
Indian Mounds Vegetation Assessment

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Siggelkow Park, Woodland Commons,
Taylor Road Conservancy,
Indian Mounds Community Park

Village of McFarland,
Wisconsin

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Prepared by:

Mr. Scott O. Taylor
Taylor Conservation, LLC
3856 Schneider Dr.
Stoughton, WI. 53589
(608) 444-7483

Prepared for:

Mr. Steve Hoeft
Asst. Director of Public Works
Village of McFarland
5115 Terminal Drive
McFarland, WI 53558
Office 608-838-7287



Table of Contents

Introduction.....	2
Methods.....	2
Results.....	2
Description of Vegetation Structure	2
Potential for Soil Erosion.....	3
Invasive Plants	3
Table 1: Invasive Plants	4
Oak Savanna Restoration Potential.....	4
Figure 1: Forest Canopy Tree Species Relative Composition, by Park.....	5
Table 2: Complete Species List for Mounds in all Parks.....	6
Vegetation Management: Recommended Objectives & Actions	8
Indian Mound Inventory	10
Map 1	17
Map 2	18
Map 3	19

Introduction

The vegetation of 14 native American mounds, hereafter “mounds”, located in four village parks - Siggelkow Park (2 mounds – Map 1), Woodland Commons (2 mounds – Map 2), Taylor Road Conservancy (1 mound – Map 2), and Indian Mounds Community Park (9 mounds – Map 3) – was evaluated to (1) determine vegetation effectiveness at protecting the mounds from soil erosion, and (2) evaluate vegetation potential for oak savanna restoration.

The purpose of this report is to describe the species composition and structure of mound vegetation, and then to recommend a vegetation management approach that will maximize stabilization of mound soil, and thereby avoid soil erosion, and encourage the development of an oak savanna plant community.

Methods

The vegetation growing on each mound was sampled by estimating the areal cover, i.e. the percentage of the mound area covered by foliage when its outline, as viewed from above, is projected onto the ground, for each of 3 vertical layers of vegetation: (1) upper tree canopy layer, (2) shrub/sapling/vine layer and (3) herb layer. Saplings were defined as trees smaller than 5 inches in diameter at breast height. All vegetation, except vines, shorter than 2 feet was considered part of the herb layer; hence woody seedlings were part of the herb layer.

All plant species were tallied within each layer of vegetation. Each species was classified as dominant or non-dominant based on its relative contribution to areal cover in its layer, i.e., its relative abundance. This was determined, subjectively, by ocular estimate.

Basal area per acre of the tree layer surrounding each mound was estimated. Basal area is the total cross-sectional area of the tree trunks, measured at breast height, for a given area of the forest. More broadly, it is a measure of tree crowding, or density. It is correlated closely to canopy cover. It was measured using a 10-factor wedge prism at one or two points for each mound.

The mounds were inspected late in the growing season – early November; therefore it is likely that some plant species were present but not observed. Nonetheless, the large majority of plant species were probably noted for all mounds.

Results

Description of Vegetation Structure

All mounds but one, which sat in an open, grassy area in Taylor Road Conservancy (Mound TRC, p.12), were located in forests. Estimates of forest canopy cover varied from 50% to 90%; average canopy cover was 76%. Hence there were moderate amounts of sunlight penetrating the forest canopies and reaching the forest floor. The forests of all parks consisted of essentially the same mix of hardwoods, including oaks (bur oak, white oak, red oak and black oak), basswood, black cherry, hackberry and shagbark hickory, among other, less abundant species. Oaks, especially bur oak and white oak, were the largest, oldest trees -

they were often larger than 20 inches in diameter – while the non-oaks were smaller and younger. Approximately ½ of forest canopy cover consisted of oak tree canopies.

There were also heavy shrub/sapling layers covering many of the mounds. Brush cover varied widely – from 0-100%; average brush cover was 53%. Shrubs especially thrived where the tree canopy was light, e.g. mounds IMCP 1 (p. 12) and WC-2 (p. 11).

Herb layer cover showed the same pattern as the shrub/sapling layer. It varied from 10-100%; the average was 54%. Ten of 14 mounds (71%) showed large areas with thin or absent herb cover on much of the mound surface. Many of these mounds had high shrub cover, suggesting shrubs were suppressing herbs.

No state or federally-listed special concern, threatened or endangered plant species were noted on any of the mounds.

See page 10 for species composition of each mound.

Potential for Soil Erosion

As noted above, many of the mounds showed large areas with sparse, herbaceous vegetative cover. Since dense herbaceous or grassy cover is most effective at protecting soils from rain and erosion, many of the mounds are vulnerable to erosion.

Nonetheless, two mounds, IMCP-7 and IMCP-5, supported dense herb layers; they were exemplary mounds from the stand point of stabilizing soils and minimizing erosion.

Woodland sedges (these were difficult to identify to the species level since they were not in flower; however, most of the sedges probably consisted of either *Carex pennsylvanica* or *Carex rosea*) provided the best ground cover of any of the herb layer species. They formed thick carpets, completely protecting the soil from the impact of raindrops and runoff. Mound IMCP-7 supported a large population of woodland sedges.

Invasive Plants

Twelve alien plants were noted in the parks (see Table 1, below). In the investigator's experience, garlic mustard, honeysuckle, buckthorn and oriental bittersweet have the most potential to behave invasively. Either honeysuckle or buckthorn, or both, were dominant in the shrub or herb layers on 8 of the 14 mounds inspected (57%).

Table 1: Invasive Plants.

Garlic mustard (<i>Alliaria petiolata</i>)	Herb
Queen anne's lace (<i>Daucus carota</i>)	Herb
Phalaris arundinacea (reed canary grass)	Grass
Poa pratensis (Kentucky blue grass)	Grass
Poa canadensis (Canada blue grass)	Grass
Brome grass (<i>Bromus inermis</i>)	Grass
Lonicera X bella (honeysuckle)	Shrub
Morus alba (Russia mulberry)	Shrub
Rhamnus cathartica (buckthorn)	Shrub
Viburnum opulus (European cranberry)	Shrub
Autumn olive (<i>Elaeagnus umbellata</i>)	Shrub
Oriental bittersweet (<i>Celastrus orbiculata</i>)	Vine

Oak Savanna Restoration Potential

The mounds and the areas surrounding them had moderate potential for oak savanna restoration. The forests of all of the parks, except Taylor Road Conservancy, contained large proportions of oaks (see Figure 1), many of them with open-grown form typical of savanna trees. Fifteen of the 26 herbs, grasses and graminoids noted (58%) are known to occur in oak savanna remnants (Bader 2003. [Oak Savanna & Woodland Restoration: Appropriate Goundlayer & Shrub Species.](#)). However, 12 of these (80%) are relatively common species found in a variety of habitats besides oak savannas. Hence, there is little evidence that these forests are highly restorable oak savannas.

Nonetheless, an oak savanna structure could be created by opening the canopy through removal of non-oak canopy trees. Re-creating a distinct oak savanna herb layer would require introduction of oak savanna plants through artificial seeding.

Figure 1: Forest Canopy Tree Species Relative Composition, by Park.

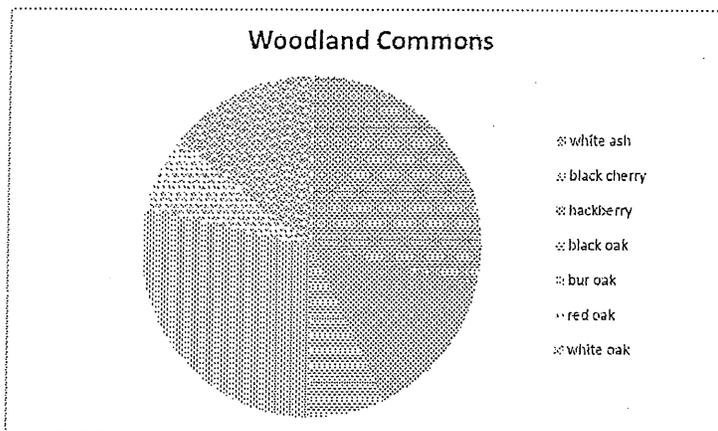
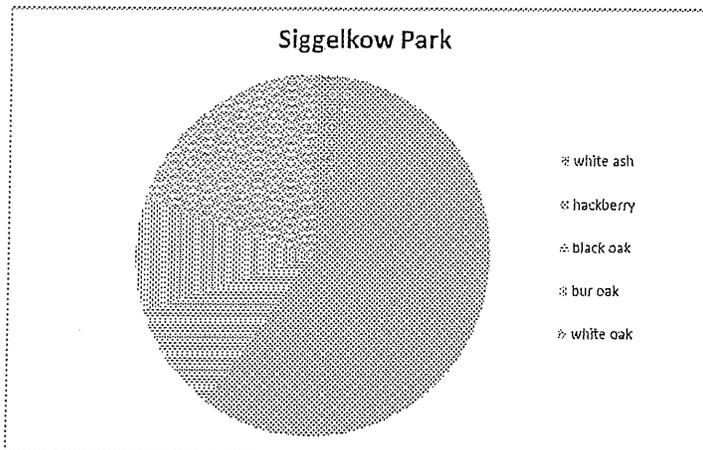
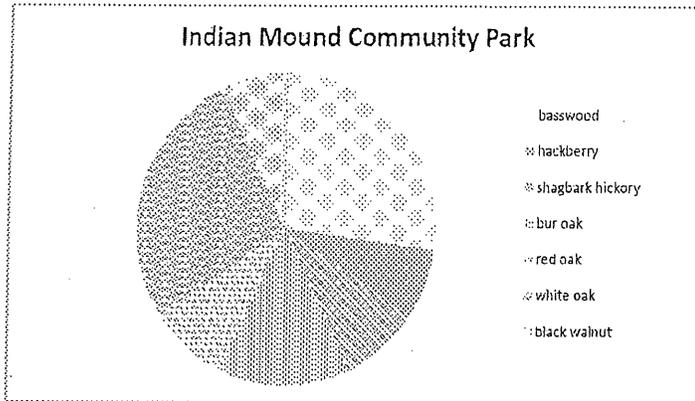


Table 2: Complete Species List for Mounds in all Parks.

Species	Growth Form	Native/Alien	C of C*	Oak Savanna Plant?
<i>Actaea rubra</i> (Red baneberry)	Herb	Native	7	No
<i>Alliaria petiolata</i> (Garlic mustard)	Herb	Alien	None	No
<i>Anemone virginiana</i> (Thimbleweed)	Herb	Native	5	Yes
<i>Aster lateriflorus</i> (Calico aster)	Herb	Native	3	Yes
<i>Aster pilosus</i> (Frost aster)	Herb	Native	1	No
<i>Circaea lutetiana</i> (Enchanter's nightshade)	Herb	Native	2	Yes
<i>Daucus carota</i> (Queen anne's lace)	Herb	Alien	None	No
<i>Eupatorium rugosum</i> (White snake root)	Herb	Native	1	No
<i>Geum canadense</i> (White avens)	Herb	Native	2	No
<i>Hackelia virginiana</i> (Stickseed)	Herb	Native	3	No
<i>Helianthus strumosus</i> (Woodland sunflower)	Herb	Native	4	Yes
<i>Lactuca canadensis</i> (Prickly lettuce)	Herb	Native	2	Yes
<i>Monarda fistulosa</i> (Bergamont)	Herb	Native	3	Yes
<i>Scrophularia marilandica</i> (Figwort)	Herb	Native	4	Yes
<i>Solidago canadensis</i> (Canada goldenrod)	Herb	Native	1	Yes
<i>Solidago gigantea</i> (Giant goldenrod)	Herb	Native	3	Yes
<i>Solidago ulmifolia</i> (Elm-leaved goldenrod)	Herb	Native	5	Yes
<i>Carex blanda</i> (Common wood sedge)	Graminoid	Native	3	No
<i>Carex pennsylvanica</i> (Pennsylvania sedge)	Graminoid	Native	3	Yes
<i>Carex rosea</i> (Rosy sedg)	Graminoid	Native	4	Yes
<i>Bromus inermis</i> (Brome grass)	Grass	Alien	None	No
<i>Elymus hystrix</i> (Bottlebrush grass)	Grass	Native	6	Yes
<i>Elymus villosus</i> (Silky wild rye)	Grass	Native	6	Yes
<i>Phalaris arundinacea</i> (Reed canary grass)	Grass	Alien	None	No
<i>Poa canadensis</i> (Canada blue grass)	Grass	Alien	None	No
<i>Poa pratensis</i> (Kentucky blue grass)	Grass	Alien	None	No
<i>Cornus racemosa</i> (Grey dogwood)	Shrub	Native	2	No
<i>Elaeagnus umbellata</i> (Autumn olive)	Shrub	Alien	None	No
<i>Lonicera X bella</i> (Honeysuckle)	Shrub	Alien	None	No
<i>Morus alba</i> (Russia mulberry)	Shrub	Alien	None	No
<i>Prunus virginiana</i> (Chokecherry)	Shrub	Native	3	No
<i>Rhamnus cathartica</i> (Buckthorn)	Shrub	Alien	None	No
<i>Rhus hirta</i> (Sumac)	Shrub	Native	2	No
<i>Rubus occidentalis</i> (Black raspberry)	Shrub	Native	2	No
<i>Viburnum opulus</i> (European cranberry)	Shrub	Alien	None	No
<i>Zanthoxylum americanum</i> (Prickly ash)	Shrub	Native	3	No
<i>Vitis riparia</i> (Riverbank grape)	Vine	Native	2	No

Species	Growth Form	Native/Alien	C of C*	Oak Savanna Plant?
<i>Dioscorea villosa</i> (Wild yam)	Vine	Native	4	Yes
<i>Celastrus orbiculata</i> (Oriental bittersweet)	Vine	Alien	None	No
<i>Acer negundo</i> (Box elder)	Tree	Native	0	No
<i>Carya ovata</i> (Shagbark hickory)	Tree	Native	5	Yes
<i>Celtis occidentalis</i> (Hackberry)	Tree	Native	4	No
<i>Fraxinus americana</i> (White ash)	Tree	Native	5	No
<i>Juglans nigra</i> (Black walnut)	Tree	Native	3	No
<i>Pinus resinosa</i> (Red pine)	Tree	Native	7	No
<i>Populus deltoides</i> (Cottonwood)	Tree	Native	2	No
<i>Prunus serotina</i> (Black cherry)	Tree	Native	3	No
<i>Quercus alba</i> (White oak)	Tree	Native	7	Yes
<i>Quercus ellipsoidalis</i> (Pin oak)	Tree	Native	5	Yes
<i>Quercus macrocarpa</i> (Bur oak)	Tree	Native	5	Yes
<i>Quercus rubra</i> (Red oak)	Tree	Native	5	Yes
<i>Quercus velutina</i> (Black oak)	Tree	Native	5	Yes
<i>Tilia americana</i> (Basswood)	Tree	Native	5	No

*Coefficient of Conservatism – a measure of a species fidelity to relatively undisturbed native habitats; higher numbers indicate greater sensitivity to disturbance and, usually, greater rarity.

Vegetation Management: Recommended Objectives & Actions

The vegetation management goals for the mounds are to protect them from soil erosion while discouraging invasive plants and encouraging the structure and plant species composition of an oak savanna.

Following these objectives and actions will help the village reach its goals:

Objective: Reduce forest canopy cover surrounding the mounds to increase light penetration to the forest floor.

Action: Cut all non-oak trees on and within 75 feet of the mounds. Reducing the canopy can trigger excessive growth of understory shrubs and wildflowers. To avoid this, remove non-oaks in stages: (1) cut trees smaller than 8 inches in diameter, (2) 2 years later cut trees larger than 8 inches. Cut trees under frozen or dry ground conditions to avoid damage to mounds. Use directional felling techniques to avoid dropping trees on mounds. Have a certified arborist remove trees growing on the mounds themselves. Kill smaller trees (<10 inches in diameter) by stump-treating them with appropriate herbicide after cutting.

Action: Kill all shrubs, including black raspberries, growing directly on the mounds. Kill them by cutting and stump-treating with appropriate herbicide.

Action: Kill all exotic shrubs, i.e., honeysuckle, buckthorn and autumn olive, within 75 feet of the mounds. If desired, also kill native shrubs, i.e., grey dogwood and chokecherry, within this zone. But killing native shrubs may not be necessary since prescribed burns alone may hold them in check.

Objective: Restore, or re-create, dense, soil-stabilizing ground cover of native oak savanna vegetation on the mounds and in the area surrounding them.

Action: After tree and brush removal is complete, hand-scatter seed of oak savanna grasses and wildflowers, e.g., bottle brush grass, silky wild rye, purple joe-pye weed, arrow-leaved aster, silky aster, purple milkweed, among others, onto bare areas of the mounds and surrounding areas in late fall, i.e., late November. Use higher amounts of grasses than wildflowers in the seed mix to create dense, soil-stabilizing cover. The seed will work its way into the soil over the winter. Mow these areas to a height of 6-8 inches on a monthly basis during the first post-planting growing season. Spot-spray with appropriate herbicide invasive exotic or aggressive native weeds, e.g., garlic mustard, burdock, thistles or Canada goldenrod, as needed to keep their numbers in check.

Action: Conduct prescribed burns in the areas planted beginning the 3rd post-planting season. Conduct burns in the spring only; fall burns will leave the mounds bare and vulnerable to soil erosion all winter. Oak leaf litter should provide ample fuel for the fires. Remove woody debris from perimeter of burn units to reduce time

spent extinguishing smoldering wood, aka “mop-up”, following the burns. Conduct burns every 1-3 years in perpetuity. Frequent burning will encourage growth and flower production of native plants and prevent encroachment of trees and shrubs on the mounds.

Action: Scout the area for invasive plants annually, especially garlic mustard and Japanese hedge parsley, or seedlings of buckthorn, honeysuckle or autumn olive. Spray or hand-pull new colonies; if seeds are present, bag the plants and remove them from the site.

Indian Mound Inventory

SP=Siggelkow Park
 WC=Woodland Commons
 TRC=Taylor Road Conservancy
 IMCP=Indian Mounds Community Park

Mound ID: SP-1			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	20%	80%	80%
Dominant Plant Species:	Buckthorn	Hackberry, honeysuckle, buckthorn	White oak, black oak, hackberry
Non-Dominant Plant Species:	white ash, garlic mustard	Black cherry, shagbark hickory, White ash, choke cherry	Pin oak

Remarks: There are several large, dead and declining black oaks on or next to this mound. They must be removed to avoid damage to the mound from falling wood. There is much bare soil on the mound that is vulnerable to erosion.

Mound ID: SP-2			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	10%	80%	90%
Dominant Plant Species:	Buckthorn	Buckthorn	Hackberry
Non-Dominant Plant Species:	None	Honeysuckle, hackberry, white ash	Bur oak, white ash, black cherry

Remarks: There is one large bur oak that could drop large branches onto the mound. There is much bare soil; the mound is very vulnerable to erosion. This mound adjoins a private yard, to the west.

Mound ID: WC-1			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	75%	30%	70%
Dominant Plant Species:	Woodland sedges, honeysuckle,	Black cherry, honeysuckle, riverbank grape	Bur oak, white oak
Non-Dominant Plant Species:	Enchanter's nightshade, grey dogwood, Canada bluegrass	white ash	Black oak, red oak

Remarks: This mound supports relatively abundant herbaceous and grassy ground cover.

Mound ID: WC-2			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	15%	100%	60%
Dominant Plant Species:	Honeysuckle, wild yam, common wood sedge	Honeysuckle	Black cherry, hackberry, bur oak
Non-Dominant Plant Species:	None	Buckthorn, black cherry, hackberry, white ash, riverbank grape	white ash

Remarks: A black cherry tree is leaning heavily. It poses a high risk of tipping over and dislodging a large volume of soil from the mound. This mound supports very large honeysuckle shrubs. Herbaceous ground cover is very sparse.

Mound ID: TRC			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	100%	10%	40%
Dominant Plant Species:	Brome grass	Mulberry, white ash, riverbank grape, honeysuckle	Red pine
Non-Dominant Plant Species:	Queen anne's lace, Canada goldenrod, shagbark hickory, Kentucky bluegrass, frost aster	None	None

Remarks: This mound is on the edge of a pine plantation, which lies to the east. Most of the mound is completely open; hence, unlike any of the other mounds inspected, it supports a dense sod of grasses and wildflowers. The north end of the mound was disturbed by burrowing animals.

Mound ID: IMCP-1			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	10%	100%	50%
Dominant Plant Species:	Figwort, prickly lettuce, white avens, white snakeroot, woodland sedge, giant goldenrod	Black raspberry, grey dogwood	White oak, white ash
Non-Dominant Plant Species:	None	Sumac, autumn olive, white ash, honeysuckle	None

Remarks: The mound was almost completely free of trees growing directly on it; there were just a few saplings. It had the heaviest shrub layer of any of the mounds in this park. However the herb layer was sparse. There was a large, overhanging limb of a nearby bur oak.

Mound ID: IMCP-2			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	70%	40%	70%
Dominant Plant Species:	Woodland sedges	Black raspberry, honeysuckle	basswood
Non-Dominant Plant Species:	White avens, thimbleweed, white snakeroot, giant goldenrod	Black cherry, black walnut, shagbark hickory, basswood, red oak	None

Remarks: There were patches of bare soil, especially beneath the black raspberries. A large basswood south of the mound casts heavy shade and suppresses ground cover. There were two dead tamaracks at the base of the mound.

Mound ID: IMCP-3			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	30%	60%	90%
Dominant Plant Species:	Woodland sedges, white avens	Grey dogwood, black raspberry	Red oak
Non-Dominant Plant Species:	Elm-leaf goldenrod, white snakeroot, figwort, enchanter's nightshade	Honeysuckle	None

Remarks: There are several overhanging branches of nearby bur oaks. There was only one tree established on the mound. There was much bare soil on this mound.

Mound ID: IMCP-4			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	60%	80%	80%
Dominant Plant Species:	Woodland sedges, giant goldenrod	Black raspberry, grey dogwood	Bur oak, walnut, white oak, red oak
Non-Dominant Plant Species:	Red baneberry, garlic mustard, enchanter's nightshade, wild yam, white avens, bergamont, stickseed, white snakeroot	Prickly ash, hackberry, buckthorn, honeysuckle	hackberry

Remarks: There were several large, declining oaks with overhanging limbs that could break off and damage the mound. There was also a standing dead oak at the base of the mound.

Mound ID: IMCP-5			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	100%	0%	70%
Dominant Plant Species:	Woodland sunflower, giant goldenrod, calico aster, bottlebrush grass, reed canary grass, elm-leaf goldenrod	None	None on or near mound.
Non-Dominant Plant Species:	Canada bluegrass, violet sp., woodland sedges, silky wild rye	None	None

Remarks: This mound was completely free of trees and brush but supported a dense herb layer. Although there is a substantial tree canopy, this mound still receives much sunlight from the south. There was a bur oak with a large overhanging limb.

Mound ID: IMCP-6			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	70%	60%	80%
Dominant Plant Species:	Woodland sedges, calico aster, bottlebrush grass, elm-leaf goldenrod	Black raspberry	Bur oak, basswood
Non-Dominant Plant Species:	Giant goldenrod, thimbleweed, woodland sunflower, wild yam, violet sp.	Box elder, honeysuckle, basswood	Red oak, hackberry

Remarks: There was a bur oak with a large overhanging limb. Ground layer vegetation was very uneven; it was heavy in some places, and sparse in others.

Mound ID: IMCP-7			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	80%	5%	75%
Dominant Plant Species:	Woodland sedges	Grey dogwood, buckthorn, hackberry, black raspberry, honeysuckle	White oak
Non-Dominant Plant Species:	Elm-leaf goldenrod, giant goldenrod, thimbleberry, white avens	None	Basswood, hackberry, shagbark hickory

Remarks: There was a standing dead white oak on the mound. There was also a heavily leaning white oak, which may tip over and damage the mound. The shrubs were very small – there was essentially no shrub cover. Woodland sedge cover was very high. With the exception of TRC, which occurred in an open setting, this mound showed the greatest amount of protective herbaceous ground cover of any mound inspected in the 4 village parks.

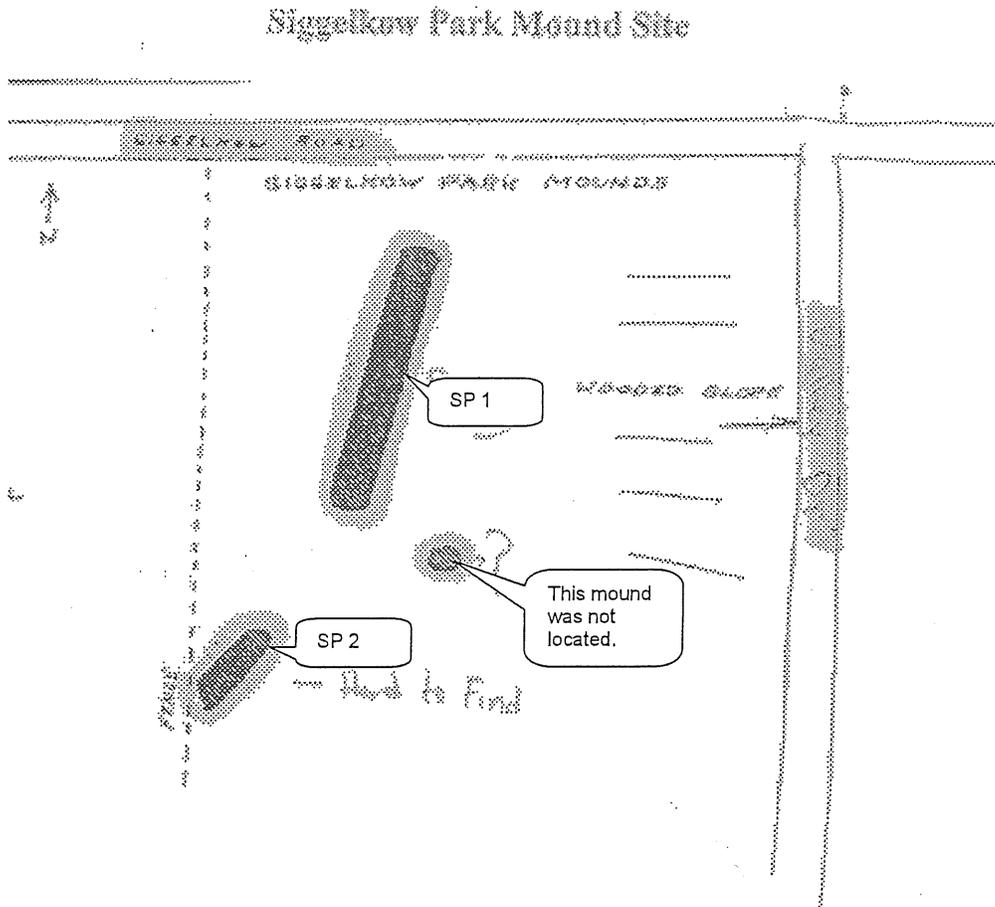
Mound ID: IMCP-8			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	40%	5%	90%
Dominant Plant Species:	Enchanter's nightshade, calico aster, woodland sedges, giant goldenrod	Black raspberry	White oak, basswood, black cherry
Non-Dominant Plant Species:	Hackberry, buckthorn, white avens, garlic mustard	Black cherry, European cranberry, honeysuckle, oriental bittersweet	Hackberry, shagbark hickory, white ash, black oak, cottonwood

Remarks: There was a large shagbark hickory with many dead limbs that could break off and damage the mound. Ground cover was uneven. Some areas had ample ground cover of woodland sedges, other areas were bare, or nearly so.

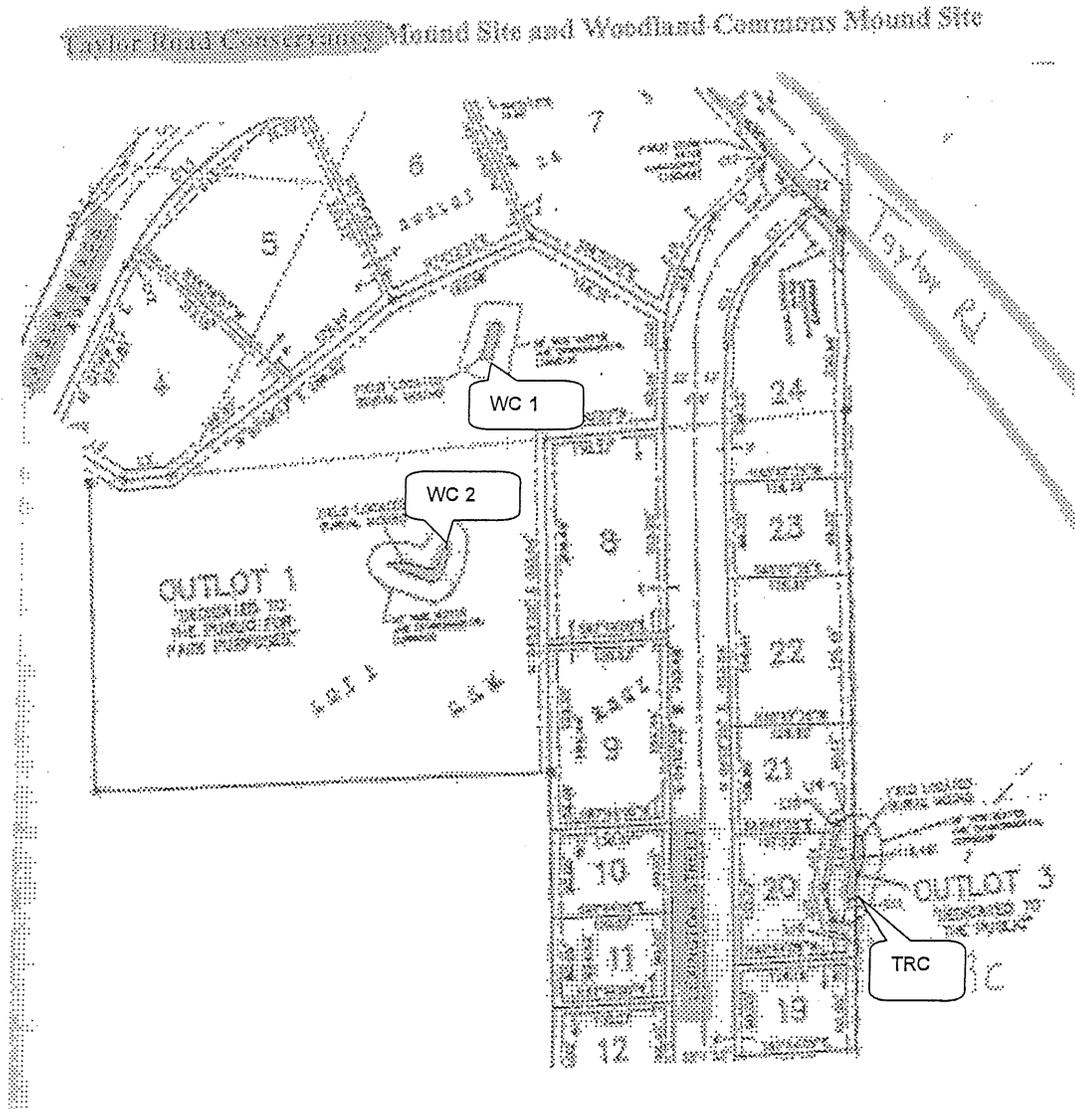
Mound ID: IMCP-9			
Vegetative Layer:	Herbs & Seedlings	Shrubs, Saplings & Vines	Trees
Areal Cover:	60%	60%	90%
Dominant Plant Species:	Woodland sedges, elm-leaf goldenrod, frost aster, calico aster	Buckthorn, black raspberry	Shagbark hickory, white oak, black cherry
Non-Dominant Plant Species:	White avens, garlic mustard	Hackberry, European cranberry, autumn olive, blackberry, black cherry, white ash, honeysuckle, riverbank grape, oriental bittersweet	Red oak, sugar maple, white ash, hackberry, walnut, bur oak

Remarks: Some areas have ample ground cover offered by woodland sedges; however many areas have no ground cover. There are exceptionally large oaks (>24 inches in diameter) growing on the mound. Large limbs from these trees could break off and damage the mound.

Map 1



Map 2



Map 3

IMCP Mound Site

