NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES

WARNING

THE LOCATION OF THIS PROPERTY IS RESTRICTED INFORMATION. THIS DOCUMENTATION MAY BE REPRODUCED ONLY WITH THE CHIEF OF REGISTRATION'S PERMISSION.

WHEN PHOTOCOPYING OR OTHERWISE REPRODUCING THIS DOCUMENT, BE CERTAIN TO COVER ALL LOCATION INFORMATION, INCLUDING THE ADDRESS BLOCKS, VERBAL BOUNDARY DESCRIPTION, UTM COORDINATES, MAPS OR ANY SECTIONS IN THE TEXT DESCRIBING LOCATION.

Property Name Judith Landing Historic District (Boundary Increase)

State Montana

County Fergus

Reference Number 14000143

NPS Form 10-900a

OMB No. 1024-0018

(8-86)

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES CONTINUATION SHEET

Section _____ Page ___

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SUPPLEMENTARY LISTING RECORD

NRIS Reference Number: 14000143 Date Listed: 4/11/2014

Judith landing Historic District (Boundary Increase)
Property Name

Fergus
County

MT
State

N/A
Multiple Name

This property is listed in the National Register of Historic Places in accordance with the attached nomination documentation subject to the following exceptions, exclusions, or amendments, notwithstanding the National Park Service certification included in the nomination documentation.

Signature of the Keeper

4/11/2014
Date of Action

==========

Amended Items in Nomination:

Not for Publication:
The nomination should be marked: *Not for Publication*. The preparers have provided a redacted version of the form for public review, which specifically restricts locational information regarding the historic Hayden Site. The general location and maps of the broader boundary increase area are not restricted.

These clarifications were confirmed with the FPO/SHPO.

DISTRIBUTION:
National Register property file
Nominating Authority (without nomination attachment)

NPS Form 10-900

OMB No. 1024-0018

United States Department of the Interior
National Park Service

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National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in National Register Bulletin, *How to Complete the National Register of Historic Places Registration Form.* If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions.

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1. Name of Property

Historic name: Judith Landing Historic District (Boundary Increase)
Other names/site number: Hayden Site/ 24FR0199
Name of related multiple property listing:
N/A
(Enter "N/A" if property is not part of a multiple property listing

2. Location

Street & number: Dog Creek Road
City or town: Judith State: MT County: Fergus
Not For Publication: ✓ Vicinity: x

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended,

I hereby certify that this X nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60.

In my opinion, the property X meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant at the following level(s) of significance:

___national X statewide ___local

Applicable National Register Criteria:

X A ___B ___C ___D

Mark F. Baumler / SHPO 11/1/2013

Signature of certifying official/Title: **Date**

Montana State Historic Preservation Office

State or Federal agency/bureau or Tribal Government

In my opinion, the property ✓ meets ___ does not meet the National Register criteria.

Signature of commenting official: **Date**

Robin D Hawks January 2, 2014

Title : **State or Federal agency/bureau or Tribal Government**

Federal Preservation Officer BLM

4. National Park Service Certification

I hereby certify that this property is:

✓ entered in the National Register

___ determined eligible for the National Register

___ determined not eligible for the National Register

___ removed from the National Register

___ other (explain:) _____

Signature of the Keeper 4/11/2014 Date of Action

5. Classification

Ownership of Property

(Check as many boxes as apply.)

Private:	X
Public – Local	
Public – State	
Public – Federal	X

Category of Property

(Check only **one** box.)

Building(s)	
District	X
Site	
Structure	
Object	

Number of Resources within Property
(Do not include previously listed resources in the count)

Contributing	Noncontributing	
0	0	buildings
1	0	sites
0	0	structures
0	0	objects
1	0	Total

Number of contributing resources previously listed in the National Register 32

---

6. Function or Use
Historic Functions
(Enter categories from instructions.)
LANDSCAPE/natural feature
LANDSCAPE/unoccupied land
INDUSTRY/PROCESSING/EXTRACTION/extractive facility

Current Functions
(Enter categories from instructions.)
LANDSCAPE/natural feature
LANDSCAPE/unoccupied land

7. Description

Architectural Classification
(Enter categories from instructions.)
N/A

Materials: (enter categories from instructions.)
Principal exterior materials of the property: N/A

Narrative Description

Summary Paragraph

The Judith Landing Historic District includes the beautiful, rugged landscape of dry high bluffs, intermittent creeks, and verdant bottomlands along the Missouri River at the mouths of the Judith River and Dog Creek. The district established in 1975 embraces a 15-square mile area and includes property in both Fergus and Chouteau Counties. The boundary increase area addressed in this nomination lies within Fergus County, and abuts the southeastern side of the original district, including a portion of the Dog Creek drainage and breaks encompassing the site where Ferdinand Hayden uncovered and collected several specimens of fossilized dinosaur bones and teeth in 1855. Hayden's discoveries constituted the first identified dinosaur skeletal remains in the Western Hemisphere. Subsequent paleontological expeditions, including the 1875 Army Corps of Engineers Expedition led by Col. William Ludlow with George Bird Grinnell and Edward S. Dana, the 1876 Edward Drinker Cope expedition, and Charles H. Sternberg's 1914 trek, also explored the fossil beds in the Dog Creek Drainage first discovered by Hayden.

The Dog Creek drainage provides a natural trail leading from its mouth up to the rugged breaks above the Missouri River. In October 1855, Ferdinand Hayden followed narrow drainages, ridges, and animal trails when he explored the exposed outcrops of ancient fossil beds. These fossil beds are part of the Judith River Formation, a geological unit dating to the Upper Cretaceous Period, rich in paleontological sites. The bluffs within the boundary increase area are steep and often unstable, cut by in some cases by extremely narrow gullies and sandy slopes. From atop the breaks, the vista provides a remarkable view of the entire Judith Landing Historic District, including Council Island in the Missouri River.

Narrative Description

The Judith Landing Historic District is located within the boundaries of the Upper Missouri River Breaks National Monument (UMRBNM) in north-central Montana. These lands hold a spectacular array of plant life, wildlife, unique geological features, as well as significant historical and cultural resources. The rugged landscape has retained much of its unspoiled character over the centuries and, as a result, displays remarkable integrity of setting, feeling, and association. In some areas, including the Judith Landing Historic District Boundary Increase area, the BLM lands intermingle with private property.

In 1975, approximately fifteen square miles of property, now located within the monument boundary, were listed in the National Register of Historic Places as the Judith Landing Historic District. The district encompasses the verdant valley surrounding the confluence of the Judith and Missouri Rivers and the mouth of Dog Creek, extending from the Missouri's Deadman Rapids at its west edge to the Holmes Council Islands to the east. The Boundary Increase area nominated here includes the majority of the north half of section 31, Township 23 North, Range 17 East. Section 31 is a fractional section, and its entirety includes 920.64 acres. The boundary increase area consists of Lots 1-8 and the W ½ of the NE ¼ of section 31, for a total of 344 acres. This area includes the approaches to the Hayden site, the area explored by Hayden and subsequent paleontologists in the late nineteenth and early twentieth centuries, and the Hayden site itself.

The Hayden site lies at the north edge of a relatively flat-topped bluff formed by the Dog Creek drainage to the south and an unnamed intermittent tributary to the north. The steep outcrops along the bluff's edge bear numerous fossil beds featuring a variety of prehistoric fauna, ranging from marine invertebrates, such as ancient mollusks, to vertebrate reptilian species. At its west and east extremities, the Missouri River runs deep within the district boundary, narrowly channeled by steep sandstone bluffs. Geologically, the bluffs represent part of the Judith River Formation that dates to the Cretaceous Period.

The Cretaceous Period and the Judith River Formation[1]

The Cretaceous is the third and final period of the Mesozoic Era, dating from approximately 145.6 to 65 million years ago. During this period, the Pangaea supercontinent had broken apart nearly completely. As a result, huge waterways, including the Atlantic Ocean, came into existence. Global sea levels were extraordinarily high, and shallow seas, called epicontinental seas, covered much of the continents' low-lying areas. During part of Late Cretaceous, the Western Interior Seaway connected the Gulf of Mexico with the Arctic Ocean through the center of North America.[2] Cretaceous flora and fauna abounded, both in the oceans and on land, the fossils of which can now be found in beds above the Judith River.

The Judith River Formation is an eastward-thinning, clastic wedge of nonmarine and shallow marine rocks, measuring approximately 590 feet thick near the Judith River-Missouri River confluence.[3] The Judith River Formation consists of a lower sandstone-dominated portion deposited when the interior seaway regressed, and an upper mudstone-dominated portion deposited during a later seaway expansion, called the Bearpaw seaway transgression.[4] The formation consists of interbedded deposits of fluvial

[1] Information taken, with permission, from: Rebecca R. Hanna, "*Class I Overview Of The BLM Lewistown Resource Management Plan Area: Including portions of Blaine, Cascade, Chouteau, Fergus, Judith Basin, Lewis & Clark, Meagher, Petroleum, Phillips, Pondera, and Teton Counties, Montana,* Volume 2: Paleontological Resources, Part 1," Prepared for Lewistown Field Office, Bureau of Land Management, 2009.

[2] Gale Cenage, "Cretaceous Period," *World of Earth Science*, 2003, online at E-Notes http://www.enotes.com/cretaceous-period-reference/cretaceous-period, accessed 5/9/2013.

[3] Raymond R. Rogers, "Sequence Analysis of the Upper Cretaceous Two Medicine and Judith River Formations, Montana: Nonmarine Response to the Claggett and Bearpaw Marine Cycles," *Journal of Sedimentary Research* 1998, 68(4):615-631.

[4] John R. Horner, James G. Schmitt, Frankie Jackson, and Rebecca R. Hanna, "Bones and Rocks of the Upper Cretaceous Two Medicine-Judith River Clastic Wedge Complex, Montana," in *Mesozoic and Cenozoic Paleontology in the Western Plains and Rocky Mountains: Guidebook for the Field Trips, Society of Vertebrate Paleontology, 61st Annual Meeting*, edited by C. L. Hill, pp. 1-13. Museum of the Rockies Occasional Paper No. 3, Montana State University, Bozeman, Montana, 2001; Rogers 1998.

sandstone, carbonaceous mudstone, siltstone, and coal with an oyster coquina near the top, and Parkman Sandstone Member at the base in some areas.[5] Invertebrates and trace fossil zones occur in the lower part.

Vertebrate skeletal material found throughout the formation includes fossilized remains of plants, reptiles, fish, insects, sharks, amphibians, mammals, and birds. Most of the well-preserved dinosaur skeletons occur in the coastal environment deposits that comprise the lowermost part of the Judith River Formation or the distal part of the clastic wedge. The upper part of the formation is very fossiliferous and contains abundant microsites, a few dinosaur bone beds, and occasional dinosaur nests.[6]

The Hayden Site

In his report on his 1854-1855 expedition, Hayden described the geology of the Dog Creek area:

> As we proceed toward the mouth of the Judith river and near the Judith mountains we find quite thick beds of concretionary sandstone, which form the "Stone Walls," "Citadel," &c. It is from these beds that we have obtained a group of fossils which we have referred provisionally to No. 1, but which seem to be specifically distinct from all others in the West. It may be that when this group of beds, now referred to Nos. 1 and 2, comprising a thickness of fifteen hundred to two thousand feet in this region, are more carefully studied, that several subdivisions will be made...[7]

Located high on the northern edge of a large bluff overlooking the Dog Creek drainage, the Hayden site is located at: [redacted] It occurs in a gray siltstone that represents a pond/lake environment in the Cretaceous Judith River Formation. The diversity of the fossil fauna recovered there during paleontological surveys in 2012 mirrors those fossils collected by Hayden in 1855 and described by Leidy in 1856 (Tables 1, 2). One and one quarter mile proximate to Council Island, where Hayden camped with his party, the 2012 surveys identified the site not only by the fossils collected there, but also by surveying and finding a general lack of vertebrate fossils lower in section or at other areas in the vicinity of the Judith River/Council Island. Alluvium and Cretaceous marine shale predominate in the area, neither of which contain the array of terrestrial animals collected by Hayden in 1855.

Access to the Hayden site begins at river level at the base of the breaks, near the northwest corner of Section 31, Township 23 North, Range 17 East. The ascent follows well established animal trails (see Map 5) up a sandy drainage along the north side of the bluffs. Crossing an unnamed tributary of Dog Creek, the trail traverses lower reaches of rocks typically exposed in the Breaks, including marine shale

[5] Robert N. Bergantino, Karen W. Porter, and B. Carter Hearn, Jr. , "*Geologic Map of the Rocky Boy 30' x 60' Quadrangle, North-Central Montana*," Montana Bureau of Mines and Geology Open File Report 451, scale 1:100,000, 2002; Mark A. Sholes and Robert N. Bergantino, "*Geologic Map of the Havre 30' x 60' Quadrangle, North-Central Montana*.," Montana Bureau of Mines and Geology Open File Report 467, scale 1:100,000, 2002.

[6] John R. Horner, "Egg Clutches and Embryos of Two Hadrosaurian Dinosaurs." *Journal of Vertebrate Paleontology*, 1999, 19(4):607-611; Horner, et. al, 1998; Raymond R. Rogers and Susan M. Kidwell, "Associations of Vertebrate Skeletal Concentrations and Discontinuity Surfaces in Terrestrial and Shallow Marine Records: A Test in the Cretaceous of Montana," *Journal of Geology,* 2000, 108:131-154; Raymond R. Rogers and Mara E. Brady, in review, "Origins of microfossil bonebeds: insights from the Upper Cretaceous Judith River Formation of North-Central Montana," (Manuscript on file at Department of Geology, Macalester College, St. Paul, Minnesota.) *Paleobiology*.

[7] Ferdinand V. Hayden, "On the Geology and Natural History of the Upper Missouri," *Transactions of the American Philosophical Society*, Vol. XII (1862): 1-4.

and sandstone units that yield a few undurated shell beds, but no vertebrate fossils. Evergreen trees line the edges of the bluffs, the tops of which are flat and grassy.

Surveyors in 2012 identified a bentonite layer, volcanic in origin and geologically distinctive, and sampled it to obtain a radiometric age for this section of the Judith River Formation. Vertebrate fossils litter the slope above the bentonite horizon. The site itself includes 30-40 horizontal meters around a knob comprised of approximately one meter of clay-rich siltstone capped by a two- to three-meter thick sandstone. The site sits approximately 925 meters above sea level, and one and one-quarter miles as the crow files from Council Island. The survey team collected all the surface fossils at the site in the Spring of 2012, and again in August 2012, after a rainy summer exposed more specimens. These surface collections captured the full range of those organisms represented in Hayden's original collection. Further survey in August 2012 included sedimentary units several more miles farther upstream within Dog Creek Drainage, but did not yield any site as productive, nor any that produced the array of large and small bodied vertebrates recovered at the Hayden site.

The following table demonstrates the specimens collected by Hayden in October 1855 and those collected in 2012:

Table 1. Fossils collected by Hayden (1855) and by KCR, RRR, & MT BLM (2012).

Taxon	Hayden 1855	Expedition 2012
Lepisosteus (garfish scales)	X	X
Champsosaur (vertebrae)	X	X
Crocodylomorpha (teeth)	X	X
Basilemys (turtle shell fragments)	X	X
Hadrosaur (including teeth and bones)	X	X
Theropod (multiple species of teeth)	X	X
Ankylosaur (teeth only)	X	-

Table 2 describes and quantifies the fossils collected at the Hayden site in 2012.

Table 2. Fossils collected summer of 2012.

Taxon	Preserved Remains	Number of Fossils
Lepisosteus	Scales	2
Basilemys	Carapace and Plastron Fragments	8
Champsosaur	Vertebra	1
Crocodylomorpha	Teeth	2
Hadrosaur indet.	Teeth, Postcranial Bones (vertebrae, limb elements)	14, 63
Theropoda indet.	Teeth	2
Snail	Operculum	1

Integrity:

The Judith Landing Historic District Boundary Increase area retains an extremely high degree of integrity. Because of the remote location of this natural landscape feature, the property remains as it was during the period of significance. The high bluffs and rugged terrain preclude much human interaction with the site, and therefore the setting, feeling, and association are strong. The viewshed includes some irrigated fields to the north and west, but otherwise looks as it has for centuries. Integrity of design, workmanship, and materials are not applicable to this property, as no man-made structures or buildings are associated with it.

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

[x] A. Property is associated with events that have made a significant contribution to the broad patterns of our history.

[ ] B. Property is associated with the lives of persons significant in our past.

[ ] C. Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

[ ] D. Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

[ ] A. Owned by a religious institution or used for religious purposes

[ ] B. Removed from its original location

[ ] C. A birthplace or grave

[ ] D. A cemetery

[ ] E. A reconstructed building, object, or structure

[ ] F. A commemorative property

[ ] G. Less than 50 years old or achieving significance within the past 50 years

Areas of Significance
(Enter categories from instructions.)
_Science_____

Period of Significance
_1855-1876_____

Significant Dates
_1855, 1856, 1875___
__1876_____

Significant Person
(Complete only if Criterion B is marked above.)
___N/A_____

Cultural Affiliation
___N/A_____

Architect/Builder
___N/A_____

Statement of Significance Summary Paragraph

Established in 1975, the Judith Landing Historic District includes approximately 15 square miles of cultural landscape, and encompasses the complex layers of archaeological and historic resources located there. The 1975 statement of significance already includes a discussion of the district and its relationship to the history of science. Specifically, it notes Ferdinand Hayden's exploration of the District, though erroneously places him there in 1856, rather than 1855. The purpose of this boundary increase is to include and document the area through which Hayden traversed and from which he collected. The Judith Landing Historic District Boundary Increase encompasses the approaches and site where Hayden uncovered and collected several specimens of fossilized dinosaur bones and teeth in 1855. Prominent Academy of Natural Sciences comparative anatomist/paleontologist Joseph Leidy reported on the find in 1856, identifying the collection as including the first dinosaur species scientifically identified in the Western Hemisphere. Subsequent expeditions, including the 1875 Ludlow Expedition and the 1876 Cope Expedition, explored the fossil beds in the Dog Creek Drainage first discovered by Hayden. For its association with the formative years of the history of paleontology and the seminal paleontological discoveries made there, the Judith Landing Historic District Boundary Increase is eligible for listing in the National Register under Criterion A at the statewide level of significance.

Narrative Statement of Significance (Provide at least **one** paragraph for each area of significance.)

The Beginnings of Paleontology

Evidence unearthed from ancient archaeological sites across Europe show that even from the time of the Neanderthals, humans have known about and been intrigued by the fossils of even more ancient creatures. European schools of thought that explained the existence of fossils evolved through millennia. Greek philosopher Aristotle postulated fossils were incomplete creatures, spontaneously generated by inorganic processes within an eternal and unchanging earth. Some Middle Age Europeans thought that fossils were the work of the Devil. Many Christians believed, and some still do, that they represent species that perished during Noah's flood, or other world-wide catastrophes. In Asia, some cultures identified fossils as the remains of dragons.[8] During the eleventh century, Chinese scientist and statesman Shen Kuo found marine fossils in the Taihang Mountains and theorized on geological processes, including geomorphology and the shifting of seashores over time. Shen observed petrified bamboos obtained from a dry climate zone that did not then support bamboo growth, and argued for a theory of gradual climate change.[9]

As Europe emerged from the Middle Ages, more scientific approaches to the study of natural history began to develop. By the mid-1400s, a few scholars, including Leonardo da Vinci, recognized fossils as the remains of extinct ancient life. In the 1600s, Danish scholar Nicholas Steno recognized the stratified nature of the earth and superposition, whereby older rocks underlay newer layers. Concurrently, naturalists more widely began to embrace the idea that fossils were examples of extinct creatures and plants, though the vast majority failed to recognize their antiquity, and continued to assume they existed at the time of Genesis.[10]

By the late eighteenth century, Georges Cuvier, often called the "father of paleontology," established extinction as a fact, and made great strides in comparative anatomy, theorizing the idea of functional integration:

> The functional integration of organisms meant that each part of an organism, no matter how small, bore signs of the whole. Thus it was possible to reconstruct organisms from fragmentary remains, based on rational principles. Cuvier had a legendary ability to reconstruct organisms from fragmentary fossils, and many of his reconstructions turned out to be strikingly accurate.[11]

Cuvier's work, together with the work of other scholars like Britain's William Smith, who identified and mapped geologic layers based on fossils present, instigated a wave of fossil collection and identification.[12] By 1822, the editor of *Journal de Physique* coined the term "paleontology," to refer to the study of

[8] Glen Kuban, "A Brief History of Paleontology," excerpted from *Introduction to Fossil Collecting*, (copyright 1994-2000) accessed online on June 5, 2013, http://paleo.cc/kpaleo/fosshist.htm.
[9] Anonymous, "Shen Kuo - One of the Greatest Scientists in China's History," on the Cultural China webpage accessed June 18, 2013, http://history.cultural-china.com/en/50History6059.html.
[10] Ibid.
[11] Anonymous, "Georges Cuvier (1769-1832)," University of California Museum of Paleontology website, accessed June 5, 2013, http://www.ucmp.berkeley.edu/history/cuvier.html.
[12] Kuban, "Brief History of Paleontology,"; Anonymous, "William Smith (1769-1839)," University of California Museum of Paleontology website, accessed June 5, 2013, http://www.ucmp.berkeley.edu/history/smith.html.

fossilized organisms. A broader understanding of geologic forces also developed through the early 1800s, including the principles of erosion and deposition. This understanding culminated in Charles Lyell's seminal, two-volume *Principals of Geology* in 1830 and 1833. Lyell also theorized on evolution, and heavily influenced Charles Darwin.[13] In 1842, Darwin's colleague Sir Richard Owen, also a scholar of comparative anatomy, was the first to define the taxon *Dinosauria*.[14] Indeed, the scientific strides made in the areas of geology, comparative anatomy, and by naturalists during the late eighteenth and early nineteenth centuries were revolutionary.

Progress in geology, natural history, and paleontology extended beyond Europe. Interest in the fields grew, particularly in North America, where a number of geological and natural history societies, such as the American Philosophical Society, provided scholarly outlet "to cultivate the finer arts, and improve the common stock of knowledge."[15] By the early 1800s, scientists could find work at universities, museums, and on private and governmental geological surveys. Not only were the sciences increasingly popular, the geologists and naturalists provided vast amounts of information regarding the continent's natural resources – and their potential for economic development. Savvy politicians recognized this, and sent expeditions westward to explore the North American continent. Though these journeys were most often military expeditions, the sponsors placed great emphasis on geology and identifying and collecting flora and fauna.[16]

In the United States, the centers for natural science studies included the University of Pennsylvania, where Joseph Leidy served as one of the leading naturalists in the nation; the Smithsonian Institution, where, by 1850, Spencer Fullerton Baird worked to establish a national museum with massive collections, and the New York Geological Survey, which employed leading geologist James Hall. These three men greatly influenced aspiring geologist and naturalist Ferdinand Vandeveer Hayden.

Ferdinand Vandeveer Hayden

Hayden spent his childhood in Massachusetts, New York State, and Ohio. Born in 1828 or 1829 – accounts vary – young Ferdinand lived with his parents for his first decade, then moved with his mother and siblings to Rochester, New York when his parents separated. His mother remarried in 1841, and at that time she sent Ferdinand to live with an aunt in Ohio. In 1845, Hayden travelled to Oberlin, Ohio to continue his education.[17] While at Oberlin, he studied geology under George Allen, a proponent of natural theology, the leading approach to the natural sciences that purported: "the deliberate and purposeful design of the Creator was responsible for the entire universe in all its detail and complexity.

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[13] Anonymous, "Charles Lyell: The Principles of Geology," from Montana PBS"s Evolution Library, accessed June 7, 2013, http://www.pbs.org/wgbh/evolution/library/02/4/l_024_01.html.

[14] Anonymous, "Sir Richard Owen," University of California Museum of Paleontology website, accessed June 5, 2013, http://www.ucmp.berkeley.edu/history/owen.html.

[15] Benjamin Franklin quoted on the American Philosophical Society's webpage: http://www.amphilsoc.org/about, accessed June 6, 2013.

[16] The famed Corps of Discovery was one such expedition, and Lewis and Clark passed through the Judith Landing Historic District area on May 29, 1805. Clark named the Judith River after his future wife, and described its clear waters and the surrounding vegetation and wildlife. Meriwether Lewis and William Clark, "May 29, 1805," *Journals of the Lewis and Clark Expedition,* accessed June 7, 2013, http://lewisandclarkjournals.unl.edu/read/?_xmlsrc=1805-05-29.xml&_xslsrc=LCstyles.xsl.

[17] Mike Foster, *Strange Genius: The Life of Ferdinand Vandeveer Hayden,* (Niwor, Colorado: Robert Rinehart Publishers, 1994) pp. 11-18.

The role of natural history was to discover and illustrate that design in nature."[18] Allen's instruction emphasized classification and description of the natural world.

Upon graduation in 1850, Hayden supported himself by teaching, and enrolled in Oberlin's Theology Department. The following year he attended classes at the Cleveland Medical School, studying under Jared Kirkland and John Newberry. Medical school provided the best opportunity for Hayden to continue his studies in natural history, learning more about biology and botany. There his mentors introduced him to James Hall, who at a young age established himself at the Geological Survey of New York. Hall invited Hayden to complete his studies in Albany in 1853, and the two, together with Hall's assistant Fielding Bradford Meek, began planning an expedition to the Nebraska Territory[19] to collect fossils. Concurrently, Hayden established a connection to the Smithsonian's Spencer Fullerton Baird and naturalist Joseph Leidy, and looked to them as potential mentors as well.

Meek and Hayden undertook their trip west, privately sponsored by Hall, in May 1853. They arrived at Fort Pierre in mid-June. They travelled with a rival surveying party, under the leadership of Governor Isaac Stevens, who sought practical railroad routes through the area. Baird secured a place for naturalist John Evans in Stevens' party to collect specimens for the Smithsonian. Also on the boat to Fort Pierre were American Fur Company representative Alexander Culbertson, and Indian Agent Alfred Vaughn. The trip not only provided Hayden with essential contacts among the leading naturalists, collectors, businessmen, and government surveyors, it also provided him with a personal understanding of the potential for scientific discovery in the American West. Though their trip was fraught with trouble and cut short, Meek and Hayden returned to Albany in July 1853 with a remarkable collection of fossils. The collection impressed even Baird and Leidy, who played a large role in Hayden's subsequent expeditions.[20]

Eager to return West, Hayden arranged to spend 1854 and 1855 exploring the Missouri River country. He garnered the support of Vaughn and Baird, who helped finance the trip. He arrived with Vaughn at Fort Union, at the confluence of the Missouri and Yellowstone Rivers, in July 1854. They travelled an additional 300 miles up the Yellowstone to Fort Sarpy, meeting with members of the Crow nation. Along the way, Hayden collected literally tons of fossils to be sent back east for Leidy and Baird's collections.[21]

He remained in the Missouri country with Vaughn, spending the winter of 1854-55 at Fort Pierre, and taking opportunities to explore the White River and other surrounding areas. By the summer of 1855, Hayden had grown as a seasoned explorer, and Culbertson invited him on a trip up the Missouri to Fort Union, and on to Fort Benton. Previous explorations in Missouri country, including Lewis and Clark's travels 1804-1806, Maximillian, Prince of Neuweid's journeys with artist Karl Bodmer in 1833, Joseph Nicolas Nicollet in 1839, as well as discoveries by employees of the fur trading outfits, provided reliable indications of Cretaceous fossil-yielding formations, but did not constitute complete studies in the area's geology.[22]

[18] Foster, p. 25.
[19] The expedition travelled to the White River area in what is now South Dakota, which was in 1853 part of the Nebraska Territory.
[20] Foster, pp. 43-53.
[21] Foster, pp. 62-63.
[22] Hayden, "On the Geology and Natural History of the Upper Missouri," p. 1-4.

In July 1855, Hayden and his travelling companions arrived at Fort Union, and from there the group travelled in keelboats and mackinaws. The party included Colonel Alfred Cumming, head of the Office of Indian Affairs' Central Superintendency.[23]

Hayden in the Judith River Country

Cumming brought with him goods intended for various tribes in his Superintendency, and supplies for the Blackfeet Council, a huge gathering of Indian nations and the Office of Indian Affairs scheduled for August 1855 at Fort Benton. Cumming was to meet Isaac Stevens, his Council co-commissioner. Stevens became frustrated by Cumming's delays, as historian David Walter explains:

> Against Stevens' advice, Cumming had contracted the American Fur Company's steamboat *Saint Mary* to transport treaty goods to Fort Union, from where they had to be cordelled upriver in keelboats, battling seasonally low water. Because the company was delivering trade goods to its own posts up along the Missouri from St. Louis, the journey to Fort Union had already been slowed…Cumming had then caused additional delay by using the trip to distribute government annuity goods to tribes on the lower Missouri…[24]

For the naturalist Hayden, the slow progress of the journey offered additional opportunities to explore, and he took advantage of travelling with Cumming. He wrote to Meek from Fort Union on July 17, 1855:

> The steamboat has just arrived at this place and all is bustle and confusion as you saw it at Fort Pierre. It was confidently expected that the boat would go 300 or 400 miles above this point, but low water prevents, and I am behind hand with my matters.
>
> I am now at this place on my way to Fort Benton in the Blackfoot country, 780 miles from this place by water. I expect to have a grand time of it, and in addition, I will be at the treaty with the Blackfeet...
>
> …Col. Cumming, Superintendent of Indian Affairs, goes to Blackfeet... He proposes to attach me to his corps. This would give me a fine chance. What to do about it I don't know. Perhaps it would be best for the purpose of connecting the geology of Mo. with Miss. and determining more fully the boundaries of Cretaceous and Tertiary. [25]

The region along the Missouri upriver from Fort Union was new to Hayden; geologically it had never been studied. He came to call this country the "badlands of the Judith," the "Mauvaises Terres of the Blackfoot country," and the "badlands of the Upper Missouri." In all, he traversed nearly 800 miles in a little over a month, and is thought to have arrived in Fort Benton on August 17, 1855 in the company of Cumming. From July 12 to December 8, 1855, no letters or journal entries recorded by Hayden exist, leaving much of his path of exploration through the "Far West" shrouded in mystery. He had hoped to visit the mountains neighboring Fort Benton, and may have spent time exploring this country until the

[23] Foster, p. 66; Fritiof Fryxell, *Ferdinand Hayden: A Young Scientist in the Great West*. (Rock Island, IL: Augustana Historical Society, 2010), p. 216-219.
[24] David A. Walter, "Montana Episodes: The 1855 Blackfeet Treaty Council, a Memoir by Henry A. Kennerly," *Montana: The Magazine of Western History,* Vol. 32, No. 1 (Winter 1982), p. 44.
[25] Ferdinand Hayden to Fielding Bradford Meek, July 17th, 1855, transcribed in F. Fryxell, p. 216.

fall. His presence on the journey and at the council is confirmed by other sources and references to the trip, and by Hayden in his later letters and reports. [26]

The heavily laden keel boats and mackinaws arrived at the confluence of the Judith and Missouri Rivers in mid-October, and the commissioners resolved to relocate the planned council there. When Cumming's party arrived, there were over 3,500 tribal members gathered, representing the Piegan, Blood, Blackfeet, Gros Ventre, Flathead [Salish], Upper Pend d'Oreille, Kootenai, Nez Perce, and Cree.[27] Hayden served as a paid member of the commission when the council began main deliberations on October 16, 1855.[28] Over the next two days, the commissioners negotiated with the tribes present. From October 19- 21, the Indian agents distributed goods to the tribes. Hayden departed the council ground on October 22, 1855 on a vessel heading downstream toward home. Over those few days, Hayden explored some of the most remote and fossiliferous country on earth – the 75 million year old outcrops of the Judith River Formation easily accessed from Council Island, near the mouths of the Judith River and Dog Creek.

Hayden's explorations of the Judith River Formation badlands resulted in new assemblages of Cretaceous fossils from both marine and terrestrial ecosystems. In all, Hayden recognized that over the course of his travels through the Upper Missouri country, he'd discovered "hundreds of new species."[29] In a December 26, 1855 letter to Spencer Baird, a supporter of his expedition, he wrote: "I made a small, but I think it will prove valuable, collection of vertebrate remains."[30] Hayden shipped the vertebrate fossils from the Judith River Formation to Spencer Baird, with the understanding they would be forwarded to Joseph Leidy, one of his scientific sponsors and a well-respected comparative anatomist at the Academy of Natural Sciences in Philadelphia. Leidy had published *Ancient Fauna of Nebraska* in 1853, and was considered the leading North American paleontologist.[31] Apparently, Baird understood the magnitude of Hayden's find, writing to Leidy that some of the specimens "would make your eyes water."[32]

In March 1856, Leidy published a description of the remains collected by Hayden in the Judith River Formation. Among them were teeth of ankylosaurs, hadrosaurs, ceratopsian, and at least two different types of theropod dinosaur, crocodile teeth, turtle shell fragments, and the scales of garfish.[33] These fossils hold the distinction as the first skeletal remains of dinosaurs identified in North America. Leidy's report caused a sensation, and whetted the appetite of other naturalists. Hayden's 1862 report, "On the Geology and Natural History of the Upper Missouri," provided even more stimulus.

Hayden continued to explore the West, securing positions in government topographical surveys, including the Raynolds Expedition to the Upper Yellowstone in 1859-60. After the Civil War, Hayden returned

[26] Fryxell, p. 217.
[27] In August 1855, as many as 12,000 tribal members gathered to participate in the proposed Ft. Benton council. The Assiniboine, Snake, and Crow parties, had left the area by the time the council assembled in October. Walter, p. 44.
[28] Hayden to Spencer Baird, December 26, 1855, transcribed in Fryxell, p. 225. According to this letter, Hayden received $25 for his work at the Council.
[29] Ibid.
[30] Hayden to Spencer Baird, December 26, 1855, transcribed in Fryxell, p. 224.
[31] Joseph Leidy, *The Ancient Fauna of Nebraska: A Description of Remains of Extinct Mammalia and Chelonia, from the Mauvaises Terres of Nebraska*, Smithsonian Institution, 1853. These descriptions included ancient mammals and turtles.
[32] Baird to Leidy, February 14, 1856, as quoted in Foster, p. 66.
[33] Joseph Leidy, "Notices of Remains of Extinct Reptiles and Fishes, discovered by Dr. F.V. Hayden in the Bad Lands of the Judith River, Nebraska Territory," *Proceedings of the Academy of Natural Sciences of Philadelphia*. Vol. VIII (1856): 72-73.

west, this time leading expeditions. By 1867, he served as geologist-in-charge of the United States Geological and Geographical Survey of the Territories. In this position, he returned to the Missouri and Yellowstone country, leading the expedition to what would become Yellowstone Park in 1871. In 1877, he issued a *Geological and Geographical Atlas of Colorado*. His explorations resulted in a valuable series of volumes in all branches of natural history and economic science. By the late 1870s, a new generation of naturalists, including Edward Drinker Cope and Othniel Charles Marsh, began to dominate the scene. A contender for the directorship of the newly formed United States Geological Survey in 1879, political in-fighting and Hayden's failing health kept him from receiving the appointment. He returned to Montana during the mid-1880s, working as a government geologist, and passed away in 1887. As a result of Hayden's extensive geological work, numerous dinosaur fossils were uncovered and brought back east for further scientific study. Much of what he brought back is still housed in the collection of the Smithsonian Institution.[34]

Hayden's Legacy of Paleontology in the Upper Missouri

Just two years after Leidy's report on Hayden's collection was published, in 1858, W. Parker Foulke uncovered a nearly complete dinosaur skeleton, *Hadrosaurus foulkii* Leidy, in Haddonfield, New Jersey.[35] Leidy joined Foulke in the excavation, and went on to describe it, publishing his findings in the *Proceedings of the Academy of Natural Sciences of Philadelphia* and *Smithsonian's Contributions to Knowledge*. The find became even more popular in 1868, when Benjamin Waterhouse Hawkins assembled the skeleton for display.[36] By the 1860s and 1870s, the race among naturalists to find collections of dinosaur fossils, preferable large caches and nearly complete skeletons, accelerated.

Several of these expeditions traveled through the Judith Landing Historic District and the Boundary Increase area. In 1875, Colonel William Ludlow led his Corps of Engineers expedition to the Carroll Trail in Montana. Party members included George Bird Grinnell and Edward S. Dana of Yale College. They traversed the Dog Creek badlands in September 1875, and described the area:

> The beds of the mouth of Judith have been explored only once before, (by Dr. Hayden), and their age has hitherto been in doubt. We were able to remain but two days in this interesting locality, … Enough, however was seen to establish the age of the beds at this point as beyond a doubt Cretaceous…The Bad Lands…on Dog Creek stretch back into the bluffs for about fifteen miles, running over to meet those of the Judith for about 6 miles of this distance. [37]

[34] Foster, Chapters 22-24.
[35] The National Park Service designated the *Hadrosaurus foulkii* Leidy Site a National Historic Landmark in 1994, NR # 94001648. John W. Bond, "*Hadrosaurus foulkii* Leidy Site National Register of Historic Places Registration Form," 1993, on file at the New Jersey State Historic Preservation Office, Trenton, NJ.
[36] Bond, pp. 11-13.
[37] Edward S. Dana and George Bird Grinnell, "Geological Report, From Armells Creek to the Mouth of the Judith," In William Ludlow, *Report of a Reconnaissance from Carroll, Montana Territory, on the Upper Missouri, to the Yellowstone National Park, and Return, Made in the Summer of 1875*, U.S. Army Corps of Engineers, (Washington, D.C.: U.S. Government Printing Office, 1876), p. 114.

On their journey, Dana and Grinnell took copious notes describing the geology of the area, and collected numerous fossils, which were sent to Marsh for identification. From the Judith Landing area, they collected discovered remains of dinosaurs (*Hadrosaurus*), turtles (*Trionyx*), and invertebrates (*Unio*).[38]

Just a year later, in August and September of 1876, Edward Drinker Cope undertook a private expedition to the Upper Missouri for the express purpose of finding fossils, seeking "the area from which Hayden had sent Leidy dinosaur fragments in the 1850s."[39] Self-described fossil collector Charles Sternberg and J. C. Isaac travelled with him. Cope and his party arrived in Helena via the stage road from Ogden, Utah, and from there travelled to Fort Benton, and then on to Judith Landing. Sternberg wrote of their arrival:

> We crossed the Missouri, here a clear, sparkling stream, and the Judith River, and went into camp in the narrow valley of Dog Creek, in the midst of the fossil fields which we had come so far and at such risks to explore…On top of the Bad Lands were the Judith River beds…here tablelands and level prairies offered plenty of grass for our ponies, so we climbed to these heights, picketed our horses, and went into the gorges to search for fossils…It was necessary to give the loose shale the most careful examination, as only a streak of dust a little different in color from the uniform black around it, indicated where the bones were buried.[40]

They examined the Dog Creek badlands thoroughly, but "…found no complete specimens of any fossil animals…"[41] Even so, they did discover some microsites in the area that produced bones and teeth of dinosaurs, teeth and scales of fish, and turtle shell "…near the summit of the Bad Lands, under beds of yellowish sandstone…"[42] Sternberg wrote in 1914:

> We were camped on the narrow flood plain, and every morning at day-break we mounted our horses and climbed to the top of the strata, where our real work began. We passed over what Cope called the Pierre and Fox hills groups of Dr. Hayden, to the latter's typical locality, from which he secured the material described by Dr. Leidy, viz., of Trachodon, Deinodon, Trionyx, etc. We secured many specimens of these types, and many Cope described as new to science.[43]

More interested in finding large caches of fossils rather than isolated bones and teeth, Cope moved his party downstream. They set their sights on new terrain and moved approximately 30 miles east to explore in the vicinity of Cow Island [outside the Judith Landing Historic District Boundary Increase area]. There, they had better luck, and discovered remains of a horned dinosaur in the Upper Cretaceous Judith River Formation, which became known as *Monoclonius crassus.*[44]

Inspired by the Hayden, Dana and Grinnell, and Cope expeditions, several other parties set out for the Upper Missouri country in search of fossils and to define the stratigraphy more accurately. In 1888, Cope's rival Othneil Charles Marsh sent paleontologist John Bell Hatcher to the Judith Formation area.

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[38] Ibid, p. 115; Hanna, p. 44.
[39] David Rains Wallace, *The Bonehunters' Revenge: Dinosaurs, Greed, and the Greatest Scientific Feud of the Gilded Age*, (New York: Houghton Mifflin Harcourt, 2000), p. 122.
[40] Charles H. Sternberg, *Life of a Fossil Hunter*, (New York: H. Holt and Company, 1909), p. 68, 70.
[41] Sternberg (1909), p. 77.
[42] Sternberg (1909), p. 77.
[43] Charles H. Sternberg, "Notes on the Fossil Vertebrates Collected on the Cope Expedition to the Judith River and Cow Island Beds, Montana, in 1876," *Science*, New Series, Vol. 40, No. 1021, Jul. 24, 1914, p. 134.
[44] Hanna, p. 47.

Hatcher collected hadrosaur and ceratopsian remains from the Cow Creek area east of the Judith Landing. Paleontologist Rebecca Hanna explains:

> There was an intense rivalry between Professors Marsh and Cope during the late 1800s (known as the "fossil feud" or "bone war"), resulting in competition for specimens, collecting areas, and number of publications. In 1892, Hatcher collected more vertebrate material from the Missouri River breaks for Marsh, including fossil bird remains. With the deaths of Cope in 1897 and Marsh in 1899, the fossil feud began to wane somewhat, although there was still a fairly intensive competition between the various east coast museums for acquisition and display of specimens. [45]

In 1903, Hatcher undertook a two-month field investigation with T. W. Stanton to elucidate the age of north-central Montana's Judith River Formation. Exploring the area west of the Judith Landing Historic District, Stanton and Hatcher collected and described fossilized remains of vertebrates, invertebrates, and plants.

In 1914, Charles H. Sternberg returned to the Judith River country with his paleontologist son Charles M. Sternberg and Mr. D. B. Dowling of the Geological Survey of Canada: "…I spent ten days in the Judith River country, going over the same region I walked over in 1876 as Professor Cope's assistant."[46] After camping on Taffy Creek, a tributary east of Dog Creek outside the boundary increase area, the group ended up in the Cow Island region: "We followed the same trail first traveled by Professor Cope down the prairie level to near Cow Island, getting water at 'Lone Tree' spring as in 1876, and camped near our old camp, on the Missouri River" (Sternberg 1915:132).[47] In the vicinity of Taffy Creek, Sternberg collected a vast variety of marine animal teeth and scales, as well as dinosaur bones.

As the twentieth century progressed, paleontological investigations continued across north central Montana. Flamboyant fossil collector Barnum Brown arrived during the late 1890s, and in 1902 uncovered the first *Tyrannosaurs Rex* remains in the Hell Creek formation in the Missouri Breaks approximately 140 miles east of the Judith Landing Historic District Boundary Increase Area. Brown continued his Hell Creek excavations over the next eight years, and returned again to the Great Falls area in 1936.[48] Brown's discovery of *Deinonychus* in southeastern Montana in 1931 proved to be, after further excavations and description by John Ostrom in the 1960s, one of the most important finds of the twentieth century. Prior to the 1940s, expeditions typically focused on acquisition of large, display-quality skeletons. Collectors usually identified the formation from which they acquired their finds, but the field crew would not always have the time or ability to place them within a particular part of the formation.[49]

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[45] Hanna, p. 48.
[46] Charles S. Sternberg, "Evidence Proving that the Belly River Beds of Alberta are Equivalent with the Judith River Beds of Montana," *Science* 42(52)(1915), p. 131.
[47] Sternberg (1915), p. 132.
[48] Brown's Hell Creek digs produced enough fossils to fill train cars regularly. As was common practice, Brown's crews used controlled blasts of dynamite to remove the tons of rock covering their fossil discoveries. Barnum Brown, "Memoirs of Barnum Brown: Discovery, Excavation and Preparation of the Type Specimen *Tyrannosaurus rex*, (AMNH No. 973), Discovered 1902,Completely Excavated 1905," as printed in Appendix II of Lowell Dingus and Mark Norell, *Barnum Brown: The Man Who Discovered Tyrannosaurus rex*, (Berkeley and Los Angeles: University of California Press, 2010), p. 310.
[49] Hanna, p. 29.

World War II effectively halted the search for vertebrates in the West at mid-century. However, work continued at the local level by scientists like Great Falls native William A. Cobban, who in addition to collecting, named and defined most of the Upper Cretaceous zones used in determining the spatial and temporal distribution of fossil organisms. When they began again in the 1960s, expeditions had multifaceted goals and employed some different collection methods, including screening.[50]

During the mid-1960s, a team of paleontologists from the American Museum of Natural History explored the Judith River Formation north of the Boundary Increase area, in Chouteau and Blaine counties, where they collected remains of large and small vertebrates and described the area's stratigraphy. After 1968 and through the early 1990s, several expeditions focused on the Bear Gulch Limestone area, part of the Mississippian Heath Formation, in southeastern Fergus County. Subsequent work focused farther east, along the Rocky Mountain Front. An exciting find occurred in 1978:

> Marion Brandvold and John R. (Jack) Horner discovered baby duck-billed dinosaur bones and eggshell in exposures of the Two Medicine Formation west of Choteau (Willow Creek Anticline, Teton County). While affiliated with Princeton University (Princeton, New Jersey), and then later with Museum of the Rockies (Montana State University-Bozeman), Horner undertook extensive studies of the Two Medicine Formation along the Rocky Mountain Front, which began with this discovery and continue to present day.[51]

Fossil-rich Montana, including the Judith River Formation, continues to serve as a center of paleontological activity. Presently, in addition to the Judith Landing Historic District and the Boundary Increase, investigators focus on the Two Medicine Formation, the Heath Formation (Bear Gulch Limestone), Morrison Formation, Hell Creek Formation, St. Mary River Formation, and various Cretaceous marine shales.[52]

In June 2012, paleontologist Kristina Curry Rogers and geologist Raymond R. Rogers, working with the Bureau of Land Management, brought a group of paleontology students from Macalester College on an expedition to the Missouri Breaks. They set out to explore the exposures of the Judith River Formation in the vicinity of Council Island to try to trace Hayden's steps. The survey team sought to identify the site from which Hayden gathered his Judith River Formation dinosaur collection in 1855. Just south of Council Island on the right bank of the Missouri River, between the mouths of Dog Creek and the Judith River, they identified several localities that yielded vertebrate fossils, but only one with a concentration similar to that collected by Hayden in 1855 and reported by Leidy in 1856. In this region, the exposures of the terrestrial Judith River Formation are high in section, and located near the top of the Breaks. Lower in section, sedimentary rocks are dominated by the marine shales and do not preserve the terrestrial vertebrates most common in Hayden's collection.[53]

The survey began by following animal trails up into the Judith River Formation exposures from the PN Ranch within the boundaries of the Judith Landing Historic District. They identified a bentonite (ash) bed

[50] Hanna, p. 29.
[51] Hanna, p. 30.
[52] Hanna, p. 30.
[53] Though Hayden's original material also included vertebrae and ribs of plesiosaurs, marine reptiles that are common in the Claggett Shale that underlies the Judith River Formation in the region.

and traversed the Breaks eastward to its exposure on a point, with Council Island in view below. At this site the team discovered the remains of a disarticulated, partial skeleton of a hadrosaur (a duckbilled dinosaur) that included several broken limb and pedal elements as well as vertebrae and ribs. In addition, they recovered pieces of plastron, carapace, and limb bones of turtles, crocodile teeth and vertebrae, the vertebra of a champsosaur, the scales of garfish, and the teeth of hadrosaur and theropod dinosaurs. The team returned in August 2012 to continue their survey toward the Dog Creek drainage (Tables 1, 2). Though they identified other localities in the vicinity that yielded fossils, none exhibited the diversity of fauna and size range of skeletal remains that matched Hayden's original find more closely than the first locality.

Conclusion

Ferdinand V. Hayden's trek into the Dog Creek drainage in 1855 inspired the next 150 years of study. His small collection of the first dinosaur fossils found in North America sparked the interest of naturalists and fossil hunters and contributed to the science of paleontology significantly. His work, and the descriptions by Leidy in 1856, inspired governmental, university, and private expeditions to the Missouri River Breaks and greater Montana's vast cache of ancient remains. The Hayden Site, identified in 2012 by Kristina Curry Rogers' team from Macalester College and the Bureau of Land Management, represents a watershed moment in the history of North American paleontology. The original Judith Landing Historic District National Register nomination identified Hayden's presence as one of the many areas of significance associated with the property. The Judith Landing Historic District Boundary Increase serves to better define not only the significance of Hayden's experience, but also to include the location of his discovery. Therefore, the Judith Landing Historic District Boundary Increase is eligible for listing in the National Register of Historic Places under Criterion A.

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Previous documentation on file (NPS):

____ preliminary determination of individual listing (36 CFR 67) has been requested
____ previously listed in the National Register
_____previously determined eligible by the National Register
_____designated a National Historic Landmark
____ recorded by Historic American Buildings Survey #_____
_____recorded by Historic American Engineering Record # _____
____ recorded by Historic American Landscape Survey # _____

Primary location of additional data:

_X_State Historic Preservation Office
____ Other State agency
_X_ Federal agency
____ Local government
____ University
____ Other
Name of repository: _____

Historic Resources Survey Number (if assigned): _____

10. Geographical Data

Acreage of Property ___344_____

Use either the UTM system or latitude/longitude coordinates

Latitude/Longitude Coordinates
Datum if other than WGS84:_____
(enter coordinates to 6 decimal places)
1. [redacted]

2. Latitude: Longitude:

3. Latitude: Longitude:

4. Latitude: Longitude:

Or

UTM References
Datum (indicated on USGS map):

[x] NAD 1927 or [ ] NAD 1983

Judith Landing Historic District Boundary Increase Coordinates

A. Zone: 12	Easting: 604123	Northing: 5286833
B. Zone: 12	Easting: 605790	Northing:5286860
C. Zone: 12	Easting: 605800	Northing: 5286040
D. Zone: 12	Easting : 604130	Northing: 5286007

Hayden Site Coordinates: [redacted]

Verbal Boundary Description (Describe the boundaries of the property.)
The Judith Landing Boundary Increase consists of Lots 1-8 and the W2 of the NE ¼ of section 31, Township 23 North, Range 17 East, for a total of 344 acres.

Boundary Justification (Explain why the boundaries were selected.)
The boundary is drawn to encompass the approach to the Hayden site, the surrounding Upper Cretaceous geologic setting, and the Hayden site itself.

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11. Form Prepared By

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telephone: (651) 696-6799
date: June 25, 2013

Additional Documentation

Submit the following items with the completed form:

- **Maps:** A **USGS map** or equivalent (7.5 or 15 minute series) indicating the property's location.
- **Sketch map** for historic districts and properties having large acreage or numerous resources.
- **Additional items:** (Check with the SHPO, TPO, or FPO for any additional items.)

Photographs

Photo Log

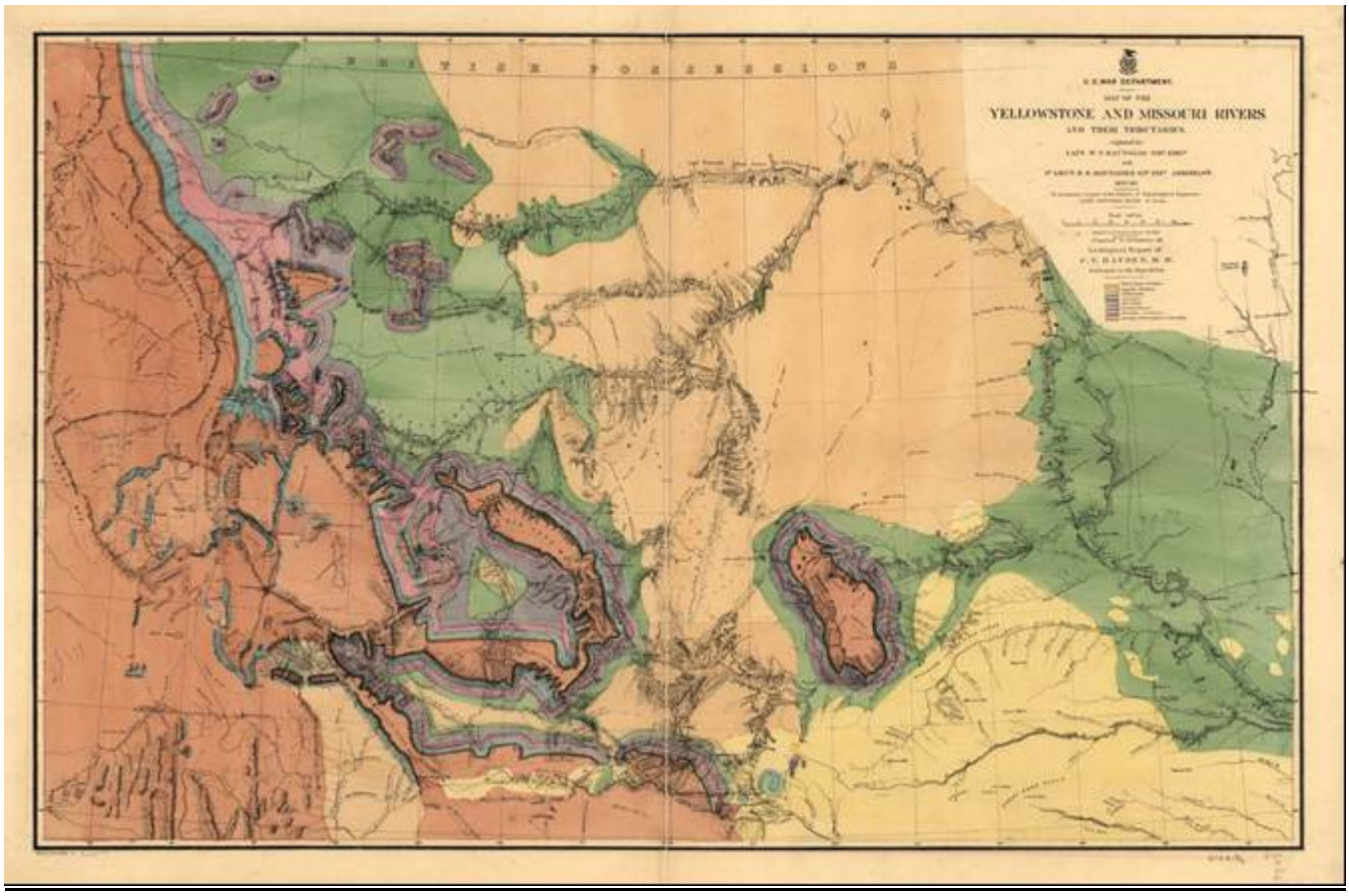
Name of Property:
City or Vicinity:

County: State:
Photographer:
Date Photographed:
Description of Photograph(s) and number, include description of view indicating direction of camera:

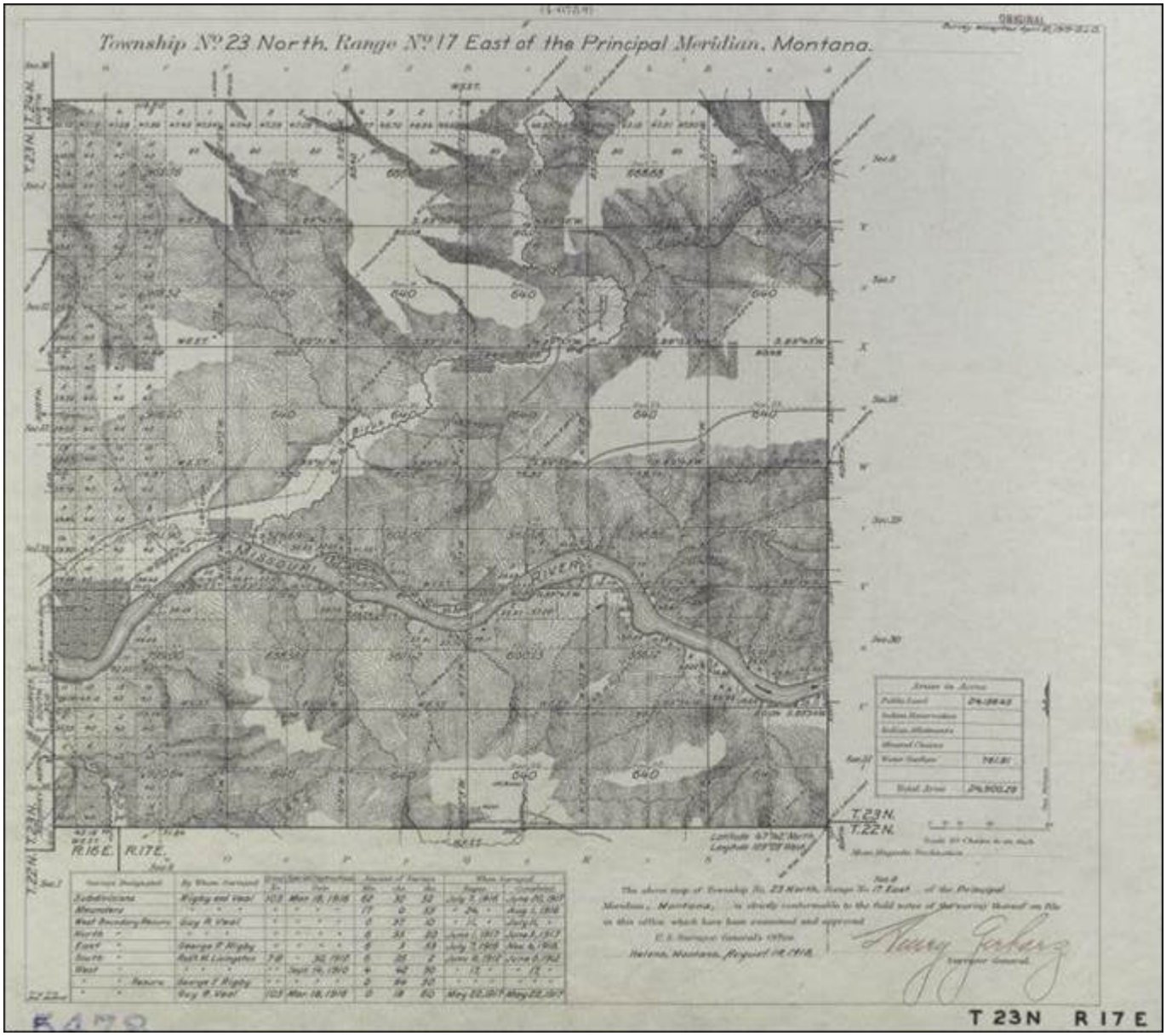
1 of ___.

See Continuation Sheets

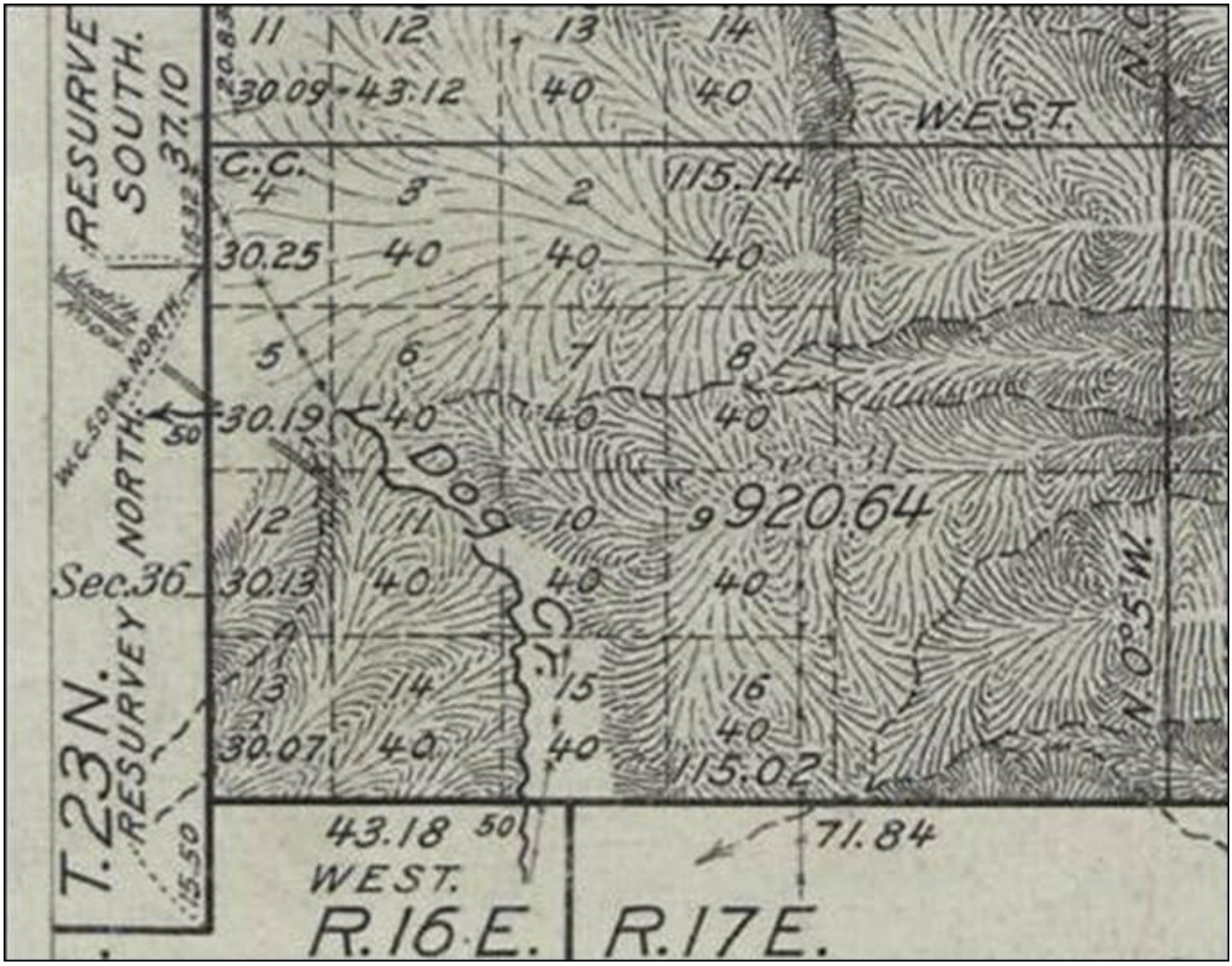
Paperwork Reduction Act Statement: This information is being collected for applications to the National Register of Historic Places to nominate properties for listing or determine eligibility for listing, to list properties, and to amend existing listings. Response to this request is required to obtain a benefit in accordance with the National Historic Preservation Act, as amended (16 U.S.C.460 et seq.).
Estimated Burden Statement: Public reporting burden for this form is estimated to average 100 hours per response including time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding this burden estimate or any aspect of this form to the Office of Planning and Performance Management. U.S. Dept. of the Interior, 1849 C. Street, NW, Washington, DC.



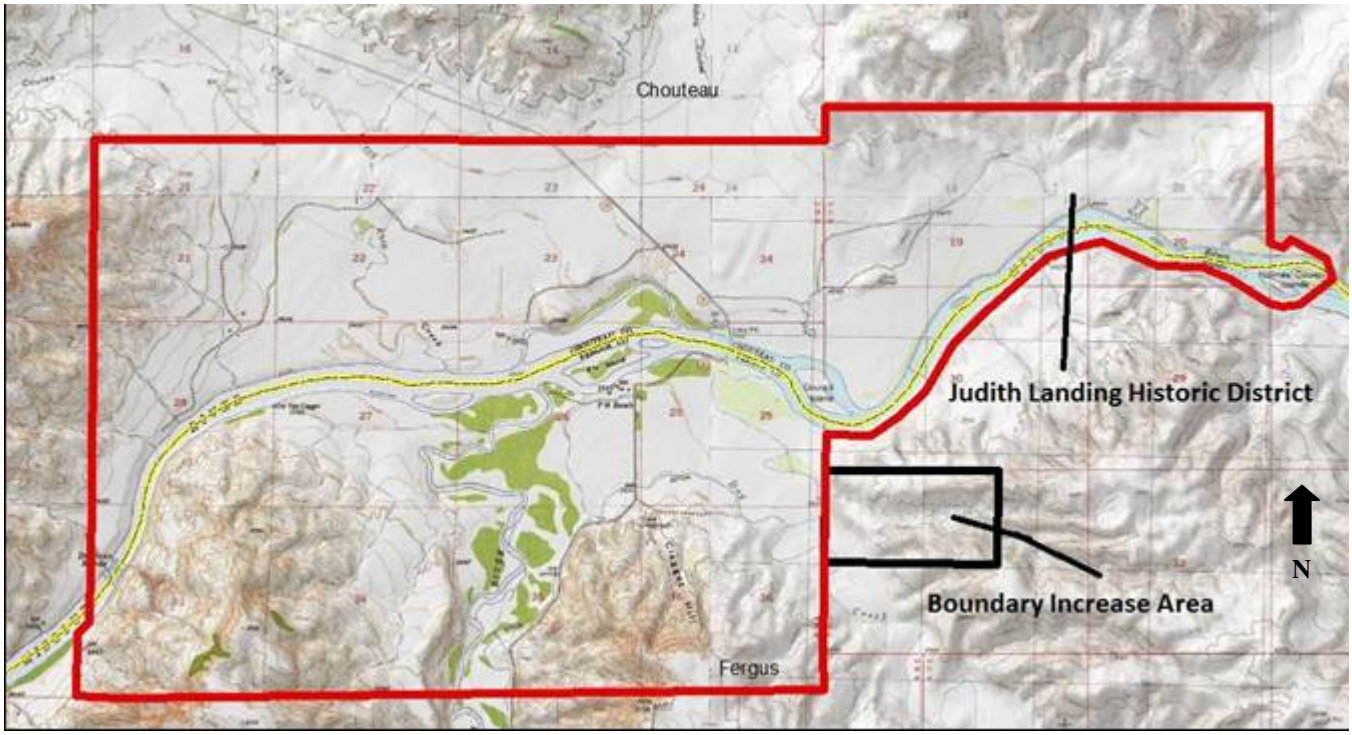
Map 1. Plate from Hayden's 1862 report, showing the geological formations in the Missouri and Yellowstone River areas. . Ferdinand V. Hayden, "On the Geology and Natural History of the Upper Missouri." *Transactions of the American Philosophical Society*, Vol. XII (1862),



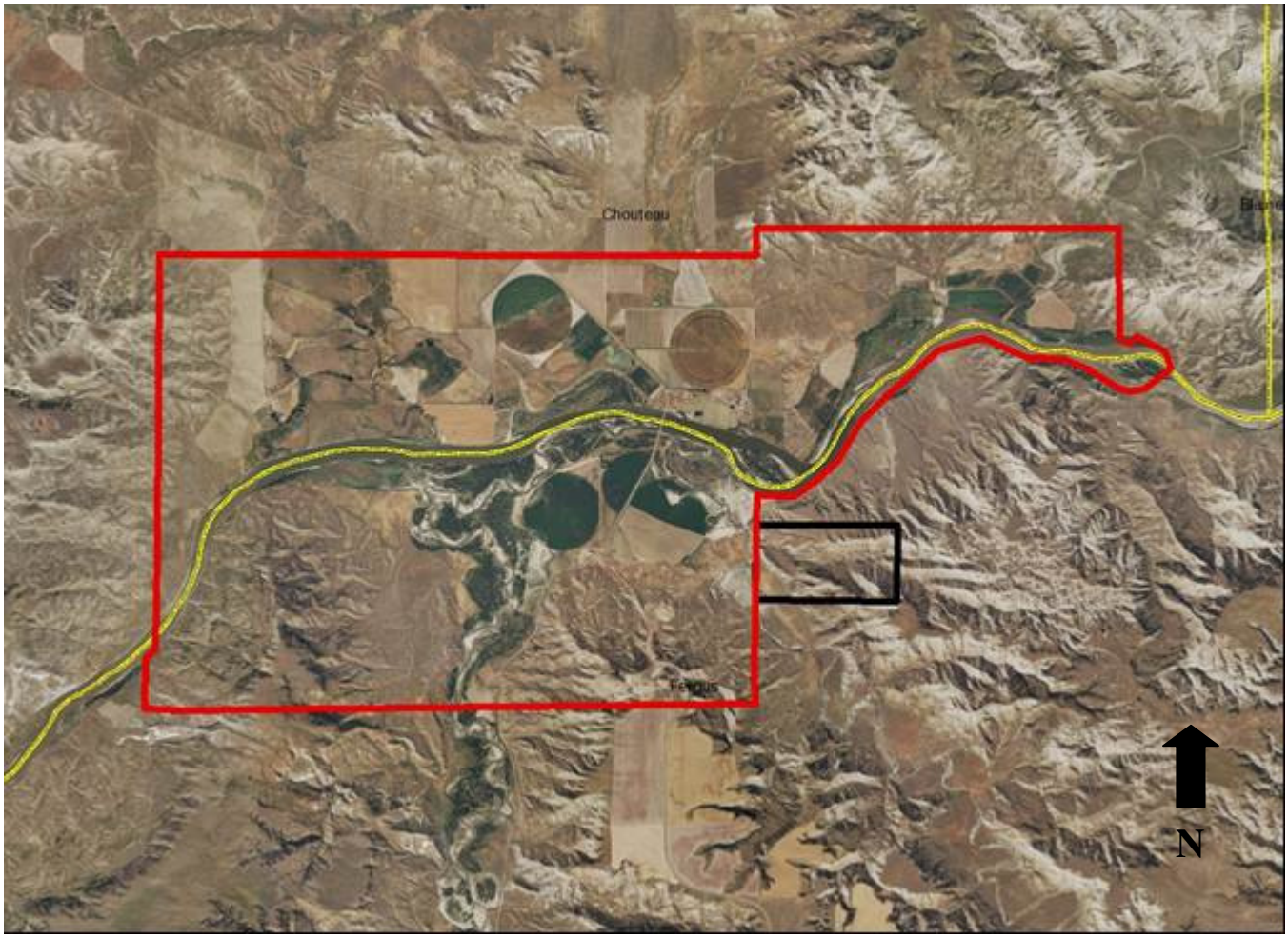
Map 2. U.S. Survey General's Office. "Township No. 23 North, Range No. 17 East, of the Principal Meridian, Montana." Washington, D.C.: Government Printing Office, August 14, 1918.



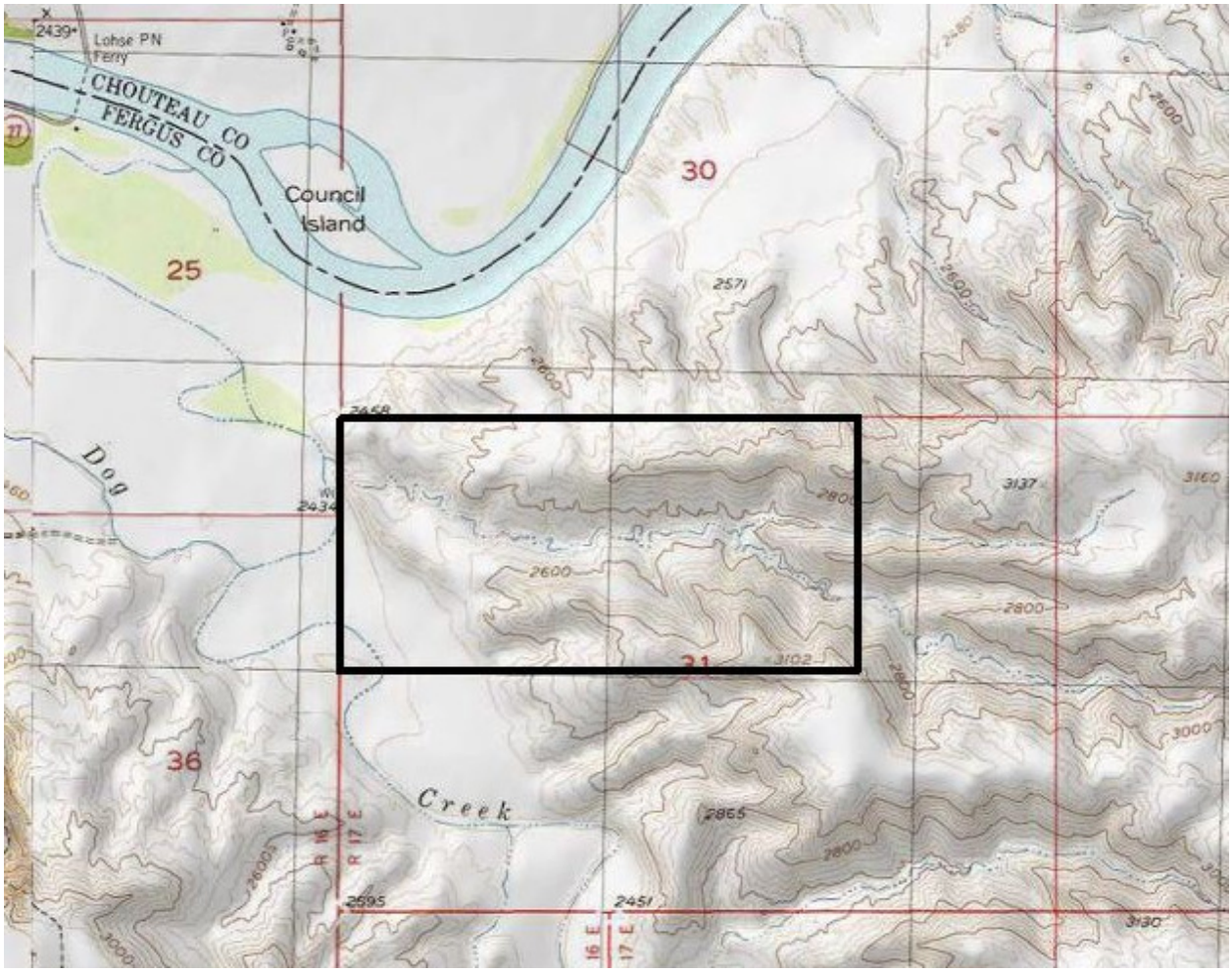
Map 2 (detail): Detail 1918 GLO Survey Map for T23N, R 17 E, showing section 31.



Map 3: Topographic Map showing Judith Landing Historic District (red) and the Boundary Increase Area (black).



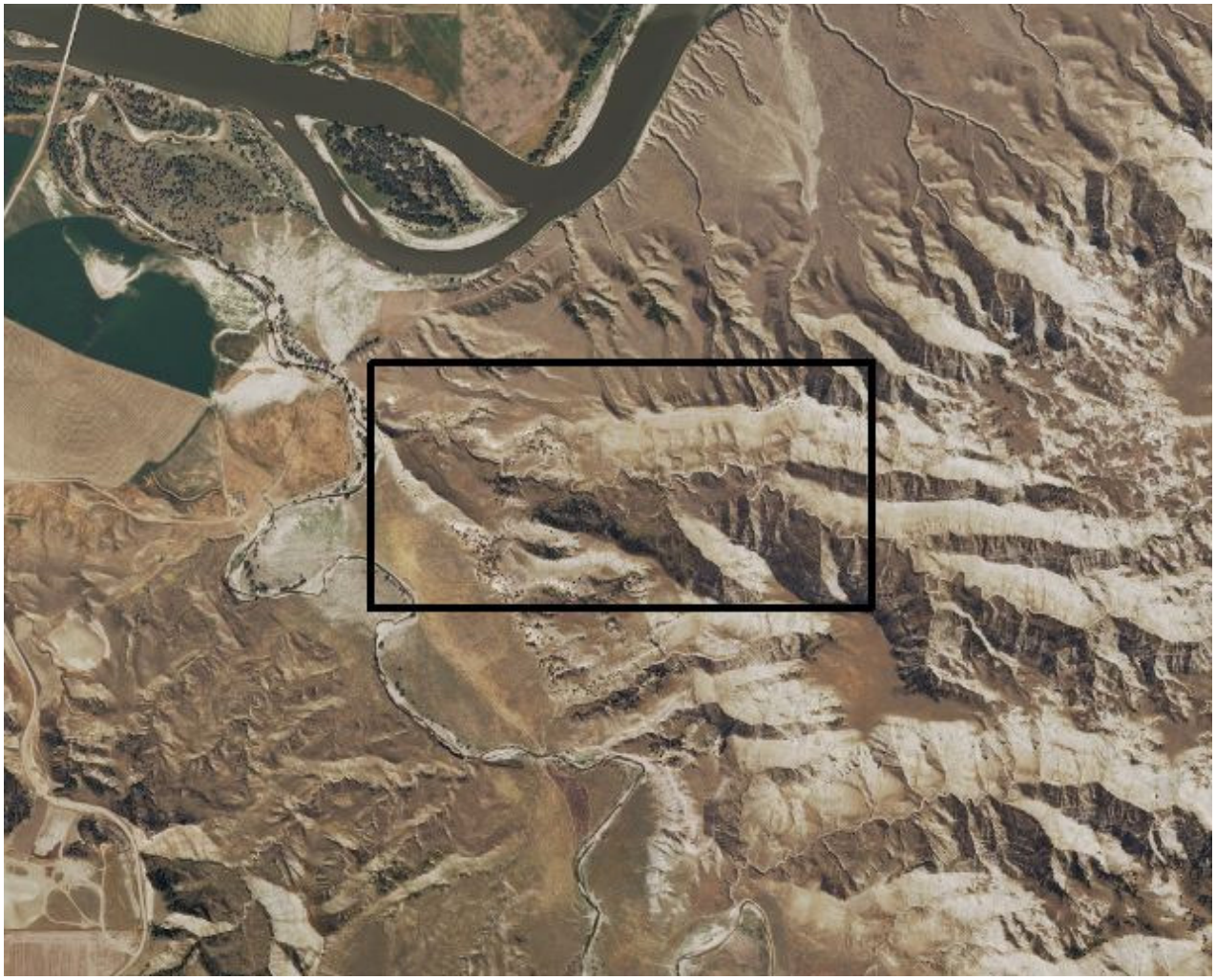
Map 4: Aerial view showing Judith Landing Historic District (red) and the Boundary Increase Area (black).



Scale: 1 mile=

N

Map 5: Topographic Map showing only Judith Landing Historic District Boundary Increase Area (black). Found on the Council Island, MT 7.5' topographic map (1954).



Scale: 1 mile=

N

Map 6: Aerial view showing only Judith Landing Historic District Boundary Increase Area (black).

Map 7. Google Earth view of the route taken by the Macalester College 2012 survey team that located the Hayden Site. REDACTED

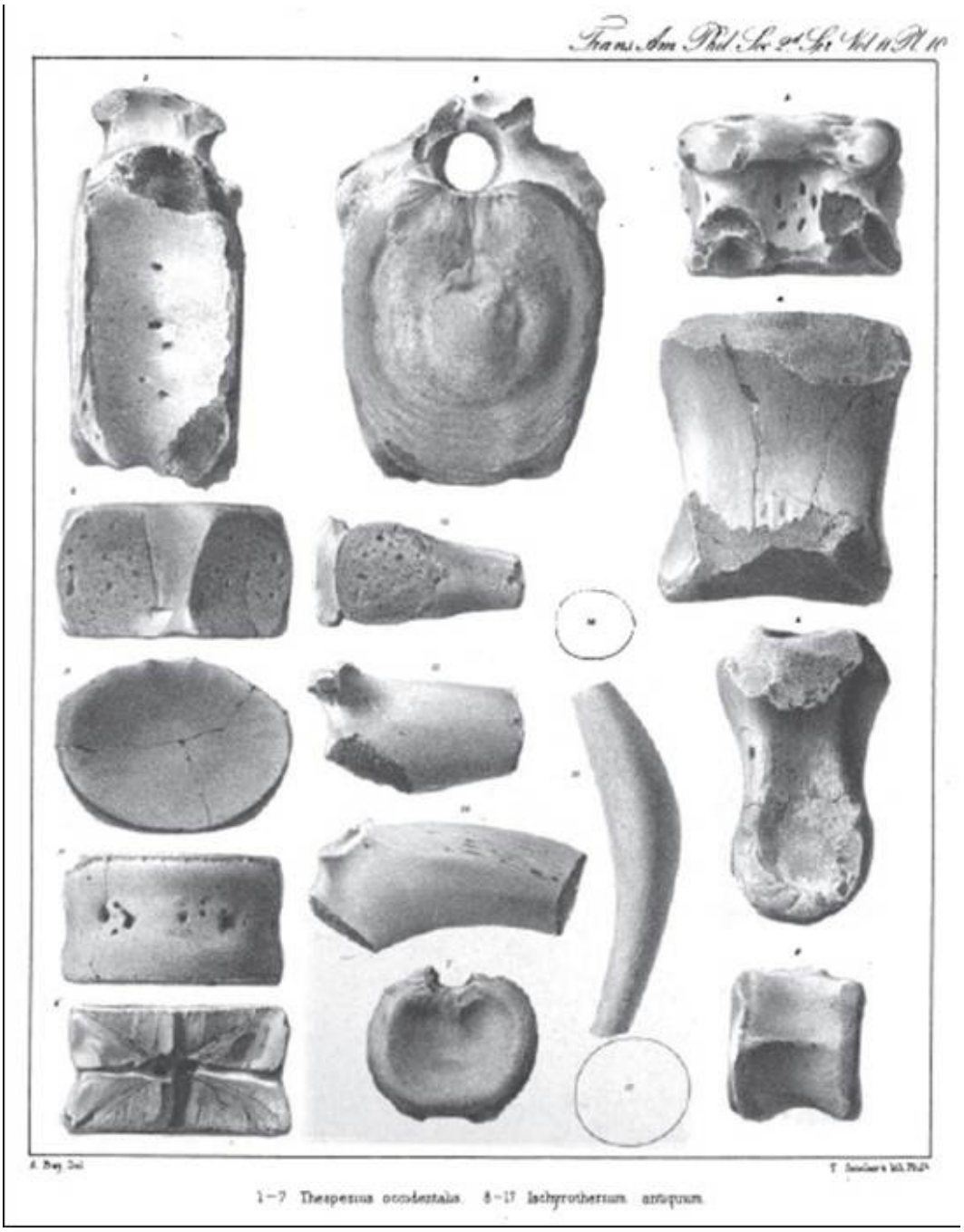


Figure 1. Leidy, Joseph. "Extinct Vertebrata from the Judith River and Great Lignite Formations of Nebraska, with three plates, IX, X, XL." *Transactions of the American Philosophical Society*, Vol. XI – New Series (1860), pp. 139-155. Plate X, showing Hayden's 1855 collection of large bones in multiple views.

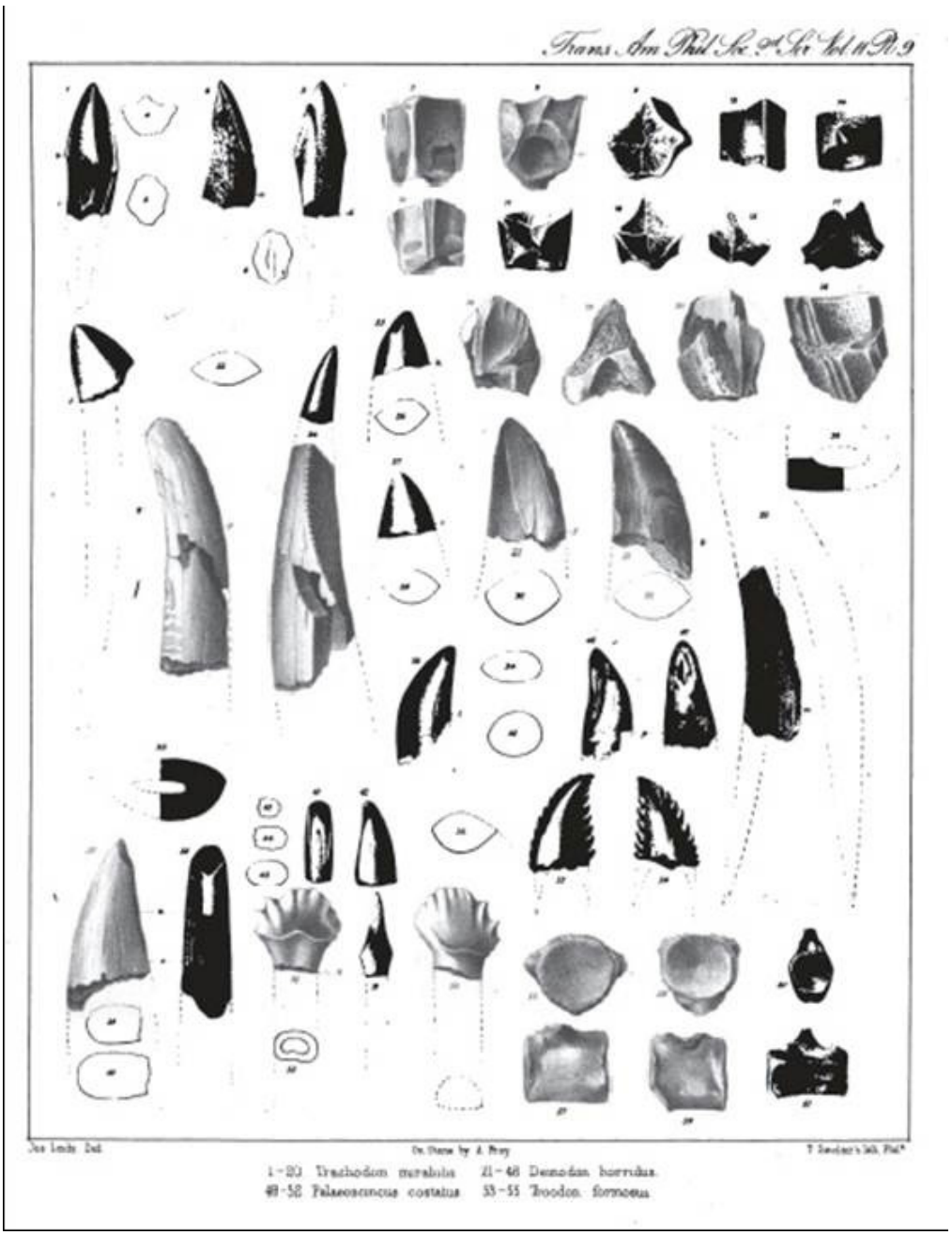
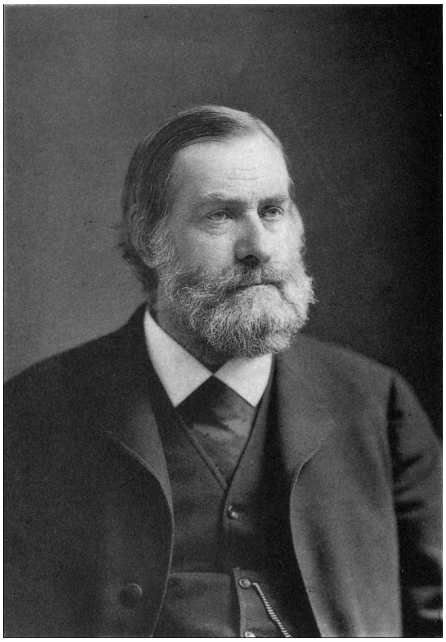


Figure 2. Leidy, Joseph. "Extinct Vertebrata from the Judith River and Great Lignite Formations of Nebraska, with three plates, IX, X, XL." *Transactions of the American Philosophical Society*, Vol. XI – New Series (1860), pp. 139-155. Plate X, showing Hayden's 1855 collection of teeth in multiple views.

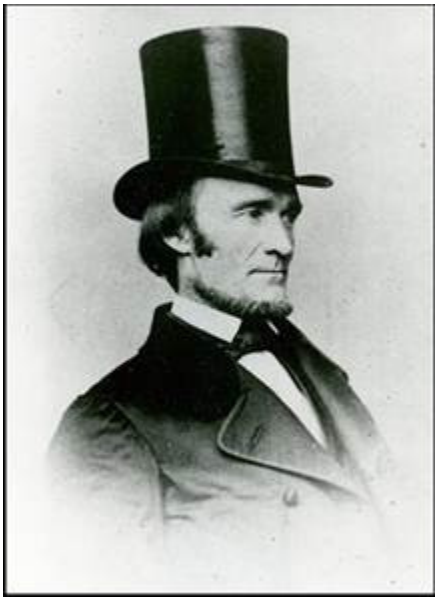
Figure 3. Collection of vertebrate microfossils from the Judith River Formation near the mouth of Dog Creek and Council Island. Collected in 2012 by K. Curry Rogers, R. Rogers, Z. Fulbright, and C. Rye. **A**, Hadrosauria indet., caudal vertebral centrum; **B**, Champsosaur vertebra; **C**, *Lepisosteus* (gar fish) scales; **D**, Two Theropoda indet. teeth; **E**, Crocodile cranial fragment; **F**, Ornithopoda indet., teeth; **G**, 12 Hadrosauria indet. teeth; **H**, Two Crocodile teeth; **I**, Chelonia indet. limb and girdle elements; **J**, Hadrosauria indet., caudal vertebral centrum; **K**, Hadrosauria indet., distal metapodial; **L**, Chelonia indet., carapace and plastron; **M**, Dinosauria ossified tendon. Scale bar equals 3 cm.

Ferdinand V. Hayden



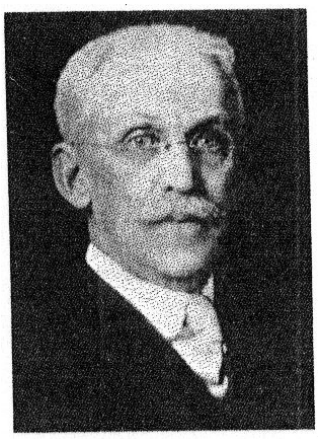
Joseph Leidy

Spencer Fullerton Baird



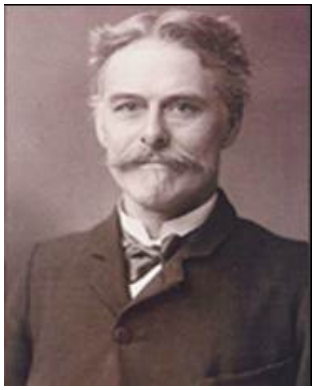
Fielding Branford Meek

George Bird Grinnell



Edward S. Dana

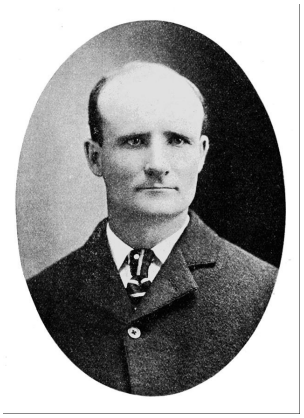
William Ludlow



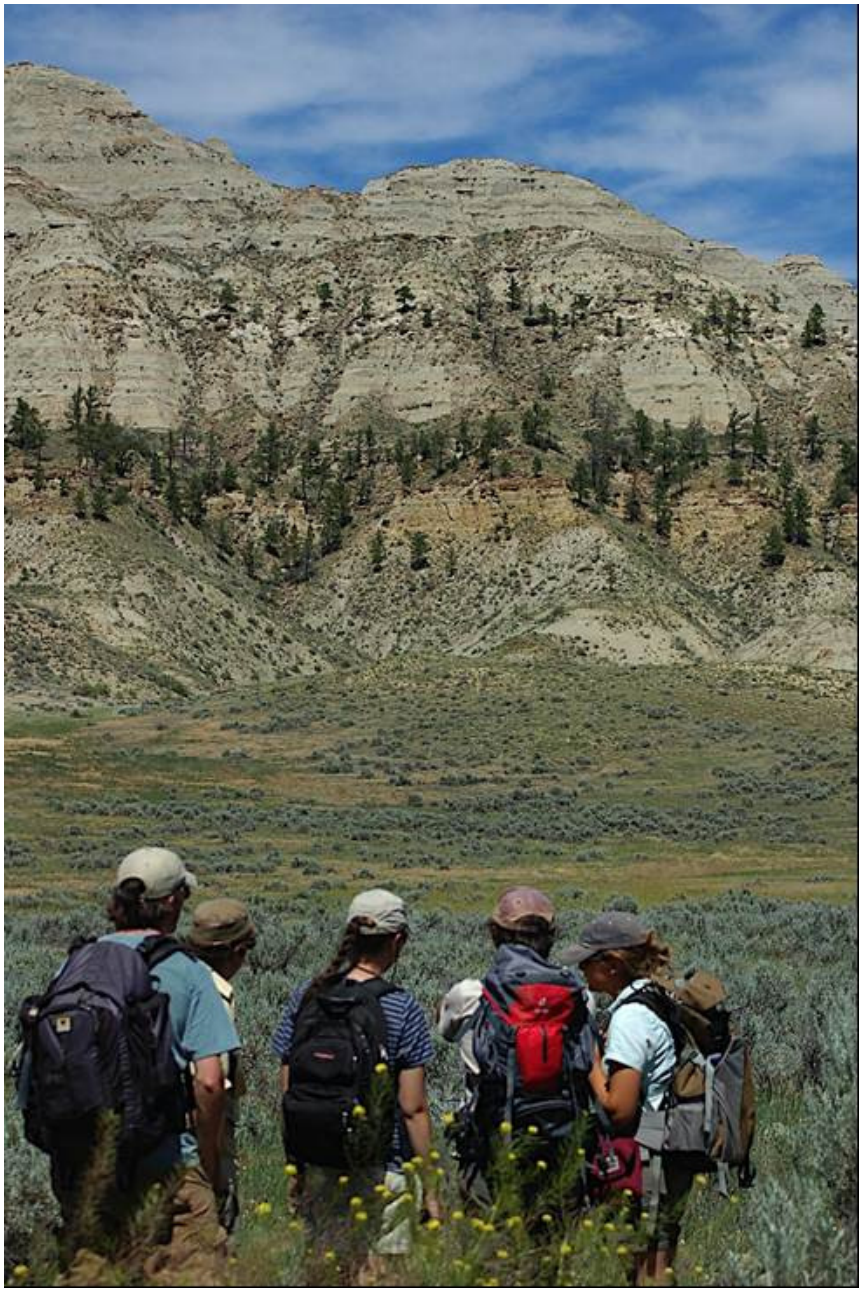
Edward Drinker Cope

Charles H. Sternberg

Othneil Charles Marsh



John Bell Hatcher



2012 Macalester College Student Survey Team

National Register Photographs

Each of the National Register photographs associated with this submission have the following information in common:

Name of Property: Judith Landing Historic District (Boundary Increase)
City or Vicinity: Judith Landing Vicinity
County: Fergus **State:** MT
Date Photographed: June 2012

Photo Log

MT_FergusCounty_JudithLandingHD(Boundary Increase)_001
Photographer: Zane Fulbright
Description of Photograph(s) and number, include description of view indicating direction of camera:
Approach to Hayden Site from the northwestern corner of the Boundary Increase Area. View to the east.
1 of _11__.

MT_FergusCounty_JudithLandingHD(Boundary Increase)_002
Photographer: Zane Fulbright
Description of Photograph(s) and number, include description of view indicating direction of camera:
Overview of Dog Creek Drainage and Judith Landing Historic District from west side of Boundary Increase Area, view to the WNW.
2 of _11__.

MT_FergusCounty_JudithLandingHD(Boundary Increase)_003
Photographer: Ray Rogers
Description of Photograph(s) and number, include description of view indicating direction of camera:
Overview of Hayden Site, high on the edge of the outcrop on the right side of the photo, and view to Council Island in the Missouri River at the left edge of the photo. View to the north.
3 of _11__.

MT_FergusCounty_JudithLandingHD(Boundary Increase)_004
Photographer: Ray Rogers
Description of Photograph(s) and number, include description of view indicating direction of camera:
Hayden Site. View to the northeast.
4 of _11__.

MT_FergusCounty_JudithLandingHD(Boundary Increase)_005
Photographer: Zane Fulbright
Description of Photograph(s) and number, include description of view indicating direction of camera:
Hayden Site. View to the NW.
5 of _11__.

MT_FergusCounty_JudithLandingHD(Boundary Increase)_006
Photographer: Zane Fulbright
Description of Photograph(s) and number, include description of view indicating direction of camera:
Detail of dinosaur bone unearthed at Hayden Site in 2012.
6 of _11__.

MT_FergusCounty_JudithLandingHD(Boundary Increase)_007
Photographer: Zane Fulbright
Description of Photograph(s) and number, include description of view indicating direction of camera:
Detail of dinosaur vertebra unearthed at Hayden Site in 2012.
7 of 11__.

MT_FergusCounty_JudithLandingHD(Boundary Increase)_008
Photographer: Zane Fulbright
Description of Photograph(s) and number, include description of view indicating direction of camera:
Overview of Boundary Increase Area taken from about halfway up the access trail to the Hayden Site. The high rocky ridge at center obscures the view to the site. View to the ESE.
8 of _11__.

MT_FergusCounty_JudithLandingHD(Boundary Increase)_009
Photographer: Zane Fulbright
Description of Photograph(s) and number, include description of view indicating direction of camera:
Overview of southwest quarter of Boundary Increase Area taken from about halfway up the Hayden Site access trail. Dog Creek visible at the right hand side of photo. View to the S.
9 of _11__.

MT_FergusCounty_JudithLandingHD(Boundary Increase)_010
Photographer: Zane Fulbright
Description of Photograph(s) and number, include description of view indicating direction of camera:
Overview of northwest part of Boundary Increase Area and Judith Landing Historic District. View down ridgeline taken from about halfway up the Hayden Site access trail. Dog Creek visible at the right hand side of photo. View to the NW.
10 of _11__.

MT_FergusCounty_JudithLandingHD(Boundary Increase)_011
Photographer: Zane Fulbright
Description of Photograph(s) and number, include description of view indicating direction of camera:
Overview from Hayden Site to the northwest part of Boundary Increase Area and Judith Landing Historic District. Missouri River visible in distance. View to the WNW.
11 of _11__.

Name of Property: Judith Landing Historic District (Boundary Increase)
City or Vicinity: Judith Landing Vicinity
County: Fergus **State:** MT
Photographer: Zane Fulbright
Date Photographed: June 2012
Description of Photograph(s) and number, include description of view indicating direction of camera:
Approach to Hayden Site from the northwestern corner of the Boundary Increase Area. View to the east.
1 of 11.

Name of Property: Judith Landing Historic District (Boundary Increase)
City or Vicinity: Judith Landing Vicinity
County: Fergus **State:** MT
Photographer: Zane Fulbright
Date Photographed: June 2012
Description of Photograph(s) and number, include description of view indicating direction of camera:
Overview of Dog Creek Drainage and Judith Landing Historic District from west side of Boundary Increase Area, view to the WNW.
2 of 11.

Name of Property: Judith Landing Historic District (Boundary Increase)
City or Vicinity: Judith Landing Vicinity
County: Fergus **State:** MT
Photographer: Ray Rogers
Date Photographed: June 2012
Description of Photograph(s) and number, include description of view indicating direction of camera:
Overview of Hayden Site, high on the edge of the outcrop on the right side of the photo, and view to Council Island in the Missouri River at the left edge of the photo. View to the north.
3 of 11.

Name of Property: Judith Landing Historic District (Boundary Increase)
City or Vicinity: Judith Landing Vicinity
County: Fergus **State:** MT
Photographer: Ray Rogers
Date Photographed: June 2012
Description of Photograph(s) and number, include description of view indicating direction of camera:
Hayden Site. View to the northeast.
4 of 11.

Name of Property: Judith Landing Historic District (Boundary Increase)
City or Vicinity: Judith Landing Vicinity
County: Fergus **State:** MT
Photographer: Zane Fulbright
Date Photographed: June 2012
Description of Photograph(s) and number, include description of view indicating direction of camera:
Hayden Site. View to the NW.
5 of 11.

Name of Property: Judith Landing Historic District (Boundary Increase)
City or Vicinity: Judith Landing Vicinity
County: Fergus **State:** MT
Photographer: Zane Fulbright
Date Photographed: June 2012
Description of Photograph(s) and number, include description of view indicating direction of camera:
Detail of dinosaur bone unearthed at Hayden Site in 2012.
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Photographer: Zane Fulbright
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Photographer: Zane Fulbright
Date Photographed: June 2012
Description of Photograph(s) and number, include description of view indicating direction of camera:
Overview of Boundary Increase Area taken from about halfway up the access trail to the Hayden Site. The high rocky ridge at center obscures the view to the site. View to the ESE.
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11 of 11.