APPENDIX F

Oak Openings Rapid Assessment Method

1. Protocol
2. Data Collection Worksheet
3. Definitions
4. Percent Cover Guide

OAK OPENINGS RAPID ASSESSMENT METHODOLOGY AND GUIDELINES FOR ASSESSING RESTORATION NEEDS AND PROGRESS IN THE OAK OPENINGS REGION OF NORTHWEST OHIO AND SOUTHEAST MICHIGAN

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1.0 INTRODUCTION AND STATEMENT OF NEED

The Oak Openings region of northwest Ohio and southeast Michigan has been a focus of conservation and restoration for several decades, with increased restoration activities since regional conservation agencies formed the Green Ribbon Initiative (GRI) in 2000. Despite its widely recognized importance as a biodiversity hotspot within the Lake Erie watershed, the Oak Openings continues to face threats associated with industrial, urban, and agricultural growth. Much of the region suffers from altered hydrology, altered fire regime, invasive species, and fragmentation. Significant resources have been invested in restoring and maintaining Oak Openings communities by public agencies and private organizations. Although some monitoring is carried out at individual sites, monitoring procedures have generally required botanical expertise and more time and resources than available to managers. Thus, there has been no consistent evaluation of the habitat quality of the Oak Openings at the landscape scale or across ownerships. Given that the Oak Openings consists of 1,300 square miles across two states, and that over a dozen conservation agencies are actively restoring habitat in the region, a region-wide method of assessing habitat quality will provide a) a consistent means of measuring site-level change as a result of restoration activities, and b) a system to assess changes in quality at the landscape scale over time.

Although rapid assessment methods exist for several community types within the Oak Openings (e.g., Ohio Rapid Assessment Method for Wetlands [ORAM]; Michigan Natural Features Inventory [MNFI] Ecological Community Survey; The Nature Conservancy's Coarse-Level Metrics for Oak Barrens, Pine Barrens, Dry Sand Prairie, and Dry Prairie), none accurately capture the vegetative communities, habitat alterations, and plant structure that characterize the Oak Openings. For example, an Oak Openings wet prairie that is dominated by non-native buckthorn, yet contains conservative plant species in the understory, consistently ranks as a Category 3 wetland under the ORAM despite the fact that its ecological function may be severely degraded. The MNFI Community Assessment automatically ranks any wet prairie with a history of agriculture as a D on a scale A-D; however, management history and professional experience show that wet prairies in the region can recover diversity and ecological function within a few decades after ceasing plowing.

With the inadequacies of other coarse and rapid assessments in mind, the Green Ribbon Initiative Science Committee developed the Oak Openings Rapid Assessment Methodology (OORAM) to quickly assess habitat quality and track improvements at both site and landscape scales. It is the intent of the Science Committee that most or all conservation partners in the Oak Openings use the OORAM, and therefore improvements in habitat quality can be tracked consistently across the region.

These metrics provide a relatively quick and inexpensive means to track the progress of restoration and maintenance in six Oak Openings communities: Wet Prairie, Savanna/Upland Prairie, Upland Deciduous Forest, Floodplain Forest, and Flatwoods Forest. Use of these metrics requires basic understanding of these systems, but does not require extensive botanical expertise. The metrics are designed so that land managers and stewards can evaluate restoration success, and determine the next restoration or management step(s) needed, without relying on external botanists or ecological consultants.

Version 1 has been developed using data collected on 94 sites, or Assessment Units, within Lucas County, OH, during 2013 and 2014. The format and organization was heavily inspired by the ORAM because it a) addressed the three broad categories deemed important to assessing habitat quality (size, landscape context, site condition), b) had a preferred structure (modules of related questions) and c) had an intuitive ranking system (1-100 scale). Metrics were selected based on existing protocols and factors known by the GRI Science Committee to impact habitat quality in the Oak Openings, such as ditches or fire regime. Scores were assigned to each metric based on observed values, difference from reference (i.e., known high quality) sites, and existing protocols' scores. It is the goal of the Science Committee, as a second phase in the development of these metrics, to compare the ranking derived via these scoring systems to fine-scale biological surveys, such as Floristic Quality Index (FQI). An initial round of surveys is scheduled for 2015, and will likely use a modified FQI that accounts for plant coverage ('VIBI-FQ,' see Gara 2013). Scores for OORAM metrics may be adjusted based on these findings.

2.0 Defining Assessment Units

The OORAM is designed to evaluate an assessment unit (AU) with fixed boundaries. The term 'assessment unit' was selected to reduce confusion with other terms currently used by conservation partners in the Oak Openings, such as management unit, site, plot, or parcel. Assessment units should be delineated by managers prior to filling out assessments. A goal or 'desired future condition' for the unit should be clearly articulated, as this will determine the scoring system to use when evaluating this AU (Table 1). However, if the desired future condition changes, the raw scores can be reevaluated based on the new goal, given that the same metrics are collected in all community types.

TABLE 1. COARSE DESCRIPTION OF THE COMMUNITY TYPES FOR WHICH OORAM SCORES ARE BEING DEVELOPED, INCLUDING THE CORRESPONDING LAND COVER CLASS AS DEFINED IN SCHETTER AND ROOT, 2011.

OORAM Community Type	Land Cover Class	Primary characteristics (current or desired)
Wet Prairie	Wet Prairies	Hydric soils, seasonally inundated, dominated by sedges, tree canopy primarily comprised of oak species and typically <20% cover, shrub cover low or absent, at least 10 hummocks or tussocks per acre
Savanna/Upland Prairie	Upland Savannas, Upland Prairies, Sand Barrens	Sandy soils, dominated by native grasses (big bluestem, little bluestem, Indian grass) and forbs, tree canopy primarily comprised of oak species and typically 20-40% cover, shrub cover (blueberry, raspberry) averages 20%, 1-10 snags per acre
Deciduous Forest	Upland Deciduous Forest	Sandy soils; tree canopy primarily comprised of oak species and typically >80% cover; shrubs comprised of blueberry, witch hazel, sassafras, and young oak covering approximately 20% of the unit, >10 snags per acre
Floodplain Forest	Floodplain Forests	Poorly to moderately drained soils, within floodplain of stream or ditch, tree canopy primarily comprised of Eastern cottonwood, sycamore, and ash at >80% cover
Flatwoods Forest	Swamp Forest	Seasonally inundated hydric soils or muck overlaying sandy soils; tree canopy comprised primarily of pin oak and swamp white oak at >80% cover; herbaceous layer includes Canada bluejoint, cinnamon

OORAM Community Type	Land Cover Class	Primary characteristics (current or desired)
		fern, royal fern, and may be patchily distributed where sunlight penetrates canopy

Assessment units must:

Have discrete boundaries. Boundaries may be defined by a change in management type, change in plant community, ownership boundary, road, etc. Assessment units may not cross roads or other boundaries that interrupt ecosystem function or management processes (e.g., permanent burn breaks, major ditches).

Be within a single management unit, or otherwise receive relatively uniform management. This will strengthen the link between management and changes habitat quality, and will provide the most accurate and relevant information for each AU.

Be comprised of one community type. Habitat quality/ranking scores are based on objectives for each community type, and will not accurately rank units comprised of more than one community. Given that Oak Openings communities were historically often interspersed with pockets of other communities (e.g., small wet prairie pockets embedded within upland savanna), **an assessment unit may contain** a) **up to 10%** of another community type in one contiguous piece, or b) **up to 20%** of another community(ies) in several disjunct pieces.

Assessment units may be defined using any combination of aerial photography, LandSat data, soil maps, historic maps, topographic maps, and field visits. There is no right or wrong way to define AUs as long as all of the above criteria are met. Over time, as units become more similar in structure to their surrounding AUs, the units may be combined into a single AU. See Appendix A for examples of AU delineations.

3.0 Surveying Assessment Units

3.1 Timing

Modules 1 and 2 can be conducted from within the office at any time of the year. Aerial photography, Landsat imagery, or other means of assessing landscape features (e.g., patches of natural landcover, roads) may be used from any time of year. The metrics in these modules are unlikely to change over short periods of time, and therefore these modules can be completed at less-frequent intervals as determined appropriate by the land manger. Values for each metric can be carried forward from year to year until they are re-evaluated.

Modules 3 and 4 must be completed within the field. **Field surveys should occur between June 15 and September 30**, or prior to leaf-drop, of each year. Surveys should occur at this time to ensure all vegetation is leafed out and visible. The latter part of this timing also coincides with the end of typical field seasons, capturing to the greatest extent the changes that have occurred within the past year of management. Modules 3 and 4 should be completed as frequently as possible up to once per year. These modules contain metrics that will change more quickly as a result of management or weather conditions. At minimum, these metrics should be collected at least once prior to major restoration, and once post restoration.

3.2 Observers

Observers for Modules 1 and 2 should be familiar with the tools necessary to accurately assess and measure landscape parameters. Familiarity with the plant communities of the region may be helpful, but is not essential. Observers for Modules 3 and 4 should be familiar with the Oak Openings landscape, and have spent time within

known high quality savanna, wet prairie, flatwoods, or floodplain forest communities in the region. They should be familiar with the terms and definition throughout this text, most established nonnative or invasive/aggressive plants within the region, and be able to identify the oak genus (*Quercus*). We recommend three observers conduct surveys simultaneously to ensure assessment units are thoroughly surveyed, but acknowledge that two observers can be used when capacity is limited without impacting quality of data (see Appendix B for details).

Observers may fill out a single sheet in coordination, or their own sheets separately. Module 4 has been designed to record three observer's data. In this way, multiple "samples" are obtained, and can be used to compare change in individual metrics between two sampling periods (see Box 1). Observers should conduct surveys at the same time, but may assess units separately if visits are within one week of each other and no management or other major activity occurs between visits.

Box 1. Retaining individual observers' observations for short-term comparisons.

Recording each individual observers' estimates for metrics in Module 4 allows managers to statistically compare change in each metric over two sampling periods.

For example, during pre-restoration sampling of Assessment Unit #17, Observers 1, 2, and 3 assign tree canopy cover of 45%, 42%, and 51%, respectively. During post-restoration sampling, a different set of three Observers assign tree canopy cover values of 26%, 33%, and 24%.

A manager can now use statistical methods, such as a Student's t-test or Mann-Whitney U-test, to evaluate if these samples (i.e., populations) differ significantly from each other. In this case, the results of a Mann-Whitney U-test suggest that although the average tree canopy decreased from 46% to 27%, there is no evidence that the samples are significantly different from each other (W = 9, p = 0.10).

To ensure AUs are adequately covered, survey routes will be established on a map using the following protocol. A line will be drawn along the long axis of each unit. The starting point for each survey will be located at one of the points at which the long axis intersects the AU boundary. A series of parallel lines will be established perpendicular to the long-axis line and extending to the unit boundaries. Parallel lines will be positioned every 33 yards (30m) for AUs <10ac (4.05ha), every 109 yards (100m) for AUs 10-100acres (4.05-40.5ha), and every 328 yards (300m) for AUs >100ac (40.5ha), as shown in Figure 1 below. Beginning at the starting point, a survey route will be drawn such that it connects to successive opposite points where parallel lines intersect the boundary of the AU. The result should be a zig-zag route across the entire unit Observers should follow routes to opposite points to ensure the AU is thoroughly assessed, see Figure 1.

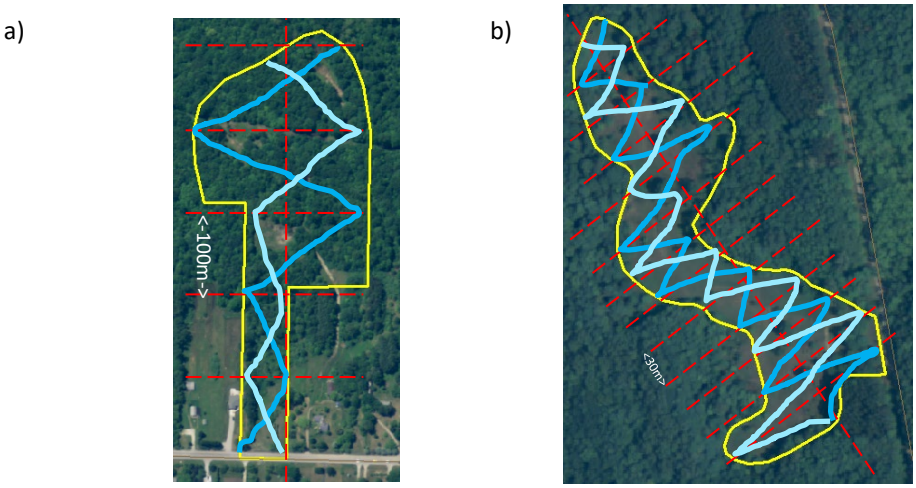

FIGURE 1. EXAMPLES OF ASSESSMENT UNITS (YELLOW OUTLINE), GUIDANCE OUTLINED HEREIN (RED DOTTED LINES) TO SET UP SURVEY PATH (BLUES) WITHIN A) 15-ACRE AND B) 8-ACRE AUS. OBSERVERS SHOULD FOLLOW OPPOSITE PATHS (LIGHT BLUE, DARK BLUE).

4.0 Collecting Metric Values

The OORAM consists of five Modules: Size; Landscape context; Habitat alteration; Plant communities, interspersion, and microtopography; and Special considerations. The score is on a 100-point scale. Scoring and interpretation of scores is detailed in Section 5.0.

4.1 Module 1 – Size

This module is best completed prior to visiting the assessment unit (AU) using orthophotos within a geographic information system, or can be estimated from aerial photos of the AU.

Total area of assessment unit

Record the size of the Assessment Unit (acres or hectares). This metric will not be scored, given that AU boundaries may be arbitrarily defined by property lines or trails.

Total area of community patch

Record the size of the community patch in which the AU is embedded. In many cases, the AU and patch size are the same. In other cases, the patch may extend outside of the AU boundaries due to changes in management regime or land ownership. Community patches should contain >80% wet prairie, savanna/upland prairie, deciduous forest, floodplain forest, or flatwoods forest. They *must* end at paved roads, *may* end at major maintained ditches, and *may not* contain cultural landcover types (Appendix C, Schetter and Root 2011). Although habitat (e.g., tree canopy) may appear contiguous at roads or ditches, these features can function as barriers to insects and herptiles, and disrupt water flow. Patches may be particularly difficult to delineate where habitat edges are soft; use best judgment and document the decision process. See Appendix D for examples.

Total area of natural patch

This module is scored based on the size of the natural patch where the AU is located. Refer to Table 1 for guidance on defining natural patch boundaries. Like community patches, natural patches *must* end at paved roads, *may* end at major maintained ditches, and *may not* contain cultural landcover types.

4.2 Module 2 – Landscape Context

This module is based heavily on ORAM Metric 2: Upland Buffers and Surrounding Land Use. Quotations below are taken directly out of the ORAM 5.0 User's Manual (Mack 2001). Brackets indicate changes from the ORAM. **Buffer width and intensity of surrounding land use will be measured around the Community Patch**. Given that the boundaries of the Assessment Unit can be arbitrary, such as property lines, measurements around the community patch in which the AU is housed will better indicate the landscape context of the AU. Ultimately, goals will often be to restore nearby AUs to similar high quality conditions and merge them into a single AU equivalent to the entire community patch.

Average buffer width

"For the purposes of this question, 'buffer' means [natural] landscape features which have the capability of protecting the biological, physical, and/or chemical integrity of the [habitat patch containing the Community Patch] from effects of human activity. Typically, a buffer could be forested or shrubby margin, prairie, streams or lakes, old fields, and in certain instances more managed landscapes like meadows or Conservation Reserve Program fields. Intensive human land uses should not be counted as buffers…The key concept is whether the buffer area, whatever it is, functions to protect the [AU] from degradation." Cultural land cover classes (Appendix C) should not be considered as buffer. **Buffers may cross roads**; although roads degrade habitat in many ways, (e.g., paths for invasive plants, alter water flow), natural landcover adjacent to or across the street from another natural community

can act as a buffer from domestic predators such as cats, noise, or a subset of edge effects such as wind. The negative effects of roads are accounted for in Modules 1 and 3.

Where Community Patches are small or have relatively equal side lengths, the observer may follow these guidelines from the ORAM: "In order to calculate the average buffer width, estimate the width of buffer on each side of the [Community Patch] to a **maximum of [100m]** and divide by the number of sides." In the following example, B represents the buffer width for a given side, and n is the total number of sides.

$$\frac{B_1 + B_2 + \cdots B_n}{n}$$

$$\frac{100 + 100 + 100 + 100 + 60}{5}$$

$$= 92 \text{ meters}$$

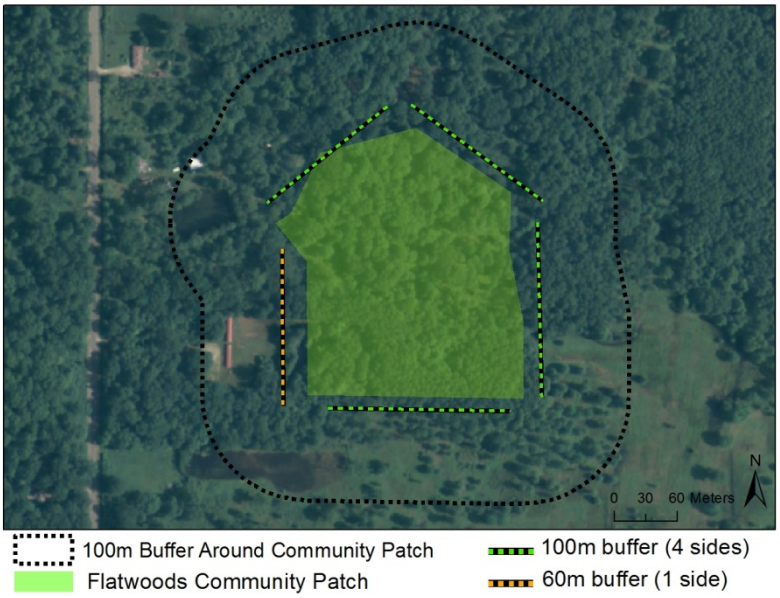

FIGURE 2. EQUATION AND EXAMPLE OF ESTIMATING BUFFER WIDTH FOR A SMALL COMMUNITY PATCH (GREEN).

If the sides are unequal in length, weight each side's estimated buffer by the proportional length of that side. In the following example, B represents the buffer width for a given side, and P is the proportion of the total perimeter comprised by that side. Total perimeter for AU below is 1293 yards (1183m); therefore, Side 1 comprises 32% of the perimeter, Side 2 21%, Side 3 14%, and Side 4 33%.

$$B_1 * P_1 + B_2 * P_2 + \cdots B_n * P_n$$

$$100*0.32 + 40*0.21 + 0*0.14 + 100*0.33$$
$$= 32 + 8.4 + 0 + 33$$
$$= 73.4 \text{ meters}$$

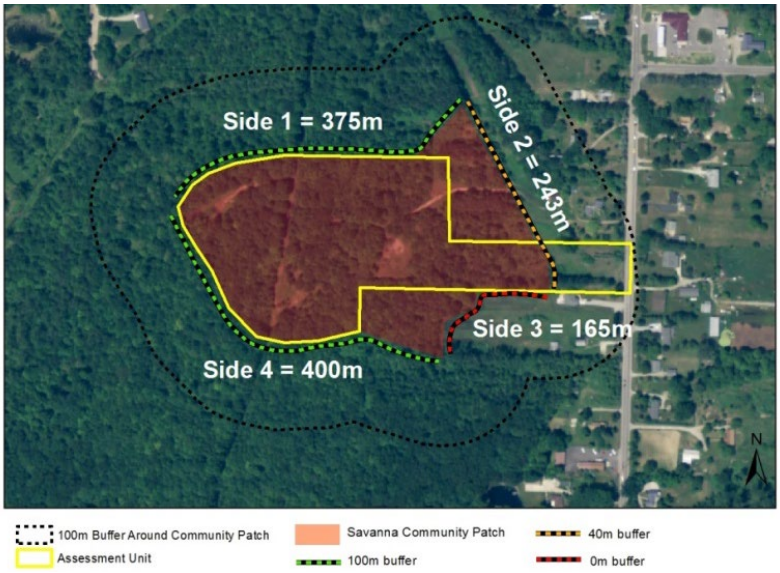

FIGURE 3. EQUATION AND EXAMPLE OF ESTIMATING BUFFER WIDTH FOR AN IRREGULAR COMMUNITY PATCH (PINK).

Ultimately, this parameter will be scored based a coarse range of widths (<25m, 25 to <50m, 50 to <100m, ≥100m). To expedite the process, the observer may assign each side the *maximum value of the most appropriate category* instead of estimating average buffer width for each side. Using this method, the buffer in Figure 3 above would be estimated as follows (changes double-underlined):

$$100*0.32 + \underline{50}*0.21 + \underline{25}*\ 0.14 + 100*33 = 32 + 10.5 + 3.5 + 33 = 79 \text{ meters}$$

Though the estimated buffers are slightly different from each other, both methods will typically result in representative estimates of buffer widths and fall into the same broad categories for scoring. **Be sure to record the estimated buffer width, and not the category**. This will allow flexibility in future version of the Protocol.

INTENSITY OF SURROUNDING LAND USES

Record the proportion of the AU perimeter surrounded by each category of land use intensity (Table 2). Proportions may be measured in geographic information systems, or by estimating length on aerial photos (Figure 4).

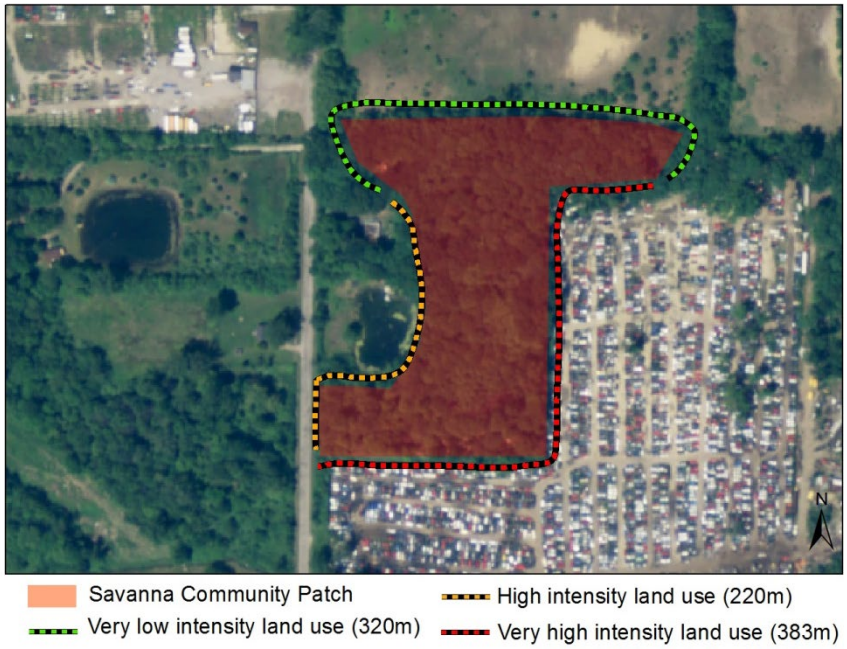

FIGURE 4. MEASURING INTENSITY OF SURROUNDING LAND USE. RECORD THE PROPORTION OF THE TOTAL PERIMETER SURROUNDED BY EACH LAND USE INTENSITY.

In the example above, the total perimeter is 1009 yards (923m). Therefore, record the values shown in the right column of Table 2, representing the proportion of the Community Patch surrounded by each land use intensity.

TABLE 2. DESCRIPTION OF LAND USE INTENSITY, INCLUDING THE VALUE TO BE RECORDED GIVEN THE EXAMPLE IN FIGURE 4 (PROPORTION OF PERIMETER COLUMN)

Land use intensity	Description	Length of side surrounded by this land use type	Proportion of perimeter
Very low	Second growth or mature forest, prairie, savanna, wet prairie, flatwoods forest, or floodplain forest	320m	**35%**
Low	Old field, unmanaged scrub/shrub, unmanaged young (<20 years) forest	0m	**0%**
Moderate	Pasture, fallow field, orchard, non-residential turf, pond	0m	**0%**
High	Feedlot, cropland, large-lot residential	220m	**22%**

Land use intensity	Description	Length of side surrounded by this land use type	Proportion of perimeter
Very high	Dense urban, residential subdivision, quarry	383m	**43%**

4.3 Module 3 – Habitat Alteration

The Habitat Alteration module addresses the extent to which the Assessment Unit has been or is currently being affected by anthropogenic influences. These metrics are to be obtained in the field by at least two observers, as described in Section 3.2. Observers will travel the AU separately and reconvene after surveying the entire unit. Observers complete Module 3 together, using collective knowledge to fill in appropriate habitat alterations. **Observers must reach a consensus on Module 3 values**.

Recent management history

Recent management history identifies the type of management practices applied to the AU within the recent past. Additionally, historic farming/grazing activities are also recorded. This metric specifically addresses **broadcast management**, i.e., management over at least 50% of the AU. Low-intensity management, such as removal of a select few trees or treating a small patch of invasive plants, should not be recorded. Instead, the site is rewarded if it is in a condition that does not require, or has not recently required, broadcast management (i.e., "Not needed in next 2 years"). Observers should use collective knowledge of the site, as well as visual evidence, to complete this section.

Observers will check one box for each of eight management types listed below. Check box options are as follows:

Latest disturbance for a given management was within…

a. ≤2 growing seasons
b. 3 to 5 growing seasons
c. >5 growing seasons
d. Absent, but necessary
e. Absent, but not needed in next two years

Fire

Both prescribed and natural/accidental fires are included under this category, as the two may be readily differentiated in the field and can have similar ecological effects. Observers may include more information about fires based on their knowledge in the comments section, including year of most recent fire, and details on prescribed vs. accidental. Evidence of fire may include:

≤2 years: burned leaf litter, burned standing shrubs, scars on trees
3-5 years: scars on trees, burned coarse woody debris visible, burned shrubs re-sprouting
>**5 years**: scars on trees; large burned coarse woody debris is decaying

Whole tree removal

Whole tree removal includes the mechanical removal of trees over 6in (15cm) dbh. Trees may have been removed by chainsaw or heavy machinery. Whole tree removal must be evident across at least 50% of the AU, and be at a density high enough to affect canopy cover (observer discretion). Evidence of whole tree removal may include:

≤2 years: stumps are freshly cut, stumps and cut trees retain bark, soil shows disturbance from heavy machinery (if applicable),
3-5 years: stumps appear weathered, stumps and cut trees are losing bark, disturbance from heavy machinery is recovering (if applicable)
>5 years: stumps are overgrown with new growth, stumps and cut trees begin to decay

Shrub removal

Shrub removal includes the removal of shrubs and saplings (<15cm/6in dbh) via brush-cutting, hand-clipping, or other means. Evidence of shrub removal may include:

- **≤2 years**: woody stems uniformly cut, herbicide dye visible, woody debris on ground or freshly piled
- **3-5 years**: woody stems uniformly cut, not very noticeable under regrowth, woody debris compacted on ground of in piles
- >**5 years**: woody stems uniformly cut & decaying, almost no woody debris noticeable on ground

Mowing/Hydro-ax

Mowing includes the mechanical removal of herbaceous and woody stems using a tractor or hydro-ax. Evidence of mowing may include:

- **≤2 years**: woody stems uniformly cut at deck height (~8-24in/20-60cm), still noticeable, woody debris or clippings on ground
- **3-5 years**: woody stems uniformly cut at deck height (~8-24”/20-60cm), not very noticeable under regrowth, no cut debris noticeable
- >**5 years**: evidence is absent, but box may be checked based on observer knowledge.

Disk/plow/scrape (as habitat management)

Disking, plowing, and scraping can be employed as a form of habitat management to disturb the soil, cycle nutrients, and expose the seed bed. Evidence of this management technique may include:

- **≤2 years**: plow lines visible, dirt exposed
- **3-5 years**: plow lines noticeable but not easily visible under new growth
- >**5 years**: evidence is absent, but box may be checked based on observer knowledge

Row crop OR production grazing

Row crop includes monoculture crops typically planted on agriculture fields in the Oak Openings, such as corn and soybeans. Grazing includes industrial, commercial, or residential grazing by a domestic herd (e.g., cattle, sheep). If the observer has knowledge of a few domestic animals grazing (e.g., pet horse, goat), but the evidence does not exceed that of typical deer browse, make a comment and do not check any boxes. Evidence of agriculture and production grazing are below. Note, however, that these managements may not be evident after several decades, and boxes may be checked based on observer/manager knowledge, or by referencing historical data.

- **≤2 years**: CROP: currently in agriculture, or plow lines are still visible, remnant crop regrowth, crop debris (e.g., corncobs, stems) easily visible; GRAZE: animal paths evident, scat abundance, heavily browsed vegetation re-sprouting multiple sprouts
- **3-5 years**: CROP: plow lines noticeable but not easily visible under new growth, crop debris may be evident; GRAZE: animal paths are noticeable but overgrowing with vegetation, some scat remains and is heavily decayed
- >**5 years**: CROP: plow lines/furrows barely noticeable under heavy regrowth; GRAZE: evidence is likely absent, but box may be checked based on observer/manager knowledge

Grazing for natural land management

Grazing for natural land management is most likely to occur on lands managed for conservation. This may include low densities of native or nonnative ungulates that are shifted among paddocks to avoid overgrazing.

- **≤2 years**: animal paths may be evident, scat abundant, some browsed vegetation re-sprouting multiple sprouts
- **3-5 years**: animal paths may be overgrowing with vegetation, some scat may remain and is heavily decayed

>5 years: evidence is likely absent, but box may be checked based on observer/manager knowledge

Seeding

Reseeding with native seed is a relatively common restoration practice in the Oak Openings, particularly in areas that have been heavily degraded for several decades. Seeding is not always necessary, but may enhance the diversity of native plants or include fast-growing/adventive native plants to compete with potential growth of nonnative plants. Consult the land manager if the site history is not known to observers and check the appropriate box.

Anthropogenic soil disturbance

Observers check the boxes associated with each type of anthropogenic soil disturbance observed on the AU. Observers do not have to come to a consensus. Observers should take notes on all disturbance evident, including an estimate of length of trails and description of disturbance.

Footpath, horse trail, boardwalk

A footpath is a visible path of matted vegetation or bare ground obviously traversed and/or maintained by humans. Horse trails may be marked as such, or determined based on hoof prints. Paths in this category do not alter/impede water flow or hydrology.

Low: single tracks, vegetation present in trail, <0.6mi/5ac (<0.5km/hectare) or adjacent to <20% of the perimeter

Medium: predominantly single tracks with occasional double track/two-person wide, little to no vegetation in tracks, 0.6 to 2.4mi/5ac (0.5 to 2km/hectare) or adjacent to 20-40% of the perimeter

High: predominantly two-person wide trails, predominantly no vegetation in tracks, soil churned by footprints, >2.4mi/5ac (>2km/hectare) or adjacent to >40% of the perimeter

Road, hardened path

A path paved for bikers and hikers, or paved maintenance road, may run through or along the unit.

Low: single lane, dirt or poorly-maintained, <5 cars or people/hr., <0.6mi/5ac (<0.5km/hectare), adjacent to <20% of the perimeter

Medium: two-lane, paved, 6-20 cars or people/hr., 0.6 to 2.4mi/5ac (0.5 to 2km/hectare) or adjacent to <20% of the perimeter; IF a single/dirt/low traffic lane, then adjacent to 20-40% of the perimeter

High: 2+ lanes, paved, >20 cars or people/hr., >2.4mi/5ac (>2km/hectare) and adjacent to any proportion of the perimeter; IF a single/dirt/low traffic lane, then adjacent to >40% of the perimeter; IF a moderate traffic lane, then adjacent to >20% of the perimeter

ATV/2-track

ATV trails and 2-tracks are unpaved trails that are often travelled by off-road vehicles. They may be marked, unmarked, legal, illegal, private, or public. These trails are differentiated from footpaths based on their width and presence of tire tracks. See Footpath/Horse Trail for ranking.

Burn breaks

Burn breaks may be maintained as narrow paths devoid of vegetation, or as wider trails allowing for light vehicle use. The observer should comment on knowledge of burn breaks. Burn breaks may run throughout or along the unit. See Footpath/Horse Trail for ranking.

Dam/berm

A dam or berm includes either earthen, concrete, wooden, or other obstruction to the flow of water. Dams or berms may intersect streams or old ditches, or may exist in low areas to capture water during runoff events.

Low: 1 dam/berm present, no more than 10ft (~3m) wide and 3ft (~1m) deep/tall

Medium: 2 dams/berms <10ft (<~3m) wide & <3ft (~1m) deep/tall, or 1 dam/berm not to exceed 16ft (5m) wide and 6ft (~2m) deep/tall

High: >2 dams /berms <10ft (~3m) wide & 3ft (~1m) deep/tall, or 1 dam/berm exceeding 16ft (5m) wide & 6ft (~2m) deep/tall

Fill/old home site

Fill is a common occurrence within the Oak Openings, particularly in wet prairies. Fill may consist of soil moved from within the same area, concrete fill or broken concrete waste, piled garbage, or soil imported from other locations. Old home sites may or may not include fill, but are often affected in similar ways, including reduced vegetative diversity and low quality soils.

Low: amount covers <12 yd^2 (<10m^2), elevational change 3ft (<1m), fill site primarily vegetated

Medium: amount covers 12-60 yd^2 (10-50m^2) elevational change 6ft (2m), may be >50% vegetated, fill or debris may be exposed

High: amount cover >60 yd^2 (>50m^2) elevational change >6ft (2m), may or may not be vegetated with exposed debris

Train tracks

Train tracks will usually signify the edge of an AU, although in rare circumstances tracks may run through a unit. An old rail line with tracks removed can also be included in this section. Both 'train tracks' and a footpath category can be checked in situations where old rail lines have been converted to paths, as both categories address separate potential disturbances (e.g., impediment to water flow [train tracks], impervious surface [paved path]).

Low: track present but appears to be in disuse, tall vegetation growing in tracks, adjacent to <20% of the perimeter

Medium: single track with minimal maintenance, vegetation present along track, adjacent to <20% of the perimeter; IF disused track, then adjacent to 20-40% of the perimeter

High: track well maintained, may be elevated, lined with gravel, may have multiple tracks, adjacent to >10% of the perimeter; IF disused track, then adjacent to >40% of the perimeter; IF minimally maintained track, then adjacent to >20% of the perimeter

Utility line

Utility lines include corridors maintained by gas, electric, water, or other utility companies. Utility lines may run through or adjacent to AUs. Consider 2-tracks for maintenance as a part of the utility line, not separately under the 2-track section.

Low: single line of poles, vegetation largely undisturbed/maintained along line, vegetation >18in (>0.5m), may contain shrubs

Medium: line moderately maintained, mowed to <18in (<0.5m), lack of woody vegetation, maintenance path may be visible

High: heavily maintained, little/low vegetation, maintenance line apparent/dirt/paved (count here, not as Road)

Natural Disturbance

Natural disturbance historically played a large role in shaping Oak Openings communities and setting back succession. Check the appropriate box where evidence of tornado, flood, ice storm, plant pathogen/insect damage is

observed. Observers may share knowledge of site history. Make notes about damage type, extent, and approximate date on comments section. Observers should reach a consensus.

Hydrological Modifications

Hydrological modifications are pervasive throughout the Oak Openings, and can include both ditching and tiling (note that berms are addressed in Anthropogenic Soil Disturbance metric). Include modifications within and adjacent to the AU (e.g., ditches alongside a road paralleling the AU). Describe all modifications in comments, and estimate length of ditches where possible. Check the appropriate box based on the following definitions:

0 – No modifications are visible

1 – Only **shallow ditches** (<25cm/10in deep, vegetation, can step over), do not carry water most of the year

2 – Single **medium ditch** (25-50cm/10-20in deep, vegetated, may easily jump over), may carry water out of unit during rain events; **small, insubstantial manmade pond** (<60yd^2/50m^2)

3 – **Multiple medium**, or **combination of medium & shallow**, ditches carrying water out of unit; **moderate man-made pond** (60-120yd^2/50-100m^2)

4 – **Major ditch** (e.g., Wiregrass) or tiling within or adjacent to unit, carrying water out of unit most of year (>50cm/20in deep, bottom scoured from flow, retains water most of year); **major man-made pond** (>120yd^2/100m^2)

4.4 Module 4 – Plant Communities, Interspersion, and Microtopography

The Plant Communities, Interspersion, and Microtopography module addresses vegetative structure and composition. These metrics are to be obtained in the field by at least two observers, preferably three. Metrics are recorded after the observers survey the AU using the protocols outlined in Section 3.0. Although not every metric may be relevant to each community type (e.g., hummocks & tussocks may only be found in wet systems), all should be recorded in the event that the management regime changes course.

Microtopography

Microtopography and varied habitat structure provide microclimates critical to maintaining the diversity of vegetation typical of the Oak Openings region. To keep this assessment rapid, components of microtopography are estimated and categorized rather than counted individually. Observers should try to estimate the total number of occurrences, or occurrences per acre, in the event that these categories are shifted during OORAM refinement. Use the categories to estimate level of each variable.

TABLE 3. DESCRIPTION OF RANKING SYSTEM FOR ESTIMATING LEVEL OF MICROTOPOGRAPHY FEATURES.

Ranking	Details
Absent	Absent
Low	<3/acre (9/ha)
Medium	3-10/acre (9-25/ha)
High	>10/acre (25/ha)

Coarse woody debris: dead/dying woody vegetation >6in (15cm) dbh resting on the ground

Snag: dead tree or portion of tree >6in (15cm) dbh, at least 6ft (2m) tall. Large dead branches meeting these measurements may also be included, as they perform the same ecological function as a snag rooted in the ground (e.g., habitat for cavity nesters, foraging habitat for insectivores).

Vegetated hummocks/tussocks: a small mound made of clumped grasses and/or sedges.

Soil mounds: small mounds of soil created by ant hills, furrows, wheel ruts, or uprooted trees. Mounds are often devoid of vegetation, but are not required to be.

PLANT STRUCTURE AND GROUNDCOVER

Plant structure, composition, and groundcover play a large role in the health of Oak Openings communities. Observers should estimate the proportion (%) of the unit cover by each of the following:

- Woody cover (i.e., any woody species - trees, shrub, or sapling – shading the unit)
- Trees (woody species >6in (15cm))
- NATIVE shrubs/saplings (woody species <6in (15cm))
- NON-NATIVE shrubs/saplings
- Forbs
- Grasses and sedges
- Herbaceous non-natives and highly competitive native herbaceous plants. An incomplete list of highly competitive native herbaceous plants is provided in Table 4; species may be added based on management experience.
- Bare ground (exposed soil as visible from above, without kicking or scraping away leaf litter or grasses, and not including bare ground under standing water)
- Flammable materials (consider typical weather during early spring or later fall burn season)

TABLE 4. INCOMPLETE LIST OF NATIVE HIGHLY COMPETITIVE/ADVENTIVE PLANT SPECIES.

Common name	Scientific name
Horseweed	*Conyza canadensis*
Field horsetail	*Equisetum arvense*
Pokeweed	*Phytoloacca americana*
Bracken fern	*Pteridium aquilinum*
Canada goldenrod	*Solidago Canadensis*

Next, record the ***proportion of trees that are oak***, and the ***proportion of NATIVE shrubs/saplings that are oak***. This is important in a) determining the composition of the forest canopy, which should be dominated by oak in most Oak Openings communities, and b) assessing the regeneration of oak. As an example, if 60% of a savanna is shaded by trees, and half of those trees are oaks, record 60% for 'Trees,' and 50% for 'What proportion of these trees are oak?' (not 30%).

COMMUNITY INCLUSIONS AND INTERSPERSION

Many communities within the Oak Openings historically existed in patchwork interspersions or matrices. Inclusions of a different community type provide a variety of microhabitats, potential refugia, and resources or soil conditions that promote increased diversity of fauna and flora. First, record the number of inclusions. Next, estimate the proportion of the AU covered by each inclusion community type (see Figure 5). Observers should discuss and reach consensus on the types of interspersed communities that are present. Observers do not have to reach consensus on the number of inclusions or the proportion of the unit covered by inclusions.

Using the proportions estimated in the first section, fill in the table provided in the second portion of the inclusion metric. This table helps the observer rank the level of community interspersion. If there is only one community type, circle the ranking in the left (pink) side of the column; if there are multiple community types, circle the ranking in the right (green) side of the column.

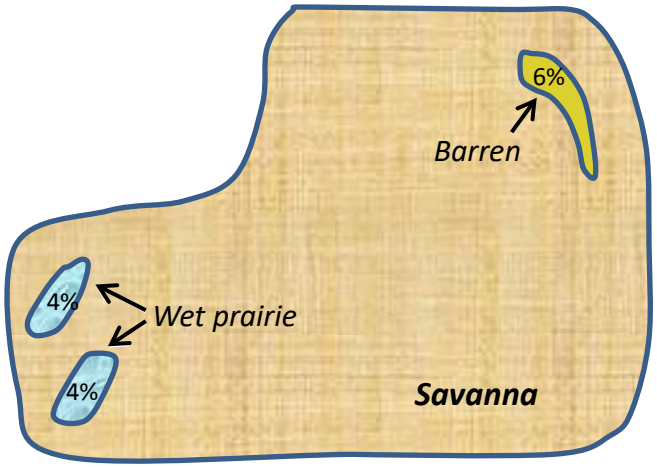

FIGURE 5. EXAMPLE SAVANNA ASSESSMENT UNIT WITH THREE INCLUSIONS: TWO WET PRAIRIE, EACH COMPRISING 4% OF THE ENTIRE AU, AND ONE BARRENS COMPRISING 6% OF THE AU.

For example, a primarily savanna AU contains a small patch of sandy barrens (6%) and two small patches of wet prairie (4% each). Combined, these inclusions comprise 14% of the unit in 3 separate patches:

		Total % cover of all inclusions							
1 Community Type	2 or more Communities	1-5%		6-10%		11-15%		16-20%	
1 Patch		Low	--	Low	--	Med	--	Med	--
2 Patches		Low	Low	Med	Med	Med	Med-Hi	Med-Hi	High
3+ Patches		Med	Med	Med	Med-Hi	Med-Hi	High	High	High

FIGURE 6. INCLUSION CHART. WHERE INCLUSIONS ARE COMPRISED OF A SINGLE COMMUNITY TYPE, USE THE LEFT COLUMN (PINK). WHERE INCLUSIONS ARE COMPRISED OF >1 COMMUNITY TYPE, USE THE RIGHT COLUMN (GREEN).

4.5 Module 5 – Special Considerations

There are many variables within the Oak Openings that indicate high quality communities, habitat suitable to threatened or endangered species, or the presence of listed species or species of concern. Use observations in the field, land manager knowledge, and state Heritage records to record notable species populations or species of concern. In general, these will be records of rare, threatened, and endangered fauna, or threatened and endangered flora (Table 5). For each of the categories below, record the species known to occur within the AU within the appropriate category.

If this module is omitted, the Rapid Assessment should be graded on a 90-point scale.

TABLE 5. CRITERIA AND DESCRIPTION OF NOTABLE SPECIES/SPECIAL CONSIDERATIONS FOR SCORING MODULE 5.

Criteria	Description
State or federally endangered animal	Persistent population or naturally recolonized area
Breeding rails, golden-winged warbler	N/A
State or federally endangered animal	Assisted (reintroduced) population
State or federally threatened animal	Persistent population or naturally recolonized
Federally endangered plant	Persistent population or naturally recolonized
State or federally endangered animal	Single occurrence, population status not known

Criteria	Description
State or federally threatened animal	Assisted (reintroduced) population
Animal species of state conservation concern	Persistent population or naturally recolonized
Animal species of state conservation concern	Single occurrence; population status not known
State endangered plant	N/A

5.0 Scoring Metrics

Scores were developed separately for each community type to more accurately assess community quality. Scoring can be completed directly within printed datasheets (OORAM_Datasheet_v1.xlsx) by referencing the scores within the complimentary scoring datasheet Excel file (e.g., OORAM_POINTSManual_WetPrairie_v1). Alternatively, data can be entered into an Excel sheet developed to automatically calculate scores for each community type (OORAM_DataEntry_POINTSAuto_v1.xlsx). Scores are not provided on the field datasheets to avoid influencing the observer's estimates.

As of June 2016, scores are developed for Wet Prairie and Savanna/Upland Prairie communities. Flatwoods scores are expected to be complete by spring 2017.

5.1 Module 1 (10 points)

Total area of assessment unit (0 points)

This metric is not scored.

Total area of community patch (5 points)

All Community Types

Use Table 6 to assign scores.

TABLE 6. SCORES FOR COMMUNITY PATCH METRIC.

Acres	Hectares	Points
<1	<0.4	0
1 - <5	0.4 - <2	1
5 - <10	2 - <4	2
10 - <25	4 - <10	3
25 - <50	10 - <20	4
≥50	≥20	5

Total area of natural patch (5 points)

All Community Types

Use Table 7 to assign scores.

TABLE 7. SCORES FOR NATURAL PATCH METRIC.

Acres	Hectares	Points
<2	<0.8	0
2 - <8	0.8 - <3.2	1
8 - <12	3.2 - <4.8	2
12 - <44	4.8 - <17.8	3

44 - <500	17.8 - <202	4
≥500	≥202	5

5.2 Module 2 – Landscape Context (15 Points)

Average buffer width (7 points)

All Community Types

Use Table 8 to assign scores.

TABLE 8. SCORES FOR BUFFER WIDTH METRIC.

Yards	Meters	Points
<27	<25	0
27 - <53	25 - <50	1
53 - <108	50 - <100	4
≥108	≥100	7

Intensity of surrounding land uses (8 points)

All Community Types

Use the following point system and equations to calculate the score for Intensity of Surrounding Land Use. This is calculated in the same way for all communities, where the point value of the land use type (e.g., Very Low Intensity value = 8 points) is weighted by the proportion of the Community Patch's perimeter surrounded by this type. Round to the nearest whole number.

TABLE 9. CALCULATING SCORE FOR INTENSITY OF SURROUNDING LAND USE

Land use intensity	Description	Length of side surrounded by this land use type	Proportion of perimeter
Very low	Second growth or mature forest, prairie, savanna, wet prairie, flatwoods forest, or floodplain forest	L_1	P_1
Low	Old field, unmanaged scrub/shrub, unmanaged young (<20 years) forest	L_2	P_2
Moderate	Pasture, fallow field, orchard, non-residential turf, pond	L_3	P_3
High	Feedlot, cropland, large-lot residential	L_4	P_4
Very high	Dense urban, residential subdivision, quarry	L_5	P_5

$$P_1 * 8 + P_2 * 6 + P_3 * 4 + P_4 * 2 + P_5 * 0 = Score$$

Using the example set forth in Section 4.2, the score would be calculated as follows:

$$0.32 * 8 + \ 0.00 * 6 + 0.00 * 4 + 0.22 * 2 + 0.43 * 0 = \ 2.56 + 0.00 + 0.00 + 0.44 + 0.00 = 3.00$$

5.3 Module 3 – Habitat Alteration (15 Points)

Module 3 is worth a total of 15 points. In each subsection of this Module, an AU may gain points for natural land management activities or absence of disturbance, or it may lose points for lack of management or excess disturbance. Therefore, **the starting point for this Module is 7 points**. **Add or subtract the points obtained in each subsection to 7, for a minimum of 0 or maximum of 15**.

Recent Management History (5 Points)

All Community Types

Use Table 10 to assign scores. **Sum the total of all scores, for a minimum of -5 and maximum of 5**.

TABLE 10. SCORES FOR RECENT MANAGEMENT HISTORY METRIC.

Latest disturbance within…	Fire	Whole tree removal	Shrub removal	Mow/ Hydroax	Disc/plow/ scrape	Row crop or production grazing	Graze for natural land mgmt..	Seeding
≤2 growing seasons	+1	+1	+1	+1	+1	-1	+1	+1
3 to 5 growing seasons	0	+1	+1	+1	+1	-1	+1	+1
>5 growing seasons	-1	0	0	0	0	0	+1	+1
Absent, but necessary	-1	-1	-1	-1	-1	+1	0	-1
Absent, but not needed in next 2 years	0	+1	+1	+1	+1	N/A	0	0

Anthropogenic Soil Disturbance (5 Points)

All Community Types

Use Table 11 to assign scores. **Sum the total of all scores, for a minimum of -5 and maximum of 5**.

TABLE 11. SCORES FOR ANTHROPOGENIC SOIL DISTURBANCE METRIC.

Disturbance Type	None	Low	Medium	High
Footpath, horse trail, boardwalk	+1	+1	0	-1
Road, hardened path	+1	-1	-2	-3
ATV/2-track	+1	+1	0	-1
Burn break	+1	+1	0	-1
Dam/berm	+1	+1	0	-1
Fill/old home site	+1	-1	-1	-1
Train tracks	+1	+1	0	-1
Utility line	+1	+1	0	-1

Hydrological Modifications (5 Points)

All Community Types

Use Table 12 to assign scores. **Sum the total of all scores, for a minimum of -5 and maximum of 5.**

TABLE 12. SCORES FOR HYDROLOGICAL MODIFICATIONS METRIC.

Modification	Points
No modifications are visible	+5
Only **shallow ditches** (<25cm/10in deep, vegetation, can step over), do not carry water most of the year	+3
Single **medium ditch** (25-50cm/10-20in deep, vegetated, may easily jump over), may carry water out of unit during rain events; **small, insubstantial manmade pond** (<60yd^2/50m^2)	+0
Multiple medium, or **combination of medium & shallow**, ditches carrying water out of unit; **moderate man-made pond** (60-120yd^2/50-100m^2)	-3
Major ditch (e.g., Wiregrass) or tiling within or adjacent to unit, carrying water out of unit most of year (>50cm/20in deep, bottom scoured from flow, retains water most of year); **major man-made pond**	-5

Modification	Points
(>120yd^2/100m^2)	

5.4 Module 4 – Plant Communities, Interspersion, and Microtopography – 50 Points

Microtopography (10 points)

If necessary, average observer's scores. This can be accomplished by a) accepting the most commonly checked value (for example, where three observers recorded Medium, High, High, select High as the value), or by b) converting each observer's values to a point system (e.g., Absent = 0, Low = 1, Medium = 2, High = 3), averaging their scores, rounding to the nearest whole number, and converting back to a ranked value. In the previous example, this is accomplished as follows: 2 + 3 + 3 = 8; 8 ÷ 3 observations = 2.67; round 2.67 to 3 → the "average" ranked value for this metric is High.

All Community Types

Use Table 13 to assign scores. **Sum the total of all scores, for a maximum of 10.**

TABLE 13. SCORES FOR MICROTOPOGRAPHY METRIC.

Metric	Absent	Low	Medium	High
Coarse woody debris	0	+1	+2	+3
Snags	0	+1	+2	+3
Vegetated hummocks	0	+1	+2	+3
Soil mounds	0	+1	+2	+3

Plant Structure and Groundcover (25 points)

Wet Prairie

Use Table 14 to assign scores. Point values are in the header. **Sum the total of all scores.**

TABLE 14. WET PRAIRIE SCORES FOR PLANT STRUCTURE AND GROUNDCOVER METRIC.

Metric	0 Points	1 Point	2 Points	3 Points
Woody cover/any tree, shrub, or sapling	>64%	<20% or 40-64%	20-39%	n/a
Trees	>69%	45-69%	20-44%	<20%
Proportion of trees that are oak	<50%	50-74%	>74%	n/a
Native shrubs/saplings	>64%	40-64%	<20%	20-39%
Proportion of native shrubs/saplings that are oak	<5%	5-14% or >59%	15-59%	n/a
Non-native shrubs/saplings	>29%	10-29%	5-9%	<5%
Forbs	<5%	5-19% or >49%	20-49%	n/a
Grasses & sedges	<10%	10-39% or >79%	40-79%	n/a
Herbaceous non-natives/highly competitive native herbaceous	>24%	5-24%	<5%	n/a
Bare ground (exposed soil)	>9%	5-9%	<5%	n/a
Flammable materials (under typical weather in burn season)	<50%	50-79%	>79%	n/a

Savanna, Upland Prairie, & Barrens

Use Table 15 to assign scores. Point values are in the header. **Sum the total of all scores.**

TABLE 15. SAVANNA, UPLAND PRAIRIE, & BARRENS SCORES FOR PLANT STRUCTURE AND GROUNDCOVER METRIC.

Metric	0 Points	1 Point	2 Points	3 Points
Woody cover/any tree, shrub, or sapling	>75%	<24% or 50-74%	25-49%	n/a
Trees	>80%	50-79%	<25%	<25-49%
Proportion of trees that are oak	<30%	30-74%	>74%	n/a
Native shrubs/saplings	>80%	40-79%	<15%	15-39%
Proportion of native shrubs/saplings that are oak	<20%	20-39% or >59%	40-59%	n/a
Non-native shrubs/saplings	>15%	5-15%	1-5%	<1%
Forbs	<5%	5-29% or >49%	30-49%	n/a
Grasses & sedges	<10%	10-39% or >80%	40-79%	n/a
Herbaceous non-natives/highly competitive native herbaceous	>25%	5-24%	<5%	n/a
Bare ground (exposed soil)	<1%	1-5% or 20-49%	5-20%	n/a
Flammable materials (under typical weather in burn season)	<25%	25-50%	>50%	n/a

Flatwoods and Floodplain Forests

Use Table 16 to assign scores. Point values are in the header. **Sum the total of all scores.**

TABLE 16. FLATWOODS AND FLOODPLAIN SCORES FOR PLANT STRUCTURE AND GROUNDCOVER METRIC.

Metric	0 Points	1 Point	2 Points	3 Points
Woody cover/any tree, shrub, or sapling	0-<40%	75-100%	25-<75%	n/a
Trees	0-<25%	75-100%	30-<50%	50-<75%
Proportion of trees that are oak	0-<30%	75-100%	30-<75%	n/a
Native shrubs/saplings	0-<15%	80-100%	15-<40%	40-<80%
Proportion of native shrubs/saplings that are oak	0-10%	50-100%	10-<50%	n/a
Non-native shrubs/saplings	30-100%	10-<30%	5-<10%	0-<5%
Forbs	0-<5%or 75-100%	5-<15%	15-75%	n/a
Grasses & sedges	0-<5% or 50-100%	20-50%	5-<20%	n/a
Herbaceous non-natives/highly competitive native herbaceous	25-100%	5-<25%	<5%	n/a
Bare ground (exposed soil)	<1% or 60-100%	1-<10%	10-<60%	n/a
Flammable materials (under typical weather in burn season)	51-100%	n/a	0-<51%	n/a

COMMUNITY INCLUSIONS AND INTERSPERSION (15 POINTS)

All Community Types

Use Table 17 to assign scores.

TABLE 17. SCORES FOR COMMUNITY INCLUSIONS AND INTERSPERSIONS METRIC.

Rank	Points
Absent	0
Low	4
Medium	8
Medium-High	12
High	15

5.5 Module 5 – Special Considerations (10 Points)

All community types

Use Table 18 to assign scores.

TABLE 18. SCORES FOR SPECIAL CONSIDERATIONS METRIC.

Criteria	Description	Points
State or federally endangered animal	Persistent population or naturally recolonized area (e.g. breeding rails, golden-winged warbler)	10
State or federally endangered animal	Assisted (reintroduced) population	5
State or federally threatened animal	Persistent population or naturally recolonized	5
Federally endangered plant	Persistent population or naturally recolonized	5
State or federally endangered animal	Single occurrence, population status not known	3
State or federally threatened animal	Assisted (reintroduced) population	3
Animal species of state conservation concern	Persistent population or naturally recolonized	3
State endangered plant	Persistent population or naturally recolonized	1 (max 5)
Animal or plant species of local conservation concern	Single occurrence; population status not known (e.g. Red Headed Woodpecker)	1 (max 5)

LITERATURE CITED

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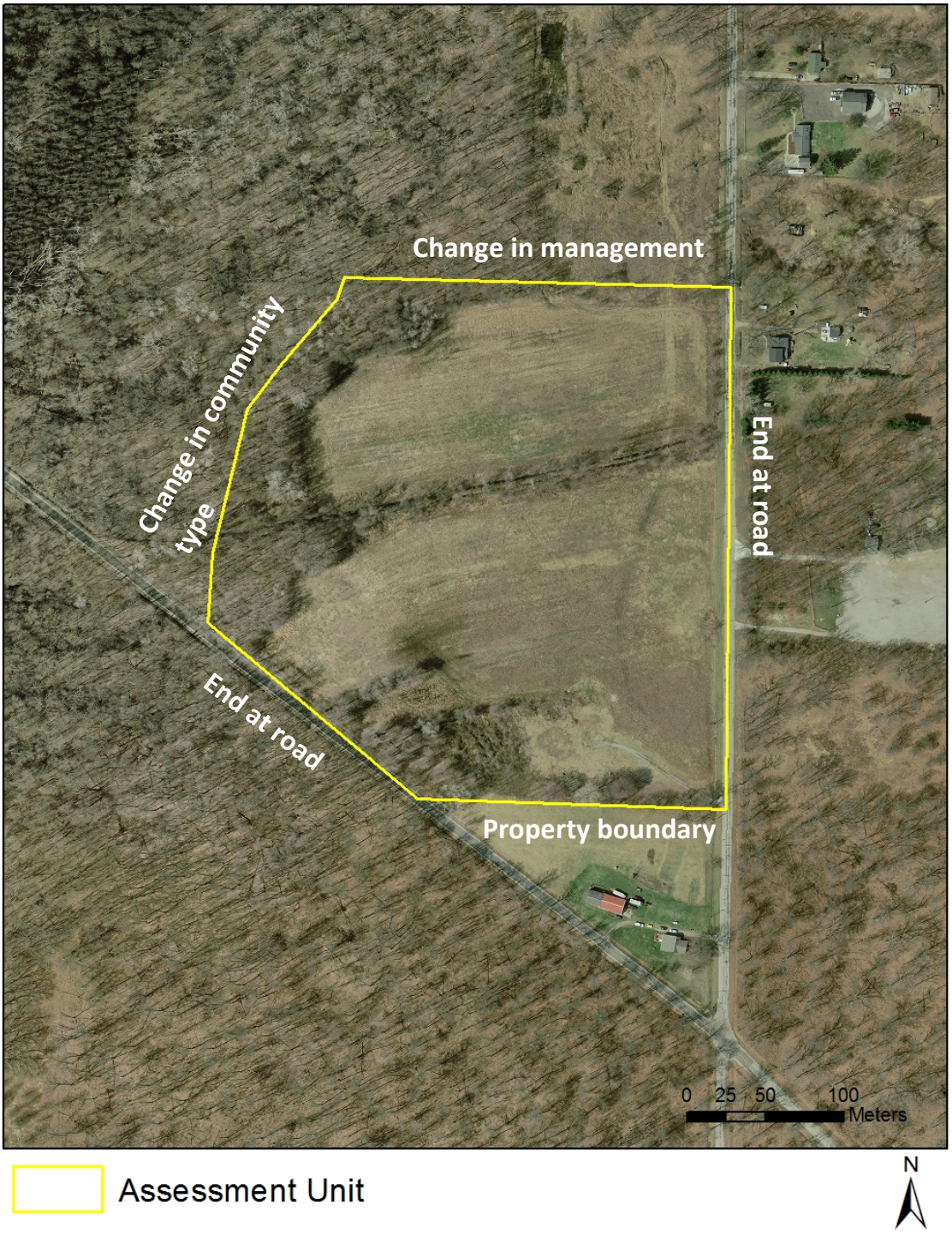
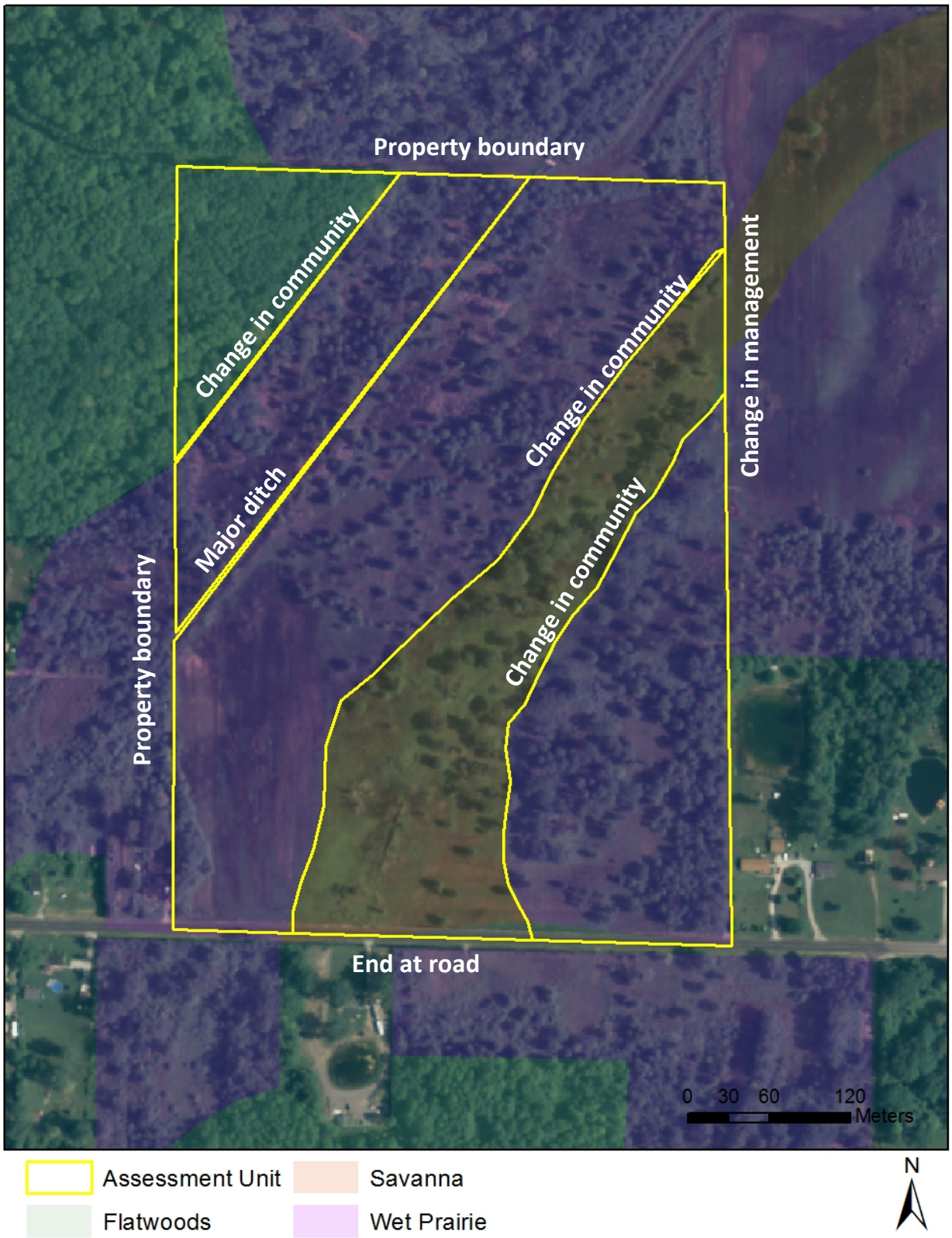
Gara, B. 2013 The Vegetation Index of Biotic Integrity "Floristic Quality" (VIBI-FQ). Ohio EPA Technical Report WET/2013-2. Ohio Environmental Protection Agency, Wetland Ecology Group, Division of Surface Water, Columbus, OH.

Schetter, TA and Root, KV. 2011. Assessing an imperiled oak savanna landscape in Northwestern Ohio using Landsat data. *Natural Areas Journal*, *31*(2), 118-130.

APPENDIX A. EXAMPLES OF ASSESSMENT UNIT DELINEATIONS

Examples of delineating Assessment Units. Justification for boundaries is described within each figure, consistent with rules in Section 2.0.




Property boundary
Change in community
Major ditch
Change in community
Change in community
Change in management
Property boundary
End at road
0 30 60 120
Meters
Assessment Unit
Savanna
Flatwoods
Wet Prairie
N

APPENDIX B. TESTING VARIATION IN PERCENT COVER ESTIMATES BY NUMBER OF OBSERVERS

For the collection of in-field metrics, we examined the degree to which observers' estimates of plant cover deviated from the mean when two, three, and four observers were in the field. We found no significant difference in variation, i.e., standard deviation, of estimates whether two, three, or four observers were employed ($F = 0.15$, $p = 0.70$). We also examined a subset of values from 11-89%, after verifying that estimates near 0% or 100% cover showed very little variation among observers. This subset of estimates also showed no substantial variation among observers ($F = 1.9$, $p = 0.17$).

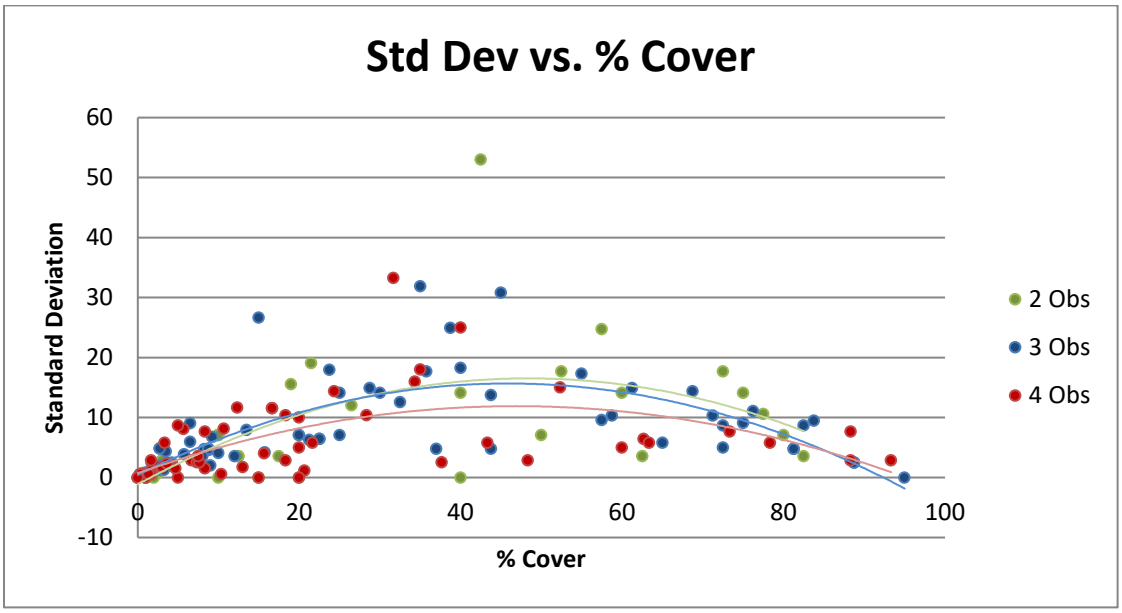


FIGURE 7. GRAPH SHOWING THE STANDARD DEVIATION AMONG ESTIMATES OF PERCENT PLANT COVER OBTAINED BY GROUPS OF 2, 3, OR 4 OBSERVERS. ESTIMATES ARE WRITTEN, DISCUSSED, AND ADJUSTED IN THE FIELD TO REDUCE POTENTIAL FOR OUTLIERS OR INACCURACIES.

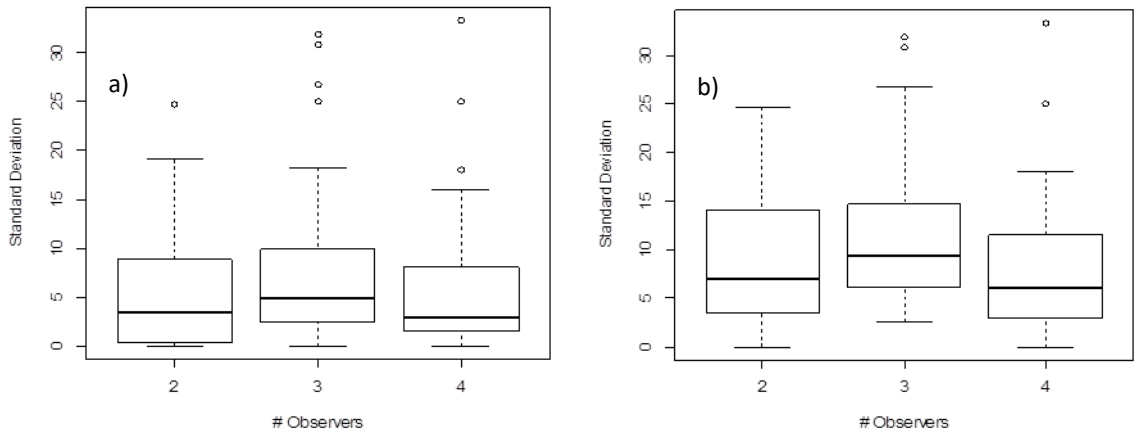


FIGURE 8. BOXPLOT OF STANDARD DEVIATIONS SHOWN IN FIGURE 1 FOR A) ALL ESTIMATES 0-100% ($F = 0.15$, $P = 0.70$), AND B) ESTIMATES FROM 11-89% ($F = 1.9$, $P = 0.17$). BOTH GRAPHS EXCLUDE ONE OUTLIER (OBSERVERS 2, 52%) ESTIMATED BY AN INDIVIDUAL NEW TO THE REGION ON HER FIRST DAY OF CONDUCTING OORAM. DATA SUGGEST THAT ESTIMATES OBTAINED BY 2, 3, OR 4 OBSERVERS WILL SHOW SIMILAR DEGREES OF VARIATION.

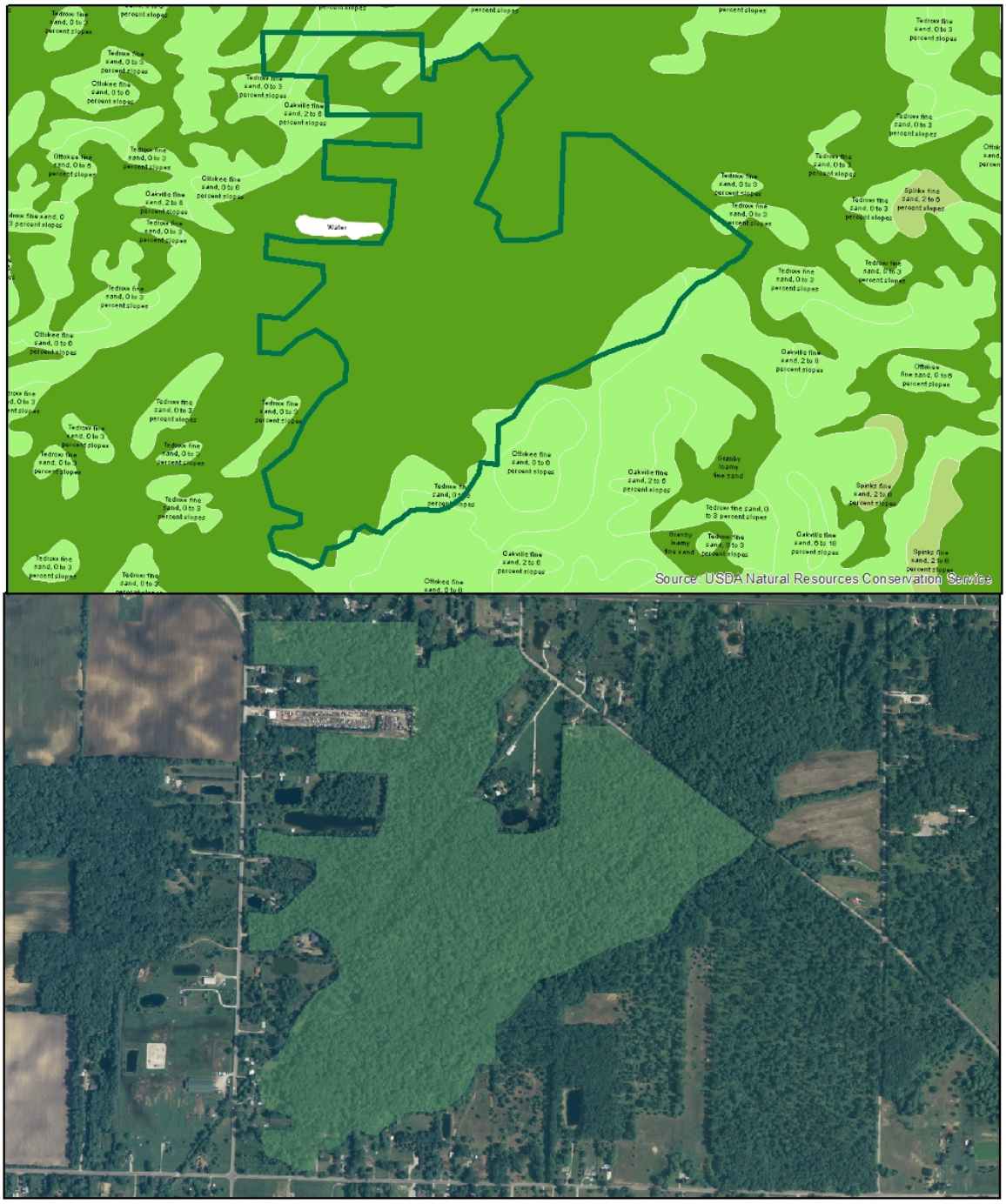
APPENDIX C. LANDCOVER CLASSES AND DESCRIPTIONS, ADAPTED FROM SCHETTER AND ROOT, 2011.

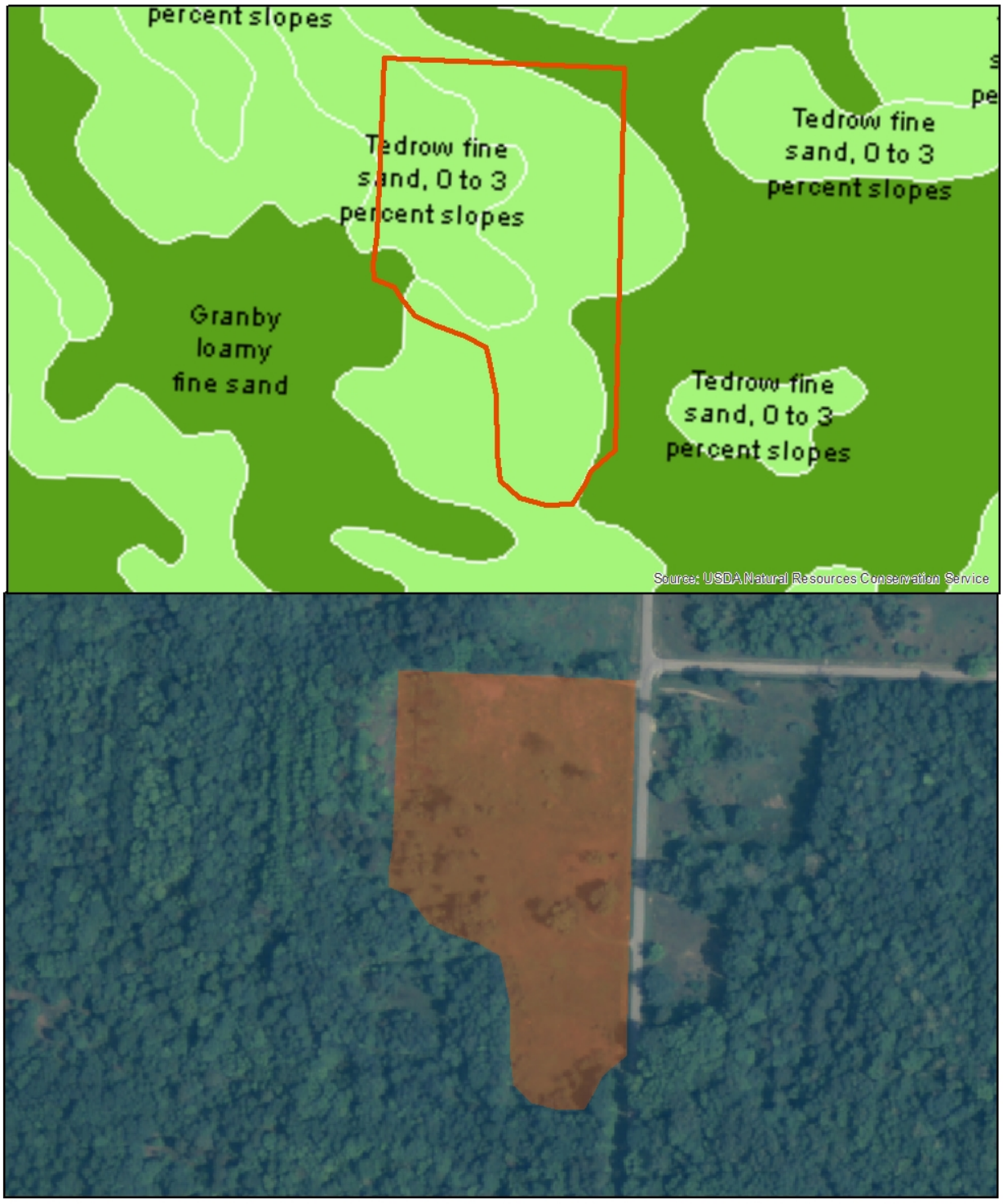
Class type	Land Cover Class	Class Description
NATURAL Forests/Woodlands	Swamp Forests	Semi-permanent to seasonally-inundated closed canopy deciduous swamps and flatwoods on poorly drained soil; typically dominated by *Quercus palustris* and/or *Quercus bicolor*, with *Acer rubrum* common in the subcanopy.
	Floodplain Forests	Closed to open canopy deciduous forests on poorly to moderately well drained soils within floodplains (often broad and poorly defined due to flat topography); near stream channels or ditched waterways, characterized by large *Populus deltoides*, *Platanus occidentalis*, and dead/dying *Fraxinus* sp. Broader floodplains often characterized by young even-aged stands of *Acer saccharinum*, *Populus* sp., *Fraxinus* sp., and *Quercus* sp.
	Upland Deciduous Forests	Closed canopy mesic to dry forests (also a few open canopy woodlands) on moderately to well drained soils on slopes and ridges; typically dominated by *Quercus velutina*, *Quercus alba*, and/or *Quercus rubra*; understory characterized by *Sassafras albidum*, *Prunus serotine*, *Acer rubrum*, and low growing *Vaccinium* sp; herbaceous layer often characterized by continuous cover of *Carex pensylvanica*.
	Upland Coniferous Forests	Mostly monospecific plantations of *Pinus* sp. with few adventive examples. Did not occur in the Oak Openings prior to European settlement.
Savannas	Upland Savannas	Open canopy stands of *Quercus velutina* and/or *Quercus alba* (with some *Quercus palustris* and *Quercus coccinea*) on well drained soils with a well-developed shrub and/or herbaceous layer typically dominated by warm-season grasses (primarily *Andropogon gerardii* and *Sorghastrum nutans*) and forbs.
Shrublands	Wet Shrublands	Semi-permanent to seasonally inundated shrublands on poorly drained soils. Most sites dominated by dense monospecific stands of *Rhamnus frangula*. A few sites feature a more open shrub layer characterized by *Salix* sp., *Cornus* sp., *Cephalanthus occidentalis*, and *Physocarpus opulifolius*, and a well-developed herbaceous layer characterized by *Carex* sp.
Prairies & Meadows	Wet Prairies	Semi-permanent to seasonally-inundated prairies on poorly drained soils. Trees nearly to entirely absent, shrubs typically sparse or absent, herbaceous layer dominated by *Carex* sp. and/or *Calamagrostis* sp.
	Upland Prairies	Mesic to dry sand prairies characterized by warm-season grasses (typically *Andopogon gerardii*, *Sorghastrum nutans*, and *Schizachyrium scoparium*) and forbs. Trees nearly or entirely absent, shrub layer typically sparse or absent.
	Sand Barrens	Early successional herbaceous communities on sand blowouts and recently-disturbed well-drained soils; bare sand typically exceeds 50% of total ground cover. Characterized by *Schizachryium scoparium*, *Andropogon virginicus, Aristida* sp., annual forbs and drought-tolerant species. Trees nearly or entirely absent. Shrub layer (characterized by *Rubus* sp. when present) typically sparse or absent. Many sites are also heavily influenced by Eurasian species.
	Eurasian Meadows	Mesic to dry cool-season grasslands and old fields dominated by Eurasian species such as *Festuca* sp., *Poa* sp., and *Bromus* sp. Unmanaged sites often characterized by invasive shrubs such as Rosa multiflora and *Eleaegnus umbellate*.

Class type	Land Cover Class	Class Description
Water	Perennial Ponds	Permanent excavated ponds, impoundments, and former sand mines; not associated with natural surface water drainage; did not occur prior to European settlement.
CULTURAL		
Built-Up	Dense Urban	Areas dominated by large tracts or asphalt, parking lots, flat rooftops and other impermeable surfaces.
	Residential/Mixed	Areas of closely associated residential structures, mowed lawns and shade trees; also includes roadways and maintained ditches where trees are absent.
Vacant	Turf/Pasture	Large areas of frequently mowed turf grasses such as cemeteries, athletic fields and golf courses; livestock pastures.
	Croplands	Characterized by large fields of row crops, primarily corn and soybeans.

APPENDIX D. DELINEATING COMMUNITY PATCHES.

Using soil data, road boundaries, changes in plant community type and landcover class, changes in management, and ditches to delineate community patches.


Water
Source: USDA Natural Resources Conservation Service
Flatwoods
Wet Prairie
Savanna
0 120 240 480
Meters
N


percent slopes
Tedrow fine sand, 0 to 3 percent slopes
Tedrow fine sand, 0 to 3 percent slopes
Granby loamy fine sand
Tedrow fine sand, 0 to 3 percent slopes
Source: USDA Natural Resources Conservation Service
Flatwoods
Wet Prairie
Savanna
0 30 60 120
Meters
N

Module 5 Examples

Ohio Status Designations for Animals

E: Endangered: A native species or subspecies threatened with extirpation from the state. The danger may result from one or more causes such as habitat loss, pollution, predation, inter-specific competition, or disease.

T: Threatened: A native species or subspecies whose survival in Ohio is not in immediate jeopardy, but to which a threat exists. Continued or increased stress will result in becoming endangered.

Species of Concern: A species or subspecies which might become threatened in Ohio under continued or increased stress. Also, a species or subspecies for which there is some concern, but, for which information is insufficient to permit an adequate status evaluation. This category may contain species designated as a furbearer or game species but whose statewide population is dependent on the quality and/or quantity of habitat and is not adversely impacted by regulated harvest.

Special Interest: A species that occurs periodically and is capable of breeding in Ohio. It is at the edge of a larger, contiguous range with viable population(s) within the core of its range. These species have no federal, endangered, or threatened status, are at low breeding densities in the state, and have not been recently released to enhance Ohio's wildlife diversity. With the exception of efforts to conserve occupied areas, minimal management efforts will be directed for these species because it is unlikely to result in significant increases in their populations within the state.

Rare plant species are listed as Endangered, Threatened, and Potentially Threatened, and their status was determined by the Department of Natural Resources, Division of Natural Areas and Preserves with the advice and guidance of the Ohio Rare Plants Advisory Committee.

Ohio Status Designation Criteria for Plants

E: Endangered: A native Ohio plant species may be designated endangered if, based on its known status in Ohio, one or more of the following criteria apply:

- The species is a federally endangered species extant in Ohio.
- The natural populations of the species in Ohio are limited to three or fewer.
- The distribution of the natural populations of the species in Ohio is limited to a geographic area delineated by three or fewer U. S. Geological Survey 7.5-minute quadrangle maps.
- The number of plants in all the natural populations of the species in Ohio is limited to one hundred or fewer individual, physically unconnected plants.

T: Threatened: A native Ohio plant species may be designated threatened if, based on its known status in Ohio, one or more of the following criteria apply:

- The species is a federally threatened species extant in Ohio but not on the state endangered species list.
- The natural populations of the species in Ohio are limited to no less than four or more than 10 occurrences.
- The distribution of the natural populations of the species in Ohio is limited to a geographic area delineated by no less than four or more than seven U. S. Geological Survey 7.5-minute quadrangle maps.

P: Potentially Threatened Species: A native Ohio plant species may be designated potentially threatened if one or more of the following criteria apply:

- The species is extant in Ohio and does not qualify as a state endangered or threatened species, but it is a proposed federal endangered or threatened species or a species listed in the *Federal Register* as under review for such proposal.
- The natural populations of the species are imperiled to the extent that the species could conceivably become a threatened species in Ohio within a foreseeable future.
- The natural populations of the species, even though they are not threatened in Ohio at the time of designation, are believed to be declining on abundance or vitality at a significant rate throughout all or large portions of the state.

*Notes local species of concern. Species of "Local Concern" are species that are specific to certain upland/dune habitats and/or wetland/wet prairie habitats. These are often species that can only be found in the Oak Openings region in Ohio and/or are limited to a small number of counties in the state.

State-Listed Bird Species Documented In the Oak Openings Region

I.Birds: Common Name	**Scientific Name**	**Status**	**Park Locations**
Lark Sparrow	*Chondestes grammacus*	E Breeding	OO
American Bittern	*Botaurus lentiginosus*	E Migratory	OO
Kirtland's Warbler	*Dendroica kirtlandii*	Federally endangered; Migratory	OO, OOC
Northern Harrier	*Circus cyaneus*	E Migratory	OO
Least Bittern	*Ixobrychus exilis*	T Migratory/Summer	OOC
Sedge Wren	*Cistothorus platensis*	Species of Concern Migratory/Summer	OOC
Sharp-shinned Hawk	*Accipiter striatus*	Species of Concern Migratory	OO
Sora Rail	*Porzana carolina*	Species of Concern Breeding/Migratory	OO, OOC,
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Species of Concern Migratory	OO, WW
Wilson's Snipe	*Gallinago delicata*	Special Interest Migratory/Breeding	OO
Black-throated Blue Warbler	*Dendroica caerulescens*	Special Interest Migratory	WW, OO
Blackburnian Warbler	*Dendroica fusca*	Special Interest Migratory	WW, OO
Brown Creeper	*Certhia americana*	Special Interest Migratory	All Parks
Canada Warbler	*Wilsonia canadensis*	Special Interest Migratory	WW, OO, OOC
Dark-eyed Junco	*Junco hyemalis*	Special Interest Winter	All Parks
Golden-crowned Kinglet	*Regulus satrapa*	Special Interest Migratory	All Parks

Hermit Thrush	*Catharus guttatus*	Special Interest Migratory	All Parks
Least Flycatcher	*Empidonax minimus*	Special Interest Migratory	OOC
Magnolia Warbler	*Dendroica magnolia*	Special Interest Migratory	SE, WW, OO, OOC
Pine Siskin	*Carduelis pinus*	Special Interest Migratory/Winter	OO, OOC, SE, WW
Purple Finch	*Carpodacus pupureus*	Special Interest Migratory/Winter	OO, OOC, SE, WW
Red-breasted Nuthatch	*Sitta canadensis*	Special Interest Migratory/Winter	All Parks
Winter Wren	*Troglodytes troglodytes*	Special Interest/Winter	OO, OOC

State-Listed Butterfly Species Documented in the Oak Openings Region

II. Butterflies: Common Name	**Scientific Name**	**Status**	**Park**
Karner Blue	*Lycaeides melissa samuelis*	Federally endangered	OO
Silver-bordered Fritillary	*Boloria selene*	T	OOC
Frosted Elfin	*Callophrys irus*	E	KT
Persius Duskywing	*Erynnis persius*	E	KT
Dusted Skipper	*Atrytonopsis hianna*	Species of Concern	OO, OOC, WW
Edward's Hairstreak*	*Satyrium edwardsii*	Local concern	OO
Leonard's Skipper*	*Hesperia leonardus*	Local Concern	OO, OOC, WW
Dukes' skipper*	*Euphyes dukesi*	Local Concern	OO, OOC
Dion skipper*	*Euphyes dion*	Local Concern	OO, OOC
Broad-winged Skipper*	*Poanes viator*	Local Concern	OO, OOC

State-Listed Mammal Species Documented in the Oak Openings Region

III. Mammals: Common Name	**Scientific Name**	**Status**	**Park**
Badger	*Taxidea taxus*	Species of Concern	OOC, OO

Big Brown Bat	*Eptesicus fuscus*	Species of Concern	OO, SE, WW
Hoary Bat	*Lasiurus cinereus*	Species of Concern	OO, SE, WW
Little Brown Bat	*Myotis cinereus*	Species of Concern	OO, SE, WW
Northern Myotis	*Myotis septentrionalis*	Federally Threatened	OO, SE, WW
Red Bat	*Lasiurus borealis*	Species of Concern	OO, SE, WW
Silver-haired Bat	*Lasionycteris noctivagans*	Species of Concern	OO, SE, WW
Tri-colored Bat	*Perimyotis subflavus*	Species of Concern	OO, SE, WW
Evening Bat	*Nycteceius humeralis*	Special Interest	OO, SE, WW

State-Listed Dragonfly Species Documented in the Oak Openings Region

IV. Dragonflies: Common Name	**Scientific Name**	**Status**	**Park**
Chalk-fronted Corporal	*Ladona julia*	E	OO
Marsh Bluet	*Enallagma ebrium*	T	OOC
Amber-winged spreadwing*	*Lestes eurinus*	Local concern: only known population in Lucas County	OO
Banded Pennant*	*Celithemus fasciata*	Local concern: only known population in Lucas County	OOC

State-Listed Moth Species Documented in the Oak Openings Region

V. Moths: Common Name	**Scientific Name**	**Status**	**Park Locations**
Unexpected Cycnia	*Cycnia inopinatus*	E	OO, WW

Insects of Local Concern Documented in the Oak Openings Region

VI. Rare Insects: Common Name	**Scientific Name**	**Status**	**Park Locations**
Antenna Waving Wasp*	*Tachysphex pechumani*	Local Concern	OO, OOC

Ghost Tiger Beetle*	*Cicindela lepida*	Local Concern: only known from 4 Ohio counties	OO, OOC
Gray Ground Cricket*	*Allonemobius griseus*	Local concern/Potentially Rare	OO
Long-horned Grasshopper*	*Psinidia fenestralis*	Local concern/Potentially Rare	OO, OOC
Boll's Grasshopper*	*Sparagemon bolli*	Local concern/Potentially Rare	OO
Mottled Sand Grasshopper*	*Sparagemon collare*	Local concern/Potentially Rare	OO, OOC
Marsh Meadow Grasshopper*	*Pseudochorthippus curtipennis*	Local concern/Potentially Rare	OOC
Green-legged/Benni's Grasshopper sp.*	*Melanoplus viridipes (group).**	Local concern/Potentially Rare	OO, OOC

State-Listed Reptile Species Documented in the Oak Openings Region

VII. Reptiles: Common Name	Scientific Name	Status	Park Locations
Blanding's Turtle	*Emydoidea blandingii*	T	OO, WW, OOC
Spotted Turtle	*Clemmys guttata*	T	OO, OOC
Eastern Box Turtle	*Terrapene carolina Carolina*	Species of Concern	OO, WW, SE, OOC
Eastern Fox Snake	*Pantherophis gloydi*	Species of Concern	WW
Eastern Garter Snake (melanistic)	*Thamnophis sirtalis sirtalis*	Species of Concern	WW, OO

State-Listed Plant Species Documented in the Oak Openings Region

VIII. Plants: Common Name	Scientific Name	Status	Park
Red Baneberry	*Actea rubra*	T	SE, OOC
Gattinger's Foxglove	*Agalinis gattingerii*	E	OOC

Small flowered Foxglove	*Agalinis purpurea var. parviflora*	E	OOC
Rock Serviceberry	*Amelanchier sanguinea*	P	OO
Prairie Thimbleweed	*Anemone cylindrica*	T	OO, WW
Southern Hairy Rock Cress	*Arabis pycnocarpa var. adpressipilis*	P	OO, WW
Forked Three-awn Grass	*Aristida basiramea*	E	OO
False Arrow Feather	*Aristida necopina*	E	OO, WW
Purple Triple-awn Grass	*Aristida purpurescens*	P	OO, WW
Blunt-leaved Milkweed	*Asclepias amplexicaulis*	P	OO
Prairie Fern-leaved False Foxglove	*Aureolaria pedicularia var. ambigens*	E	OO
Missouri Rock Cress	*Boechera missouriensis*	E	OO, WW
Leathery Grape Fern	*Botrychium multifidum*	E	OO
Least Grape Fern	*Botrychium simplex*	E	OO
Pale Straw Sedge	*Carex albolutescens*	P	OO
Golden-fruited sedge	*Carex aurea*	P	OOC
Bebb's Sedge	*Carex bebbii*	P	OO, OOC
Bicknell's Sedge	*Carex bicknellii*	T	OO, WW
Thin-leaved Sedge	*Carex cephaloidea*	P	OO
Little Yellow Sedge	*Carex cryptolepis*	P	OOC
Slender Sedge	*Carex lasiocarpa*	P	OOC
Long's sedge	*Carex longii*	E	WW
Hay Sedge	*Carex siccata*	E	OO, WW
Pipsissewa	*Chimaphila umbellata*	T	OO
Sweet-fern	*Comptonia peregrina*	E	OO, OOC, WW
Bushy Horseweed	*Conyza ramosissima*	P	WW
Spotted Coral Root	*Corallorhiza maculata*	P	OO
Round-leaved dogwood	*Cornus rugosa*	P	WW
Plains Frostweed	*Crocanthemum bicknellii*	P	OO, WW
Canada Frostweed	*Crocanthemum canadense*	T	OO, WW
Tansy Mustard	*Descurainia pinnata*	P	OO, WW
Sessile Tick-trefoil	*Desmodium sessilifolium*	T	OO, WW
Narrow-headed Panic Grass	*Dicanthelium spretum*	E	OOC
Carolina Whitlow Grass	*Draba reptans*	T	WW
Spathulate-leaved Sundew	*Drosera intermedia*	E	OO
Engelmann’s Spike-rush	*Eleocharis engelmannii*	E	OOC
Slender Spike-rush	*Eleocharis tenuis*	T	OO
Variegated Scouring Rush	*Equisetum variegatum*	E	OO, OOC
Rattlesnake Master	*Eryngium yuccifolium*	P	OO, SE
Great Lakes Goldenrod	*Euthamia caroliniana*	T	OO, WW, OOC
Prairie Gentian	*Gentiana puberulenta*	E	OO
Soapwort Gentian	*Gentiana saponaria*	E	OO
Fringed Gentian	*Gentiana crinita*	P	OO, WW, OOC

Bicknell's Cranesbill	*Geranium bicknellii*	E	OOC
Rough Pennyroyal	*Hedeoma hispida*	P	OO, WW, OOC
Porcupine Grass	*Hesperostipa spartea*	E	OO
Canada St. John's Wort	*Hypericum canadense*	E	OO
Kalm's St. John's Wort	*Hypericum kalmanium*	T	OO, OOC, WW
Greene's Rush	*Juncus greenei*	T	OO, WW, OOC
Inland Rush	*Juncus interior*	T	OO, WW
June Grass	*Koeleria macrantha*	E	OO
Virginia Dwarf Dandelion	*Krigia virginica*	T	OO
Thyme-leaved Pinweed	*Lechea minor*	T	OO, OOC
Hairy Pinweed	*Lechea mucronata*	P	OO,OOC, WW, BC
Leggett's Pinweed	*Lechea pulchella*	T	OO, OOC
Scaly Blazing Star	*Liatris squarrosa*	P	OO
Wood Lily	*Lilium philadelphicum*	E	OO
Drummond's Dwarf Bulrush	*Lipocarpha drummondii*	E	OOC
Dwarf Bulrush	*Lipocarpha micrantha*	T	OOC
Plains Puccoon	*Lithospermum caroliniense*	T	OO, OOC, WW
Wild Lupine	*Lupinus perennis*	P	OO, OOC, WW
Northern Appressed club moss	*Lycopodiella subappressa*	E	OO
Cow-wheat	*Melampyrum lineare*	E	OO
Dotted Horsemint	*Monarda punctata*	E	OO
Old-field Toadflax	*Nuttallanthus canadensis*	E	OO, OOC
Common Prickly Pear	*Opuntia humifusa*	P	OO
Balsam Squaw-weed	*Packera paupercula*	T	OO, WW
Mountain Phlox	*Phlox latifolia*	E	OO
Yellow Fringed Orchid	*Plantanthera ciliaris*	T	OO
Small Purple Fringed Orchid	*Platanthera psycodes*	P	OO
Gay-wings	*Polygala paucifolia*	E	OO
Racemed Milkwort	*Polygala polygama*	T	OO, WW
Prairie Rattlesnake Root	*Prenanthes racemosa*	P	OO, OOC
Sand Cherry	*Prunus pumila var. cuneata*	E	OO, WW
Hairy Mountain Mint	*Pycnanthemum verticillatum var. pilosum*	T	OO, OOC
Green-flowered Wintergreen	*Pyrola chlorantha*	E	OO
Virginia Meadow Beauty	*Rhexia virginica*	P	OO, WW
Slender Willow	*Salix petiolaris*	T	OO
Tall Nut-rush	*Scleria triglomerata*	P	OO, WW
Showy Goldenrod	*Solidago speciosa*	P	OO, WW
Shining Ladies-Tresses	*Spiranthes lucida*	P	OOC
Great Plains Ladies -Tresses	*Spiranthes magnicamporum*	P	OO, OOC

Bushy Aster	*Symphotrichum dumosum*	T	OOC
Lance-leaved Violet	*Viola lanceolata*	P	OO, OOC
Birdfoot Violet	*Viola pedata*	T	OO
Twisted Yellow-eyed Grass	*Xyris torta*	T	OO, OOC

Assessment Unit:		Size:	Observer(s):
Dominant community type (existing or goal):			Date(s):

Module 3: Habitat Alteration (i.e., Actions)

Recent management history (completed by Manager)

For each disturbance type, check the box associated with the most recent visible evidence

Disturbances are broadcast disturbance, i.e., management across ≥50% of unit

Discuss and share knowledge of unit: agreement among observers must be achieved

	Fire	*Whole tree removal*	*Shrub removal*	*Mow/ Hydroax*	*Disc/plow /scrape*	*Row crop OR production graze*	*Graze for natural land mgmt*	*Seed*
Latest disturbance within	☑	☑	☑	☑	☑	☑	☑	☑
1. ≤2 growing seasons	☐	☐	☐	☐	☐	☐	☐	☐
2. 3 to 5 growing seasons	☐	☐	☐	☐	☐	☐	☐	☐
3. >5 growing seasons	☐	☐	☐	☐	☐	☐	☐	☐
4. Absent, but necessary	☐	☐	☐	☐	☐	NONE: ☐	☐	☐
5. Absent, but not needed in next 2 yrs	☐	☐	☐	☐	☐	N/A	☐	☐

Comments:

Anthropogenic soil disturbance

Check the appropriate box to rank the intensity of actions within or adjacent to AU. Where not present, check 'none.'

	None	Low	Med	High		None	Low	Med	High
Footpath, horse trail, or boardwalk	☐	☐	☐	☐	Dam/berm	☐	☐	☐	☐
Road, hardened path	☐	☐	☐	☐	Fill/old home sit	☐	☐	☐	☐
ATV/2-track	☐	☐	☐	☐	Train tracks	☐	☐	☐	☐
Burn breaks	☐	☐	☐	☐	Utility line	☐	☐	☐	☐

Comments, including size and length estimates:

Natural disturbance

Check the box for all natural disturbances observed, including comments where relevant

☐ Tornado ☐ Flood ☐ Ice storm ☐ Plant pathogen/insect damage ☐ None

Comments:

Hydrological modifications

*Check one box best describing the observed drainage alterations. Consider ditches **within** and **bordering/running parallel to** unit.*

☐	None apparent
☐	Only **shallow ditches** (<25cm/10in deep, vegetated, can step over), do not carry water most of year
☐	Single **medium ditch** (25-50cm/10-20in deep, vegetated, may easily jump over), may carry water out of unit during rain events; **small, insubstantial manmade pond** (≤0.1 acre)
☐	**Multiple medium**, or **combination of medium & shallow**, ditches carrying water out of unit; **moderate mandmade pond** (0.1-1 acre)
☐	**Major ditch** (e.g., Wiregrass) or **tiling within or adjacent to** unit, carrying water out of unit most of year (>50cm/20in deep, bottom scoured from flow, retains water most of year); **major mandmade pond** (≥1

Describe modifications:

					Size:			Observer(s):			
Dominant community type (existing or goal):								Date(s):			

Module 4: Plant communities, interspersion, microtopography

Habitat Structure Ranking Scale
A = *Absent*
L = *Low*: Very small amounts (<3/acre or <5% of unit)
M = *Medium*: Moderate amounts (3-10/acre or 5-10% of unit)
H = *High*: Great amounts (>10/acre or >10% of unit)

Habitat structure/microtopography

To assign level, rank each variable using the Habitat Structure Ranking Scale -->

Rank				Rank			
bs.1	Obs.2	Obs.3		Obs.1	Obs.2	Obs.3	
___	_____	_____	Coarse woody debris >15cm (6in) dbh	___	_____	_____	Vegetated hummocks/tussocks
___	_____	_____	Snags >15cm (6in) dbh	_____	_____	_____	Soil mounds (ant hills, furrows, wheel ruts, uprooted trees

Comments:

Plant structure & groundcover

What proportion of the unit is covered by…?

Obs.1	Obs.2	Obs.3					
_____%	_____%	_____%	Woody cover (*i.e., trees/shrubs/saplings shading the unit*)				
_____%	_____%	_____%	Trees →	_____%	_____%	_____%	What % of these trees are oak?
_____%	_____%	_____%	NATIVE shrubs/saplings →	_____%	_____%	_____%	What % of these native shrubs/saplings are oa
_____%	_____%	_____%	NON-NATIVE shrubs/saplings				
_____%	_____%	_____%	NATIVE Forbs				
_____%	_____%	_____%	NATIVE Grass, sedge, rush				
_____%	_____%	_____%	Herbaceous non-natives/highly competitive native herbaceous				
_____%	_____%	_____%	Bare ground (*exposed soil*)				
_____%	_____%	_____%	Flammable materials (under typi weather in burn season)				

Metric definitions:
Tree = woody plants >15cm/6in dbh
Shrub/sapling = woody plants <15cm/6in dbh
Herbaceous = non-woody plants

Metric details:
· All metrics in left columns are the **proportion of unit covered by "XX cover"**
· Metrics in right column are a *component* of total tree or shrub/sapling cover, i.e., if tree cover = 60%, but all trees are oak, the canopy comprised of oak =

Comments:

Community/association inclusion

Are other communities/associations contained within the unit? Record approximate # of inclusions / % of unit coverd by each type.
Assess the inclusions in their current condition (e.g., a very overgrown wet prairie may be recorded as a flatwoods inclusion)

bs.1 (#/%)	Obs.2 (#/%)	Obs.3 (#/%)	
___/____%	2. ___/____%	3.___/____%	Wet prairie (*e.g., <20% canopy cover, abundant sedges/rushes, standing water into July, pin oaks*)
___/____%	2. ___/____%	3.___/____%	Upland prairie (*e.g., <5% canopy cover, sandy soils, big bluestem & other warm season grasses*)
___/____%	2. ___/____%	3.___/____%	Oak savanna (*e.g., 6-75% canopy cover, blueberry/huckleberry present, dry sandy soils*)
___/____%	2. ___/____%	3.___/____%	Barrens (*e.g., exposed sand, cryptobiotic crust, patchy vegetation, often lupine*)
___/____%	2. ___/____%	3.___/____%	Flatwoods (*e.g., moist soils, heavy leaf litter, >75% canopy cover, often maples and sassafrass*)
___/____%	2. ___/____%	3.___/____%	Riparian woodlands (*e.g., >70% canopy cover adjacent to stream, risk of flooding during high water*
___/____%	2. ___/____%	3.___/____%	Upland forest (*e.g., >75% canopy cover, dominated by mature trees*)
___/____%	2. ___/____%	3.___/____%	Buttonbush swamp (*e.g., moist wooded area, buttonbush present*)

Use the average # and %'s above to circle the → appropriate interspersion

		Total % cover of all inclusions							
1 Community Type	2 or more Communities	1-5%		6-10%		11-15%		16-20%	
1 Patch		Low	--	Low	--	Med	--	Med	--
2 Patches		Low	Low	Med	Med	Med	Med-Hi	Med-Hi	High
3+ Patches		Med	Med	Med	Med-Hi	Med-Hi	High	High	High

Comments:

Module 5: Special considerations

Rare/T&E/Heritage records:

Module 3 Supplement: Definitions and clarifications for field

Recent Management Histroy Evidence key. Use manager knowledge where possible:

Fire: prescribed fire (not burn piles)

≤2: Burned leaf litter, burned standing shrubs, scars on trees

3-5: Scars on trees, burned coarse woody debris visible

>5: Scars on trees, no other evidence of burn

Whole tree removal: mechanical removal of trees >15cm/6in dbh

≤2: Trees on ground retain bark, stumps are freshly cut, may be resprouting

3-5: Trees on ground losing bark, stumps weathered

>5: Trees on ground and stumps are beginning to decay/break down, overgrown with new vegetation

Shrub removal: brush-cutting, hand-clipping

≤2: Woody stems uniformly cut , herbicide dye visible, woody debris on ground or freshly piled

3-5: Woody stems uniformly cut , not very noticeable under regrowth, woody debris compactedon ground or in piles

>5: Woody stems uniformly cut & decaying, almost no woody debris noticeable

Mowing : mechanical removal of herbaceous and woody stems (tractor, hydro-ax)

≤2: Woody stems uniformly cut at mower's height (~8-16"), still noticeable, woody debris or grass clippings on ground

3-5: Woody stems uniformly cut at mower's height (~8-16"), not very noticeable under regrowth, no cut debris noticeable

>5: Evidence is absent, but box may be checked based on observer knowledge

Disc/plow/scrape (as management): Ground tilled or plowed by conservation agency

≤2: Plow lines visible, dirt exposed

3-5: Plow lines noticeable but not easily visible under new growth

>5: Evident is absent, but box may be checked based on observer knowledge

Agriculture (monoculture): Is or has been in monoculture crop

≤2: Plow lines still visible, remnant crop regrowth

3-5: Plow lines noticeable but not easily visible under new growth, crop debris may be evident (e.g., corncobs)

>5: Plow lines/furrows barely noticeable under heavy regrowth

Grazing: Industrial, commercial, or residential grazing by domestic herd (e.g., horse, cattle)

≤2: Animal paths evident, scat abundant

3-5: Some scat/patties remain, paths noticeable but not bare

>5: Evidence is absent, but box may be checked based on observer knowledge

Anthropogenic soil disturbance Evidence key:

Footpath, horse trail, boardwalk ~ AND ~ ATV/2-track ~ AND ~ Burn breaks

Low: single tracks, vegetation present in trail, <0.5km/hectare (<0.6mi/5ac) or adjacent to <20% of the perimeter

Med: predominantly single tracks with occasional double track/two-person wide, little to no vegetation in tracks, 0.5 to 2km/hectare (0.6 to 2.4mi/5ac) or adjacent to 20-40% of the perimeter

High: predominantly two-person wide trails, predominantly no vegetation in tracks, soil churned by footprints, >2km/hectare (>2.4mi/5ac) or adjacent to >40% of the perimeter

Road, hardened path

Low: single lane, dirt or poorly-maintained, <5 cars or people/hr, <0.5km/hectare (<0.6mi/5ac), adjacent to <20% of the perimeter

Med: two-lane, paved, 6-20 cars or people/hr, 0.5 to 2km/hectare (0.6 to 2.4mi/5ac) or adjacent to <20% of the perimeter; IF a single/dirt/low traffic lane, then adjacent to 20-40% of the perimeter

High: 2+ lanes, paved, >20 cars or people/hr, >2km/hectare (>2.4mi/5ac) and adjacent to any proportion of the perimeter; IF a single/dirt/low traffice lane, then adjacent to >40% of the perimeter; IF a moderate traffic lane, then adjacent to >20% of the perimeter

Dam/berm

Low: 1 dam/berm present, no more than 3m (~10ft) wide and 1m (~3ft) deep/tall

Med: 2 dams/berms <3m (~10ft) wide & <1m (~3ft) deep/tall, or 1 dam/berm not to exceed 5m (16ft) wide and 2m (~6ft) deep/tall

High: >2 dams /berms <3m (~10ft) wide & 1m (~3ft) deep/tall, or 1 dam/berm exceeding 5m (16ft) wide & 2m (~6ft) deep/tall

Fill/Old home site

Low: amount covers <10m² (<12 yd²), elevational change <1m (3ft), fill site primarily vegetated

Med: amount covers 10-50m² (12-60 yd²), elevational change <2m (6 ft), may be >50% vegetated, fill or debris may be exposed

High: amount cover >50m² (>60 yd²), elevational change >2m (6 ft), may or may not be vegetated with exposed debris

Train tracks

Low: track present but appears to be in disuse, tall vegetation growing in tracks, adjacent to <20% of the perimeter

Med: single track with minimal maintenance, vegetation present along track, adjacent to <20% of the perimeter; IF disused track, then adjacent to 20-40% of the perimeter

High: track well maintained, may be elevated, lined with gravel, may have multiple tracks, ajdacent to >10% of the perimeter; IF disused track, then adjacent to >40% of the perimeter; IF minimally maintained track, then adjacent to >20% of the perimeter

Utility line/Gas/electric line

Low: single line of poles, vegetation largely undisturbed/maintained along line, vegetation >0.5m (>18in), may contain shrubs

Med: line moderately maintained, mowed to <0.5m (<18in), lack of woody vegetation, maintenance path may be visible

High: heavily maintained, little/low vegetation, maintenance line apparent/dirt/paved (count here, not as Road)

PERCENT COVER