Chapter 10:

Vegetation Change and Management

INTRODUCTION

This chapter addresses the vegetation in the Platt District from the standpoint of the overall district. While distinct areas of the park retain their own designed vegetative character, it is also important to view the designed landscape in the context of larger ecosystem concerns and plant communities.

The chapter begins with a history of the area's vegetation, which charts both change in the composition and management of the district's vegetation and change in scientific understanding or perception of that vegetation. This is followed by an analysis of change in the district, which leads to a proposed approach to vegetation management. In addition to historic concerns, existing management conditions are also described and taken into account for proposed vegetation management actions.

HISTORY OF THE PLATT DISTRICT'S VEGETATION

Regional Vegetation Context, to 1902

Early information about the native vegetation of the area now known as the Platt District is limited. Most early written sources focus on the area that is now Oklahoma, and even these sources are sparse. According to Bruner, in his 1931 article "The vegetation of Oklahoma," documentation "on the vegetation of Oklahoma secured by early explorers and traders is meager."[1] However, most of these early sources, such as Josiah Gregg's "Commerce of the Prairies" (1844), depict the area as the "fringe of the great prairies" and as a continuous brushy strip composed of blackjack oak, post oak, hickory, and elm. An 1853 report by Captain R. B. Marcy contains five drawings, which seem to be the first views of the larger region and an 1856 article by Bigelow gives a short, but high-quality narrative on the area's vegetation, including a long list of trees and shrubs. Bigelow described the state as "being in nearly its whole breath a beautiful and fertile country" and considered "most beautiful and picturesque" the areas where woodland alternated with prairies that were arranged so as to "give them the appearance of vast cultivated fields formed on a scale of great magnitude stretching away in every direction as far as the eye can reach."[2] Another early report by Fitch describes the distribution of the woodlands throughout the Indian Territory, with brief, but informative descriptions of the timber in each township, determined from surveyors' notes. Fitch's report also includes a map showing the distribution of vegetation in any part of Oklahoma. Other early Oklahoma studies include Butler (1878) and Holzinger (1892) lists of the state species, the Carleton report (1892) on distribution of the vegetation in the state and the Shannon list (1913) of native and introduced species of trees and shrubs of Oklahoma. In general, most of these studies recognized that prairie fires were the main factor in keeping prairies free from trees and even at this early date pioneers had observed the spread of forests into various grassland areas that were protected from fire.

Geographically, the Platt District lies within the Arbuckle Mountains, and documentation of this specific area is also limited. The first general study of the flora of Arbuckle Mountains was in a form of a brief checklist developed in 1908 by Gage. He focused on the portion of Arbuckle Mountains comprised of six townships: 1 South, Range 1 East, 2 East, and 3 East; and 2 South, Range 1 East, Range 2 East, and 3 East. [3] The flora along the Washita River, Rock Creek and Falls Creek was described as "varied and luxuriant" due to rich humus content and an abundant water supply.[4] Gage also listed some of the most common tree species such as elms, oaks, pecans, maples, ash, cottonwoods, walnuts and willows found along the stream banks.[5]

The Gage (1909) plant collection and the studies conducted by G. W. Stevens from 1911 to 1913 represent most of the early documents available. Unfortunately, these collections and other valuable specimens and data on Arbuckle plants were lost when the herbarium of the University of Oklahoma was twice destroyed by fire.[6]

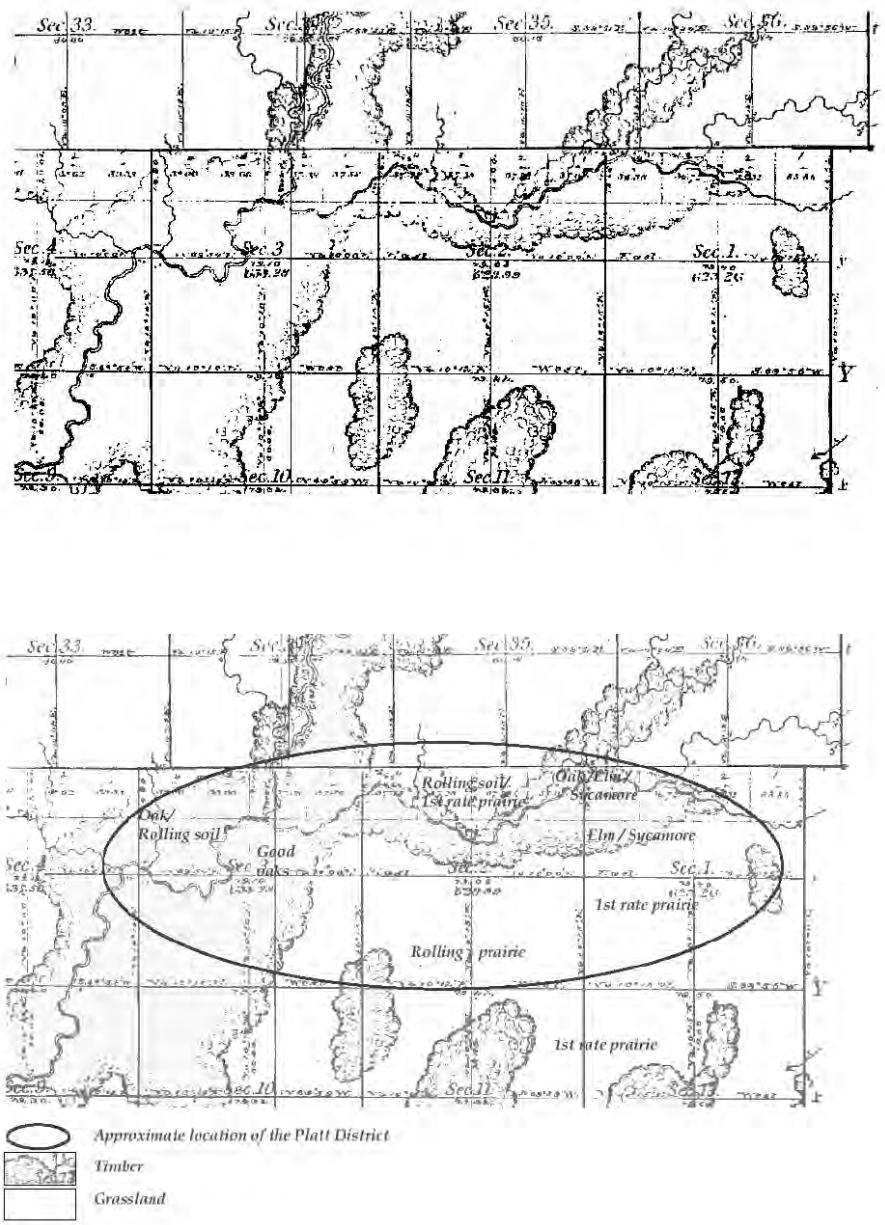


Figure 10-1. Top: Portions of the 1871 Township No. 1South, Range 3 East and Township No.1 North Range 3 East plat maps. Bottom: Same portions, annotated based on the surveyor's notes (Oval indicates approximate location of the Platt District).

Other studies about the flora, fauna and ecology that embrace information on Arbuckle Mountains date to the 1930s and include "Vegetation of Oklahoma" by Bruner (1931), "Notes on some Plants of Oklahoma" by Palmer (1934) and "The biotic districts of Oklahoma" by Blair and Hubbell (1938). Bruner's study describes the Arbuckle area as having steep, rocky hills, where "[t]he slopes and valleys are mostly forest-covered but grasses predominate on the upland."[7] He considers the region to be located within the Oak–Hickory savannah, a name applied to the broad transition zone between the deciduous forest and the true prairie associations. According to Bruner, this vegetation region crosses the central part of the state in a generally north-south direction.

In contrast, Palmer compares the flora of the Arbuckle Mountains with that of the Edwards Plateau of Texas. Blair and Hubbell in "The biotic districts of Oklahoma" noted that the Arbuckle Mountains were similar to the Osage Savanna district, a biotic region of sandstone hills covered by a dry scrubby forest mostly composed of blackjack oak, post oak, and black hickory as well as grassland communities most closely related to the

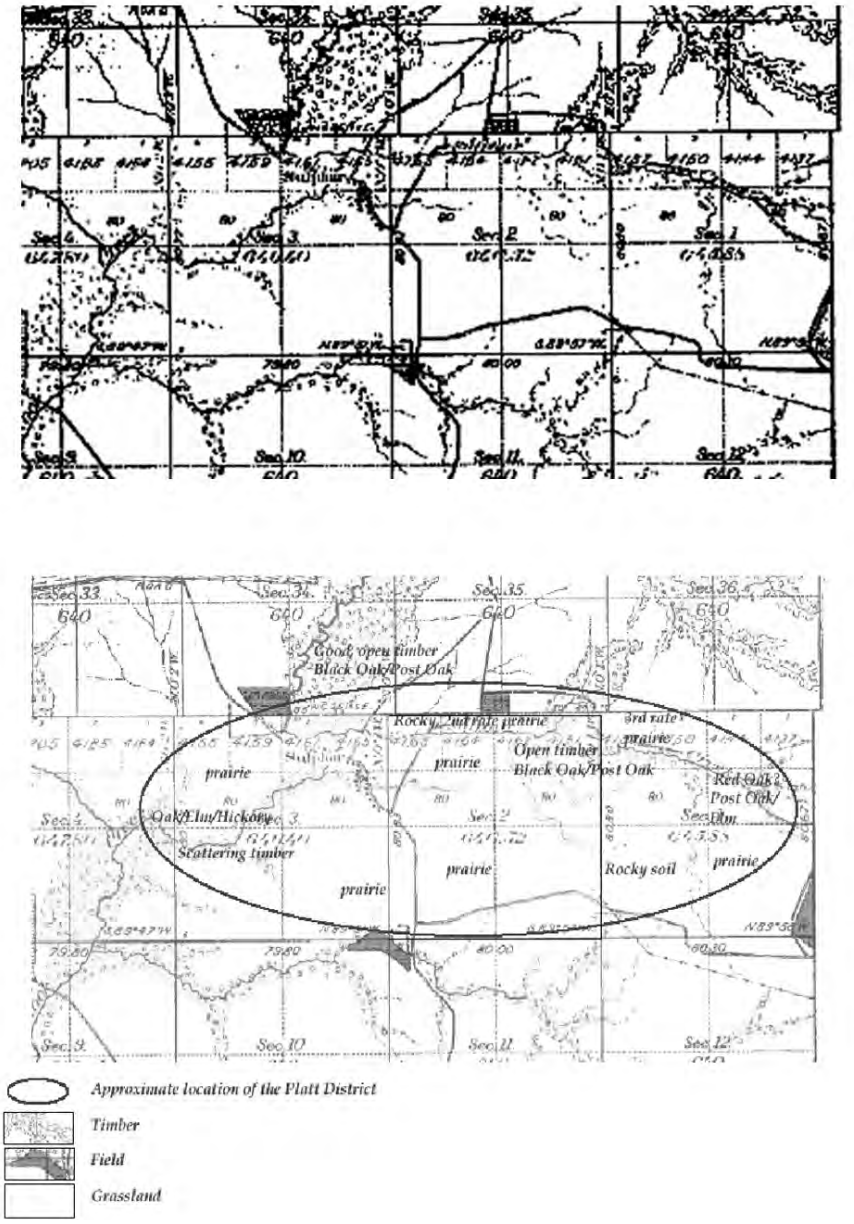


Figure 10-2. Top: Portions of the 1897 Township No. 1 South, Range 3 East and Township No. 1 North Range 3 East plat maps. Bottom: Same portions, annotated based on the surveyor's notes (Oval indicates approximate location of the Platt District).

grasslands of the mixed-grass Plains district.[8] Blair and Hubbell also note that the Arbuckle Mountains contained more mesic ravine forest, containing spotted oak, redbud, juneberry, and winged elm.

Platt District Vegetation, 1871–1902

Documentation of the historic vegetation of the Platt District prior to park development is even more limited than floristic studies of Oklahoma. The major evidence of historic vegetation from times prior to the park's designation comes from the 1871 and 1897 surveyors' notes and plat maps for Murray County conducted by the General Land Office (GLO). Lands in the Chickasaw Indian Nation near Fort Arbuckle in what is now Murray County were some of the first surveyed in Oklahoma. The area now known as the Platt District is primarily depicted within Sections 1, 2, 3 of the maps for Township No. 1 South Range 3 East (Figures 10-1 and 10-2), though a small portion of it also appears in Sections 34 and 35 of Township No. 1 North Range 3 East. These plat maps indicate streams, cultivated fields, orchards, both grazed and ungrazed areas of grassland,

Figure 10-3. Office of U.S. Townsite Survey circa 1900. Joseph Swords Collection, courtesy of the Oklahoma Historical Society, negative 2153.20.

and woodland vegetation. Unfortunately, they do not give indication of vegetation density and structure. Also, in the authors' opinion, the accuracy of surveyors' notes and plat maps is questionable. This is most evident on the 1871 plat map, where most streams were drawn with a wavy line and some smaller streams were not marked or marked differently in comparison to 1897 map.

The portion of the 1871 plat map corresponding to the area of the current Platt District (Figure 10-1) shows Rock Creek running east and west, with several smaller tributaries branching off to the north. In general, the stream valleys are shown as wooded with the balance of the area depicted as grassland. The choice of graphic representation—in which trees are rendered (as grey "cloud" shapes) but prairie is not (but simply left blank, or white)—may indicate that surveyors were less concerned about mapping grassland, as it had little commercial or aesthetic value, than they were about mapping timber. The more careful denotation of woodland may indicate its importance as fuel and building material as well as a perception of prairie as being "open" or empty space. The map's accompanying surveyors' notes describe the district's timber as predominantly "first rate," with post oak as the dominant species. More specifically, woodlands in the eastern part of the district were composed of oaks, elms and sycamores, while the western part contained "good oaks." Field notes also indicate that the district's upland areas were occupied either by "rolling prairie" or "first-rate prairie." Though there are records of some early Chickasaw and Euro-American homesteads in the area, the only evidence of human settlement marked on the 1871 plat map is the road from Fort Arbuckle to Boggy Depot.

The second set of the GLO plat maps and notes from 1897 (Figure 10-2) appear to be more accurate and detailed than the 1871 survey. For instance, the 1897 map shows additional streams not indicated on the 1871 map. Interestingly, the 1897 plat map indicates that the area of the current Platt District was much more open than in 1871. Hoagland states that these grassland openings may have been the result of land clearing.[9] While, this might be true for the larger area of Murray County, this conclusion may not be appropriate for the area of the Platt District. The 1897 map shows the area with little human activity, except for a few cultivated fields, roads and the small rural development of Sulphur Springs.

In general, the 1897 map is consistent with the 1871 map. The upland areas, again rendered as white space, were covered by native prairie, described variously by surveyors in their notes as "rocky," "rolling," or "second rate" prairie. Woodlands again appear to be limited to the stream corridors and their branches and were described as containing red, post and black oaks, and elms, hickories and ashes. The 1897 GLO survey notes describe the woodlands as "scattering," "good," and "open." These notes are consistent with a 1900 description in a report entitled "Woodland of Indian Territory" by Fitch, which describes the timber characteristics of all townships in Indian Territory. The report includes a brief description of woodland in township No. 1 South, Range 3 East, the area of the Platt District: "One-third of the township is well timbered with oak, elm, and hickory. Along the streams is found an abundant growth of walnut, sycamore, ash, and pecan timber, which is of little value commercially."[10]

A collection of early photographs of Sulphur taken by Joseph Swords in the 1890s, held by the Oklahoma Historical Society, also provides clues to the nature of the area's early vegetation. In many cases the photographs portray an open landscape as background for small log cabins or frame houses snapped in the foreground. One such example is a picture (Figure 10-3) depicting the office of the U. S. Townsite Survey set in an open, treeless landscape. Another image, taken just above Antelope Springs in the current district, reveals the fairly open scenery of what appears to be grassland with a few scattered trees and shrubs among it (Figure 3-75).

Figure 10-4. Travertine Creek circa 1900. Joseph Swords Collection, courtesy of the Oklahoma Historical Society, negative 2153.72.

A third photograph (Figure 3-53) of a more developed part of the town portrays a similarly open landscape with deciduous trees scattered among the houses. One interpretation of these images is that given the extent of the open landscape in the photographs, the houses were built in areas where open grassland uplands were spotted with groups of isolated shrubs and trees. This would imply the presence of a savanna landscape prior to town construction. However, it is also possible, but seems less likely, that these photographs represent a landscape that has been completely denuded by human logging.

The Swords photographs also depict a different type of vegetation located along the streams. It appears the areas along Rock and Travertine Creeks were surrounded by a dense young forest with a thick understory layer of shrubs and vines. A good representation of this dense forest is captured in pictures of Travertine Creek (Figure 10-4) and Panther Falls (Figure 10-5)

In summary, the graphic and verbal descriptions of the pre-park landscape appear to indicate that the early, and perhaps pre-European, settlement vegetation of the area was a combination of wooded ravines and upland savanna landscape.

Platt District Vegetation Conditions, 1902–1932

With the reservation of the park in 1902, buildings were removed, and the creation of a park environment was begun. The earliest appearance of the park is documented in a 1902 report, written by Special Inspector Frank C. Churchill, describing the initial reconnaissance of the park's land. The report notes that "high land which is in

Figure 10-5. Panther Falls, circa 1890. Albertype Collection, courtesy of the Oklahoma Historical Society, negative 18827.639.

the general level of the Arbuckle Mountains is a prairie" and that "the forest is confined to the immediate valleys of Sulphur and Rock Creek and the lower stretches of their tributary branches." These ravine woodlands are further depicted as "a dense jungle of young forest" comprised of "more than twenty kinds of [trees] common to this latitude" and "numerous shrubs and vines." Churchill also describes larger trees standing on the uplands near the valleys, a description which might designate the presence of a savanna type of landscape.[11]

In his report Churchill also emphasizes the importance of "the preservation of the forest and the beauty of the landscape" indicating the high aesthetic and cultural values associated with trees. The report also noted that due to "protection from fire, the forest is rapidly spreading, and that without a doubt it can be made to extend over any part of the prairie land by care and protection."[12] Such descriptions appear to indicate a desire to increase an existing small amount of timber preferentially over larger extent of prairie.

In addition to the park's natural areas along streams, the new reservation included most of the existing town of Sulphur. Clearly, the initial location of the town site within the reservation limits affected the original character of the park's vegetation, though documentation of this is limited. Presumably, at the time of designation, some platted house sites were denuded of any vegetation cover, while others were designated as agricultural fields or pastures. Also, it is presumed that a number of ornamental exotics currently located in the park—such as irises, lilacs, and roses—date to the settlement period, as these plants were commonly planted around settlers' houses.

Written documentation from 1902–1932 (primarily Superintendents' Reports) reveal that what vegetation management occurred did indeed focus on protecting the existing forest and the beauty of landscape. A 1908 description of the park indicates that out of the park's 848 acres woodland constituted 200 acres and grassland 500 acres, and that dominant woodland species at the time included: oak, elm, hickory, black walnut, persimmon, hackberry, box elder, willow, redbud, cottonwood, sycamore, plum, ash, acacia, pecan, linden, bois d'arc, red cedar, black locust, honey locust, mulberry, wild cherry, black haw, red haw and dogwood.[13] Though grassland clearly constituted the dominant vegetation cover, there is no accompanying description of grassland communities, their character or distribution in the park. Thus it is not known whether these grasslands were native prairies or cleared grazing lands. However, reports referred to some of these areas as "denuded portions of the Park" that could be "reforested without further efforts" due to natural reforestation process.[14] During the early stage of the park's development, other cover types included agriculture, with several acres of oats, corn and alfalfa and pastureland planted at various locations within the park's boundary. These areas were former agricultural fields, abandoned since the establishment of the park and overgrown with weeds of the most noxious and unsightly character.[15]

Between 1908 and 1909 one of the first protective plantings was established. To prevent erosion Bermuda sod plantings were implemented at West Central Park (now Flower Park), Bromide Springs and along creeks banks. [16] Also, in the spring of 1909 several hundred willow stacks were set along exposed portion of the creek banks to stabilize eroded slopes.

In 1909 some of the first ornamental plantings were also implemented. At Superintendent Greene's initiative, flower beds were established at various locations in the Park: three at Bromide Springs, two near the Odneal Hotel and one near the Lincoln Bridge (Figure 3-50). These beds were circular enclosures about twelve feet in diameter, made of conglomerate rock, and filled with rich earth. Some shade and ornamental trees were also planted, although due to unfavorable climatic conditions fifty percent did not survive.[17]

More effort seems to have been placed in reforestation. Following recommendations made by Forester Rogers in a 1908 or 1909 report entitled "Planting Plan" the first reforestation plantings were implemented in the spring of 1909. The Rogers report, although it has not been located in park files, seems to have been the first recommendation to plant red cedars in the park. As a result, oaks, walnuts, elms, maples and cedars and other forest trees were planted in the yard of the Superintendent's residence and other unspecified locations in the park.[18]

However, reforestation plantings were difficult to implement due to vandalism in the park and required "extraordinary efforts and precaution to protect young evergreens planted."[19] In spite of all difficulties, in 1909 Superintendent Greene gladly reported that, due to fencing of the park and exclusion of livestock, natural reforestation had occurred, primarily on the lands that were plowed and seeded to Bermuda grass. He hoped that if this natural growth of oak, walnut, ash and elm sprouts could be protected, "the denuded portions of the Park will be reforested without further efforts." He also stated: "Fire and livestock are the enemies that must be guarded against," strongly advocating profound fire suppression within the park.[20] Such statements would seem to indicate that from the early years of the park establishment reforestation efforts were considered as the most preferable vegetation management alternative. It seems also that the idea of planting evergreens, namely red cedars, originates from this period.

Other than reforestation, management was primarily limited to fire suppression and exclusion of livestock from the park.[21] Other maintenance practices were very limited, consisting of mowing weeds, eliminating poison ivy and limb trimming. Since some of the workers did not have required skills and knowledge, even these simple practices caused adverse effects. A lack of adequate parking facilities resulted in cars compacting soil and

damaging both newly planted and mature. By the 1930s, prior to the CCC, the vegetation of Platt National Park was in poor condition, with much of the park "overgrown with weeds, vines, brush and trees, some of which were dead and dying, presenting a very untidy and overgrown appearance."[22]

Platt District Vegetation Conditions, 1933–1940

In contrast to earlier periods, between 1933 and 1940 a distinct vegetation management approach was established for the Platt District. In general, the goal of the CCC efforts overall was to preserve natural resources and enhance visitors' experience. As Richey described, it was an attempt "to strike a balance between the preservation of natural features and the accommodations of the visitor."[23] In other words, natural park conditions had to be carefully modified to better serve new uses and provide easy access for the park's explorers. Within this goal, the CCC considered vegetation management "one of the first and most important tasks of the whole program," and in May 1933, soon after their arrival, the CCC started an extensive forestry program addressing "the care and protection of the existing trees." The program had two major objectives: "first, the protection and rejuvenation of the existing vegetation insofar as possible" and second "to replenish and re-establish the deforested areas."[24]

Within these objectives, projects included fire prevention, general cleanup, forest stand improvement, insect pest control, nursery work, and erosion control.[25] Reports described also other landscape work such as sodding, mowing and tree surgery.[26] Vegetation projects were often done in winter, mostly between November and March. In Oklahoma's climate, work was often impossible in summer or spring due to heat and drought conditions. Therefore, the CCC took advantage of mild winter months to implement most of the planting projects.

A rather specialized project took place during the spring and summer of 1935. Mr. Merrill, landscape foreman, collected plant material in the park with the intent of creating a herbarium collection. According to Richey and Miller, this herbarium collection contained many varieties of flowers not previously known to exist in the park and "should be of great value."[27] In 1935 and 1936, 600 species of plants of this CCC herbarium collection were identified by Harvard University's Arnold Arboretum, as reported in the 1942 Development Outline. This specimen list does not include information about the locations from which the plants were collected. Therefore its use is somewhat limited for this study. This botanical collection is stored at CNRA (Civilian Conservation Corps Herbarium List).[28]

To prevent repetition with earlier history chapters outlining the sequence of CCC design and construction, here we have classified the CCC landscape work into several categories. This classification defines the design intent of the planting programs of 1933–1940, as described in park documents and as built and existing conditions. In addition to plant maintenance work, there were five general types of plantings established by the CCC: reforestation plantings, ornamental plantings, nursery plantings, boundary plantings and protective plantings.

Reforestation Plantings

Reforestation plantings were the top priority among other CCC landscape works. The intention of this extensive planting program was to restore the park to its "original conditions" and to "strengthen the design."[29] As described in previous sections, the exact "original conditions" of the district are difficult to define today, and the CCC staff never strictly defined their vision of the park's original vegetation. However, based on the CCC planting objectives and widely spread reforestation actions, it appears that managers believed that the park used to be considerably more wooded than it was in the early 1930s. It is also possible that the CCC idea of reforestation was simply a continuation of Superintendent Greene's vision from 1909, since no written or photographic records support the fact that the park was originally primarily wooded.

The CCC began to implement a reforestation program with initial reforestation plantings beginning in the fall of 1933. About 4,000 small evergreens, including 1,000 Austrian Pine, 1,000 short-leaf pine, 2,000 red cedar, were planted "in groups over the park at places designated by the Landscape Architects."[30] The CCC also planted deciduous trees and shrubs. For instance, Richey mentioned that dogwoods were "planted in a good soil." Other species and the exact locations of these plantings are not specified in the reports. We know, however, that in 1934 a total number of 489 eastern red cedars and 30 other large trees of mixed varieties were moved to the park (Figure 10-6).

Figure 10-6. Trees ready to be moved into the park circa 1934.

Due to long-lasting drought, reforestation plantings were discontinued in spring of 1934.[31] Nonetheless, despite the unfavorable weather conditions 3,000 shrubs, probably dogwoods, were planted during the 3rd enrollment period.[32] A few months later, during the 4th enrollment period, at the request of park designers, extensive reforestation plantings were carried on. Most of these plantings were implemented during the winter of 1934/35. For example, in January of 1935 approximately 300 red cedars and over 1,000 shrubs were planted.[33] In 1935 Superintendent Branch reported on the plantings of native trees and shrubs, including 200 red cedars and 2,000 shrubs, under the supervision of Forester Stauffer.[34] Again, no locations for these plantings are provided.

CCC work also included reforestation of "several areas which were formerly used for cultivation and which were denuded of tree and shrub growth."[35] For instance the large area formerly used as an alfalfa field on the Lincoln Bridge-Bromide Trail "was planted to native oak and walnut trees in accordance as nearly as possible with natural distribution of this species elsewhere in the park". To implement this planting, seeds were collected in the park.[36] Also an attempt was made to restore a "natural

Figure 10-7. Red cedar being set at main entrance circa 1935.

growth of Cedar intermingled with other tree varieties" at Bromide Hill, by planting 3,000 red cedar seedlings on the hillside between Rock Creek and ridge. This project also included plantings of 21,800 Osage orange and 1,400 persimmon seeds in several barren areas at unknown locations in the park. [37]

These reports show that park managers made a great effort to implement reforestation plantings using native species. In most cases, tree seedlings and seeds were gathered in the park. Some common plants such as red cedar were acquired at low cost from nearby farmers. However, the reasons for selecting red cedar as a main species planted in the park by CCC are difficult to discern. Even though red cedar is a native to the region it was not common in the park originally. Use of red cedar appears to have been dictated by low purchase price and wide availability.

Ornamental Plantings

As opposed to reforestation plantings ornamental plantings in the Platt District were not established to restore the park to its "original conditions," but rather to improve these conditions. The goal of these plantings was to enhance the most significant park areas and "bring them in harmony with the general plan."[38] The designers' intent was not necessarily to imitate the natural landscape, but rather to make it visually appealing. These plantings were established to generate an appropriate setting for the rustic pavilions, spring enclosures and park residences with the consideration of the visitors' experience. Therefore, in addition to common trees such

as oak, elms and walnuts, more ornamental, flowering shrubs such as redbud, magnolia, jasmine and euonymous were planted. Furthermore, to generate a desirable setting extensive lawn areas were established at the most prominent park locations.

Ornamental plantings were implemented at the Employee Residences, Flower Park, Buffalo Springs, Bromide Springs and the temporary CCC Camp at Walnut Grove. Most of the plants were dug within the park and some were purchased from nearby nurseries. The landscape architects emphasized the use of native species. However, as noted above, ornamental horticultural plantings had been along-standing tradition in the park since the early 1900s. For that reason, in 1936, Superintendent Branch wrote to the NPS director for clarification of regulations regarding planting exotics "such as petunias, verbenas, cosmos, marigolds and bulbs such as tulips, dahlias, gladiolus and cannas at employee residences."[39] He further noted:

> It may be remembered that formerly there were beds of plants and shrubs planted and kept up in what is now the flower park. These have been done away with but it is the desire of the employees to have flowers around their quarters and none of the varieties planted spread or become a nuisance.

Chief landscape architect Thomas Vint was sympathetic to these concerns responding:

> Branch has gone a long way toward eliminating exotics in his park—I think we could well approve his permitting employees to have their own flower beds—inconspicuously placed and forbidding only such varieties as may escape. This is in line with the practice at Yellowstone-Glacier-Grand Canyon.[40]

Favorable conditions between October 1934 and April 1935 (4th enrollment period) led to the implementation of a large planting program in the high-use areas of the park. Branch noted that "[p]lanting operations were confined to areas accessible to watering and with apparent suitable environment for growth. These areas being mostly the highly congested and important areas of the park."[41] Approximately 600 large trees were planted, including red cedar, oak, elm, hackberry, chittamwood and walnut. Also, about 25,000 shrubs such as dogwood,

Figure 10-8. Red cedar plantings at Hillside Springs parking circa 1935.

chaparral, sumac, redbud, coralberry, black haw, wild rose and euonymous shrubs. These plantings were implemented at the following locations: Flower Park (including the revetment wall and main entrance); the parking area at Hillside Springs; the maintenance area; at residences one, two, three, four and seven; and many other undefined areas. Photographs (Figures 10-7 and 10-8), depict the CCC crews planting large cedars at the north main entrance and results of planting evergreens at the Hillside Springs parking area.[42]

Ornamental plantings were established in other park locations as well. An extensive plan was developed at Buffalo Springs (Figure 4-99) under the direction of Landscape Foreman Walkowiak. Although no planting plan for this area has been located, it is clear these plantings were intended to be ornamental, as Walkowiak noted they were "planted according to the effect desired."[43] In total the CCC planted 142 trees in this area including red oak, American elm, winged elm, and red haw; eleven of these were large trees, balled and burlapped and planted in "special locations." Flowering natives such as dogwood, wild plum, red bud and hackberry were planted also planted in "special locations" such as around the Buffalo Springs enclosure, to enhance the appearance of the rustic structures. Finally, 1,040 shrubs were planted "in masses as screens or borders." These included chapperal, dogwood, euonymous, bush plum, redbud and sumac.

Non-native species were not commonly used by the park designers. Because park designers did not want to use exotic species, most trees and shrubs used in ornamental plantings appear to have been "native collected stock."[44] However, some ornamental evergreens including Pfitzer

Figure 10-9. Nursery on 1940 aerial photograph.

Figure 10-10. CCC crews planting boundary plantings, circa 1934.

junipers, American holly, magnolia, and jasmine from the nursery stock were planted around Buffalo Springs. Also, non-native grasses were introduced in the park to create lawn areas. For example, between April and September of 1935 "all highly congested areas" were "carefully planted with Bermuda grass." [45] In general, 27 acres of "sod" cut mostly from outside of the park was planted by September 1935. Bermuda sod plantings were established at Flower Park and Bromide Area as well as at Central Campground, Black Sulphur Springs, and around employee residences.

The NPS ornamental plantings in Platt District represent a significant part of the overall design. This combination of native trees, flowering shrubs and lawns was quite unusual with the typology of national park landscapes. Many areas in the Platt District, especially Bromide and Flower Park, resembled typical urban parks rather than "natural" national park landscapes. Such areas were in many aspects more similar to picturesque gardens and 19th century urban park design and constituted the core of the Platt District, in a contrast with the less prominent, though more natural, native Oklahoma landscape.

Nursery Plantings

In 1933, between Central and Cold Springs Campgrounds on the south side of Travertine Creek, a nursery was established "to provide plants for future ornamental plantings." The nursery, seen in Figure 10-9 contained 2,303 plants in 1934. Most of these plants were harvested from the park and a few others were from commercial nurseries. In addition, under the direction of the landscape architects, bulbs and seeds of "Spanish Larkspur" and "Oamassia" were collected in the park for use in ornamental plantings.[46] It is unclear exactly which

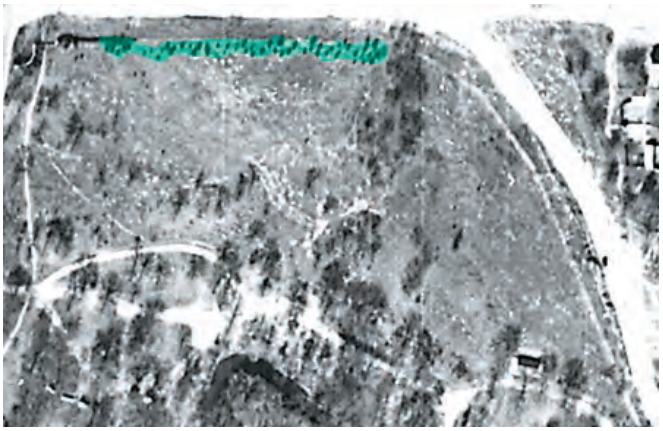


Figure 10-11. Red cedar boundary plantings (top of photograph) along northern edge of Central Campground, 1940.

species these plants were, since these names appear to be no longer commonly used. Native seed plantings were also done for other woody and herbaceous species.

By March 1935 the area of the nursery was doubled in size. "Practically all suitable stock was moved out of the nursery and planted in various parts of the park area and a large number of plants placed in the nursery for next years [sic] planting."[47] During spring and summer of 1935 the general maintenance of the nursery area was continued. In the spring and summer of 1935, approximately 3,500 shrubs and 10,000 cedar seeds were planted for use in later plantings, giving an indication of the extent of the plantings in the park.[48] The nursery continued to be used until the CCC left the park in 1940. Some remaining trees are still there.

Boundary Plantings

Boundary plantings are usually implemented to delineate a property line or to establish limits of a design. They are

also used as a screening to provide privacy, separate areas of different use, and hide unattractive views. In the case of the Platt District boundary plantings were established to separate the park from the town of Sulphur, exclude livestock and screen unsightly farm buildings. Figure 10-10 shows CCC enrollees planting these wide bands of plantings circa 1934.

In 1934, boundary plantings ranging from 6 to 20 feet wide were "installed around approximately one-third of the park boundary to definitely mark the enclosure and to shut out undesirable views."[49] To implement this project, 69,890 plants, mostly native trees and shrubs, were dug in the park.[50] As seen in the 1940 aerial photograph, these plantings were established at Bromide, Central Campground and Cold Springs Campground, many of them using red cedars, which appear as dark spots on the aerial photos (Figure 10-11). Boundary plantings can also be seen along boundaries screening views from the perimeter road.

Protective Plantings

Within the conservation-minded CCC, protection of both soil and woodland seems to have been a priority, not surprisingly in a state famous as part of the Depression-era Dust Bowl. Consequently, protective plantings were implemented by CCC in the Platt District was to control erosion and prevent fire from damaging both the forests and the town of Sulphur.

During the 4th enrollment period about 3,000 red cedar seedlings were planted at the Bromide Hill between Rock Creek and the ridge. Richey and Miller (1935) believed that this area should be revegetated due to "the need for the for a permanent growth to protect soil, the existence of several large existing cedars; and the fact that at one time this whole area was covered with large cedars."[51] Similar plantings were implemented during the previous winter (1933/34), but because of steep and rocky soil, the survival rate was only 20%. In the 1935 plantings crew laborers set each plant in a pocket of a good soil, composted and watered.

Erosion control plantings occurred on newly built earthen structures such as the Flower Park revetment wall and the Buffalo Pasture dam. Erosion control plantings on these landforms included a technique called "brushing," where small bundles of brush were tied together and staked to the slopes in horizontal rows three feet apart. In between the rows, rapidly spreading species such as buck brush, honeysuckle, ground rose, and cat brier were used. This technique was used on the back of Buffalo Pasture dam, where 7,000 plants, some "of particularly thorny nature" were placed.[52] Along the Flower Park revetment wall a dense willow and low shrub planting was planted using a similar technique. In 1935 the entire 900-foot length of the wall was planted and the slopes above it were sown with Bermuda grass.[53]

The designers thought that grass fires were dangerous, difficult to control and "very detrimental to the natural growth in the park."[54] They believed that fires were easier to manage in woodland areas. Therefore, tree plantings were established to divide the broad grassland areas. The most common species used in such plantings was red cedar. Also, to reduce fire hazards in the park, grass was cut in and near most congested areas and around trees and shrubs. Finally, in its design, the perimeter road was also intended to act as a fire break, preventing spreading of town fires into the park.

The documentation of protective plantings within the park was somewhat limited, and it may be that more were implemented in other unspecified locations in addition to the more prominent areas described above. Protective plantings are difficult to distinguish from reforestation plantings and boundary plantings in aerial photographs because red cedars were commonly used in both types of plantings. It is also possible that plantings were considered to have dual purposes, for example, groupings of red cedars acting as both boundary and erosion control plantings.

Maintenance Actions

In 1933, the vegetation of the Platt District was in poor condition due to a lack of maintenance during the park's early establishment. Trees had been injured by ground fires and "unrestricted drivers."[55] In addition, visitor activity caused soil compaction and serious damage to vegetation in some areas. As described by Walkowiak in the early 1930s "despite the natural beauty of Platt National Park, it was quite evident […] that many fine areas had been totally neglected and too many terribly mistreated" leaving "a lot of room for improvement and repair."[56] To "improve the general conditions of park vegetation," tree conservation and protection work performed by the CCC crew included tree surgery, pruning, filling the cavities of large trees, thinning and fertilizing.[57] Many dead limbs were removed, and low hanging branches were raised to 9 feet. During the 3rd

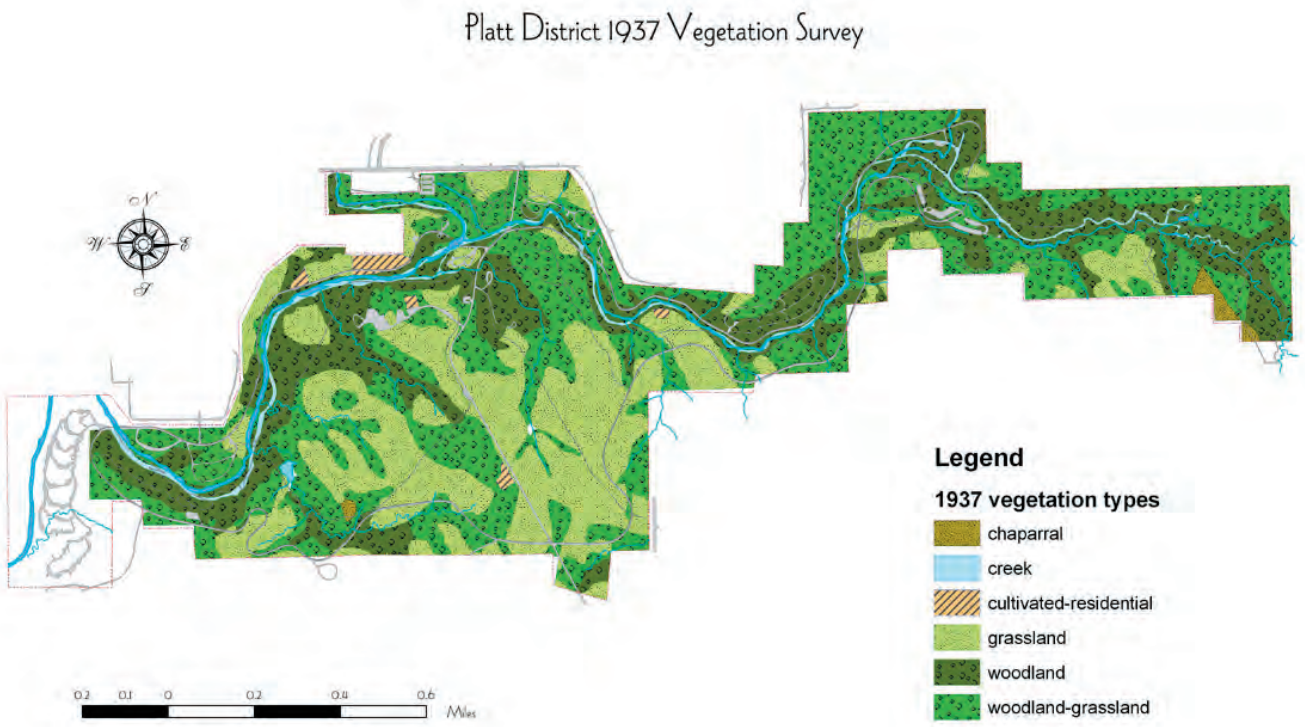


Figure 10-12. 1937 Vegetation Survey.

enrollment period approximately 7,000 trees along roads and trails were trimmed. All roads were given a 14-foot clearance, bridle paths a 10-foot clearance and trails a 7-foot clearance. Tree trimming was also done in Cold Springs, Bromide campgrounds and in Buffalo and Antelope Springs picnic areas.[58] In winter, extensive thinning of existing timber stands was carried out. Dead, diseased, crooked or misshaped trees were removed. In general, the density of the vegetation was reduced "to allow the trees more light and air," although certain "tangles" were left as "bird sanctuaries."[59] Creek clean-up was performed. Trees that obstructed creeks were removed from the streams to allow better water flow. In particular Rock Creek between East and West Sulphur was cleaned up and the "former tangled underbrush" was taken out. Existing trees, especially large oaks, were fertilized with 8-5-5 fertilizer applied by drilling holes around the trees. In summer some insect control was carried out. Web worms from walnut and persimmon trees were burned and red ant colonies destroyed.[60] Also, all trees in view from public areas infected with tent caterpillars were sprayed to kill the worms.[61] Finally, poison ivy was eradicated along the roads, trails and in camp and picnic areas.[62]

Vegetation maintenance including pruning and trimming was also carried out during the 4th enrollment period. According to Branch (1935) about 1,500 trees were treated under the supervision of the park Forester Gerry Stauffer. Some areas were also fertilized with mix of soil and 5,000 pounds of cotton bolls.[63] In the summer of 1935 tree maintenance continued, and work included removing dead trees that failed due to extreme drought of 1934. CCC crews also watered newly planted trees and shrubs, so that only about one percent of trees and five percent of shrubs planted during the 4th enrollment period were lost.

Such maintenance continued until 1940 as documented by CCC crew members in oral histories. In general, such maintenance actions performed by the CCC crews significantly improved vegetation conditions, and were beneficial to the overall health, safety and aesthetic qualities of the park.

1937 Vegetation Survey

By 1937, the CCC design intent was generally implemented with a majority of plantings established and most maintenance actions completed. In addition, in 1937 a comprehensive "Vegetation Type Survey" was undertaken in the summer of 1937 by N.E. Dole, Junior Forester. Dole's survey and its accompanying map (Figure

10-12) provide a snapshot view of the vegetation near the end of the period of significance:

> The stream bottoms are marked by a heavy woodland growth composed of oaks, elms, hickories, and other hardwoods. Above the streams, on the flat or slightly rolling country of the Buffalo Pasture and the old golf course, a mixed grassland is the dominant cover. This is interspersed with types of woodland-grass, the woodland being made up largely of persimmon.[64]

Dole also noticed that due to the small size of Platt National Park and its intensified development, the area "nearly resembles a city park than one of the larger parks that can be kept closer to natural conditions."[65] He also noted, that an effort was being made "to return much of the open area to what is probably very like its original condition by planting may seedlings of eastern red cedar." According to Dole, the results of these plantings were "very gratifying, . . . although the young trees are still too small to be seen above the grass."

Dole's survey gives information on vegetation types and species composition with the specific description about the component landscapes' vegetation. According to the report, in 1937, woodland generally consisted of American elm, post oak, red bud, winged elm, and sycamore. Other less significant tree species, appearing in the woodland to the extent of 20%, were pecan, black willow, bur oak, slippery elm, silver maple, and green ash. The most common understory species were redbud and Virginia creeper. The only evergreen found growing naturally in the park was red cedar. However, it appears that red cedar had a very limited range, since the only area reported to have mature cedars in the park historically was Bromide Hill. This location is confirmed by reports by both Branch and Miller that also describe large cedars on Bromide Hill. The presence of cedars on the hill probably encouraged NPS designers to replant them there.

At the time of vegetation survey of 1937 the upland areas were covered with "either open grassland, or a mixture of grassland and woodland."[66] Dole describes the grassland as "not made up purely of grass" but rather of "herbaceous character." Some of the flowers and forbs described included broomweed, ragweed, goldenrod, and gayfeather. This description may indicate the presence of a dry xeric type of prairie.

Figure 10-13. Mixed woodland and grassland with persimmon, west of Travertine Island, circa 1937.

Mixed woodland-grassland communities were "composed of grass, miscellaneous herbaceous species such as are found in the open grassland herbaceous type and persimmon."[67] (Figure 10-13). Dole felt these trees were at early stage of succession, since they "can hardly be called tree size at present, but barring fire, they should attain tree size soon." Dole's statement indicates the fire suppression executed in the park and the greater value park staff placed of woodlands over grassland communities. Also, Dole believed that the grasslands were the areas of high fire hazard. He based his conception on the events of 1936, when a grassland fire was uncontrollable until it hit the woodlands, where it was more easily managed. Furthermore, Dole anticipated that red cedar plantings implemented by the CCC would reduce future fire hazards "as the broad grassland areas become broken up."

These statements indicate a lack of knowledge and understanding of ecological processes of prairie communities. It is apparent that by 1937 grasslands presented little economical and aesthetic values to the park. Park managers saw them as hazardous and unwanted. Therefore fire was suppressed and many reforestation actions were undertaken to replace prairie with woodland. This idea, commonly accepted in the 1930s, would result in the gradual decline and loss of prairie communities within the district.

Platt District Vegetative Conditions, 1940–1965

The demise of the CCC program in 1940 and reduced funding for national parks during World War II ushered

in years of benign neglect for the Platt District, both for built elements and vegetation. With the exception of spraying for insect pests, occasional pruning, and minimal tree planting, widespread vegetation management was uncommon following 1940.

During the 1950s, droughty seasons in 1953–1955 and 1959 increased forest susceptibility to insect pests, and elm bark beetle (*Hylurgopinus rufipes*), fall webworm (*Hyphantria cunea*), tent caterpillar (*Malacosoma americanum*), and, walnut caterpillar (*Datana integerrim*) were recognized as a threat to the park's trees.[68] Elm bark beetle caused the worst problems, and by 1954 many of the district elms were dead or dying. Fall webworm was also a problem during this period, attacking pecan, black walnut, persimmon, redbud and sycamore trees in Cold Springs Campground and areas along the perimeter road.[69]

As a result, in the late 1950s and early 1960s, insect control actions were common. Infected trees were removed or pruned to control infestations and chemical control was also widely used. For example, in 1955 "25% DDT emulsion was applied by a large mist blower along all roadsides and in all public use areas" [70], in 1957 "an infestation of bagworms in some junipers at the Superintendent's residence was treated with DDT.[71] In 1954 about 850 trees infested with Dutch Elm disease were cut and burned, and in 1963 numerous areas were sprayed with Sevin (Naphthyl Methyl-carbonate).[72]

The dry years also made fire a constant concern in the district. Fire suppression was a priority management practice and to prevent fire "employees carefully cut grass at Park fences and near Park shrubbery and cedars." [73] They also "met with the fire department once a month to coordinate fire control measures." The firebreak in the Prairie Uplands, running along Buckhorn Road (now Highway 177), was regularly cleared and grass was cut in "high fire hazard areas." Although other firebreaks existed, the precise locations of these are unknown, with the exception of a fire break constructed south of Rock Creek campground in 1953.[74]

Other management problems in the 1950s and 1960s included poison ivy, prevalent at Buffalo and Antelope Springs, the Cold Springs and Rock Creek Campgrounds, and Pavilion Springs. These areas were regularly checked and selectively sprayed with 2-4-5-T when necessary. In 1960, park managers received more complaints about poison ivy than any other one item.[75]

Beavers also caused headaches for park managers in the 1950s and 60s. They inhabited the length of the park, wreaking havoc on vegetation from Bromide to Little Niagara. In late 1960, beaver felled numerous trees, including cottonwoods and willows up to two feet in diameter, causing bank erosion. Other trees were simply marked.[76]

By the early 1960s, thoughts had returned to "reforestation," perhaps as a reaction to losses caused by drought and pests. However, the planting campaign that took place between 1960 and 1963 was limited, focusing on high use areas such as campgrounds. Osage orange seeds were collected and planted near Cold Springs Campground in 1961.[77] In 1962, 534 trees, mostly American elm, southern red oak, and Osage orange, were planted in high use areas, with 243 planted in Cold Springs Campground alone. Ten signs were put up in the campground to ask visitors help protect the new trees.[78]

Though management was reduced in the 1950s and 1960s, during this time the park was the focus of two vegetative studies, one on the area's grassland communities (1959) and one on its forest ecotypes (1965). Like the 1937 survey, these two studies provide a snapshot of the park's landscape at a particular point in time. Both studies considered the Platt District as a primarily natural landscape. The area was perceived as offering "unusually fine opportunities for the study of native vegetation because its natural features" were "protected from exploration and disturbance by man" and "one of the few areas in southern Oklahoma where plant communities have been protected for many years."[79]

The 1959 grassland study (Figure 10-14) identified the Platt District as containing three natural grassland types: little bluestem, seep muhly and hairy grama. In 1959 the little bluestem (*Andropogon scoparius*) type was the largest of the three types present. It covered 64% of the natural grassland area (about 178 acres). It was most common on mesic upland sites, such as north-facing slopes, hilltops and other upland areas with fairly deep well-drained soils.[80] This community most likely resembled the true prairie, which originally occurred in this region. Many of the grassland species recorded by Dale in 1959 were also listed by Bruner in his 1931 study of the vegetation of Oklahoma. The major difference from the native prairie

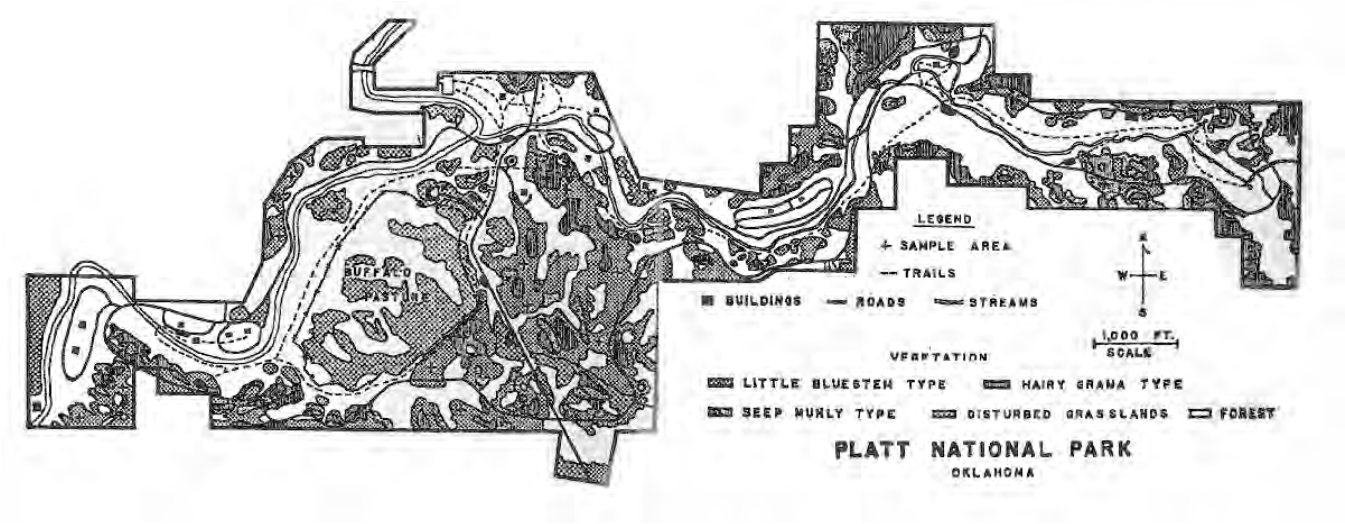


Figure 10-14. Map from "The grasslands of Platt National Park, Oklahoma," depicting 3 major grassland types (Dale, 1959).

was determined to be the relatively greater percentage of weedy forbs, especially along the roads and fences, and on the area of former golf course.[81] Although little bluestem grassland was scattered throughout the whole park, it occurred primarily along its southern boundary. Small patches of this community covered the areas south of Rock Creek Campground and north of Cold Springs Campground. The greatest percentage, however, was present in the area known now as Prairie Uplands, the site of former golf course.

The hairy grama *(Bouteloua hirsuta)* community was "the second largest of three grassland types and the most xeric." [82] It covered about 75 acres of the park area (26% of the natural grassland area) and occurred on dry hillsides with thin, poorly developed rocky soils. Although, it was mapped throughout the entire Platt District, it was more common in the eastern part of the park. The most dominant plants were mostly southwestern species of short grasses mixed with a relatively high percentage of weedy forbs.

The seep muhly (*Muhlenbergia reverchoni)* grassland was the smallest type of the three grassland types present in 1959. It covered approximately 39 acres (13% of the natural grassland). It generally occurred in small patches on old building sites cleared from forested areas and along sides of ravines where highly calcareous soils were present. It was also associated with "seeps" or wet places that were poorly drained for at least part of the growing season.[83] In most cases this community occurred in the central and eastern part of the park. The largest spot of this type was mapped west from Travertine Island at most northern corner of the Platt District.

Generally, in 1959 native grassland communities covered about 292 acres (32%) of the entire area of Platt National Park. The remaining area was overgrown with forest, brush or disturbed grasslands.[84] By that time many of the old building sites, dating to the original Sulphur townsite, were covered by native vegetation. However, these former residential sites were still distinguishable "by the presence of beds of iris, lilacs, roses and other exotics."[85] Some of these are still present today (2003), as iris beds are located in Central Campground, the Administration area, Bromide Springs and other areas.

The 1965 woodlands study, "Final report on the vegetation and microenvironments of Platt National Park," similarly identified four principal forest types, including the short-lobed oak type, the post oak–winged elm type, the Texas oak–chinquapin oak type, and the American elm–southern hackberry type.[86] According to Dale, the short-lobed oak community, found near the Bromide Hill, was the most xeric of all types of forest present in the park in 1965. It was characterized by small groups of short, scrubby trees usually not taller than 15 feet with open spaces between patches of trees. Dale described this type of forest as highly dense with no understory species within the shaded areas and with brushy xeric species within the open places. The post oak–winged elm type was the next most xeric forest present in the park. It covered the area located south of the perimeter road west of Highway 18 and an area east of the museum (now the Administration Building)

near the Buffalo Pasture. The Texas oak–chinquapin oak type was the third most xeric community studied. In 1965, this type was the most extensive forest community present in the park, being dependent on various environmental conditions either relatively xeric (hillsides) or quite mesic. The most mesic forest was the American elm–southern hackberry type, found along the streams. Representative areas he described included Travertine Island, south of the Flower Park, and an area southeast of the museum near Rock Creek.

The Dale 1965 study concluded that "the east end of the park is relatively mesic, and the west end is relatively xeric."[87] This relation was reflected by the vegetation occurrence throughout the park. However, there were also few exceptions, such as several areas in the west part of the park that were the most mesic of all communities studied. In additional Dale noted that woody species, mostly brush such as catbrier, sumac, persimmon, and skunkbush had begun to invade grassland areas. According to Dale, the increase in woody species was a result of "the cessation of prairie fires since the area has been protected."[88]

Both of Dale's studies considered the Platt District to be a "natural" landscape. However, the park was managed from its beginning and human actions were essential to its character. Furthermore, actions that in 1959 were considered beneficial to the grasslands, are known today to cause adverse effects. Although in the 1950s fire suppression and the elimination of grazing by livestock were common, today it is widely understood that natural disturbances, especially fires and grazing, are essential to the health, persistence and continued species diversity of the prairie ecosystem. Without regular burnings a prairie community does not regenerate and gradually changes toward woodland species. This degradation was observed merely six years after the 1959 study, when the slow invasion of woody vegetation into grassland was noted.[89] Although this process was associated with fire suppression no comments were made on the potential loss of native grassland in the park.

Platt District Vegetation, 1965–2000

Between 1965 and 2000, it appears little major vegetative management was undertaken in the district, though this is a little difficult to tell due to the paucity of historic documentation found for this era. In the 1960s, some replanting of areas occurred under the aegis of the Job Corps programs, but in general, construction of new facilities for the Arbuckle Recreation Area seems to have taken priority over vegetation management within the smaller national park. In general, it appears that during the 1970s and 1980s a somewhat "hands-off" management approach was taken, with basic tree and forest maintenance undertaken as needed to protect visitor safety,

Vegetation studies during this time were also relatively uncommon. A popular history of the park, Platt National Park: Environment and Ecology was published in 1975 by Barker and Jameson, but was predominantly based on Dale's 1959 and 1965 studies.

More recently, vegetation in the overall CNRA has been more studied. Between 1998 and 2003, three vegetative studies were performed by Bruce Hoagland of the University of Oklahoma. However, these studies focus on the vegetation conditions of the entire CNRA and contain only limited information relating specifically to the Platt District.

EXISTING VEGETATION CONDITIONS AND ANALYSIS OF CHANGE

This section of the document describes the existing conditions of the park's vegetation and then analyzes changes in that condition since the period of significance. Existing condition descriptions are largely based on the Dale studies of 1959 and 1969, since existing plant communities and overall vegetation patterns are fairly similar to conditions in 1965. Information is also drawn from field surveys and from three vegetative studies on the CNRA performed by Hoagland in 1998–2000. In addition, a major source of information about the Platt District vegetation patterns and their change over time are aerial photographs from 1940, 1969, 1984 and 1999.

This section considers the park's overall or district-wide vegetation first, then describes the park's individual or component landscapes in greater detail. These descriptions generally expand the descriptions of vegetation provided in Chapter 6, especially with respect to individual areas' species composition.

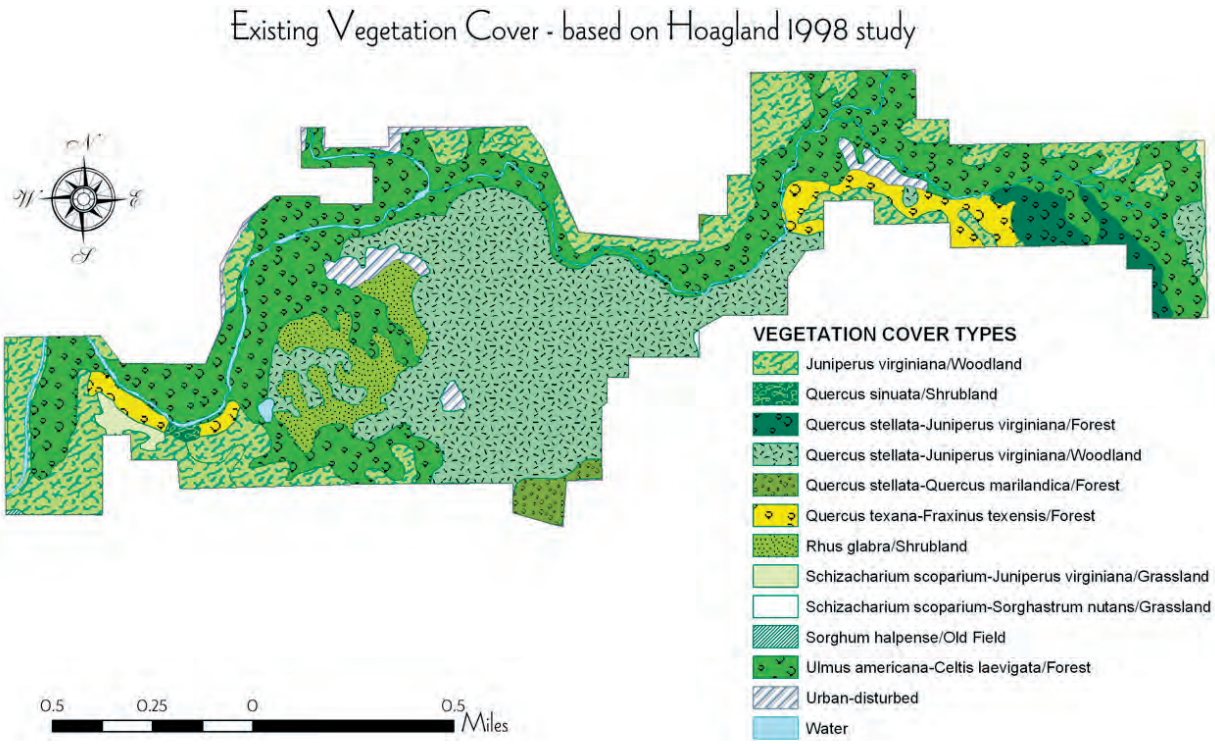


Figure 10-15. Existing Vegetation Cover Types, based on Hoagland's 1998 study.

Existing District-wide Vegetation Conditions

Overall, the vegetation of the Platt District represents a variety of ecosystems such as prairie, oak savanna, woodland and designed vegetation—the latter condition being a "park" type of landscape. The district's vegetation patterns are representative of the transitional ecotone between the eastern deciduous forest and the western short-grass prairie. This transitional zone contains a rich mixture of grassland and woodland species such as yucca, sumac, prickly pear cactus, sycamore and oak.[90]

Today, forest and woodland types dominate the Platt District (Figures 10-15, 10-16, Table 10-1). The overall extent of woodland cover is approximately 740 acres. According to Hoagland, the most prevalent forest type is American elm–sugarberry (*Ulmus americana–Celtis leavigata*) forest. This community occurs on wet to moist soils in riparian corridors along Travertine and Rock Creeks. It covers roughly 343 acres. Characteristic tree species of this dense lowland forest association are: American elm, sugarberry, chinkapin and other oaks, black walnut, pecan, and bitternut hickory. In the understory, green dragon, Indian woodoats, Carolina moonseed, elephant's foot, wild rye, elderberry, western soapberry, rough dogwood, Indian coralberry, Virginia creeper, and smilax are common.[91]

Most vegetation communities of the Platt District are dominated by eastern red cedar. Extensive areas of the park are covered either by eastern red cedar forest or woodland and only small patches of declining grassland still exist south of the park's highest elevations. The most common red cedar vegetation type is post oak–red cedar (*Quercus stellata–Juniperus virginiana*) woodland, which covers about 274 acres of the Platt District. This woodland is open evergreen woodland where trees over 15 feet tall form a 25 to 60 percent canopy cover. This vegetation type extends almost entirely over the Prairie Uplands area, over most of the Buffalo Pasture and over a small patch east of Buffalo Springs.

The second most common red cedar type is eastern red cedar (*Juniperus virginiana*) woodland. It covers approximately 160 acres, mostly along the northern park boundary, around Rock Creek Campground, and along the southwestern district boundary. A third red cedar vegetation type identified by Hoagland (1998) is the post oak–red cedar (*Quercus stellata–Juniperus virginiana*) forest. There are two patches of this forest association, about 23 acres in extent, in the southern part of Buffalo and Antelope Springs. This forest type differs from the woodland type of the same name, in that trees over 15 feet tall provide an increased canopy cover of 61 to 100 percent. Representative plant species of this

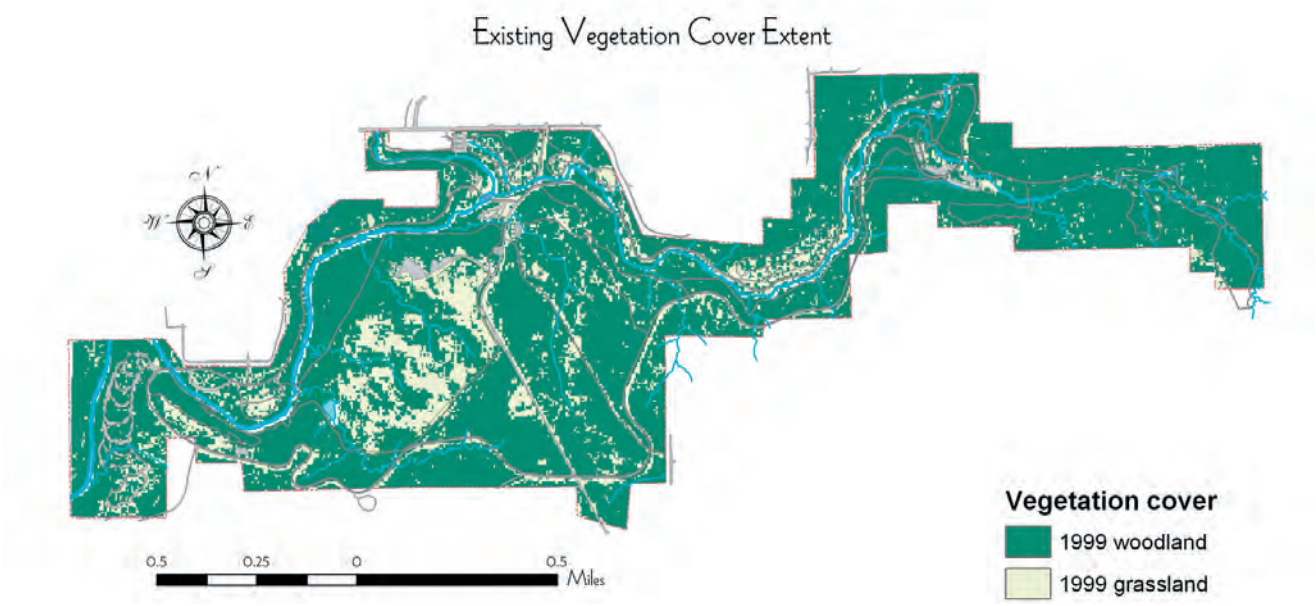


Figure 10-16. Existing Vegetation Cover Extent, based on the 1999 aerial photograph.

forest type include big bluestem, black hickory, blackjack oak, fragrant sumac, smooth sumac, little bluestem, and coralberry. Only one patch of red cedar grassland was identified by Hoagland, the little bluestem–red cedar (*Schizachyrium scoparium–Juniperus virginiana*) grassland located south of Bromide Hill. It is a site of barely eight acres, and like other district grasslands, has reached a stage of decline, and is being gradually invaded by red cedar.

Other less common vegetation types include smooth sumac (*Rhus glabra*) shrubland, Texas oak–Texas ash (*Quercus texana–Fraxinus texensis*) forest and cross-timbers (*Quercus stellata–Quercus marilandica*). Smooth sumac shrubland covers approximately 44 acres of the Buffalo Pasture; 35 acres of Texas oak–Texas ash deciduous forest extend over the area south of Travertine Nature Center; and a small, 10-acre patch of cross timber forest is located at the most southern portion of the Platt District.

All of the vegetation types described above were identified in Hoagland's 1998 study and are presented in Table 10-1 with their approximate acreages. This table shows that red cedar vegetation types dominate in the Platt District, covering a total of approximately 465 acres or more than 50% of the entire district. Although red cedar is native to Oklahoma, the rapid increase of this species has profound negative impacts on the ecology of the natural grassland and woodland types. These impacts include an increased risk of wildfire and a decrease in biodiversity.

Cover type	Acres
Juniperus virginiana/woodland	161.497
Quercus sinuata/shrubland	1.961
Quercus stellata-Juniperus virginiana/forest	23.001
Quercus stellata-Juniperus virginiana/woodland	274.221
Quercus stellata-Quercus marilandica/forest	10.896
Quercus texana-Fraxinus texensis/forest	35.002
Rhus glabra/shrubland	44.832
Schizacharium scoparium-Juniperus virginiana/grassland	8.515
Schizacharium scoparium-Sorghastrum nutans/grassland	0.378
Sorghum halpense/old field	0.329
Ulmus americana-Celtis laevigata/forest	343.641
Urban-disturbed	22.834
Water	1.140
Total acreage	**928.247**

Table 10-1. Summary of vegetation types in the Platt District as identified by Hoagland, 1998. Acreages calculated from GIS coverages.

Existing Component Landscape Vegetation Conditions

Bromide and Bromide Hill

Vegetation in this area generally correlates with topographic conditions. The steeply sloped areas along Rock Creek and Bromide Hill contain naturalized vegetation, while the flat terrace at the base of the hill is covered with more maintained and planned vegetation of park-like character. In general, flora of this area is characteristic of the lowland forest association of the eastern deciduous forest. The principal forest type along

the Rock Creek adjacent to the park-like Bromide Springs is the American elm–southern hackberry type, which is typically located near streams.

Such species classification, however, does not take into consideration the designed landscape most typical to the area. Today, the flat terrace at the base of the hill is mostly a maintained, park-like setting of trees in turf rather than a "natural" or forest-like setting. Within the Bromide Springs area CCC ornamental plantings were implemented around the pavilion, and included red cedar planted around the semi-circular wood bench and additional tree plantings within the picnic area, though these were generally not documented. Mature shade trees set in the smooth turf are most representative of the CCC plantings. The designed nature of these plantings is most strongly expressed at the 12th Street fountain, where soapberry trees are located more or less symmetrically around the enclosing walls of the fountain plaza. Two perennial beds containing iris and day lily are also located near the Bromide Springs Pavilion and may be remnants CCC plantings or, more likely, even earlier flower plantings in the park.

Analysis of change (Figure 10-17)
Natural vegetation shows major change in terms of loss of grassland communities. This includes both a loss in the extent and area of grassland and a change in species composition due to invasion of woody species. In 1937 and 1959, areas on the top of Bromide Hill were classified as open herbaceous grassland (Dole 1937 map). Today, as evident on the Hoagland 1998 vegetation cover map, all grassland communities of Bromide Hill are overgrown with woodland species. Only a small patch of little bluestem grassland exists now, but it is in the late stage of succession, due to profound red cedar domination. The expansion of the red cedar in the area is most certainly a result of the CCC boundary plantings as well as a result of fire suppression in the park fire.

The designed, park-like setting of the Bromide Springs is retained today, though also not without some change and loss. Many mature trees within the picnic area show signs of age and stress from the 2000 ice storm. Though major tree work was undertaken in the months following the storm, some trees need additional pruning and structural work. As in natural areas, species composition has also changed over time. As described in Chapter 6, in general, there has been a shift over time away from mature oak toward colonization species.

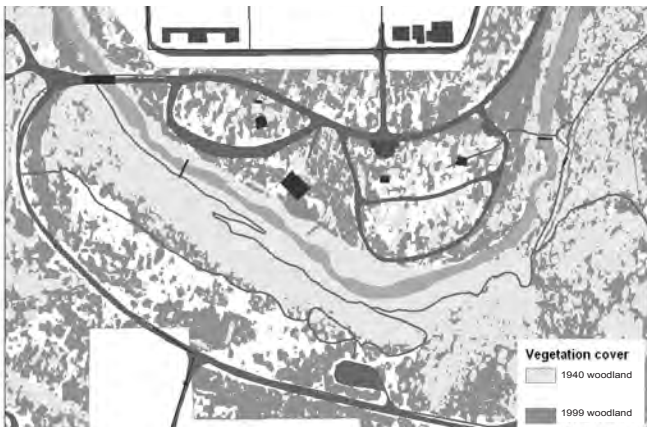


Figure 10-17. Bromide and Bromide Hill Vegetation Change (1940–1999).

Walnut Grove

Walnut Grove can be characterized as a wooded, moderately flat, floodplain terrace located just above Rock Creek. To the north of the terrace are steep, south-facing hillsides covered with dense deciduous forest. Today, Hoagland (1998) defines the Walnut Grove vegetation as Juniperus virginiana woodland and American elm–sugarberry (*Ulmus americana–Celtis leavigata*) forest typical of the Rock Creek terrace.

While natural vegetation is located on the area's slopes, the level, open picnic area below represents a somewhat more managed type of vegetation, characterized by canopy trees in turf. Trees, often located in islands of understory vegetation, are also located close along the perimeter road and lining the parking areas. Dominant tree species in the lawns include hackberry, black walnut, Osage orange and oak. Turf species include native grasses such as buffalo grass, gramas, and little bluestem in sunny areas, though Bermuda grass dominates. Shady areas under trees along the perimeter road and near the comfort station also contain Canadian wild rye, known for its shade tolerance. The contorted Osage orange known as the "Monkey Tree," with its low-hanging branches, continues to be a popular climbing spot for children. The tree is something of a local landmark for Sulphur children and residents.

Analysis of change (Figure 10-18)
Since 1940, the area's naturalized vegetation shows some changes in species composition. In 1959 Dale classified only a small area of Walnut Grove along the

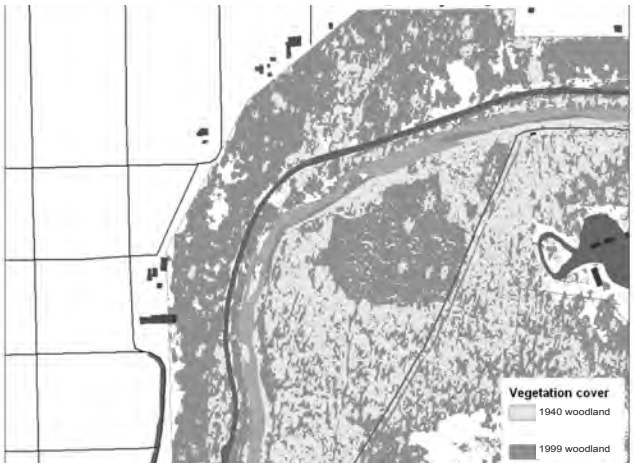


Figure 10-18. Walnut Grove Vegetation Change (1940–1999).

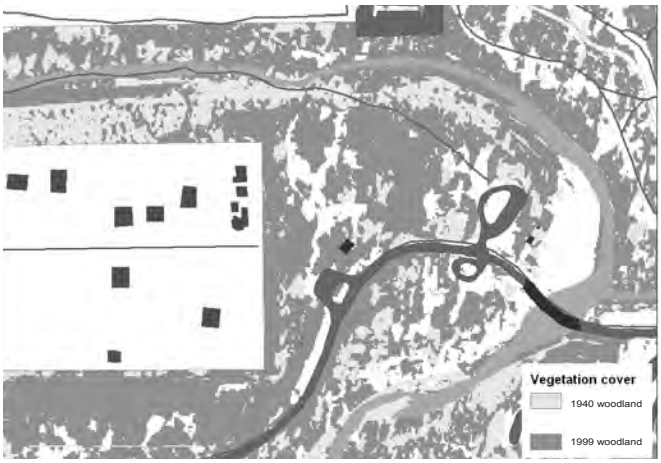


Figure 10-19. Black Sulphur Springs Vegetation Change (1940–1999).

northern park boundary as natural grassland, mostly little bluestem. Most of Walnut Grove was shown in Dale's 1965 study as the mesic American elm–southern hackberry community. Thus, over time, there has been a loss of naturalized grassland and increases in red cedar. Changes in the more managed area are difficult to chart, due to lack of documentation. In general, however, the overall character-defining aspect of the area as mature trees in open turf is clearly retained.

Black Sulphur Springs

Most of this area, located in the area around the Black Sulphur Springs pavilion and the picnic areas to the west and south is maintained and managed vegetation. Species on this floodplain terrace of Rock Creek are representative the American elm–sugarberry forest of the eastern deciduous forest and elms, oaks, walnuts and hackberries are the most common overstory species. From a physical and spatial standpoint, the vegetation might be characterized as shaded level turf or mature trees scattered over open lawn. A shrubby redbud may be a remnant of a more extensive parking lot island planting, though this is not documented. A cluster of trees around the Black Sulphur Springs Pavilion may also be considered character-defining. These trees, which provide cooling, dappled shade around the pavilion, are seen in historic photographs; the large Osage orange behind the pavilion is clearly seen in many. However, some of the trees in close proximity to the pavilion are large enough to potentially damage the structure. Two clusters of cedars located near the pavilion appear to date from the 1930s, based on age and size, and the fact that similar trees are seen on a 1937 topographic survey of the area. However, existing plantings to not seem to correlate significantly with planting designs proposed for the area.

Analysis of change (Figure 10-19)

Although plantings were designed for the area around the pavilion, precise implementation of these plans is not fully evident in photodocumentation of the area. Thus, specific changes in this area are difficult to determine. Species are consistent with those recorded in 1937 and in 1959 when Dale classified the Black Sulphur Springs area as disturbed grassland. Even though little extant formally designed vegetation appears to be retained throughout the area, the vegetation's major character-defining aspect—turf shaded by trees—is clearly retained.

Flower Park

Most of Flower Park vegetation has a distinct park-like character, different from other, more natural areas of the Platt District. Only the slopes of Rock and Travertine Creek valley are covered with native deciduous lowland forest, classified by Hoagland in 1998 as American elm sugarberry forest. Vegetation above the stream valleys, on main Flower Park terrace is designed and consists of shade trees set in open lawn. Tree canopy is dense enough to provide a pattern of almost half sun and shade over lawn, paths, and water features throughout the day.

Somewhat different in character is the vegetation on the northern hillside of Flower Park behind the comfort station. Densely wooded, the area is dominated by red cedar and some Ashe juniper that were planted here

during the CCC area to create a buffer between town and park. A few sunny patches on the slopes in this area contain native grasses, including little bluestem. Hoagland's 1998 study classifies this area as red cedar woodland.

Analysis of change (Figure 10-20)
Vegetation along Travertine and Rock Creeks is consistent with the native vegetation of the area, and appears to have experienced little change. Of course, vegetation along Creek, where the revetment wall was constructed, is primarily regrowth vegetation, though the current, naturalized conditions were the expected outcome of that construction.

Within the park-like area of Flower Park, vegetation is consistent with surveys made during the period of significance. The 1935 topographic survey (NP-PLA-5033) of the area shows species such as oaks, elms, sycamore, willow, hackberry, walnut and persimmon within the level terrace of Flower Park. Based on size, many of the trees shown on this plan still exist today, though correlating them exactly is difficult, due to discrepancies between historic and current maps.

Some loss of character-defining overhead canopy has occurred. Based on the analysis done by ISU students in November of 2002 (see Chapter 6), it appears the overall number of shade trees in Flower Park has decreased by about 10%. In contrast, species composition has changed quite significantly. In 1936, more than half of the shade trees were oak species; today, only 25% of the trees are oak, and seem to have been replaced by hackberry. In general, tree condition is good, but some structural pruning is required on numerous trees in the area. Beaver have recently begun chewing the bark on the hackberry in the park, and these trees, many already wounded, are currently protected with metal screening.

The greatest change seen in vegetation is the northern hillside. As shown on 1937 survey plan (Dale 1937, Figure 10-12) the area historically was open grassland spotted with various species of oak, a condition also recorded in 1959. Comparisons of aerial photographs taken in 1940 and 1999 show major growth of red cedar in this area, as reflected in Hoagland's classification of this area as cedar forest. While not a natural forest, this area is clearly a result of the expansion of CCC red cedar plantings. While remnants of the area's grassland remain, they are not visually or spatially significant.

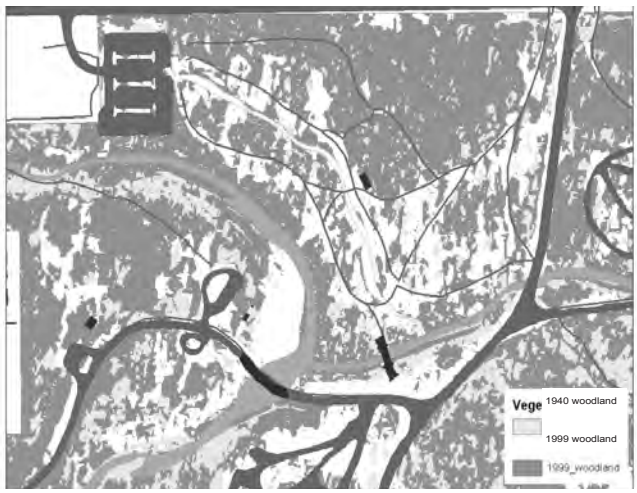


Figure 10-20. Flower Park Vegetation Change (1940–1999).

Central Campground

Central Campground is generally covered by dense native and naturalized vegetation with camping areas defined by a canopy of widely spaced specimen trees. As characterized by Hoagland in 1998, naturalized vegetation in this area is representative of American elm sugarberry forest along Travertine Creek and red cedar woodland (to the north and east).

In contrast, the northern knoll of Central Campground, historically open grassland (containing bluestem and hairy grama) is now overgrown with red cedar woodland. The dominant overstory species in this forest area are red cedar, blackjack oak and post oak. Characteristic forbs and grass species are ragweed, broomsedge bluestem, prairie threeawn and bearded skeletongrass.[92] This woodland association occurs on the areas of old fields and prairies where fire has been suppressed. In this case red cedars were planted by the CCC in the 1930s as boundary plantings along the campground's northern and eastern boundary. These plantings spread over time over the larger area and now cover significant extent of northern corner of Central Campground.

Camping areas within the campground, located mostly within the two loop roads are characterized by turf with shade trees. Over the years these trees have been impacted by soil compaction and recent ice storms. This is most evident in the west loop, where a lack of shade and numerous stumps attest to recent tree losses. In general, the existing condition of trees in the camping areas is rather poor.

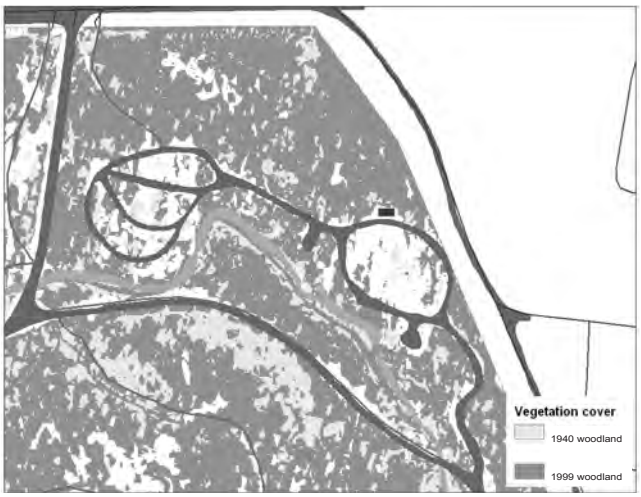


Figure 10-21. Central Campground Vegetation Change (1940–1999).

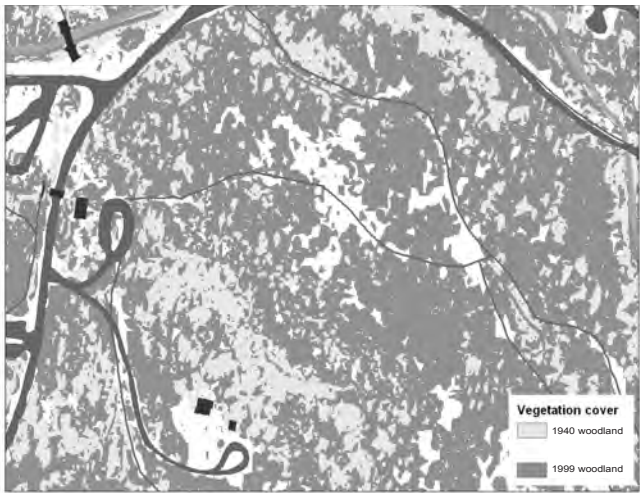


Figure 10-22. Pavilion Springs Vegetation Change (1940–1999).

Analysis of change (Figure 10-21)

As described above, the naturalized vegetation of the area is consistent with historic conditions. In 1937, when the area was surveyed by Dole, listed tree species included: southern hackberry, common persimmon, bitternut hickory, eastern cottonwood blackjack oak, chinquapin oak, red oak, post oak, winged elm and American elm. These species are consistent with current species. Major change, however, has occurred within the northern part of the campground, where cedar forest now dominates. The growth of this forest is a result of expansion of red cedar boundary plantings that are clearly visible on the 1940 aerial photograph of the park. In the more managed areas of Central Campground restricted by the loop roads, vegetation has changed in yet another way. A shade tree inventory conducted in this area (see Chapter 6) in November 2002, shows that the overall number of trees in the circumscribed areas has increased over time. However, a change in species composition is seen. Oaks still dominate the area, but have decreased from 52% to 43%. An increase in other species such as elms, hickories and cedars was noted. Consequently, although the overall number of trees increased it appears that the shaded canopy area has decreased over time.

Pavilion Springs and Employee Residence

Vegetation in this area is largely naturalized. The vegetation located within the floodplain and on the lower hillsides consists of the predominantly mesic community of the American elm–sugarberry forest. Near the Prairie Uplands to the south is the more xeric post oak–red cedar woodland.

Though no specific CCC planting plan has been located for Pavilion Springs, the area was likely altered by the planting of trees, shrubs, and turf grasses to create a more managed zone located just south of the pavilion and west of the parking area. This area is a lawn shaded with mature trees, which include elms, ash, hackberry and oaks. Individual specimens of cottonwood and bois d'arc also occur. A similarly domesticated zone was designed around the Employee Residence. Although a planting plan was created for this area, it does not seem to have been strictly followed. Today, the area surrounding the residence is primarily turf, with a few specimen trees in the lawn, and some iris around the residence.

Analysis of change (Figure 10-22)

The area's current broad vegetative patterns generally reflect historic conditions. In 1965, Dale described the floodplain area as American elm–Southern hackberry forest and the area to the south as post oak–winged elm type. These are generally consistent with Hoagland's findings in 1998, though it is apparent the southern portion of the area contains more red cedar than it did historically. A notable change is the loss of a grassland area east of the pavilion. In 1937 this area was mapped by Dole and was described as grassland of herbaceous character, a character confirmed by Dale in 1959. Dale's map shows this area as containing little bluestem, hairy grama and seep muhly. These grassland species and area seems to have been lost today.

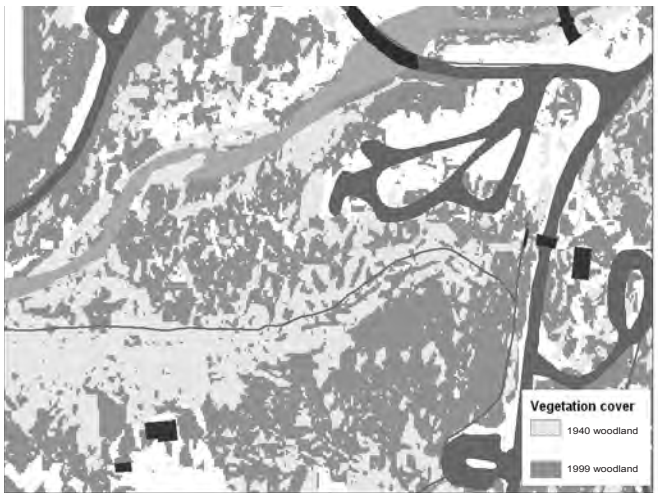


Figure 10-23. Former Elk Paddock Picnic Area Vegetation Change (1940–1999).

Figure 10-24. Hillside Springs Vegetation Change (1940–1999).

The managed landscape of trees and turf around the Pavilion has experienced minor change, primarily due to loss of canopy trees. Many trees here were lost or damaged during the ice storm of 2000. Particularly noticeable are the large stumps indicating lost trees at the base of the pavilion to the north and east. While the loss of such trees may ultimately benefit long-term maintenance of the structure, their loss has reduced shade and reduced the integration of building and landscape, adversely impacting the quality and appearance of the whole landscape. Similarly, at the Employee Residence, details of the original planting plan have been lost.

Former Elk Paddock Picnic Area

The vegetation of this area is mostly of park-like character with mature trees placed in turf. This more managed landscape is surrounded with natural forest consistent with American elm sugarberry forest.

Analysis of change (Figure 10-23)
The area's naturalized is consistent with 1965 classifications of this area as American elm–sugarberry forest. While a lack of historic documentation of this area hinders precise assessment of change, the area's current vegetative character of turf with canopy trees is similarly consistent with historic conditions.

Hillside Springs

Vegetation at Hillside Spring is dominated by dense red cedar woodland. Cedars line Highway 177 on both sides of the parking area, and also enclose the slopes above and below the spring enclosure's retaining wall. Cedars also buffer the area visually from the former Headquarters building up slope. The cedar forest is composed of mature trees of similar age, with some in decline. Understory is limited and many of the cedars have lost their lower branches due to the shade created by the density of the plantings. As a result, the vegetation, while dense, appears ragged and patchy, with dead and downed trees interspersed among the living. The appearance of vegetation is particularly unappealing immediately behind the spring wall.

Analysis of change (Figure 10-24)
Historically, as captured on 1930s photographs, Hillside Springs was a more open landscape with both grassland and woody vegetation. Dole's 1937 survey depicted the area as containing elms, ashes and cottonwoods. Dale's 1959 survey also indicated a large patch of little bluestem type grassland covering the area north of Hillside Springs. Today, none of these conditions are extant and have been replaced by red–cedar woodland.

Existing conditions are likely the result of the CCC design intent was to alter this open condition and create a sense of enclosure. As a result, Hillside Springs is now less open and more enclosed than it was in the years immediately after the plantings were installed. Today,

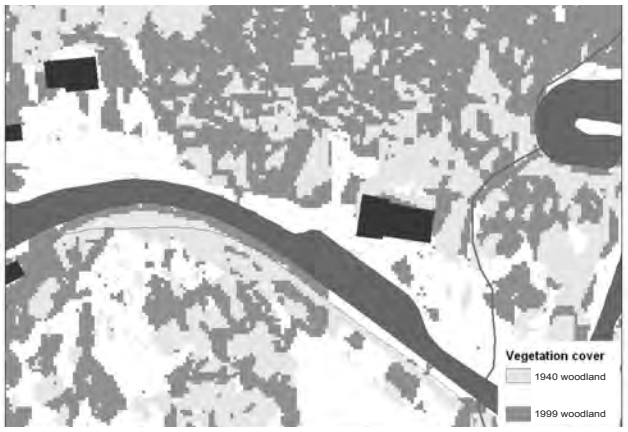


Figure 10-25. Headquarters Vegetation Change (1940–1999).

Figure 10-26. Maintenance Area Vegetation Change (1940–1999).

though planted by the CCC, red cedar plantings appear fully naturalized.

Headquarters

Vegetation in this area is of two major characters: naturalized woodland and overgrown foundation plantings. The area north of the building is classified by Hoagland as post oak–red cedar woodland. Originating from CCC reforestation plantings, the red cedar woodland separates the Headquarters area from Hillside Springs below and its character is the same as described above for Hillside Springs.

The tree, shrub, and groundcover foundation plantings include redbud and periwinkle. A few of these plants may be historic, but in general, these plantings are rather haphazardly arranged around the building. An iris bed is located just east of the building.

Analysis of change (Figure 10-25)
As recorded by Dole in 1937, the Headquarters area was fairly open, with the area to the north, behind the building, covered with herbaceous grassland spotted with elms, cottonwoods and red buds. By 1959, Dale reclassified the area adjacent to the building as disturbed grassland with a small patch of native little bluestem type was mapped to the north, behind the building. This reclassification shows a gradual change in the area from grassland to red cedar forest, as a result of CCC plantings.

Foundation plantings today are overgrown and this character does not reflect historic conditions, when foundation plantings were meant to blend the base of the building with the ground plane. However, the species composition of these plantings is likely similar to what existed historically, since it is known that redbuds did exist in this location. Based on changes seen in historic photographs, foundation plantings have been revised at least once since 1940, and possibly more often. However, detailed planting plans for the area seem never to have been produced, so restoring exact historic conditions and character for these plantings will not be possible.

Maintenance Area (Utility Area)

The most current vegetation survey (Hoagland 1998) classifies the utility area as urban–disturbed. According to this study, the area to the north is covered with post oak–red cedar woodland and the American elm–sugarberry forest. This dense forest edge serves to define and screen the maintenance area from the rest of the park. There are also small areas of more managed vegetation character. For instance trees near the entry area and the archives building were planted to provide a shade for parking. There are also some remnant residential plantings of trees and perennial flowers around Building #6, dating to its former use as employee housing.

Analysis of change (Figure 10-26)
Vegetation is not a particularly significant feature in this utilitarian area. Historically, as recorded by Dole in 1937, the area was disturbed grassland of herbaceous character with addition of persimmon to the south in the area adjacent to Buffalo Pasture. To the north woodland species were common, including elm and hackberry. The current conditions are consistent, indicating only minor change has occurred in this area.

Buffalo Pasture

The Buffalo Pasture is composed of approximately 90 acres of naturalized vegetation, including woody deciduous and evergreen species as well as native prairie grasses. Hoagland's (1998) vegetation study identifies the large portion of the Buffalo Pasture as smooth sumac (*Rhus glabra*) shrubland, where smooth and shining sumacs are aggressive prairie invaders.[93] To the north and west the area is enclosed by American elm–sugarberry forest dominating the Rock Creek banks. A significant portion of the area is occupied by post oak–red cedar woodland. The domination of red cedar is a result of the CCC reforestation efforts that occurred in this area. Much of the red cedar was planted in the 1930s and has matured and expanded its range since then. The vegetation around the pasture's perimeter is dense and provides a strong sense of enclosure and exclusion from the pasture.

Analysis of change (Figure 10-27)
In general, fire suppression within the Platt District has encouraged dense growth of both evergreen and deciduous woody vegetation. This, combined with expansion of CCC red cedar plantations in the southern part of the pasture, has created a landscape more enclosed, more dominated by woody species, and less open than existed historically.

In 1937, when Dole surveyed the park's vegetation, the Buffalo Pasture was predominantly open grassland of herbaceous character dominated by persimmon. Unfortunately, the Buffalo Pasture was not extensively considered by Dale's vegetative study of 1959, so comparisons with later conditions are more difficult. Dale defined the grasslands of the area as disturbed and did no further description, mapping only the area south of the pasture. This area was described as dominated by little bluestem with small patches of hairy grama and seep muhly prairies. The 1965 study mapped similarly limited areas, and indicated that post oak–winged elm forest and Texas oak–chinquapin oak forest were the dominant communities. It is notable that red cedar was not surveyed in the area, indicating that the dominance of this species today is likely a great change.

Despite a lack of survey information about species composition change, aerial photographs clearly show a change in the spatial pattern of vegetation. As seen in Figure 10-27, the area has become significantly more

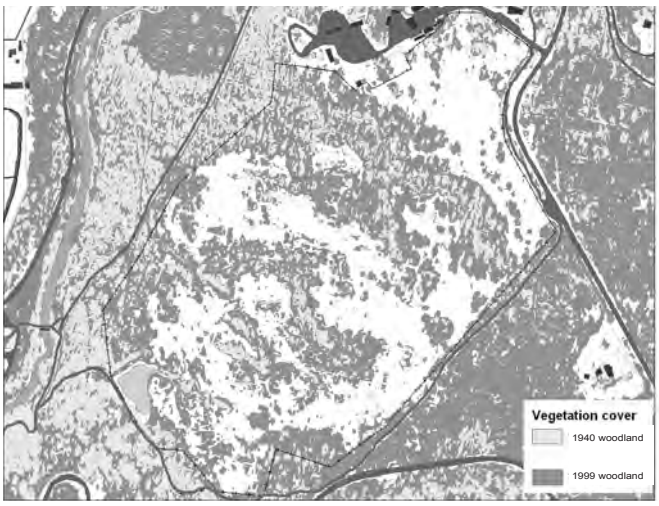


Figure 10-27. Buffalo Pasture Vegetation Change (1940–1999).

enclosed and more wooded, with only small amounts of open pasture remaining. This constitutes a major change in the feeling and appearance of the pasture's vegetation, as well as its utility for bison foraging.

Prairie Uplands and Superintendent's Residence

The vegetation of the Prairie Uplands today is primarily classified as post oak–red cedar woodland, dominated almost exclusively by these two species. The 1998 Hoagland study also mapped a small patch of cross timbers (*Quercus stellata–Quercus marilandica*) forest in the south corner of the area. Although the Hoagland study mapped no grassland areas, there are small patches of little bluestem grassland interspersed within the predominantly red cedar forest. The Superintendent's Residence is a large area of turf with ornamental trees and plantings located within the larger area, and is today something of an island of openness in the sea of red cedar. Also worth mentioning is that on the edge of the upland area, along Travertine Creek's south bank a few large white pines are extant from the CCC nursery, indicating its historic location.

Analysis of change (Figure 10-28)
As with the Buffalo Pasture, change within the Prairie Uplands is predominantly due to CCC plantations of red cedar and fire suppression within the Platt District. The resulting landscape is visually opaque with an enclosed feeling.

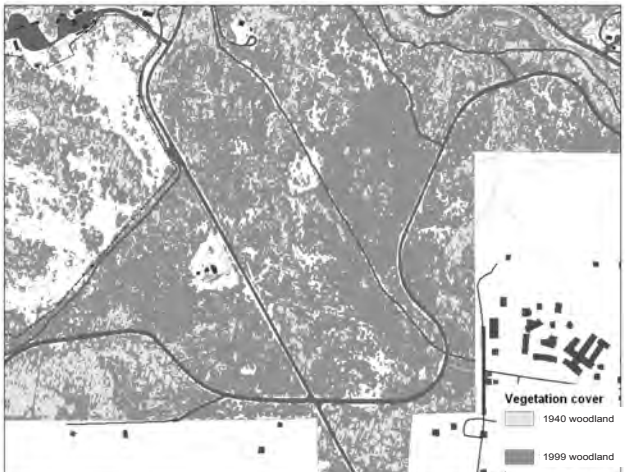


Figure 10-28. Prairie Uplands Vegetation Change (1940–1999).

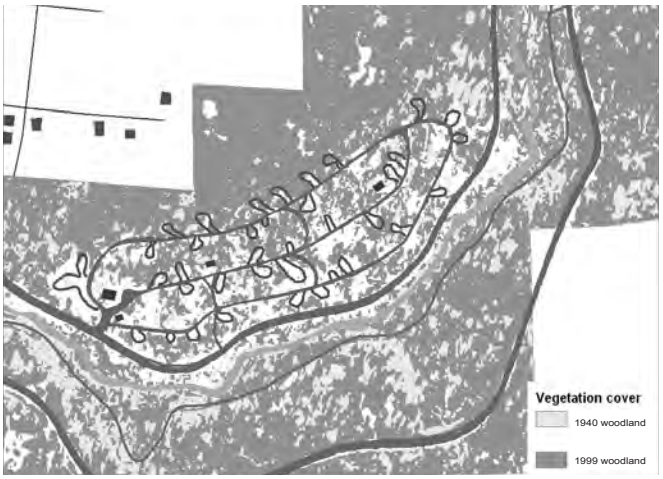


Figure 10-29. Cold Springs Campground Vegetation Change (1940–1999).

When surveyed by Dole in 1937, the prairie uplands were dominated by open grassland of the herbaceous character. Only a small fraction of woody vegetation was present. These conditions were maintained at least through 1959, when Dale described the area as comprising most of the "natural grasslands" of the Platt District. Dale noted that the little bluestem type was the most common, although both hairy grama and seep muhly types also occurred in the area.

Today, most of this grassland has vanished, with the result that the current vegetation conditions of the Prairie Uplands are very different from the historic. The expansion of woody vegetation is a result of both the spreading of red cedars from original CCC reforestation and fire control plantings established in the area circa 1930. The growth of both evergreen and deciduous woody vegetation has been further encouraged by the suppression of fire within the district. As a consequence, dense woody vegetation has radically changed the appearance of this component landscape making it less open and more enclosed than it was during the period of significance.

Cold Springs Campground

The area around Cold Springs Campground is a moderately flat, heavily wooded floodplain of Travertine Creek. According to Hoagland's 1998 vegetation study, the Cold Springs Campground is mostly covered by the American elm sugarberry forest which dominates the rest of the Travertine Creek floodplain. Red cedar woodland covers the area along the northern edge of the campground. This is most likely a result of 1930s boundary plantings. A small patch of cross timbers (*Quercus stellata–Quercus marilandica*) forest covers the most north-central corner.

There is little designed vegetation within the campground; rather native, naturalized vegetation serves to provide shade and separate campsites. Some understory vegetation provides screening between the campground and the perimeter road as well as screening between campsites. The overstory is in fair condition, however many mature trees were lost or damaged by the 2000 ice storm. Understory vegetation is reduced compared to other parts of the district, mostly because of the heavy visitor use the area receives. Foot traffic between campsites is heavy and small shrubs and forbs are quickly trampled. This reduces privacy between sites and in some areas, campsites are clearly visible from the perimeter road due to lack of vegetative screening. Shrubby vegetation tends to be denser around the campground perimeters, where foot traffic is less.

Analysis of change (Figure 10-29)

The vegetation at Cold Springs Campground is generally in keeping with historic conditions. Historic accounts of vegetation include a 1937 topographic maps and the 1937 Dole study. These surveys indicate common tree species included sycamore, elm, willow, oak, hackberry and walnut, all in keeping with the site's classification as American elm–sugarberry forest. The Dole survey and the Dale study of 1959 also indicated that the northern part of the campground was covered with open grasslands

of herbaceous character. This grassland has been mostly replaced today by the red cedar woodland. The growth of red cedar to the north is clearly the result, over time, of CCC boundary plantings.

Other changes in the area are a perceived loss of understory contributing to a lack of privacy between campsites. There is also a perceived decline in the health of mature trees. These changes are a result of storm damage, forest maturation and soil compaction due to intensive campground use. However, overall, the campground's vegetative character—mature trees providing overhead canopy and shade and a sense of wooded enclosure—is strongly retained despite changes in the condition of individual trees.

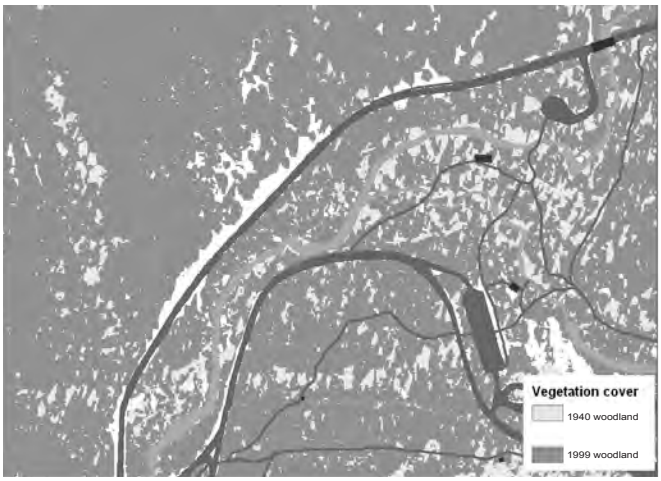


Figure 10-30. Travertine Island and Little Niagara Falls Vegetation Change (1940–1999).

Travertine Island and Little Niagara Falls

Travertine Island and Little Niagara Falls is a moderately flat, quite densely wooded floodplain terrace. Vegetation is characteristic of the lowland association of the eastern deciduous forest and includes elms, oaks, black walnut, and sugarberry. Hoagland's 1998 study associates the area with the American elm sugarberry forest, the community that dominates the banks of Travertine and Limestone Creeks. Red cedar woodland is also present in the northeastern corner of the area and in a strip along the park's south boundary, indicating 1930s CCC boundary plantings. To the south, a small area adjacent to the American elm–sugarberry forest is covered with *Quercus texana–Fraxinus texensis* forest.

In general, the Travertine Island and Little Niagara Falls area is mostly released native vegetation, with little obviously "designed" vegetation in the area. The most important aspect of the area's vegetation is the shade provided from tall trees, and many of the Platt District largest trees are located in the area. A significant cluster of trees are located in and around the large stone picnic area on Travertine Island; all of the trees over 36 inches in diameter date to the period of significance.

Analysis of change (Figure 10-30)

The existing and historic vegetation conditions of the area seem to be very similar. Historic documents do not indicate that the Travertine Island and Little Niagara Falls area received CCC-era ornamental plantings, although some may likely have been installed around the stone tables. It also appears that a significant amount of species composition change has not occurred over time. A topographic survey from 1936 (NP-PLA-5038) indicates the area was covered mostly by oaks, elms and hackberries, though other species such as pecan, walnut, sycamore, cottonwood, box elder and red bud were also noted. These species are consistent with the 1937 Dole study of the area, as well as Dale's 1959 and 1965 areas. Thus, species seem to have been consistent with those of American elm–sugarberry forest since the period of significance to the present day.

One minor change has been the loss of grassland patches mapped in 1959. These were recorded by Dale, and were large patches of hairy grama type grasslands, located to the north and west above the creek banks. These areas are no longer extant.

In recent years change has begun in the overstory. Many large trees have been lost in summer and winter storms throughout the area, reducing shade and giving the area a more open feeling. This is particularly true around the Travertine Island Comfort Station, which has lost its wooded setting and feels rather denuded, despite rapidly regenerating understory. Better quality understory and overstory vegetation is located around the island's northern parking area, which retains a more wooded feeling.

Buffalo and Antelope Springs

The Antelope Springs, Buffalo Springs, and Nature Center area is a wooded stream valley between north- and

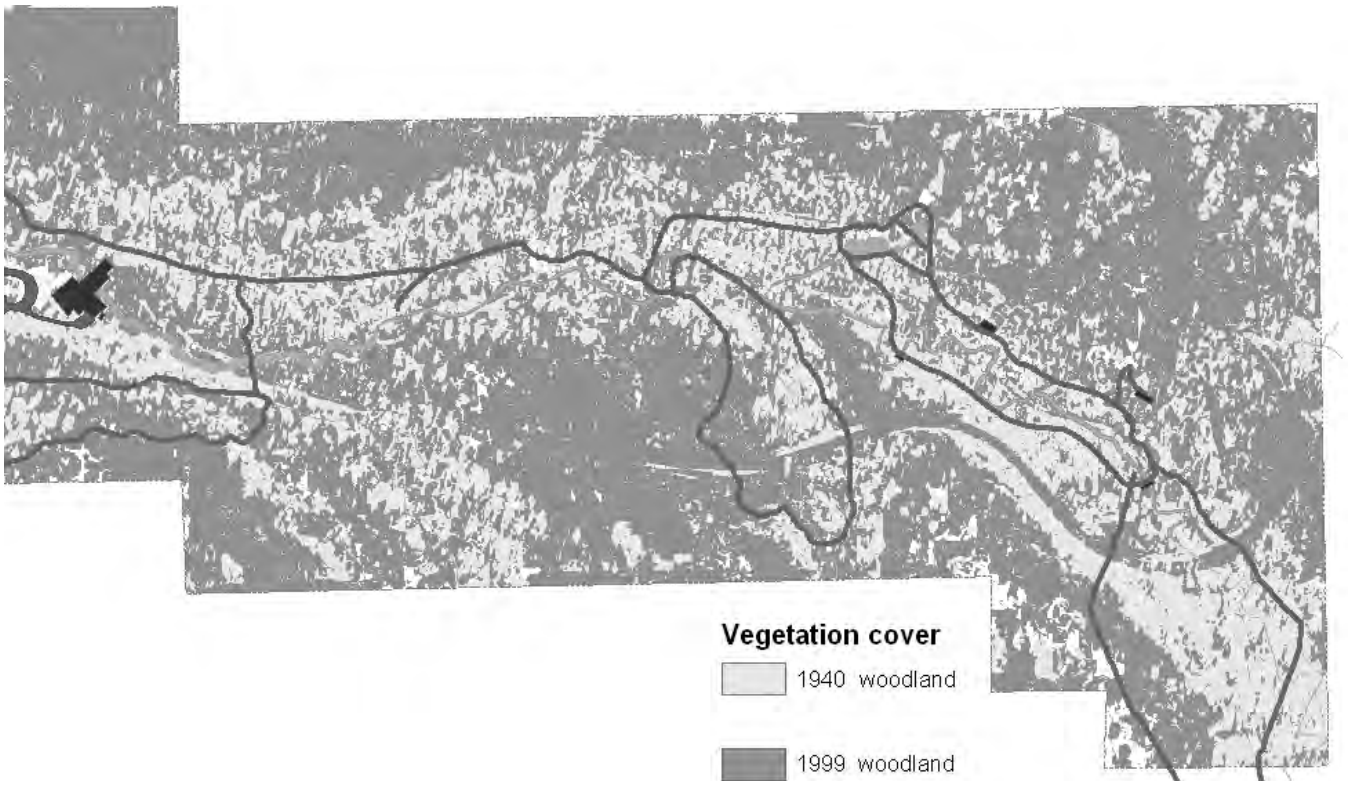


Figure 10-31. Buffalo and Antelope Springs Vegetation Change (1940–1999).

south-facing ridges. The vegetation of this area, located along Travertine Creek is characteristic of the eastern deciduous forest, and includes elm, oak, black walnut, and sugarberry. Hoagland's 1998 study describes this as American elm–sugarberry forest, typical of the rest of the eastern portion of the park. To the north red cedar woodland dominates and small areas of post oak–red cedar forest and *Quercus texana–Fraxinus texensis* forest are located along the southern boundary. A small patch of post oak–red cedar woodland and narrow strip of little bluestem–red cedar grassland are located along the eastern park boundary.

Vegetation is predominantly native and released. Evidence of any designed vegetation is no longer extant. In general, the area is characterized by dense canopy and thick understory vegetation.

Analysis of change (Figure 10-31)

It appears that vegetation conditions in 1937 were significantly more open than today. Based on the Dole survey of 1937, deciduous forest was confined almost exclusively to the Travertine Creek banks and areas above the stream were predominantly open, covered with herbaceous grassland, or a mixture of woodland and grassland vegetation. These prairie areas, as a result of fire suppression, were overgrown with shrub-size persimmon. This type of vegetation was most common along the most of the boundaries of the park in 1937. Conditions were somewhat similar in 1959, when Dale's study depicted grassland communities along the north and south park boundary in the Antelope and Buffalo Springs area. Hairy grama type grasslands were the most common, although little bluestem and seep muhly types were also present. The only remnant of these grasslands today are small patches along the abandoned perimeter road and along the far eastern park boundary. In general, it appears much of the grassland has been replaced with red cedar–post oak woodland, which is typically located on former prairies where fire has been suppressed.

Overstory vegetation, however, seems to have changed little in species composition, since both the Dole and Dale studies of 1937 and 1959 describe the area in terms consistent with the existing elm–hackberry association. Larger changes may be seen in the character of the forest. In general, over time woodland vegetation in both understory and in canopy cover has significantly increased in the area. This is strongly evidenced by aerial photographs and by comparing extant conditions at Antelope Springs and its downstream pools with current

conditions. Only recently have summer and winter storms damaged trees, creating sunny openings.

Finally, there is no indication of the designed or ornamental vegetation around the Buffalo Springs enclosure, and this has presumably been lost. However, it is difficult to define the degree or nature of this change. Although vague verbal descriptions of this work exist, little as-built documentation of this vegetative character have been located.

Rock Creek Campground

Vegetation of Rock Creek Campground is typical to the lowland forest association of the eastern deciduous forest. The recent vegetation study by Hoagland (1998) confirms this and defines the area of the campground as the American elm sugarberry forest (*Ulmus americana –Celtis leavigata*). According to this survey areas adjacent to the campground are covered with red cedar woodland.

In general the campground is shaded by a canopy of native overstory trees, particularly on the flat level terrace near the Rock Creek. Tall, hardwood trees provide the enclosure and shelter from the sun. Understory shrub cover is relatively dense and shows less visitor impact than in the other park campgrounds. This vegetation layer serves as a screen between campsites, providing some sense of privacy. Different in character is vegetation in the in the newer section of campground on Chigger Hill. This area is significantly more open and has clumps of cedars interspersed with native grasses and little deciduous overstory canopy. No significant designed plantings are apparent. The exotic invasive species tree-of-heaven and mimosa have been identified in the campground.

Analysis of change (Figure 10-32)

Of all the park's component landscapes, Rock Creek Campground probably exhibits the least change. The area's vegetation was first recorded by Dale in 1959 and 1965. The 1959 survey mapped small little bluestem grassland patches to the south and disturbed grassland to the west. The 1965 survey described the site as Texas oak–chinquapin oak forest, containing oaks, elms, and ash. Although this is slightly different from the area's current classification as elm–sugarberry forest, it is certainly not inconsistent. Although still present, grasslands located near Chigger Hill are slowly being invaded by red cedar,

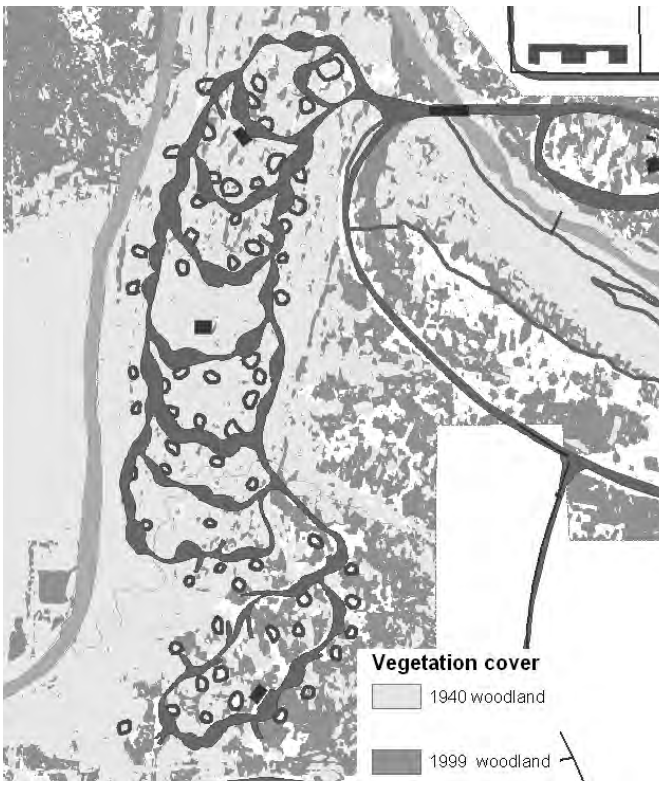


Figure 10-32. Rock Creek Campground Vegetation Change (1940–1999).

as is common in fire-suppressed areas. However, at this time, grassland loss does not mark a significant change in the area. In general, the site was designed as and remains as a site with naturalized vegetation.

DISTRICT-WIDE ANALYSIS OF CHANGE

The major change in the overall Platt District vegetation patterns is the change in the relationship between grassland and woodland communities. As a result of fire suppression, and a "hands-off" vegetation management philosophy over the district's past 50 years, wooded areas significantly increased in the park, diminishing the areas of natural grasslands. As a result, the historically open park landscape, once dominated by prairie, has become enclosed with woodland types.

In 1940, the district's tree cover was limited, comprising only about 26 percent of entire park area (Figure 10-33). Woodlands were mostly restricted to the streams and ravines, while the remaining landscape was open.

A gradual shift in vegetation types started shortly after 1940, when the results of CCC reforestation, ornamental

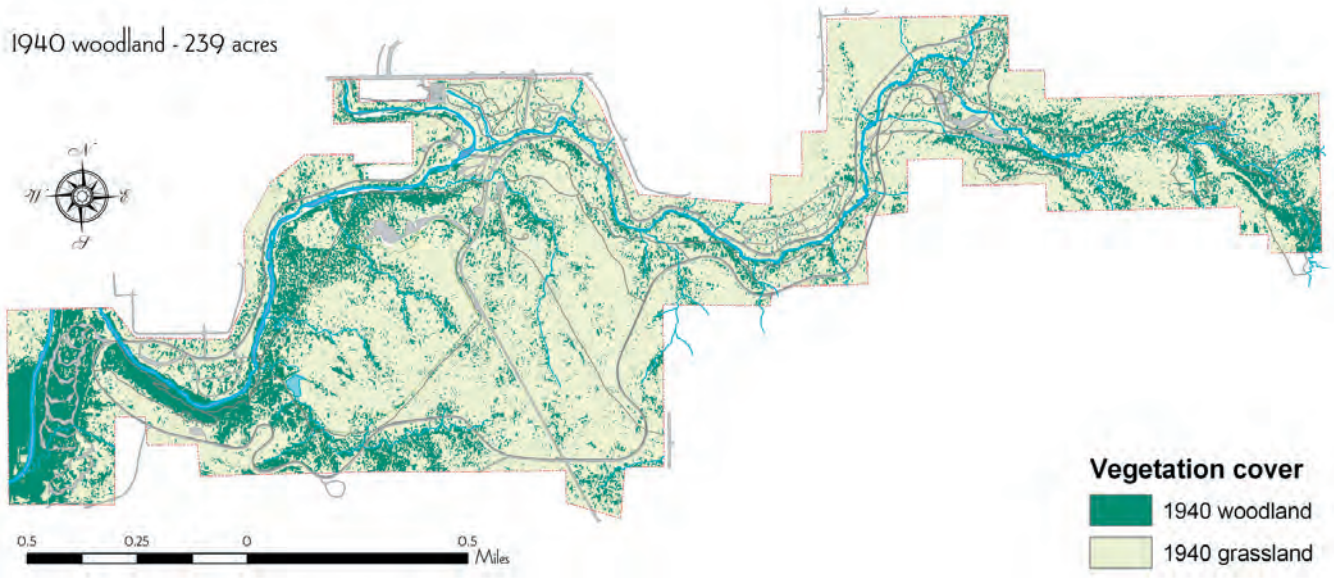


Figure 10-33. 1940 Vegetation Cover.

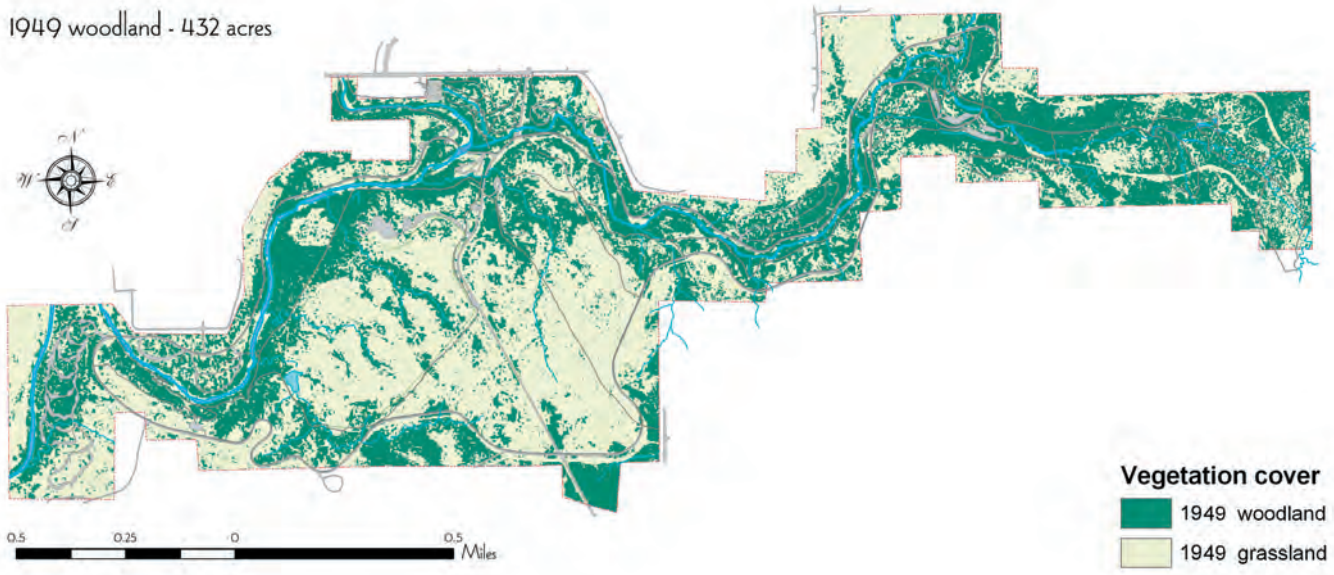


Figure 10-34. 1949 Vegetation Cover.

and protective planting efforts became apparent in the landscape. In the first years after the CCC plantings were established, tree growth was very rapid, with most of the woodland expansion occurring between the 1940s and 1960s. In 1949 tree cover had already increased by about 193 acres, occupying about 430 acres (47 %) of the district area (Figure 10-34). By 1956 tree cover had increased another 36 acres to comprise 470 acres (51 %) of the park (Figure 10-35). This analysis indicates that in less than two decades, the area of tree cover area doubled in size. By 1969 the relationships between grassland and woodland types shifted radically, so that tree cover comprised about 658 acres or more than 70 % of the total park area (Figure 10-36). Today tree cover comprises about 740 acres (81%) of the park area (Figure 10-16).

A remarkable aspect of this increased tree cover (Figure 10-37) is that it has primarily been caused by a single species: eastern red cedar. As such, the cover change clearly does not represent an ecology of plant succession,

Figure 10-35. 1956 Vegetation Cover.

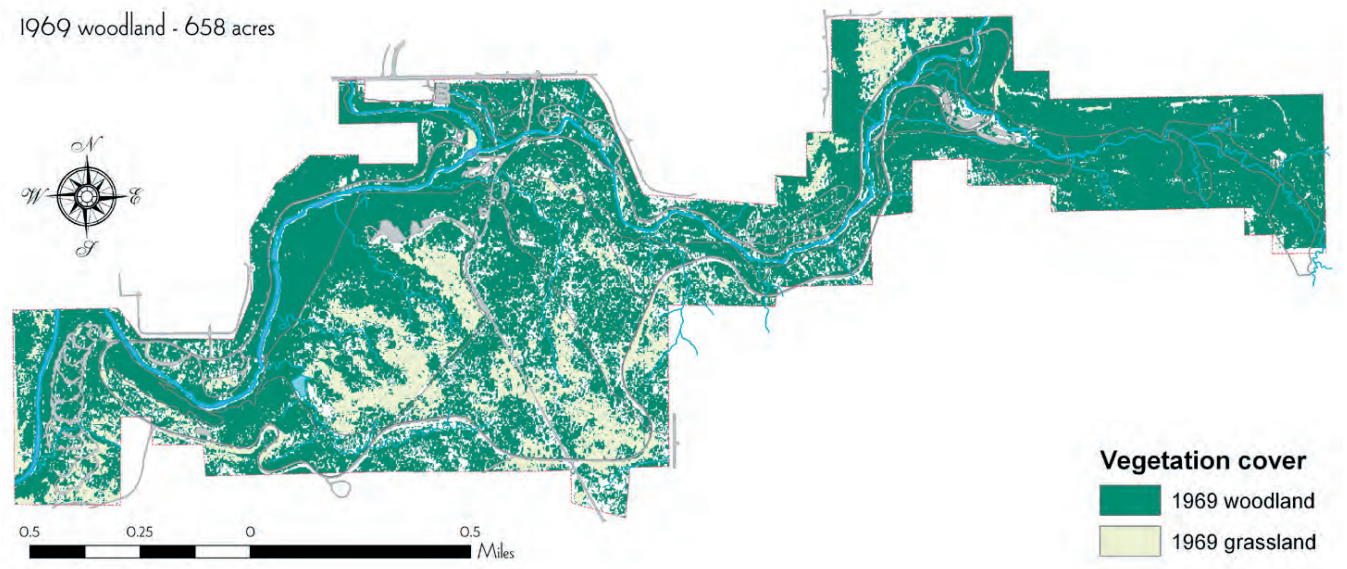
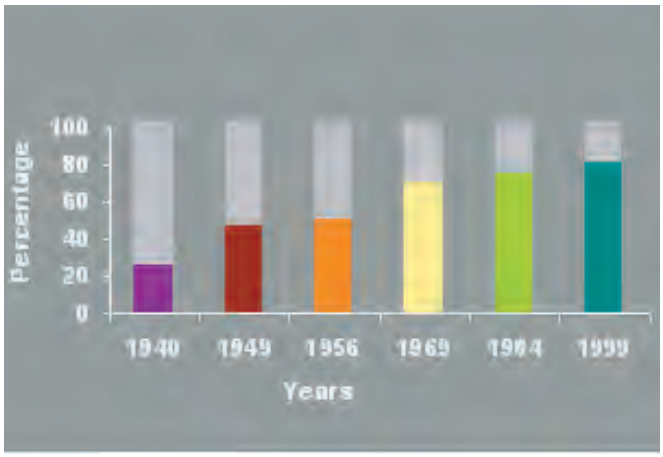


Figure 10-36. 1940 Vegetation Cover.

but rather of species invasion. The results of cedar encroachment is two-fold. First, the overall density of vegetation in the district has significantly increased, changing the district's visual appearance and feeling. Low-branching evergreen trees, cedars create a thick, visually and physically impenetrable forest. Across the 900 acre district, these forests create a visually opaque landscape where views and vistas are blocked and visitors feel enclosed. Second, the increase in cedar cover types has significantly decreased the district's biodiversity. Native prairies in particular have reduced ecological value due to loss of species, with native wildlife also impacted by loss of habitat and food sources. In general, most grassland types within the park are beginning to decline and will require active management if they are to be retained. Yet cedar has not just invaded grassland cover types; it has also invaded woodland communities. As a result, biodiversity has also declined in woodland communities



Time Period	Hectares	Acres	Percentage
1940	96.5	239.1	26
1949	175.06	432.6	47
1956	190.01	469.5	51
1969	266.52	658.6	71
1984	280.59	693.4	75
1999	300.38	742.3	85

Figure 10-37. Tree cover growth over time, bar graph (left) and corresponding table (right). Acreages calculated in GIS based on aerial photographs.

as cedars restrict regeneration of shade-intolerant hardwoods. The risk and potential dangerous effects of wildfires within the district also increase in cedar-encroached areas, because of the volatility of red cedar as a wildfire fuel.

As a result, even though red cedar expansion has slowed down since the 1950s and 1960s, its adverse effects have become increasingly evident over time. As described above, the areas that have changed the most include the Prairie Uplands, the Buffalo Pasture, and Buffalo and Antelope Springs. In these areas, historically open grassland spotted with individual mature trees has been replaced with thick red cedar woodland. While there are still some small patches of native prairie remaining in these areas, as little remainders of the district's historically most prominent vegetation type, if no vegetation management actions are taken in the future, these too will soon disappear.

Despite red cedar domination, the vegetation of the Platt District still retains its unique composition of both natural and designed vegetation. This combination of vegetation creates a diversity of feeling and experience in the park, ranging from those on an urban park to those of a wilderness area. The retention of this vegetative character over time is remarkable. However, active vegetation management actions would help to improve the ecological condition of native areas, recreating the historic ecological balance between the district's grassland and woodland types as well as the aesthetic balance between natural and designed landscape types.

VEGETATION MANAGEMENT ISSUES

In addition to historic conditions, future management of the park's vegetation must also take into account issues of vegetative health and growth as well as maintenance. The following issues have been identified as having potential impacts on ecological health of the park's ecosystems.

Invasive, exotic, and nuisance plant species

Invasive or exotic species are plants which are transported to and then overcome otherwise intact, pre-existing native ecosystems. These species can rapidly overtake ecosystems and change both their appearance and function. In the Platt District there are two types of invasive species—those which are native to Oklahoma, such as red cedar and poison ivy, and those which are exotic, such as mimosa and tree-of-heaven. All of these species are rapidly growing, crowd out other plants, and are particularly problematic because they replace more desirable native species and reduce the overall biodiversity of the park. The major problematic species are described below.

Red cedar

Although it is a native to Oklahoma, eastern red cedar was not common in the park before it was widely planted by the CCC. During, the redesign of the park in the 1930s cedars were planted as screens, firebreaks, erosion prevention and for ornamental purposes. Such cedar plantings flourished, propagated themselves, and spread rapidly, in part due to decades of fire suppression

in the park. As a result, these evergreens have gradually invaded all natural ecosystems of the district. While red cedar encroachment is most evident in the prairie areas, woodland communities have also experienced similar encroachment.

The invasion of junipers into native plant communities fundamentally changes the species composition, structure and overall habitat conditions of plant communities. Encroachment occurs as the trees shade out understory vegetation. The pre-existing species of plants and the animals that use them for food and habitat begin to decline and are eventually eliminated from the area. In particular, the production of grasses and forbs sharply declines as cedar trees increase in canopy cover and density. Thus, cedar expansion reduces biological diversity by reducing the number of living organisms, their functions, and interactions.

Within the Platt District, red cedar expansion has caused a number of problems. As described above, it has impinged on the aesthetics and appearance of the historic landscape. In general, park is more spatially enclosed, many of the historic views and vistas are blocked and integrity of areas such as Prairie Uplands is considerably diminished. In addition, it has also degraded both the quality and area of pasturage in the Buffalo Pasture, since forage production has sharply declined with to increasing shade and canopy cover. In addition, the increase of red cedar dominated vegetation types significantly contributes to the risk of wild fire. According to the Hazard Fuel Assessment document "this encroachment posses a far greater concern in terms of fuel management, than increased down and dead fuel loads resulting from the ice storm damage."[94] The problem is most crucial along the urban interface, when red cedar can increase the risk of fire damage to private property by serving as ladder fuels to overstory deciduous trees and by serving as a volatile fuel source near homes. Finally, the red cedar expansion affects the park integrity.

Today, park managers are concerned with further encroachment of the red cedar and its potential effects on the district's natural and cultural resources. However, at the same time, in some areas cedar trees are also recognized as historic fabric, planted by the CCC, and potentially important to the designed landscape.

Exotic invasive species

In addition to red cedar invasion, the Platt District contains a few non-native invasive plants. Non-native invasive species with noticeable and growing populations within the park include the following: Johnson grass; mimosa; tree-of-heaven; Japanese honeysuckle; and privet. Some of these plants, such as honeysuckle and privet were introduced by the CCC in the 1930s. The introduction of other species cannot be specified exactly. Some exotic species may have been planted by the residents of original Sulphur town, while other plants such as mimosa were possibly seeded by naive park visitors.

Today, the most abundant exotic species in the Platt District is Japanese honeysuckle. It is a fast-growing ground cover that invades all woodland types and disturbed areas. Japanese honeysuckle creates dense, continuous cover at the forest edge and over the forest floor, reducing the establishment and growth of native seedlings and herbs. Also, because honeysuckle significantly increases forest density, it consequently contributes to the wildfire risk, especially along the urban interface.

Another rapidly spreading plant is Johnson grass, a noxious, perennial weed native to the Mediterranean region. Johnson grass invades riverbank communities and disturbed sites, particularly fallow fields and forest edges, where it crowds out native species and slows succession. In the CNRA Johnson grass dominates areas that have been heavily disturbed in the past such as old fields. It occurs also within mixed grassland types where it reduces natural plant diversity. Within the district, its key locations of invasion are isolated roadside and trail areas and entrance to Rock Creek campground. Johnson grass has been monitored within the larger CNRA and has occasionally been sprayed with Roundup to reduce its spread.

The mimosa tree is found throughout the entire district, especially along roadsides and trails, but also within the campgrounds, picnic and woodland areas. The Buffalo and Antelope Springs area and Travertine Island are two places where it is quite apparent. Privet and tree-of-heaven are less commonly found. Privet is limited mostly to the floodplain forest and seep areas, and sometimes marks locations of former home sites since it was commonly used as a hedge and ornamental plant. Tree-of-heaven, though not listed in Hoagland's 1998

vegetation study, has been found in and around Rock Creek campground.

In general, the location, abundance, and aggressiveness of the district's exotic species varies. In most cases they do not appear to present an immediate hazard to the district's natural resources. Still, such species contribute to the reduction of native plant species and decrease biodiversity, and because of this, their presence should be monitored to determine rate of expansion. The following vines and shrubs should be monitored: Japanese honeysuckle, amur honeysuckle, and privet.

Poison ivy

Poison ivy is not an exotic plant, but it can be invasive and can be a nuisance, if not dangerous, to park visitors and employees. It has been always been a maintenance problem; in the 1900s, Superintendent Greene recommended cutting this plant because it was "very dangerous in a public park where great number of people are constantly passing among the trees during the tourists' season."[95]

The district's environment is favorable to poison ivy growth, as is typical of all moist, wooded areas in the region, and the plant occurs throughout the entire park. Growth is particularly luxuriant along creek banks, which creates a hazard at all swimming places in the park. Round-Up is occasionally sprayed in the areas of most intensive visitor use to reduce the plant's presence. While control is possible, poison ivy will be impossible to completely eradicate.

Pests

Insects

In the past, insects such as the elm bark beetle (*Hylurgopinus rufipes*), fall webworm (*Hyphantria cunea*), tent caterpillar (*Malacosoma americanum*), and walnut caterpillar (*Datana integerrim*) have been a problem in the park's vegetation. Today, however, pest insects do not appear to be a serious problem, despite individual tree deaths due to Dutch elm disease and occasional outbreaks of tent worms and bores. If necessary, infected trees may be removed. However, the park does monitor for some damaging insects. The USDA has set traps to monitor the CNRA for gypsy moths, but so far none have been detected.

Beaver

Beaver have been a problem in the Platt District since the 1960s, and periodically assert their presence in varied areas of the park. At the current time, beaver activity has been detected near Buffalo and Antelope Springs, Travertine Island, and Flower Park. Damage is most evident in Flower Park, where large trees, primarily hackberry, have been girdled by gnawing. Heavy gauge wire netting has been wrapped around the trunks to discourage beaver from chewing on their preferred species, and in 2002 beavers were trapped and removed from the Flower Park.

Wildfire concerns

As in any natural woodland environment, fire, whether started by natural causes such as lightning, or accidentally, by humans, is always a concern. While in recent decades the benefits of fire to forest ecology are becoming increasingly clear, the damage fire can cause to cultural resources within a park or private property outside a public landscape is also something land managers must also consider. This is particularly true in the Platt District, which contains both important cultural resources and whose boundary interfaces with a more or less urban or suburban area.

Over the years, the suppression of natural fires in the district has led to a large buildup of forest fuels. Hazardous fuel loads are result of long-term accumulation of dead or damaged trees in a woodland floor. In the Platt district, this accumulation is caused by natural factors such as ice storms, winds, diseases and aging. However, fuel loading has increased as vegetation has grown older, denser and less diverse than it was historically. In addition, the increase in the extent of woodland communities over the last 40 years makes fuel loading and fire management of greater concern over more of the park's area.

Another source of concern in terms of fire management is the encroachment of red cedar in all vegetation types. A volatile softwood, Eastern red cedar can increase fire temperature and speed, increasing risk to firefighters. Cedar can also serve as a "ladder" fuel, spreading fire up its dense branches to overstory deciduous trees, sometimes even across firebreaks. Laddering is of special concern along the park's urban interface, where dense red

cedar cover significantly increases the risk of fire damage to the private properties adjacent to the park.

Such fire management issues are also crucial today also because of the district's dense vegetation and accompanying lack of firebreaks. A lack of fire breaks increases the risk of rapid wildfire movement throughout the park, impedes access for firefighters, creates more hazardous conditions and impairs fire control. In some cases fire breaks that existed previously (such as one along Highway 177 through the Prairie Uplands) are overgrown or no longer maintained. Other areas, such as along the park's boundaries or along the abandoned perimeter road near Buffalo and Antelope Springs, were once open and have grown in, and would now benefit from the considered construction of firebreaks.

Turf management

Turf is the most common ground cover in the Platt District, and it is regularly mowed in high-use areas such as Flower Park or Bromide Springs. Mowing of the district is scheduled as part of the overall mowing of the entire CNRA. Mowing occurs between May and October on an as-needed basis, with mowing often ceasing in July and August due to hot, dry weather. Mowing is scheduled on a prioritized mowing cycle, with high-visitor-use district landscapes, such as Vendome and Flower Park at the top of the cycle, and the more primitive areas of the CNRA, such as Guy Sandy West, at the end of the cycle. Most district landscapes are mowed within the first half of the prioritized list. In addition, certain areas may be mowed one week or a few days prior to special events, such as an arts and crafts festival or Easter egg hunt in Flower Park and Bromide area. Along roadways, mowed edge varies to as little as two inches beyond road edge to more than 10 feet beyond edge. Selected areas are mowed to the invert of ditch lines to keep ditch lines from woody vegetation. Grass is generally mowed to about two and one-half inches, and mower widths require six-foot, six-inch clearance. In addition to mowing, to prevent weedy growth roundup is applied around small-scale features and on terraces approximately twice per year.

Due to climatic conditions such as long droughty periods and due to heavy visitor use, many turf areas are not in a good condition, with patches of bare ground and weeds. The problem is most obvious in areas of heavy foot traffic (around comfort stations, at Cold Springs Campground, Central Campground and Panther Falls), where bare, compacted soil is exposed and may erode. Another issue related to turf management is the time and effort required to mow between the boulder barrier lining parking areas and roadsides. In some areas, mowers are too large to fit between the aligned boulders, and areas are then mowed with weed whackers.

Tree maintenance

Over the years, tree cover has significantly increased in the Platt District, though most of this increase is due to red cedar expansion. According to Hoagland's 1998 study red cedar woodlands or forest occupy about 90% of all vegetation types. At the same time, in some parts of the district deciduous forest is reaching maturity. As some of the large individuals in these forests begin to decline, or are lost due to drought conditions, aging, beaver damage, or disease, they are not necessarily being replaced by regeneration. In some areas, new trees are shaded out by cedar or are replaced by colonization species such as hackberries. This trend is particularly evident in the more park-like areas of the district.

Thus, protecting mature trees, to preserve their shade and aesthetic qualities, is a priority in many areas of the district. However, the ice storm of 2000 damaged many trees throughout the park, a fact particularly evident at Travertine Island and Little Niagara Falls and at Buffalo and Antelope Springs. Damage was also great at Bromide Springs, Central and Cold Springs Campgrounds, and Pavilion Springs. Though major tree work was undertaken in the months following the storm, some trees need additional pruning and structural work. In campgrounds, soil compaction is another issue affecting tree health.

Today, the tree maintenance in the Platt District primarily consists of trimming, pruning and removal. Vegetation is trimmed to maintain appropriate vertical clear areas along trails (8 feet), roads (14 feet) and campsites spur (14 feet). Red cedars are removed along roads and trails to facilitate these areas' use as fire breaks. Cedars and other trees are also periodically removed from the bison pasture. Clearance for safety reasons is a priority. Diseased, weak and hazardous limbs and trees are regularly removed in all heavily used public areas. Although tree removal is carried out on a regular basis, staffing limitations make it is difficult to keep up with demand and removals for

aesthetic or tree condition reasons may be postponed it appear not sufficient enough. In numerous locations (Hillside Springs, Travertine Island, Buffalo and Antelope Springs) there are still number of dead or damaged trees that create potential hazard for the visitors.

Enclosure and loss of viewsheds

Historically, the landscape of the Platt District was significantly more open. In 1940, tree cover consisted of only about 20% (approximately 240 acres) of the total park area. As a result, large vistas provided views both within the park and outside of the park. Some of the exterior views were undesirable and were screened with red cedar boundary plantings, but major vistas existed at the townsite overlook, along the Bromide Hill trail, and along Buckhorn Road and around the Buffalo Pasture.

Over time, the landscape has become more enclosed so that today forest covers almost 90% (approximately 740 acres) of the park area. While most exterior views from roads and trails have been successfully blocked by vegetation, at the same time, many viewsheds within the park have also been blocked by both evergreen and deciduous trees and understory. Fortunately, the most important viewshed in the park, form the Bromide Hill Overlook, is properly maintained and still remains, providing a wide vista over the park and the town of Sulphur. Other views, such as those from the Townsite Overlook or the viewing area into the Buffalo Pasture, are still extant, though partially blocked. For example, because of red cedar enclosure, visitors rarely have a chance to see the park's buffalo herd.

On the other hand smaller viewing "windows" along the perimeter road, park trails and Highway 177 that used to offer park visitors broad views of the park rolling landscape are practically non-existent today, due to forest growth and eastern red cedar at edges and within forests. While precise locations of such smaller windows are difficult to ascertain from limited historic photographic documentation, a distinct sense of enclosure is present in the landscape today, as perceived along the southern part of the perimeter road and along the Bromide Hill and Buffalo Pasture trails.

TREATMENT PHILOSOPHY FOR VEGETATION

Defining the management for the vegetation of a cultural landscape requires considering both natural and cultural resource management issues. While treatment of small, designed vegetative features such as alleés, orchards, and foundation plantings is relatively straightforward, managing larger scale landscapes, which might function more as ecosystems and less as horticultural features, is more difficult, requiring consideration of natural resource management issues as well as cultural resource issues. Such is the case of the Platt District. On one hand the district's vegetation is truly a natural resource with its dynamics, seasonal changes and dependence on natural factors. On the other hand, the vegetation was also designed to create certain scenery, modified to allow specific uses, and enhanced to evoke emotions and feelings. Thus, while the district is a cultural landscape, falling under the purview of "NPS 28: Cultural Resource Management" and the Secretary of the Interior's *Standards for the Treatment of Historic Properties* and the *Guidelines for the Treatment of Cultural Landscapes*, its 900 acres of vegetation might equally well be managed as a natural resource, under "NPS 77: Natural Resources Management Guidelines." As a result, vegetation management recommendations must consider the park from both a natural resource and a cultural resource perspective.

From a cultural resource standpoint, as described in Chapter 8, the overall treatment philosophy for the Platt District is Preservation. This treatment was proposed due to the high integrity of the district and need to retain the districts' extant historic fabric. However, the use of a preservation treatment for the park's vegetation is somewhat problematic. Retaining the current conditions, in which invasive cedar growth has compromised the ecological health of the landscape, reduced biodiversity, and increased fire risk, does not really address the park's vegetation from a natural resource standpoint. In fact, preserving the extant vegetative conditions will perpetuate the on-going degradation of native plant communities in the district and, probably, to their eventual loss.

Therefore, Rehabilitation is proposed as a district-wide approach to vegetation management. The goals of this plan are to reinstate more ecologically healthy conditions

by enhancing diverse native communities through management.

The proposed overall vegetation management plan is shown in Drawing 35, in the drawing set at the back of the report. This plan calls for the re-establishment of a more open landscape, in which conditions more closely recreate the historic balance between prairie and woodland. Areas recommended for grassland rehabilitation were identified using geographic information systems (GIS) analysis. The analyses were conducted using cover data based on aerial photographs (much of this cover data has been shown in this chapter's previous figures). Analysis criteria were developed based on the historic vegetation research described previously in this chapter, preservation goals, and discussions about management goals and trade-offs with park managers. The resulting criteria indicated that the areas most suitable for grassland rehabilitation should be:

- located within the boundary of the Platt District, approximately 20 meters* (60 feet) from the boundary (buffer along the boundary to be retained as screening plantings).
- located outside of major streams and ravines (30 meter buffers around major streams and 20 meters around ravines to be retained as woodland).
- located outside of road management zone (5 meter buffer).
- located outside of developed areas (campgrounds, maintenance, picnic areas, etc.).
- located outside of areas historically covered with woodland.
- located on relatively level ground (because removal of wooded vegetation on steep slopes may cause erosion).
- located on sites that changed the least over time.
- have a soil type suitable for grassland rehabilitation.
- and, for educational purposes, areas for grassland rehabilitation should be located close to trails.

In general, these criteria reflect recommendations that woodland communities be retained along major streams and ravines, along boundaries as screening plantings, in areas of high soil erosion hazard, and in places where woodlands occurred historically. At the same time, areas where prairie existed in 1940 should be cleared of invasive red cedar and prairie grasses reintroduced, where possible and feasible. Approximately 214 acres was selected as suitable for grassland rehabilitation. These areas are primarily the Buffalo Pasture, Prairie Uplands, with some smaller areas near Buffalo and Antelope Springs, Travertine Island and Bromide Springs.

Other areas feasible for prairie restoration may be identified and implemented by park staff based on investigations of field conditions. It is important to note that clearing back to 1940s conditions is not the goal of these actions; that would be the goal of a Restoration treatment. The goal of this Rehabilitation treatment, in contrast, is the removal of invasive red cedar as a means to create healthier ecological conditions, which at the same time will create a landscape that is visually, physically, and spatially more similar to that which existed historically. In addition, vegetation management actions are proposed to address management concerns such as wildfire. Consequently, the plan, as shown in Drawing 35, also proposes thinning of vegetation along the urban interface and the creation of firebreaks within the district.

In the following text and the next chapter, management actions are described in greater detail and addressed at two levels: District-wide recommendations and treatment project level recommendations. District-wide recommendations provide general techniques and guidance for rehabilitating the district's vegetation overall, addressing issues at the scale of 900 acres. These recommendations follow immediately. In contrast, treatment project recommendations are listed in Chapter 11. These describe projects for individual component landscapes more specifically, though at the same time incorporate district-wide recommendations and guidelines.

* Buffer distances are approximate and were used only to simplify the analysis process in the computer; these distances should not be considered as specific rehabilitation guidelines. Appropriate buffer distances will vary based on field conditions and should be carefully determined based on additional field reconnaissance.

DISTRICT-WIDE MANAGEMENT RECOMMENDATIONS

Recommendations for invasive species

Red cedar control

A literature review reveals the best management practice for removing red cedars is an integrated treatment combining natural ecological processes (i.e., fire) and human influenced (i.e., mechanical) practices. While fire alone is the most economical way to control young red cedars, it is not as effective when trees are large or when fuel loading in the forest is low. In areas where fuel loads are small (200 lbs/acre or less), only about 60% of the cedars 5 feet or smaller are killed. In addition "[t]rees over 6 feet are less effectively controlled with the fire under the normal fuel loading in Oklahoma. Killing trees over 10 feet tall requires very heavy fuel loads. Taller trees often are partially crown scorched in a fire."[96] In the Platt District, where many trees are taller than 6 feet and where fuel loading is generally low due to reduced understory vegetation, a combination of mechanical removal and prescribed burning is recommended for treating dense red cedar woodlands.

In general, a long-term strategy for red cedar control within the district should consist of removing female and non-CCC cedars. In particular, groves of cedar should be thinned along the urban interface (However, in some places along the interface, where screening with deciduous trees and shrubs is not possible, it may be necessary to replant some cedars (more widely spaced, perhaps) when stands mature and die). In the interior of the district, where the CCC planted cedar as accents, screening, and winter color or for privacy, noise control, or other reasons, female cedars should be gradually replanted with male trees as trees die in these plantings.

The largest areas where red cedar should be controlled include the Buffalo Pasture, the Prairie Uplands, as well as Bromide Hill and around (north, east and south) Buffalo and Antelope Springs. Other small areas for removal include Hillside Springs and Headquarters. While specific recommendations for individual areas are described in more detail in Chapter 11, the following are some general recommendations for red cedar control.

First, chemical control is not recommended as it is expensive and and known to be ineffective, particularly on large (over 6 feet) trees.[97] ** Second, because large red cedar (over 6 feet) are less effectively controlled with the fire, mechanical removal will be necessary within the Platt District. In some areas, such as along the urban interface close to private homes, fire is potentially more dangerous and in these areas, cedar should clearly be removed mechanically. In some cases, cedar should be removed selectively to maintain screening or enclosure. In these locations it is important to preferentially eliminate the female trees when possible. Female trees produce a lot of seed, increasing cedar invasion, and therefore only males should be retained as a protective cover for wildlife, or as buffers along boundaries.

Depending on the situation, mechanical methods of removal may include mowing, chopping, shredding, tree pulling, shearing at the base, or sawing. On larger areas (such as the Buffalo Pasture or the Prairie Uplands) the suggested mechanical control method is sawing or cutting below bottom branch. Cedar trees cut below the bottom branch will kill the tree with no resprouting.

Park current mechanical removal practices include:

- Chainsaw at or near ground (any size trunk using staff or by contract).
- Loping shears and handsaws (usually 0-2" using volunteers).
- Cutting blades on front of small four wheeler (up to 4" using staff).
- Scissors shear on front of bobcat (up to 6" using staff).

While mechanical removal alone may be sufficient to control the cedar, fire might be used as a follow-up method. For example, a follow-up prescribed fire is recommended to reduce the debris on the area after cutting.[98] In addition, fire could precede or follow mechanical cedar control as a means to promote grassland regeneration in addition to cedar and other woody species control.

Fire might also be used as a primary control method on young stands of cedar. The following are some general recommendations on the use of fire in managing

** Small individual trees could, if necessary, be treated with Grazon PC or Velpar. May and early June are the best times for application of these herbicides, and if possible they should be applied on dry soil just prior to a 1- or 2-inch rain.

cedar, provided here as a means for making broad management decisions. It should be noted that none of the recommendations contained in this report should be considered as a burn plan. Prior to undertaking any burn, a detailed plan indicating the burn's extent, methods, personnel, and safety precautions should be developed, and the fire executed by individuals with proper training and experience in prescribed burning.

Burns should be carefully undertaken and monitored. Once an area containing cedars has been burned, and the trees thoroughly scorched, after 2 to 3 weeks any large remaining trees should be eliminated by mechanical removal or by individually reigniting trees by hand with a propane torch or similar device.

Following burn and cedar removal, grasses and herbaceous forbs will regenerate. According to Steve Burrough, Natural Resource Manager for CNRA, burns in the Guy Sandy area of the CNRA have shown good regeneration of native prairie species within one year of initial clearing. However, regeneration should be monitored. In areas where natural regeneration is weak, plant communities might be enhanced by planting individual plants as plugs. Or, complete prairie restoration with NRCS-produced seed from CNRA seed sources or seed collected locally should be considered in areas where natural regeneration is especially poor. To promote and maintain grassland vegetation, a spring mowing or prescribed burning regime might be implemented in initial years to inhibit cool season grasses and encourage warm season prairie grasses. Due to erosion concerns, late spring burns are recommended, as they minimize exposure to rain. Once established, a regular schedule of prescribed burns should be included in a CNRA ten-year burn plan and should be implemented to maintain prairie vegetation. While some sources say prairie burns should be conducted every 3–5 years to suppress woody species, more recent studies indicate that once every 7–10 years may be sufficient. The interval chosen for maintenance burning should be based on monitoring of local conditions as well as on staffing and budget considerations.

Exotic species control

Control of exotics is usually only feasible in small, highly-used areas where intensive control efforts are cost-effective. In addition, some species may be too difficult or expensive to eradicate without causing other environmental problems (such as through extensive herbicide application). For example, the total removal of Japanese honeysuckle, widespread within the Platt District, is not feasible (see below).

As a result, it is recommended that invasive exotic species should be maintained only in the developed areas such campgrounds, picnic areas or prominent parts of the park such as Flower Park and Bromide Springs, or in areas where a species is becoming increasingly aggressive. Exotic species should also be removed along the urban interface where they contribute to the wildfire hazard. However, the status of all exotic invasive plants throughout the entire park should be monitored for change in their condition and status. Additional treatment information for individual species is provided below.

Johnson grass. Dense patches of Johnson grass can be controlled by spraying the foliage with a glyphosphate herbicide during June, just prior to seed maturity. Care should be taken to avoid contacting non-target plants, since Roundup is a nonselective herbicide. In addition, repeated and close mowing, in accessible areas, can be used to kill Johnson grass seedlings. It prevents seed production, and reduces rhizome growth and regrowth of shoots.

Mimosa. Cutting is an initial control measure for the mimosa control. Cutting must be followed by either an herbicidal control and/or repeated cutting of re-sprouting shoots. Trees should be cut before they begin to flower to prevent seed production. Young seedlings can be effectively controlled by manual removal; they should be pulled after a rain when the soil is loose. It is important to remove the entire root since broken fragments may re-sprout. Chemical control (foliar application) with Roundup (glyphosphate) or Triclopyr should be considered only for large thickets of mimosa seedlings where risk to other native species is minimal.

Tree-of-heaven. Tree-of-heaven cannot be completely controlled by herbicides, because their roots are so extensive that the chemical is not transported throughout the whole root system.

Cutting or mowing is recommended way to control tree-of-heaven. Treatment must be persistent, until the root system has run out of reserves and can no longer sprout. Cutting may be necessary every few weeks and the site must be monitored frequently until the trees have died.

Honeysuckle. Japanese and Amur honeysuckles are not tolerant of fire, and prescribed burning can be used to control it. Prescribed burning should be done in spring, when it will kill young seedlings and the tops of mature plants. Repeat fires are recommended for adequate control. Honeysuckle can be also effectively controlled by foliar applications of a glyphosphate herbicide (20% Roundup or Rodeo), since it has such a great percentage of foliage compared to stems and roots. Herbicide should be applied in late summer, early fall, or the dormant season to be most effective.

Privet. Privet can be controlled by hand pulling of seedlings or by cutting stands and painting exposed stumps with a glyphosphate herbicide. Before using herbicide, the NPS IPM coordinator should be contacted to ensure that an NPS approved herbicide is used.

Poison ivy control

Although toxic to people, poison ivy is native to Oklahoma and has considerable wildlife value as food for songbirds and small mammals. For this reason, the current management approach—control only in areas where the plant directly affects visitors—should be considered.

The best removal results are accomplished in the winter when the plants are dormant. Because poison ivy can be very persistent, in addition to manual removal, chemical control is recommended. The plants should be sprayed during late summer or early fall with a glyphosphate herbicide or with Triclopyr. However, neither glyphosphate nor Triclopyr will provide complete control from a single application, and repeat applications to treat re-growth may be necessary.

Recommendations for Pest Control

Insects affecting vegetation are currently not a major management issue, so current policies of monitoring and treatment as needed should simply continue.

Beavers—and their effects in the landscape—are difficult to eliminate, especially where trapping and killing are not permitted. Damage prevention is often the best approach. As the major issue in the district is tree damage, tree protection is recommended. Thiram is a commercial product known to repel beaver, but is recommended to protect individual or ornamental species in areas where other species provide alternative food sources. Therefore, barrier protection, as is currently used in Flower Park, is generally recommended to prevent beaver damage and should be continued in the district. Trees should be wrapped with galvanized metal fencing or chicken wire, at least 3 feet high. Roofing felt, secured with string or wire, is also recommended for tree protection by some agencies. The NPS coordinator may provide agency-specific information on beaver control.

Where flooding is an issue, "beaver pipes" can be installed across a dam or a culvert to allow water to flow across a beaver-constructed barrier. Recommendations for constructing these features varies, and are available from the Oklahoma OWCD.

Recommendations for Wildfire Management

In 2001, following the December 2000 ice storm, a task force of fire management personnel from the Intermountain Region of the NPS visited CNRA and produced the "Hazard Fuels Assessment." Noting that wildfire has the potential to damage administrative and maintenance facilities and cultural and natural resources within the park and private property outside the park, this report makes recommendations to reduce the likelihood and potential dangers of wildfire. The following text seeks to support these recommendations by proposing ways to accomplish wildfire control goals while also considering the district's historic and cultural landscape. In general, the overall goals of vegetation management should be to help reduce wildfire, while at the same time protecting the park's overall cultural landscape and individual landscape features. In most cases, these goals are mutually compatible; in other areas, compromises will have to be made.

Hazardous fuel management

The "Hazard Fuels Assessment" recommends that hazardous fuel situations be identified, modified, and monitored over time throughout the Platt District. The reduction of red cedar forest through mechanical control and prescribed burns, to promote a more historic appearance and to improve ecological health, as described above, is fully compatible with hazardous fuel management goals. Thus, these projects should be undertaken in a synergistic manner.

Reducing hazardous fuels around historic structures is another issue where cultural resource protection goals and wildfire reduction goals mesh. As recommended, dead fuels within close proximity to historic structures or masonry features should be removed. In general, reduction of volunteer trees, shrubs and underbrush around historic structures is also an excellent idea from a cultural resources standpoint. However, the creation of an empty area completely devoid of live vegetation around structures should be avoided. While volunteer vegetation should be removed as per the "Assessment" guidelines, care should be taken to retain historic and designed vegetation around structures and landscape features. Foundation plantings of trees and shrubs were one way NPS designers sought to blend rustic structure with the landscape and extant designed plantings should be retained.

Urban interface

Portions of the Platt district's boundary is an urban interface where the district's woodlands abut private property, usually home or business sites. This area is of particular concern with regards to wildfire, since a woodland wildfire within the district could easily spread across the park boundary onto private lands, with potential loss of property or life. To reduce potential danger and liability, the "Hazard Fuels Assessment" recommends defining a buffer zone along the urban interface. Within this buffer zone, vegetation would be removed or significantly reduced, in effect creating a firebreak between the district and private lands. Locations of this buffer at the urban interface zone are shown in Drawing 35.

As noted in the "Assessment," the buffer zone should be approximately 12 feet wide, depending on local conditions. In some places, the buffer might be easily instituted on the historically open boulevard right-of-way that surrounds portions of the district. In areas close to residences or privately-owned structures, most vegetation, and particularly red cedars, should be removed. In other areas, where fire spread may be less damaging, a low density of trees and fire fuels should be maintained. Thinning should focus on removing female red cedars, since they are seed sources. In addition, dense shrubs and exotic species such as honeysuckle should be cleared. Furthermore, all dead or diseased trees should be removed and damaged limbs trimmed. However, some habitat trees should be retained, to the degree possible when balancing historic character with safety.

The creation of this buffer zone through vegetation removal along the district boundaries would require removal of historic boundary screening plantings planted by the CCC during the period of significance. While removal of such historic fabric may seem problematic, as described above, the cedar plantings have become overgrown, have contributed to vegetative enclosure of the entire district landscape, and should be reduced. Therefore, it is proposed that historic boundary plantings, as identified in Drawing 35 should be retained, but should be significantly thinned as part of the urban interface buffer creation. Again, thinning should focus on removals of female cedar trees and those less than three inches, as well as dense stands of understory, and dead or diseased trees. Care should be taken to maintain some visual screening for privacy along boundaries where private homes or structures are within 200 feet or less of the park boundary. Happily, these locations are actually quite few within the district, primarily along the district's northern boundaries, at Cold Springs Campground, Central Campground, Walnut Grove and Bromide Springs.

In addition, prior to any clearing along park boundaries, local residents should be contacted and consulted, to give them advance warning of the project and to advise them of wildfire hazards. Such public relations work can also encourage private property owners to protect their property on their own, by creating open lawn between the park boundary and their homes or structures, and by removing cedar trees or other vegetation in close proximity to their homes.

Firebreaks

The "Hazard Fuels Assessment" also proposes that new firebreaks be established. Firebreaks could easily be established in a manner in keeping with the park's historic landscape, along old firebreaks or along formerly open areas within the park. Suggested areas for firebreaks are shown in Drawing 35. One firebreak is proposed along the western boundary of Rock Creek Campground. In addition, it is strongly suggested that a second firebreak be created by clearing vegetation from the abandoned portions of the perimeter road around Buffalo and Antelope Springs. A third and a fouth firebreak are proposed for the urban interfaces near Veteran's Hospital and just north of Cold Springs Campground.Vegetation within the former road prism should be removed to create a corridor able to accommodate type 6 fire vehicles, approximately fifteen feet wide. This cleared corridor

will create both a firebreak along the park boundary as well as emergency fire access. While major improvements to the surfacing of the road are not recommended, the cleared road prism might also be used as management access road as well. Other firebreaks should be established in conjunction with projects to open the park's enclosed landscape and reduce red cedar woodland.

The "Hazard Fuels Assessment" also proposes that the extant perimeter road may also serve as a firebreak, and proposes clearing vegetation from and widening the road corridor. From a cultural landscape perspective, extensive clearing along the perimeter road may impinge on its character. In particular, clearing of overhead canopy in areas where trees create a tunnel effect along the road, is not recommended. A pattern of enclosure followed by open views is a character-defining aspect of the road, and creating a completely open, non-enclosed driving experience is not recommended. However, vegetative thinning could easily be accomplished on other parts of the roadway, and even in areas where canopy touches over the road, cedars and dense understory trees and shrubs could be cleared from along the roadside without deleterious effects. In sum, evergreen and dense vegetation may be cleared from along the roadside to enhance the road's firebreak qualities, but large trees with overhead canopies should be retained

Recommendations for Turf Management

Where possible, mowing regimes might be reduced to lessen the economic burden of this activity. One alternative is to mow less frequently; approximately once a month. This should be sufficient for most areas, especially those of less public usage. Another alternative for the areas where reduced mowing is desired is to replace turf areas with low maintenance native groundcover. Native grass areas of wild rye might, for instance, be established on slopes and in shaded areas where visitor use is low or Buffalo grass in open areas. Eliminating mown turf in areas such as Bromide Springs and Flower Park, however, is not feasible nor desired. Some specific recommendations for reducing mowing in component landscapes are described in Chapter 11.

In some areas, mown turf cover might be replaced by other species. This would be a valuable strategy particularly in areas, such as around Hillside Springs or the former Headquarters Building, where cedar woodland is to be removed or thinned. These areas could be seeded with a mixture of low growing grassland species including little bluestem, hairy grama and seep muhly, recreating historic conditions.

In other areas, where turf is shaded or difficult to maintain, woodland forb species might be useful replacements. Potential native woodland forb species include spiderwort, wild phlox, evening primrose. Potential shrub and vine species include coralberry and Virginia creeper.

Recommendations for Tree Maintenance

Tree maintenance should continue, and if possible, increased, perhaps during the late fall and winter, the best time to do such work and which happily coincides with decreased visitation. Although time- and budget-consuming, increased tree care would greatly benefit the park's specimen trees and woodlands. The greatest need at this time is structural pruning of damaged, diseased or dead trees within the designed parts of the park. Additional efforts should focus on specimen trees significant to park design and history, such as the large cottonwood at the Bromide pavilion or the monkey tree in Walnut Grove. Removal of all dead and damaged trees in natural areas is neither feasible nor recommended, as they are natural part of the ecosystem and might be valuable for wildlife habitat and organic matter. However, in areas where intensive storm damage has created hazardous fuel accumulations, trees should be removed. Dead trees that indicate a serious insect or disease problems should be identified and eliminated. Trees in streams and creeks that pose a risk of log jams at low water crossing, bridges and near the Travertine Nature Center should also be monitored.

In addition, priority should be placed on monitoring trees surrounding campsites as they are often suffer from soil compaction. Compacted soils reduce the amount of oxygen and water that can reach the root zone of trees, adversely affecting their root systems and overall health. To mitigate the risk of tree failure layer of coarse woody mulch 2–4 inches thick should be spread around the root zones of these trees. Clearly defined paths should be established in these zones to direct the flow of park visitors. Further information on such projects is provided as part of individual vegetation projects in Chapter 11.

Finally, in areas where trees have been lost, replacement is recommended to retain character-defining aspects of canopy cover and enclosure. This is an issue in areas such as Bromide Springs, Flower Park, Black Sulphur Springs, Walnut Grove, Nature Center and Little Niagara, and other places where there are large lawns or open areas with scattered tree cover. While tree replacement projects for these areas are described in Chapter 11, it is worth emphasizing here that it is generally not recommended to replace specific, individual historic trees. In general, documentation is not detailed enough to support such actions. Although historic topographic surveys with tree locations exist for many of these areas, these surveys often depict their landscapes prior to CCC changes. Historic aerial photographs are not particularly useful in this regard either, because they show general tree cover patterns and do not accurately show locations of specific trees. In addition, the park has not collected detailed tree surveys for current tree locations, and obtaining such surveys would be expensive. Thus comparisons and determinations of missing, historic and existing trees, a prerequisite for individual tree replacement, are extremely difficult to make accurately.

A far better strategy is to consider replacing an area's historic percent of canopy cover, an aspect of all of these component landscapes that has been identified as a character-defining feature. Canopy cover can be determined from aerial photographs, and in fact, period plans show the extent of canopy based on the 1940 aerial photograph. Thus, in-field comparisons, or comparisons to recent aerial photographs can be made and used as means for identifying locations for tree replacement. In-field conditions such as dips or stumps can also be used as a means for locating where replacement trees should be planted. In addition, when trees are lost in storms or due to aging, stumps should be ground and the location marked for a future tree re-location. As replacement trees are planted in various locations, as described in the Chapter below, it is worth considering collecting seeds or propagating plants from trees within the park as a way of preserving and promoting local genotypes. This will, obviously, require advance planning.

Recommendations for Vista Clearance and Management

As described above, as the park landscape has been enclosed by red cedar, views and viewsheds have certainly been lost, although only a few of these vistas can be definitively located, due to a lack of historic documentation. However, the loss of viewsheds is perceived in the monotony of the park landscape, particularly when viewed from the perimeter road. While some of these vistas should be recreated without specific effort as a result of the cedar removals within the Buffalo Pasture and Prairie Uplands, it is also recommended that a few key vistas be opened up intentionally to reinstate a more expansive park landscape. As shown inFigure 11-39, these include expanding the viewshed at the townsite overlook and creating a viewshed from Bromide Hill Trail. The presence of both of these viewsheds has been confirmed through historic photographs taken of these viewsheds.

While large areas of cedar will be removed from the Buffalo Pasture and other areas, this treatment is not recommended for recreation of vistas. In other words, "clear-cutting" is not recommended. Rather, vista clearing should be done carefully, in some locations on an individual tree-by-tree basis. On Bromide Hill Trail, for example, two individuals communicating remotely might be required, one at a higher elevation and viewpoint to determine which trees should be removed and one below, marking trees at their base. From an implementation standpoint, vista reestablishment requires both tree and understory vegetation removal as well as ongoing treatment of some sort (mowing, herbicide painting, periodic re-clearing) to prevent regrowth in the new vista.

Thus, the creation and maintenance of vistas for scenic and interpretive purposes is labor-intensive, as vegetation is continuously regenerating and growing in the cleared areas. Therefore, in the Platt District, viewshed reinstatement is recommended as a long term project, one to be undertaken after other, more crucial activities have been accomplished.

VEGETATION TREATMENT PROJECTS

This chapter has provided background and general guidelines for vegetation management. Specific vegetation treatment projects utilizing these guidelines are contained in Chapter 11.

Notes to Chapter 10

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