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CURRENT AND HISTORIC NATURAL RESOURCES
OF THE FORT UNION TRADING POST
NATIONAL HISTORIC SITE

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INTRODUCTION

Fort Union Trading Post, situated at the confluence of the Missouri and Yellowstone Rivers, was one of the largest and most important fur posts on the Upper Missouri. It was described by Hiram Chittenden as "... the best built post on the Missouri, and with the possible exception of Bent's Fort on the Arkansas, the best in the entire West" (1954, vol. 2, p. 959). Founded in 1829 by Kenneth McKenzie, an employee of the American Fur Company, the post received accolades from travelers for its lavish hospitality, unusual for an isolated outpost of civilization, and for its accessibility to excellent hunting areas.

Fort Union was an important focal point for the Assiniboiné, Cree, and Crow tribes who came to trade, receive the annuities, and inquire about White activities. The financial success of the post depended upon the hunting and trapping efforts of these Indians, who brought in bison robes and other animal pelts to trade for White goods. Thus, the success of the post was directly related to the natural resources of the area.

This report describes these resources -- the mammals, reptiles, birds, insects, and plants -- both at the present time (1979) and historically (1806-1856). Included are four sections: a historical summary of the observations of travelers and explorers to the area, a report on the historic and contemporary animal populations, a report on the historic and contemporary plant species and communities, and maps of the plant communities on the site. Because the historic observations lacked precision as to the exact location of plants and animal communities, no maps could be prepared for these data.

The historical portion of this project inventories, to the extent permitted by the available information, the natural resources of the Fort Union area during the decades of the 1840's and 1850's. These were the decades during which the post reached its peak and the target periods for its reconstruction.

These decades were also the ones during which many noted travelers, traders, missionaries, Indian agents, naturalists, artists, and sportsmen visited the post. Best known are Audubon (1860), Harris (1851), Kurz (1837), De Smet (1805), Point (1867), Larpenteur (1862), Stevens (1860), Warren (1856), Denig (1861), Palliser (1856), and Culbertson (1852). Reports of the Indian agents are located in the Annual Reports of the Commissioner of Indian Affairs. Not only did these observers set down information about the Indians of the area, they also filled their accounts with descriptions of the flora and fauna, especially the size of the bison herds and the ferocity of the mosquitoes and grizzly bears. These accounts are the primary sources for the development of the inventory and narrative report.

Because the Fort Union Historic Site covers a relatively small area of 192 acres, the historic data have been broadened to include both a greater time span and geographic area. Similar information has been abstracted from the 1830's accounts, especially those by George Catlin (1813), and Prince Maximilian du Neu-wied (1806), and from those of the 1860's. Accounts during this latter period include those by Morgan (1859), Fisk (1863), Brown (1850), and Stuart (1863). The geographic area surveyed for historic information extends from Fort Union south along the Missouri River to the Mandan-Hidatsa villages near the mouth of the Knife River. Many of the observers sailing up the Missouri wrote vivid descriptions of the flora and fauna of the area. The inclusion of this area, which remained during historic times relatively uninhabited, permits the incorporation of the important botanical work of Thomas Nuttall who stayed in a Mandan village near the Heart River in 1811 and explored the area along the Missouri.

Other sources of historical information include the paintings by Bodmer, Kurz, Catlin, Stanley, and Point. Caution, however, must be used when drawing upon these paintings as a data source because frequently the artists took lib-

erties when depicting the natural environment. Information pertaining to the history of the fort has been drawn from the reports by Dougherty (1957) and Thompson (1968).

Descriptions of the contemporary natural resources have been restricted to the Fort Union Trading Post Site.

The primary goal of this research is to provide the National Park Service with the necessary data in order to assist with the restoration and management of the Fort Union Trading Post National Historic Site. In order to return the existing flora and fauna to that which was present when Fort Union was in operation, it is necessary to know what natural resources currently exist on the site, the history of these resources during the 1840's and 1850's and the modifications which would have to occur in order to accurately restore the area.

While it may not be possible to restore completely the historic animal populations, this information may be of value in preparing museum exhibits and in providing visitors with information about Fort Union and its place in an Upper Missouri environment, the influence which the fort had upon its surroundings and the human-flora-fauna relationships associated with the fur trade.

METHODS

The historic portion of the project involved library research of journals, diaries, reports, letters, and surveys written by those who visited the fort and nearby areas during the period under study. The majority of these works are located in the University of Montana Library, which holds a large collection of Western Americana.

In order to reconstruct the faunal complex extant in the Fort Union area during the period of its operation, the records were examined and the observations catalogued. Any attempt to quantify animal populations was soon abandoned. References to numbers were, of course, vague, and were made only to the larger mammals of especial interest for food and furs and to the ever-present scavengers that provided much sport-shooting. The fauna were unequally treated; the vast majority of the sitings noted and specimens taken were of birds and mammals. The lower animals, fishes, amphibians, and reptiles, are very poorly represented in the records. For the upper Missouri river area, little useful information was found on the insects and other invertebrate fauna.

All species records found in the literature cited are presented in this report, with reference to the source given. Very often, due to taxonomic changes, current vernacular names being at variance with those in use in the mid-1800's, and vagueness as to the description of the animals, identification of the species recorded is now problematical. Records from other sources than those pertaining strictly to the Fort Union area were consulted in order to support an opinion as to the true identity of an observation. Extensive use was made of checklists and other publications of the ranges and habitat preferences of the animals in question. In addition, persons with expertise greatly assisted in making some of the determinations. I (J. Lowe) am especially grateful in this regard to Drs. S. S. Frissell, B. R. McClelland, G. F. Weisel, and P. L. Wright, of the University of Montana, for their assistance. The final opinion is my own, for which I take responsibility. Where doubt remains as to the identity of the species, it is indicated by a (?) following the entry.

An animal species list has been developed for each of the plant communities developed for the Fort Union site by Dr. Willard in this report. The lists were developed largely by utilizing current checklists and other publications on the fauna of the area. On-site observations were made to determine the habitats rep-

resented now, and in conjunction with the vegetation and site survey, to determine the potential for development of former habitats. The mammals of the area are listed according to the natural vegetation type categories developed by Dr. Willard. Except for animals that might utilize all habitats in the area, and move through certain habitats as corridors, in which case they may be listed in more than one vegetation category, an attempt has been made to list them only in their most typical habitat. The birds, since in most cases their habitat uses, as for perching and nesting on the one hand, and feeding on the other, do not coincide with the discrete vegetation types, are listed by appropriate groups such as "mixed forest and prairie."

A plant species list has been developed for each existing plant community and the percentage of each species within the total community has been determined. Plant species composition (% of each species of the total) is expressed as percentage by weight. Weight was determined by standard methods, including clipping and weighing, supplemented by ocular estimates. A list of exotic plant species in each community is included in the report.

The local Soil Conservation Service in Montana and North Dakota were contacted to obtain soils maps and data for the site. The soils were used as a guide to the potential plant communities. The Soil Conservation Service descriptions of climax range sites on each soil type serve as a base from which to determine potential plant communities. In addition, similar areas containing these same soils were sought along the Missouri River. These were sampled, as available, to provide an indication of the potential for each soil. A literature review has been incorporated with the above-mentioned information to provide a description of potential or "climax" plant communities at Fort Union.

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HISTORICAL OBSERVATIONS OF FLORA
AND FAUNA BY TRAVELERS AND
EXPLORERS IN THE FORT UNION AREA

Katherine M. Weist

From the explorations of Lewis and Clark, the first whites to record their observations of the area, to the close of the fur trade on the Upper Missouri, Fort Union was visited by a number of naturalists--botanists, geologists, and zoologists--who described the flora and fauna of the area. The most important of these observers were Meriwether Lewis and William Clark, Thomas Nuttall, John Bradbury, John J. Audubon, Edward Harris, and Ferdinand V. Hayden. Other observers of less importance were George Catlin, Prince Maximilian du Weid, and the members of the Northern Pacific Railroad Survey. The findings of each of the primary observers are discussed, supplemented by other observations. Attached are appendices which list by species name and, when possible, the common names and the locations of the plants and animals noted.

Meriwether Lewis and William Clark

Meriwether Lewis and William Clark, leading the first scientific expedition to the Northern Plains and beyond, spent the winter of 1804-1805 at the Mandan villages located at the mouth of the Heart River. They resumed their expedition west in April and camped for two days, April 25-27, at the mouth of the Yellowstone River and spent their time exploring the area. Both Lewis and Clark praised the virtues of the area, its suitability for a fur

post, the vegetation along the river bank, and the animals which visited the region.

Before the confluence of the two rivers was reached, Lewis left the party and crossed to the mouth of the Yellowstone by land. Climbing a hill which overlooked the rivers, he described the view as "...most pleasing view of the country, particularly of the wide and fertile vallies formed by the missouri and yellowstone rivers, which occasionally unmasked by the wood on their borders disclose their meanderings for many miles in their passage..." (Lewis and Clark, 1969, vol. 1, p. 334). William Clark also described the area as follows:

...on the forks about 1 mile from the point at which place the 2 rivers are near each other a beautifull low leavel plain commences, and extends up the Missouri & back, this plain is narrow at its commencement and widens as the Missouri bends north, and is bordered by an extencisve wood land for many miles up the Yellow Stone river, this low plain is not Subject to over flow, appear to be a fiew inches above high water mark and affords a butifull commanding situation for a fort near the commencement of the Prarie, about (blank space in MS.) miles from the Point & (blank space in MS.) yards from the Missouri a small lake is Situated, from this lake the plain rises gradually to a high butifull country (Lewis and Clark, 1969, vol. 1, p. 342).

According to Lewis, the woodland extended about a mile "when the rivers approach each other within less than half a mile; here a beatifull level low plain commences and extends up both rivers for many miles, widening as the rivers recede from each other, and extending back half a mile to a plain about 12 feet higher than itself" (1969, vol. 1, p. 344).

Lewis, the more astute observer of flora and fauna of the two, gave a lengthy description of the plants he noted growing in the area. He was especially impressed with the quantity of timber which he thought to be more plentiful than any other area along the Missouri above the mouth of the Cheyenne River. The most prevalent trees were cottonwood with some small elm, ash, and

boxalder along the low plain. Along the river and on the sandbars, Lewis described the undergrowth as being primarily small-leaved willow, with rose bushes, service berry, and red berry (called buffalo berry today) on what he termed the "low bottoms." The area termed "high bottoms," or the next higher terrace, had the same type of underbrush plus broad-leaved willow, gooseberry, chokecherry, purple currant and honeysuckle. On the open bottoms which bordered the hills, Lewis noted the presence of wild hyssop.

Lewis and Clark disagreed as to the best location for a fort. Clark thought it would be best located on the low plain which became wider the farther away it extended from the confluence of the rivers. Lewis, however, considered this area to be not suitable because of the shifts in the Missouri River course. He judged the best place to be on the higher plain next to the lower end of a small lake which extended at that time parallel to the Missouri for about one mile and was about 200 yards in width. Lewis estimated that the site would be about 400 yards from the Missouri and 800 from the Yellowstone. One of the important assets of the fort would be ready access to numerous game which was present in the area.

From the Mandan villages to the Yellowstone, Lewis and Clark saw herds of buffalo, elk, and antelope on the plains, deer in the more wooded areas, and beaver located at every bend. The birds they noted were magpie, swans, geese, ducks, and bald eagles. Lewis considered the eagle to be more abundant at the mouth of the Yellowstone than in any other place they had passed thus far. Of particular interest to Lewis was the relationship between the magpie and eagle. He remarked on the closeness of the magpies' nests to those of the eagles for, "we scarcely seen an Eagle's nest unaccompanied with two or three Magpies nests within a short distance" (1969, vol. 1, p. 345). On the

day they departed from the area; Lewis spotted four brown bear and Clark saw three.

On their return trip in 1806, Clark reached the study area before Lewis. Lewis and Clark had separated west of the Rocky Mountains, with Lewis returning by way of the Missouri and Clark exploring the Yellowstone. Proceeding down the Missouri as they approached the mouth of the Yellowstone, Lewis spotted some birds in flight which he described as about the size of a pigeon with the top of their heads black. Elliott Coues, an ornithologist who edited one of the editions of the Lewis and Clark journals, believed that these birds were terns, probably Sterna forsteri (1969, vol. 5, p. 237).

Nearing the mouth of the Yellowstone, Clark saw some Mountain Big horns or Audubon mountain sheep, and a member of his party was able to kill a ram. When they arrived at the mouth, Clark killed a large male elk which, along with a few others, had been feeding on the young willows in the point between the two rivers. Because the mosquitoes were so bothersome and because no buffalo were in the area, Clark headed downstream, leaving a note for Lewis of this move. On their way south, Clark's party had several encounters with grizzly bears and again saw big horn sheep. Further down river, Clark or members of his party killed antelope, black tailed or mule deer, and elk. Along the bottom on the hill sides, Clark noted a species of cherry with which he was unfamiliar. His men dug a large number of roots which they called "white apples." This root is also called "prarie potato" or "bread root" (Psoralea esculenta) and was used by the Plains Indians, after it had been dried and pounded, in meat soups.

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Fort Union Trading Post

Thomas Nuttall and John Bradbury

Not until 1811 did "professional" naturalists ascend the Missouri to describe the flora of the region and collect specimens. Two British naturalists, Thomas Nuttall and John Bradbury, traveled with parties of fur traders to Fort Lisa, a Missouri Fur Company post, located about ten miles above the mouth of the Knife River. Bradbury arrived at the post on June 22 and Nuttall on June 25. Bradbury did not stay long but left the area on July 6; Nuttall, on the other hand, remained until autumn (McKelvey 1955:144-145). From what is known, neither naturalist collected as far north as Fort Union, but many of the plants noted may well have been found in the study area at that time.

Of the two, only Bradbury kept a journal (1904). He noted a number of plants found in the area and was particularly interested in the "pomme blanches" or Psoralea esculenta because of its importance. He was informed that "...this root is of the greatest importance, not only to the Indians, but to the hunters, who, in case of the failure of other food, from the want of success in hunting, can always support life by resorting to it..." (1904:154). Bradbury had great difficulty collecting because of the numerous mosquitoes which drove the horses to the fort each night to await the construction of a fire, the smoke of which was increased by putting some green weeds on it. In a valley four miles from the fort, Bradbury found what he thought to be a new species of eleagnus, "intermixed with a singular procumbent species of cedar juniperus" (1904:158). He also noted the presence of a species of lily (lilium catesbaei). At the conclusion of his journal is a list of the "rare or valuable" plants he collected on his journey from St. Louis north. (See appendix 2).

Thomas Nuttall, who became one of the foremost botanists of the 19th century, traveled west under instructions of a noted Philadelphia botanist, to

survey the Northwest Territories. He continued to move westward, however, and spent approximately three months collecting along the Upper Missouri. Although he never wrote a journal of his trip, he did gather together his finds into his botanical classic, Genera of North American Plants, published in 1819. The data for his finds, listed in Appendix 3, were drawn from this publication.

George Catlin

In 1832, the first steamboat reached Fort Union, bearing as a passenger, George Catlin, an artist who became famous for his portraits of Northern Plains Indians. Although Catlin gave fewer details about the natural resources of the area than about the Indians, he did provide some. He described Fort Union as the "largest and best-built establishment of the kind on the river, being the seat or principal head-quarters and depot of the Fur Company's business in this region" (1973, vol. 1, p. 21). He further exclaimed about the magnitude of the animal herds, especially the buffalo, elk, and antelope, and about the agility of the mountain sheep which inhabited the bluffs along the Missouri River.

Catlin was more descriptive of the country on his canoe trip down the Missouri to the Mandan villages than he was of Fort Union. The day he left the Grand Detour area, he encountered a prairie dog town. In reference to a sketch he did of such a town, he mentioned that he drew the one located near the mouth of the Yellowstone.

Catlin also remarked on the plants of the area. He was particularly impressed with the quantity of wild berries growing along the Missouri. He noted the presence of gooseberries, service berries, plum trees and wild currants. The buffalo berries were especially lush, and he considered it possible

to make wine from them and sell it in St. Louis. Catlin mentioned seeing sunflowers and lilies, which he characterized as being "voluptuous" (1973, vol. 1, p. 72).

Maximilian, Prince of Wied

The German prince, Maximilian du Wied, accompanied by the artist Karl Bodmer, spent a longer time on the Upper Missouri than Catlin, residing at Fort Union from June 26 to July 6 and from September 29 to October 30, 1833. Maximilian explored the region and recorded some of his findings.

Maximilian and Bodmer examined the area, finding in a nearby wood a tree burial which had fallen down. Under the tree was a rose bush in full bloom, and in the skull of one of the bodies, Bodmer found a mouse's nest. Maximilian made few other comments regarding the natural resources of the area during his first stay at the fort. He did remark on the absence of moths which would have damaged the furs traded at the post. He further stated that the Indian women to the north (exact location not specified) knew how to make red dyes from Galium tinctorium and boreale roots and black dye from the bark of the alder tree (1906, vol. 23, p. 13).

On the first day of his journey upstream to Fort McKenzie, Maximilian saw no game, "it being too near the fort" (1906, vol. 23, p. 26), although he did see evidences of buffalo and "stags." He also heard a yellow-breasted Icteria viridis singing in the rose bushes. On his return trip to Fort Union, Maximilian noted other birds including many kingfishers, cranes, and avosets (Recurvirostra americana).

During his second and longer stay at the Fort, Maximilian found the area quite different from when he first saw it; the prairie was dry and withered

with the trees along the river turning yellow. The birds were flying to their winter nesting areas, and with few Indians coming into the Fort, some animals came in closer to seek food. As he described the scene:

...large flights of blackbirds, and numbers of ravens, crows, and magpies, were flying along the skirts of the woods; thrushes were departing in small companies, and some species of finches still animated the thorny bushes; the yellow goldfinch had already put on its winter dress (1906, vol. 23, p. 199).

Flocks of ducks and geese were on the river and the lake located near the mouth of the Yellowstone where numbers of waterfowl could be seen. At this time of the year, cranes and pelicans flew over in large flocks. Muskrats also inhabited the lake area.

While at Fort Union, Maximilian joined the hunters of the fort in a buffalo chase. They crossed the river from the Fort where Maximilian found along the bank "...a lofty forest of poplar, ash, negundo, and elm, with a thick undergrowth of symphoria, roses covered with beautiful red blossom, and buffalo berries, which had then ripe red fruit" (1906, vol. 23, p. 192). The birds that he noted on the prairie were a species of numenius or charadrius, prairie chickens, larks, ravens, and crows. The prevalent animals were wolves, prairie foxes, and striped squirrels. At a creek called "La Riviere aux Tortues," he found a beautiful tortoise, resembling Emys picta in the shallow pools. In the ravines, he found ash, elm, and maple with roses, bird-cherry, and other species intertwined with clematis. Other plants noted were rose bushes, solidago, aster, and snake-root Galardia bicolor (1906, vol. 23, pp. 194-195).

With the coming of winter, the animals had either gone into hibernation, such as the squirrels, or were coming closer to the Fort and the river valley. Wolves were seen prowling around, even during the day, and the little prairie fox (kit fox) came to the Fort, hiding in the tufts of grass left from where the Indians had set their tents and sneaking into the Fort at night to steal food. Herds of antelope, numbering between thirty to forty animals per herd, were

coming closer to the Missouri to seek shelter. Most of the amphibians had gone underground, and when new palisades were put in place, the workmen dug up several snakes of the Coluber proximus category (1906, vol. 23, pp. 198-200).

Before he left the area, Maximilian visited Fort William, the opposition post. The underbrush between the two forts had lost its foliage except for the buffalo berries, and the only birds he noted there were prairie hens, magpies, and coal titmice. The tracks of other animals were seen, among them two different species of mice.

On October 31, 1833, Maximilian and his companions left Fort Union to go downriver for their winter stay at a Mandan village. The only new plants and animals he observed in the Fort Union area were cornus and grapes in the underbrush, a small flock of Fringilla linaria, which was exceptionally tame, and a four-striped squirrel (Tamias quadrivittatus). He remarked that they saw many more traces of animals than the animals themselves. Near the mouth of the White Earth River, the prairies were either bare or covered with artemisia, through which he saw the tracks of buffalo, elk, and bears (Ursus ferox). At a number of points on the trip south, he saw evidences of beaver and heard the whistling of elk stags.

John J. Audubon and Edward Harris

Audubon and Harris traveled together up the Missouri River in 1843. They arrived at Fort Union on June 12 and departed August 16. During their stay at the fort, they made numerous collections of the flora and fauna. Their journals contain vivid descriptions of the plants and animals. The following descriptions and narratives are taken from the journal of Audubon (Audubon, 1960). These accounts are extracted as they occur in the journal, and no attempts are made to edit them.

June 12

Saw wild geese and ducks with their young.

Saw a Wolf giving chase, in driving away four Ravens from a sand-bar; finest sight--shortly before we came to the mouth of the Yellowstone--and that was no less than twenty-two Mountain Rams and Ewes mixed, and amid them one young only.

June 14

Walked to the wooding-place...one of the worst, the very worst, upon which we ever trod; full of wild rose-bushes, tangled and matted with vines, burs, and thorns of all sorts, and encumbered by thousands of pieces of driftwood...we saw nothing but a few Ravens.

As reached the prairies, travelled faster and passed by the late garden of the fort. Harris caught a handsome snake...we saw Lazuli Finches and several other sorts of small birds.

Before dinner--saw a good number of Tamias holes, many cacti of two sorts and some plants hitherto uncollected by us. Saw a few Arctic Ground Finches and two Wolves.

Culbertson collected white wolf.

Another wolf seen trotting off towards the hills.

June 15

Bell and Harris hunted a good while but procured only a Lazuli Finch and a few other birds.

Mackinaw boats arrived--gentlemen gave me a fine pair of Deer's horns; and to Mr. Culbertson a young Gray Wolf, and also a young Badger...head has all the markings of an adult though it is a young of the present spring.

Man to go off after Antelopes for me.

Saw several Wolves, but none close to the fort. Both the common Crow and Raven are found here.

June 16

Men went over the river to try to procure Antelopes. Bell and Alexis returned to dinner without any game, although they had seen dozens of the animals wanted, and also some Common Deer.

June 17

The song of the Lazuli Finch so much resembles that of the Indigo Bird that it would be difficult to distinguish them by the note alone. They keep indifferently among the low bushes and high trees. He (Bell) also brought a few specimens of Spermophilus hoodii of Richardson (note by Coues "this is a synonym of Spermophilus tridecem-lineatus, the Thirteen-lined, or Federation Spermophile, the variety that is found about Fort Union being S. t. Pallidus).

In evening--shot a fine large Gray Wolf.

June 18

Alexis--killed two male Antelopes and Provost one Deer.

Alexis' wife went across (the river) also to gather gooseberries.

Across river to collect antelope and deer on cart--We jogged on through thick and thin for about two miles, when we reached a prairie covered with large bushes of *Artemisia* (called "Herbe Sainte"), and presently, cutting down a slope, came to where lay our Antelope, a young male. Returned--not by road but across the prairie and immediately under the clay hills where the Antelope go after they have fed in the prairie below from early dawn until about eight o'clock....Part of the way we travelled between ponds made by the melting of the snows, and having on them a few Ducks and a Black Tern, all of which no doubt breed here. After we had passed the last pond, we saw three Antelopes several hundred yards to the lee of us....We now entered the woods, and almost immediately Harris saw the head of a Deer about fifty yards distant--proved to be a Doe with very large milk-bags. While looking at the Deer shot this day, Harris and I thought that their tails were very long, and that the animals themselves were very much larger than those we have to the eastward.... I am told that the Rocky Mountain Rams lost most of their young during the hard frosts of the early spring; for, like those of the common sheep, the lambs are born as early as the 1st of March, and hence their comparative scarcity. Harris and Bell have shot a handsome White Wolf, a female, from the ramparts.

June 19

Chardon...left a Wolf feeding out of the pig's trough, which is immediately under the side of the fort. Larpenteur--opens the gates at sunrise, saw seven Wolves within thirty yards, or less, of the fort....There are some notions that two kinds of Deer are found hereabouts, one quite small, the other quite large; but of this I have no proof at present....Young Mr. McKenzie and a companion went across the river, but returned soon afterwards, having seen nothing but one Grizzly Bear. Later--brought two new birds: one a Lark¹, small and beautiful; the other like our common Golden-winged Woodpecker², but with a red mark instead of a black one along the lower mandible running backward.

(Coues note 1. First intimation of the discovery of the Missouri Titlark, which Audubon dedicated to Mr. Sprague under the name of Aluada spragueii, now well known as Anthus (Neocorys) spraguei.)

(Coues note 2. Original indication of the curious Flicker of the Upper Missouri region which Audubon named Picus ayresii after W. O. Ayres. It is the Colaptes hybridus of Baird, and the C. aurato-mexicanus of Hartlaub; in which the specific characters of the Golden-winged and Red-shafted Flickers are mixed and obscured....)

June 20

Hunters returned without anything, though they saw three or four Deer, and a Wolf almost black, with very long hair....

Harris and Bell came back bringing several small birds, among which w/ three or four proved to be a Blackbird¹ nearly allied to the Rusty Grackle, but with evidently a much shorter and straighter bill.

(Coues note 1. Quiscalus brewerii of Audubon...now known as Scolecophagus cyanocephalus. It was new to our fauna when thus dedicated by Audubon to his friend Dr. Thomas M. Brewer...but had already been described by Wagler from Mexico.... It is an abundant bird in the West, where it replaces its near ally, Scolecophagus carolinus.)

June 21

Bell and young McKenzie went off after breakfast, but brought nothing but a Sharp-tailed Grouse, though McKenzie shot two Wolves. In this part of the world Wolves feed upon Wolves, and no mistake. Wolves here not only eat their own kind, but are the most mischievous animals in the country; they eat the young Buffalo calves, the young Antelopes, and the young of the Bighorn on all occasions, besides Hares of different sorts, etc.... Bell brought home the hind parts, the head, and one forefoot of a new species of small Hare (Coues--no doubt the Lepus Artemisia of Bachman...later described and figured by Aud. and Bach.... It is now generally rated as a subspecies of the common Cottontail, L. sylvaticus).

Harris and I walked several miles...found the nest of a Sparrow-hawk.... Sprague went across the hills eastward, and was fortunate enough to shoot a superb specimen of the Arctic Bluebird.... Culbertson told me the Rabbit were plentiful on the road to the steamboat landing. Audubon etc walked ther but saw none and only procured a Black-headed Grosbeak.

June 22

Harris and Bell--returned with several birds, among which was a female Red-patched Woodpecker (Coues--the same hybrid Woodpecker already noted) and a Lazuli Finch.

After dinner, off after Hares--found none but started a Grizzly Bear from her lair.

Deer killed--This species of Deer is much larger than the one we have in Virginia, but perhaps no more so than those in Maine. And as yet we cannot tell whether it may, or may not, prove a distinct species.

The little new Lark that I have named after Sprague has almost all the habits of the Skylark of Europe.... We have not yet been able to discover its nest. Bell is of opinion that the Red-collared Ground Finch has its nest in the deserted holes of the Ground Squirrel (Coues--the Chestnut-collared Longspur, Calcarius ornatus--Bell was mistaken...as it nests on the open ground, like Sprague's Lark, McCown's Longspur, and most other small birds of the Western plains).

Went to Opposition fort in Wagon. In going, we found we could approach the birds with comparative ease, and we had the good fortune to shoot three of the new Larks.... Young Meadow Larks, Red-shafted Woodpeckers, and the Red-cheeked ditto, are abundant (Coues shows that Audubon observed individuals of the hybrid Woodpecker which he considered identical with Colaptes cafer, and also others which he regarded as belonging to the supposed new species--his C. ayresii).

As we were in search of birds, we saw a small, whitish-colored Wolf trotting across the prairie, which hereabouts is very extensive and looks well, though the soil is poor. The prairie is covered with cacti.... The Otters and Muskrats of this part of the country are smaller than in the States; the first is the worst enemy that the Beaver has.

June 24

Killed a small wolf last night and Harris wounded another. After breakfast Harris went off on horse back and brought in a Sharp-tailed Grouse. He saw only one Deer, species not identified.

Audubon went off to watch the Larks fly.... On the way home (from Fort Mortimer) Bell shot a fifth Lark, and when we reached the ravine I cut out of a treestump the nest of an Arctic Bluebird, with six eggs in it, of almost the same size and color as those of the common Bluebird.

June 25

Harris and Mr. Denig brought in several Arkansas Flycatchers.... A few more catfish have been caught, and they are truly excellent.

June 26

They (the hunters) have killed three Antelopes, three bull Buffaloes, and one Townsend's Hare.... This afternoon early Provost brought in a Deer of the large kind.... After this Harris and Bell went off and brought in several Lazuli Finches, and a black Prairie Lark Finch of the species brought from the Columbia by Townsend and Nuttall. We caught several catfish and a very curious sturgeon.

June 27

...later he, Harris, and I, walked to the hills to procure the black root plant which is said to be the best antidote for the bite of the rattlesnake. We found the root and dug one up, but the plant is not yet in bloom. The leaves are long and narrow, and the flowers are said to resemble the dwarf sunflower.

Harris shot two of what he calls the Small Shore Lark, male and female; but beyond the size being a little smaller than those found at Labrador, I cannot discover any specific difference.

They saw an Antelope, some Magpies, and a Swift Fox, but no Buffaloes, though they were fifteen miles from the fort. They ran a Long-tailed Deer.... The Kit or Swift Fox which they saw stood by a bunch of wormwood and whilst looking at the hunters, was seen to brush off the flies with his paws.

Account by Lewis Squires of a buffalo hunt.

On prairie saw a cactus of a conical shape, having a light straw-colored, double flower, differing materially from the flower of the flat cactus.

Pond of water--on opposite side--saw a Grizzly Bear but he was unapproachable. We saw a great many Magpies, Curlews, Plovers, Doves and number of Antelopes... on way home--saw two Grizzly Bears at the lake again.

June 28

...they said a hunter from Fort Mortimer had brought a Bighorn and skinned it... brought only the skin of a young female of the White-tailed Deer...it had the germ of a horn about one inch long; the skin was quite red.... A young Elk was brought in good condition. We procured a young Red-shafted Woodpecker, killed by an Indian boy.

June 29

(He saw a Grouse within a few feet of him.) Bell and I took a long walk, and shot several birds. We both were surprised to find a flock of Cliff Swallows endeavoring to build nests beneath the ledges of a clay bank.... Previous to this, as I was walking along a ravine, a White Wolf ran past within fifteen or twenty paces of me.... We found a nest of the Prairie Lark, with four eggs. We saw Arctic Bluebirds, Say's Flycatcher and Lazuli Finches. Say's Flycatcher has a note almost like the common Pewee. We returned home to dinner, and after-- find the young of the Red-shafted Woodpecker have pale-yellow shafts, instead of deep orange-red.

Harris shot also a Grouse, and a Woodpecker that will prove a Canadensis; he killed the male also, but could not find it, and we found seven young Red-shafted Woodpeckers in one nest. I killed a female Meadow Lark, the first seen in this country by us. Provost told me...that, during the breeding season of the Mountain Ram, the battering of the horns is often heard as far as a mile away.... We find the mosquitoes very troublesome, and very numerous.

June 30

Last winter Buffaloes were extremely abundant close to this fort, so much so that while the people were engaged in bringing hay in carts, the Buffaloes during the night came close in, and picked up every wisp that was dropped.

July 1

Bell found the nest of the Arkansas Flycatcher. The nest and eggs, as well as the manners, of this bird resemble in many ways those of our King-bird. The nest was in an elm, twenty or twenty-five feet above the ground, and he saw another in a similar situation.

Brought the most curious set of five birds that I ever saw, and which I think will puzzle all the naturalists in the world. The first was found near the nest, of which Sprague shot the female, a light-colored Red-shafted Woodpecker. It proved to be of the same color, but had the rudiments of black stripes on the cheeks. Next, Sprague shot an adult yellow-winged male, with the markings principally such as are found in the Eastern States. Harris then shot a young Red-shafted, just fledged, with a black stripe on the cheek. His next shot was a light-colored Red-shafted male, with black cheeks, and another still, a yellow Red-shafted with a red cheek.

July 2

Mosquitoes--Provost tells me are more scarce this season than he ever knew them thus far up the Missouri.

Sprague saw a Wolf in a hole a few yards from the fort, but said not a word of it till after dinner, when Bell and Harris went there and shot it through the head.

July 3

The Bighorn hunters returned this afternoon with a Bighorn, a female, and also a female Black-tailed Deer.

July 4

Shot and wounded a deer but couldn't kill it. After dinner went to get it and found Wolves and Turkey Buzzards had fared well.

July 5

Provost and Squires returned drenched and hungry, before dinner. They had seen several Deer, and fresh tracks of a large Grizzly Bear.

Went to see Mr. Collins (Fort Mortimer). The large patches of rose bushes are now in bloom, and they are so full of sweet fragrance that the air is perfumed by them.... Old Provost has been telling me much of interest about the Beavers, once so plentiful but now very scarce.

July 6

After breakfast Harris etc. went off on horseback. They saw a Red Fox of the country, which is different from those of the States (*Coues--Vulpes utah* of Aud. and Back.... or *V. macrourus* of Baird.... This is the Western variety of the common Red Fox, now usually called *Vulpes fulvus macrourus*).

July 7

After dinner Harris, Bell, and I started on foot, and walked about four miles from the fort; the day was hot, and horseflies and mosquitoes pretty abundant ...we had gone after Rabbits, the tracks of which had been seen previously. We walked immediately near the foot of the clay hills which run from about a mile from and above the fort to the Lord knows where. We first passed one ravine where we saw some very curious sandstone formations, coming straight out horizontally from the clay banks between which we were passing; other lay loose and detached; they had fallen down, or had been washed out some time or other.

I must not forget to say that on our way we passed through some grasses with bearded shafts, so sharp that they penetrated our moccasins and entered our feet and ankles, and in the shade of a stumpy ash-tree...the Lazuli Finches and Arctic Bluebirds sang in our view.

Didn't find Rabbits.... Rested awhile, and ate some service-berries, which I found good; the gooseberries were small and green.... On our return, as we were descending the first deep ravine, a Raven flew off close by.... After we reached the prairie I shot a Meadow Lark.

Dying procupine quills by Mr. Denig.

July 8

Went off to the Opposition camp, and when he returned told me that a Porcupine was there.

July 10

Went off for Antelopes.

I took a walk and made a drawing of the beautiful sugar-loaf cactus.

July 11

Took a ride to look at some grass for hay. We saw two Wolves, a common one and a prairie one.

July 13

Went off nine miles over the prairies to look at the "meadows," as they are called, where Mr. Culbertson has heretofore cut his winter crop of hay, but we found it indifferent compared with that above the fort. We saw Sharp-tailed Grouse, and what we thought a new species of Lark.... I caught one of its young, but it proved to be only the Shore Lark. Before we reached the meadows we saw a flock of fifteen or twenty Bob-o-link, Emberiza orizivora ...first seen since we left St. Louis.... I shot seven Arkansas Flycatchers.... After an hour's walking, my companions returned, but had seen nothing except the fresh tracks of a Grizzly Bear. I shot at one of the White-rumped Hawks.

We found the beds of Elks and their fresh dung, but saw none of these animals.

After Harris returned to the fort he saw six Sharp-tailed Grouse...return from Fort Mortimer--saw eighteen Wolves...among them were two Prairie Wolves.

July 14

Went about six miles on road we travelled yesterday--caught two young Shore Lark, killed seven of Sprague's Lark.... Hunted for Grouse in the wormwood bushes.

Harris shot a very young one of Townsend's Hare, Mr. Denig gave Bell a Mouse, which, although it resembles Mus leucopus greatly, is much larger, and has a short, thick, round tail, somewhat blunted.

July 15

Going up the Yellowstone...saw several Antelopes, some on the prairie...we shot a common Red-winged Starling...heard notes--Audubon believed to be Short-billed Marsh Wren of Nuttall. Camping-place about 20 miles.

On way back to fort--we saw a Sand-hill Crane about two years old.

We saw more Antelope at a distance, here called "Cabris," and after a while we reached the wood near the river, and finding abundance of service-berries.

July 18

Went to see mowing--started an Owl, which I took for the barred one...killed a Rock Wren...Harris saw a Shrike but of what species he could not tell, and he also found some Rock Wrens in another ravine. Killed the Owl, which proves to be precisely the resemblance of the Northern specimen of the Great Horned Owl.

July 20

Observed a Rabbit running across the road, and saw some flowers different from any I had ever seen.

We saw more Antelopes, but not one Wolf; these rascals are never abundant where game is scarce, but where game is, there too are the Wolves.

July 21

Went after Black-breasted Lark Buntings, of which we saw many.

On return saw young Golden Eagles, Ravens and Buzzards. I found the Short-billed Marsh Wren quite abundant, and in such localities as it is found eastward. The Black-breasted Prairie-bunting flies much like a Lark.... I saw only one Gadwall Duck, these birds are found in abundance on the plains where water and rushes are to be found.

July 24

The Wolves must be migratory at this season, or so starved out that they have gone elsewhere, as we now see but few.

July 26

Saw two Antelopes on entering the bottom prairie. Saw two Grouse.... We saw a fine large Hawk, apparently the size of a Red-tailed Hawk, but with the whole head white.... I have no doubt that it is a species not yet described.

Saw a Swift Fox...30 miles from Fort Union, close to the three Mamelles.

Birds killed (Coues note--male and a female killed by Bell--Baird's Bunting, Emberiza bairdii--special interest for bird was not only the first one ever dedicated to Baird, but the last one ever named, described, and figured by Audubon. This bird became the Centronyx bairdii of Baird, the Passerculus bairdi of Coues and the Ammodramus bairdi of other ornithologists).

July 29

(He and Bell went off again, and brought home an old and young of the Sharp-tailed Grouse. This afternoon they brought in a Loggerhead Shrike and two Rock Wrens)...we collected berries of the dwarf cherries of this part, and I bottled some service-berries to carry home.

July 31

Owen caught a Spermophilus hoodii.... Near river--saw five Wild Geese.

August 1

Indian women went off after pommes blanches...Owen told me that he had seen, on his late journey up the Yellowstone, Grouse, both old and young, with a black breast and with a broad tail; they were usually near the margin of a wood.

August 2

Bell and Owen started on their tour up the Yellowstone after Cocks of the Plain (Sage Grouse, Centrocercus urophasianus). Returned on Aug. 5 with no Cocks but brought the skin of a female Elk, a Porcupine, and a young White-headed Eagle.

August 7

Mr. Denig says the Assiniboins killed a Black Bear on White Earth River, about sixty miles from the mouth; they are occasionally killed there, but it is a rare occurrence. Mr. Dengi saw the skin of a Bear at their camp last winter, and a Raccoon was also killed on the Cheyenne River by the Sioux, who knew not what to make of it.

August 8

We killed a Spermophilus hoodii.... We saw a family of Rock Wrens, and killed four of them.

August 16

(Left Fort Union.)

August 17

Saw three Bighorns, some Antelopes, and many Deer, fully twenty; one Wolf, twenty-two Swans, many Ducks.

Northern Pacific Railroad Survey

Fort Union was not destined to continue its roles as guardian and jewel of the Upper Missouri fur trade. Beginning with the discovery of gold in California and the search for a western paradise in the 1840s, eastern civilization pushed West as emigrants sought new paths to reach their destinations.

Eventually the Northern Plains opened up to white settlement, the buffalo herds were demolished, and Indians were pushed onto reservations. Harbingers of change were the explorers, railroad surveyers, and naturalists who sought knowledge about the geology, flora and fauna, water sources, new trails or roads, and the possibilities of white settlement.

Clearly railroads provided a better alternative to wagons, and the exploration for the best routes began in 1848 with John C. Fremont's expedition of the central route along the 38th parallel (Goetzman 1966:266). In 1853 Congress authorized a government survey of all the possible railroad routes to be undertaken by the U.S. Army Topographical Engineers. The survey of the Northern Plains, between the 47th and 49th parallels, was directly by the newly-appointed governor of Washington Territory, Issac I. Stevens. The area from St. Paul to Puget Sound was surveyed and the party stayed briefly at Fort Union during the summer of 1853. Stevens said little about the area except that "there is a grassy plain around and near the fort, extending to the base of the rising ground, which is a full mile distant on the eastern side" (U.S. Cong., House 1855:86). More valuable than his brief remarks was the collection of flora and fauna by the naturalists Dr. G. Suckley and J. G. Cooper. Their reports on the birds, mammals, and reptiles appeared in the 1860 government publications of the railroad survey reports. The species found in the Fort Union area are listed in appendix 6. Unfortunately their observations were less complete for this area than for those of Washington Territory.

Associated with these efforts to catalogue the natural resources in the West were the reports, compiled under the supervision of Spencer Baird of the Smithsonian Institution, of the mammals and birds sent by various collectors and stored at the Museum of Natural History. These lists are reproduced in appendix 7.

Gouverneur Kemble Warren and Ferdinand V. Hayden

Under the auspices of the U.S. military, a more complete survey was undertaken in 1856. Stemming from government difficulties with the Brule Sioux, General William S. Harney led an expedition designed to punish the Brule for their role in the 1854 killing of a small army command at Fort Laramie. To assist in gaining information about what was virtually unknown territory to the government, Lieut. G. K. Warren, topographical engineer, was assigned to accompany Harney on his 1855 march. During this summer, he surveyed the Black Hills. The next summer, he was commissioned by the War Department to ascend the Yellowstone River in search of sites suitable for the construction of military posts. To do this, Warren considered it necessary to also survey the upper reaches of the Missouri from Fort Pierre to Fort Union (Flanagan 1970:181). Ferdinand V. Hayden, who was later the naturalist or leader of other government sponsored explorations, and sixteen other men accompanied him.

Warren's expedition reached Fort Union on July 10 and remained there until July 25 when it left to survey the Yellowstone. The party returned to Fort Union and left the area on September 1. Warren included in his report a short description of the area. He said that:

While at Fort Union and in the neighborhood we had after this abundance of rain, so that the whole landscape in August and September wore a beautiful green, and grass was plenty in places where, in July, there was not a blade of it. The highest temperature we experienced here was on the 20th of July, the thermometer, at 2 p.m., reading 93°. The earliest frost ever recorded to have occurred here was in the month of August of 1855 (1875:33).

Hayden undertook extensive observations of all the natural resources, including the geology and paleontology, mammals, birds, fishes, reptiles, molluscs, and plants. Those items which he noted for the study area are listed in appendix 7.

APPENDIX 1

Birds and Mammals Sighted by Lewis and Clark

Identification and species designation are from Reid and Gannon (1926/27).

Birds:

magpie - Pica pica hudsonia
 swan - species unknown
 goose - Canadian goose - Branta canadensis canadensis
 duck - believed to be mallard - Anas platyrhynchos
 bald eagle - Haliaeetus leucocephalus leucocephalus
 pigeon - Elliott Coues believed this was a tern, probably Sterna forsteri

Mammals:

buffalo - Bison bison bison
 mountain big horn - Audubon Mountain Sheep - Ovis canadensis auduboni
 elk - American elk - Cervus canadensis canadensis
 antelope - pronghorned antelope - Antilocapra americana americana
 deer - Plains White-tailed deer - Odocoileus virginianus
 black-tailed deer - mule deer - Odocoileus hemionus hemionus
 beaver - Missouri River beaver - Castor canadensis missouriensis
 black bear - black or cinnamon bear - Ursus americanus americanus
 Grizzly bear - Ursus horribilis horribilis

Plants Noted by Lewis and Clark

Identification and species designation are from Cutright (1969).

cottonwood - Populus deltoides occidentalis
 elm - probably Ulmus americana
 ash - Fraxinus pennsylvanica lanceolata according to Sargent
 willow - Salix longifolius
 box alder - box elder - Acer negundo
 rose - probably Rosa woodsii
 honeysuckle - Lonicera involucrata
 currant - Ribes
 red berry - buffalo-berry - Shepherdia argentea
 choke cherry - probably Prunus virginiana
 prairie potato - pomme blanche; prairie apple - Psoralea esculenta
 serviceberry - Saskatoon service-berry - Amelanchier alnifolia
 gooseberry
 hyssop
 dwarf cedar - Juniperus sabina procumbens

APPENDIX 2

Plants Noted by John Bradbury

This list is drawn from Bradbury's journal (1904:317-320). Only plants identified as being in the area have been included. The entries with parenthesis around them are from O.A. Stevens' article on Bradbury and Nuttall (1959).

Stipa Juncea, Prairies, Aricaras to the Mandans. Membranaces, Fort Manden.
Probably not a Stipa. (Oryzopsis hymenoides).

Festuca Spicata, Common on the Missouri.

Allionia Ovata, banks of the Missouri,

Plantago Lagopus, alluvion of the Missouri, common (P. purshii)

Eleagnus Argentea, bluffs near the Mandan nation (E. commutata)

Batschia Longiflora, first occurs near the mouth of the Platte, on ascending the Missouri. (Lithospermum hirtum).

Salsola Depressa, on the Missouri, near the mouth of Knife River (Suaeda depressa)

Lilium Umbellatum, bluffs near the Mandan village (L. Philadelphicum)

Eriogonum Pauciflorum, near the Minateree villages on the Missouri, both
E. Sericeum growing together (E. flavum)

Penstemon Angustifolia, near the Minateree village

Bartonia Ornata, on the bluffs above Knife River (Mentzelia decapetala)
B. Nuda

Cleome Pinnata, on the prairies between the Aricaras and Mandans. (Stanleya pinnata)

Armorpha Fruticosa, common on the Missouri and Mississippi.

Sonchus Pulchellus, banks of the Missouri, common (Lactuca pulchellus)

Troximum Cuspidatum, common on the prairies between the Mahas and Mandans.
(Agoseris cuspidatum)

Eupatorium Altissimum, Missouri and Mississippi, common

Artemisia Dracunculus

A. Cana common on the Missouri

A. Campestris

A. Santonica

(A. Caudata)

(A. frigida)

Arnica fulgens, prairie from the Aricaras to the Mandans

Cineraria Integrifolia, common on the Missouri (Senecio canus)

Erigeron Divaricatum, common on the Missouri

Amellus Villosus

A. Spinulosus common on the bluffs of the Missouri (Chrysopsis villosa)
(Haplopappus spinulosus)

APPENDIX 3

Plants Noted by Thomas Nuttall

Items on this list are from Nuttall's The Genera of North American Plants (1971). Because Nuttall was not exact on his locations for many plants, this list only includes those which he located near Fort Mandan or in the Upper Missouri River region.

Limnetis (Richard) Trachynotia (Michaux) Spartina (Schreber) marsh grass
species glabra - This last species grows up the Missouri as far as the great Northern Bend, around Fort Mandan

Eriocoma silk-grass
on the grassy plains of the Missouri, from the Arikaree village to the Northern Andes.

Bruchmannia (Jacquin)
erucaeformis. Around Fort Mandan, on the Missouri, in alluvial soil

Crypsis (Lavarck) thorn-grass - near Grand Detour

Aristida (L.) pallens - in depressed situations, near Fort Mandan on the Missouri

Stipa (L.) feather grass
parviflora - grows on the plains of the Missouri

Sesleria (L.) moor-grass
dactyloides on the open grazzy plains of the Missouri; abundant. Flowers in May and June

Festuca (L.) fescue-grass
spicata - On the banks of the Missouri, not a foot high, covering extensive tracts.

Bromus (L.) Brome-grass
altissimus (Pursh) Near Fort Mandan, on the Missouri, very large; scarcely distinct from the B. canadensis of Michaux.

Koeleria (Persoon)
nitida - On the plains of the Missouri

Atheropogon (Muhlenberg)
Apludoides up the Missouri, probably to its sources; appears to be confined to calcareous soil
A. Oligostachyum - on the plains of the Missouri with the above. Common.

Lepturus (R. Brown)
paniculatus On dry saline plains, near Fort Mandan, on the Missouri. Flowering in June

Aegilops (L.)Hystrix On the arid plains of the MissouriHordeum (L.) barleypusillum - on the arid saline plains of the Missourijubatum - on the banks of the Missouri

Class Tetratria

Elaeagnus (L.) OleasterArgentea - on the argillaceous broken banks of the Missouri, near Fort MandanCornus (L.) Cornel. Dog-woodAlba - The fruit of this species, though bitter and unpalatable is eaten by the savages of the Missouri, from whence it seems to extend across the continent...Centunculus (L.) bastard pimpernel. chaff-weedlanceolatus - In depressed, and inundated situations on the margins of ponds, near Fort Mandan on the Missouri -- abundant. 4 to 6 inches high; flowering in July.Plantago (L.) plantainpusilla - on arid saline hills near the Missouri. flowers in Maygnaphaloides - on the summits of high and gravelly hills; commencing to appear near the confluence of the river Janke (James?) and the Missouriglabra - In arid soils, near Fort Mandan

Class Pentandria

Myosotio (L.) scorpion-grassglomerata on the arid agillaceous hills around the Great Bend of the Missouri. Flowering in JuneBatshcia (Genelin, Michaux)Batschia longiflora - on banks of the Missouri to its sourcesdecumbens - around the Mandan villagesCynoglossum (L.) hounds-tonguepilosum? on arid hills above Rapid river, MissouriEllisia (L.)ambigua In alluvial soils on the banks of the Missouri; common; flowering in April and May.Androsace (L.)occidentalis on dry and elevated plains from the Maha villages to the mountains, near the river Missouri, flowering in AprilDodecatheon (L.) American cowslipintegrifolium - extends westward to the mountainous sources of the Missouri

Collomia

linearis near banks of the Missouri, about the confluence of Shian river, and in the vicinity of the Arikaree village, in moist places.

Above the confluence of the Platte and the Missouri we no longer meet with any species of Phlox.

Solanum (L.) night-shade

triflorum - As a weed in and about the gardens of the Mandan and Minitarees, and in no other situations. Near Fort Mandan.

Androcera (Solanum species)

Solanum herterandrum (Pursh) Near the banks of the Missouri, in arid, denudated soils, from the confluence of the river Platte to the mountains. Flowering in July and August.

Nicotiana (L.) tobacco

rustica cultivated also by aborigines of Mississippi & some tribes on the Missouri

Caprifolium (Towinefort. Jess.) Coral-honey-suckle.

parviflorum - I have observed as far westward as Fort Mandan on the Missouri

Symphoria (Persoon, Juss)

S. glomerata from Virginia to Florida, in Tennessee and up the Missouri to its sources. Common.

S. racemosa on the banks of the Missouri

Viola (L.) violet

Nuttalli (Rursh) Flowering in May. Near the confluence of Rock river and the Missouri, and from thence to the Mountains. This is the only species of Viola on the plains of the Missouri from the confluence of the river Platte to Fort Mandan.

Paronychia (Tournefort and Jussieu)

sessiliflora - on the highest hills of the Missouri, near Fort Mandan

Gentiana (L.) gentian

acuta In depressed situations, on the plains of the Missouri, near Fort Mandan flowering time August and September

Ferula (L.)

allied to Pastinaca on the high plains of the Missouri, commencing about the confluence of the river Jauke. Flowering in April and May

Smyrniun nudicaule hab. with the above; also on the plains of the Columbia river

Thapsia (L.)

T. glomerata on the open plains of the Missouri, commencing 40 miles below the confluence of White river. Flowering time May and June.

Seseli (L.) Meadow-saxifrage

triternatum - on the arid and denudated plains of the Missouri, commencing about 30 miles below the confluence of White river.

Atriplex (L.) Orache

canescens on the denudated saline hills of the Missouri; commencing about 15 miles below the confluence of White river, and continuing to the mountains. Flowering in May.

Chenopodium (L.) goosefoot

subspicatum - in saline soils around the Mandan village, Missouri

Botrys - indigenous on the banks of the Missouri and Mississippi

Salsola (L.) salt-wort

salsa After a scrupulous comparison also of this plant, now before me, with the Salsola depressa of Pursh, I find them to be the same species; so that the range of this plant is from the Atlantic sea-coast, probably, to the sources of the Missouri, in arid and saline tracts.

Kochia (Roth)

dioica In sterile and saline places, near the Missouri; abundant near Fort Mandan, & c. Flowering in May

Linum (L.) flax

perenne That of the Missouri was, however, smaller, and the seeds of a paler color. Commencing about Fort Mandan, and becoming more abundant towards the mountains; growing on the declivities of water courses.

rigidum Around Fort Mandan. About 6 inches high, flowers pale yellow

Sibbaldia (L.)

parviflora. On the highest gravelly hills, 10 to 15 miles from the Mandan villages

Order Hexandria

Brodæa (Smith)

grandiflora. On the plains of the Columbia and Missouri

Phalangium (Tournefort) uncertain if located there?

Lilium (L.) lily

andinum - In the moist situations, on the margins of small streams and vallies, abundant, from Fort Mandan to the mountains.

Fritillaria (L.) checquered lily

lanceolata in vallies and declivities, from Fort Mandan to the mountains.

Smilacina (Fefontaines)

canadensis - abundant on the banks of Lake Erie (Ohio) and on the Missouri to the Mandans

Melanthium (L.)

glaucum in calcareous soil; around the Cataract of Niagara... and up the Missouri to Fort Mandan

Class Octandria

Gaura (L.)

coccinea - on the declivities of bare gravelly hills, from the Maha village to the Mandans.

Acer (L.) maple

Fraxinifolium North-westward on the banks of the Missouri to the mountains?

Class Decandria

Jussieua (L.)

leptocarpa On the Mississippi and Missouri, copious; not aquatic

Cassia (L.)

marilandica in Louisiana, a considerable distance up the Missouri

Thermia (Thermopsis)

rhombifolia on denudated argillaceous hills near Fort Mandan

Class Icosandria

Cactus (L.) indian Fig, melon thistle

mamillaris on the high hills of the Missouri probably to the mountains

viviparus - with the above, on the summits of gravelly hills; flowering from June to August;

Opuntiae ferox prickly-pear

in arid situations on the plains of the Missouri, common

fragilis from the Mandans to the mountains, in sterile, but moist situations much smaller than the preceding, and remarkable for its brittleness, the articulation though not very tumid coming off

Bartonia

ornata On the banks of the Missouri in broken argillaceous soils. Flowering from the later end of August through September, and into October, but never in July

nuda near the Great Bend of the Missouri, on gravelly hills, apparently perennial, at least often existing 3 or 4 years.

Aronia (Persoon) Mespilus (L)

Alnifolia In ravines and on the elevated margins of small streams from Fort Mandan to the Northern Andes

Geum (L.) avens

triflorum around Fort Mandan on the Missouri

Potentilla (L.) cinquefoil

humifusa on high gravelly hills near Fort Mandan, Missouri. Flowering about April or May

Portulaca (1) purslane
oleracea. Indigenous on the saline and denudated plains of the Missouri.

Stylophorum (Chelidonium (Michaux))
diphyllum also on the banks of the Missouri
 flowering in March and April

Delphinium (L.) larkspur
virens. on the plains of the Missouri

Anemone (L.)
tenella flowering in April. In elevated plains around the Maha village
 on the Missouri

Hyssopus (L.) Hysop
Stachys Foeniculum On the plains of the Missouri near Fort Mandan, on the
 borders of thickets.

Dracocephalum (L.) Dragon's head
parviflorum Around Fort Mandan, on the Missouri; on the borders of thickets

Pentstemon (L.)
gracile From the Arikarees to Fort Mandan, in depressed soils. Flowering in June
cristatam On arid denudated argillaceous hills from the confluence of
 Teeton river and the Missouri to the Mountains
erianthera in arid soils near the confluence of Shian river
caeruleum on the plains of the Missouri, near Fort Mandan and the Indian
 towns
albidum on the plains of the Missouri, common, from the confluence of the
 river Platte to the Mountains
grandiflorum on the plains of the Missouri, common, from the confluence
 of the river Platte to the Mountains; also near the Prairie
 du Chien, Miss.

Euchroma (Bartsia (L.)) painted-cup
grandiflora on the plains of the Missouri from the confluence of the river
 Platte to the Mountains, common; ... Flowering from April to May

Orthocarpus
luteus In humid situations on the plains of the Missouri, near Fort Mandan;
 very local. Flowering in July and August

Orobanche (L.) broomrape
americana In sandy alluvial soils, around Fort Mandan, abundant, and not
 apparently parasitic
Gymnocaulis fasciculata with the above. Flowering in June and July.

Class Tetradynamia

Draba (L.) whitlow-grass
nemoralis flowering in May. on the gravelly hills of the Missouri, from
 the river Platte to Fort Mandan, rare.

Erysimum (L.) hedge-mustard. winter cress

parviflorum on the gravelly banks of the Potomac, & c. Virginia, on the banks of the Missouri, around the Mandan villages.

Cheiranthus (L.) wall-flower. stock

erysimoides. on the plains of the Missouri, commencing near the confluence of White river. Flowers in June.

Stanleya

pinnatifida commencing, (as we observed,) near the confluence of Paint creek and the Missouri, growing on the talus of broken calcareous cliffs from hence it occurs locally for 2 or 300 miles further up the river, so that it appears only to occupy a limited belt which traverses the Missouri. It flowers in the month of May.

Cleome (L.)

dodecandra common on the sandy shores of lake Erie, near Buffaloe creek, also along the margins of the Mississippi and the Missouri.

serrulata abundant on the alluvial and sandy margins of the Missouri for more than a thousand miles continuance.

Class Monadelphica

Malva (L.) mallow

coccinea from the confluence of the river Platte and the Missouri, often extending over the plains in such quantities as to communicate a brilliant redness to thousands of acres.

Class Diadelphica

Petalostemon (Michaux)

villosum on the sandy banks of Knife river, near Fort Mandan, Missouri. Flowering in August.

Amorpha (L.)

microphylla on the woodless and grassy hills of the Missouri, from the river Platte to the Mountains, growing only from 6 inches to a foot high. Flowers purplish blue and fragrant, coming out in the month of May.

canescens. from the banks of Fox river and the Ouisconsin to the Mississippi; around St. Louis, Louisiana, and on the banks of the Missouri probably to the Mountains.

Lupinus (L.) lupine

pusillus on the barren argillaceous plains of the Missouri, near the confluence of White river.

Orobus (L.) bitter-vetch

dispar. on arid hills near Fort Mandan. Flowering in June.

longifolius sand-hills, on the banks of the Missouri, not far from the confluence of the river Platte. Flowering in May.

Lathyrus (L.) vetchling, everlasting pea
polymorphus on the grassy alluvial plains of the Missouri, from its confluence to its sources?

Vicia (L.) vetch
sylvatica. on the alluvial banks of the Missouri as far as Fort Mandan

Phaca (L.) bastard vetch
villosa on sandy hills in the Pine forests of South Carolina...
 and on the high hills of the Missouri to its sources?
caespitosa on arid gravelly hills near the confluence of Sawanee river (?)
 and the Missouri.

Oxytropis (Decondolle) Astragalus (L.)
O. Lambertii on the woodless hills of the Missouri, from the river Platte to the Mountains.

Astragalus (L.) milk-vetch
hypogiettis on the low and level plains of the Missouri, commencing about the confluence of the river Jauke, and continuing upwards probably to the Mountains; flowering in May.
Laxmanni. On the hills of the Missouri, forming a luxuriant and nutritive herbage for herbivorous animals, and would probably be worth cultivating upon light and otherwise productive soils.
carnosiis on the plains of the Missouri from the confluence of the river Platte
galeoides on saline alluvial soils, from White river to the Mountains common.
gracilis from White river to the Mountains, on the plains of the Missouri.
 Flowering in May

Dalea (L.) aurea on gravelly hills, near White river, Missouri; rare
laxiflora on the high hills and naked grassy plains of the Missouri

Psoralea (L.)
incana on the open plains of the Missouri with P. esculenta
tenuiflora on the plains of the Missouri, near the Arikaree village; rare
arenaria on the sandy banks of the Missouri, from the river Platte to the Mountains. Flowering in July and August.

Glycyrrhiza (L.)
lepidota abundant around St. Louis, where it was first detected by Mr. John Bradbury... it is also common on the alluvial banks of the Missouri to the Mountains, and is in all probability the Liquorice mentioned by Sir A. Mackenzie as indigenous to the coasts of the North Pacific Ocean.

Trigonella (L.) fenugreek
americana on the dry and open alluvial soils of the Missouri, from the river Platte to the Mountains.

Prenanthes (L.)
juncea from the river Platte to the Mountains, in the alluvial sandhills of the Missouri. Flowering in May.

Lactuca (L.) lettuce

integrifolia on the grassy alluvial soils of the Missouri and the lesser streams, from the Arikarees to the Mountains.

Sonchus (L.) sow-thistle

ludovicianus in humid places, in the open plains, around Fort Mandan on the Missouri. Flowering in June.

Troximon (Oertner)

glaucum on the grassy plains of Upper Louisiana, near Fort Mandan; rare
marginatum on the grassy plains of Upper Louisiana; common

Chrysocoma (L.) goldy-locks

graveolens on the banks of the Missouri in denudated soils; common
nauseosa on the banks of the Missouri; rare

Hymenopappus (L. Heritier)

scabiosaes tenuifolius on gravelly hills near the banks of the Missouri; common

Artemisia (L.) wormwood, southernwood

serrata near the Prairie du Chien, on the banks of the Mississippi, also on the banks of the Missouri, in open alluvial soils
columblensis on the arid and saline hills which border the Missouri and the lesser streams, commencing about 30 miles below White River and continuing to the Mountains... in these regions, I am credibly informed, that it furnishes the savages with the sole article of fuel or of shelter (on Columbia River)... It is the plant which was known to the party of Lewis and Clarke by the name of "Wild Sage"

ludoviciana on the banks of the Mississippi, near St. Louis; also on the alluvial plains of the Missouri

Sericea on the summits of the highest gravelly hills of the Missouri; commencing to appear about Plum creek

canadensis abundant on all the sandy shores of the St. Laurence... also on the hills of the Missouri, around the Mandan towns to the Mountains?

Erigeron (L.) flea-bane

pumilum on the plains of the Missouri. Flowering in May
asperum on the plains of the Missouri. Flowering in August
glabellum on the plains of the Missouri. (around Fort Mandan, abundant) Flowering in August

Inula (L.) flea-bane

villosa on the plains of the Missouri; from its confluence to its source?

alba on the plains of the Missouri, near Fort Mandan

Aster (L.) star-wort

pauciflorus on the margins of saline springs, near Fort Mandan, on the Missouri, flowering in August.

biennis on denudated agrillaceous soils, from the Arikarees to Fort Mandan. Flowering from August to October.

Aster oblongifolius on the banks of the Missouri

Donia (R. Brown)

squarrosa on rocky calcareous hills near the leadmines of the Meremek, Mississippi... also abundant on the broken banks of the Missouri.

Brachyris

Euthamiae. Solidago sarothrae. On the arid hills of the Missouri, from the Arikarees to the Mountains.

Arnica (L.)

montana on the margins of marshy springs and in depressed situations, from the Arikarees to Fort Mandan, and probably as far as the Mountains. Flowering in July.

Boebera (Willdenow)

glandulosa A common weed on the banks of the Mississippi and Missouri to the Mountains, in denudated soils.

Trichophyllum

oppositifolium on denudated sterile hills, near Fort Mandan; abundant. Flowering in July and August.

Starkea (Willdenow)

Amellus spinulosus on the plains of the Missouri, common. Flowering Aug-Sept.

Actinella (Jussieu)

acaulis on high gravelly hills near Fort Mandan, Missouri; flowering June and July.

Galardia (Fougeroux. Juss. Willd.)

bicolor. Indigenous to the grassy hills of the Missouri; abundant near Fort Mandan, and from thence to the Mountains

Helianthus (L.) sunflower

giganteus In Upper Louisiana, on the banks of rivers, probably to the sources of the Missouri.

Iva (L.)

axillaris in arid and saline soils on the banks of the Missouri; flowering in May

Ambrosia (L.) bitter-weed

tomentosa in Upper Louisiana on the banks of the Missouri; rare

Class Gynandria
Class Monoecia

Zea (L.) maize, Indian Corn

Z. Mays successfully cultivated by the aborigines of the Missouri to its sources, ripening in a climate where no other variety could exist (he is wrong about this)

filifolia on the dry plains and gravelly hills of the Missouri, common

Diotis (Schreber)

lanota (?) on the banks of the Missouri, in arid situations near the "Grand Detour" (big bend before Yellowstone). Flowering in June.

Euphorbia (L.) spurge

marginata on the banks of the Missouri near the Arikaree station

Momordica (L.)

echinata very abundant in the Michigan Territory and on the banks of the Mississippi and Missouri

Salix (L.) willow

angustata the most abundant species on the slowest alluvial formations of the Missouri and Mississippi, probably extending to the sources of those rivers.

nigra on the banks of the Missouri and Mississippi

Humulus (L.) hop

Lupulus abundant on the banks of the Mississippi and Missouri

Populus (L.) popular

angulata principally on the alluvial banks of the larger rivers of western America; on the banks of the Mississippi and Missouri to their sources

Juniperus (L.) juniper

virginiana from Canada to Florida, and on the banks of the Mississippi and Missouri to their sources

prostrata? on the sandy shores of lake Huron and also on the high hills of the Missouri, near Fort Mandan

Class Cryptogamia

Azolla (Lamark)

caroliniana throughout the southern and western states; probably to the sources of the Mississippi and Missouri

APPENDIX 4

Natural Resources Noted by Maximilian du WiedPlants

Galium tinctorium
Galium boreale
alder
rose
ash
negundo
elm
poplar
symphoria
buffalo berries
solidago
aster
snake-root - Galardia bicolor
artemisia
clematis
cornus
grape

Birds

Icteria virides
kingfisher
crane
avoset - Recurvirostra americana
swan
duck (Anas boschas et sponsa)
prairie chicken
numenius or charadrium
lark
raven
crow
blackbird
magpie
goldfinch
goose
pelican
coal titmouse
Fringilla linaria

Mammals

beaver
buffalo
elk
wolf
(Continued)

Mammals (Cont.)

prairie fox

striped squirrel - Tamias quadrivittatus

muskrat

antelope

mouse

bear - Ursus feroxAmphibiansnake - Coluber proximustortoise - resembles Emys picta

APPENDIX 5

Audubon and HarrisAnimals

mountain rams & ewes
 snake
 wolves
 gray wolf
 badger
 antelopes
 deer
 by Richardson
Spermophilus Loodii
 (s.t. pallidus)
 white wolf
 grizzly bear
 hare (Lepus artemisia)
 otter
 muskrats
 Townsend's Hare
 buffalo
 swift fox
 long-tailed deer
 white-tailed deer
 black-tailed deer
 red fox
 (Vulpes fulvus macrourus)
 rabbit
 porcupine
 elk
 prairie wolves
 mouse
 mosquitos
 horseflies
 venomous snakes - saw
 one copperhead & a
 common garter

Birds

raven
 Lazuli finches
 Arctic ground finches
 crow
 ducks
 black tern
 lark (Alauda spragueii)
 now Anthus (Neocorys)
 Spraguei
 flicker (Colaptes hybridus)
 blackbird (Quiscalus
 brewerii)
 now Scolecophagus
 cyanocephalus
 sharp-tailed grouse
 sparrow-hawk
 Arctic bluebird
 black-headed Grosbeak
Calcarius ornatus - Chestnut-
 collared Longspur
 meadow lark
 red-cheeked ditto
 Arkansas flycatcher
 prairie lark finch
 shore lark
 magpie
 plovers
 doves
 diff swallows
 Say's flycatcher
Canadensis (woodpecker)
 turkey buzzard
 bob-o-link (Emberiza orizivora)
 white-rumped hawks
 red-winged starling
 sand-hill crane on prairie
 rock wren
 shrike
 Great horned owl
 black-breasted lark buntings
 golden eagles
 buzzards
 gadwall duck
 short-billed marsh wren
 (Continued next page)

Plants

rose bushes
 cacti
 gooseberries
 Artemisia
 black root plant
 wormwood
 (cactus-conical shaped)
 elm
 serviceberries
 sugar-loaf cactus
 dwarf cherries
 pommes blanches

Birds

hawk (whole head white)

Emberiza bairdii - Baird's bunting

loggerhead shrike

wild geese

white-headed eagle

swans

titmouse - probably long-tailed chickadee

Sprague's Pipit

blackbird - called Brewer's blackbird
(Quiscalus brewerii)

APPENDIX 6

Mammals listed by Spencer Baird

This list is based upon mammals stored at the Smithsonian Institution, many of which indicate where and when it was collected and by whom. The list is part of a U.S. Congress, Senate document (1857).

Sorex cooperi - Heyden's Shrew (S. Haydeni) same as specimen from Fort Union

Felis concolor (Lim) The American panther obtained from A. Culbertson (skull)

Lynx canadensis Canadian lynx Winter, 1850 - obtained A. Culbertson - (skull)

Canis occidentalis - var. Griser-albus, gray wolf - on Upper Missouri - pure white wolf description of wolf in Maximilian.
Collected by Warren 1856 on Yellowstone

Canis occidentalis - var. nubelus - dusky wolf - Fort Union 1850 by Culbertson

Canis latrans (Sax) Prairie Wolf, Coyote, young prairie wolf by Suckley, west of Fort Union

sub family Vulpinae - Foxes

Vulpes velox

Vulpes macrotis, Prairie fox
by Warren - Fort Union

Vulpes velox - kit fox or swift fox
winter by Culbertson

Putorius longicauda ermine or Milk River, Yellowstone, Fort Clark

Lulo luscus - Wolverine
large specimen- brought to Fort Union from some of the posts toward the Rocky Mountains

Mephitis mephitis skunk
Heart river 1856 - Warren

Taxidea Americana American badger
Upper Missouri, Warren, 1856, Stevens

Ursus horribilis

range- first appears on Missouri, above Fort Pierre, and becomes more and more abundant higher up the Missouri, and especially on the Yellowstone; thence, to the Rocky Mountains, which it inhabits throughout its entire extent in the United States
coll. by Denig (Skin); St. Clark & Ft. Union by Warren

Tamias quadrivittatus

Ft. Sarpy 1854 Col. A. Vaughan
 mouth of Judith Hayden 1855
 Yellowstone 1856 Warren
 " 1856 Hayden

Spermophilus tridecem-lineatus

stripped prairie squirrel

Warren - 1856 Fort Union & Yellowstone
 Hayden - Upper Missouri

Cynomys ludovicianus - Missouri prairie dog has an extensive distribution, being found over the entire extent of the region between the Missouri River and the Rocky Mountains.

Yellowstone - Warren 1856, Aug. 10

Castor canadensis American beaver

Upper Missouri Hayden

Thomomys rufescens (Maxim.) Fort Union Gopher

mouth of Yellowstone - 1856 - Warren

Jaculus hudsonius jumping mouse

1856 Warren

Hesperomys myoides - hamster mouse

1856 Warren

Neotoma cinerea

1853 - Gov. Stevens Milk River
 1854 A. Vaughan Mt. Sarpy

Erethizon epixanthus

yellow-haired porcupine
 T. Culbertson

Lepus campestris prairie hare

Denig & T. Culbertson Winter?
 Stevens 1853

Lepus sylvaticus Gray rabbit

1856 Warren

Lepus artemisia sage rabbit

Suckley - 100 mi. above Ft. Union; 1853 Stevens, 1856 Warren

Suckley

Cervus canadensis - American elk

Warren 1856 Ft. Berthold, Yellowstone

Cervus leucurus White-tailed deer

Warren 1856 U. Missouri, Yellowstone

Cervus macrotus mule deer
Yellowstone, Upper Missouri Warren 1856

Antilocapra americana - pronghorn cabree antelope
as far north as the North Saskatchewan - plains between Missouri river
to Rocky Mountains
1850 T. Culbertson - Ft. Union
1856 Yellowstone - Warren
1854 Upper Missouri Vaughan

Ovis Montana mountain sheep, bighorn
Fort Union - Grand hand Office
Fort Union - T. Culbertson
Yellowstone- Warren 1856
Upper Missouri - Vaughan 1954

Bos americanus American buffalo
Fort Union - Denig & A. Culbertson
Yellowstone- 1856 Warren

Birds listed by Spencer Baird

This list is based upon birds stored at the Smithsonian Institution, many of the items specifying where and when it was collected and by whom. This list is part of a U.S. Congress, House document (1858).

Falco polyagrus
Knife River - Warren 1856

Falco sparverius Sparrow hawk
Milk River - Stevesn 1853
Yellowstone Hayden 1856

Accipiter mexicanus
mouth of Yellowstone Hayden 1856

Buteo swainsoni Swainson's buzzard
mouth of Yellowstone 1856 Warren

Bubo virginianus great horned owl
Warren Fort Union - ?

Melanerpes erythrocephalus red-headed woodpecker
Warren - above Yellowstone R.
Stevens - Milk River

Colaptes auratus; flicker, yellow-shafter woodpecker
Upper Missouri 1856 Warren
Fort Union

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Fossil
Fossils

Colaptes hybridus (Woodpecker)

hybrid

Yellow Predomination of shafts Warren 1856

Orange Predomination of shafts Warren 1856

Antrostomus nuttalli Nuttall's Whippoorwill

Yellowstone river 1856 Warren

Ceryle alcyon Belted king fisher

Yellowstone river 1856 Warren

Tyrannus carolinensis King bird or Beemartin

Upper Mo. - Warren 5/12/56

Milk River 8/28/53 Stevens

Tyrannus verticalis Arkansas flycatcher

Audubon 1843 Fort Union

Sayornis sayus Say's flycatcher

near Fort Union Aug 1856 Warren

Knife River Sept. 12, 1856 Warren

Contopus richardsonii short-legged pewee

Blackfoot country July 1855, Hayden

Turdus aliciae gray-cheeked thrush

Upper Missouri ? Warren

Turdus migratorius robin

10 mi. north of Yellowstone July 1856 Warren

Sialia arctica Rocky Mountain blue bird

Audubon - Fort Union July 1, 1843

Neocorys spraguei Missouri skylark

Audubon Fort Union 1843

Helminthophaga peregrina Tennessee warbler

Fort Union 1843 Audubon

Dendroica aestiva Yellow warbler

Yellowstone R. Warren June 25, 1856

Setophaga ruticilla red start

Upper Missouri May 13? Warren

Hirundo horreorum barn swallow

Yellowstone July 23, 1856 Warren

Cotyle riparia -

Yellowstone Aug - 1856 Warren

Progne Purpurea purple martin

Fort Union July 1856 Warren

Ampelis cedrorum cedar bird
Yellowstone r. July 24, 1856 Warren

Collyrio excubitoroides white-rumped shrike
U. Missouri Aug. 19, 1857 Warren
Yellowstone Aug. 22, 1856 Warren

Vireo belli Bell's vireo
Fo-t Union Audubon 1843

Salpinctes obsoletus rock wren
Fort Union Audubon July 8 & 18, 1843

Troglodytes parkmanni Parkmann's Wren
Upper Missouri May 1856 Warren

Eremophila cornuta Skylark; shore lark
Yellowstone R. Warren 1857

Chrysomitris pinus pine finch
Little Missouri Sept. 15, 1856 Warren

Plectrophanes ornatus Chestnut-collared bunting
Fort Union. Audubon 1843

Centronyx bairdii (a bunting?)
mouth of Yellowstone Audubon 1843

Pooecetes gramineus Grass finch; bay-winged bunting
Fort Union 1853 - Stevens
Fort Union 1856 - Warren

Chondestes grammacus lark finch
Fort Union 1843 Audubon
Upper Missouri 5/14/1856 Warren

Zonotrichia leucophrys white-crowned sparrow
Knife River May 8, 1856 Warren

Zonotrichia querula Harris's finch
Upper Missouri Warren

Spizella pusilla field sparrow
Knife River Sept. 1856 Warren

Spizella pallida clay-colored bunting
Fort Union 1843 Harris

Melospiza lincolni Lincoln's finch
Upper Missouri 1843 Audubon

Queraca melanocephala Black-headed grosbeak
Fort Union 1843 Audubon

Cyanospiza amoena Lazuli finch
Fort Union 1843 Audubon

Pipilo arcticus robin
Fort Union 1843 Audubon

Nolothrus pecoris cow black bird, cow bird
mouth of Yellowstone July 23, 1856 Warren

Xanthocephalus icterocephalus yellowheaded blackbird
Fort Union 1843 Audubon

Sturnella neglecta western lark
Fort Union 1843 Audubon
Fort Union 1856 Warren

Icterus baltimore Baltimore oriole
Yellowstone Aug. 4, 1856 Warren

Scolecophagus cyanocephalus Brewer's blackbird
Upper Missouri 1856 Warren

Picicoruu columbianus Clarke's crow
Milk River Sept. 2, 1853 Suckley (Steven's)

Pica hudsonica magpie
Milk River Suckley (Stevens)
Fort Berthold Hayden (Warren)

Ectopistes migratoria wild pigeon, passenger pigeon
above the mouth of Yellowstone Aug. 8, 1856 Hayden

Centrocercus urophasianus sage cock; cock of the plains
90 miles above mouth Yellowstone July 28, 1856 Warren

Pediocaetes phasianellus sharp-tailed grouse
Fort Union Audubon

Charadrius virginicus golden plover; bull-head
Fort Berthold Sept. 16, 1856 Warren

Aegialitis vociferus kill-deer
mouth of Yellowstone Warren

Aegilitis montanus mountain plover
mouth of Milk River Suckley (Stevens)

Recurvirostra americana American avosit
Yellowstone River July 30, 1856 Warren

Tringa bonapartii sandpiper - ?
Yellowstone River Warren

Gambetta melanoleuca stone snipe
Fort Berthold Warren

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Fort Union Trading Post NHS

- Rhyacophilus solitarius solitary sandpiper
Fort Union July 1856 Warren
- Tringoides macularius spotted sandpiper
Knife River Sept. 12, (?) Warren
- Actiturus bartramius Bartram's field plover sandpiper
Fort Union July, 1855 Col. Vaughan
- Limosa fedoa marbled godwit
Fort Union Lt. Warren
- Numenius borealis Esquimaux curlew
Upper Missouri 1841 Warren
- Fulica americana coot; poule d'eau mud hen
Upper Missouri July 20, 1857 Warren
- Cygnus buccinator trumpeter swan
Yellowstone Aug. 27, 1956 Warren
- Anser hyperhoreus snow goose
Missouri River Audubon
- Anser gambelii white fronted goose
Missouri River Audubon
- Bernida canadensis
Yellowstone Warren
- Anas boschas mallard
Upper Mississippi and Yellowstone Warren
- Mergus americanus goosander, fish duck, sheldrake,
Yellowstone river Aug. 16, 1856 Warren
- Lophodytes cucullatus hooded merganser
Yellowstone July 24 (?) Warren
- Sterna frenata the least tern
Yellowstone July 2, 1857 Warren
- Podiceps californicus California grebe
Fort Berthold Sept. 17, 1856 Warren

APPENDIX 7

Mammals collected by F.V. Hayden on Warren Expedition

These mammals were collected or sighted by F.V. Hayden on the 1856 expedition to Fort Union and the Missouri River. This list is drawn from G.K. Warren's report (1875).

The buffalo, which has been so important an agent in the preservation of the Indians, is now gradually gathering into a smaller area; and although in the valley of the Yellowstone and along the Upper Missouri thousands may yet be seen, they are annually decreasing at a rapid rate....Probably at this time all the larger animals, as buffalo, elk, deer, antelope, bighorn, and beaver, are more abundant in the valley of the Yellowstone than in any other portion of the Upper Missouri.

Sorex Haydeni, Baird Hayden's Shrew -- Fort Pierre to Fort Union, Nebraska Range on the Missouri River, from latitude 44.20 to 48.00. It is seldom seen alive, though sometimes found dead along river banks. A single specimen was caught at Fort Pierre in the autumn of 1856, and a second one at Fort Union near the mouth of the Yellowstone.

Lynx rufus, Raf. -- Wild Cat... Upper Missouri to the Gila River.
...The skins of this animal are very often brought to the different tradingposts on the Upper Missouri by the Indians, though seldom seen by the traveler. There is no portion of the country bordering on the Missouri River, or its tributaries, where it does not exist to a greater or less extent.

Canis occidentalis var. griseo-albus. -- white and gray wolf. North America generally? -- Canis occidentalis var. nubilus -- dusky wolf -- Missouri River to the Pacific. This species, with its numerous varieties, is exceedingly abundant throughout the region of the Upper Missouri, above 43°. It is most abundant where the buffalo range, and subsists mostly upon them.

Canis latrans, Say -- Coyote; Prairie Wolf -- Fort Riley, Kansas, to the Pacific and Upper Missouri to the Rio Grande... -- It is exceedingly abundant throughout the Upper Missouri country, extending down into the settlements, where they often do much mischief to the farmers.

Vulpes macrourus, Baird -- Prairie Fox Upper Missouri to Plains of Columbia

Vulpes velox, Aud & Bach -- Kit Fox; Swift Fox. -- Plains west of Missouri to the Cascade Mountains...It is very abundant around prairiedog villages, and subsists to a great extent upon the inhabitants.

Putorius longicauda, Rich -- long-tailed weasel -- Upper Missouri and Platte. Not uncommon throughout the Northwest, though seldom seen by the traveler.

Lutra canadensis, Sab. -- American Otter -- Northern parts of the United States to Florida, and west to the Rocky Mountains. ... I cannot ascertain that it has been seen above the mouth of the Niobrara River on the Missouri.

Mephitis mephitis -- common skunk--very common throughout the Upper Missouri country. Taxidea americana, Waterh. -- Missouri Badger. This animal is not rare, though not very abundant on the Missouri.

Ursus horribilis, Ord. -- grizzly bear -- Plains of Upper Missouri to the Rocky Mountains, and along their base...This formidable animal is still quite abundant toward the sources of the Missouri. At the present time it is very seldom, if ever, seen below Fort Pierre.

Tamias quadrivittatus, Rich. -- Missouri Striped Squirrel -- Upper Missouri to Rocky Mountains... Seldom, perhaps never, seen below Fort Pierre.

Spermophilus tridecem - Lineatus, Aud. & Bach. -- Striped Gopher; Prairie Squirrel -- Eastern Michigan to the plains of the Missouri...Very abundant on all the prairies of the Northwest

Spermophilus townsendii, Bachman. Townsend's Spermophile -- Rocky Mountains to the north.

Cynomys ludovicianus -- Prairie Dog -- Milk River and Upper Missouri; ...very abundant from the mouth of the Niobrara to the mountains; found in great numbers in the valley of the Yellowstone and along the Missouri above Fort Union.

Castor canadensis, Kuhl - throughout the entire area of North America.

Thomomys rufescens, Maxim. -- Fort Union Gopher -- Fort Pierre to Fort Union on the Missouri. Two specimens were collected at Fort Union and one at Fort Randall on the Missouri.

Jaculus hudsonius -- Jumping Mouse. Only two specimens were obtained near Fort Union. Very rare.

Perognathus flavus, Baird -- Upper Missouri

Mus musculus, Lin Common mouse

Abundant at all the fur-trading posts on the Missouri. Mus rattus, or common rat is also introduced.

Hesperomys sonoriensis, LeConte -- Sonorian Mouse -- Upper Missouri and Rocky Mountains...Very abundant near Fort Union and along the Yellowstone.

Hesperomys leucogaster -- Missouri Mouse -- Plains along the Upper Missouri -- very rare

Neotoma cinerea -- Rocky Mountain Rat -- eastern slope of Northern Rocky Mountains and Upper Missouri -- not rare, but seldom captured; usually found among the dry trees on the river-bottoms...

Lepus campestris, Back -- prairie hare -- Upper Missouri and Saskatchewan plains ...This hare, though not extremely abundant, is not uncommon in the Northwest, from the mouth of Niobrara River to the mountains.

Lepus sylvaticus, Back -- gray rabbit -- from Massachusetts...west to the Missouri as far as Fort Union, Nebraska. -- Found all along the Missouri River to the mountains, but mostly confined to the wooded bottoms of the rivers and streams.

Lepus artemisia, Bach. Sage Hare -- Regions west of the Missouri to the Rocky Mountains...Abundant in the Bad Lands and on the sage plains of the Upper Missouri River...

Cervus canadensis, Erxl. -- American Elk -- Northern portions of United States to Upper Missouri, and west to the Pacific. Most abundant in the valley of the Yellowstone and along the Missouri River above Fort Union.

Cervus leucurus, Douglass. -- White-tailed Deer -- Upper Missouri and Platte... Very abundant along the river-bottoms; most common from Council Bluffs to Fort Pierre.

Cervus macrotis, say Mule Deer -- Upper Missouri and Platte to the Cascade range...Much more abundant on the Upper Missouri than the Cervus leucurus.

Antilocapra americana, Ord. -- Prong-horn Antelope; Cabree -- Plains west of Missouri...is found everywhere on the open grassy plains, from the mouth of the Niobrara River to the Mountains.

Ovis montana, Cuvier -- Bighorn; Mountain Sheep -- Broken ground on the Upper Missouri and Platte...Very abundant in the rugged and inaccessible portions of the Upper Missouri, especially the "Bad Lands."

Bos americanus, Gmelin -- American buffalo -- ...Now confined to the plains west of the Missouri and along the slopes of the Rocky Mountains.

Birds collected by F.V. Hayden on Warren Expedition

These birds were collected or sighted by F.V. Hayden on the 1856 expedition to Fort Union and the Missouri River. This list is drawn from G.K. Warren's report (1875).

I have included only those listed for the Upper Missouri.

Colaptes hybridus - Cross between two preceeding. Upper Missouri.
(Colaptes mexicanus - Red-shafter flicker. Western North America, from the Black Hills to Pacific. and Colaptes auratus - Sw. Flicker. Eastern North America to the eastern slopes of the Rocky Mountains; Greenland)

Sayornis sayus - Say's Flycatcher. Upper Missouri River and central high plaining westward to the Pacific and south to Mexico.

Sialia arctica - Rocky Mountain Bluebird. Upper Missouri to Rocky Mountain range, and south to Mexico; rare on the coast of California.

Collyrio excubitoroides - White-rumped Shrike. Missouri plains and fur countries to Pacific coast; eastward into Wisconsin, Illinois, and Michigan (?)

Harporhynchus rufus - Brown Thrush. Eastern North America to Missouri River, and perhaps to high central plains, unless replaced by a long-tailed variety (H. Longicauda)

Troglodytes parkmanni - Parkman's Wren. Western America, from the high central plains and Upper Missouri to the Pacific.

Plectrophanes (Centrophanes) ornatus - Chestnut-collared Bunting. Plains of the Upper Missouri.

Spizella pallida - Clay-colored Bunting. Upper Missouri River and high central plains to Saskatchewan country.

Pipilo arcticus - High central plains of Upper Missouri, Yellowstone, and Platte; Fort Bridger

Fish collected on the Warren Expedition

Stizostedion boreus - Fort Union Mo.

Scaphirhynchus platyrhynchus - Upper Missouri

Land shells collected on the Warren expedition

Helix arborea - Drift on the Missouri, near Fort Berthold

Helix cheresina - Drift on the Missouri, near Fort Berthold

Helix electrina - Drift on the Missouri, near Fort Berthold

Pupa nebraskana (new spec.) Fort Berthold, Nebraska Territory

Pupa Blandi - (new spec.) Fort Berthold

Pupa armigera - Fort Berthold

Bulimus lubricus - Fort Berthold, on Missouri

Succinea lineata - Fort Union and Yellowstone

Succinea nuttalliana - Fort Union

Succinea obliqua - Fort Berthold, Nebraska Territory

Fluviatile Shells

Amnicola porata - Fort Berthold

Amnicola lapidaria - Fort Berthold

Plants collected by F.V. Hayden on Warren Expedition and identified by George Engelmann

This list is from G.K. Warren's report (1875) of his expedition to Fort Union and the Missouri River

- Clematis lingusticifolia, Nutt. Very abundant about Fort Union.
- Ranunculus sceleratus, Lin. Not rare throughout the Upper Missouri country.
- Ranunculus cymbalaria, Pursh. Seen on the Yellowstone and Missouri.
- Nasturtium obtusum, Nutt. On the Upper Missouri and Yellowstone
- Nasturtium calycinum, Engelman. Sandy bottoms of the Yellowstone River, Fort Sarpy to Fort Union.
- Arabis canadensis, Linn. Common along Missouri to Fort Union.
- Arabis hirsuta, Scop. Fort Union and Bad Lands
- Erysimum asperum, D.C. Abundant on the high prairies to Fort Pierre and Fort Union.
- Cleome integrifolia, Forr. and Gray. Bad Lands, Fort Union, Yellowstone, Bad Lands of Judith, Platte Valley, Fort Laramie, and not generally diffused plant, but growing abundantly in localities.
- Paronychia sessiliflora, Nutt. Fort Union, Laramie Peak, Black Hills.
- Linum rigidum, Pursh. Throughout the prairie portion of the Upper Missouri.
- Linum perenne, Linn. Fort Pierre and Fort Union.
- Oxalis corniculata, Linn. Upper Missouri
- Celastrus scandens, Linn. Along Missouri to Fort Union
- Euonymus atropurpureus, Jacq. Woody bottoms to Fort Union.
- Polygala alba, Nutt. On sterile hills to Fort Union.
- Vicia Americana, Muhl. Upper Missouri generally.
- Lathyrus Linearis, Nutt. Upper Missouri generally.
- Amorpha nana, Nutt. Fort Laramie and high up the Missouri.
- Astragalus Missouriensis, Nutt. Fort Pierre to Fort Union.
- Astragalus Drummondii, Douglass. Sterile hills around Fort Union

Phaca elongata, Hook. Fort Pierre to Fort Union

Hedysarum boreale, Nutt. Abundant, mouth of Yellowstone.

Schrankia uncinata, Willd. Gravelly hills on the Upper Missouri generally

Agrimonia parviflora, Ait. Around Fort Union

Geum triflorum, Pursh. Fort Union ✓

Potentilla arguta, Pursh. Fort Clark and Fort Union. L

Fragaria vesca, Linn. Along Missouri to Yellowstone L

Fragaria Virginica, Ehsh. Fort Union.

Sanguisorba annua, Nutt. Fort Union.

Amelanchier Canadensis, Torr. and Gray. Common throughout the Upper Missouri country; bears a delicious fruit, which ripens in June.

Oenothera cespitosa, Nutt. Arid hills of Upper Missouri

Myriophyllum spicatum, Linn. Common in ponds throughout upper Missouri

Hepparis vulgaris, Linn. In standing pools, Upper Missouri.

Opuntia Missouriensis, D.C. Common throughout the Upper Missouri region

Opuntia fragilis, Nutt. Peculiar to arid plains, Upper Missouri.

Mammalaris Nuttalli. Common throughout the Upper Missouri country above Fort Pierre

Ribes floridum, Linn. Common on the Upper Missouri and valley of Yellowstone

Ribes aureum, Pursh. Banks and ravines along Missouri and Yellowstone

Cornus sericea, Linn. Abundant along Missouri bottoms. The inner bark is much used by the Sioux Indians with their tobacco in proportions of three to one; called by the traders "red osier."

Cornus stolonifera, Michx. Wooded bottoms of Missouri from mouth to source.

Aster levis, Linn. Upper Missouri.

Aplopappus spinulosus, D.C. High prairies of Upper Missouri

Grindelia squarrosa, Dunal. Common on high prairies from latitude 45° to the mountains. Medicinal among Indians. ✓

Iva axillaris, Pursh. Dry argillaceous hills. Fort Pierre and Fort Union

✓ Echinacea purpurea, Moench. Purple cone flower; called rattlesnake weed in the West, and is found abundantly throughout the country. Root very pungent. Used very effectively by the traders and Indians for the cure of the bite of the rattlesnake.

Helianthus giganteus, Linn. Common on Upper Missouri

Dysodia chrysanthemoides, Lag. Very abundant in prairie-dog villages on the Upper Missouri.

Antennaria plantaginea, R. Br. Upper Missouri and Black Hills.

Antennaria dioica, R. Br. Same as last

Lygodesmia juncea, Don. A very abundant plant all over the sterile hills of the Upper Missouri and its tributaries; grows most luxuriantly on the second upland prairie.

Specularia perfoliata, D.C. Throughout the Upper Missouri country

Plantago patagonica, var. gnaphaloides. Very abundant in sand soil and gravelly places on the Upper Missouri.

Penstemon cristatum, Nutt. On high prairies; Upper Missouri

Verbena bracteosa, Michx. A very common plant about prairie-dog villages on the Upper Missouri

Hedeom hirta, Nutt. Abundant in the prairie-dog village, Upper Missouri

Ellisia nyctelea, Linn. About old houses and gardent to Big Sioux, and along old roads in prairie-dog villages on the Upper Missouri

Collomia linearis, Nutt. Common about Fort Pierre; Fort Union ✓

Solanum triflorum, Nutt. Very abundant in prairie-dog villages on Upper Missouri

Androcera lobata, Nutt. Very abundant about old trading-houses, along old roads, and in prairie-dog villages on Upper Missouri

Salicornia herbacea, Linn. Saline places; Fort Union ✓

Sarcobatus vermicularis, Nees. This is one of the most abundant shrubs on the Upper Missouri. It makes its first appearance near latitude 44⁰, and seems to thrive best in the saline clays of the Cretaceous and Tertiary formations. It is sometimes called "greasewood" by the traders, and is often used for fuel by them on the Yellowstone River, where it grows to the height of ten or twelve feet, with trunks two to three inches in diameter. On the Yellowstone and along the Missouri it sometimes covers many square miles to the exclusion of other plants.

Euphorbia polygonifolia, Linn. Along old roads, Upper Missouri

Humulus lupulus, Linn. Most abundant in the Upper Missouri country.

Lemna. Common in ponds on Upper Missouri

Alisma plantago, Linn.

List of Nebraska Carices

Carex petasata, Dew. Upper Missouri

Carex stenophylla, Wahl. Upper Missouri

Carex obtusata, Lily. Upper Missouri

Species seem to be new

Agrostis michauxiana, Torr. Bottoms of Kansas, also on James and Shyenne Rivers, Upper Missouri.

Muhlenbergia glomerata, Linn. Abundant on prairies of Upper Missouri; wood-lands, & c.

Stipa spartea, Linn. Prairies of Upper Missouri

Sesleria dactyloides, Nutt. This is one of the most abundant as well as useful grasses on the Upper Missouri. It grows in low matted tufts, covering the prairies oftentimes for many miles, and furnishing a most nutritious and palatable food for the buffalo, deer and other game; also for the horses of the Indian and voyageur.

Uniola stricta, Torr. Hills of the Upper Missouri.

APPENDIX 8

Reports on explorations and surveys from Railroad Reports of Explorations and Surveys, U.S. Congress Senate Document (1860). The following collections were made along the survey route.

Birds collected by J.G. Cooper

This list is drawn from the Railroad Reports of Explorations and Surveys..., U.S. Congress, Senate document (1860).

Falco sparverius (Lin.) sparrow hawk. exceedingly abundant along the upper Missouri and its tributaries, wherever there was timber, or, at least, where the timber was sparse.

Otus wilsonias (Lesson) long-eared owl
I obtained a bird of this species in a dense thicket, on a small branch of Milk river, Nebraska. I suppose that, owing to the scarcity of hollow trees in that vicinity, the umbrageous shelter of thick brush is used as substitute.

In my late journey to Fort Laramie, Nebraska Territory, I observed with much surprise the fact first mentioned by Audubon, that after getting fairly out on the plains the song of the larks differs very much from that of the eastern bird.

Picea hudsonica (Bonap.) Magpie I first saw this bird about 100 miles west of Fort Union

Picicorvus columbianus (Bon) Clarke's Crow. Habitat Mauvaises Terres of the Upper Missouri...a specimen on Milk River.

Ectopistes migratoria (Swainson) wild pigeon, passenger pigeon
A bird in immature plumage, which I took to belong to this species, I saw in a clump of choke cherry bushes on a branch of Milk river, near Bear's Paw Mountains.

Centrocercus urophasianus (Swainson) Sage Cock; Cock of the Plains
In August, 1953, a sage cock was shot by a member of our party on the Milk river, two hundred miles west of Fort Union... I observed a small block of these birds on the plains, bordering the Milk river.

Pediocaetes phasianellus, (Baird) sharp-tailed grouse
This bird replaces the pinnated grouse in the western country. We first noticed the species in Nebraska, near Fort Union, at the mouth of the Yellowstone River. From that point to the Cascade mountains of Oregon and Washington Territories the species is exceeding abundant wherever there is open country and sufficiency of food.

Waterbirds collected by Dr. G. Suckley

This list is drawn from the Railroad Reports of Explorations and Surveys..., U.S. Congress, Senate document (1860)

Aegialitis montanus (Towns.) cassin. Rocky Mountain Plover

I obtained a specimen of this bird, shot in a "prairie dog town" on Milk river, Nebraska... The habits of the bird I obtained in Nebraska seem somewhat to resemble those of the golden plover in apparently preferring dry open ground.

Reptiles collected by J.G. Cooper

This list is drawn from the Railroad Reports of Explorations and Surveys..., U.S. Congress, Senate document (1860)

Tapaya douglassii, Girard The Oregon Horned Toad. This animal was found by me at Fort Benton, on the Upper Missouri, and again on the plains west of the Rocky mountains, as far as the Cascade range.

Crotalus confluentus (Say) Prairie Rattlesnake. Milk River. This species is very numerous on the Missouri river and its tributaries, between Fort Union, Nebraska, and the Rocky mountains. In July and August they are found very common in the dry canons, and among the willow brush, and cottonwood forests along the banks of the river...

Siredon lichenoides, ? (Baird) "Ground Puppy"; "Four legged Fish."

A specimen of Siredon collected by Dr. Suckley, near Fort Union, Nebraska, differs from the typical S. lichenoides, in fuller form, and in spots on a grayish ground ground, the spots larger and more distinct than in S. mexicanus; This siredon was obtained on the route between Fort Union and Fort Benton, Nebraska. Vast numbers of a species apparently identical are found in the small brackish lakes of central Minnesota.

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VEGETATION OF THE FORT UNION

TRADING POST AND VICINITY

E. Earl Willard

Natural Vegetation of the Area

The Fort Union Trading Post site is located in the southern part of the glaciated plains commonly known as the mixed prairie. Thus, the vegetation of the uplands is typical of the mixed prairie, while that along the Missouri River is a mixture of mixed prairie, riparian, and Rocky Mountain species. Several attempts have been made to describe the natural vegetation of the surrounding area.

Hanson and Whitman (1938) sampled 36 sites in the vicinity of Sentinel Butte and Medora in western North Dakota, in an unglaciated portion of the mixed prairie. The sites were mostly located in winter-grazed pastures, in ungrazed portions of land adjoining cropland and in lightly-grazed pastures. They found that the natural grassland community on upland plateaus and gentle slopes was dominated by Bouteloua gracilis, Stipa comata, and Carex filifolia. Agropyron smithii and Koeleria cristata were found in greater amounts in lower successional stages and are subdominants in the climax. The Artemisia cana type was restricted to flats along streams and in valleys.

Payne (1973) mapped and described the major vegetative rangeland types in Montana. He described the uplands around Fort Union as sandy or loamy soils in which the major plant species are Bouteloua gracilis, Stipa comata, and Agropyron smithii. The distinguishing species of the type is Schizachyrium scoparius. Other common species include Muhlenbergia cuspidata, Poa sandbergii,

Stipa viridula, Carex filifolia, Carex eleocharis, Gutierrezia sarothrae, Sphaeralcea coccinea, Plantago purshii, Eriogonum umbellatum, Phlox spp., Artemisia frigida, Opuntia polyacantha, Rosa spp., Rhus trilobata and Juniperus Horizontalis. He described the river bottoms as a rich alluvial soil containing considerable Agropyron smithii and various species of Poa. Other common species include Salix spp., Populus spp., Rosa spp., Artemisia cana, Chrysothamnus nauseosus, Symphoricarpus albus, Shepherdia argentea, Stipa comata, Bouteloua gracilis, Distichlis stricta, Helianthus spp., Plantago purshii, Chenopodium album, Lappula spp., and Opuntia polyacantha.

The Soil Conservation Service has developed a Range Site and Condition Guide for northeastern Montana which lists the plant species expected in the climax community. The climax dominants for upland silty or sandy soils include Stipa viridula, Schizachyrium scoparius, Muhlenbergia cuspidata, Stipa spartea, Calamovilfa longifolia, Bouteloua curtipendula, Agropyron trachycaulum, Atriplex nuttallii, and Ceratoides lanata. Subdominants which increase with overgrazing of the dominants include Bouteloua gracilis, Stipa comata, Calamagrostis montanensis, Koeleria cristata, Poa sandbergii, Sporobolus cryptandrus, Carex spp., Artemisia frigida, and Artemisia cana. Climax forbs are not listed on the guide. The area along the river is in the wetland and overflow sites should include among the dominant climax species Elymus canadensis, Phalaris arundinacea, Spartina pectinata, Carex spp., Agropyron smithii, and unspecified woody species and forbs.

Coupland (1950) described the natural plant communities of the mixed prairie in southern Canada. While the monograph was developed from data collected in Canada, the plant community descriptions should apply equally well to the area around Fort Union. He classified the upland grasslands into the following plant communities: Stipa-Bouteloua, Bouteloua-Stipa, Agropyron smithii, and Bouteloua - Agropyron.

The Stipa-Bouteloua communities occur on medium-textured soils deposited upon undifferentiated glacial till deposits. The type occurs to a limited extent on soils of undulating topography developed on glacial outwash. This type is postclimax to the Bouteloua-Stipa type. The dominants include Bouteloua gracilis, Stipa comata, and Stipa spartea; subdominants are Agropyron smithii, Koeleria cristata, Carex filifolia and Agropyron dasystachyum; and the secondary species include Poa secunda, Stipa viridula, and Poa cusickii.

The Bouteloua-Stipa communities occur on soils of medium texture developed on undifferentiated glacial till deposits in the drier areas, where conditions are less favorable for mid grasses. This type is dominated by Bouteloua gracilis, with an interspersed of Stipa comata. Artemisia cana is the most conspicuous shrub, while Artemisia frigida and Phlox hoodii are the most important forbs. Dominant grasses are Bouteloua gracilis and Stipa comata; subdominants include Koeleria cristata, Agropyron smithii, Carex filifolia and Agropyron dasystachyum; while other species of lesser importance include Poa sandbergii, Sporobolus cryptandrus, Artemisia frigida, Artemisia cana, Phlox hoodii, Sphaeralcea coccinea and Ceratoides lanata.

The Agropyron smithii subtype occurs on slightly alkaline clay flats and on certain alluvial clay flats. It is often the sole dominant, often forming almost pure stands. Less common grasses include Koeleria cristata and Poa sandbergii, while Phlox hoodii is an important forb. Stipa comata and Bouteloua gracilis are rare or lacking. Gutierrezia sarothrae is common.

The Bouteloua-Agropyron subtype occurs on clay loam "burn-outs" and has Bouteloua gracilis as the dominant. The droughty nature of the soils caused by impermeability and location in a drier zone favors Bouteloua gracilis while the fine texture favors species of Agropyron, especially in eroded sites.

Artemisia cana is less common, and Opuntia polyacantha is prominent. Only four grasses are abundant in the community: Stipa comata, Koeleria cristata, Poa sandbergii, and Calamagrostis montanensis.

Quinnild and Cosby (1958) studied the vegetation on two ungrazed mesas in the Little Missouri River Badlands in western North Dakota. The soils were a silt loam. The plant communities were classified as an Agropyron smithii type, and included the following species listed in order of abundance: Bouteloua gracilis, Agropyron smithii, Stipa viridula, Stipa comata, Artemisia frigida, and Agropyron dasystachyum. Bouteloua gracilis was present in an understory topped by the mid-grasses. It seems able to survive in these conditions, and will increase when conditions become less favorable for the mid grasses. Artemisia frigida was the most important forb.

Characterization of the climax vegetation on the northern Great Plains would have to include grazing as a natural part of the ecosystem. Bison undoubtedly had a major influence on the character of the Great Plains communities before livestock were introduced (Willard 1979). They overgrazed certain areas of the grasslands, but their wandering nature would probably have resulted in their leaving the area for "greener pastures," and not returning for an extended period of time. During this time, the range would recover (England and DeVos 1969). Thus, intense grazing followed by deferment or rest seems to have existed on the grasslands.

Larson (1940) suggested that the Great Plains was formerly grazed heavily by bison and other animals which held the western plains in a short grass state. England and DeVos (1969) mentioned an account provided by the diary of David Thompson which recorded a statement by the Piegan Indians that the bison sometimes grazed during the summer and fall along the Missouri

River until the ground was essentially bare and the bison could no longer live there. They quote several sources as stating that bison may have destroyed woody vegetation in certain areas by trampling, browsing and rubbing. However, they also conclude that overgrazing and wallowing by bison may have produced disturbed sites favorable to invasion by woody plants and other pioneering species. The impact of bison on the vegetation was probably related to the migratory habits of the herds. Wherever they were migratory, the disturbed sites were opened to invasion, and the plant community was in a subclimax state, however, as the herd moved on, the vegetation would recover. Complete recovery to a climax state depended on rest from grazing for several years.

Fires were also a dominant factor in determining the plant species on an area. Lewis and Clark observed numerous fires during their trip up the Missouri River, and suggested that these explained the absence of woody plants on much of the plains (Cutright 1969). This theory has generally been supported by more recent studies (Wells 1965, Sauer 1950, Tester and Marshall 1962, Kirsch and Kruse 1972). Stewart (1953) concluded that grasslands occurring on deep, fertile soils are man-made, essentially by Indians periodically setting fire to the grass which kept woody vegetation from growing. However, woody plants would probably never dominate the northern mixed prairie because of erratic precipitation, along with severe droughts (Weaver and Albertson 1956, Humphrey 1962).

Nelson and England (1977) reviewed the causes and effects of fires in the northern grasslands of Canada and the United States from 1750-1900. They concluded that fires were frequently started by lightning and by man, and that these fires caused extensive destruction of woody vegetation. Stewart (1953) documented the existence of numerous wildfires on the central

Great Plains before adequate fire suppression was developed.

Early explorers and naturalists, including Audubon, Cabeza deVaca, and Escalante, reported the purposeful setting of fires by Indians. George Catlin, an artist who visited Fort Union in the mid-1800s, painted pictures of Indians setting grass fires on the plains. His description of prairie grass fires in his book Manners, Customs, and Conditions of the North American Indians, first published in 1842, provides an insight into these phenomena.

He wrote:

The prairies burning form some of the most beautiful scenes that are to be witnessed in this country, and also some of the most sublime. Every acre of these vast prairies (being covered for hundreds and hundreds of miles, with a crop of grass, which dies and dries in the fall) burns over during the fall or early spring, leaving the ground of a black doleful color.

There are many modes by which the fire is communicated to them, both by white men and by Indians - par accident; and yet many more where it is voluntarily done for the purpose of getting a fresh crop of grass, for the grazing of their horses,.....

But there is yet another character of burning prairies, that requires another Letter, and a different pen to describe - the war, or hell of fires! where the grass is seven to eight feet high, as is often the case for many miles together, on the Missouri bottoms....

Considerable differences may exist between a climax plant community and the presettlement vegetation. Vegetation on the plains prior to European settlement was greatly influenced by bison and prairie fires. The bison are gone, and have been replaced by livestock. Differential influences of bison and livestock have not been established. However, livestock grazing probably does not simulate that of bison. Now that wildfires are uncommon on a particular site, the vegetation is naturally different.

It is much more feasible, then, to return rangeland vegetation to a climax state than to that of presettlement conditions. An area can be fenced

to exclude grazing, thus leading to climax vegetation. However, the introduction of migrating bison herds and prairie wildfires as occurred prior to settlement is not feasible.

Natural Vegetation of Fort Union

The foregoing discussion of the natural vegetation of the Mixed Prairie is valuable in providing a general description of the natural or potential vegetation. However, the natural variability of vegetation from one site to another dictates that some refinement of these descriptions is necessary to describe the natural vegetation for a specific site. In attempting to reconstruct the natural vegetation of the Fort Union Trading Post site, searches were made of the local area for relatively undisturbed sites, along with relicts of natural vegetation. Few such sites were observed. However, sufficient evidence is available in the literature and on relatively undisturbed sites around Fort Union to develop a reasonably accurate list of plant species which would occupy the area.

The Fort Union Trading Post site has been divided into eight ecologically distinct vegetation types. These are shown on Map Number 1. Descriptions of the natural vegetation are as follow:

Hardwood Draws. This site is in a natural drainage which is naturally wooded. The soils are deep and well-drained, and the drainage receives extra water which drains from surrounding uplands. The site is somewhat naturally disturbed due to siltation from the upper areas. Wooded drainages such as this are not well described in the literature. A reconstruction of the natural vegetation, then, must necessarily rely upon some degree of assumption. Vegetation natural to the drainage would include the following:

Fraxinus pennsylvanica
Ulmus americana
Prunus virginiana
Rosa woodsii
Symphoricarpos occidentalis
Crataegus douglasii
Agropyron smithii
Agropyron dasystachyum
Stipa viridula
Sphaeralcea coccinea
Artemisia ludoviciana

Because of the disturbed nature of the drainage, certain exotic species are present. These are not native to North America and do not belong on the site. Exotic species present include:

Poa pratensis
Melilotus officinalis
Bromus inermis
Agropyron cristatum
Euphorbia esula
Medicago sativa

Upland Hills. This site is the least disturbed of all sites on the area. Although some evidence of livestock grazing were found on the site, no recent abuse has occurred. The site is composed of rather shallow soils on low-lying hills. Such a site is usually rich in a variety of plant species. Natural vegetation would include the following:

Dominants

Stipa comata
Agropyron smithii
Stipa viridula
Linum perenne
Oxytropis sericea
Petalostemon candidum
Petalostemon purpureum
Echinacea angustifolia
Bouteloua gracilis
Lupinus argenteus
Calamovilfa longifolia
Bouteloua curtipendula
Schizachyrium scoparius
Linum rigidum
Agropyron dasystachyum

Subdominants

Artemisia frigida
Gutierrezia sarothrae
Eriogonum flavum
Koeleria cristata
Chrysothamnus nauseosus
Castilleja sessiliflora
Chrysopsis villosa
Geum triflorum
Ceratoides lanata
Atriplex nuttallii
Yucca glauca
Sporobolus cryptandrus
Symphoricarpos occidentalis
Calamagrostis montanensis
Artemisia cana

Dominants (cont.)

Stipa spartea
Muhlenbergia cuspidata

Subdominants (cont.)

Carex filifolia
Amelanchier alnifolia
Poa sandbergii

Site number two has very few exotic plants present. A few invading natives are present on the site. These include Helianthus annuus and Plantago spinulosa. However, these are present in small amounts and will recede as the site is rested from grazing.

Upland Prairies. This site occurs in the lower areas of the uplands. The soils are deep, medium-textured and highly productive. Only a small percentage of the site remains in natural vegetation; the remainder is either in wheatland or has been planted to exotic grass and legume species.

The natural dominant and subdominant plant species on the site would be very similar to those on the site number two. However, sufficient differences exist to separate the two sites. Natural vegetation for site number three includes the following:

Dominants

Stipa viridula
Agropyron smithii
Stipa comata
Linum perenne
Petalostemon candidum
Petalostemon purpureum
Echinacea angustifolia
Lupinus argenteus
Linum rigidum
Agropyron dasystachyum
Stipa spartea

Subdominants

Oxytropis sericea
Bouteloua gracilis
Muhlenbergia cuspidata
Artemisia frigida
Koeleria cristata
Poa sandbergii
Castilleja sessiliflora
Geum triflorum
Ceratoides lanata
Sporobolus cryptandrus
Atriplex nuttallii
Yucca glauca
Calamagrostis montanensis
Artemisia cana
Carex filifolia
Opuntia polyacantha

Lowland Prairies. This site is an upper terrace of the Missouri River. Soils are silty clay loams and silty loams, nearly level, and water moves freely through them. This site is all in hayland and has been planted to exotic species. Such sites along the Missouri River have almost all been placed in cultivation, so that the location of undisturbed natural vegetation is difficult. Natural vegetation for site number four should contain at least the following:

Dominants

Stipa viridula
Agropyron smithii
Agropyron dasystachyum
Stipa comata
Elymus canadensis
Atriplex nuttallii
Ceratoides lanata
Stipa spartea
Petalostemon purpureum
Petalostemon candidum

Subdominants

Opuntia polyacantha
Artemisia cana
Artemisia frigida
Bouteloua gracilis
Koeleria cristata
Poa sandbergii
Calamagrostis montanensis
Sporobolus cryptandrus
Lupinus argenteus
Linum perenne
Oxytropis sericea
Chrysothamnus nauseosus
Geum triflorum
Echinacea angustifolia
Lupinus argenteus
Linum rigidum
Sporobolus cryptandrus
Sumphoricarpus occidentalis
Artemisia ludoviciana
Posa woodsii

Hardwood Bottomlands. This site is a hardwood bottom on a low terrace above the river. Soils are deep silty clay loams through which water moves freely. The plant community is of recent origin which has developed as the Missouri River moved southward. Natural vegetation on the site would contain at least the following:

Port Union Library
 Trading Post NES

Dominants

Populus deltoides
Acer negundo
Fraxinus pennsylvanica
Salix spp.
Cornus stolonifera
Rosa woodsii
Symphoricarpus occidentalis
Ribes cereum
Prunus virginiana
Prunus americana

Subdominants

Glycyrrhiza lepidota
Equisetum arvense
Elymus canadensis
Agropyron smithii
Rhus americana
Smilacina stellata

Willow Bottomland. This site is recently developed from a river sandbar left as the river moved southward. The site is a natural willow bottom with a few other species beginning to move in. The natural vegetation is that which is now present:

Dominants

Salix exigua
Salix spp.

Subdominants

Cornus stolonifera
Equisetum arvense
Glycyrrhiza lepidota
Phragmites communis

Wet Bottomland. This site also is recently developed as the river recedes. It is a part of a recent river channel and is subjected to periodic flooding. A high water level exists on the site. The natural vegetation is that which is now present:

Dominants

Phalaris arundinacea
Juncus spp.
Carex spp.
Agropyron smithii
Typha latifolia

Subdominants

Spartina pectinata
Elymus canadensis
Ranunculus cymbalaria
Salix spp.
Salix exigua
Equisetum arvense
Potentilla anserina
Hordeum jubatum
Phragmites communis
Echinochloa crusgalli

Barren Sandbars. This site is a sandbar essentially void of vegetation.

South Bank of Missouri River. This site is a sandy loam bench just south of the river. It is a natural hardwood plant community which is presently in a disturbed state. Numerous exotic species are present. The natural plant community would be very similar to that described for site number five.

Vegetation at Time Fort Union Was in Operation

The vegetation around Fort Union would have been in a rather advanced stage of disturbance during the period of its operation. Historic records indicate that numerous horses and cattle were kept by the traders at the fort. Also, the Indians camped on the grounds near the fort would have contributed significantly to the disturbance through normal trampling and wood-gathering activities and from the grazing of their horses.

Weber (1859) mentioned that both milk cows and work cattle were kept at the fort. Catlin (1891) recorded that at the time he visited Fort Union there were about one hundred and fifty horses at the fort. Prince Maximilian (1833-1834) reported that the fort contained "about fifty or sixty horses, some mules, and an inconsiderable number of cattle, swine, goats, fowls, and domestic animals. The cattle are very fine, and the cows yield abundance of milk. The horses are driven, in the day time, into the prairie, guarded and exercised by armed men, and, in the evening, brought back into the quadrangle of the fort, where the greater part of them pass the night in the open air."

The disturbed condition of the vegetation is further expressed by the abundance of cactus in the area. Denig, in his journals as edited by Ewers

(1961) recorded that "the principal hinderance to foot travelers in this district is the innumerable family of cacti, some of which are armed with very long and strong points and ruin the feet of anyone walking without strong soles to his shoes." Maria Audubon (1897) recorded the diary of James Audubon who also visited Fort Union. He wrote that there were "many cacti of two sorts" and that "the prairie is covered with cacti." Willard and Herman (1977) found that prickly-pear cactus (Opuntia polyacantha) increases with excessive grazing in eastern Montana.

Only one photograph has been found of the fort, and this was taken in 1866 by A.J. Fisk one year before the fort was abandoned. Only two plant species can be seen in the photograph. These are Artemisia frigida and Cirsium arvense, two perennial forbs well known to invade or increase under excessive grazing. These two species are still found at the fort, but in minor amounts.

Several of the early explorers, traders, and naturalists noted the vegetation in the vicinity of Fort Union. Accounts are generally general and list only the more obvious or interesting plants. It may be assumed that the plant species present when the fort was in operation are still present in the area, although their distribution may have changed. The narratives provided by early accounts, however, may serve as an indication of the character of the plant communities. These accounts follow.

The following quotations are from James Audubon (Audubon 1987):

At six this morning all hands rose early; the residue of the cargo for St. Louis was placed on board. Our captain told us time was up, and we all started for the fort on foot, quite a short distance. Having deposited our guns there, Bell, Mquires, and I walked off to the wooding-place, where our captain was to remain a good while, and it was there we should bid him adieu. We found this walk one of the worst, upon which we ever trod; full of wild rose-bushes,

tangled and matted with vines, burs, and thorns of all sorts, and encumbered by thousands of pieces of driftwood, some decayed, some sunk in the earth, while others were entangled with the innumerable roots exposed by floods and rains.

...three of us took a walk, and saw a good number of *Tamias* holes, many cacti of two sorts, and some plants hitherto uncollected by us.

...later he, Harris, and I, walked to the hills to procure the black root plant which is said to be the best antidote for the bite of the rattlesnake. We found the root and dug one up, but the plant is not yet in bloom. The leaves are long and narrow, and the flowers are said to resemble the dwarf sunflower.

I must not forget to say that on our way we passed through some grasses with bearded shafts, so sharp that they penetrated our moccasins and entered our feet and ankles, and in the shade of a stumpy ash-tree we took off our moccasins and drew the spines out.

We were all very warm, so we rested awhile, and ate some service-berries, which I found good; the gooseberries were small and green, and almost choked Harris with their sharp acidity.

This evening Moncr vier and Owen went on the other side of the river, but saw nothing. We collected berries of the dwarf cherries of this part, and I bottled some service-berries to carry home.

Weather cool and pleasant. After breakfast we despatched La Fleur and Provost after Antelopes and Bighorns. We then went off and had a battue for Rabbits, and although we were nine in number, and all beat the rose bushes and willows for several hundred yards, not one did we see, although their traces were apparent in several places.

Edwin Q. Denig wrote a description of Fort Union, July 30, 1843, which was published by Audubon (1897):

The front of the fort is but a few steps, say twenty-five, from the bank of the Missouri. Behind the fort is a prairie with an agreeable ascent to the commencement of the bluffs, about one and a half miles in width, and two in length, surrounded at the borders with high hills, or bluffs. Above and below, at the distance of two hundred yards commence the points, or bottoms, of the Missouri, which contain great quantities of cottonwood, ash, and elm, supplying the fort with fuel, boat and building timber.

(Biddle, Ed. 1962)

Lewis and Clark (Biddle, Ed. 1962) described the vegetation in 1805 at the confluence of the Yellowstone and Missouri Rivers before the fort was built.

The timber consists principally of cottonwood, with some small elm, ash, and boxelder. The under growth on the sandbars and verge of the river is the small leafed willow; the low bottoms, rose bushes which rise to three or four feet high, the redberry, serviceberry, and the redwood; the high bottoms are of two descriptions, either timbered or open; the lowest lies next to the river and it's under brush is the same with that of the low timbered bottoms with the addition of the broad leafed willow, Goosbury, choke cherry, purple currant, and honeysuckle bushes; the open bottoms border on the hills, and are covered with many parts of the wild hyssop which rises to the height of two feet.

A little way up the Yellowstone River the country in every direction is plains except the moulded bottoms of the river, which are covered with some indifferent timber such as Cotton wood, Elm and small ash, with different kind of shrubs and bushes on the forks about one mile from the point at which place the two rivers are near each other a beautiful low level plain commences, and extends up the Missouri and back, this plain is narrow at its commencement and widens as the Missouri bends north, and is bordered by an extensive wood land for many miles up the Yellow Stone river....

Granville Stuart in 1886 described the land along the Missouri River (Dawson's Book Shop 1963) as follows:

The country keeps its gently rolling, grassy, habitable appearance as far as Fort Union, five miles above the Yellowstone River, having very large bottoms of cottonwood, ash and elm, and many very dense willow fields with occasional patches and thickets of elm, ash, choke cherry and service bushes scattered about over the country.... Through these bottoms the river winds tortuously, the bends being heavily timbered and bushy....

About noon the bad lands began to decrease in height and assume gently undulating forms, and being well clothed with grass made it look like a low rolling prairie as far as the eye could reach, except an occasional low bluff that had its end washed off, exposing the regular clay strata with small seams of coal in them. The river bottoms also became much wider (from four to eight miles) and were covered with an excellent growth of large cottonwood, among which are considerable ash and elm of good size, and many more of a smaller growth. There were also many small groves and thickets of the two latter, with plum and choke cherry in the little valleys and "sags" of the prairies. In fact the country has a much more habitable appearance along here than anywhere since we have passed Fort Randall.... There are many impenetrable thickets of willows along here; fully as dense as canebrakes in the South.

Prince Maximilian du Weid (1832-1834) visited Fort Union and provided an account of the vegetation of the area:

...make excursions into the neighbouring woods on the river-side, and to the prairie. In a wood, below the fort, we found a tree, on which the corpses of several Assiniboins were deposited; one of them had fallen down, and been torn and devoured by the wolves ...Dreidoppel, who discovered this tree, took up the skull of a young Assiniboin, in which a mouse had made its nest for its young; and Mr. Bodmer had an accurate drawing of the tree, under which there was a close thicket of roses in full blossom...

...went across the river. We landed in a lofty forest of poplar, ash, negundo, and elm, with a thick undergrowth of symphoria, roses covered with beautiful red blossom, and buffalo berries, which had then ripe red fruit. ... passed through the forest, then across a meadow, where a few isolated bushes grew, and where we raised a covey of prairie hens, and then over a chain of hills, where we followed a beaten path. ... From the summit of the chain of hills we had a fine view of the valley of the Missouri. On the further side runs a whitish chain of hills, with their singular angles and ravines, before them the yellow prairie, with its orange-coloured woods of poplar and ash on the banks, where Fort Union appears: on this side of the wood were dark stripes of bushes, and large forest trees, the reddish or brown bark of which contrasted with the yellow foliage of the poplars; at our feet were the whitish-grey sand-stone hills, and the greyish-brown eminences covered with dry grass, and dark green cedars, under which was the grassy plain, with its silvery green shrubs.

Among the plants there were whole tracts covered with dwarf rose bushes, about a foot high; some species of solidago and aster, with bunches of whitish flowers, and snake-root (Galardia bicolor)

Present Vegetation at Fort Union

The present vegetation at Fort Union is a mixture of plant communities and cultivated lands. The plant communities are shown on Map Number 2. Altogether, thirty-one different vegetation types were mapped on the area; plant species and percentages of each are listed in Appendix 1.

Exotic Species. Numerous plant species not native to North America are present on the Fort Union Trading Post site. These are listed in Appendix 2.

Relationship to Natural Vegetation. Much of the site has been placed in cultivation, some areas are not cultivated but are in various stages of disturbance, while other areas contain natural vegetation. Those areas containing natural vegetation are designated on Map Number 2 as W-1, W-2, W-3, W-4, W-6, W-8, W-22, W-23, and W-24. These should be protected from disturbance. No further modifications are necessary. All other areas will require drastic modifications to return the vegetation to a natural mixture of species.

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Appendix 1. Plant Community Descriptions for the Fort Union Trading Post Site.

Writeup #1

<u>Scientific Name</u>	<u>%</u>
<i>Gutierrezia sarothrae</i>	2
<i>Stipa comata</i>	21
<i>Agropyron smithii</i>	24
<i>Stipa viridula</i>	7
<i>Artemisia frigida</i>	2
<i>Linum perenne</i>	Trace*
<i>Oxytropis sericea</i>	Trace
<i>Eriogonum flavum</i>	Trace
<i>Petalostemon candidum</i>	Trace
<i>Petalostemon purpureum</i>	Trace
<i>Echinacea angustifolia</i>	1
<i>Bouteloua gracilis</i>	9
<i>Koeleria cristata</i>	12
<i>Lupinus argenteus</i>	Trace
<i>Chrysothamnus nauseosus</i>	Trace
<i>Castilleja sessiliflora</i>	Trace
<i>Calamovilfa longifolia</i>	2
<i>Bouteloua curtipendula</i>	Trace
<i>Chrysopsis villosa</i>	Trace
<i>Geum triflorum</i>	Trace
<i>Ceratoides lanata</i>	4
<i>Plantago spinulosa</i>	2
<i>Atriplex nuttallii</i>	Trace
<i>Schizachyrium scoparius</i>	Trace
<i>Yucca glauca</i>	Trace
<i>Linum rigidum</i>	Trace
<i>Sporobolus cryptandrus</i>	Trace
<i>Symphoricarpos occidentalis</i>	Trace
<i>Asclepias speciosa</i>	Trace
<i>Calamagrostis montanensis</i>	2
<i>Agropyron dasystachyum</i>	3
<i>Lithospermum incisum</i>	Trace
<i>Opuntia polyacantha</i>	Trace
<i>Tragopogon dubius</i>	Trace
<i>Stipa spartea</i>	Trace
<i>Artemisia cana</i>	Trace
<i>Carex filifolia</i>	1
<i>Helianthus annuus</i>	Trace
<i>Juniperus scopulorum</i>	Trace
<i>Amelanchier alnifolia</i>	Trace
<i>Muhlenbergia cuspidata</i>	8
	100%

*The term "trace" is used to express the presence of the species in the community in amounts below one percent.

Writeup #2

	<u>%</u>
<i>Stipa comata</i>	4
<i>Stipa spartea</i>	Trace
<i>Stipa viridula</i>	36
<i>Echinacea angustifolia</i>	3
<i>Bouteloua gracilis</i>	2
<i>Bouteloua curtipendula</i>	Trace
<i>Agropyron smithii</i>	30
<i>Agropyron dasystachyum</i>	2
<i>Tragopogon dubius</i>	Trace
<i>Ceratoides lanata</i>	2
<i>Artemisia frigida</i>	2
<i>Artemisia cana</i>	Trace
<i>Koeleria cristata</i>	12
<i>Opuntia polyacantha</i>	Trace
<i>Gutierrezia sarothrae</i>	1
<i>Lupinus argenteus</i>	Trace
<i>Ratibida columnaris</i>	Trace
<i>Chrysopsis villosa</i>	Trace
<i>Plantago spinulosa</i>	Trace
<i>Yucca glauca</i>	Trace
<i>Schizachyrium scoparium</i>	Trace
<i>Calamagrostis montanensis</i>	3
<i>Allium</i> spp.	Trace
<i>Carex filifolia</i>	2
<i>Petalostemon purpureum</i>	Trace
<i>Petalostemon candidum</i>	Trace
<i>Oxytropis sericea</i>	Trace
<i>Artemisia ludoviciana</i>	Trace
<i>Symphoricarpos occidentalis</i>	1
<i>Rosa woodsii</i>	Trace
<i>Linum perenne</i>	Trace
<i>Sphaerolcea coccinea</i>	Trace
	100%

Writeup #3

<i>Agropyron smithii</i>	6
<i>Bouteloua gracilis</i>	9
<i>Bouteloua curtipendula</i>	Trace
<i>Stipa comata</i>	34
<i>Stipa viridula</i>	2
<i>Koeleria cristata</i>	24
<i>Gutierrezia sarothrae</i>	Trace
<i>Artemisia frigida</i>	1
<i>Linum perenne</i>	Trace
<i>Linum rigidum</i>	Trace
<i>Oxytropis sericea</i>	Trace
<i>Petalostemon purpureum</i>	Trace
<i>Petalostemon candidum</i>	Trace
<i>Echinacea angustifolia</i>	1

Writeup #3 (cont.)

	%
<i>Lupinus argenteus</i>	Trace
<i>Calamovilfa longifolia</i>	1
<i>Chrysopsis villosa</i>	Trace
<i>Ceratoides lanata</i>	3
<i>Plantago spinulosa</i>	4
<i>Atriplex nuttallii</i>	Trace
<i>Schizachyrium scoparius</i>	Trace
<i>Yucca glauca</i>	Trace
<i>Sporobolus cryptandrus</i>	Trace
<i>Calamagrostis montanensis</i>	6
<i>Opuntia polyacantha</i>	Trace
<i>Tragopogon dubius</i>	Trace
<i>Allium</i>	Trace
<i>Agropyron dasystachyum</i>	4
<i>Carex filifolia</i>	5
	100%

Writeup #4

<i>Stipa viridula</i>	36
<i>Stipa spartea</i>	Trace
<i>Stipa comata</i>	4
<i>Ceratoides lanata</i>	3
<i>Agropyron smithii</i>	39
<i>Artemisia frigida</i>	2
<i>Linum perenne</i>	Trace
<i>Oxytropis sericea</i>	Trace
<i>Petalostemon purpureum</i>	Trace
<i>Petalostemon candidum</i>	Trace
<i>Echinacea angustifolia</i>	Trace
<i>Bouteloua gracilis</i>	4
<i>Koeleria cristata</i>	7
<i>Lupinus argenteus</i>	Trace
<i>Calamovilfa longifolia</i>	Trace
<i>Plantago spinulosa</i>	1
<i>Atriplex nuttallii</i>	Trace
<i>Symphoricarpos occidentalis</i>	Trace
<i>Agropyron dasystachyum</i>	2
<i>Lithospermum incisum</i>	Trace
<i>Opuntia polyacantha</i>	Trace
<i>Tragopogon dubius</i>	Trace
<i>Carex filifolia</i>	Trace
<i>Rosa woodsii</i>	Trace
<i>Linum rigidum</i>	Trace
<i>Helianthus annuus</i>	Trace
<i>Cirsium arvense</i>	Trace
<i>Lactuca pulchella</i>	Trace
<i>Artemisia ludoviciana</i>	Trace
<i>Poa sandbergii</i>	2
<i>Gutierrezia sarothrae</i>	Trace
<i>Echinacea angustifolia</i>	Trace
<i>Linum perenne</i>	Trace
	100%

Writeup #5

	<u>%</u>
<i>Fraxinus pennsylvanica</i>	3
<i>Ulmus americana</i>	3
<i>Prunus virginiana</i>	Trace
<i>Rosa woodsii</i>	1
<i>Poa pratensis</i>	7
<i>Melilotus officinalis</i>	Trace
<i>Agropyron smithii</i>	57
<i>Agropyron dasystachyum</i>	Trace
<i>Bromus inermis</i>	3
<i>Thalaspi arvense</i>	Trace
<i>Stipa viridula</i>	7
<i>Sphaeralcea coccinea</i>	Trace
<i>Chenopodium album</i>	Trace
<i>Agropyron cristatum</i>	12
<i>Symphoricarpos occidentalis</i>	7
<i>Vicia americana</i>	Trace
<i>Artemisia ludoviciana</i>	Trace
<i>Euphorbia esula</i>	Trace
<i>Crataegus douglasii</i>	Trace
<i>Medicago sativa</i>	Trace
<i>Arabis sp.</i>	Trace
	100%

Writeup #6

<i>Stipa comata</i>	Trace
<i>Stipa viridula</i>	22
<i>Echinacea angustifolia</i>	Trace
<i>Bouteloua gracilis</i>	1
<i>Agropyron smithii</i>	31
<i>Atropyron dasystachyum</i>	3
<i>Tragopogon dubius</i>	Trace
<i>Ceratoides lanata</i>	Trace
<i>Artemisia frigida</i>	Trace
<i>Koeleria cristata</i>	27
<i>Gutierrezia sarothrae</i>	2
<i>Calamovilfa longifolia</i>	3
<i>Calamagrostis montanensis</i>	7
<i>Petalostemon purpureum</i>	Trace
<i>Oxytropis sericea</i>	Trace
<i>Artemisia ludoviciana</i>	Trace
<i>Rosa woodsii</i>	1
<i>Linum perenne</i>	1
<i>Juniperus horizontalis</i>	1
<i>Phlox hoodii</i>	Trace
<i>Atriplex nuttallii</i>	Trace
<i>Eriogonum flavum</i>	Trace
<i>Bromus inermis</i>	1
<i>Sphaeralcea coccinea</i>	Trace
	100%

Writeup #7

	<u>%</u>
<i>Agropyron cristatum</i>	96
<i>Melilotus officinalis</i>	Trace
<i>Agropyron smithii</i>	1
<i>Ceratoides lanata</i>	Trace
<i>Tragopogon dubius</i>	Trace
<i>Sphaeralcea coccinea</i>	Trace
<i>Artemisia frigida</i>	3
<i>Medicago sativa</i>	Trace
<i>Stipa spartea</i>	Trace
<i>Echinacea angustifolia</i>	Trace
<i>Gutierrezia sarothrae</i>	Trace
<i>Lupinus argenteus</i>	Trace
	100%

Writeup #8

<i>Ceratoides lanata</i>	2
<i>Artemisia frigida</i>	18
<i>Bouteloua gracilis</i>	14
<i>Melilotus officinalis</i>	1
<i>Stipa comata</i>	31
<i>Atriplex nuttallii</i>	Trace
<i>Agropyron smithii</i>	29
<i>Plantago spinulosa</i>	1
<i>Gutierrezia sarothrae</i>	Trace
<i>Tragopogon dubius</i>	Trace
<i>Poa sandbergii</i>	2
<i>Agropyron cristatum</i>	Trace
<i>Carex filifolia</i>	2
<i>Ratibida columnaris</i>	Trace
	100%

Writeup #9

<i>Bouteloua gracilis</i>	35
<i>Artemisia frigida</i>	2
<i>Agropyron smithii</i>	20
<i>Stipa comata</i>	22
<i>Ceratoides lanata</i>	4
<i>Plantago spinulosa</i>	1
<i>Agropyron cristatum</i>	9
<i>Melilotus officinalis</i>	1
<i>Carex filifolia</i>	6
<i>Lupinus argenteus</i>	Trace
<i>Tragopogon dubius</i>	Trace
<i>Opuntia polyacantha</i>	Trace

Writeup #9 (cont.)

	<u>%</u>
<i>Allium</i> sp.	Trace
<i>Sphaeralcea coccinea</i>	Trace
<i>Rosa arkansana</i>	Trace
<i>Calamovilfa longifolia</i>	Trace
<i>Stipa spartea</i>	Trace
	100%

Writeup #10

<i>Agropyron cristatum</i>	96
<i>Artemisia frigida</i>	Trace
<i>Ceratoides lanata</i>	Trace
<i>Thlaspi arvense</i>	Trace
<i>Melilotus officinalis</i>	4
<i>Arabis</i> sp.	Trace
	100%

Writeup #11

<i>Stipa comata</i>	70
<i>Artemisia frigida</i>	4
<i>Plantago spinulosa</i>	1
<i>Ceratoides lanata</i>	2
<i>Agropyron cristatum</i>	1
<i>Koeleria cristata</i>	7
<i>Lupinus argenteus</i>	Trace
<i>Gutierrezia sarothrae</i>	Trace
<i>Carex filifolia</i>	3
<i>Bouteloua gracilis</i>	10
<i>Agropyron smithii</i>	2
	100%

Writeup #12

<i>Agropyron cristatum</i>	93
<i>Hordeum jubatum</i>	Trace
<i>Sphaeralcea coccinea</i>	1
<i>Ceratoides lanata</i>	1
<i>Artemisia frigida</i>	3
<i>Plantago spinulosa</i>	1
<i>Bouteloua gracilis</i>	1
<i>Melilotus officinalis</i>	Trace
<i>Medicago sativa</i>	Trace
<i>Lupinus argenteus</i>	Trace
<i>Tragopogon dubius</i>	Trace
<i>Stipa comata</i>	Trace
<i>Agropyron smithii</i>	Trace
	100%

Writeup #13

	<u>%</u>
<i>Kochia scoparia</i>	92
<i>Thlaspi arvense</i>	1
<i>Chenopodium album</i>	3
<i>Agropyron smithii</i>	4
<i>Rumex crispus</i>	<u>Trace</u>
	100%

Writeup #14

<i>Bouteloua gracilis</i>	24
<i>Agropyron smithii</i>	3
<i>Plantago spinulosa</i>	2
<i>Stipa comata</i>	44
<i>Medicago sativa</i>	Trace
<i>Agropyron cristatum</i>	1
<i>Artemisia frigida</i>	22
<i>Petalostemon purpureum</i>	Trace
<i>Gutierrezia sarothrae</i>	Trace
<i>Lupinus argenteus</i>	Trace
<i>Carex filifolia</i>	3
<i>Melilotus officinalis</i>	1
<i>Oxytropis sericea</i>	Trace
<i>Allium</i> sp.	Trace
<i>Tragopogon dubius</i>	Trace
<i>Astragalus</i> sp.	<u>Trace</u>
	100%

Writeup #15

<i>Agropyron cristatum</i>	91
<i>Medicago sativa</i>	2
<i>Bromus inermis</i>	<u>7</u>
	100%

Writeup #16

<i>Bromus inermis</i>	76
<i>Robinia pseudoacacia</i>	1
<i>Ulmus</i> sp.	1
<i>Medicago sativa</i>	1
<i>Melilotus officinalis</i>	Trace
<i>Tragopogon dubius</i>	Trace
<i>Hordeum jubatum</i>	Trace
<i>Bromus japonicus</i>	1
<i>Agropyron cristatum</i>	5
<i>Rumex crispus</i>	<u>Trace</u>

Writeup #16 (cont.)

	<u>%</u>
<i>Lactuca pulchella</i>	Trace
<i>Thlaspi arvense</i>	1
<i>Chenopodium album</i>	1
<i>Eleagnus angustifolia</i>	13
<i>Cirsium arvense</i>	Trace
<i>Arabis</i> sp.	<u>Trace</u>
	100%

Writeup #17

<i>Bromus inermis</i>	84
<i>Agropyron cristatum</i>	1
<i>Medicago sativa</i>	15
<i>Melilotus officinalis</i>	<u>Trace</u>
	100%

Writeup #18

<i>Agropyron smithii</i>	12
<i>Agropyron cristatum</i>	68
<i>Melilotus officinalis</i>	13
<i>Artemisia frigida</i>	Trace
<i>Achillea millefolium</i>	Trace
<i>Artemisia cana</i>	Trace
<i>Kochia scoparia</i>	7
<i>Helianthus annuus</i>	Trace
<i>Hordeum jubatum</i>	<u>Trace</u>
	100%

Writeup #19

<i>Medicago sativa</i>	93
<i>Vicia americana</i>	Trace
<i>Thlaspi arvense</i>	6
<i>Bromus inermis</i>	1
<i>Hordeum jubatum</i>	Trace
<i>Agropyron cristatum</i>	Trace
<i>Arabis</i> sp.	<u>Trace</u>
	100%

Writeup #20

	<u>%</u>
<i>Poa pratensis</i>	3
<i>Medicago sativa</i>	44
<i>Bromus inermis</i>	52
<i>Agropyron cristatum</i>	Trace
<i>Agropyron smithii</i>	1
<i>Arabis</i> sp.	Trace
<i>Thalaspi arvense</i>	Trace
	100%

Writeup #21

<i>Poa pratensis</i>	3
<i>Medicago sativa</i>	89
<i>Bromus inermis</i>	7
<i>Agropyron smithii</i>	1
<i>Thalaspi arvense</i>	Trace
	100%

Writeup #22

<i>Echinochloa crusgalli</i>	Trace
<i>Phragmites communis</i>	Trace
<i>Phalaris arundinacea</i>	85
<i>Carex nebraskensis</i>	1
<i>Juncus</i> spp.	2
<i>Carex</i> spp.	2
<i>Hordeum jubatum</i>	Trace
<i>Potentilla anserina</i>	1
<i>Equisetum arvense</i>	Trace
<i>Salix exigua</i>	Trace
<i>Salix</i> spp.	Trace
<i>Agropyron smithii</i>	8
<i>Typha latifolia</i>	Trace
<i>Ranunculus cymbalaria</i>	Trace
<i>Elymus canadensis</i>	Trace
<i>Spartina pectinata</i>	1
	100%

Writeup #23

<i>Salix exigua</i>	78
<i>Salix</i> spp.	12
<i>Cornus stolonifera</i>	2
<i>Equisetum arvense</i>	3
<i>Glycyrrhiza lepidota</i>	5
<i>Phragmites communis</i>	Trace
	100%

Writeup #24

	<u>%</u>
<i>Salix exigua</i>	1
<i>Salix</i> sp.	Trace
<i>Populus deltoides</i>	6
<i>Cornus stolonifera</i>	1
<i>Glycyrrhiza lepidota</i>	Trace
<i>Equisetum arvense</i>	1
<i>Rosa woodsii</i>	1
<i>Poa pratensis</i>	2
<i>Elymus canadensis</i>	Trace
<i>Agropyron smithii</i>	7
<i>Agrostis alba</i>	Trace
<i>Apocynum cannabinum</i>	Trace
<i>Symphoricarpos occidentalis</i>	2
<i>Fraxinus pennsylvanica</i>	72
<i>Ribes cereum</i>	Trace
<i>Prunus virginiana</i>	2
<i>Bromus inermis</i>	4
<i>Acer negundo</i>	1
<i>Lactuca pulchella</i>	Trace
<i>Asparagus officinalis</i>	Trace
<i>Prunus americana</i>	Trace
<i>Rhus radicans</i>	Trace
<i>Smilacina stellata</i>	Trace
	100%

Writeup #25

<i>Agropyron smithii</i>	24
<i>Agropyron cristatum</i>	6
<i>Agrostis alba</i>	Trace
<i>Melilotus officinalis</i>	55
<i>Euphorbia esula</i>	4
<i>Shepherdia canadensis</i>	Trace
<i>Phragmites communis</i>	Trace
<i>Typha latifolia</i>	Trace
<i>Artemisia cana</i>	1
<i>Artemisia ludoviciana</i>	Trace
<i>Hordeum jubatum</i>	Trace
<i>Poa pratensis</i>	1
<i>Medicago sativa</i>	Trace
<i>Phalaris arundinacea</i>	Trace
<i>Bromus inermis</i>	5
<i>Tragopogon dubius</i>	Trace
<i>Prunus virginiana</i>	Trace
<i>Rosa woodsii</i>	Trace
<i>Apocynum cannabinum</i>	Trace
<i>Salix</i> sp.	Trace
<i>Cirsium arvense</i>	Trace

Writeup #25 (cont.)

	<u>%</u>
<i>Ribes aureum</i>	Trace
<i>Artemisia frigida</i>	3
<i>Stipa comata</i>	1
<i>Atriplex nuttallii</i>	Trace
<i>Asclepias speciosa</i>	Trace
<i>Stipa viridula</i>	Trace
<i>Opuntia polyacantha</i>	<u>Trace</u>
	100%

Writeup #26

<i>Artemisia cana</i>	Trace
<i>Bromus inermis</i>	38
<i>Artemisia ludoviciana</i>	Trace
<i>Melilotus officinalis</i>	7
<i>Agropyron cristatum</i>	55
<i>Vicia americana</i>	Trace
<i>Tragopogon dubius</i>	Trace
<i>Medicago sativa</i>	Trace
<i>Poa pratensis</i>	Trace
<i>Arabis sp.</i>	Trace
<i>Thlaspi arvense</i>	<u>Trace</u>
	100%

Writeup #27

<i>Bromus inermis</i>	52
<i>Melilotus officinalis</i>	25
<i>Agropyron cristatum</i>	5
<i>Vicia americana</i>	Trace
<i>Medicago sativa</i>	18
<i>Poa pratensis</i>	Trace
<i>Arabis sp.</i>	Trace
<i>Thlaspi arvense</i>	<u>Trace</u>
	100%

Writeup #28

<i>Bromus inermis</i>	12
<i>Melilotus officinalis</i>	Trace
<i>Agropyron cristatum</i>	42
<i>Vicia americana</i>	Trace
<i>Tragopogon dubius</i>	Trace
<i>Medicago sativa</i>	31
<i>Poa pratensis</i>	13
<i>Arabis sp.</i>	2

Writeup #28 (cont.)

	<u>%</u>
<i>Thlaspi arvense</i>	Trace
<i>Hordeum jubatum</i>	Trace
<i>Stipa viridula</i>	<u>Trace</u>
	100%

Writeup #29

<i>Bromus inermis</i>	32
<i>Medicago sativa</i>	27
<i>Agropyron cristatum</i>	33
<i>Arabis</i>	Trace
<i>Thlaspi arvense</i>	1
<i>Vicia americana</i>	Trace
<i>Agropyron smithii</i>	<u>7</u>
	100%

Writeup #30

<i>Melilotus officinalis</i>	21
<i>Bromus inermis</i>	72
<i>Agropyron cristatum</i>	<u>7</u>
	100%

Writeup #31

This area around the visitor center and fort site has been mowed, so that positive identification of plants is not possible. However, the major plant is crested wheatgrass.

Appendix 2. List of Exotic Plant Species on the Fort Union Trading Post Site.

Grasses:

Agropyron cristatum
Agrostis alba
Bromus inermis
Bromus japonicus
Poa pratensis

Forbs:

Kochia scoparia
Medicago sativa
Melilotus officinalis
Tragopogon dubius

Trees and Shrubs:

Eleagnus angustifolia
Robinia pseudoacacia

Appendix 3. Scientific and Common Names of Plant Species Referenced in the Text.

Grasses and Grass-like:

<i>Agropyron cristatum</i>	Crested wheatgrass
<i>Agropyron dasystachyum</i>	Thickspike wheatgrass
<i>Agropyron smithii</i>	Western wheatgrass
<i>Agropyron trachycaulum</i>	Slender wheatgrass
<i>Agrostis alba</i>	Redtop
<i>Bouteloua curtipendula</i>	Sideoats grama
<i>Bouteloua gracilis</i>	Blue grama
<i>Bromus inermis</i>	Smooth brome
<i>Bromus japonicus</i>	Japanese brome
<i>Calabagrostis monanensis</i>	Plains reedgrass
<i>Calamovilfa longifolia</i>	Prairie sand reedgrass
<i>Carex</i> spp.	Sedges
<i>Carex eleocharis</i>	Needleleaf sedge
<i>Carex filifolia</i>	Threadlead sedge
<i>Carex nebraskensis</i>	Nebraska sedge
<i>Distichlis stricta</i>	Inland saltgrass
<i>Echinochloa crusgalli</i>	Barneyard grass
<i>Elymus canadensis</i>	Canada wildrye
<i>Hordeum jubatum</i>	Foxtail barley
<i>Juncus</i> spp.	Rushes
<i>Koeleria cristata</i>	Prairie junegrass
<i>Muhlenbergia cuspidata</i>	Plains muhly
<i>Phalaris arundinacea</i>	Reed canarygrass
<i>Phragmites communis</i>	Common reedgrass
<i>Poa cusickii</i>	Cusick bluegrass
<i>Poa pratensis</i>	Kentucky bluegrass
<i>Poa sandbergii</i>	Sandberg bluegrass
<i>Schizachyrium scoparius</i>	Little bluestem
<i>Spartina pectinata</i>	Prairie cordgrass
<i>Sporobolus cryptandrus</i>	Sand dropseed
<i>Stipa comata</i>	Needle-and-thread grass
<i>Stipa spartea</i>	Porcupine grass
<i>Stipa viridula</i>	Green needlegrass

Forbs:

<i>Achillea millefolium</i>	Western yarrow
<i>Allium</i> spp.	Wild onion
<i>Apocynum cannabinum</i>	Dogbane
<i>Arabis</i> spp.	Rock cress
<i>Artemisia ludoviciana</i>	Cudweed sagewort
<i>Asclepias speciosa</i>	Showy milkweed
<i>Asparagus officinalis</i>	Wild asparagus
<i>Astragalus</i> spp.	Milkvetches
<i>Castilleja sessiliflora</i>	Downy paintbrush
<i>Chenopodium album</i>	Lamb's quarter

Chrysopsis villosa
Cirsium arvense
Echinacea angustifolia
Equisetum arvense
Eriogonum flavum
Eriogonum umbellatum
Euphorbia esula
Geum triflorum
Glycyrrhiza lepidota
Helianthus annuus
Kochia scoparia
Lactuca pulchella
Linum perenne
Linum rigidum
Lithospermum incisum
Lupinus argenteus
Medicago sativa
Melilotus officinalis
Oxytropis sericea
Petalostemon candidum
Petalostemon purpureum
Phlox
Phlox hoodii
Plantago purshii
Plantago spinulosa
Potentilla anserina
Ranunculus cymbalaria
Ratibida columnaris
Rhus radicans
Rumex crispus
Smilacina stellata
Sphaeralcea coccinea
Thlaspi arvense
Tragapogon dubius
Typha latifolia
Vicia americana

Hairy goldaster
 Canada thistle
 Pale purple-coneflower
 Common horsetail
 Yellow eriogonum
 Sulfur eriogonum
 Leafy spurge
 Prairie smoke
 Wild licorice
 Common sunflower
 Kochia
 Blue lettuce
 Blue flax
 Stiffstem flax
 Cleft gromwell
 Lupine
 Alfalfa
 Yellow sweetclover
 White locoweed
 White prairie-clover
 Purple prairie-clover
 Phlox
 Hood's phlox
 Woolly plantain
 Spindle plantain
 Silverweed cinquefoil
 Shore buttercup
 Upright prairie-coneflower
 Poison ivy
 Curl dock
 Starry false solomon's-seal
 Scarlet globemallow
 Fanweed
 Western salsify
 Cattail
 American vetch

Trees and Shrubs:

Acer negundo
Amelanchier alnifolia
Artemisia cana
Artemisia frigida
Atriplex nuttallii
Ceratoides lanata
Chrysothamnus nauseosus
Cornus stolonifera
Crataegus douglasii
Eleagnus angustifolia
Fraxinus pennsylvanica

Boxelder
 Serviceberry
 Silver sagebrush
 Fringed sagebrush
 Nuttall saltbrush
 Winterfat
 Rubber rabbitbrush
 Redozier dogwood
 Douglas hawthorn
 Russian olive
 Green ash

Gutierrezia sarothrae
Juniperus horizontalis
Juniperus scopulorum
Opuntia polyacantha
Populus deltoides
Prunus americana
Prunus virginia
Rhus trilobata
Ribes aureum
Ribes cereum
Robinia pseudoacacia
Rosa arkansana
Rosa woodsii
Salix
Salix exigua
Shepherdia argentea
Shepherdia canadensis
Symphoricarpus albus
Symphoricarpus occidentalis
Ulmus
Ulmus americana
Yucca glauca

Broom snakeweed
 Horizontal juniper
 Rocky Mountain juniper
 Plains pricklypear
 Plains cottonwood
 Wild plum
 Chokecherry
 Skunkbush
 Golden currant
 Squaw currant
 Black locust
 Prairie rose
 Woods rose
 Willows
 Slender willow
 Buffalo-berry
 Canadian buffalo-berry
 Common snowberry
 Western snowberry
 Elm
 American elm
 Small soapweed

ANIMALS OF THE FORT UNION TRADING POST
AND VICINITY
The Historic and Contemporary Animal Species Present

J. H. Lowe, Jr.

This report is in three parts:

1. Appendix 1 -- A checklist of animals of Fort Union compiled from the historic record.
2. Appendix 2 -- A checklist of current animals by habitat (vegetation type).
3. Appendix 3 -- A list of accepted common names of the animals with their scientific names.

The checklist (Appendix 1) of animals cited by the explorers, naturalists, railroad and military surveys, and fur company employees was developed from the historical literature in conjunction with modern accounts of the fauna of the area, both published and by personal communication. An attempt has been made to compile as complete a listing as the scope of this study would allow. No attempt has been made to show estimated numbers in the historical period. It is generally known from the many accounts of the animals of the Northern Plains that large numbers of bison, elk, and antelope roamed the plains, and that wolves and bears existed in great abundance. The Audubon's Mountain Sheep was abundant in the nearby cliffs and mountains. Many of these species are vanished from the area now, some extinct. Of the animals lesser in size and number, only conjecture based on an understanding of the vegetation communities and their condition during the period of operation of the Fort could be made. The naturalists who traveled in the area were concerned with the acquisition of new species, and with understanding the variations upon familiar ones that they encountered (such as the "curious flicker" -- the intermediate of the then-separate Red-shafted Flicker and the Yellow-shafted Flicker, now the Common Flicker). Their accounts of specimens taken and observed, then, are not indicative of relative abundance. They were selective in their observations.

Records of the birds and mammals are the most complete; lower vertebrates and the invertebrates are scarcely noticed. The insect fauna is barely mentioned, other than by reference to "mosquitos" and "gnats." Many species of biting Diptera, such as mosquitos (Culicidae), the biting midges (Ceratopogonidae), the biting flies (Simuliidae and Tabanidae) are indigenous to the area, and exist in great annoying abundance seasonally. The enormous numbers of carcasses occasioned by natural death, the fur trade, sport-shooting, and provisioning, must surely have been the cause for the abundant presence of many scavenging insects such as the Carrion Beetles (Coleoptera: Silphidae) and the Hide Beetles (Dermestidae) although no mention was discovered of reference to these. Interestingly, the only comment in reference to the garment-infesting insects that was found, was of the absence of clothes moths (Lepidoptera: Tineidae). One presumes that the incontinuity of domiciles and the severe winter temperatures prevented their establishment in the area until towns developed.

The historical lists are presented in taxonomic order, with the inferred correct scientific name accompanying each entry. The reference or references from which the record was obtained are given. In many cases several references listed the animal. Only one reference, the most definitive, is given unless comments of interest were made, in which case the more interesting or informative as to identity are given.

The checklist (Appendix 2) of current animal species is presented by vegetation type. Only the accepted common names of the animals are given on each list for brevity; Appendix 3 lists in taxonomic order the common name and the scientific name, for reference.

APPENDIX 1

A checklist of animals of Fort Union compiled from the historic record.

(letter says to examine 100)

FISHES

1. "Stizostedion boreus." Sauger (S. canadensis). (The Walleye (S. vitreum) now present, is an introduced species.) (e)
2. "Scaphirhynchus platyrhynchus." Shovelnose Sturgeon (S. platyrhynchus). (e)
3. "Catfish." Channel Catfish (Ictalurus punctatus) or Stonecat (Noturus flavus). Both fish are native and present in the Missouri River. The Black Bullhead (I. melas) and the Yellow Bullhead (I. natalis) are introduced; the latter is primarily up in the Yellowstone River. (many references)

SALAMANDERS

1. "Siredon lichenoides, ? Baird. 'Ground puppy'; 'Four-legged Fish.'" ? Allusion to ground puppy usually meant mud puppy; size would suggest the Tiger Salamander (Ambystoma tigrinum). (f)

TOADS

1. "Tapaya douglasii, Girard. The Oregon Horned Toad." ? This may refer to a specimen from elsewhere. The most likely collections from the Fort Union area would be: Great Plains Toad (Bufo cognatus); Plains Spadefoot (Scaphiopus bombifrons); and, least likely, Dakota Toad (B. hemiophrys). (f)

SNAKES

1. "Snake Colubar proximus. Racer (C. constrictor)." (d)
2. "(Audubon saw) ... Common garter (Snake)." Indeterminate. (Thamnophis spp.) Three Garter Snakes are found in the vicinity of Fort Union: Common Garter Snake (T. sirtalis), Western Garter Snake (T. elegans), and Plains Garter Snake (T. radix). (i)
3. "(Audubon saw) ... one copperhead." ? Copperhead (Agkistrodon mokasin). Ft. Union is very much beyond the range. (i)
4. "Crotalus confluentus (Say). Prairie Rattlesnake ... very numerous (at) Fort Union." Prairie Rattlesnake (C. viridis). (f)
5. "tortoise ... resembles Emys picta." Painted Turtle (Chrysemes picta). (d)

BIRDS

1. "California grebe. Podiceps californicus." Either Pied-billed Grebe (Podilymbus podiceps), Eared Grebe (Podiceps nigricollis); possibly Horned Grebe (P. auritus) or Western Grebe (Aechmophorus occidentalis). (e)
2. "Swans." Either Trumpeter Swan (Olor buccinator) (especially if nesting) or Whistling Swan (O. columbianus) (esp. if migrating). (b) (c)
 "trumpeter swan. Cygnus buccinator." (e)
3. "Wild geese." No description. Probably Canada Goose (Branta canadensis), Snow Goose (Chen caerulescens), or White-fronted Goose (Anser albifrons), in declining order of likelihood. (a) (c)
 "snow goose. Anser hyperboreus. (e)
 "white-fronted goose. A. gambeli." (e)
4. "Mallard. Anos boschos." Mallard (A. platyrhynchos). (e)
5. "gadwall duck." Gadwall (Anos strepera). (b)
6. "Pintails." Pintail (Anos acuta). (a)
7. "hooded merganser." Hooded Merganser (Lophodytis cucullatus). (e)
8. "goosander, sheldrake, fish duck. Mergus americanus." Either Common Merganser (M. merganser), Hooded Merganser (Lophodytes cucullatus) or Red-breasted Merganser (M. serrator). (e)
9. "buzzard" If vulture, then Turkey Vulture (Cathartes aura). May be a large buteo. (a)
 "Turkey Buzzard." (b)
10. "Swainson's buzzard." Swainson's Hawk (Buteo swainsoni). (e)
11. "hawk ... with white head and breast, differing entirely from the Fish Hawk...." Ferruginous Hawk (Buteo regalis). (a)
 "hawk, size of red-tailed, whole head white." (b)
12. "Golden eagle." (Aquila chrysaeton). (a) (b)
13. "White-headed eagle." Bald Eagle (Haliaeetus leucocephalus) (b) (c)
14. "Sparrow hawk." American Kestrel (Falco sparverius). (a) (b) (e) (g)

15. "Sharp-tailed grouse." Sharp-tailed Grouse (Pediacetes phasianellus)
(a) (e) (g)

"grouse with black breast and with a broad tail; usually near the margin of a wood." Description is contradictory; habitat description suggests Sharp-tailed Grouse, even though the tail, normally held, is pointed. The mountain grouse, ruffed grouse, and prairie chickens are not known from this area. (b)
16. "plain (Sage Grouse. Centrocercus urophasianus.)" Sage Grouse (C. urophasianus). (b)

"sage cock; cock of the plains." (e) (g)
17. "Common crane." Sandhill crane (Grus canadensis). (a)

"Sand-hill crane." (b)
18. "coat, poule d' eau, mud hen." American Coot (Fulica americana). (e)
19. "kill-deer. Aegialitis vociferus." Killdeer (Charadrius vociferus). (e)
20. "mountain plover. Aegialitis montanus." Mountain Plover (Charadrius montanus). (e) (h)
21. "Curlews." Long-billed curlew (Numenius americanus). The resident curlew in this area. (a)
22. "Bartram's Sandpiper." Upland Sandpiper (Upland Plover) (Bartramia longicauda.) (a)

"Bartram's sandpiper, field plover. Actiturus bartramius." (e)
23. "spotted sandpiper. Tringoides macularius." Spotted Sandpiper (Actitus macularia). (e)
24. "solitary sandpiper. Rhyacophilus solitarius." Solitary Sandpiper (Tringa solitaria). (e)
25. "Marbled godwit." Marbled Godwit (Limosa fedoa). (e)
26. "American avoset (sic)." American avocet (Recurvirostra americana). (e)
27. "large white gulls." Either California Gull (Larus californicus) or Herring Gull (L. argentatus) or, less likely (based on size) Ring-billed Gull (L. delawarensis). (c)
28. "Black tern." Probably Forster's Tern (Sterna forsteri). (b)

"least tern. Sterna frenata." Probably either Forster's Tern (S. forsteri) or Common Tern (S. hirundo). (c)

29. "Wild pigeons." Unclear. The Mourning Dove (Zenaida macroura) would have been familiar to the observers. Breeding of the Passenger Pigeon (Ectopistes migratorius) in this area is questioned (cf. Skaar). The Rock Dove (Columbia livia) is feral now in this area. (a)
- "pigeon." (c)
- "wild pigeon, passenger pigeon. E. Migratoria." (e)
- "... bird in immature plumage which I took to be this species...." (g)
30. "great Virginian long-eared owl." Probably Great Horned Owl (Bubo virginianus) rather than Long-eared Owl (Asio otus) based on vernacular usage and paucity of records of the latter in this area. (a)
- "great horned owl." (e)
31. "owl ... took for the barred one." Possibly Barred Owl (Strix varia); it has been moving into the West. (b)
32. "long-eared owl. Otus wilsonia." Identified by both the (old) scientific name and the vernacular name. No record from this exact locality, few from general area. (g)
33. "Goatsucker (Nuttall's whip-poor-will)." The Poorwill (Phalaenoptilus nuttallii) is not recorded from this area. The similar (in appearance when resting) Common Nighthawk (Chordeiles minor) is abundant. (a) (e)
34. "night hawk, bull bat. Chordeiles popetue." Common Nighthawk (C. minor). (f)
35. "Belted king fisher." Belted Kingfisher (Megaceryle alcyon). (e) (f)
36. "Yellow winged woodpecker with a red stripe on the cheek..."; "of intermediate color between the Yellow-shafted and the Red-shafted...." "Common Flicker (Colaptes auratus.) (a)
- "Curious flicker of the Upper Missouri region." (b)
- "hybrid ... (woodpecker). C. hybridus." (e)
- "Red-shafted flicker. C. mexicana." (f). "C. hybridus." (h)
37. "Black Wood Cock; log cock. Hylatomus pileatus." Pileated Woodpecker (Dryocopus pileatus.) (f)

There are no records of the pileated woodpecker from this area. The old name (Hylatomus) and the vernacular names (above), are such definite statements, and this large bird is so unmistakable, that we must include this as a sighting.

38. "Harris's woodpecker, or Canada woodpecker." Probably Hairy Woodpecker (Picoides villosus). The similar-sized woodpeckers of more northerly affinity, the Black-backed Three-toed (P. arcticus) and the Northern Three-toed (P. tridactylus) are not recorded here. (a)
39. "red-headed woodpecker." Red-headed Woodpecker (Melanerpes erythrocephalus). (e)
40. "Lewis's woodpecker. Melanerpes torquatus." The Lewis' Woodpecker (M. lewis) is distinctive and not recorded from this area. This observation is questionable. (f)
41. "Tyrannus carolinensis. King bird or Bee martin." Eastern Kingbird (T. tyrannus). (e) (f)
42. "Arkansas flycatcher." Probably Western Kingbird (Tyrannus verticalis.) (a) (b) (e) (f)
43. "Say's flycatcher." Say's Phoebe (Sayornis saya). (a) (e)
"S. sayus." (h)
44. "Empidonax pusillus." ? The only Empidonax flycatcher from this area is the Least Flycatcher (E. minimus). The Willow Flycatcher (E. traillii) may inhabit this area. (f)
45. "Skylark; shore lark. Eremophila cornuta." Either Horned Lark (Eremophila alpestris) or Sprague's Pipit (Anthus spragueii) often called "Sprague's lark" in these early journals. (e)
46. "black Prairie Lark Finch of the species brought from Columbia by Townsend and Nuttall." Horned Lark (Eremophila alpestris). (b)
47. "barn swallow. Hirundo horreorum." Barn swallow (H. rustica.)
48. "Cliff Swallows." Cliff Swallows (Petrochelidon pyrrhonata). (b)
49. "purple martin. Progne purpurea." Purple Martin (P. subis). (e)
50. "Magpies." Black-billed magpie (Pica pica). (a) (c)
"magpie. Pica hudsonica." (e) (f)
51. "Ravens." Common Raven (Corvus corax). (b)
52. "Clarke's crow. Picicorus columbianus." Clark's Nutcracker (Nucifraga columbiana). (e) (g)
53. "Titmouse, black-headed...; Titmouse, very similar to Northern Chickadee." Black-capped Chickadee (Parus atricapillus). (a)
54. "Short-billed Marsh Wren of Nuttall." Short-billed Marsh Wren (Cistothorus platensis). (b)

55. "Rock wren or Rocky Mountain anteater of Say." Rock Wren (Salpinctes obsoletus). (a) (b) (e)
 "Parkman's Wren. Troglodytes parkmanni." From comment on range of the bird sighted, Rock Wren. (h)
56. "Brown Thrush. Harporhynchus rufus." Brown Thrasher (Toxostoma rufum). (h)
57. "robin. Turdus migratorius." Robin (T. migratorius). (e) (f)
58. "varied thrush, painted robin. Turdus naevius." ? The Varied Thrush (Ixoreus naevius), to which this is clearly a reference, is not recorded from this area.
59. "gray-checked thrush. Turdus aliciae." Very unlikely. Probably Swainson's Thrush (Hylocichla ustulata) or Veery (H. fuscescens). (e)
60. "Arctic bluebird." Mountain bluebird (Sialia currucoides). (a) (b)
 "Rocky Mountain blue bird. Sialia arctica." (e) (h)
61. "Shore lark." "Anthus or Titlark (Missouri Titlark which Audubon named for Sprague here)." Either Sprague's Pipit (Anthus spragueii), the more likely, or Water Pipit (Motocilla spinoletta). (a)
 "Arctic ground finch." "Sprague's Lark. (b) "Missouri skylark, Neocorys spraguei (sic)." (e)
62. "cedar bird. Ampelis cedrorum." Cedar Waxwing (Bombycilla cedrorum). (e)
63. "Shrike." Probably Loggerhead Shrike (Lanius ludovicianus). (a)
 (b) "Loggerhead Shrike." (b) "White-rumped shrike, Callyrio excubitoroides." (e) (h)
64. "Bell's vireo. Vireo belli." Very unlikely. Probably either Red-eyed Vireo (Vireo olivaceus) or Warbling Vireo (V. gilvus). (e)
65. Tennessee warbler. Helminthophaga peregrina." Rather unlikely. More likely: Warbling Vireo (Vireo gilvus) or Red-eyed Vireo (V. olivaceus). (e)
66. "Yellow warbler. Dendroica aestiva." Yellow Warbler (D. petichia). (e)
67. "red start." American Redstart (Setaphoga ruticilla). (e)
68. "Bob-o-link." "Rice birds." Bobolink (Dolichonyx oryzivorus). (a).
69. "New meadow lark." Western meadow lark (Sturnella neglecta). (a)
 "western lark." (e) (g)

70. "Yellowheaded blackbird. Xanthocephalus icterocephalus." Yellow-headed Blackbird (X. xanthocephalus). (e)
71. "Common Red-winged Starling." Red-winged Blackbird (Agelaius phoeniceus). (b)
72. "Baltimore oriole. Icterus baltimore." Northern Oriole (I. galbula). (e)
73. "Rusty Grackle (Brewer's blackbird)." Either common Grackle (Quiscolus quiscola) or Brewer's Blackbird (Euphagus cyanocephalus). Rusty Blackbird (E. carolinus) unlikely. (a)

 "Blackbird. Quiscolus brewerii of Audubon = Scolecophagus cyano-philus. Had already been described by Wagler from Mexico as Psarocolius cyanophalus. (b)

 "Brewer's blackbird. Scolecophagus cyanociphalus." (E. cyanocephalus). (e)
74. "Cow black bird. Cowbird. Molothrus pecoris." Brown-headed cowbird (M. ater). (e)
75. "Western tanager (Louisiana tanager) Piranga ludoviciana." Western Tanager (P. ludoviciana). (c)
76. "Blackheaded Grosbeak." Blackheaded Grosbeak (Pheucticus melanocephalus). (a) (b)

 "Black-headed grosbeak. Gueraca (sic) melanocephala." (e)

 "Pine finch. Chrysometris pinus." ?
77. "Lazuli finch." Lazuli Bunting (Passerina amoena). (a) (b)

 "Lazuli finch. Cyanospiza amoena. (e)
78. "robin. Pipilo arcticus." ? Possibly Rufus-sided Towhee (Pipilo erythrophthalmus) (e) "P. arcticus." (h)
79. "Lark bunting." Lark Bunting (Calamospiza melanocorys). (a)

 "Arctic ground finch." (b)
80. "Baird's Bunting." Baird's Sparrow (Ammodramus bairdii). (a)
81. "finch ... resembles Henslow's Bunting, its note similar to the short-billed Marsh wren of Nuttall." Probably LeConte's Sparrow (Passerberbulus caudacutus). (a)
82. "Bay winged Buntings." Vesper sparrow (Poocetes gramineus). (a)

 "grass finch; bay-winged bunting. P. gramineus." (e)

83. "lark finch. Chondestes grammaca." Lark Sparrow (C. grammacus).
(e)
84. "Enberiza pallida." Clay-colored sparrow (Spizella pallida). (a)
"Clay-colored bunting." (e) (h)
85. "field sparrow." Field Sparrow (Spizella pusilla). (e)
86. "Harris' finch." Harris' Sparrow (Zonotrichia querula). (e)
87. "White-crowned sparrow." White-crowned Sparrow (Zonotrichia leucophrys). (e)
88. "Lincoln's finch." Lincoln's Sparrow (Melospiza lincolni). (e)
89. "Chestnut-collared Lark finch." Chestnut-collared Longspur (Calcarius ornatus). (a)
"Red-collared Ground Finch = Chestnut-collared Longspur (Calcarius ornatus)."
"Black-breasted Prairie Bunting." (b)
"Chestnut-collared bunting. Plectrophanes ornatus." Snow Bunting
(Plectrophenax nivalis) unlikely. (e) (h)

MAMMALS

1. "Sorex cooperi. Hayden's Shrew (S. haydeni).\" Indeterminate. Most likely Masked Shrew (S. cinereus) or the more uncommon Merriam Shrew (S. merriami). (e)
2. "black bear on White Earth River ... 'rare' ..." Black Bear (Ursus americanus). (b)
3. "grizzly bear." Grizzly Bear (Ursus horribilus). (b)
"bear. Ursus ferox." (d)
(e)
4. "Putorius longicauda. ermine." Short-tailed Weasel (Mustela erminea). (e)
5. "Gulo luscus. Wolverine. Wolverine (G. gulo). (e)
6. "Mephitis mephitis. Skunk." Striped Skunk (M. mephitis). (e)
7. "badger." Badger (Taxidea taxus). (a)
"T. americana. American badger." (e)
8. "Otter." River Otter (Lutra canadensis). (b)
9. "Red Fox." Red Fox (Vulpes vulpes). (a)
"Red Fox. Vulpes utah or V. macrouris. W. variety of the Common Red Fox, V. fulvus (sic) macrouris." (b)
Possibly refers to Kit Fox (V. macrotis).
10. "Swift fox" Swift Fox (Vulpes velox). (a)
"Kit fox." "Kit or Swift Fox." (b)
"prairie fox." (d)
"Vulpes macrouris. Prairie fox. V. velox. Kit or swift fox." (e)
Swift and kit foxes are now rare, the latter possibly extinct.
11. "Canis latrans (Say). Prairie wolf, coyote." Coyote (C. latrans). (e)
12. "white wolf." Gray Wolf (Timber Wolf) (Canis lupus). (b)
"wolf." (d)
"Canis occidentalis var. griseoallius. gray wolf." "Canis occidentalis var. nubilus. dusky wolf." (e)

13. "Felis concolor. The American panther." Mountain Lion (F. concolor). (e)
14. "Lynx canadensis. Canadian Lynx (L. canadensis). (e)
15. "Spermophile." "Spermophilus hoodii of Richardson = S. tridecemlineatus or Federation spermophile; variety found at Fort Union is S. t. pallidus." Thirteen-lined Ground Squirrel (Citellus tridecemlineatus). (b)
S. tridecem-lineatus. Stripped (sic) prairie squirrel." (e)
16. "Cynomys ludovicianus. Missouri prairie dog. Blacktail Prairie Dog (C. ludovicianus). (e)
17. "Small Tamias." Least Chipmunk (Eutamias minimus). (b)
Tamias quadrivittatus." Possibly E. minimus. The Colorado chipmunk (E. quadrivittatus) is not found in this area. (b) (d)
T. quadrivittatus." (e)
18. "Thomomys rufescens. Fort Union Gopher." Probably Northern Pocket Gopher (Thomomys talpoides). (e)
19. "beaver." Beaver (Castor canadensis). (d)
C. canadensis. American beaver. (e)
20. "mouse." Indeterminate. Most probably Harvest Mouse (Reithrodontomys megalotis) or Northern Grasshopper mouse (Onychomys leucogaster); possibly Deer Mouse (Peromyscus maniculatus) or White-footed Mouse (P. leucopus). (d)
21. "Neotoma cinerea." Bushytail Woodrat (N. cinerea). (e)
22. "Muskrat." Muskrat (Ondatra zibethica). (b) (d)
23. "Jaculus hudsonius. jumping mouse." Probably Prairie (or Meadow) Jumping Mouse (Zapus judsonius). (e)
24. "porcupine. ... species entirely different from those of our northern states and Canada." ? Porcupine (Erethizon dorsatum) (a)
 "porcupine." (b)
E. epixanthus. Yellow-haired porcupine." (e)
25. "Townsend hares." Whitetail Jackrabbit (Lepus townsendi). (a)
 "Townsend's Hare." (b)
Lepus campestris. Prairie hare." (e)

26. "hare. ...less in size than the common rabbit, with short ears and legs and a slender head, its feet and claws are completely hidden in a strong covering of hairs...." Probably the Desert Cottontail (Sylvilogus auduboni). Possibly Eastern Cottontail (S. floridans) or Mountain cottontail (S. nuttalli). (a)
- "small hare. Lepus artemisia. Now generally rated as a subspecies of common cottontail, L. sylvaticus." (b)
- "L. sylvaticus. gray rabbit." "L. artemesia. sage rabbit." (e)
27. "elk." Elk (Wapiti) (Cervus canadensis). (d)
- "Cervus canadensis. American elk." (e)
28. "Long-tailed deer." Whitetail Deer (Odocoileus virginianus).
- "Cervus leucurus. White-tailed deer." (e)
29. "Common deer." "Mule or Black-tailed Deer." Mule Deer (Odocoileus hemionus). (a)
- "Cervus macroles. Mule deer." (e)
30. "antelope are called Kabri (or cabri)..." Pronghorn (Antilocapra americana). (a)
- Comment that: antelope (is) next in abundance to bison. (c) (d) (e)
31. "buffalo." Bison (Buffalo) (Bison bison). (d)
- "Bos americanus. American buffalo." (e)
32. "Bighorns." Bighorn Sheep (Ovis canadensis). This was the Audubon's Bighorn (O. c. auduboni). (a)
- "O. montana. mountain sheep, bighorn." (e)

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APPENDIX 2

A checklist of current animals by habitat (vegetation type).

BIRDS BY HABITAT

Hardwood Bottomlands and Shrub Communities

Great Horned Owl
Red-headed Woodpecker
Hairy Woodpecker
Downy Woodpecker
Western Wood Pewee
Tree Swallow
House Wren
Gray Catbird
Red-eyed Vireo
Warbling Vireo
Yellow Warbler
Rufous-sided Towhee

Mixed -- Prairies and Woods

Turkey Vulture
Red-tailed Hawk
Ferruginous Hawk
Golden Eagle
Bald Eagle
Marsh Hawk
Prairie Falcon
Merlin
American Kestrel
Rock Dove
Mourning Dove
Common Flicker
Eastern Kingbird
Western Kingbird
Black-billed Magpie
Common Raven
Common Crow
Black-capped Chickadee
American Robin
Mountain Bluebird
Bohemian Waxwing
Cedar Waxwing
Starling
House Sparrow
Northern Oriole
Lazuli Bunting
American Goldfinch
Chipping Sparrow
Song Sparrow

Prairie (Sagebrush)

Sharp-tailed Grouse
Sage Grouse
Ring-necked Pheasant
Gray Partridge
Sora
Killdeer
Upland Sandpiper
Burrowing Owl
Short-eared Owl
Common Nighthawk
Horned Lark
Bank Swallow
Rough-winged Swallow
Barn Swallow
Cliff Swallow
Rock Wren
Sprague's Pipit
Loggerhead Shrike
Bobolink
Western Meadowlark
Lark Bunting
Savannah Sparrow
Grasshopper Sparrow
Vesper Sparrow
Lark Sparrow
Chipping Sparrow
Clay-colored Sparrow
Brewer's Sparrow

Shore (Including Willow Bottomlands and Shrub Communities)

Killdeer
Common Snipe
Long-billed Curlew
Upland Sandpiper
Spotted Sandpiper
Solitary Sandpiper
Willet
American Avocet
Wilson's Phalarope
Short-eared Owl
Common Nighthawk
Say's Phoebe
Least Flycatcher
Western Wood Pewee
Tree Swallow
Bank Swallow
Rough-winged Swallow
Barn Swallow
Cliff Swallow

continued

Shore (cont.)

House Wren
Rock Wren
Gray Catbird
Red-eyed Vireo
Warbling Vireo
Yellow Warbler
Common Yellowthroat
Yellow-breasted Chat
American Redstart
Bobolink
Yellow-headed Blackbird
Red-winged Blackbird
Brewer's Blackbird
Common Grackle
Brown-headed Grackle
Chestnut-collared Longspur

Water (Including ponds)

Eared Grebe
Western Grebe
Pied-billed Grebe
White Pelican
Double-crested Cormorant
Great Blue Heron
Black-crowned Night Heron
American Bittern
Canada Goose
Mallard
Gadwall
Pintail
Green-winged Teal
Blue-winged TEal
American Wigeon
Northern Shoveler
Redhead
Canvasback
Lesser Scaup
Common Goldeneye
Ruddy Duck
American Coot
California Gull
Ring-billed Gull
Belted Kingfisher

MAMMALS BY HABITAT

Hardwood Bottomlands

Masked Shrew
Little Brown Bat
Little Long-eared Bat
Say Bat
Big Brown Bat
Red Bat
Hoary Bat
Silver-haired Bat
Black Bear
Long-tailed Weasel
Least Weasel
Raccoon
Red Fox
Beaver
Ord Kangaroo Rat
Harvest Mouse
Deer Mouse
White-footed Mouse
Bush-tailed Wood Rat
Meadow Vole
Muskrat
Porcupine
White-tailed Deer

Willow Bottomland

Little Brown Bat
Little Long-eared Bat
Say Bat
Big Brown Bat
Red Bat
Hoary Bat
Silver-haired Bat
Black Bear
Long-tailed Weasel
Raccoon
Beaver
Ord Kangaroo Rat
Harvest Mouse
White-footed Mouse
Bush-tailed Wood Rat
Deer Mouse
Meadow Vole
Muskrat

Upland Hills

Merriam Shrew
Grizzly Bear
Black-footed Ferret
Badger
Swift Fox
Coyote
Gray Wolf
Bobcat
Richardson Ground Squirrel
Thirteen-line Ground Squirrel
Black-tailed Prairie Dog
Least Chipmunk
Ord Kangaroo Rat
Grasshopper Mouse
Prairie Vole
White-tailed Jack Rabbit
Desert Cottontail
Elk
Mule Deer
Pronghorn Antelope
Bison

Upland Prairie

Merriam Shrew
Grizzly Bear
Black-footed Ferret
Striped Skunk
Badger
Swift Fox
Coyote
Gray Wolf
Richardson Ground Squirrel
Thirteen-line Ground Squirrel
Black-tailed Prairie Dog
Least Chipmunk
Ord Kangaroo Rat
Grasshopper Mouse
Prairie Vole
White-tailed Jack Rabbit
Desert Cottontail
Elk
Mule Deer
Pronghorn Antelope
Bison

Lowland Prairies

Merriam Shrew
Little Brown Bat
Little Long-eared Bat
Say Bat
Big Brown Bat
Red Bat
Hoary Bat
Silver-haired Bat
Grizzly Bear
Long-tailed Weasel
Black-footed Ferret
Striped Skunk
Badger
Red Fox
Swift Fox
Swift Fox
Coyote
Gray Wolf
Bobcat
Richardson Ground Squirrel
Thirteen-line Ground Squirrel
Black-tailed Prairie Dog
Least Chipmunk
Ord Kangaroo Rat
Grasshopper Mouse
Harvest Mouse
Deer Mouse
Prairie Vole
White-tailed Jack Rabbit
Desert Cottontail
Elk
Mule Deer
Pronghorn Antelope
Bison

Hardwood Draws

Masked Shrew
Least Weasel
Striped Skunk
Coyote
Mountain Lion
Bobcat
Porcupine
White-tailed Deer

River Edge

Little Brown Bat
Little Long-eared Bat
Say Bat
Big Brown Bat
Red Bat
Hoary Bat
Silver-haired Bat
Long-tailed Weasel
Mink
Otter
Raccoon
Beaver
Muskrat

APPENDIX 3

A list of accepted common names of the animals with their scientific names.

TOADS

Canadian Toad	<u>Bufo hemiophrys</u>
Great Plains Toad	<u>Bufo cognatus</u>
Rocky Mountain Toad	<u>Bufo woodhousii</u>

SNAKES

Racer	<u>Coluber constrictor</u>
Hog-nosed Snake	<u>Heterodon nasicus</u>
Bull Snake	<u>Pituophis catenifer</u>
Plains Garter Snake	<u>Thamnophis radix</u>
Common Garter Snake	<u>Thamnophis sirtalis</u>
Prairie Rattlesnake	<u>Crotalus viridis</u>

TURTLES

Common Snapping Turtle	<u>Chelydra serpentina</u>
Painted Turtle	<u>Chrysemys picta</u>
Western Spiny Softshell	<u>Trionyx spiniferus hartwegi</u>

BIRDS

Eared Grebe	<u>Podiceps nigricollis</u>
Western Grebe	<u>Aechmophorus occidentalis</u>
Pied-billed Grebe	<u>Podilymbus podiceps</u>
White Pelican	<u>Pelecanus erythrorhynchos</u>
Double-crested Cormorant	<u>Phalacrocorax auritus</u>
Great Blue Heron	<u>Ardea herodias</u>
American Bittern	<u>Botaurus lentiginosus</u>
Canada Goose	<u>Branta canadensis</u>
Mallard	<u>Anas platyrhynchos</u>
Gadwall	<u>Anas strepera</u>
Pintail	<u>Anas acuta</u>
Green-winged Teal	<u>Anas crecca</u>
Blue-winged Teal	<u>Anas discors</u>
American Wigeon	<u>Anas americana</u>
Northern Shoveler	<u>Anas clypeata</u>
Redhead	<u>Aythya americana</u>
Canvasback	<u>Aythya valisineria</u>
Lesser Scaup	<u>Aythya affinis</u>
Common Goldeneye	<u>Bucephala clangula</u>
Ruddy Duck	<u>Oxyura jamaicensis</u>
Turkey Vulture	<u>Cathartes aura</u>
Red-tailed Hawk	<u>Buteo jamaicensis</u>
Ferruginous Hawk	<u>Buteo regalis</u>
Golden Eagle	<u>Aquila chrysaetos</u>
Bald Eagle	<u>Haliaeetus leucocephalus</u>
Marsh Hawk	<u>Circus cyaneus</u>

Prairie Falcon	<u>Falco mexicanus</u>
Merlin	<u>Falco columbarius</u>
American Kestrel	<u>Falco sparverius</u>
Sharp-tailed Grouse	<u>Pediacetes phasianellus</u>
Sage Grouse	<u>Centrocercus urophasianus</u>
Ring-necked Pheasant	<u>Phasianus colchicus</u>
Gray Partridge	<u>Perdix perdix</u>
Sora	<u>Porzana carolina</u>
American Coot	<u>Fulica americana</u>
Killdeer	<u>Charadrius vociferus</u>
Common Snipe	<u>Capella gallinago</u>
Long-billed Curlew	<u>Numenius americanus</u>
Upland Sandpiper	<u>Bartramia longicauda</u>
Spotted Sandpiper	<u>Actitis macularia</u>
Solitary Sandpiper	<u>Tringa solitaria</u>
Willet	<u>Catoptrophorus semipalmatus</u>
American Avocet	<u>Recurvirostra americana</u>
Wilson's Phalarope	<u>Steganopus tricolor</u>
California Gull	<u>Larus californicus</u>
Ring-billed Gull	<u>Larus delawarensis</u>
Rock Dove	<u>Columba livia</u>
Mourning Dove	<u>Zenaida macroura</u>
Great Horned Owl	<u>Bubo virginianus</u>
Burrowing Owl	<u>Athene cunicularia</u>
Short-eared Owl	<u>Aegolius funereus</u>
Common Nighthawk	<u>Chordeiles minor</u>
Belted Kingfisher	<u>Megasceryle alcyon</u>

Common Flicker	<u>Colaptes auritus</u>
Red-headed Woodpecker	<u>Melanerpes erythrocephalus</u>
Hairy Woodpecker	<u>Picoides villosus</u>
Downy Woodpecker	<u>Picoides pubescens</u>
Eastern Kingbird	<u>Tyrannus tyrannus</u>
Western Kingbird	<u>Tyrannus verticalis</u>
Say's Phoebe	<u>Sayornis phoebe</u>
Least Flycatcher	<u>Empidonax minimus</u>
Western Wood Pewee	<u>Contopus sordidulus</u>
Horned Lark	<u>Eremophila alpestris</u>
Tree Swallow	<u>Iridoprocne bicolor</u>
Bank Swallow	<u>Riparia riparia</u>
Rough-winged Swallow	<u>Stelgidopteryx ruficollis</u>
Barn Swallow	<u>Hirundo rustica</u>
Cliff Swallow	<u>Petrochelidon pyrrhonota</u>
Black-billed Magpie	<u>Pica pica</u>
Common Raven	<u>Corvus corax</u>
Common Crow	<u>Corvus brachyrhynchos</u>
Black-capped Chickadee	<u>Parus atricapillus</u>
House Wren	<u>Troglodytes aedon</u>
Rock Wren	<u>Salpinctes obsoletus</u>
Gray Catbird	<u>Dumetella carolinensis</u>
American Robin	<u>Turdus migratorius</u>
Mountain Bluebird	<u>Sialia currucoides</u>
Sprague's Pipit	<u>Anthus spragueii</u>
Bohemian Waxwing	<u>Bombycilla garrulus</u>
Cedar Waxwing	<u>Bombycilla cedrorum</u>

Loggerhead Shrike	<u>Lanius ludovicianus</u>
Starling	<u>Sturnus vulgaris</u>
Red-eyed Vireo	<u>Vireo olivaceus</u>
Warbling Vireo	<u>Vireo gilvus</u>
Yellow Warbler	<u>Dendroica petechia</u>
Common Yellowthroat	<u>Geothlypis trichas</u>
Yellow-breasted Chat	<u>Icteria virens</u>
American Redstart	<u>Setophaga ruticilla</u>
House Sparrow	<u>Passer domesticus</u>
Bobolink	<u>Dolichonyx oryzivorus</u>
Western Meadowlark	<u>Sturnella neglecta</u>
Yellow-headed Blackbird	<u>Xanthocephalus xanthocephalus</u>
Red-winged Blackbird	<u>Agelaius phoeniceus</u>
Northern Oriole	<u>Icterus galbula</u>
Brewer's Blackbird	<u>Euphaga cyanocephalus</u>
Common Grackle	<u>Quiscalus quiscula</u>
Brown-headed Cowbird	<u>Molothrus ater</u>
Lazuli Bunting	<u>Passerina amoena</u>
American Goldfinch	<u>Carduelis tristis</u>
Rufous-sided Towhee	<u>Pipilo erythrophthalmus</u>
Lark Bunting	<u>Calamospiza melanocorys</u>
Savannah Sparrow	<u>Passerculus sandwichensis</u>
Grasshopper Sparrow	<u>Passerculus savannarum</u>
Vesper Sparrow	<u>Poocetes gramineus</u>
Lark Sparrow	<u>Chondestes grammacus</u>
Chipping Sparrow	<u>Spizella passerina</u>
Clay-colored Sparrow	<u>Spizella pallida</u>

Brewer's Sparrow

Spizella breweri

Song Sparrow

Melospiza melodia

Smith's Longspur

Calcarius pictus

MAMMALS

Masked Shrew	<u>Sorex cinereus</u>
Merriam Shrew	<u>Sorex merriami</u>
Little Brown Bat	<u>Myotis lucifugus</u>
Little Long-eared Bat	<u>Myotis evotis</u>
Say Bat	<u>Myotis subulatus</u>
Big Brown Bat	<u>Eptesicus fuscus</u>
Red Bat	<u>Lasiurus borealis</u>
Hoary Bat	<u>Lasiurus cinereus</u>
Silver-haired Bat	<u>Lasionycteris noctivagans</u>
Black Bear	<u>Ursus americanus</u>
Grizzly Bear	<u>Ursus arctos</u>
Long-tailed Weasel	<u>Mustela frenata</u>
Least Weasel	<u>Mustela rixosa</u>
Mink	<u>Mustela vison</u>
Black-footed Ferret	<u>Mustela nigripes</u>
Striped Skunk	<u>Mephitis mephitis</u>
Badger	<u>Taxidea taxus</u>
Otter	<u>Lutra canadensis</u>
Raccoon	<u>Procyon lotor</u>
Red Fox	<u>Vulpes vulpes</u>
Swift Fox	<u>Vulpes velox</u>
Coyote	<u>Canis latrans</u>
Gray Wolf	<u>Canis lupus</u>
Richardson Ground Squirrel	<u>Citellus richardsonii</u>
Thirteen-line Ground Squirrel	<u>Citellus tridecemlineatus</u>

Black-tailed Prairie Dog	<u>Cynomys ludovicianus</u>
Least Chipmunk	<u>Eutamias minimus</u>
Beaver	<u>Castor canadensis</u>
Ord Kangaroo Rat	<u>Dipodomys ordii</u>
Grasshopper Mouse	<u>Onychomys leucogaster</u>
Harvest Mouse	<u>Reithrodontomys megalotis</u>
Deer Mouse	<u>Peromyscus maniculatus</u>
White-footed Mouse	<u>Peromyscus leucopus</u>
Bush-tailed Wood Rat	<u>Neotoma cinerea</u>
Meadow Vole	<u>Microtus pennsylvanicus</u>
Prairie Vole	<u>Microtus ochrogaster</u>
Muskrat	<u>Ondatra zibethica</u>
House Mouse	<u>Mus musculus</u>
Porcupine	<u>Erethizon dorsatum</u>
White-tailed Jack Rabbit	<u>Lepus townsendii</u>
Desert Cottontail	<u>Sylvilagus auduboni</u>
Elk	<u>Cervus canadensis</u>
White-tailed Deer	<u>Odocoileus virginianus</u>
Mule Deer	<u>Odocoileus hemionus</u>
Pronghorn Antelope	<u>Antilocapra americana</u>
Bison	<u>Bison bison</u>

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