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## Historical evidence of riparian forests in the Great Plains and how that knowledge can aid with restoration and management.

Riparian areas—land adjacent to a streambank or other water body—filtering nonpoint source pollution. Unfortunately the riparian areas of today, include only narrow bands of forests, or no woody vegetation. This greatly minimizes their ecological function. In deciding how to manage these areas, knowing the natural riparian makeup before humans settled in the area is vital. Management essentially is then restoration.

**W**hile some argue that the Great Plains were dominated by grasslands and that riparian woodlands were rare, others contend that trees would logically have occurred in riparian areas due to favorable microenvironment conditions. Historically, what native plant communities were found in riparian zones of the Great Plains? The answers to this question depend to a large extent on what time period is used as a reference of pre-settlement conditions.

The U.S. Fish and Wildlife Service (1981) drew upon conditions in 1905 for insight and concluded that trees were “wholly absent” or consisted of scattered cottonwood and willow. However, such a view rests on a flawed and incomplete reading of the record. Indeed, by 1900 most riparian zones in the Great Plains had long since been depleted of their natural woody vegetation component.

However, abundant historical evidence from the 1800’s supports a very different picture, with different ecological implications. In fact, to tell the story of this land we need to begin a long, long, time ago. . . prior to the construction of the

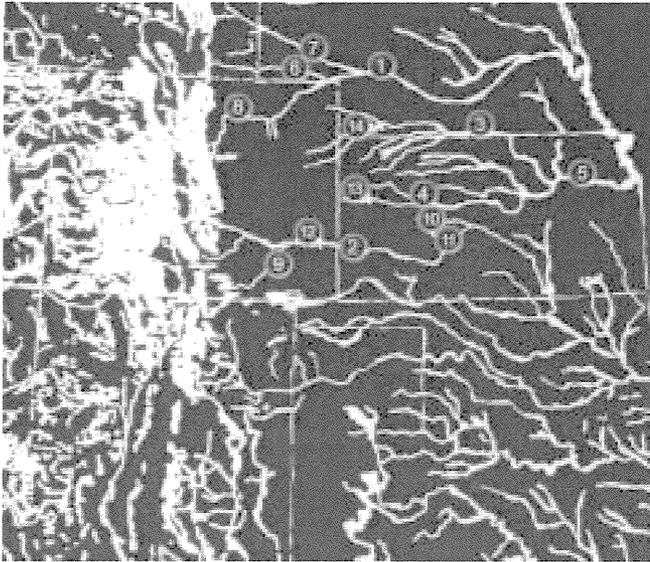
transcontinental railroad spur lines in the 1860’s; before the 1859 Denver gold rush; and before the Great Westward Movement of the 1840’s along the Oregon Trail (Ambrose, 2000; West, 1998). These defining events drew many people into and through the Great Plains on their way to seek their fortunes and build their futures.

This, then, is a story of the Great Plains and how riparian areas along major rivers and their tributaries were once significantly forested. They came under great pressure beginning in the mid 1800’s from the simultaneous and cumulative impact of Indians, gold seekers, soldiers, railroad crews, and settlers who all played important roles in determining the way riparian areas look today.

### The Story...

The Great Plains as a whole hosted far fewer trees than the Missouri valley to the east and the Rocky Mountains to the west. The Arkansas River provides an illustration. Records from the early 19th century indicate that for 150 miles east of the current Kansas-Colorado border only an occasional cottonwood would have been seen. Three conditions occurred that did not favor the persistence of trees: sandy soil, heavy springtime flooding, and the low banks that allowed prairie fires to burn down to the water’s edge (Wells, 1965). But at the eastern end of this portion of the river, around present day Great Bend, Kansas, trees lined the aptly named Walnut and Ash Creeks that emptied into the Arkansas.

Field notes from a 1825 surveying expedition, describe those streams as well shaded by stands of hardwoods and report other wooded tributaries downstream from there (Brown, 1913). At the other end of that poorly wooded stretch to the west—about where the river today crosses from Colorado to Kansas—began one of the best-known woodlands of the Plains, the “big timbers” of the Arkansas (See sidebar for additional historical evidence).



1. Platte River
2. Arkansas River
3. Republican River
4. Smoky Hill River
5. Kansas River
6. Lodgepole Creek
7. North Platte River
8. South Platte River
9. Purgatory River
10. Walnut Creek
11. Pawnee Creek
12. Big Timber of Arkansas
13. Big Timbers of Smoky
14. Big Timbers of Republic

OPPOSITE The locations for the specific rivers discussed are indicated on the map.

### SELECTED HISTORICAL EVIDENCE FOR WOODED RIPARIAN ZONES

1806 – When Lt. Zebulon Montgomery Pike ascended the Arkansas River, he reported that “*the river banks began to be entirely covered with woods on both sides*” just west of the present Colorado border (Jackson, 1966, vol. 2, Pp. 344-345). For about sixty miles upstream cottonwoods abounded.

1821 – Jacob Fowler wrote of thickly wooded islands and “*Points of [timber] in the bends more plenty*” (Coues, 1970, pp. 44). During the next forty years many sources remarked on the considerable (although, dwindling) cottonwood groves along the Arkansas, especially below the mouth of Sand (or Big Sandy) Creek.

This large stand, was one of three “*big timbers*” of the Central Plains. The second was on the Smoky Hill River in present Wallace County in far western Kansas. The third was on the Republican River not far south of present McCook, Nebraska. All are well documented.

1835 – Henry Dodge wrote in 1835 that the Platte River above the heavily timbered Grand Island had abundant trees on the south bank while feeder ravines were “*covered with timber of small growth.*” From a hill at the confluence of the North and South Platte, he could see the hills above the river downstream “*covered with scattered groves*” while at “*an immense distance*” were “*the feathery outline of some tall trees...above the horizon.*” (Report of the Secretary of War, 1835)

1857 – Two Buttes Creek, which enters the Arkansas near present Holly, Colorado, was named Piles of Driftwood by Southern Cheyennes for the great tangle of dead trees at its mouth. Lt. Francis Bryan reported that a similar sight at the mouth of a tributary of the Republican suggested flourishing timber along this creek: “*indeed, a quantity [of trees] could be seen from the point where we crossed it*” (Report of the Secretary of War, 1857, pp. 472).

1860 – Like Walnut and Ash Creeks, many tributaries of larger watercourses were well wooded. J.E.B. Stuart wrote of the Purgatory River that flowed into the Arkansas from the south that “*timber [is] heavy and abundant near the river.*” (Hafen, 1959, pp. 235)

So while the soil and lay of the land gave trees little or no chance to take hold along some streams, conditions on many others encouraged healthy stands of trees—mostly cottonwoods, willows, and hackberries on the western Plains and to the east, a mixture of deciduous species.

These woodlands could be a striking sight after a long crossing of the treeless highlands between watersheds. An Irish private in 1849, after four days of crossing the sea of shortgrass in eastern Colorado, greeted the treetops of the Republican’s wooded bottoms with a joyful cry: “*Be Jesus we’re in sight of land again*” (Mattes, 1953).

The analogy was insightful, for these riparian groves were safe harbors for some Plains inhabitants during winter, when sudden blizzards and bitterly cold temperatures threatened any warm-blooded creature caught in the open. For Plains grazers—bison, deer, pronghorns, and elk—the even slightly lower elevation of a stream bottom provided some shelter from the wintery blasts. More protective were the stands of timber, which broke the force of the wind and conserved some heat.

From the Quaking Asp River on the northern Plains comes a vivid account of the value of these natural shelters. When a storm caught Alexander Toppance’s freighting outfit in January, 1866, they took shelter in groves along the river and soon were joined by hundreds of bison. So crowded were men and beasts that many bison remained exposed. They



froze where they stood, and the next spring Toppance found that their bones formed a bleached border to the stand of timber. (Toppance, 1923)

The dependence of people and animals on shelters like these, once understood, is further evidence for timber along Plains watercourses. The year-round presence of people, horses and bison on the high Plains supports the existence of riparian woodlands simply because the one could not have survived without the other.

**Trees play a supporting role in the story**  
Given the ample historical documentation from the 19th century, only a fraction of which is presented here, there can be no doubt that trees were commonly found along Plains streams. So why is there still a perception that in the Great Plains, timbered valleys are aberrations and that reestablishment of natural vegetation along rivers should largely preclude trees?

The reason apparently is the historical baseline used to determine normal conditions. The accounts used to describe such conditions date back to the early 20th century. In those reports trees were, in fact, largely absent or thinly represented along many watercourses. No one should conclude from these records, however, that the absence of timber was natural. Rather the lack of trees was the consequence of some of the most rapid and wrenching changes that region has ever known.

Three sequential but overlapping

developments help us understand what happened. First, the spread of horses out of the Southwest and the rise of the Plains horse culture led to an increase in Native American population, which in turn wore away at the resources of the river valleys. In 1821, Jacob Fowler estimated that a winter camp in the big timbers of the Arkansas hosted twenty thousand horses; twenty-seven years later an Indian agent reported Cheyenne and Sioux villages along eighty miles of the South Platte River (Coues, 1970; Fitzpatrick, 1848). The amount of wood cut and burned even by these and smaller camps was considerable.

The second development, the overland migration of white pioneers, took a much greater toll on some of the Plains'

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richest riverine woodlands. The losses were confined mostly to a few major streams—especially the Platte, including the North and South Platte, and the Arkansas—that offered level terrain for ox-drawn wagons as well as water, forage, and (for a while) fuel for cooking fires. While the Indians' use was concentrated

## RIPARIAN AREAS PROVIDE ESSENTIAL ECOLOGICAL FUNCTIONS:

A recent National Academy of Sciences, Natural Resources Council report stated, "Restoration of riparian functions along America's waterbodies should be a national goal....." (NAS, 2002)

Unfortunately, many of America's fresh water bodies are too polluted for recreational activities like swimming or fishing. Polluted often by nonpoint source pollution attributed to sediments, fertilizers, and pesticides entering into streams flowing through agricultural lands (USEPA, 2000).

Today, the riparian areas along the rivers and streams within the Great Plains region of the United States typically contain only narrow bands of forests. In some cases, riparian areas have no woody vegetation, and in far too many cases, are farmed up to the edge with row crops and grains.

Nowadays, considerable interest exists in restoring riparian zones to reestablish "native" plant communities that can better provide a range of ecological functions to manage water quality, flooding, and biodiversity. Trees and shrubs have been shown to play an important role in providing microclimate modifications and shading, streambank stabilization, inputs of organic litter and large woody debris to aquatic systems, water and nutrient run runoff recycling, wildlife habitat, and general food-web support for a wide range of aquatic and terrestrial organisms (Sweeney, 1992).



in the winters, the overlanders swarmed up trails between February and July. It was a massive onslaught. Between 1840 and 1860 an estimated third of a million persons crossed the Plains en route to Oregon, California, and Utah, and tens of thousands more passed through on their way to Colorado and Montana from 1859 to 1865 stripping virtually all trees from the Platte valley.

The third development, the advance of the farming and stock-raising frontiers onto the Plains, compounded the effects of the first two. Between 1870 and 1880 sixteen new counties were formed in central and western Kansas and several more in western Nebraska. The population of just four Kansas counties in the watersheds of the Solomon and Republican Rivers increased in that decade from ninety-nine persons to more than forty-one thousand, about twice the peak population of Native Americans on the entire Central Plains (West, 1998). Settlers gravitated to streams for basically the same reasons as Native Americans and overlanders, but unlike the other two groups, they lived there year-round. As the settler population expanded farmers occupied all creeks that offered any significant timber. They did what they could to lessen their dependence on wood—sod houses and barbed wire fences are the best-known adaptations—but for some needs, most importantly winter fuel, trees were an irresistible resource.

## TREES WERE A VITALLY IMPORTANT RESOURCE TO MANY –

### INDIANS

- "A day which would be death on the high Plains may scarcely be uncomfortably cold in a thicket at the bottom of a deep narrow canyon. Indians, Plainsmen and all indigenous animals understand this perfectly, and fly to shelter at the first puff." (Dodge, 1883, p. 501)
- During the harshest weather Indians fed their horses the shoots of young cottonwoods, thus retarding new growth of the groves. "We were astonished at seeing great numbers of fallen trees, but afterwards [we] learned that the Indians are in the habit of foraging their horses in winter on the tender bark and young twigs of the cottonwood." (Lt. J. W. Abert, 1845, p. 9)

### SETTLERS

- Bloody Hand, chief of the Arickaras, told Col. Henry Dodge in 1835 that his peoples "[are] traveling all over this country, and [are] cutting the trees of [our] brothers; I don't know whether they are satisfied or not, but we have no land of our own." (Report of the Secretary of War, 1835, pp. 16-17)
- Private trading establishments, as well as military posts along the overland routes also consumed much wood. By the early 1860s the big timbers of the Arkansas had shrunk to a few hundred cottonwoods. Along the entire great valley of the Platte, an immigrant wrote in 1855, there was "not a stick in that distance large enough for a switch," and five years later the explorer Richard Francis Burton found even the islands stripped of timber. (Waters, 1929, p. 64; Burton, 1862, p. 66)

### RAILROAD

- By 1867 the Union Pacific Railroad was building up the Platte valley. Businesses appeared to supply crews with wood for ties, although they had to reach far up tributary canyons to find any. One outfit had stacked thirty thousand cords for sale to the railroad and to nearby army posts. (Bratt, 1921, p. 146)

These three episodes—the rise of the horse culture, traffic on the overland trails, and the entrenchment of white settlers—were the most significant in the history of the Great Plains during the 19th century. Different in so many ways, they had this in common: all bore down intensely on valley timberlands. That is not surprising. Humans, whatever their purposes and means of living, found the riparian woodlands to be a resource essential to survival. The same was true for animals.

Fortunately, it is possible to piece together the history of land use in the Great Plains and reconstruct a more accurate picture of what riparian zones looked like and their condition.

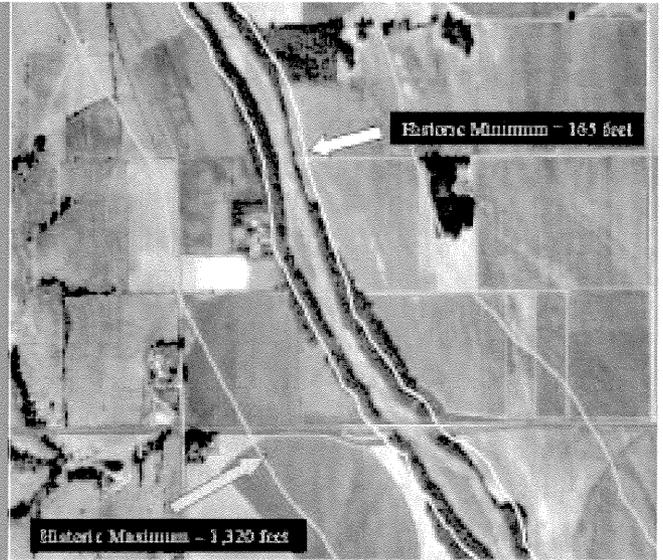
Riparian vegetation experienced substantial change during the mid to late 1800's due to human impacts. By 1900 most of the trees and other woody vegetation along the rivers and streams in the Great Plains had been cut and removed by Indians, gold seekers, soldier, railroad crews, and settlers. These riparian zones were once heavily forested with wide bands of trees but are now occupied primarily by herbaceous plants or cropland.

Natural resource restoration efforts that target "natural" conditions need to use pre-1843 scenarios to accurately depict the natural state of riparian zones in the Great Plains. Although historical reference points do not necessarily instruct us in what to do, they can provide valuable insight as to what desired future conditions riparian restoration efforts should strive toward.

### References Cited

- Abert, J.W. 1845. Journal of Lieutenant J.W. Abert from Bent's Fort to St. Louis, in 1845, U.S. Senate, 29th Congress, 1st Session, Senate Document 438.
- Ambrose, S.H. 2000. Nothing like it in the World: The Men Who Built the Transcontinental Railroad 1863-1869. Simon and Schuster, New York, New York. 432pp.
- Bellah, R.G and L.C. Hulbert. 1974. Forest succession on the Republican River floodplain in Clay County, Kansas. The Southwestern Naturalist 19:155-166.
- Bratt, John. 1921. Trails of Yesterday. Lincoln, Nebraska.
- Brown, J.C. 1913. Field Notes by Joseph C. Brown, U.S. Surveying Expedition, 1825-1827, Eighteenth Biennial Report of the Kansas State Historical Society Board of Directors, Topeka, Kansas.
- Burton, Richard. 1862. The City of the Saints and Across the Rocky Mountains to California. London, England.
- Dodge, Richard Irving. 1883. Our Wild Indians: Thirty-Three Years' Personal Experience among the Red Men of the Great West. Hartford, Connecticut.
- Fitzpatrick, Thomas J. to Thomas H. Harvey, 24 June, 1848. Bureau of Indian Affairs. Letters Received, Upper Platte Agency.
- Coues, E. 1970. The Journal of Jacob Fowler. Lincoln, Nebraska.
- Hafen, L.R. and A.W. Hafen. 1959. Relations with the Indians of the Plains, 1857-1861. Glendale, California.
- Jackson, D. 1966. Journals of Zebulon Montgomery Pike, With Letters and Related Documents. Norman, Oklahoma.
- Kansas State Board of Agriculture. 1878. First Biennial Report of the State Board of Agriculture to the Legislature of the State of Kansas, for the Years 1877-8.
- Topeka, Kansas: Kansas State Board of Agriculture. Rand, McNally & Co., Printers and Engravers, Chicago. URL:<http://skyways.lib.ks.us/genweb/archives/1878/index.html>
- Kellogg, R.S. 1905. Forest belts of western Kansas and Nebraska. U.S. Forest Service Bulletin No. 66. 44pp.
- Mattes, M.J. 1953. Capt. L.C. Easton's Report: Fort Laramie to Fort Leavenworth via Republican River in 1849. Kansas Historical Quarterly 20.
- National Research Council. 2002. Riparian Areas: Functions and Strategies for Management. National Academy Press, Washington D.C. 428pp.

RIGHT A 1991 satellite image of the Republican River in Cloud County, Kansas shows only narrow strips of trees remaining in the riparian zone. A survey in 1878 by the Kansas State Board of Agriculture reported timberbelts containing oak, cottonwood, ash, and elm trees that ranged from 165-1320 feet in width, which is shown by the yellow line (KSBA, 1878).



Report of the Secretary of War. 1835. Journal of a March of a Detachment of Dragoons, Under the Command of Colonel Dodge, During the summer of 1835. U.S. Congress, 24th Congress, 1st session. H.E. doc. 181.

Report of the Secretary of War. Report of Lt. Francis T. Bryan. 1857. U.S. Congress, 35th Congress, 1st Session. H.E. doc. 2. Appendix H.

Sweeney, B.W. 1992. Streamside forests and the physical, chemical, and trophic characteristics of Piedmont streams in eastern North America. *Water and Science Technology* 29:2653-2673.

Toppance, A. 1923. Reminiscences of Alexander Toppance, Pioneer. Salt Lake City, Utah.

U.S. Environmental Protection Agency (USEPA). 2000. The quality of our Nation's waters: Summary of the national water quality inventory: 1998 report to Congress. EPA-841-5-00-001. Office of Water, Washington, D.C.

U.S. Fish and Wildlife Service (USFWS). 1981. The Platte River ecology study special research report. U.S. Fish and Wildlife Service, Jamestown, North Dakota. Northern Prairie Wildlife Research Center Home Page. <http://www.npwrc.usgs.gov/resource/otrdata/platteco/platteco.htm>.

Waters, Lydia Milner. 1929. Account of a Trip Across the Plains in 1855. *Quarterly of the Society of California Pioneers* 6:59-79.

Wells, P.V. 1965. Scarp Woodlands, Transported Grassland soils, and Concept of Grassland Climate in the Great Plains Region. *Science* 148: 246-249.

West, E. 1998. The Contested Plains: Indians, Gold seekers, & the Rush to Colorado. University Press of Kansas. Lawrence, Kansas. 422pp.

### THE REPUBLICAN RIVER –

The Republican River begins its journey in northeast Colorado and flows slightly northeast into the northwest corner of Kansas, then into southern Nebraska. It continues east just slightly north of the Kansas border for about two hundred miles before heading south into Kansas where it joins the Kansas River. Today the Republican flows through what is primarily farm country. West of the 100th meridian most of the crops are under irrigation, while conventional dryland farming is typical to the east. Along the Republican three large dams have been constructed to create reservoirs to store irrigation waters. Along most of its bank there are only narrow strips of forests, and in some instances agricultural fields extend all the way to the river's edge (Figure 1).

Prior to 1843, the Republican River looked much different than it does today. It runs in a southeastern direction through the northern part of Cloud County in eastern Kansas. Early maps from the 1860's refer to an area called the "*Big Timbers of the Republican*" along the western Kansas and Nebraska border. Major tributaries with names like Beaver River and Red Willow pass through this area. An 1878 report by the Kansas State Board of Agriculture describes the riparian zone along the Republican as follows:

*"Average width of timber belts, 10 to 80 rods [165 to 1320 feet] - confined to the streams. Varieties: oak, cottonwood, ash, hackberry, mulberry, elm" (KSBA, 1878). URL: <http://skyways.lib.ks.us/genweb/archives/1878/cloud.shtml>.*