

Natural Resource Inventory and Restoration Plan for the Black Jack Battlefield Site

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Summary

This inventory and restoration plan for the 40-acre Black Jack Battlefield Site was prepared by inventorying the site for existing vegetation and studying the historical aspects of the land. The site can be restored to native prairie and savanna, while retaining historical aspects. Techniques emphasized for success include removal of trees and brush, herbicide use to remove unwanted vegetation, the planting of native grasses and wildflowers and mowing and burning for management. Restoration and management costs are significant and are given below along with recommendations and time lines.

Natural Resource Inventory

Location and Historic Vegetation of the Site

The Black Jack Battlefield Site is located three miles east of Baldwin City, Kansas in Douglas County, which has the growing university town of Lawrence as its county seat. The site is located in the unglaciated Osage Cuestas physiographic province. Because of the proximity to Lawrence and Kansas City, development pressure on all parcels of land near the Battlefield Site has been increasing. This provides an incentive to not only to protect and restore the property, but also to protect an important historical site and provide a location for public recreation. Prior to Euro-American settlement, the Kansa and other Native American tribes inhabited the area. Historically the land was primarily prairie, maintained by fire set by Indians or started by lightning. When Euro-American settlement began in the 1850s, federal land surveyors estimated that prairie covered 94% of Douglas County (Kansas State Board of Agriculture 1877; Public Land Surveys of Kansas, 2005). The rest of the land was primarily covered with forest. Europeans at first settled the Kansas River area because they wanted access to timber and water transportation for use in commerce, but then expanded to upland prairies that were tilled for crops and used for pasture. With settlement came livestock grazing and suppression of fire which both led to woody growth replacing grassland. In addition, conversion of grassland to farmland further reduced prairie acreage. Current land use of the property is seen in Figure 1.

Soils and Geology

The primary upland soil of the Black Jack Battlefield Site is Sibleyville loam (Dickey et al. 1977). It is found in the most upland portions of the property, including most of the former field in the southeast portion of the property (Figure 2). This soil is a moderately deep, well-drained loam. The underlying bedrock geology that forms this soil is loamy shale and sandstone. Vegetation planted in this soil type will respond well to restoration efforts. This soil is bounded by a mix of Sibleyville loam and other soils that are thinner and which have sandstone and shale often within less than 20 inches of the surface. These thinner soils on sandstone are the most likely locations where blackjack and post oaks would have been located. The above Sibleyville series soils cover about 80% of the property. The remaining soil on the property is Kennebec silt loam and is located in riparian channels that parallel the creeks and drainages of the property where the historic and current springs, seeps, and wet areas occur (see Figure 2). These areas can flood frequently, especially in the spring. Kennebec soils are darker and contain significant amount of clays. The entire property is underlain by the Douglas Group of the Pennsylvanian sandstone (O'Connor 1960).

Historical Vegetation at the Time of the Battle

As evidence that the historical landscape was mostly prairie in Palmyra Township in southeast Douglas County, most section lines described in the 1856 Public Land Survey of Kansas (2005) are characterized as first quality prairie and suitable for cultivation. There was mention of trees in the township, primarily along the ravines. Comments included “timber: Oak, walnut and hickory” or “Hazel and elm brush on streams.” A complete list of trees mentioned in the township notes includes: oak, elm, hickory, walnut, hackberry, and hazel brush. Only two types of oak are mentioned: black oak and blackjack and these names probably refer to a mix of blackjack oak (*Quercus marilandica*), post oak (*Quercus stellata*), and black oak (*Quercus velutina*), and possibly some other oaks.

For Section 12, where the battlefield is located, the measured boundaries for the south, west, and north sides of the section are all listed as prairie (with no trees). The east side of the section line and on the SE corner of the existing Black Jack Trust property has this comment where the creek and ravine enter the property: “Entering young black oak timber bears SE and SW.” For this entire section line (the entire east side of section 12) the comment is: “Land principally high rolling prairie, first rate, and fit for cultivation. Timber consists of very few scattering dwarfish black oak or black jacks with an under-story of the same, good water in the stream” (Public Land Survey of Kansas, 2005).

Current Vegetation of the Site

Previous land use of the site can be interpreted by looking at aerial photographs from 1937 through 1986 (see Figures 3-8). Since the land was primarily prairie at the time of settlement, its vegetation has been altered by farming activities. It is most likely that the entire site was grazed and appears to have been grazed heavily. Evidence for this is the small number of prairie species compared to the nearby Boyd Prairie. The southeast

portion of the site was plowed and already cropland when the first available aerial photograph was taken in 1937 (Figure 3). Other influential land uses include the impact of the farmstead on the property and the intense use of the land adjacent to the homestead. By looking at the series of photos taken since 1937 (Figures 3-8), we can see the continued encroachment of trees and shrubs on the property due to the lack of fire or other methods of brush and tree removal. This is especially evident in the areas where heavy grazing of the native prairie permitted the invasion of trees and brush, particularly those species that were the most resistant to cattle—thorny or non-palatable trees such as osage orange (*Maclura pomifera*), honey locust (*Gleditsia triacanthos*), and red cedar (*Juniperus virginiana*).

It was important to thoroughly survey the property for plant species to see which native species remained on the property. Staff at the Kansas Biological Survey visited the property numerous times during the spring, summer, and fall of 2006 to document the plant species that occur on the property (see Appendix 1). Of particular interest were species with prairie or savanna affinities. As a way to look at the property and to develop a restoration plan, the property was divided into land use or habitat types. Those five land use or habitat units can be seen in Figure 1 and are:

- 1) Creek/Seeps/Wetland—area adjacent to the creek that contains wet soils and seeps (13.9 percent of the property or 5.6 acres).
- 2) Field—area of farmed ground in the southeast portion of the property (15.6% or 6.5 acres).
- 3) Woods or Forest—most densely wooded areas in the northwest of the property and near the creek area (29.3% or 11.7 acres).
- 4) Prairie/Pasture—area that was pasture but still somewhat open, primarily in the southwest portion of the property (33.5% or 13.4 acres).
- 5) Ornamental or Planted—area immediately around the house and planted sugar maple grove (7.7% or 3.1 acres).

Overall, the property has good plant diversity of plant species with 216 species found at the site. Although additional fieldwork will result in finding a few more species, the species list is relatively complete, allowing a discussion of the current vegetation. The current vegetation reflects the past years of management and use of the farm. One of the tools used to judge the quality of a site is the Floristic Quality Assessment (FQA). FQA is a standardized tool used to estimate the floristic quality of a natural area based on the vascular plants growing there (Taft et al. 1997; Freeman and Morse 2002). By extension, it can be used to assess the overall ecological quality of a site. Ecologists, botanists, environmental professionals, and land managers use FQA to establish baseline assessments, to conduct long-term monitoring, and to assess restoration progress in a variety of ecological settings (Herman et al. 1997; Taft et al. 1997). Developed in the 1970s (Wilhelm 1977; Swink and Wilhelm 1979), the method has been refined from its original form (Wilhelm and Ladd 1988; Taft et al. 1997; Rooney and Rogers 2002) and now is in use or development in numerous states and provinces in the United States and Canada (Taft et al. 1997).

The method was developed to avoid subjective measures of natural community quality such as “high” or “low.” Some elements of FQA are still subjective, but the method has clear advantages over other evaluation tools, including repeatability and ease of application. Ideally, FQA should be used with other content-based and context-based measures (*sensu* Rooney and Rogers 2002) to estimate the integrity of native plant communities (Taft et al. 1997).

The FQA method is based on calculating an average coefficient of conservatism (C) and a floristic quality index (FQI) for a site. It may be used to compare several sites supporting the same community type (e.g., several Glaciated Tallgrass Prairies) but should not be used to compare different community types (Rooney and Rogers 2002). A coefficient of conservatism is an integer from 0–10 that is assigned to each native plant species in a given geographic region, often a state or province. Naturally occurring hybrids are not assigned coefficients.

Coefficients of conservatism express two basic ecological tenets: plants differ in their tolerance of the type, frequency, and amplitude of human disturbance, and plants vary in their fidelity to remnant natural plant communities (Taft et al. 1997). As employed in FQA, these two principles exhibit an inverse relationship: the lower a species’ tolerance of human-mediated disturbance, the higher its likelihood of occurring only in a natural plant community. Low coefficient values (0–3) denote species (see Appendix 1) often found in highly disturbed habitats and without a strong affinity for natural communities. High coefficient values (7–10) denote species (see Appendix 1) that tolerate only limited disturbance and usually are found in natural communities. With these principles as a guide, the C value applied to each species represents a relative rank based on observed behavior and patterns of occurrence in Kansas’s natural communities. Non-native species are not assigned coefficients because they were not part of the pre-settlement landscape. They do have an effect on FQA, however, and they may be incorporated in the assessment process.

The FQA process begins with a thorough inventory of vascular plants. The checklist then is used to calculate a floristic quality index (FQI). A mean C value (mean C) is calculated. The mean C value is the arithmetic mean of the coefficients of all native vascular plants occurring on the entire site ($\text{mean } C = \Sigma C/N$), without regard to dominance or frequency. Non-native species are excluded from the calculation of mean C. The FQI is the mean C multiplied by the square root of the total number of species (\sqrt{N}) inventoried on the site ($\text{FQI} = \text{mean } C \times \sqrt{N}$).

For the Black Jack Battlefield Site all Coefficients of Conservatism and FQA scores for each unit are given in Appendix 1. Although the majority of scores at the site indicate that native species are present, the overall quality is low to medium. Conservative species have for the most part been lost at the site, which means that there is an opportunity for their reintroduction in a restoration attempt. The FQA score for the prairie site is the highest, but it is only 18.5. High quality native prairie remnants, such as the nearby Ivan Boyd Prairie have scores as high as 30. These low scores indicate that all management units at the Blackjack Battlefield Site are in great need of restoration.

Restoration Plan: Prairie, Savanna and Other Areas of the Black Jack Battlefield Site

The Black Jack Trust lands were originally entirely or almost entirely prairie. A few blackjack oaks occurred on the property along its east side. An important goal of the restoration process is to return natural vegetation, in this case prairie and savanna vegetation, to areas of the property. In addition, there is a historic portion of the property related to the historic farm that also needs to be conserved. The battlefield area will be easier to observe without significant under-story brush or trees. Over the last few decades, much of the property has grown up in shrubs and trees. In addition, trees were planted, including a sugar maple grove, to commemorate the battle site and around the farmstead. Most of these large trees should be left on the property as part of that history. The focus of the re-vegetation efforts will be the former field area in the southeast portion of the property and the prairie/pasture area in the southwest (see Figure 1). These two areas combined contain most of the lands south of the house and farm buildings on the property and are the bulk of the acreage of the property. They will be treated separately in the outline below because of their different management history and recent land use. Costs of tasks are given below and reflect estimates based on hiring the work done.

A) Prairie/pasture Area in Southwest Portion of the Property (area south of the barn)

This area is composed primarily of brush, trees, and grass. Some areas have been recently cut and some areas have been disturbed by removal of trash and debris. The size of the restoration project should be the maximum area in the southern portion of the property that can be cleared (estimates based on 13.4 acres and provided here for illustrative purposes).

- 1) Rotary mow as much of the area as possible as soon as possible (\$50/acre or \$670).
- 2) Cut as many trees and shrubs as close to the ground as possible, so that mowing equipment will not hit stumps; then treat stumps with herbicide (\$600/acre or \$8,000 for cutting, stump treatment, burning brush, and removing trees).
- 3) As soon as the trees and shrubs have dried, burn them and as much of the surrounding pasture area as possible (prescribed burn--\$1,600 for mowing fire breaks, obtaining permit, liability concerns, and scheduling and organizing volunteers/crew). Piles of woody material to be burned should be placed in areas where soil sterilization is not a problem, that is, where there is no desirable remaining vegetation.
- 4) Purchase seeds of native grasses and wildflowers (from Table 1 and 2; approximately \$1,100 at \$80/acre for native grasses).
- 5) During the growing season, apply herbicide areas with undesirable perennial vegetation—patches of poison ivy, re-sprouting brush, etc. This will likely be done with a tractor and spray rig (\$65/acre or \$900).
- 6) In the late spring, closely following fire and herbicide, no-till drill all grass seed and broadcast all prairie wildflowers (these seeds are odd shaped and not easy to distribute using drilling equipment). It is recommended to strategically seed some

areas more heavily or with specific forbs to make more natural patchiness (\$1,000 for installation at \$65/acre).

- 7) Follow up with spot herbicide treatment on re-sprouting woody vegetation and invasive weeds (if necessary) during the summer months (\$65/acre or \$900).
 - 8) Mow at a height of 8-10 inches to discourage weedy vegetation (\$50/acre or \$670).
 - 9) Evaluate in the fall for seedlings (\$670).
 - 10) Burn in the late fall or spring wherever there is enough fuel to carry a fire (\$1,200 2nd year burn).
 - 11) Consider reseeding the following spring.
 - 12) Use spot herbicide to discourage woody and weedy vegetation (\$600 for 2nd year).
 - 13) Burn several years in a row to encourage the native vegetation and to discourage the woody vegetation (\$1,000 for 3rd burn).
- Total costs: approximately \$18,310.

B) Former Crop Field Area in the Southeast Portion of the Property (area south of the house; estimate based on 6.5-acre site and provided here for illustrative purposes).

- 1) Remove woody vegetation around edges, cut very close to the ground, treat the stumps with herbicide (\$300).
- 2) Till the field once in the fall to remove current vegetation (\$600).
- 3) Purchase seeds of native grasses and wildflowers (from Table 1 and 2; \$550 for seeds).
- 4) No-till drill all grass seed and broadcast all prairie wildflowers (these seeds are odd shaped and not easy to distribute using drilling equipment; approximately \$550).
- 5) Follow up with spot herbicide treatment on re-sprouting woody vegetation and weeds (if applicable) along the edge during the summer months (\$150).
- 6) Mow the site at 8-10 inches to discourage weedy vegetation (\$300).
- 7) Evaluate in the fall for seedlings.
- 8) Burn in the late fall or spring wherever there is enough fuel from the dried vegetation to carry a fire (\$800).
- 9) Consider reseeding the following spring.
- 10) Burn several years in a row to encourage the native vegetation (\$800).

Total costs: approximately \$4,050.

C) Blackjack Savanna Restoration Area

In areas with larger trees along both sides of the stream in the central portion of the property, selective cutting should leave the large native trees, such as oak (*Quercus* spp.), elm (*Ulmus* spp.), hackberry (*Celtis occidentalis*), walnut (*Juglans nigra*), and hickory (*Carya* spp.). Where trees are widely spaced, native grasses can be established where light regularly reaches the ground. This area should be managed as part of the restored prairies mentioned above. The size of this area will be determined by how much area is cleared and how many larger trees are left. It would also be very appropriate to plant some additional blackjack oak in this area. An additional expansion of the savanna restoration could occur in the northwest portion of the former crop field (west of the

house) using the same procedures. This would facilitate a high-profile project that could involve the public and volunteers.

D) Battlefield Site in Northeast Portion of the Property

There are some very large trees (planted pecan and others) in this area that should be retained as part of the area that will be managed by mowing. Since there is great interest in this area being open and not too dense, occasional mowing between trees may be the best long-term management of the area due to its importance for historical interpretation.

- 1) Brush should be removed and all stumps treated with herbicide.
- 2) A low-growing native grass and wildflower mix will be planted. This area can be either burned or mowed for future management.

E) Sugar Maple Grove

This historic grove in the northeast portion of the property should be maintained. Occasional mowing between the trees (maybe once or twice a year) and the planting of additional grass seed, such as tall fescue (*Festuca arundinacea*), should be all that is needed for management.

F) Areas Around Farm Buildings

The farmstead areas should be maintained as lawn. Seeding of some lawn grasses may be appropriate here as this area will likely be used for historical interpretation and mowing will likely be the best management.

G) Creek/Riparian Area

This area contains the springs and seeps that were used as a watering sources along the historic trails. These areas contain significant wetland vegetation and should be kept from being overgrown by brush and trees (some thinning would be helpful). Re-seeding with riparian/wetland ground cover would complement the thinning if vegetative response is inadequate (lower priority; brushing for 5.5-acre site is estimated at \$200/acre or \$1,100.)

H) Other Wooded Areas

There are other wooded areas, including along the road and to the north of the barn, and along the riparian areas that will be left as a forested area. Although of lower priority, tree thinning in these areas would be very useful, especially to remove non-native species (osage orange, mulberry) and those species that responded to past heavy grazing and are undesirable (honey locust, red cedar, and black locust). Of note, along this ravine are some of the only blackjack oaks on the property (none of which date back to the battlefield times). Thinning the underbrush along the road, but leaving the large trees is desirable for both management reasons and to increase the visibility of the property (low-impact thinning, cutting, use of herbicide, burn brush piles, and removing trees is estimated at \$6,000 for this 11.75-acre area).

I) Trails and Connectivity to the Surrounding Area

The restoration and management plan should look beyond the property for opportunities to link with other projects and provide a way to encourage the public to make use of the site. Any opportunity to connect this parcel to the Ivan Boyd Native Prairie (diagonally adjacent to the northeast) would facilitate movement of species and create a more valuable habitat.

Trails that connect to the Ivan Boyd Memorial Prairie and the roadside cabin, the City of Baldwin, Douglas County State Lake, or even to Lawrence or the Kansas City area should be considered. A trail within the Blackjack Battlefield Site, ideally a loop that makes a large internal circle, would help facilitate use by the public and allow for interpretation of the property. Signage and kiosks could be used to interpret the historical significance of the property (both the battle and the historic farm site). In addition signage could be used to explain the prairie and savanna restorations, and a series of signs or displays could identify plants, birds, or animals on the property.

Proposed Budget for Restoration Work

Expenses for this work can only be estimated, but are useful in the planning process. These estimates include costs for hiring local contractors, but expenses can be greatly reduced if volunteers are used for some tasks.

Brush-clearing: \$15,000-20,000 given the extent of trees in pasture and riparian areas

Need to burn brush and remove trees and brush

Tilling: about \$1,000 to prepare soil for seeding an area of 3-5 acres

Native grass seed purchase: \$2,000 (\$80/acre for 25 acres) plus \$2,000 to install seed

Wildflower Seed: \$2,000 (ideally this is funding for hand collection of seeds from near-by local prairies)

Vegetation management for the 3 years after the initial seeding: \$2,500 each year (mowing all areas once or twice a year, substantial time in herbicide spot-spraying)

Follow-up seed and seeding in year 2: \$500 for seed costs

Burning: \$1,000-2,000 per year for prescribed burning depending on help, equipment availability, and personnel turnover; includes mowing firebreaks, permits, and mop up

Schedule for Plantings

The schedule can be modified related to when the restoration project begins. The following schedule would be ideal times.

Year 0

Fall—Land preparation—removal of trees and brush where they are a problem
Could burn available grass or brush

Year 1

March—Burn all brush piles and all grassy areas that can burn

March-Early April—Apply herbicide to sprouting trees and shrubs and to areas of poison ivy and other non-desirable vegetation

April—No-till drill grass seeds and broadcast seeds that will plug the drill

July—Mow the restored areas to about 8 inches tall to reduce weeds

July/August—Pray for rain; it is very important for the seedlings to make it through the first year

August/September—Follow-up herbicide spraying

Year 2

April—Burn any areas that might carry a fire

April—Reseed in areas where vegetation is thin

June, July, and August—Spot-herbicide where needed

July—Mow the restored area to about 8 inches tall

Year 3

April—Burn all restored areas that will carry a fire

June, July, and August—Spot-herbicide where needed

July—Mow the restored area to about 8 inches tall

Review previous work and make a long-term management plan

Grass Seeds for Restoration

There are many good resources for restoring prairies. They include the *Tallgrass Prairie Restoration Handbook* by Packard and Mutel (1997) and *A Guide to Prairie and Wetland Restoration in Eastern Nebraska* by Steinauer (2003).

The grass seed mix (Table 1) consists of *Andropogon gerardii*, *Schizachyrium scoparium*, *Sorghastrum nutans*, *Bouteloua curtipendula*, *Panicum virgatum*, and *Agropyron smithii*. These species are used by the Douglas County Natural Resources Conservation Service (NRCS) for their Conservation Reserve Program (CRP) plantings (C. Davison NRCS, personal communication). Other grass species that could be added if available would include Canada wild rye (*Elymus canadensis*), porcupine grass (*Stipa spartea*), prairie dropseed (*Sporobolus heterolepis*), and eastern gama grass (*Tripsacum dactyloides*).

Table 1. Warm-season grass mix.

Species	Common name	% of mix	lbs/acre	total lbs
<i>Andropogon gerardii</i>	Big bluestem	0.36	2.52	47.9
<i>Sorghastrum nutans</i>	Indian grass	0.15	1.05	19.9
<i>Schizachyrium scoparium</i>	Little bluestem	0.20	1.40	26.6
<i>Bouteloua curtipendula</i>	Side-oats grama	0.12	0.84	16.0
<i>Panicum virgatum</i>	Switchgrass	0.05	0.35	6.6
<i>Agropyron smithii</i>	Western wheatgrass	0.12	0.84	16.0
Total		1.00	7.00	133.0

Wildflowers for Restoration

Ideally wildflowers would be collected from local prairies and roadsides. In that regard, all native local species found in prairies and savannas could be a target, especially those with high coefficient of conservatism scores (see Appendix 1). Wildflower species may also be purchased. Below is a list (Table 2) of desirable species. If funds were plentiful or if volunteers spend considerable amounts of time collecting seed, ten or more pounds of wildflower seed could be planted. To collect ten pounds will require considerable effort, so a combination of the two techniques may be the best course of action.

Table 2. Native Wildflowers to Collect or Purchase.

Species	Common name
<i>Allium canadense</i>	Wild onion
<i>Amorpha canescens</i>	Leadplant
<i>Aster praealtus</i>	Willow-leaved aster
<i>Astragalus crassicaarpus</i>	Ground plum milkvetch
<i>Baptisia alba</i>	White wild indigo
<i>Ceanothus herbaceus</i>	New Jersey tea
<i>Coreopsis palmata</i>	Prairie coreopsis
<i>Dalea candida</i>	White prairie clover
<i>Dalea purpurea</i>	Purple prairie clover
<i>Desmanthus illinoensis</i>	Illinois bundleflower
<i>Echinacea pallida</i>	Pale purple coneflower
<i>Eryngium yuccifolium</i>	Rattlesnake master
<i>Eupatorium altissimum</i>	Tall boneset
<i>Helianthus maximiliani</i>	Maximillian's sunflower
<i>Helianthus mollis</i>	Ash-leaved sunflower
<i>Helianthus rigidus</i>	Stiff sunflower
<i>Lespedeza capitata</i>	Rabbit's foot lespedeza
<i>Liatris pycnostachya</i>	Tall gayfeather
<i>Monarda fistulosa</i>	Bee balm
<i>Oenothera speciosa</i>	White evening primrose
<i>Penstemon digitalis</i>	Foxglove beard tongue
<i>Phlox pilosa</i>	Prairie phlox
<i>Polytaenia nuttallii</i>	Wild parsley
<i>Psoralea esculenta</i>	Prairie turnip
<i>Psoralea tenuifolia</i>	Wild alfalfa
<i>Rosa arkansana</i>	Wild rose
<i>Rudbeckia subtomentosa</i>	Sweet coneflower
<i>Schrankia nuttallii</i>	Cat's claw sensitive brier
<i>Silphium integrifolium</i>	Rosinweed
<i>Silphium laciniatum</i>	Compass plant
<i>Solidago rigida</i>	Stiff goldenrod
<i>Tephrosia virginiana</i>	Goat's rue
<i>Tradescantia ohiensis</i>	Spiderwort
<i>Viola pedatifida</i>	Bird's foot violet

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Figure 1. Management units at the Blackjack Battlefield site. S= Creek/Seeps/Wetland; F=Old Field; W=Woods or Forest; P=Prairie/pasture; O=Ornamental Plantings around structures or tree plantation. These units are also used for completing the plant species lists in Table 1. Image from USDA 2005.



Figure 2. Soils of the Black Jack Battlefield Site.



Figure 3. 1937 aerial image from the Blackjack Battlefield site. Source: USDA photo archives.



Figure 4. 1941 aerial image from the Blackjack Battlefield site. Source: USDA photo archives.



Figure 5. 1954 aerial image from the Blackjack Battlefield site. Source: USDA photo archives.



Figure 6. 1966 aerial image from the Blackjack Battlefield site. Source: USDA photo archives.



Figure 7. 1976 aerial image from the Blackjack Battlefield site. Source: USDA photo archives.



Figure 8. 1986 aerial image from the Blackjack Battlefield site. Source: USDA photo archives.