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Spring 2000

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*Great Plains Research: A Journal of Natural and Social Sciences*. 485.  
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## **THE PRESETTLEMENT PLATTE: WOODED OR PRAIRIE RIVER?**

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**ABSTRACT**—The pre-settlement Platte River is commonly described as a mostly unwooded prairie river, comprised of water, sand, and wet grassland. However, primary historical accounts do not support this prairie river concept. Instead, the early accounts and quantitative information from the General Land Office survey indicate that, prior to settlement by European immigrants, the Platte was a wooded river traversing a prairie landscape. Woodland was reported as dense on innumerable islands in the channel, but scattered along on the outer banks. This woodland was cleared during exploration and early settlement. Thus, the openness of the post-settlement river observed early in the 1900s was an artifact of deforestation rather than of the result of natural processes. Since the 1930s, however, reforestation and channel narrowing have occurred in response to reduced streamflow and less demand for timber. The new woodland harbors high biodiversity, while occupying some areas formerly available to certain aquatic avifauna. This historical synthesis should help to reformulate restoration targets for the Platte River ecosystem.

*The Platte [R]iver is the most magnificent and most useless of streams. Abstraction made of its defects, nothing can be more pleasing than the perspective which it presents to the eye. Its islands have the appearance of a labyrinth of groves floating on the waters. Their extraordinary position gives an air of youth and loveliness to the whole scene. (Washington Irving 1832 in Root and Connelley 1901: 245)*

## Introduction

Reconstruction of past vegetation serves a number of scientific purposes. For example, vegetation reconstructed from pollen and macrofossils in lake sediments has been used extensively as a proxy for past and future climates (Davis 1976; Wright et al. 1993; Jackson et al. 1997). Frequency and intensity of disturbances, such as fire and wind, have been inferred from vegetation composition and other measures, such as fire scars (Stearns 1949; Heinselman 1973). Yet, the most common purpose of vegetation reconstruction has been to develop baseline information against which to measure and evaluate historic ecological changes caused by human actions. For example, Curtis' (1956) maps of deforestation patterns in southern Wisconsin stimulated considerable modern research into the effects of forest fragmentation on biodiversity (Burgess and Sharpe 1981; Forman and Godron 1981; Whitney and Somerlot 1985; Andersen et al. 1996). The effects of streamflow regulation by dams have been quantified by comparing modern floodplain vegetation to reconstructed pre-development vegetation (Turner 1974; Bragg and Tatschl 1977; Johnson et al. 1976; Johnson 1994). Also, vegetation has been reconstructed to serve as a benchmark or target for restoration (Jordan et al. 1987; Packard 1993).

In this paper, we use historical records to reconstruct the composition and extent of riparian woodland associated with the Platte River prior to settlement by European immigrants, and to document changes in this vegetation associated with human settlement. Sources of historical information to reconstruct vegetation in the Great Plains are many and varied. Qualitative sources of information include: personal accounts and maps from explorers, soldiers, pioneers, and immigrants (Day 1953; Sharpe and Johnson 1981; Mattes 1988; Foster 1993; Russell 1997) and old photographs (Turner 1974; Progulske and Shideler 1983; Everitt 1993). These sources vary in their reliability and relative value for vegetation reconstruction (Russell 1981, 1983, 1997).

The quantitative information for vegetation reconstruction comes primarily from the field notes and maps of the General Land Office survey; these records have been used extensively by ecologists (Stearns 1949; Grimm 1984; Johnson 1994; Andersen et al. 1996). The General Land Office surveys were conducted either before or very early in the settlement of the American West. Thus, they represent the condition of the vegetation before extensive exploitation of timber, soil, or mineral resources. These records are not un-biased, particularly by inclusion of larger trees. However, the constraints of the data are well-known, and adjustments can be made for

them (Grimm 1984). Government maps are another source of quantitative information, such as those drawn by the Missouri River Basin Commission in the 1880s (Johnson 1992, Scott et al. 1997).

The evidence used here for the Platte River combines personal historic accounts with quantitative data from the General Land Office survey. The survey results have not been used specifically for the Platte River, except by Johnson (1994). Reconstruction of the Platte River's woodland vegetation should assist in the development of historically accurate restoration targets and management objectives for the modern river.

### **Current Concept**

The current perception of the pre-settlement vegetation of the Platte River is based primarily on several published summaries. Williams (1978) reported on hydrological changes associated with water development and included old photographs of the Platte River. Most of these are oblique, ground-level photographs taken between the late 1800s and the early 1900s to show crossings near wooden bridges. Few or no trees appear in the channel or on the banks. Therefore, these photographs make striking side by side comparisons with modern, more wooded photographs of the same locations. Williams (1978) also used the General Land Office maps to establish pre-development channel conditions. Apparently, however, he did not consult the equally informative field notes from which the maps were drawn.

Williams (1978) and Eschner et al. (1981), both of whom used paired photographs of bridge crossings to document woodland increases, interpreted early historical accounts as indicating that the Platte River was timbered, particularly on islands. For example, Williams (1978) wrote:

Explorers' reports generally agree on the amount of vegetation along the North Platte and Platte River in the 1800's. The numerous islands in the river for the most part were heavily wooded in those days, usually with cottonwood and willow trees. The river banks, on the other hand, only rarely had any trees.

And, Eschner et al. (1981) summarized historical accounts by stating:

The Platte channels contained nine large islands and hundreds of smaller islands; most supported timber. Timber grew along the banks of the Platte, along the banks of the tributary rivers, in the

ravines cut into bluffs along the margins of the river, and in hollows on the valley floor.

Different conclusions regarding woodland were reached by the US Fish and Wildlife Service (1981) and Currier et al. (1985). The US Fish and Wildlife Service (1981) concluded:

In the mid-19th century, woodland was largely absent west of Grand Island, . . . [and]

Kellogg (1905) noted that over long stretches of the Platte timber growth was either “wholly absent” or consisted only of scattered cottonwood and willow.

In Nebraska, the advancement of forests along major river systems such as the Platte was generally confined to a narrow strip along the river channel because the shifting streambed and high scouring action of uncontrolled flows inhibited forest invasion on the wide alluvial bottomlands (Kellogg 1905; Gleason 1922).

Similarly, after reviewing Kellogg (1905) and McKinley (1938), Currier et al. (1985) wrote that:

trees were scarce; over long stretches of the Platte, timber growth was either “wholly absent” or consisted of scattered trees along the shoreline.

Using the journals of the Fremont and Stuart Expeditions (Jackson and Spence 1970; Rollins 1995), Currier et al. (1985) further concluded:

The islands were described as “elevations of earth,” as they apparently were without vegetation. This description is consistent with the theory that high spring flows moved great quantities of sediment, continually changing the configuration of the streambed, and preventing the development of permanently established woody vegetation. Trees and shrubs did develop on a few stabilized islands in the river channel that were elevated above the streambed and were relatively unaffected by annual scouring flows (e.g., “Thousand Islands” area near Fort Kearny). Timber was relatively

scarce, however, in the Valley, as a result of scouring flows, and a variety of adverse environmental factors including prairie fires, buffalo trampling, and an arid climate. The predominant character of the Valley was of an open, sandbottomed river channel bordered by marshes, sloughs, and endless prairies, stretching up the Valley slopes and across the tablelands.

Thus, the studies that form the foundation for much Platte River ecological research offer disparate views of the extent and distribution of woodland in the Platte River prior to use by European immigrants. One view suggests that the Platte River was a relatively featureless prairie river comprised of water, sand, and grassland with few or no trees, while the other describes a river corridor composed of wooded islands and sparsely-wooded banks traversing a prairie landscape. The unwooded prairie river description has been adopted by many recent authors (e.g., Sidle 1989; Gruchow 1989; Sidle et al. 1989; Winckler 1989; Ziewitz et al. 1992; Wilson et al. 1993; Weidensaul 1999). However, the evidence reviewed here suggests that the alternate view is more accurate.

## **Results**

### **Earliest Accounts by Explorers**

Four noteworthy explorations provide the earliest accounts of Platte River vegetation (See Tables 1-4): Robert Stuart's Astoria Narratives from 1812-1813 (Rollins 1995), the Long Expedition from 1819-1820 (James 1823), the Fremont Expedition (1842), and Lt. Woodbury's expedition (1847) to Fort Kearny. Relevant entries from their notebooks are quoted directly in Tables 1-4 (see Fig. 1 for geographic locations). Collectively, these explorers observed that trees were restricted to river courses (Tables 1-4). They reported that the Platte River proper was wooded throughout its length, particularly on its numerous in-channel islands. The explorers were struck by the starkness and vastness of the generally unforested prairie landscape, but all noted the presence of trees on low ground associated with streams or in rugged upland topography in the west. Since the Platte River may have been their first sighting of a braided, sandbed river, they commented often on: the narrow fringe of trees that lined the Platte's outer banks, the absence of trees much beyond the outermost riverbanks, and the concentration of trees on innumerable islands (Tables 1-4). Meandering

TABLE 1  
 Stuart's Observations (1812-1813) from Rollins (1995);  
 Upper Platte River proceeding downstream:

. . . we reached an Island with large timber on its banks, . . . The Island [farther downstream] has as yet abounded with Timber, but not a single tree decorates the main shore . . . (Brady Island; 214-15) . . . we encamped without any other fuel than small dry Willows and Buffaloe dung neither of which were very abundant . . . (Brady Island; 214-15) . . . the banks [of Grand Island] are well lined with Timber as is also the southern main shore, but ours is still woefully deficient in that article. (just downstream of Brady Island; 215)

we stopped for the night in a [large] thicket of Willows . . . (Willow Island; 215) . . . There was no Timber of [any] consequence on either side yesterday or today, what little we see are small Cottonwoods and are almost wholly on the numerous Islands with which the river abounds; (215-16). . . Below its mouth [Elm Creek] began a considerable body of large Timber, which runs down as far as we can see . . . (217)

The body of Timber has increased greatly and extends too far to the north for the eye to tell what is its width we are nevertheless obliged to wade a narrow channel to procure fuel as well as food for our Horse; for the grass on the main is totally consumed [by fire] and all the woods are on an Island [Elm Island] . . . (just upstream of Grand Island; 217)

The Timber now consists of Cottonwood, Elm, Box Alder [Ash] and White Willow, with an almost impenetrable undergrowth of Arrow Wood, Common and Red Willow [etc.]; (between cities of Kearney and Grand Island; 217-18)

A number of little Islands are scattered promiscuously along the channel, they possess a few Beaver and some Wood, but it is for the most part small, while that on the Big one [Grand Island] is very large and of too great [an] extent for the eye to measure it—On our side there is seldom a twig, . . . (upstream of city of Grand Island; 218)

The Grand Ile terminated two miles back, . . . it has throughout possessed great bodies of Timber affording shelter and subsistence to a good many Deer, some Elk and a few Beaver-The river is about the same breadth as formerly, much broken by innumerable Islands in which the most of the Timber generally is . . . (city of Central City; 219) . . . The Hills on this side continue as yesterday, but nothing can be seen on the other (when the Islands permit) but a smooth burnt prairie . . . (near Central City; 219)

we travelled . . . to our nights station on an Island as usual-The opposite shore seems equally destitute of Timber with this, and the Hills of either side are also Prairie. indeed it is extraordinary though no less true that while the mainland possesses but few trees and sometimes not even an Willow; yet there is scarcely an Island of however, diminutive dimensions but is for the most part wholly covered with wood-It is hardly possible to guess at the width of the river as we but seldom see the whole at once, on account of the numerous Islands which are scattered from shore to shore, but so far as we can judge it is much about what it has been for a week past . . . (downstream of Central City; 220)

TABLE 2  
 Long Expedition (1822-1823) from James (1823):  
 proceeding upstream from Platte River to tributaries

Soon after crossing the Elk-horn we entered the valley of the Platte, which presented the view of an unvaried plain, from three to eight miles in width, and extending more than one hundred miles along that river, being a vast expanse of prairie, or natural meadow, without a hill or other inequality of surface, and with scarce a tree or a shrub to be seen upon it. The woodlands, occupying the islands in the Platte, bound it on one side; the river-hills, low and gently sloped, terminate it on the other. (v. I., 429-30)

Though our route lay at the distance of several miles from the Platte, we could distinctly see the narrow and interrupted line of timber which grows along its course, and, occasionally, we had a transient view of the river itself, spreading like an expansive lake, and embosoming innumerable islands. (v. I., 431)

In the scenery of the Platte there is the utmost uniformity; a broad plain, unvaried by any object on which the eye can rest, lies extended before us; on our right are the low and distant hills which bound the valley; and on our left the broad Platte, studded with numerous small, but verdant islands. On these islands is usually a little timber, which is not met with in other situations. (v. I., 454)

. . . we arrived at an old Indian encampment, opposite an island, on which was some wood, and perceiving that none would be met with for many miles ahead, we determined to halt here for the night. . . . We had now arrived at a point about two hundred miles distant from the confluence of the Platte and Missouri, yet the character of the former river was but little changed. It was still from one to three miles in breadth, containing numerous islands, covered with a scanty growth of cotton wood, willows, the *Amorpha fruticosa*, and other shrubs. (v. I: 457-58)

The upper branches of the North Fork [North Platte River] have some timber, mostly cotton-wood and willow, and abound in beaver. (v. I: 463)

Meeting with wood at about three o'clock P. M., we resolved to encamp. On the two preceding evenings, we had found it difficult to collect as much wood as sufficed to kindle a fire, which was afterwards kept up with the dung of the bison, . . . (North Platte River; v. I: 467)

At evening we arrived at another scattering grove of cotton-wood trees, among which we placed our camp, immediately on the brink of the river. The trees of which these insulated groves are usually composed, from their low and branching figure, and their remoteness from each other, as they stand scattered over the soil, they occupy, revived strongly in our minds the appearance and gratifications resulting from an apple orchard . . . (North Platte River; v. I: 477-78)

Intermixed in the narrow fringe of timber, which marks the course of the river, are very numerous trees, killed by the action of the beaver or by the effects of old age . . . (South Platte River near confluence; v. I: 469)



TABLE 2 Continued

The river in several places, expands to the width of many miles, embosoming numerous islands, some of which are broad and considerably extensive, and all of them covered with a growth of cottonwood and willows. These are the only woodlands that make their appearance along the river; and in travelling westward, these become less numerous and extensive, till at length, they entirely disappear. Copses and skirts of woodland again present themselves in the neighbourhood of the mountains, but they are of small magnitude, and the trees they furnish, are of a dwarfish growth. For a distance of nearly two hundred miles, commencing at the confluence of the North and South Forks, and extending westwardly toward the mountains, the country is almost entirely destitute of woodland, scarcely a tree, bush, or even a shrub making its appearance. (v. II: 353-54)

rivers that dominate the eastern US, with which the explorers would have been more familiar, have the opposite forest pattern with a few small islands and wide, wooded floodplains (Knighton and Nanson 1993; Johnson 1998).

For example, Lieutenant D. P. Woodbury, who selected the site for new Fort Kearny near Grand Island enumerated his reasons for his choice in his report (Table 4). He included considerable detail regarding the natural woodland of the region in this report, since wood was needed to construct and sustain the fort (Willman 1930).

### Observations of Other Travelers

More sparing comments about the river's vegetation were made by other travelers along the Platte during this time period. However, the observations were similar. For example, Townsend (1839) wrote about the North Platte River in western Nebraska, near Scott's Bluff:

On the 18th of May [1834] we arrived at the Platte river. It is from one and a half to two miles in width, very shoal; large sand flats, and small, verdant islands appearing in every part. (Townsend 1839: 157)

On the afternoon of the 31st, we came to green trees and bushes again, and the sight of them was more cheering than can be conceived, except by persons who have travelled for weeks without beholding a green thing, save the grass under their feet. We encamped in the evening in a beautiful grove of cottonwood trees,

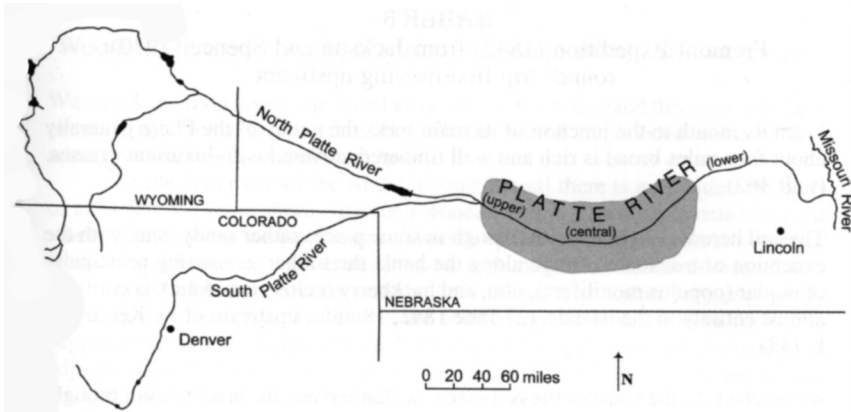


Figure 1a.

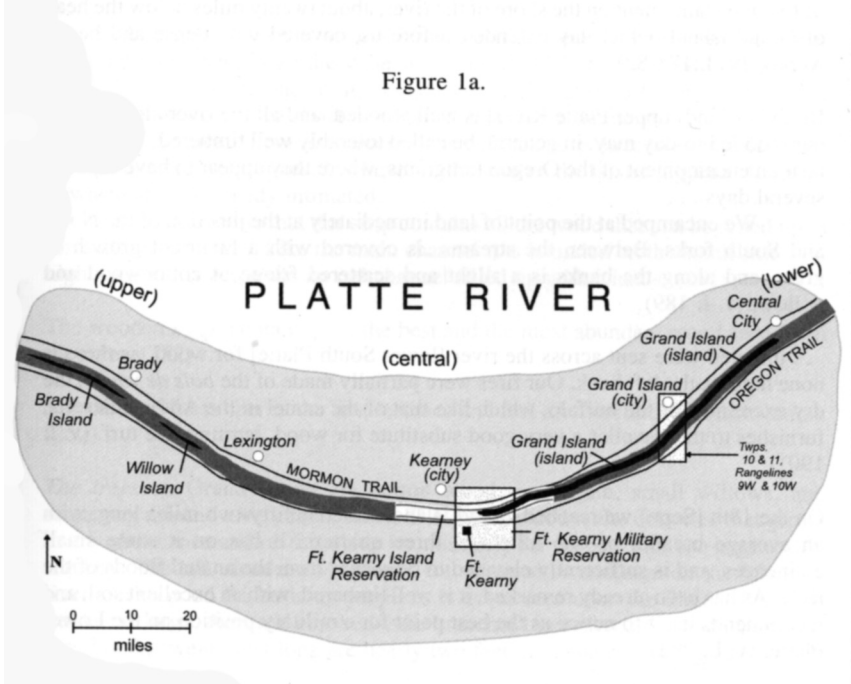


Figure 1b.

Figure 1. (a) Map of the Platte River and its major tributaries to the west. (b) Expanded map of the central Platte River area, including large islands, modern cities, military reserves, and townships mapped in Figure 3.

TABLE 3  
Fremont Expedition (1842) from Jackson and Spence (1970):  
round- trip first moving upstream

From its mouth to the junction of its main forks the valley of the Platte generally about four miles broad is rich and well timbered, covered with luxuriant grasses. (v. I: 163)

The soil here was light but rich, though in some places rather sandy; and, with the exception of a scattered fringe along the bank, the timber, consisting principally of poplar (*populus monilifera*), elm, and hackberry (*celtis crassifolia*), is confined almost entirely to the islands. (27 June 1842; 18 miles upstream of Ft. Kearny; v. I: 182)

we reached . . . the coast of the Nebraska, or Platte river. the level bottom brought us to our encampment on the shore of the river, about twenty miles below the head of Grand island, which lay extended before us, covered with dense and heavy woods. (v. I.:181-82)

Brady's island [upper Platte River] is well wooded, and all the river along which our road led to-day may, in general, be called tolerably well timbered. We passed near an encampment of the Oregon emigrants, where they appear to have reposed several days . . .

We encamped at the point of land immediately at the junction of the North and South forks. Between the streams...is covered with a luxuriant growth of grass, and along the banks is a slight and scattered fringe of cottonwood and willow. (v. I: 189)

. . . the men were sent across the river [lower South Platte] for wood, as there is none here on the left bank. Our fires were partially made of the *bois de vache*, the dry excrement of the buffalo, which like that of the camel in the Arabian deserts, furnishes to the traveller a very good substitute for wood, burning like turf. (v. I: 190)

On the 18th [Sept.] we reached Grand Island, which is fifty-two miles long, with an average breadth of one mile and three quarters. It has on it some small eminences, and is sufficiently elevated to be secure from the annual floods of the river. As has been already remarked, it is well timbered, with an excellent soil, and recommends itself to notice as the best point for a military position on the Lower Platte. (v. I.: 283)

On the evening of the 30th we encamped in an almost impenetrable undergrowth on the left bank of the Platte, in the point of land at its confluence with the Missouri, three hundred and fifteen miles, according to our reckoning, from the junction of the forks, and five hundred and twenty from Fort Laramie.

From the junction we had found the bed of the Platte occupied with numerous islands, many of them very large, and all well timbered; possessing, as well as the bottom lands of the river, a very excellent soil. With the exception of some scattered groves on the banks, the bottoms are generally without timber. A portion of these consist of low grounds, covered with a profusion of fine grasses, and are probably inundated in the spring; the remaining part is high river prairie, entirely beyond the influence of the floods . . . (v. I: 284-85)

TABLE 4  
Woodbury Expedition (1847) from Willman (1930): At Fort Kearny

We struck the river about one mile below a well wooded island three miles long—properly the foot of Grand Island for it is the last of the wooded group or strip which we afterwards traced to its head . . .

At the lower end of the island [Grand Island] there is a considerable body of trees near the south shore—part of a wooded strip which seems to run along the whole island, but as we continued our march up the river we were soon separated from it by at least one wide channel and a wide prairie on the north side of it.

South of it there are trees on the little islands and scattering groups along the margins of the channels, but on the south shore there is not even enough to supply emigrants or troops with fuel. This in some cases must be obtained from adjacent islands by fording some narrow bayou. The little islands are almost always covered with young willow and cotton wood. (251)

[A sketch shows the channel structure at the time] A main center channel about three-quarters of a mile wide, a prairie island bottom nearly one and one-half miles wide on each side of it, a bayou from 125 to 200 yards wide on the south side, and a wooded strip about one-half mile wide on the north side.

. . . the most important feature—the wooded strip three or four miles from the south shore—continues, I believe, to the foot of the island [approx. 40 miles downstream] as already intimated.

It is remarkable that this strip contains all the wood that can be relied upon for building purposes. Like the main channel it is bounded on the south side by a high dike and is evidently an old channel filled up with islands. (251)

The wooded strip [contains] . . . the best and the most abundant wood seen upon the river. (252)

The demand for timber in the first instance and fuel afterwards fixes this location. (252)

*The trees* on Grand Island are cotton wood, scrub elm, small willows, and scattering ash and a very few cedars. The cotton wood is the only tree that grows in any abundance and on this alone we must rely for timber. This too is generally scrubby. The tall, slender and straight cotton wood so common on the Missouri river and so good for building purposes is never seen upon the Platte. There the trunks are large, short and crooked—the branches large, numerous and far spreading. Trunks twenty feet long are nearly two feet in diameter at the ground. (252)

along the edge of which ran the Platte, dotted as usual with numerous islands. (Townsend 1839: 180)

In the morning, Mr. N. and myself were up before the dawn, strolling through the umbrageous forest, inhaling the fresh, bracing air, and making the echoes ring with the report of our gun, as

the lovely tenants of the grove flew by dozens before us. I think I never before saw so great a variety of birds within the same space. (Townsend 1839: 180)

And Stansbury (1852) observed the following on his expedition up the Platte (1849) to Great Salt Lake:

Our journey for the last two days [upstream from Fort Kearny] has been up the valley of the Platte, which, in some places, is more than a mile in width. From one spot I counted upward of twenty islands, which, being densely covered with green willows and cotton-woods, presented, in contrast with the naked monotonous country through which we were passing, a perfect picture of refreshing beauty. From the fact that the islands in the river are, for the most part, covered with trees, the almost total absence of this feature in the landscape of the valley must be attributed, in part at least, to the fires which periodically sweep over the country in the autumn, destroying every thing before them. (approximately 50 miles upstream of Fort Kearny) (Stansbury 1852: 32)

Also, the recollections of Moses Sydenham, a former stage coach driver, provide another broad, landscape view of the Platte River Valley, its upper tributaries, and link to the Rocky Mountains (Root and Connelley 1901):

In a good many places there was much sameness, but the monotony was broken by the large number of charming landscapes; . . . the broad Platte, with such a large number of islands, many of which were covered with a grove of willows and young cotton-woods; the bluffs at the far edge of the valley, near the crests of which was an occasional growth of cedar; canyons and gulches at intervals, down which coursed lovely streams of various sizes; . . . Indian tepees scattered for hundreds of miles along the Platte valley; (Root and Connelley 1901: 255)

### **Land Survey Data**

Several decades after the European exploration of the Platte River Valley, the US government surveyed the land to allow organized settlement. The surveys in the central Platte River were conducted for the most

part in 1859 (township boundaries) and in 1866 (section lines), with later survey dates in the west (upstream). The survey occurred after considerable amounts of timber already had been removed by pioneers, soldiers, and settlers (see below). However, they remain our best quantitative source of information on the quality and distribution of natural woodland relatively early in the settlement/deforestation period. Despite the lateness of the survey, approximately 20 years after the Fremont Expedition and the construction of Fort Kearny, the notes and associated maps indicated that woodland still occurred in the Platte River.

The General Land Office survey delineated township, range and section lines and noted natural resources present. Specific trees were selected to "witness" section corners, in case the survey marker (soil mound plus charred stake) that they placed were to be destroyed. The closest suitable witness tree in each 90 degree quadrant (maximum of four trees per section corner) was chosen. Each was identified to species, its distance and angle from a corner determined, and its diameter measured. Sometimes, witness trees were used to mark quarter-section corners or the ends of survey lines on riverbanks. Thus, the witness tree data entered into the surveyor's notebook provide historical data from which to reconstruct the size, quality, and extent of woodland relatively early in the settlement history of the Platte River.

The survey notes corroborate the observations of the explorers and travelers. Woodland was extensive on and near Grand Island in the Platte River. For example, 125 witness trees were recorded in a six-mile long river reach, comprising Townships 10N and 11N, Range 9W, near the present city of Grand Island, Nebraska (Fig. 2). Cottonwood trees dominated numerically (42%), but the largest trees, up to 40 inches in diameter, were American elm (Fig. 2). The wide size range, from saplings to large trees, indicates that tree populations were well-established and self-regenerating.

The surveyors recorded where they entered and left areas of timber, enabling government mappers to draw timber boundaries on the plat maps. Extensive areas of timber occurred on Indian and Mormon Islands, part of the Grand Island complex (Fig. 3). Trees occurred at most section corners, bank intersections, and on most islands (large and small) crossed by survey lines (Fig. 3). Fewer trees were recorded on the outermost riverbanks, which were exposed to prairie fires and which were more accessible to woodcutters.

In addition, comparable numbers of witness trees (N=242 trees) were recorded upstream in the next three townships, from Grand Island to the eastern boundary of the 30 mile long Fort Kearny Island Reserve including

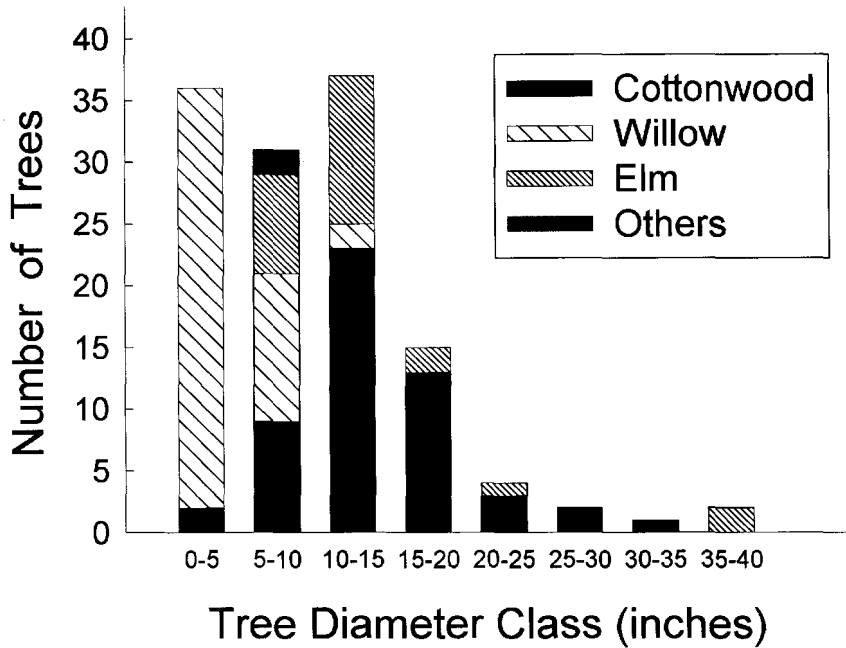


Figure 2. Size and species of witness trees in the General Land Office survey of Townships 10 and 11, Ranges 9W and 10W, measured in 1866.

the 10 mile long Military Reservation (Fig. 1a). Surveys of these reserves were not conducted until 1877, after the Fort had been decommissioned and the reserves opened for settlement. The 1877 survey notes lacked information on trees and woodland distribution. Collection of woodland information may have been outside the scope of this late survey, or no information was recorded because little woodland remained. Military letters, discussed below, indicate that, as early as 1850, little timber was left within 8 or 10 miles of Fort Kearny.

Fewer witness trees were recorded upstream of the Fort Kearny Island Reserve than downstream of it (Johnson 1994). The abrupt drop in numbers may represent a natural decline in tree density with increasing aridity upstream to the west. However, the drop also may have been steepened by cutting and by the later collection of survey data to the west. The later date

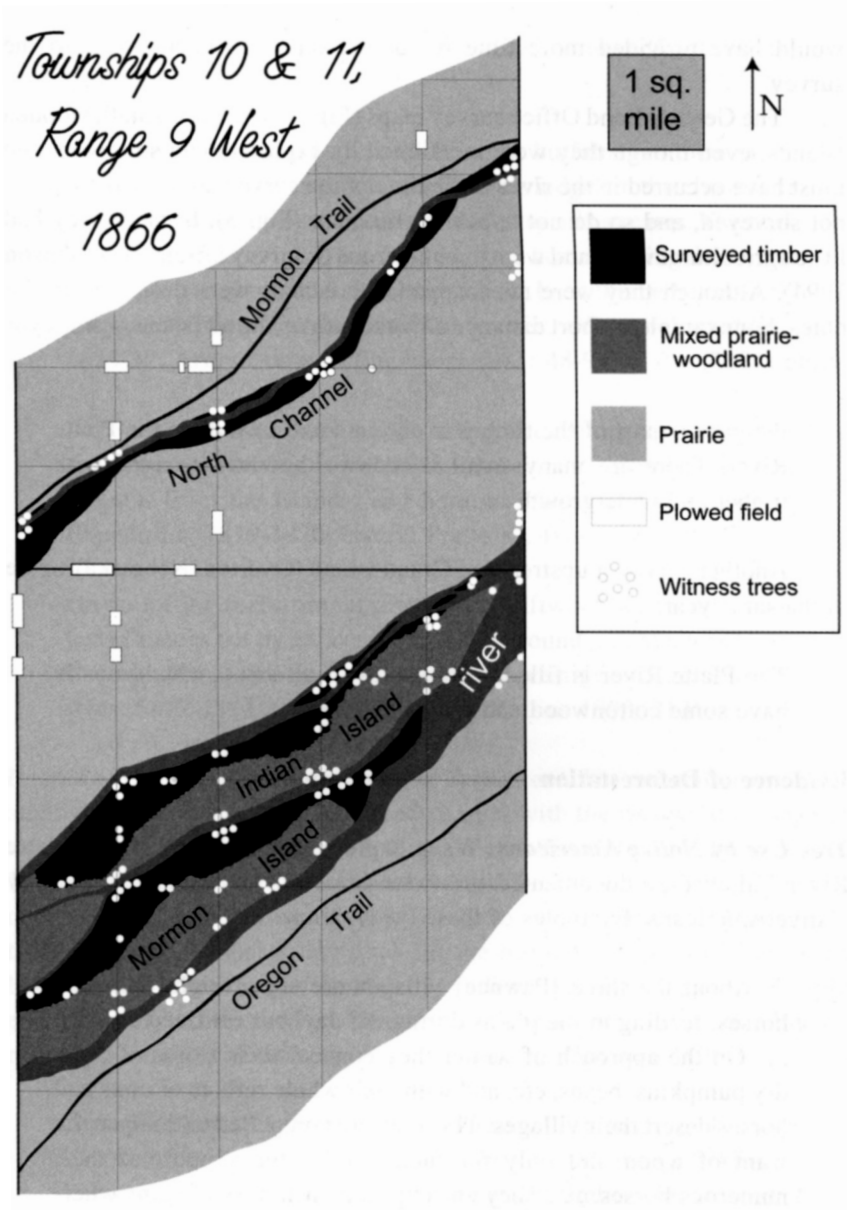


Figure 3. Map of timber, witness trees, fields, and other features from General Land Office plat maps and field notes for Townships 10 and 11 near the present city of Grand Island, Nebraska (see Figure 1b).



would have provided more time for deforestation to occur prior to the survey.

The General Land Office survey maps (Fig. 3) show few small, wooded islands, even though they were mentioned by explorers and surveyors and must have occurred in the river at the time of the survey. Many islands were not surveyed, and so do not appear in the map (Fig. 3), because they had little agricultural value and were too numerous to survey efficiently (Johnson 1994). Although they were not mapped, the islands were described in the notes. For example, a short distance downstream of Grand Island, a surveyor wrote (1865):

the greater part of the timber is on the small islands in the Platte River. There are many small islands in the river covered with timber and undergrowth . . .

Another surveyor upstream of Grand Island (Overton, Nebraska) wrote in the same year:

The Platte River is filled with islands of all sizes, which mostly have some cottonwood and willow on them.

### **Evidence of Deforestation**

***Tree Use by Native Americans.*** When explorers passed through the Platte River Valley they documented the extensive use of woodlands made by Native Americans. Examples of these observations include:

About the three [Pawnee] villages are six or eight thousand horses, feeding in the plains during the day, but confined at night . . . On the approach of winter they conceal their stores of corn, dry pumpkins, beans, etc. and with their whole retinue of dogs and horses desert their villages. This they are compelled to do from the want of wood, not only for fuel, but for the support of their numerous horses. . . . They encamp in their lodges of skins wherever the cotton wood is found in sufficient quantities for their horses, and game for themselves . . . We are, however, well assured that the Indian horses, farther to the west, about the upper branches of the Platte, and Arkansa, subsist, and thrive, during the winter, with no other article of food than the bark and branches of the

cotton wood. (Long Expedition, 1819-1820 on lower Platte River; James 1823: 445-6)

In the summer the Dakotas follow the buffaloes in their range over the prairie, and in the winter fix their lodges in the clusters or fringes of wood along the banks of the lakes and streams. The bark of the cottonwood furnishes food for their horses during the winter snows, and to obtain it many streams have been thinned or entirely stripped of their former beautiful groves. (Warren Expedition, 1855-57; Army Corps of Engineers 1981: 48-9)

We were fortunate in finding, towards evening, an old Indian encampment, where were poles, stakes, etc. which had been brought from the islands, and here we placed our camp. (Long Expedition, 1819-1820, central Platte R., James 1823: 454)

On collecting fuel from the among the driftwood we found a number of pieces cut by an axe close to the ground, . . . at a loss to say . . . who the people were who left those vestiges. (Stuart's narratives, 1812-1813, near Brady Island; Rollins 1995: 213)

***Impact of European Immigration and Settlement.*** The amount of wood cut and used by humans likely increased sharply with the westward passage of thousands of pioneers along the Great Platte River Road, early 1840s to 1866 (Mattes 1969). In addition, wood use increased with: the building and occupation of Fort Kearny, 1849-1871; the arrival of settlers, 1860 on; and, the use of local timber to lay track for the transcontinental railroad in the late 1860s. The cutting of timber by soldiers, immigrants, and the rapid exhaustion of wood near Fort Kearny, were documented in Lt. Woodbury's military correspondence to the War Department (Willman 1930):

the operations . . . have been continued with a detail of 175 men . . . employed mainly as follows, viz: . . . 25 men working as carpenters; at the saw mill; and getting out timber. (letter dated 2 August 1848; Willman 1930: 256)

Four thousand four hundred wagons have already passed by this post—nearly all destined for California. There are four men and ten draft animals to each wagon—very nearly. Many not included

above have traveled on the other side of the Platte and many—probably more than 1,000—are still to come on this side. (letter dated 2 June 1849; Willman 1930: 259)

The expense of establishing a new post 200 miles from any settlement which, under any circumstances, must have been great, has been enhanced here by the absence of every building material except a very scrubby inferior cottonwood and this so crooked and so scarce that we are now obliged to go eight miles for trees sufficiently straight for building purposes. This timber is found on islands separated from the main shore by a channel nearly one-half mile, over which is generally impassable for teams from February to August, and sometimes, it would seem impassable in the winter . . . The condition of the river has greatly increased the labor and expense of obtaining fuel which, having been exhausted on the nearest islands, can now only be procured by crossing channels of considerable width. (letter dated 14 February 1850; Willman 1930: 265)

Cottonwood proper for timber has been exhausted in the neighborhood of the fort, and must hereafter be hauled 8 or 10 miles, or more (letter dated 2 August 1851; Willman 1930: 267)

Within sight of Fort Kearney [sic], where the stream ran through the military reservation, there were scores of islands in the early '60's. Some called that vicinity "The Thousand Islands." . . . Along its banks, at intervals of a few miles, in the early days, there were occasional belts of young timber, the cottonwood predominating. There were frequent groves of willows on the islands for hundreds of miles and Willow Island was the name of one of the stage stations about fifty miles west of Fort Kearney [sic]. The few resident trappers, pioneers, traders, and ranchmen, followed by the steady march of civilization westward, soon thinned out most of the timber. (Root and Connelley 1901: 233)

In the early days of Fort Kearney [sic] there was considerable timber growing on the islands adjacent, the most of which was afterwards cut down and converted into lumber and used in the buildings which in the later '50's replaced the early structures made of sod and adobe. (Root and Connelley 1901: 240)

Additional pressure on the Platte River wood resources came from immigrants. For example, Mattes (1969) reported that, between 1841 and 1866, more than 300,000 people passed along the river roads. Also, some people settled. In 1859, General Land Office surveyors noted that:

The cabins and fields of the settler have already made their appearance in many of these townships.

In 1867, surveyors noted that Township 11, Range 9 (Fig. 3)

. . . has considerable cottonwood timber along the north channel and in every way well adapted to agricultural purposes and is already quite well settled with a thriving German community.

Survey lines occasionally crossed plowed fields (Fig. 3), and in 1866 a sawmill was in operation in Township 10, Range 10. A particularly significant entry in 1866 regarding wood utilization in the Grand Island area was:

The margin of the streams or channels of the Platte has been quite well timbered with cottonwood and elm but it has been nearly all cut down and carried away leaving only scattered timber.

Thus, the woodland in 1866 (Fig. 3), although quite extensive, already represented only a portion of that formerly present in the river.

***Impact of the Transcontinental Railroad.*** Deforestation associated with railroad construction occurred near the time of the land survey. This event pitted farmers against the railroad's woodcutting crews and led to violence. Stolley (1946), who farmed in Township 11 N., Range 9 W. (Fig. 3), wrote of events in 1866 (Stolley 1946: 75-6):

With the building of the Union Pacific Railroad, which reached our settlement in the summer of 1866, conditions changed radically . . . A band of lawless and disorderly people that was let loose by the railroad company, promptly cut down all trees big enough to furnish ties for the railroad . . . Wherever trees stood, they were taken by these railroad bandits.

. . . it was almost unbearable for me to have to watch this terrible, unjust devastation of the natural forests, especially since

many of our settlers really had perfectly legal titles to their timber claims. One of my nearest neighbors on Wood River, Friedrich Moeller, had about 100 acres of fine timber which was chopped down before his eyes while he stood helplessly by and allowed it to be done . . . Only Carl Miller, a farmer near the confluence of Wood River with the north channel of the Platte River, had the courage. Mounted and armed with a navy Colt revolver and double-barreled shotgun he drove the timber robbers from his wooded claim. As soon as they began to cut down his trees, he went to them and told them briefly and to the point that they must stop at once or he would shoot. Then he went, armed himself and came riding back again, firing merrily at the timber robbers, who now sought safety by running head over heels. Carl Miller remained unmolested after that and thus saved his woodland.

This single manly protest on the part of C. Miller, however, immediately resulted in the Union Pacific Railroad Company furnishing their people with two boxes of Henry rifles and ammunition. . . . Of course, at the time these rifles . . . were distributed, the natural timber near our settlement was virtually all destroyed. (Stolley 1946: 75-6)

***Post-Development Trends.*** Woodland began to regrow in the central Platte River in the early 1900s (Fig. 4), with peak woodland expansion in the 1950s (Johnson 1994). The principal cause was reduced streamflow, as a result of upstream water development (Eschner et al. 1983; Hadley et al. 1987; Johnson 1994). However, other factors also reduced the need to cut river trees. These included: rural electrification, commercial availability of high-quality lumber, and the maturation of tree plantings. The balance between open channel and woodland area for most reaches along the Platte River has changed little since the 1960s (Fig. 4B). Trees, however, have increased greatly in size during this period. (Johnson 1997).

## Discussion

### Natural Woodland

The combined evidence, qualitative observations from explorers and travelers plus quantitative data from the General Land Office survey, supports the view that the Platte River was a wooded river running through a

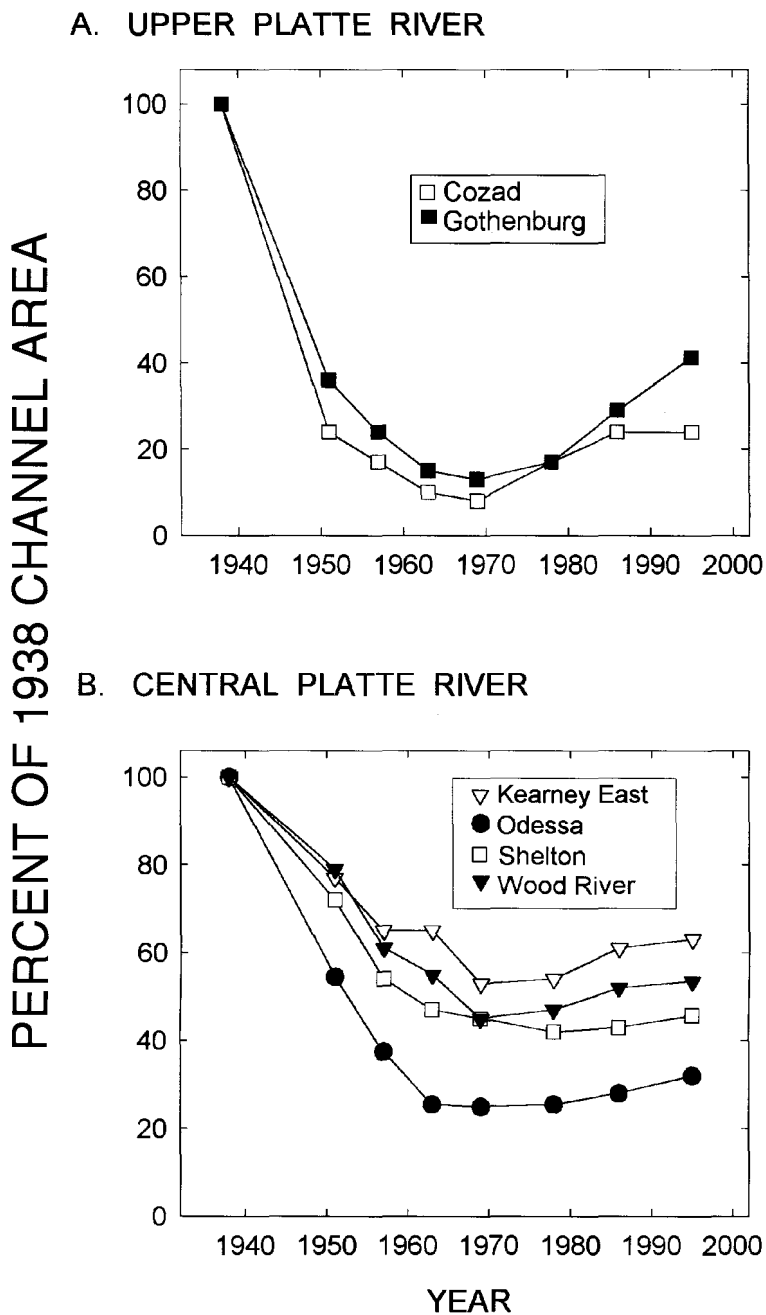


Figure 4. Proportion of open channel in reaches of the upper and central Platte River between 1938 and 1995 taking 1938 as 100% (after Johnson 1997).

prairie landscape. The large majority of woodland occurred on islands lying between the high banks of the river, typical of braided rivers in the western United States (Leopold and Wolman 1957). These wooded islands ranged widely in size from a fraction of an acre to many square miles. The large islands (Grand, Mormon, Indian) in the central Platte River (Fig. 1) were stocked with timber large enough for building construction. This pattern of woodland distribution contrasts with that of meandering rivers, like the Missouri River, or of most rivers in the northern and eastern USA, which had extensive woodland growing on a broad floodplain outside the main channel of the river.

The Platte River's wooded islands were a striking and remarkable feature of the prairie landscape. Explorers and surveyors described them as "innumerable," "numerous", and "scattered promiscuously." The river was furthermore described as "a labyrinth of groves," "embosoming innumerable islands," and "with small verdant islands appearing in every part." The Platte River near Fort Kearny was named the reach of a "Thousand Islands." Moreover, the landforms referred to as islands were described as being well-vegetated, most having trees and shrubs. Clearly, they were not unvegetated elevations of earth, as interpreted by Currier et al. (1985), the most commonly used reference for historic Platte River vegetation.

Trees did occur along the Platte River's outer banks, but they formed a thin, interrupted gallery woodland beyond which occurred an expansive meadow grassland. The lack of flooding and geomorphic action beyond the high banks, the absence of topographic barriers to halt prairie fires, and the easy access to humans needing wood, probably combined to allow few trees to persist on and beyond the outer banks.

Thus, we conclude that the Platte River was a wooded river throughout Nebraska, with the possible exception of some smaller uppermost sections. Several explorers indicated a shortage of wood for cooking/heating near the confluence of the South and North Platte rivers; yet, other explorers reported scattered woodland near the confluence. Considerable evidence documents a general upstream thinning of the woodland along the Platte River, particularly on its outer banks. Increasing aridity westward reduces tree species diversity and regeneration (Johnson 1994). Below the confluence, i.e., along the Platte River proper, all of the major islands were clearly well-wooded, including Brady, Willow, and Grand Islands.

Riparian trees and dense willow shrubland were a natural part of the presettlement Platte River (Tables 1-4). The sizes of witness trees and timber needed for Ft. Kearny suggest that, despite natural waxing and

waning of small islands and vegetated surfaces during hydrological extremes, arboreal vegetation was a permanent part of the floodplain, as it is on all other large rivers in the Great Plains (Johnson et al. 1976; Bragg and Tatschl 1977; Friedman et al. 1998). Large populations of trees persisted under the pre-European development hydrological regime, despite considerable exploitation by Native Americans. Thus, the interpretation that the Platte River was inherently inhospitable to trees because of severe flooding and sedimentation is incompatible with the evidence presented here.

The cutting of a substantial portion of the central Platte's timber between Grand Island and Kearney preceded the 1859 and 1866 General Land Office surveys. C.M. Clark, who traveled in the Platte Valley to Pike's Peak in 1859-60, wrote that the site for Fort Kearny ". . . was chosen in preference to any other, because this island (Grand Island) and the river is well timbered . . ." and able to provide the heavy timber needed to construct and sustain the Fort (Clark 1958:36). According to Clark, the presence of the Fort created intense demand for wood outside the Ft. Kearny Island Reserve boundaries, 30 river miles inclusive, because "the Government will allow no timber to be cut, and the residents have to obtain their supplies some fifteen to twenty miles distant" (Clark 1958: 37). The restriction on civilian cutting near the Fort may have caused the sharp decline in witness trees observed west of the reservation boundary.

Deforestation of the Platte River was initiated by soldiers, pioneers, and early settlers. And, it was completed by railroad woodcutters, and a burgeoning rural population. Demand for timber and firewood would have kept woodland area and tree size small for a number of decades. This prediction is supported by the evidence of sparse regrowth on the first aerial photographs in the late 1930s (Eschner et al. 1983). Early in this century the scarcity of woodland on islands and banks, created an openness to the river that was noted by many writers and portrayed in many photographs (Williams 1978). This openness was an artifact of population growth and deforestation, rather than an example of the inhospitability of the river to trees. The historical evidence strongly indicates that the presettlement Platte was a wooded river traversing a prairie landscape. The use of wood during European settlement artificially created a treeless Platte River, creating the mistaken impression in our time that treelessness is a natural characteristic of the river.

Quantification of the extent to which modern woodland area compares to pre-European settlement area is difficult. We know from explorers and surveyors that considerable woodland occurred in the Platte River in



pre-settlement times. However, our best maps for the period, drawn by the General Land Office survey, greatly underestimated woodland extent and distribution. Small islands were too numerous to survey, and the survey occurred after much woodland already had been removed (Johnson 1994). Thus, previous studies that used these plat maps as a pre-European settlement baseline (Williams 1978; Eschner et al. 1983), overestimated the extent of reforestation and channel narrowing in the subsequent period. Johnson (1994) re-surveyed an upper reach of the Platte River and estimated that a minimum of 10% the river's width on the original plat maps was occupied by wooded islands. This proportion probably increased in the downstream direction, particularly within the approximately 50 mile reach between the cities of Grand Island and Kearney ("Thousand Islands" area) which contained a marked number of islands and trees.

### **Relevance to Management**

Deliberate riparian deforestation of the Platte River was instituted in the early 1980s by private and public conservation groups. The aim was to widen the river channel to increase the area of roosting habitat for migrating Whooping Cranes (*Grus americana*) and Sandhill Cranes (*Grus canadensis*) (Lingle 1982; Currier and Stubbendieck 1985). This clearing has been justified, in part, by the premise that woodland in the Platte River is largely an anthropogenic element, caused artificially by streamflow regulation (Currier et al. 1985; Sidle 1989; Winkler 1989). Under this premise, clearing should restore the river to its more natural state and recover lost open channel habitat for migrating aquatic birds. As the historical analysis in this paper shows, however, woodland occurred naturally in the river, especially in reaches between Grand Island and Kearney that ironically have experienced the most clearing. Thus, we conclude that deforestation is not necessarily a sound, ecologically-based restoration strategy here.

Although clearing has successfully widened channels, at least temporarily, and therefore created more potential habitat for some aquatic birds (Faanes and LeValley 1993), it has counterbalancing side-effects. These include downstream sedimentation and channel narrowing and stimulation of invasive weeds, such as purple loosestrife, *Lythrum salicaria* L. (Johnson 1997; Johnson in press). In addition, clearing destroys the native riparian woodland. These cottonwood- and willow-dominated woodlands support native Nebraska species and constitute one of the most speciose communities in the Great Plains (Knopf et al. 1988). In fact, these woodlands harbor and sustain a significant portion of the biodiversity associated with the

Platte River, as they have from the time of the Pawnee, except perhaps during the early European settlement period when most woodlands were removed.

The Platte River's forests are especially rich in avifauna. Songbirds, such as the Baltimore Oriole (*Icterus galbula*), Orchard Oriole (*Icterus spurius*), Blue Grosbeak (*Guiraca caerulea*), and Yellow Warbler (*Dendroica petechia*), along with some 50 other bird species, currently nest in these forests (Colt 1996). Many of the nesting birds, such as the Wood Thrush (*Hylocichla mustelina*), Eastern Wood-Pewee (*Contopus virens*), and Great-Crested Flycatcher (*Myiarchus crinitus*), are neotropical migrants. Many neotropical migrants are declining in other parts of their ranges (Robbins et al. 1989). Two neotropical migrants which nest in woodland along the Platte River, the Yellow-Billed Cuckoo (*Coccyzus americanus*) and Bell's Vireo (*Vireo bellii*), are considered priority species in the *Partners in Flight* program for Nebraska because of their continental declines (Forsberg 1999). Additionally, a large number of other bird species probably benefit from the Platte's woodlands as migrational stopover habitat (Dean 1998).

### Summary and Conclusion

The historical synthesis here should contribute to a better definition of the optimal balance between open channel and woodland habitats needed to protect the many elements of biodiversity associated with the Platte River. The current view that the Platte River was an unwooded, prairie river in its natural state is not supported by historical evidence. The tradeoff between channel/woodland area, and the effects on biodiversity associated with all management actions, need to be acknowledged, discussed, and studied to produce the blend most favorable to the largest number of native species at local, regional, and continental scales.

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