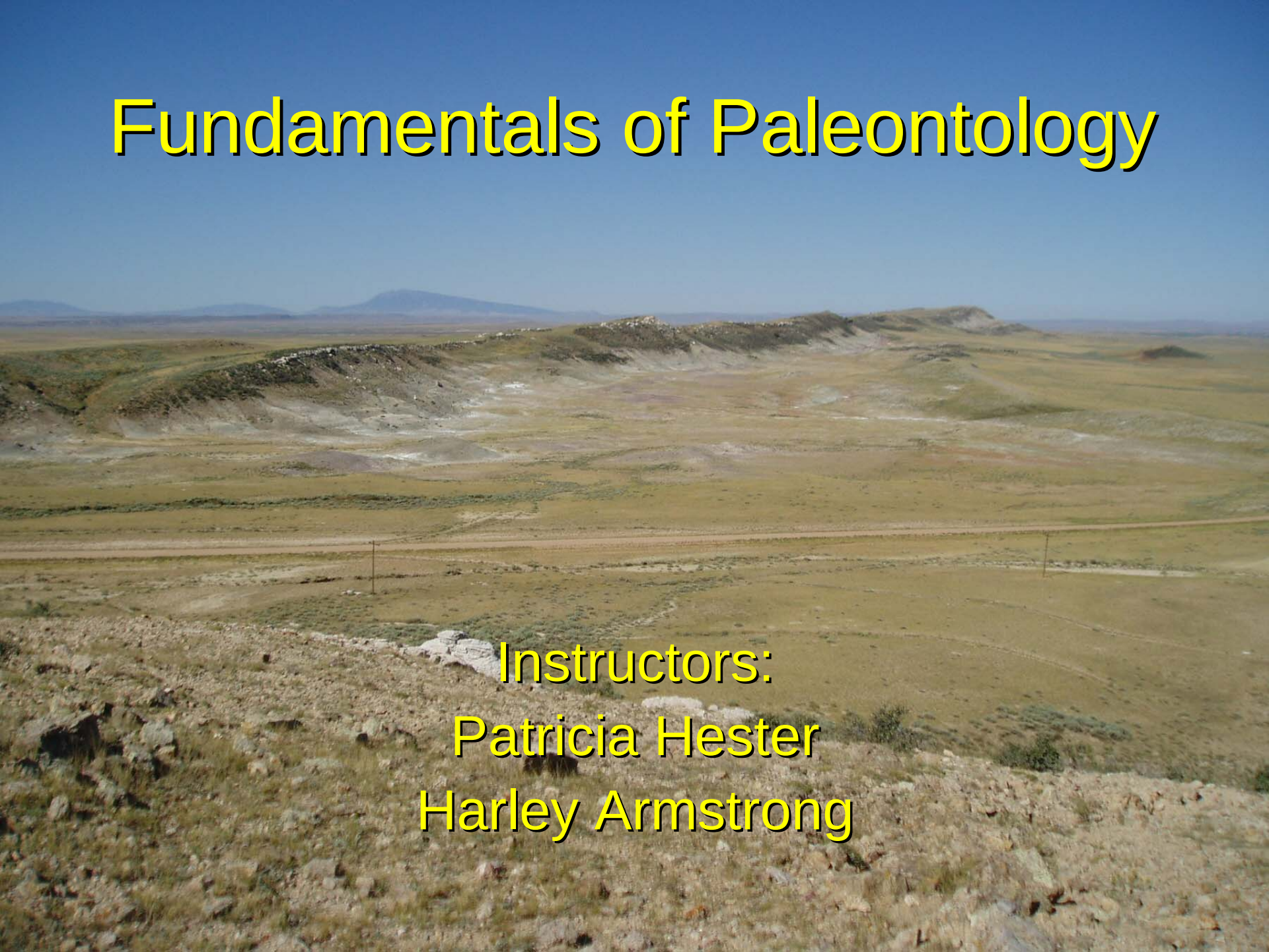
Fundamentals of Paleontology



Instructors:
Patricia Hester
Harley Armstrong

Lesson Objectives:

1. Define terms associated with paleontology
2. Give examples of what is/is not a fossil
3. Give examples of BLM paleontological resources
4. Differentiate between archaeological and paleontological resources
5. Identify and explain proper field techniques for fossil removal.

Lesson Objectives

6. Explain what happens to fossils once they've been recovered and what they can be used for
7. Describe Field Office responsibilities in law enforcement investigations.
8. Explain why geology is important to paleontology.
9. Summarize what the PFYC is and state its uses.

Definitions

Paleontology (“Paleo”)

Fossil

Paleontologist

Locality or Site

Surface Collection

Definitions

Excavation

Quarry

Paleontological Resource

Significance

Collection

Ma

Types of Fossils

Vertebrate

Invertebrate

Plant

Trace/other

Not a Fossil

Pseudomorph

Concretion

Precipitated minerals

“Cone-in-cone” structure

Dendrites

Root impressions (modern)


A rule to prevent forest fires...
"SMOKEY'S FRIENDS DON'T PLAY WITH MATCHES"

Paleo Resources - Field

Interpreted public dinosaur quarry

Paleo Resources - Field

Interpreted public trail

Paleo Resources - Field

In-situ dinosaur bones

Paleo Resources - Field

Plant fossils

Paleo Resources - Field

Invertebrates

Paleo Resources - Field

Burrows

Paleo Resources - Field

Tracks

Field Techniques

1. **Survey Methods**

Field Techniques

2. **Surface Collection**

Field Techniques

3. **Sampling**

Field Techniques

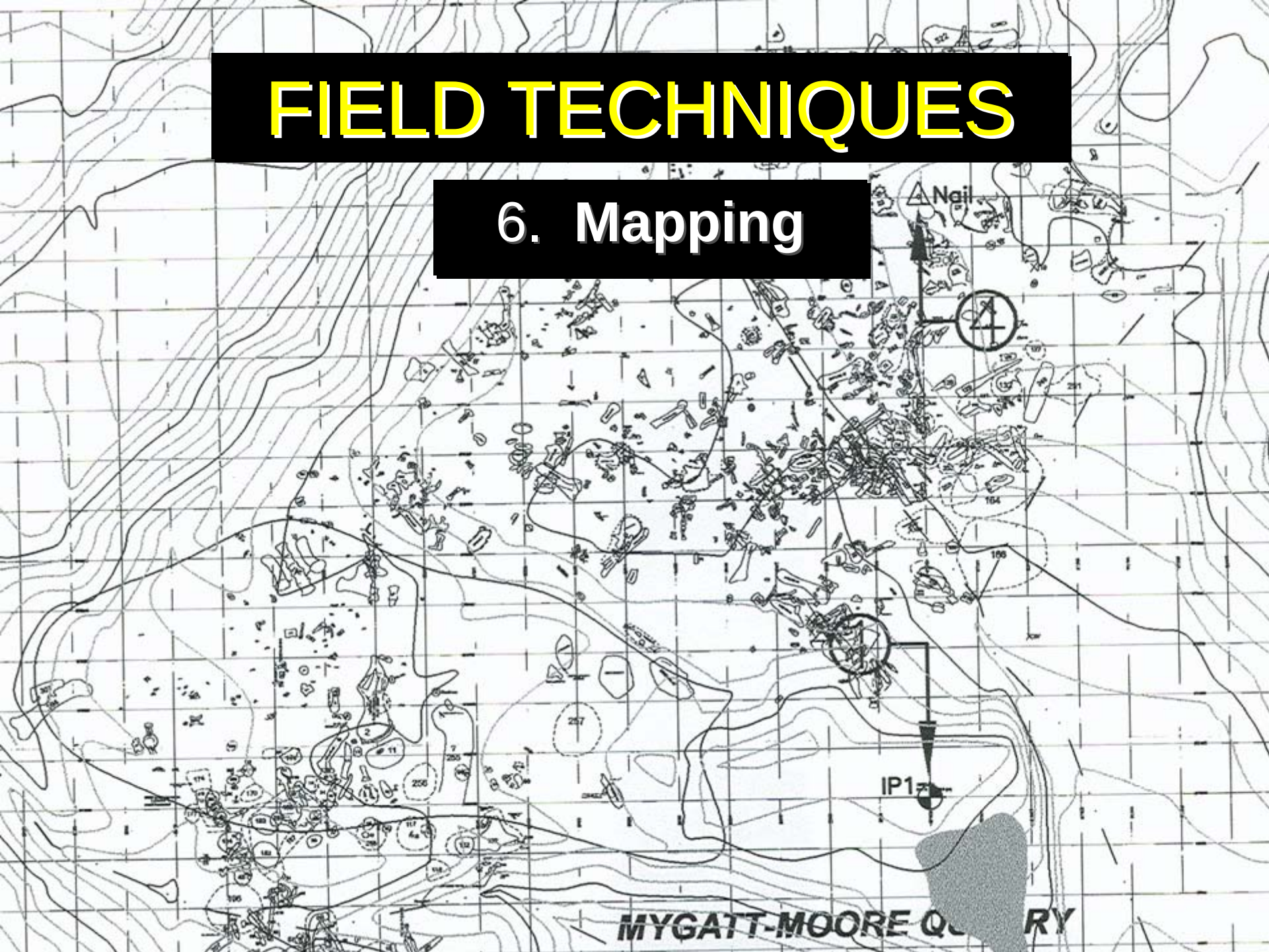
4. **Excavation**

Field Techniques

5. **Stabilization/Backfilling/Reclamation**

FIELD TECHNIQUES

6. Mapping




Locality with Collection Areas

Field Techniques

7. **Measuring a section**

Field Techniques

8. **Recordation**

Field Techniques

9. **Special Situations**

After Fossils are Collected

MP1 – Fossils collected under a permit remain Federal Property

MP2 – Preparation of fossil material varies depending upon the type of fossil

MP3 – Curation allows for a variety of ongoing studies into the future

After Fossils are Collected

Fossil removed from rock matrix.

Curation

Curation - Creating collections and ensuring their care and management over the long term.

Accession Records

Catalog Records

Locality Records

Research

- Research may continue on specific fossil material over a long period of time.
- Types of research may also involve destructive analysis.
- Teaching and exhibit are appropriate uses of federally owned fossils.

Fossils collected under permit remain US Federal Property as managed by BLM

Geology

Study of the Earth, what it's made of, the processes acting on it and the organisms inhabiting our planet.

How Earth's materials, structures, processes and organisms have changed over time.

Since paleontology is the study of those organisms, geology and paleontology are intrinsically connected.

Key Concepts

Rock types, depositional environments and reading the rocks

Fossil Preservation and Occurrence

Geologic Mapping Conventions

PFYC- a Resource Management Tool

Basic Rock Types

Igneous

Metamorphic

Sedimentary

Sedimentary Rocks

- Chemical sedimentary rocks
  - Limestones and other carbonates
  - Evaporites (salt beds, sulfates)
  - Chert
- Detrital sedimentary rocks
  - Shales, Mudstones
  - Siltstones, Sandstones
  - Conglomerates and Breccia

Depositional Environments

Detrital grains are transported by

- Gravity
- Water
- Wind
- Glacial Ice

Depositional Environments

Detrital grains are deposited in various settings under a variety of energy regimes

Beaches, lakes, rivers, deltas, deserts, swamps, continental shelves

- These environments are where plants and animals live and die

Reading the Rocks

Geologists describe various physical attributes of sedimentary rocks-

Grain size

- Internal sedimentary structures
- Bed geometry
- Degree of sorting of grains
- Relationship with underlying and overlying strata

Physical description of the “strata” is called lithostratigraphy

Biostratigraphy

Science of dating rocks by fossils. Usually the aim is correlation

Demonstrating a particular horizon in one geological section represents the same period of time as another horizon at some other section.

Both invertebrates and vertebrates are used in biostratigrphy and increments of geologic time are based on the disappearance or appearance of a specific organism or group of organisms.

Preservation and Occurrence of Fossils

What it takes to become a fossil:

- Hard parts
- Rapid burial
- Surviving the process of becoming a rock
- Preservation of traces

Fundamental Map Unit

Geologic Formation

Basic rock unit which is mappable and has definite boundaries (contacts with other units), certain obvious characteristics (such as rock type) and is traceable in outcrop from place to place.

Geologic Mapping

Representation of the rock units in a given area by formation

Suggestion of what geologic events have occurred in the area.

Shows where the rocks have been folded, faulted or pushed older rocks over younger rocks.

BLM's Classification System for Paleontological Resources

PFYC – Potential Fossil Yield Classification System

Provides baseline guidance for predicting, assessing and mitigating paleontological resources

Geologic formations can be rated for the potential to produce significant fossils such as most vertebrates, and on a case-by-case basis, some invertebrate or plant fossils .

IM 2008-009

Potential Fossil Yield Classification (PFYC) System for Paleontological Resource Management on Public Lands

Supersedes H-8270-1 Chapter II.A.2

Class 1

Very low. Units that are not likely to contain recognizable fossil remains and therefore, the probability for impacting fossils negligible.

Management concern for paleontological resources in Class 1 units is usually negligible or not applicable.

Class 2

Low. Sedimentary units that are not likely to contain vertebrate fossils or scientifically significant non vertebrate fossils and therefore, the probability for impacting fossils negligible.

Management concern is generally low

Class 3

Moderate or Unknown fossil content varies in significance, abundance, and predictable occurrence: or sedimentary units of unknown fossil potential.

Management concern if moderate or cannot be determined from existing data.

Class 3

3a: Moderate Potential – fossils are known but widely scattered

3b: Unknown Potential – little information is known about fossils in the area

Class 4

High-vertebrate fossils or scientifically significant invertebrates or plants are known to often occur and have been documented but may vary in occurrence and predictability.

Management concern is moderate to high, depending on the proposed action.

Class 5

Very High. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils.

Management concerns for paleontological resources is high to very high.

Uses

Land Use Planning. Handbook 1601.1

Establishing areas of specific consideration

Areas where recreational collection might be appropriate

Areas where monitoring and patrol by LE might be needed

Modification

Classes can be modified as more data is collected.

On the ground surveys, for mitigation or research permits.

Data collected where no data available.

Lesson Objectives:

1. Define terms associated with paleontology
2. Give examples of what is/is not a fossil
3. Give examples of BLM paleontological resources
4. Differentiate between archaeological and paleontological resources
5. Identify and explain proper field techniques for fossil removal.

Lesson Objectives

6. Explain what happens to fossils once they've been recovered and what they can be used for
7. Describe Field Office responsibilities in law enforcement investigations.
8. Explain why geology is important to paleontology.
9. Summarize what the PFYC is and state its uses.