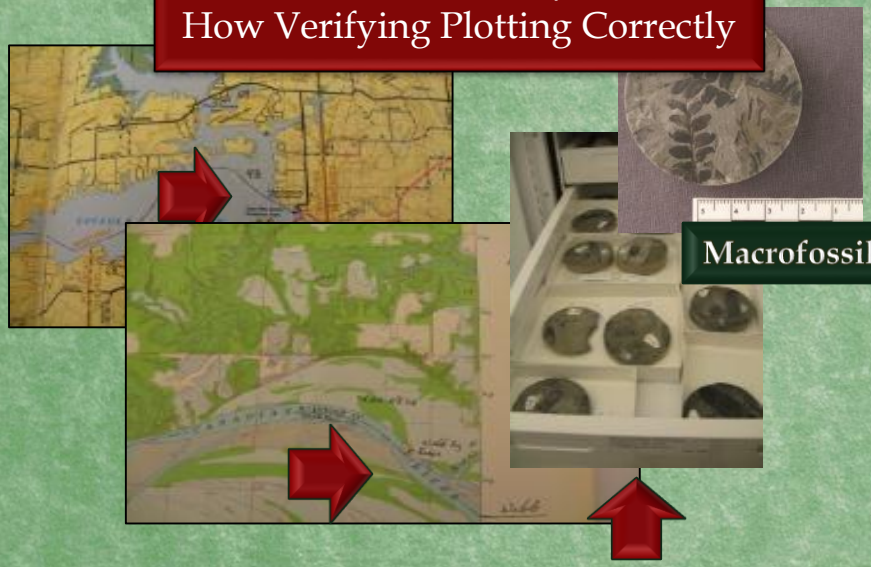
Digitizing Maps of Marked "Localities"

- Scan at Known Scale/Resolution to Appropriate Datum
- Use ArcGIS to Georectify/Georeference Maps
- Digitize Markings in ArcGIS into GIS Layer(s)



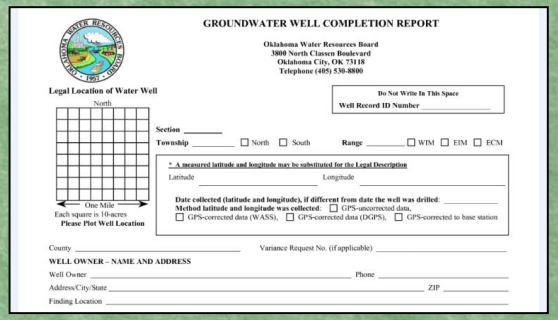
"Advanced" Georeferencing "Challenges"

Need To Determine/Ensure
How Verifying Plotting Correctly



Will Georeference
Surface of Well/Well Permit Location

"Idealized"
Core



GROUNDWATER WELL COMPLETION REPORT

Oklahoma Water Resources Board
3800 North Classen Boulevard
Oklahoma City, Ok 73118
Telephone (405) 530-8800

Legal Location of Water Well

Do Not Write In This Space
Well Record ID Number

North

Section
Township ☐ North ☐ South Range ☐ WIM ☐ FIM ☐ ECM

* A measured latitude and longitude may be substituted for the Legal Description
Latitude Longitude

One Mile
Each square is 10-acres
Please Plot Well Location

Date collected (latitude and longitude), if different from date the well was drilled:
Method latitude and longitude was collected: ☐ GPS-uncorrected data, ☐ GPS-corrected data (WASS), ☐ GPS-corrected data (DGPS), ☐ GPS-corrected to base station

County Variance Request No. (if applicable)

WELL OWNER – NAME AND ADDRESS
Well Owner Phone
Address/City/State ZIP
Finding Location

Need To Determined Paleogeographic Location
(especially if reconstructing environment)

How to Account for
Core Drift from Drilling
(To Be Determined)

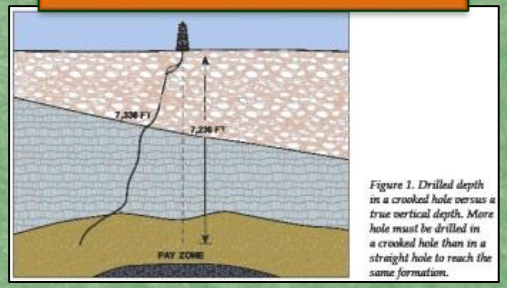


Figure 1. Drilled depth in a crooked hole versus a true vertical depth. More hole must be drilled in a crooked hole than in a straight hole to reach the same formation.

Document Both Digitally & Manually


Photo Checklist – SNOMNH Paleobotany & Micropaleontology

OPC Specimen Number	Subsample Letter (1 letter/line) (no letter = dash)	Specimen Photographed (checkmark if yes) Obverse	Reverse	Other - specify	Date Photographed (mm/dd/yyyy) (1 date/line)	Notes Useful Observations or Problems (No Abbreviations)
1230	–	✓	✓		08/26/2006	
	A	✓	✓		08/26/2006	
	B	✓	✓		08/26/2006	
1231						
1232	–	✓	✓		12/14/2012	[illegible]
1233						
1234	–	✓	✓		12/14/2012	[illegible]
1235	–			✓ radial 1 & 2	11/02/2010	
1236						
1237	–	✓	✓		12/14/2012	Oversized
	–			✓ close-up	12/18/2012	[illegible]
1238						
1239						

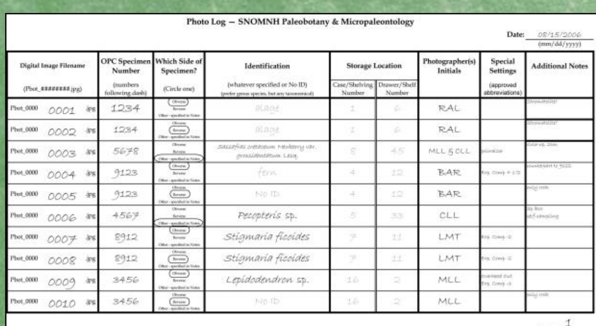


Photo Log – SNOMNH Paleobotany & Micropaleontology

Date: 08/15/2006 (mm/dd/yyyy)

Digital Image Filename (Pbot_########.jpg)	OPC Specimen Number (numbers following dash)	Which Side of Specimen? (Circle one)	Identification (whatever specified or No ID) (prefer genus species, but any taxonomical)	Storage Location: Case/Shelving Number	Storage Location: Drawer/Shelf Number	Photographer(s) Initials	Special Settings (approved abbreviations)	Additional Notes
Pbot_0000 0001 .jpg	1234	Obverse	algae	1	6	RAL		[illegible]
Pbot_0000 0002 .jpg	1234	Reverse	algae	1	6	RAL		[illegible]
Pbot_0000 0003 .jpg	5678	Other - specified in Notes	Sassafras cretaceum Newberry var. grossidentatum Lesq.	8	45	MLL & CLL	[illegible]	[illegible]
Pbot_0000 0004 .jpg	9123	Obverse	fern	4	12	BAR	[illegible]	[illegible]
Pbot_0000 0005 .jpg	9123	Reverse	No ID	4	12	BAR		[illegible]
Pbot_0000 0006 .jpg	4567	Other - specified in Notes	Pecopteris sp.	5	33	CLL		[illegible]
Pbot_0000 0007 .jpg	8912	Obverse	Stigmaria ficoides	7	11	LMT	[illegible]	
Pbot_0000 0008 .jpg	8912	Reverse	Stigmaria ficoides	7	11	LMT	[illegible]	
Pbot_0000 0009 .jpg	3456	Obverse	Lepidodendron sp.	16	2	MLL	[illegible]	
Pbot_0000 0010 .jpg	3456	Reverse	No ID	16	2	MLL		[illegible]

Page: 1

Document, Document, Document

What you are doing,
Why you are doing it,
Where you have looked,
What you found, &
What you didn't find…

…you never know
When "the" clue
to help you or a researcher
understand the record
or other records will be found

Want More Information?

Some of Our Procedures on Web:

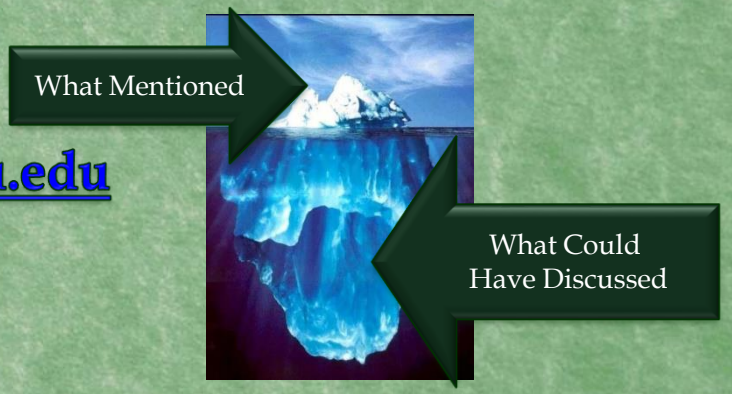
http://www.snomnh.ou.edu/collections-research/PaleobotanyPolicies.htm

Web Database

http://www.snomnh.ou.edu/db2/invp-pbot-grant/index.php

Common Fossils of Oklahoma Webpages:

http://commonfossilsofoklahoma.snomnh.ou.edu



Contact Me

Margaret Landis
Paleobotany, Micropaleontology, & Mineralogy Collection Manager
http://www.snomnh.ou.edu/collections-research/paleobotany.htm
Phone: (405) 325-8266 E-mail: paleocatstar@ou.edu
2401 Chautauqua Ave., Norman, OK 73072-7029

Sam Noble Museum
THE UNIVERSITY OF OKLAHOMA