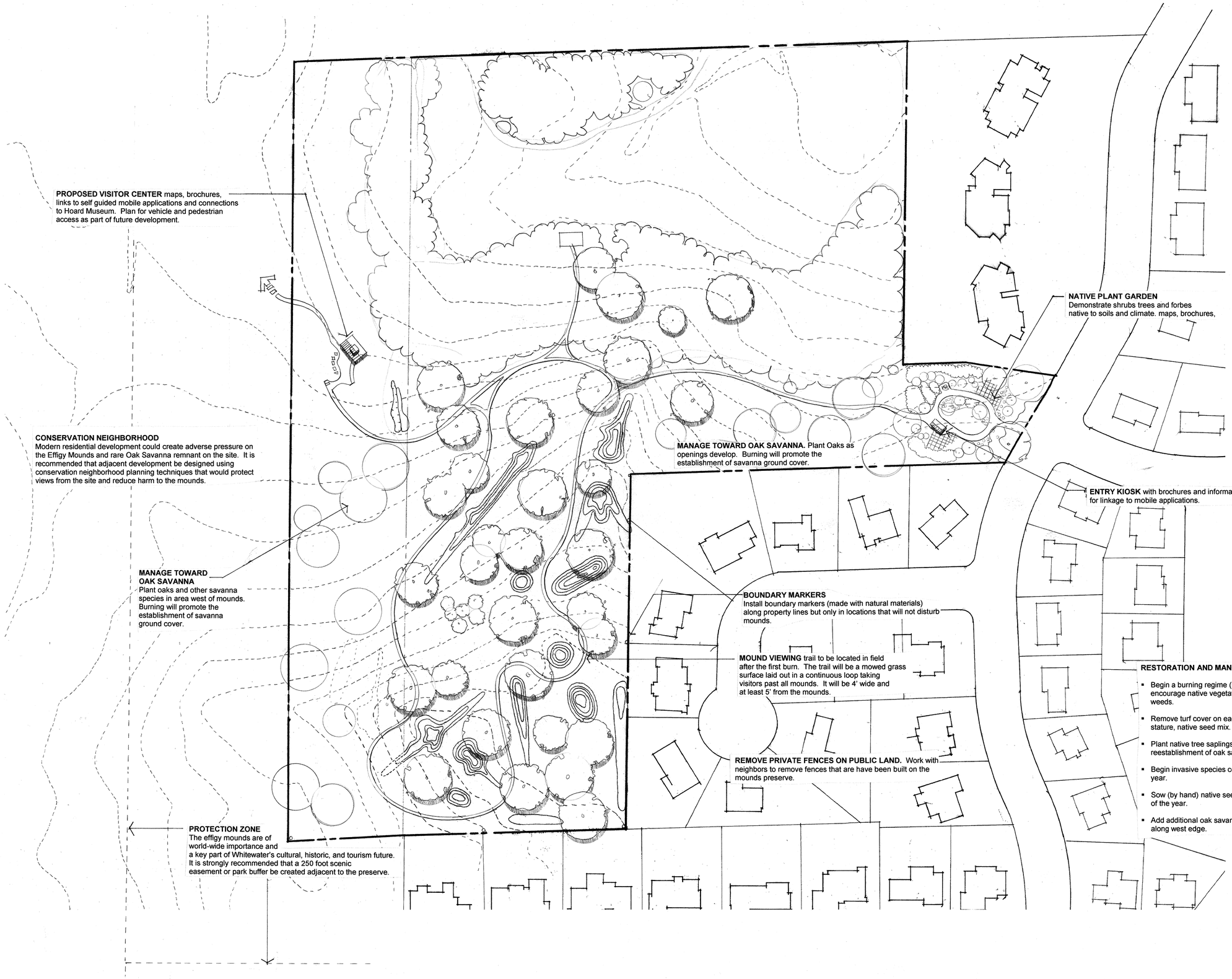

RESTORATION AND MANAGEMENT RECOMMENDATIONS

- Begin a burning regime (potential spring 2011 burn planned) to encourage native vegetation establishment and help control weeds.
- Remove turf cover on each mound and restore with a short-stature, native seed mix.
- Plant native tree saplings in the larger open areas to encourage reestablishment of oak savanna, including the DOT "strip".
- Begin invasive species control regimen at appropriate times of the year.
- Sow (by hand) native seed collected on-site at appropriate times of the year.
- Add additional oak savanna westward into the DOT prairie area along west edge.

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Whitewater Effigy Mounds Preserve

Preservation and Maintenance Plan

PREPARED FOR:
The City of Whitewater Parks and Recreation Departmenrt
Matt Amundson, Director

March, 2011
Drawn By: TPJ
Scale: 1"= 60'-0"

L-1

Sheet 1 of 1

Introduction

Whitewater Effigy Mounds Preserve (formerly Indian Mounds Park) contains one of the largest collections of effigy mounds in the country. The mounds were built sometime in between 800 – 1200 A.D., and consist of both geometric and animal shapes. This preserve is listed on the National Registry of Historical Places (1991), and was identified as a local landmark in 1994. Because the mounds are a burial site, the site is protected under Wisconsin's State Burial Law.

The primary objective of this land management plan is to provide recommendations that preserve the cultural and natural diversity at Effigy Mounds Preserve while providing public access for recreational and educational activities. Like many other natural areas and parks in Wisconsin, Effigy Mounds Preserve exhibits signs of past human disturbances such as invasive plant species and habitat fragmentation by roads, agricultural use and residential development. However, due to past stewardship and restoration activities conducted by the Parks and Recreation Department and the Friends of the Mounds group, Effigy Mounds Preserve remains as a high quality natural area. The natural plant communities at Effigy Mounds are identified in Figure 1, and specifically include an Oak Savanna remnant (which contains the effigy mound sites), a Silver maple/Bur oak stand, and a fresh (wet) meadow wetland. These communities, along with management and restoration recommendations, are discussed below.

I. Existing Habitat Types

Oak Savanna

In Wisconsin, savanna once constituted one of the most widespread communities in presettlement times. The term "savanna" was credited to the native Carib Indians, defined by an area with widely spaced tall trees, but at a density so low that it allows grasses and other herbaceous vegetation to become dominant (Curtis, 1971).

Today, the oak savanna is beyond question the rarest plant community in Wisconsin (Curtis, 1971). This has been mainly due to the absence of fire, conversion to agriculture (e.g., wheat) and urban/residential development. Therefore, the oak savanna remnant at Effigy Mounds preserve is especially important to protect and maintain as one of the last remaining stands of oak savanna.

According to the Parks and Recreation Department, various stewardship activities have been occurring within the oak savanna over the recent years, including periodic mowing, weed pulling and trail maintenance. There exists a healthy stand of bur oak, with some white oak, black cherry, shagbark hickory and black walnut in the oak savanna. Many remnant native species are also present in the herbaceous layer,

including bottlebrush grass, Indian grass, bee balm, little bluestem, cup plant, and figwort. However, a number of invasive, weedy species are currently dominating the herbaceous understory, including garlic mustard, burdock, thistles (bull and Canada), and mulberry shrubs.

For purposes of this maintenance plan, the oak savanna area includes the oak savanna remnant itself (including the effigy mounds), a stand of black cherry near the preserve entrance, and the majority of the fallow field currently referred to as the DOT "strip" (Figure 1).

Silver maple/Bur oak stand

The silver maple/bur oak stand is located to the north of the oak savanna remnant (Figure 1), and consists of a slightly moister soil type. This community type wraps around the northern portion of the preserve, extending eastward towards the entrance. Other native tree species are present within this area, including black cherry and green ash. The herbaceous layer is primarily dominated by weeds and blackberry vines (*Rubus* spp.). The abundant weeds include garlic mustard, burdock, and bull thistle.

Fresh (wet) meadow wetland

Fresh (wet) meadows are wetlands that are dominated by grasses, such as redtop grass and reed canary grass, and by forbs such as giant goldenrod, growing on saturated soils (Eggers and Reed, 1997). The fresh (wet) meadow wetland (Figure 1) area at Effigy Mounds Preserve currently consists of a monoculture of reed canary grass. Reed canary grass can be almost impossible to control (costly, labor intensive, and a long term effort), and in the future the wetland will continue to receive nutrient laden water carrying reed canary grass seed from the existing wetland complex to the northeast, which receives runoff from Main Street. As such, we do not recommend reed canary grass removal and native vegetation establishment activities at this time unless ample funding becomes available.

II. Restoration & Management Recommendations (including Effigy Mounds)

Based on the fall 2010 site visit and stakeholder meeting in December 2010, the following stewardship recommendations are provided and discussed below:

1) Begin a burning regime (potential spring 2011 burn planned) to encourage native vegetation establishment and help control weeds
2) Remove turf cover on each mound and restore with a short-stature, native seed mix
3) Plant native tree saplings in the larger open areas to encourage reestablishment of oak savanna, including the DOT "strip"
4) Begin invasive species control regimen at appropriate times of the year
5) Sow (by hand) native seed collected on-site at appropriate times of the year
6) Add additional oak savanna westward into the DOT prairie (Figure 1)

Begin a burning regime to encourage native vegetation establishment

Prior to European settlement, wildfires and human-caused fires traversed prairies, wetlands and oak savannas. Native Americans often burned grasslands to flush out game when hunting. Lightning strikes were known to ignite dry prairies that could build up and traverse across miles of prairie. Although the precise frequency of these fires was not well documented, it is thought that fires burned through an area every 2-5 years.

The goal of prescribed burning is to mimic the natural disturbance of fire as much as possible. A burn frequency of 2-5 years, 2 years for "younger" prairies/oak savannas and 5 years for more established areas is recommended. The mound sites should be burned as well.

Burn seasons in Wisconsin generally occur each spring (April – May) and fall (late October - December). The season of burn can affect growth and development of many amphibian, insect and plant species. For example, a spring burn can stimulate late flowering forbs, while a fall burn may open ground for early spring sunlight and encourage growth of cool season grasses such as Junegrass. Some species take 2 to 3 years to flower and set seed after a burn, some species will flower within months following a burn. It is important then to stagger frequencies and seasons for the benefit of the entire plant and animal community.

An example burning regime for Effigy Mounds Preserve is provided in Table 1 below. Due to the small nature of the park, the entire preserve could be burned during one event or could be divided into smaller units and burned separately. At this time, it is likely most cost efficient and effective to burn the entire preserve at once.

It is understood that a land management company who specializes in prescribed burning would carry out the burn(s) and provide the necessary equipment and permits.

Table 1. Example burning schedule for Effigy Mounds Preserve.

2011	2012	2013	2014	2015	2016	2017	2018
Spring** burn	--	Fall* burn	--	Fall burn	--	-	Spring burn

* Fall: Early November through mid-December.
** Spring: Early April through early May.

Remove turf cover on each mound and restore with a short-stature, native seed mix

The effigy mounds are currently vegetated with Kentucky bluegrass and maintained by periodic mowing. While this vegetative cover allows for good visibility of the mounds, it is maintenance intensive and invites pedestrian traffic, causing compaction. In addition, compaction has occurred from mowing and brushcutting activities. To convey a more cultural and natural appearance of the mounds, we are recommending that the mounds be re-vegetated with a short stature, native seed mix. The species that are recommended below are native to this area of Wisconsin. After the seed mix becomes established, the shorter height of this mix compared to the taller vegetation in the surrounding oak savanna will help to delineate each mound. We are also recommending that the base of each mound be mowed to help delineate the shapes for visitors.

To remove the existing turf over the mounds, treat with a glyphosate-based herbicide (e.g., Roundup™) per label requirements. The turfgrass will die off after 1 – 2 herbicide treatments (two treatments is ideal). When the turfgrass has died off, burn the surface of each mound to get rid of the dead thatch. After the mounds have been removed of turf and bare soil is exposed, hand-sow the native seed mix per the instructions in Table 2.

Table 2. Native seed mix and specifications for Effigy Mounds at Effigy Mounds Preserve.

	Common name/Scientific name
1	Thimbleweed (*Anemone cylindrica)*
2	Columbine (*Aquilegia canadensis)*
3	Side-oats grama (*Bouteloua curtipendula*)
4	Prairie brome (*Bromus kalmii)*
5	Bottlebrush grass (*Elymus hystrix*)
6	June grass (*Koeleria macrantha)*
7	Jacob's ladder (*Polemonium reptans*)
8	Brown-eyed Susan (*Rudbeckia triloba*)
9	Little bluestem (*Schyzachyrium scoparium*)
Cover	Canada wild rye (*Elymus canadensis*) (20 lbs/acre)

crop	

Notes:

- The seedbed should be prepared for optimal native seed germination.
- Canada wild rye should be used as a temporary ground cover/nurse crop.
- Seeding should be completed between 4/10 and 5/31; or between 10/15 and 12/01 – Grasses germinate well when planted in the early spring.
- Apply native grass seed at a rate of 10 Lbs. per acre.
- Apply cover crop at 20 Lbs. per acre.
- Choose at least 3 of the 5 grasses.
- No single grass species should comprise more than 30 percent (by weight) of the species in the mix.
- Seeds should be viable and will be mixed using an appropriate filler material.
- Seed should be hand sown and raked, to ensure good seed to soil contact.
- A light mulch of clean, weed-free straw or similar should be spread on the sown areas to ensure good seed-soil contact and prevent erosion if a large rain event occurs.
- Contact a local native seed nursery for a cost estimate of the seed mix, such as Prairie Ridge Nursery, Taylor Creek Nursery, or Agrecol, Inc.

Once the seed mix and cover crop has been planted and mulched, monitor the establishment of the plantings every couple of weeks for the first few months. Watering should not be necessary. For the first 2 growing seasons following seeding, maintenance should primarily consist of mowing. Mow to approximately 5” in height, once in the late spring (June) and once in the late summer (September). Weeds should not be allowed to set seed. Around the third year following seeding, mowing can stop and the mounds can be incorporated into the overall burning regime. Over time, weed control should be less necessary.

Plant native tree saplings in the larger open areas to encourage reestablishment

Parts of the oak savanna contain large open areas that do not contain native tree saplings or mature trees. In addition, the DOT “strip” is essentially a fallow agricultural field that does not contain desirable trees or saplings. Planting several tree saplings in these areas in spring or fall is recommended in order to maintain the oak savanna and encourage reestablishment after existing mature trees have died off. Refer to Table 3 for a list of suggested species.

Table 3. Suggested tree species for planting within the Oak Savanna.

Common name	Scientific name
Bur oak	*Quercus macrocarpa*
Shagbark hickory	*Carya ovata*
White oak	*Quercus alba*
Black cherry	*Prunus serotina*

Tree Planting Notes:

- Trees should be planted within 48 hours of delivery from the nursery.
- Tree plantings should occur in the spring (April 1 – May 31) or fall (October 1 – November) timeframe.
- Tree planting locations should be selected with care to avoid overcrowding and/or unnecessary competition
- Any potential tree substitutions must be approved by the City Parks Dept.
- Plant all trees slightly higher than the soil surface at root flare. Remove excess soil from top of root ball, if needed.
- Backfill tree planting holes with 80% existing soil removed from excavation and 20% plant starter mix, blended prior to backfilling holes. Avoid any air pockets and do not tamp soil down. Discard any gravel, heavy clay or stones. When hole is two-thirds full, trees shall be watered thoroughly, and water left to soak in before proceeding.
- Provide a 3" deep, 2-3 ft. diameter shredded hardwood bark mulch ring around all trees. Do not build up any mulch onto trunk of any tree. Over time, allow the surrounding oak savanna vegetation to fill in around the base of each planted tree.

Begin invasive species control regimen at appropriate times of the year

Several non-native, invasive plants that can invade oak savannas and inhibit the establishment of native species are found in Effigy Mounds Preserve. Table 4 summarizes the non-native, invasive plants at Effigy Mounds Preserve along with some effective control method(s). Invasive plants found in the oak savanna include garlic mustard (*Alliaria petiolata*), bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), and common burdock (*Arctium minus)*. The most effective control method for these species is to remove the flowering heads, preventing them from setting seed. Garlic mustard and common burdock are biennial, where the first year plants exist as a basal rosette and the second year plants flower and set seed. The thistles are biennial and perennial in nature, producing flowering heads each year.

Remove flowering heads by pulling the entire plant if the ground is moist, or, cutting the heads with pruners, bag and discard off-site. For the perennial weeds, it is more desirable to pull the plant so that one does not need to revisit the same plants each year. Herbicide application of glyphosate-based herbicide (e.g., Roundup) to the basal rosettes in the spring and fall is also effective.

There are several other non-native species in and on the trails around the savanna, such as creeping Charlie (*Glechoma hederacea*), chicory (*Chicorum intebus*) and clovers (*Trifolium* spp.). These species are usually found along roadsides, trails, and wood edges, and do not tend to invade natural areas and restorations as readily as the

previously mentioned plants. Rather than allocate resources towards controlling pathway weeds, focus efforts on control of more problematic species in the savanna interior and prescribed burning.

Table 4. Invasive species at Effigy Mounds Preserve and recommended control methods.

Common Name	**Cut at base and treat stump**	**Foliar herbicide application**	**Prescribed Fire**	**Cut or pull (get root)**	**Biological Control**
garlic mustard		**X – early spring and fall**	**Preventative**	**X – pull when flowering**	**Being researched**
common burdock		**X – early spring and fall**	**Preventative**	**X – taproot can be difficult to pull**	
thistles			**Preventative**	**X – Cut in June, August and September**	
multiflora rose	**X**		**Preventative**		
Queen Anne's lace			**Preventative**	**X – pull during flowering**	
reed canary grass		**X – in late summer (Sept)**	**Preventative**		
cut-leaved teasel			**Preventative**	**X – cut flowering stems**	
Bush honeysuckle	**X**		**Preventative**		
common buckthorn	**X**		**Preventative**		

<u>Sow (by hand) native seed collected on-site at appropriate times of the year (oak savanna areas)</u>

Hand-sowing native seed within the oak savanna areas (including the DOT strip) will help supplement the seed bank and "speed up" native species establishment while discouraging weeds. Care must be taken in selecting the most appropriate species for seeding. A private specialist or native plant nursery that specializes in restoring oak savannas should be contacted to assist with the timing and methods of seed collection and storage.

Sowing native seed needs to be timed accordingly. In general, fall or late spring (past snow-melt) plantings do the best. Sowing seed in the fall gives it the advantage of a natural dormant season, which generally increases germination success in the spring. Sometimes a combination of the two seasons is most desirable to ensure successful plant establishment.

Based on the fall 2010 site visit, the seed of the following species could be collected on-site and sown by hand (Table 5):

Table 5. Oak savanna species suitable for seed collection and hand sowing

Common Name	**Scientific Name**
Bee balm	*Monarda fistulosa*
Bottlebrush grass	*Elymus hystrix*
Cup-plant	*Silphium perfoliatum*
Figwort	*Scrophularia lanceolata*
Indian grass	*Sorghastrum nutans*
Little bluestem	*Schizachyrium scoparium*

WHITEWATER EFFIGY MOUNDS PRESERVE BUDGET

Prepared February 23, 2011

Item	Qnty.	Unit	Unit Cost	Total Cost
Begin Burn Regime Spring 2011				
Burn	1.00	Lump Sum	3,500.00	$ 3,000.00
Subtotal				$ 3,000.00
15% Contingency				$ 450.00
Total				$ 3,450.00
Remove turf cover on each mound and restore with a short-stature, native seed mix				
Round-up Treatments	2.00	Lump Sum	2,000.00	$ 4,000.00
Labor to prep and seed mounds	1.00	Lump Sum	1,250.00	$ 1,250.00
Special Seed Mix for Mounds 35,000 sf	35.00	1000sf	80.00	$ 2,800.00
Subtotal				$ 8,050.00
10% Contingency				$ 805.00
Total				$ 8,855.00
Invasive Species Control				
Training				$ -
Tools				$ -
Disposal				$ -
Subtotal				$ -
10% Contingency				$ -
Total				$ -
Planting (installed)				
Savanna Trees	45.00	ea	250.00	$ 11,250.00
Native Shrubs	80.00	ea	75.00	$ 6,000.00
Native grasses and perennials	300.00	ea	12.00	$ 3,600.00
Structures, Signs, Benches				
Visitor Center	1.00	Lump Sum	30,000.00	$ 30,000.00
Displays in Visitor Center	1.00	Lump Sum	5,000.00	$ 5,000.00
Entry Kiosk	1.00	Lump Sum	10,000.00	$ 10,000.00
Benches	5.00	ea	600.00	$ 3,000.00
Subtotal				$ 48,000.00
Professional Fees (5% of building cost)				$ 2,400.00
10% Contingency				$ 4,800.00
Total				$ 55,200.00
Fence				
Split Rail Fence	1,200.00	LF	12.00	$ 14,400.00
Subtotal				$ 14,400.00
Professional Fees (5% of building cost)				$ 720.00
10% Contingency				$ 1,440.00
Total				$ 16,560.00
Archeological Research				
Archeological Consultant Fee	?			
Subtotal				$ -
Professional Fees (5% of building cost)				$ -
10% Contingency				$ -
Total				$ -