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David C. Glenn-Lewin
Iowa State University

Thomas R. Rosburg
Iowa State Universtiy

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Natural History in Iowa: The Early Phases

DAVID C. GLENN-LEWIN and THOMAS R. ROSBURG

Department of Botany, 353 Bessey Hall, Iowa State University, Ames, Iowa 50011-1020

Natural history in Iowa prior to the 20th Century can be conveniently arranged into 4 phases: Native American, before the Louisiana Purchase, between the Louisiana Purchase and about 1850, and after 1850. Native American natural history was extensive and had a distinctly spiritual character. Natural history was a component of European exploration up to the time of the Louisiana Purchase, but was not treated as a separate endeavor; the evidence from this period comes from the journals and diaries of early exploreres, fur traders and the like. Between the Louisiana Purchase and about 1850, natural history changed from its status as an adjunct to geographic exploration, for instance government sponsored expeditions along the rivers and Army excursions into the interior, to systematic research with natural history as the primary goal. During this period, descriptions of natural history moved from being parts of exploration narratives to reports on natural history itself. After 1850, natural history in Iowa encompassed organized, systematic efforts to record the geology, environment and biota of the state.

INDEX DESCRIPTORS: Iowa, natural history, scientific development, historical landscape ecology

It is evident that the native peoples and the people who explored and settled the state accumulated a good working knowledge of the natural history of the region. It was upon this common body of natural history that the better known, more scientific compilations of the late 19th and the 20th Centuries were built. It is our purpose to review the development of natural history in Iowa up to the late 19th Century. We do not intend a comprehensive list of everyone who made observations on Iowa natural history during the periods that are covered here. Rather, we wish to identify trends, directions, and the timing of developments.

We treat the topic in four phases: 1) Native American, 2) prior to the Louisiana Purchase, 3) Louisiana Purchase to about 1850, 4) 1850 to the late 19th Century. These phases should not be taken to imply that these are discrete periods, because one can follow a continuous development of natural history in Iowa from the earliest evidence. The periods only provide convenient time posts for illustrating how natural history progressed up to its establishment as a scientific endeavor.

Native American Peoples

Both the words of Native American peoples themselves and the ethnographic evidence indicate that natural history in Native American cultures had a highly spiritual character. As peoples largely dependent upon their natural surroundings, it should not be surprising to find that Native Americans had, and have, a good knowledge of natural phenomena, for instance the relation between root length and water availability, the idea that different organisms are adapted to different habitats, and the role of scavengers (Densmore 1918). Putnam (1876) lists some names that Native Americans used for insects, and Gilmore (1919) presents Native American names and uses for about 250 kinds of plants of the Missouri region. It should also be pointed out that the journals and diaries of the white explorers indicate clearly the dependence of the explorers on the natural history knowledge of Native Americans.

Beyond scientific knowledge, however, natural history held a place in much Native American philosophical thought and in religion. Man and nature were not set apart, and the growth of organisms and their physical location (i.e., habitat) were taken as indications of the relationships between the organisms and spiritual powers, and between the organisms and Man. The words of Chief Luther Standing Bear (1933), of the Lakota Sioux illustrate the transcendent character of natural history to that people:

> The Lakota was a true naturist — a lover of nature. He loved the earth and all things of the earth... The old people came literally to love the soil and they sat or reclined on the ground with a feeling of being close to a mothering power... The soil was soothing, strengthening, cleansing and healing...to sit or lie upon the ground is to be able to think more deeply and to feel more keenly; he can see more clearly into the mysteries of life and come closer to kinship to other lives about him... For the animal and bird world there existed a brotherly feeling that kept the Lakota safe among them and so close did some of the Lakotas come to their feathered and furred friends that in true brotherhood they spoke a common tongue...

That the natural world was explicitly supernatural in the philosophy of the Omaha people is evident in the report by Fletcher and La Flesche (1911):

> When contemplating nature, man is not viewed as the master, but as one of many manifestations of life, all of which are endowed with kindred powers, physical and psychial, and animated by a life force emanating from the mysterious Wako^{n}·da. 'All forms mark where Wako^{n}·da has stopped and brought them into existance.' Man, animals, the earth, the sky and all natural phenomena are not only animated, but they bear a relation where man does not stand apart from nature, but becomes literally a part of nature, connected to it physically and related to it psychically. '...each animal has received from Wako^{n}·da some special gift. If a man asks help of Wako^{n}·da, Wako^{n}·da will send the asker the animal that has the gift that will help the man in his need.'

Prior to the Louisiana Purchase

Prior to, and to a degree after, the Louisiana Purchase, the study of natural history in the region was a component of European exploration. It was not treated as a separate endeavor. Observations from this period on natural history come mainly from journals and diaries of explorers, fur traders, and similar adventurers. In some of these writings, it is difficult to be precise about location, although the reader is usually certain of the general region to which a particular journal entry refers.

We searched the narratives from five explorations, 2 on the Mississippi River, those of Perrot (1718-1721) and Joliet and Marquette in 1673 (Steck 1928), and 3 on the Missouri River, those of Bourgmont (1714), Trudeau (1795), and Pierre Tabeau, who, with Regis Loisel, made more than one trip around the beginning of the 19th Century (Tabeau 1805). They all described general geomorphology and vegetation physiognomy. Woods along the river banks, with cottonwoods and willows, and "vast" prairies were always mentioned. Some of the journals made reference to other landscape elements: "no wood" (presumably a reflection of the interest that early travellers had in finding wood for fires and repairs, and for future settlement), "low prairies"

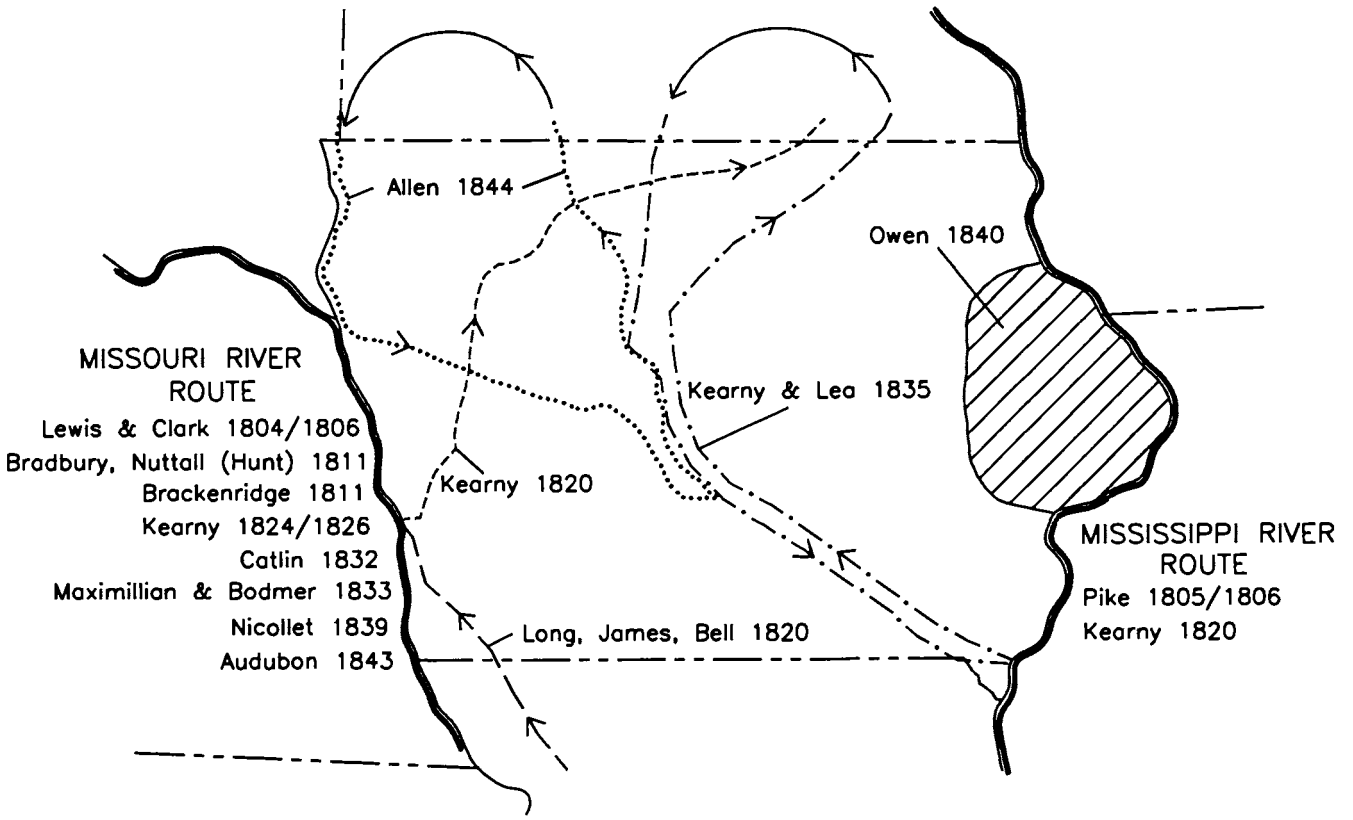

Fig. 1. Routes of important explorations in Iowa, 1800 to 1850, that included information about the natural history of the region.

along the rivers, meaning moist floodplain grasslands and meadows, and "open woods," which in context appeared to refer to what we presently term savanna. Wetlands of various conditions and topographic position were also mentioned. The descriptions of landscapes and vegetation were physiognomic and general in character, and included mention of only a modest number of organisms.

Four of the journals mentioned bison, one using the term "wild oxen," another stating that they were "abundant," and another "...as many as 400 in a single herd." Other mammals mentioned, with less frequency, included deer, "wild cats," bear, antelope, wolves (without being specific about whether the true wolf or the coyote was the object), fox, hare, skunk, lynx, muskrat, and porcupine.

Reference to birds was frequent, often in a context that implied several kinds but without naming them. Parrots (presumably Carolina parakeets), turkeys and quail are some that were listed specifically.

The form of the journals was general description, with identification of some plants, mammals and birds. There was a stress on economic or useable resources, as the reference to "no wood," and the repeated mention of game birds and mammals, would indicate.

Louisiana Purchase to about 1850

We examined 21 records of expeditions that occurred during this period, starting with the passage of the Lewis and Clark expedition along the western border of Iowa. These take the form either of journals and diaries, or formal reports from commissioned expeditions. Many were along the two border rivers, and even some of the explorations of the interior followed rivers (Figure 1). The expeditions included: Lewis and Clark (Lewis 1804), Pike (1805-1806), Bradbury in 1809-1811 (Bradbury 1819), Brackenridge in 1811 (Brackenridge 1816), James' account of Long's expedition in 1819-1820 (James 1820), Say's account of part of the same trip (Say 1819), Bell's account of Long's expedition in 1820 (Bell 1820), Kearny (1820), Maximillian (1833), Bodmer, who accompanied Maximillian in 1833 (Hunt and Gallagher 1984), Catlin, who travelled between 1832 and 1839 (Catlin 1841, McCracken 1959), Lea (1835), an anonymous member of the 1st U.S. Dragoons in 1834-1835 (Anonymous 1835), Owen, twice (1840, 1852), Audubon (Audubon 1843a, 1843b), Nicollet (1839), Allen in 1844 (Allen 1845), Steele (1850), Parry in 1848 (Parry 1852), and several surveyors for a railroad route in 1853-1854 (U.S. War Dept. 1855-56).

The overland expeditions were undertaken primarily by the military (e.g., Kearny, Lea, Allen, diaries from dragoons). Some quotes from two of these illustrate simultaneously the substance and spirit of such journals and the character of travel at the time. For the first example, between June and August 1835 the First U.S. Dragoons travelled north through the state into Minnesota and then returned (Anonymous 1835):

> Lee County: Handsome prairies.
> Wapello County: Marched 16 miles over a marshy prairie... The prairies on this section are covered with strawberries.
> Mahaska County: Handsome prairies of good quality...
> Jasper and Polk Counties: ...marched 25 miles over dry prairie... Our Indians kill much game mostly deer...
> Wright County: This day for the first season we saw buffalo. Killed 5 or 6...
> Franklin County: ...marched 20 miles over an almost boundless prairie... This evening killed an elk...
> Mitchell County: Encamped on Cedar River. Killed several buffalo...

[The party then continued into Minnesota, returning to Iowa in the vicinity of Kossuth County]

Kossuth County: Encamped in the open prairies without wood and bad water and consequently without eating. We are wandering about like half starved wolves and no person appears to know in what direction we ought to steer...

The second example contains excerpts from the journal of Captain James Allen's dragoon expedition from Fort Des Moines, in 1844 (Allen 1845):

Boone County: ...many wet places to detain the wagons...left the Des Moines far to our right; prairie large and flat, running up close to the river, where it falls off in a sudden bluff, serrated with deep short ravines, with good springs... much game is reported near the river; of elk, deer, bears, and turkeys...

Webster County: ...saw many elk at a distance; one drove estimated at 100...beautiful prairie all around and extending to the Des Moines; killed an elk and a deer...killed one deer, coons, squirrels, waterfowls...we had to double the teams, and also apply the men to draw the wagons through the slues, and these were numerous...

Emmet County: We spent the whole of this day in fruitless search of a way to lead us through these interminable lakes... The grass of this country is tall and luxuriant...but the whole of this country is good for nothing, except for the seclusion and safety it affords to the numerous water fowl that are hatched and grown in it.

[The party travelled into Minnesota, returning to Iowa in Lyon County.]

Lyon County: Buffalo have been in sight almost always since we struck this river [the Big Sioux], and we might have killed hundreds by delaying for the purpose...

Woodbury County: ...its [Little Sioux River] banks are bordered with narrow groves of large timber, cotton-wood, walnut, oak.

Calhoun County: Met another ugly prairie slue at the end of eight miles, which it took three hours to cross, when we came to a country full of marshes and old shallow grass...four fifths of the country was marsh, which turned us to all points of the compass...encamped on the open prairie; no timber near us...

In addition to the military, there were others one might call travellers, geographers, or pioneers, for instance, Maximillian (1833) and Steele (1850). Some of the travellers were artists (e.g., Bodmer, Owen, Catlin, Orestes St. John in Owen), and their drawings are useful for a visual reconstruction of the landscapes that they visited. Some of the expeditions were accompanied by natural historians. For example, James and Say accompanied Long (James 1820, Say 1819). Later in the period, primarily from 1840-1850, natural history itself became the focus of organized and systematic effort. The observations of Owen (1840, 1852), Audubon (Audubon 1843a, 1843b), and Parry (1852) illustrate this trend. Thus, this period exhibited a general trend from natural history as an observational part of exploration, but inseparable from it, to systematic research on natural history as the primary goal.

Most of the journals described the general geomorphology and vegetational features of the landscape. In a few cases, some specific data on river morphology and water speeds were recorded. Only Owen (1840, 1852) went into detail about geology.

There were many references to prairie, often with such adjectives as "immense," and "beautiful." Prairie fires were indicated in several reports. A few of the writings described upland savanna vegetation. The woods along the rivers were mentioned regularly, as was dominance of these woods by cottonwood trees. Notice was also taken wherever trees were absent along the rivers. Upland wetlands received attention (witness the quotes above from Capt. James Allen 1845), as did low "prairies" along the rivers, which we interpret to be moist tall meadows of sedges, rushes and grasses on the floodplains and in old river beds, and which largely have been drained and modified today. A few notes from the journals of Maximillian (1833) can serve to illustrate both the scope and detail of observations; these notes come from his time on the Missouri River in what is now Pottawattamie and Harrison Counties:

> We had all round us beautiful low hills, before which was alluvial land, thrown up by the river, covered with fine grass... On the left bank there were whole tracts covered with dead poplars, which had been killed by the fires caused by Indians in the forest and prairie... The banks of the stream are covered with fine high trees, and many of the plants were in flower, especially the blue lychnis, the white oak,... The country was low and uniform till we reached again the hills, which were rather bare of wood, but of grotesque form, and covered with a fine verdant carpet... On both sides there was alluvial soil, thickly covered with willows and poplars, mixed, in some places, with other trees. Here we saw, on a sand bank, two large wolves... There was abundance of grass, but not a single flower, which was caused by the prairie having been set on fire... From this place the country becomes more and more level, and bare of wood, and the eye roves over boundless prairies... The forest, which had been inundated, was likewise destitute of flowers; numerous traces of stags were everywhere seen.

The contrast in tone and subject between Maximillian's notes and those quoted above from the military is striking, and likely reflects the different goals of the journeys, the different locations, and the willingness with which each trip was undertaken.

In addition to the riverine cottonwoods, trees that were listed several times included oak, elm, black walnut, hickory, sycamore, willow, linden, ash, coffee-nut, red cedar, box elder, redbud and maple. Only in the later, more scientific, accounts (e.g., Parry 1852) were these collective identities differentiated into the constituent different species. Several of the accounts, especially again the later ones, provided lists of other plants.

Not surprisingly, mammals that were mentioned throughout the period in the reports were primarily game mammals, or species with economic value. These included: elk, deer, bison ("probably 5 thousand" in one herd, noted Kearny 1820), wolves, coyotes ("prairie wolves"), bear, beaver, and otter. Similarly, other animals that were mentioned repeatedly throughout the period tended to be those that were important food or trade species: pigeons (presumably passenger pigeons), turkeys, prairie chickens, geese, ducks, and catfish. Mosquitoes were treated with numerous disparaging remarks, and ticks obviously bothered the travellers.

When an expedition included someone specifically devoted to natural history, or was led by such a person, the observations were both more numerous and more detailed. James, who accompanied the Long expedition in 1819-1829 (James 1820), for instance, listed 34 species of mammals, 143 birds and 23 reptiles and amphibians along the Missouri River. Parry (1852), whose plant list was part of the Owen report of a geological survey, listed 727 species, many from Iowa, along with a description of their habit, behavior and habitat. Audubon (Audubon 1843a, 1843b), of course, made extensive lists of birds, and also wrote habitat descriptions and noted observations on other animals and on plants.

1850 to the Late 19th Century

This era was a time of mostly organized, systematic attempts to record Iowa natural history. We surveyed the publications of six scientific organizations in Iowa to determine the level of activity in

Table 1. Authorship of natural history papers in six Iowa serial publications between 1850 and 1900, by subdiscipline or taxa. The six publications are given in the text.

	GEOLOGY	FOSSILS	SOILS	BACTERIA	FUNGI/LICHENS	BRYO/PTERIDOPHYTES	SEED PLANTS	MOLLUSKS	CRUSTACEA	INSECTS	FISH	AMPHIBIANS	REPTILES	BIRDS	MAMMALS
Allin, N.					x										
Arthur, J.C.					x		x								
Bain, H.F.	x														
Ball, E.D.										x					
Ball, C.R.							x								
Barnes, W.D.							x								
Barris, W.H.	x	x													
Beach, A.M.										x					
Beyer, S.W.	x														
Calvin, S.	x	x													
Cratty, R.I.							x								
Drew, G.												x			
Ellis, J.B.					x										
Ellsworth, R.	x										x				
Finch, G.E.	x														
Fink, B.					x		x								
Fitzpatrick, M.F.L.						x									
Fitzpatrick, T.J.	x						x								
Fultz, F.M.	x														
Gass, J.		x													
Gillette, C.P.										x					
Gordon, C.H.	x														
Gow, J.E.							x								
Haupt, J.G.							x								
Hess, A.W.					x										
Holway, E.W.D.					x										
Jones, H.J.		x													
Keyes, C.R.	x														
Leonard, A.G.	x														
Leverett, F.	x		x												
Lonsdale, E.H.	x														
MacBride, T.H.	x				x		x								
Mally, C.W.															

natural history between 1850 and 1900, and the choice of subjects made by Iowa natural historians (Table 1). The six publications, with the date of their first volumes in parentheses, included: *Bulletin of the Laboratories of Natural History of the State University of Iowa* (1888-1890), *Proceedings of the Iowa Academy of Science* (1887-1893), *Proceedings of the Davenport Academy of Science* (1876, encompassing 1867-1876), *Transactions of the Iowa State Agricultural Society* (established in 1854), *Transactions of the Horticultural Society* (established in 1866), and the *Iowa Geological Survey Report* (1892). We assigned each paper to one of 15 subjects areas (Table 1).

The data (Table 1) demonstrate that natural history during this time was an active field moving along a broad but uneven front toward a systematic study of Iowa natural history. By the last half of the 19th Century, natural history was studied by disciplinary approaches, and over many disciplines. Geology and vascular plants received much of the attention; 26 of the authors listed in Table 1 wrote about geology (Table 1 does not include the two large Iowa Geological Survey reports of 1858 and 1870, which additionally indicate the emphasis on geology during this period; White 1870), and 16 about vascular plants. It is also noteworthy that some individuals worked on more than one aspect of natural history; 16 of the authors listed wrote on two or more subjects or groups of organisms.

All six of the scientific organizations that we surveyed for Table 1 were founded between 1850 and 1900. This is further evidence that natural history had matured in Iowa during the last half of the 19th Century, and indicated a need for a formalized means for presentation of natural history data.

It was at this point that the well-known Iowa natural historians, such as Calvin, Shimek, Pammel, Keyes, MacBride, and the others, came to the fore.

Table 1. (continued)

	GEOLOGY	FOSSILS	SOILS	BACTERIA	FUNGI/LICHENS	BRYO/PTERIDOPHYTES	SEED PLANTS	MOLLUSKS	CRUSTACEA	INSECTS	FISH	AMPHIBIANS	REPTILES	BIRDS	MAMMALS
Meek, S.E.											x				
Miller, A.A.							x								
Miller, B.L.	x														
Mueller, H.A.						x									
Myers, P.C.						x									
Nagel, J.J.							x								
Norton, W.H.	x														
Nutting, C.C.															x
Osborn, H.		x								x					
Pammel, L.H.				x			x								
Patrick, G.E.			x												
Pratt, W.H.	x								x						
Putnam, J.D.										x					
Reppert, F.						x	x								
Ross, L.S.									x						
Savage, T.E.	x					x									
Shimek, B.	x	x				x	x	x							
Sirrine, F.A.										x					
Spencer, A.C.	x														
Tilton, J.L.	x														
Todd, J.E.	x													x	
Udden, J.A.	x		x												
Vandivert, H.					x										
Walton, A.B.										x					
Webster, C.L.	x														
Weller, S.		x													
White, C.A.			x												
Whitter, F.M.						x									
Wickham, H.F.										x					
Wilder, S.	x														
Williams, H.S.														x	
Williams, I.A.	x														
	26	7	4	1	8	5	16	1	2	9	2	1	0	3	1

Conclusions

The early natural historians of Iowa saw extensive prairies, wooded river valleys and savannas. They also reported a great deal about the state's wetlands. Over time, knowledge of the geology and geomorphology, and of the identity, growth and habitats of plants, mammals, birds, fish, insects and other groups accumulated. Included amongst these were observations that, when compared to today, indicate the tremendous changes that have taken place in Iowa's natural world: the large herds of bison that no longer exist, and the several large mammals such as elk, bear, cats and wolves that are now gone. Furthermore the frequent reports of fires speak to the importance of this force in the modification and maintenance of Iowa's natural heritage. Beyond a summary of what was actually seen, we can also detect the metamorphosis of natural history as a science in Iowa:

1. Native Americans had a well-developed knowledge of natural history, and saw themselves as an integral part of it.
2. Beginning with the onset of European exploration, natural history evolved from its place as a part of geography, to natural history research in its own right, with the goal of assembling systematic records of the geology, environments and biota of the state.
3. The early motivations for natural history were human and economic necessity. Later, investigations of natural history were driven by scientific curiosity, that is, natural history was undertaken for its own sake, and consequently, it was both more thorough and more systematic.

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