

Indiana Department of Natural Resources
Division of Forestry
RESOURCE MANAGEMENT GUIDE

Harrison Crawford State Forest

Compartment: 23

Tract: 07

Wayne Werne

Date: 8/21/2023

Acres: 89

Management Cycle End Year: 2043

Management Cycle Length: 20 Years

Location

Tract 7, also known as 6342307, is in section 7, T4S, 3E, in Harrison County, approximately 6 miles southwest of Corydon, Indiana. It can be accessed off Kintner Road.

General Description

The tract consists of mesic oak-hickory, conifer (in separate stands of old field cedar areas and planted Virginia pine), mixed hardwood, and non-forested (but reforesting) cover types with most of the acreage being mesic oak-hickory. The areas currently covered in cedar were previously open farmland as evidenced by the 1940's aerial photos. The tract is primarily located on north and east aspects and some relatively flat areas as well.

History

- 1935 - Majority of tract acreage was purchased from James and Isabell Whitworth.
- 1973 - Forest inventory and short management guide was completed by Steve Winicker showing an estimated volume of 2,287 board feet (bdft) per acre.
- 1981 - Timber sale conducted by Russ Dotzauer, which included tract 6342303 totaled 109,000 bdft. An estimated 58,000 bdft was from tract 6342307. Primary species were northern red oak, black oak, American beech, and white oak. Sale was sold to Barks Lumber Co. for \$0.16 per foot.
- 2010 - Forest inventory and management guide completed by Christine Martin showing 4,102 bdft per acre of hardwoods and 581 bdft per acre of cedar totaling 4,683 bdft per acre.
- 2023 - Forest inventory and management guide completed.

Landscape Context

The landscape surrounding this tract is primarily hardwood forest with some agricultural crop and pastureland found on nearby private lands. Some residential housing is located to the west along Kintner Road, but the area is rural in nature with little additional development.

Topography, Geology, and Hydrology

This tract contains mostly gently sloping hillsides with a northeasterly aspect, and some relatively flat areas on the southwestern tip on the ridgetop. Karst topography underlies this area, which leads to numerous closed and occasional open sinkholes being present. There is a small wildlife pond on the west side of the tract near the Adventure Trail. The watershed of this tract drains to the north and east into intermittent drainages that empty into Indiana Creek a short distance to the south. Located in the tract are various karst features which will be buffered according to the 2022 Best Management Practices (BM) field guide.

Soils

The following soils are found on the tract in approximate order of importance.

GpF Gilpin-Berks complex, 18-30% slopes Upland oak SI is 70-80, Yellow-poplar SI is 70-80, est. growth is 185-260 bd. Ft/ac/yr. for oaks and for yellow-poplar.

HaE2 Hagerstown silt loam, 18-25% slopes, eroded Upland oak SI is 85-95, Yellow-poplar SI is 90-105, est. growth is 300-375 bd. Ft/ac/yr. for oaks and 335-450 bd. Ft/ac/yr. for yellow-poplar.

HaD2 Hagerstown silt loam, 12-18% slopes, eroded Upland oak SI is 85-95, Yellow-poplar SI is 90-105, est. growth is 300-375 bd. Ft/ac/yr. for oaks and 335-450 bd. Ft/ac/yr. for yellow-poplar.

CsC3 Crider soils, 6-12% slopes, severely eroded Upland oak SI is 85-95, Yellow-poplar SI is 90-105, est. growth is 300-375 bd. Ft/ac/yr. for oaks and 335-450 bd. Ft/ac/yr. for yellow-poplar.

Gu Gullied land Virginia pine SI is 53-72, est. growth is 100-200 bd. Ft/ac/yr.

ZaC3 Zanesville silt loam, 6-12% slopes, severely eroded Upland oak SI is 70-80, Yellow-poplar SI is 85-95, est. growth is 185-260 bd. Ft/ac/yr. for oaks and 300-375 bd./ ft/ac/yr. for yellow-poplar.

CoF Corydon stony silt loam, 20-60% slopes Upland oak SI is 65-75, Yellow-poplar SI is 80-90, est. growth is 155-220 bd. Ft/ac/yr. for oaks and 260-335 bd. Ft/ac/yr. for yellow-poplar.

Access

Access to this tract is via fire lane 502 off Kintner Road up the hill through tract 6343001 to where it tees into a recently maintained section of fire lane to the north along the ridgetop. This fire lane runs north-south along the ridgetop and terminates at the southwestern tip of tract 6342307. There is an old wildlife opening at the southwestern corner of this tract that could be used for a log yard.

Boundary

The northern boundary of this tract is an intermittent drainage that separates it from tract 6342303 to the north, and a portion of the northeastern boundary is private property, though there was little physical evidence of this boundary noted. The western boundary is private property. The southern boundary is another intermittent drainage that divides it from tract 6342309 to the south. And the eastern boundary is a more substantial intermittent drainage that flows south to Indian Creek, beyond which is tract 6342306 to the east.

Ecological Considerations

This tract represents typical upland forest habitat, in addition to a component of old field successional habitat, with cedar, some pine, and smaller hardwoods. Consequently, it likely receives use from a typical assemblage of common game and nongame wildlife species such as white-tailed deer, eastern wild turkey, squirrels, songbirds, snakes, box turtles, and others. Hard

most food sources are provided by the oak-hickory stand, but another habitat component would come from the advanced old field stands with cedar, pine, and denser small hardwoods. These stands provide denser cover for bedding areas, especially during the winter months.

The Division of Forestry has developed compartment level guidelines for important wildlife structural habitat features such as snags, which are standing dead or dying trees. Snags provide value to a stand in the form of habitat features for foraging activity, den sites, decomposers, bird perching, and bat roosting. Snags eventually contribute to the future pool of downed woody material. Downed woody debris provides habitat for many species and contributes to healthy soils.

Snags	Maintenance Level	Inventory	Available Above Maintenance
5"+ DBH	356	2352	1996
9"+ DBH	267	574	307
19"+ DBH	45	86	42

Current assessments indicate the abundance of these habitat features meet or exceed recommended maintenance levels in all diameter classes.

A Natural Heritage Database Review is part of the management planning process. If Rare, Threatened, or Endangered communities were identified for this area, the activities prescribed in this guide will be conducted in a manner that will not threaten the viability of those species.

Recreation

The Adventure Trail skirts through part of the western side of this tract. Based on field observations it is likely there is unauthorized horse riding on this section of the Adventure Trail. It was noted that unauthorized horse trails were identified nearby, which are being addressed. Numerous deer stands were found in this tract indicating a persistent use of this area for hunting. For public safety, use of the trail and hunting would be altered or temporarily altered within the tract during active management.

Cultural

Cultural resources may be present, but their location(s) is protected. Adverse impacts to significant cultural resources will be avoided during any activities.

Tract Subdivision Description and Silvicultural Prescription

There are four cover types/stands in this tract consisting of mesic oak-hickory, conifer, mixed hardwoods, and non-forested. Their descriptions and management recommendations are outlined below.

Stand 1: Mesic Oak-Hickory – 53.7 acres

This stand covers about 2/3 of the tract and occupies the more sloping ground generally in the middle of the tract that had not been previously cleared for farming.

The total estimated volume of the stand (10,224 bdf/acre) is composed primarily of white oak (4,180 bdf/acre), black oak (1,509 bdf/acre), pignut hickory (967 bdf/acre), and northern red oak (850 bdf/acre). The remaining 25% of the volume consists of sugar maple, shagbark hickory, yellow-poplar, and various other hardwood species.

Of the 10,224 bdf per acre an estimated range of 4,000 – 5,900 bdf per acre is harvestable. This would remove an estimated 74 square feet of basal area, which would leave the residual stand with 53 square feet of basal area. Stocking would drop from 105% to an estimated 40% with the following management recommendation.

The desired future condition of this area is a healthy vigorous stand of predominantly oak and hickory species to continue to produce hard mast food sources for wildlife and quality hardwoods. To accomplish this, dying, declining, and/or low-quality trees would be selected for harvest to allow the most vigorous and best quality trees to remain and continue to grow and reseed the area. Group selection or patch-cut openings created during the harvest would allow for the less shade tolerant species to establish a new cohort of seedlings for the future. Retaining shade intolerant tree species, like oak and hickory, while minimizing transition to shade tolerant species such as beech and maple is the goal. Ideally, creating enough sunlight to allow the advancement, establishment, and recruitment of oak and hickory species in the understory.

Since the last harvest in this stand was 42 years ago, and because it also currently contains a high volume of both harvestable material and residual growing stock, the recommendation would be to rank this stand as a medium to high priority for conducting a harvest. Any timber sale would primarily include this entire stand as well as trees from the other stands in this tract. The majority (67%) of the estimated harvest volume for stand 1 would be contained in white oak, black oak, and sugar maple, with pignut hickory, yellow-poplar, and various other species making up of the remainder of the harvest volume. A timber sale in this stand would produce a range of between 215,000 to 315,000 board feet total.

Most of the stand would be harvested under a single tree selection routine with larger group or patch cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should favor releasing future crop trees. The residual stand should be heavier to white oak, with a lesser component of other oak and hickory species, as well as mesophytic species for diversity. Application of a prescribed burn in this stand would help reduce the shade tolerant under and midstories that are dominating many of our forest understories in the absence of disturbance. Use of fire during the dormant season on a 3-5 year cycle would improve conditions aiding regenerating and recruiting the more fire tolerant oaks and hickories.

Post harvest timber stand improvement (TSI) should be performed to reduce residual cull or small pole-sized trees not removed during the harvest, as well as thin where necessary, complete any regeneration openings, and treat the understory to reduce shade tolerant species. A few individual ailanthus saplings were observed scattered around the upper slopes. These should be treated prior to the harvest.

Stand 2: Conifer – 22.8 acres

This stand could be further divided into two distinctly different stands. The major cover type (18.5 acres) is old field cedar, which consists of previously cleared areas in the east and central portion of the tract used for agricultural purposes. This area has vegetated back to mostly cedar, but also has a minor hardwood component. The large size of some of the scattered hardwood trees implies part of this may have been used for pasture with scattered trees rather than farm fields. The other minor cover type is a small stand (4.3 acres) of Virginia pine which was planted in another formerly cleared agricultural area on the southwestern tip of the tract. No inventory plots fell within the Virginia pine stand, so the numbers presented here only represent the old field cedar stand, but all parameters would be noticeably different with the larger densely stocked pine versus the smaller cedar intermixed with small hardwoods.

The total estimated stand volume (7,724 bdf/acre) is composed primarily of eastern redcedar (3,366 bdf/acre), yellow-poplar (1,779 bdf/acre), and black oak (1,633 bdf/ac). The remaining 12% of the volume consists of red maple, scarlet oak, white ash, and various other species. It should be noted that the volume of cedar is figured using a cedar log scale that results in a higher than Doyle volume and includes trees down to 6" DBH as sawtimber volume.

Of the 7,724 bdf per acre an estimated range of 3,500 – 6,500 bdf per acre is harvestable. This would remove an estimated 81 square feet of basal area, which would leave the residual stand with 51 square feet of basal area. Stocking would drop from 100% to an estimated 50% with the indicated management. The drastic reduction in stocking is a direct result of removing the majority of the major component species (i.e., cedar) intentionally to open the area for hardwood regeneration. These figures do include cedar as figured according to the cedar log scale. A timber sale in this stand would produce a range of between 50,000 to 150,000 board feet total – but mostly cedar according to the cedar scale rather than the Doyle log scale.

The desired future condition of this area is a healthy stand of predominantly hardwood species to promote more mast producing species for wildlife and quality hardwoods. Currently it contains an abundance of cedar, which is overstocked and transitioning out due to mortality from overcrowding and being overtopped by hardwoods in the stand. The cedar is also shading the understory, preventing recruitment and establishment of new hardwoods. Therefore, it is proposed to mostly liquidate the cedar and pine to favor the hardwoods that have already become established – many of which are desirable oak species. This proposed management will also have the added effect of creating early successional habitat (i.e., young forest) where mostly open areas interspersed with hardwood trees would be the resultant cover for about a decade. Eventually, the area would transition to a native hardwood stand of larger trees with natural succession. In the meantime, the early successional vegetation would provide diversity of habitat to many species of wildlife that utilize this type of habitat. Transitioning this stand to a temporarily more open habitat would also allow for more shade intolerant species like oak and hickory to potentially regenerate, though yellow-poplar would likely be the dominant hardwood regenerating. The cedar could be included with a tract wide harvest or sold separately as a cedar harvest.

The vast majority (80%) of the harvest volume for stand 2 would be contained in eastern redcedar, with black oak and a few scattered hardwoods making up the remainder. Much of the

harvest volume tallied in this stand is represented by eastern redcedar due to use of the cedar scale. A separate cedar sale could be undertaken to achieve optimal management, as most of this cedar would be removed to encourage poplar and the oak regeneration that is usually found in the understory of such stands. Ultimately, this site should be completely converted to hardwoods due to recovery of the site from former agricultural activities and erosion. Timber harvest and post-harvest TSI should concentrate on releasing any oak regeneration – mostly with follow-up TSI. Finally, TSI would remove any leftover competing trees and allow a new stand of poplar and oak to establish itself and grow here. Any ailanthus present should also be treated.

Stand 3: Mixed hardwoods – 9.3 acres

This stand was found along the drainage forming the north boundary of the tract and wrapping around on the hillside on the western side of the tract. The total estimated volume of the stand (8,485 bdf/acre) is composed primarily of sugar maple (3,468 bdf/acre), yellow-poplar (2,693 bdf/acre), and American beech (1,504 bdf/acre). The remaining 10% of the volume consists of northern red oak and shagbark hickory.

Of the 8,485 bdf per acre an estimated range of 2,200 – 3,200 bdf per acre is harvestable. This would remove an estimated 56 square feet of basal area, which would leave the residual stand with 63 square feet of basal area. Stocking would drop from about 115% to an estimated 45% with the indicated management.

The desired future condition of this area is a healthy, vigorous, and diverse stand of mixed mesophytic species adapted to the site to continue to produce quality hardwoods. To accomplish this, dying, declining, and/or low-quality trees would be selected for harvest to allow the most vigorous and best quality trees to remain and continue to grow and reseed the area. Openings created from harvesting would allow for the less shade tolerant species to establish a new cohort of seedlings for the future.

Since the last harvest in portions of this stand was 42 years ago, and because it currently contains a moderate volume of harvestable material and high volume of residual growing stock, the recommendation would be to rank this stand as a medium to high priority for conducting a harvest. The majority of harvest volume for stand 3 would be contained in American beech, sugar maple, and shagbark hickory. A timber sale in this stand would produce a range of between 23,000 to 30,000 board feet total. Most of the stand would probably be harvested under a single tree selection routine with larger group or patch cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees.

Post harvest TSI should be performed to eliminate any residual cull or small pole-sized trees not cut during the harvest, as well as thin where necessary, complete any regeneration openings, and reduce vines where present. As always, any ailanthus present should also be treated and eliminated. A few individual ailanthus saplings were found scattered around the upper slopes, and the previous plan noted some larger trees growing in this stand in places as well.

Stand 4: Non-forested – 3.2 acres

This stand is technically classed as “non forested” but is a former open wildlife area that is

transitioning to young forest habitat. It is in the southwestern tip of the tract and is surrounded by the formerly described planted Virginia pine. Historically, this whole section of the ridgetop was cleared for agriculture and later planted to pine, with some of that area either cleared or maintained as a semi-permanent wildlife opening. Since the maintenance of these wildlife openings across the forest was ceased almost 20 years ago, these areas are now growing back to early successional hardwoods.

This small stand is dominated with submerchantable and pole sized yellow-poplar with some red maple mixed in, as well as some Virginia pine from the neighboring stand. There were only a handful of merchantable Virginia pine trees tallied in this stand during the inventory. The desired future condition of this area would be either to include it as part of a regeneration opening along with the adjacent Virginia pine during a timber sale, and potentially to be used as a log yard location. The area could continue to be maintained as a wildlife opening by setting succession back or allowed to continue to develop into a mature hardwood stand as it currently is doing. Some TSI could be accomplished in this area to favor the oaks, and the better-quality stems of other species, as well as control any invasive species establishing in the area.

The current forest resource inventory was completed in June 2023 by Wayne Werne. A summary of the estimated tract inventory results is in the table below.

Tract Summary Data (trees >11”DBH):

Species	# Sawtimber Trees	Total Bd. Ft.
American beech	82	17,978
Black oak	452	113,386
Black walnut	49	6,853
Chinkapin oak	54	6,942
Eastern redcedar	810	71,200
Honeylocust	12	2,937
Northern red oak	211	53,044
Persimmon	29	1,602
Pignut hickory	396	153,489
Post oak	51	4,450
Red maple	43	3,204
Scarlet oak	26	5,785
Shagbark hickory	237	35,066
Sugar maple	524	74,048
Virginia pine	22	1,869
White ash	118	12,816
White oak	778	232,735
Yellow-poplar	339	89,356
Total:	4233	786,760

Summary Tract Silvicultural Prescription and Proposed Activities

Since the last harvest in this stand was 42 years ago, and because it currently contains a high volume of both harvestable material and residual growing stock, the recommendation would be to rank this stand as medium to high priority for conducting a timber harvest. Due to the current

condition of the stand, an improvement harvest is recommended and could be undertaken as early as this year. Overall, the tract volume would be reduced by an estimated 35-55% depending on whether the cedar component is included in a hardwood timber sale or sold separately. A marked sale in this tract would produce an estimated total volume of between 250,000 - 350,000 bdf of hardwood and 40,000 - 80,000 bdf of cedar, if included.

Utilizing numbers from the last inventory in 2010, this tract has shown a very high growth rate of approximately 320 bdf per acre per year over the last 13 years, indicating its productivity potential. With the application of the proposed management, this tract should continue to exhibit high and potentially greater growth and productivity by favoring the healthiest and best quality trees for a residual stand, while removing the declining trees.

Most of the tract would probably be harvested under a single tree selection routine with larger group or patch cut openings targeting groups of low-grade trees or multiple large trees growing together. The old field cedar areas would be harvested under a group selection or shelterwood routine to remove the cedar and encourage the hardwoods. When possible, selection should also favor releasing future crop trees. The residual stand should be heavier to white oak, with a lesser component of other oak and hickory species, as well as mesophytic species. Application of a prescribed burn would help to reduce the shade tolerant under and midstories present, and aid in regenerating and recruiting the more fire tolerant oaks and hickories.

Post harvest TSI should be performed to eliminate any residual cull or small pole-sized trees not cut during the harvest, as well as thin where necessary, complete any regeneration openings, and treat the understory to eliminate shade tolerant species in favor of oaks and other more desirable species. Any ailanthus present should also be treated and eliminated. Several individual ailanthus stems were found scattered in portions of this tract and should be treated prior to the harvest.

Due to the proximity of similar stand types, this harvest could occur at the same time as tract 6342309 and possibly 6342310. This would minimize entry into the area for management activities to ensure the least effect on recreation, wildlife, hydrology, and other concerns mentioned in this plan.

Management activities will not intentionally remove snags, with a few exceptions of large recently dead trees or storm damage when possible, so the timber sale will not negatively impact that component significantly. Creation of more snags in this size class could be undertaken by girdling large cull trees in a post-harvest TSI operation.

Additionally, management activities involving a timber sale should not affect this habitat long-term from the perspective of any wildlife utilizing it due to the maintenance of a forested habitat on the tract. There may be some conversion of cedar or the old field area to temporarily open areas that will be allowed to succeed into native hardwoods, and this would change the character of the tract over time but will not change it permanently to a non-forested cover type. Creation of regeneration openings and/or conversion of portions of the old field area into openings will create early successional habitat that will be beneficial to certain groups of wildlife dependent upon this habitat. Likely, early successional habitat created with such management will also benefit a wider segment of wildlife species that preferentially utilize such habitat for feeding and

cover more so than later successional stage habitat.

Since this tract does not border a major stream, there should be no disruption of any potential travel corridors by forest management activities. The habitat on this tract in the context of the surrounding landscape does not represent any special component that would be used more preferentially or exclusively by wildlife for traveling or dispersion, as riparian habitat might be, or as forest in a non-forested landscape might be. The small pond found in this tract would provide a valuable water source for wildlife during dry periods, and also represent good habitat for reptiles and especially amphibians.

Since this tract represents a component of contiguous forest, it is possible that forest management activities might disrupt any forest interior species by creating edge habitat for generalist species to “invade” the area. This would possibly occur if regeneration openings were put in place that offered a habitat preferred by such generalist species which might move in and start using such habitat. In the context of the surrounding landscape, this tract represents a moderate chunk of forest in a matrix of surrounding forest land.

BMPs will be followed throughout the harvest to ensure any management activities impact to soils is limited. Soil disturbance will largely be confined to the log yard and main skid trails. The BMPs will also ensure water quality is not permanently affected, and implementation of these BMPs will be contractually required of loggers.

Snags and coarse woody debris will remain at viable levels for wildlife after harvest and the harvest will not adversely affect the wildlife.

During the harvest, part of the Adventure trail would have to be shut down. However, under current restrictions, this closure would only occur from November 16th to April 1st and would not affect most of the spring, summer, and fall recreation. Hunting opportunities should be improved by the maintenance of early successional habitat and the recruitment of hard mast producers such as oak and hickory which provide food sources for a wide variety of native wildlife.

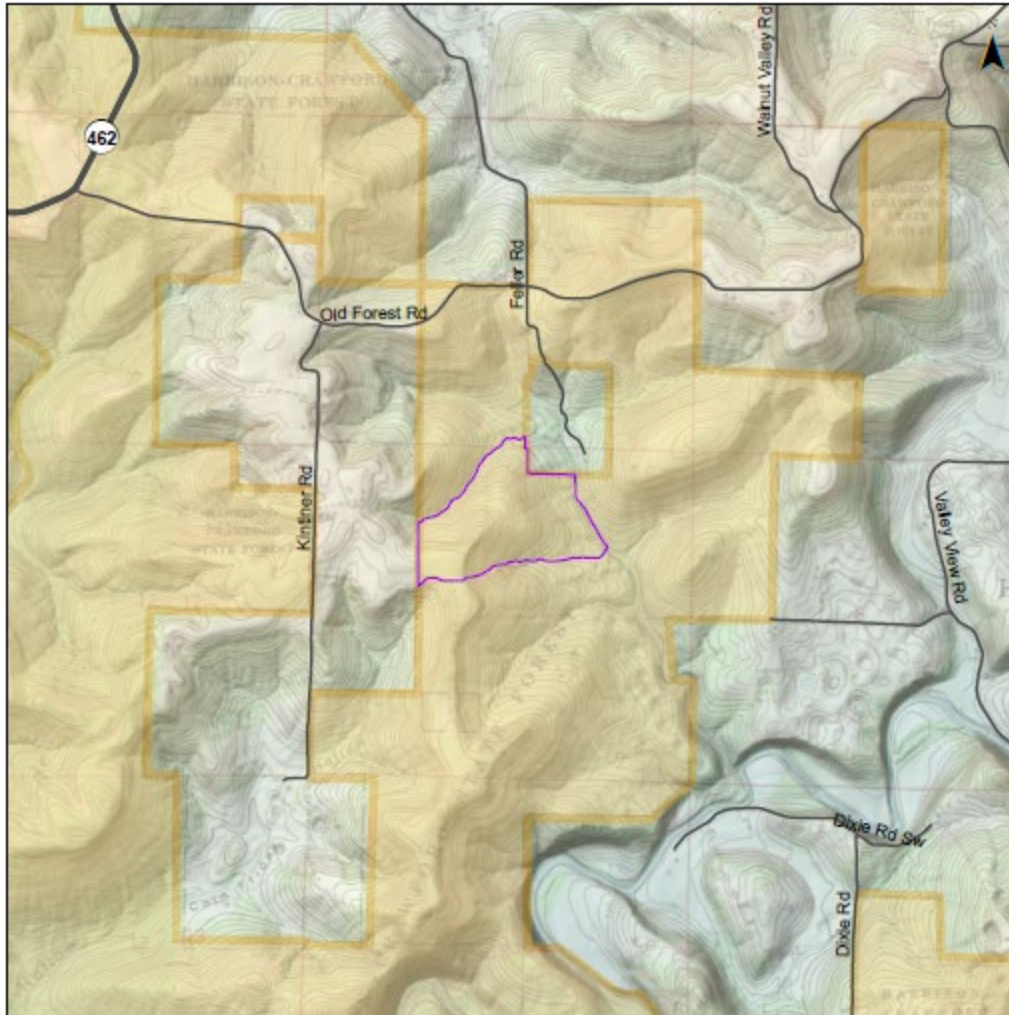
Once the harvest is complete, post-harvest TSI should be conducted and then the stand should be revisited for regeneration opening and post-harvest checks in 3-5 years to ensure proper regeneration and growth is occurring. In about 20 years, the stand should be revisited for another inventory and a new management guide can be created.

Proposed Activities Listing

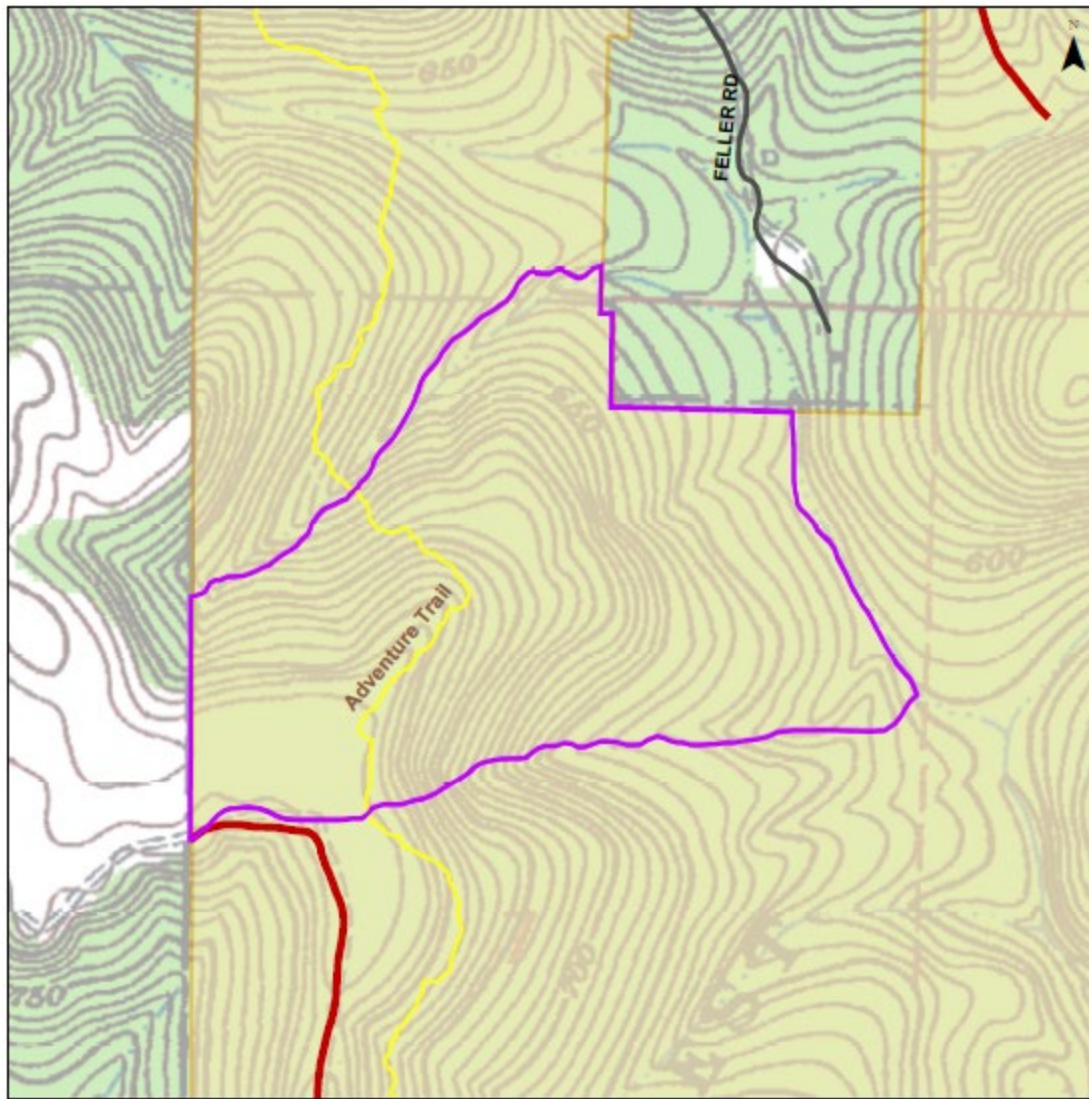
<i>Proposed Management Activity</i>	<i>Proposed Date</i>
Management Guide	2023
Mark Harvest	2023-2025
Sell Timber	2024-2025
Possible prescribed burn	2024-2025
Post harvest TSI	2025-2026
Monitor regeneration openings	Three to five years after harvest
Re-Inventory	2043

Maps



Harrison-Crawford State Forest
Location Map
Compartment 23 Tract 7



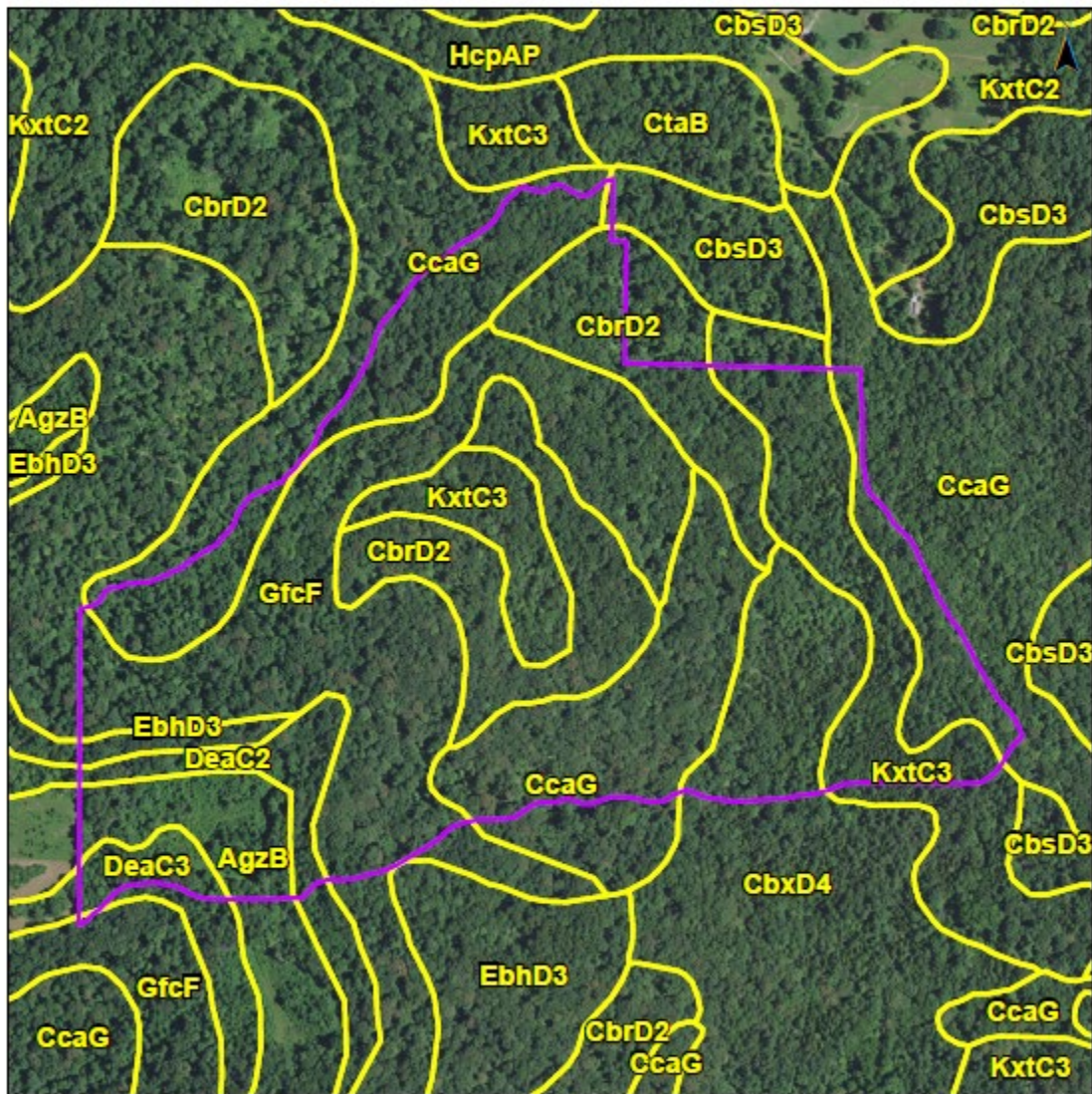
Harrison-Crawford State Forest
Compartment 23 Tract 7
Tract Map



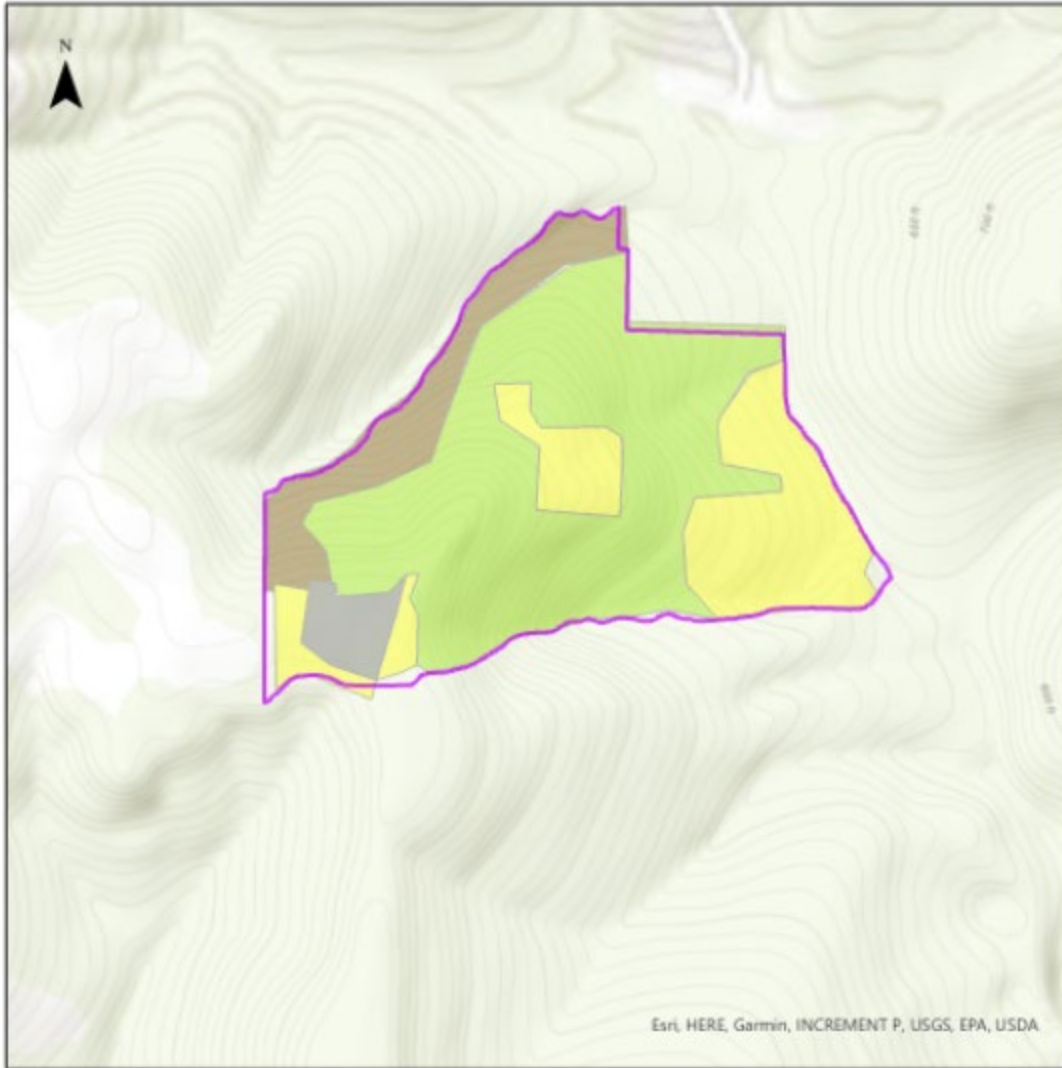
0 0.25 0.5 Miles

-  Recreation Trail
-  Fire Lane
-  Tract boundary
-  State Forest

Harrison-Crawford State Forest Compartment 23 Tract 7 Soils Map



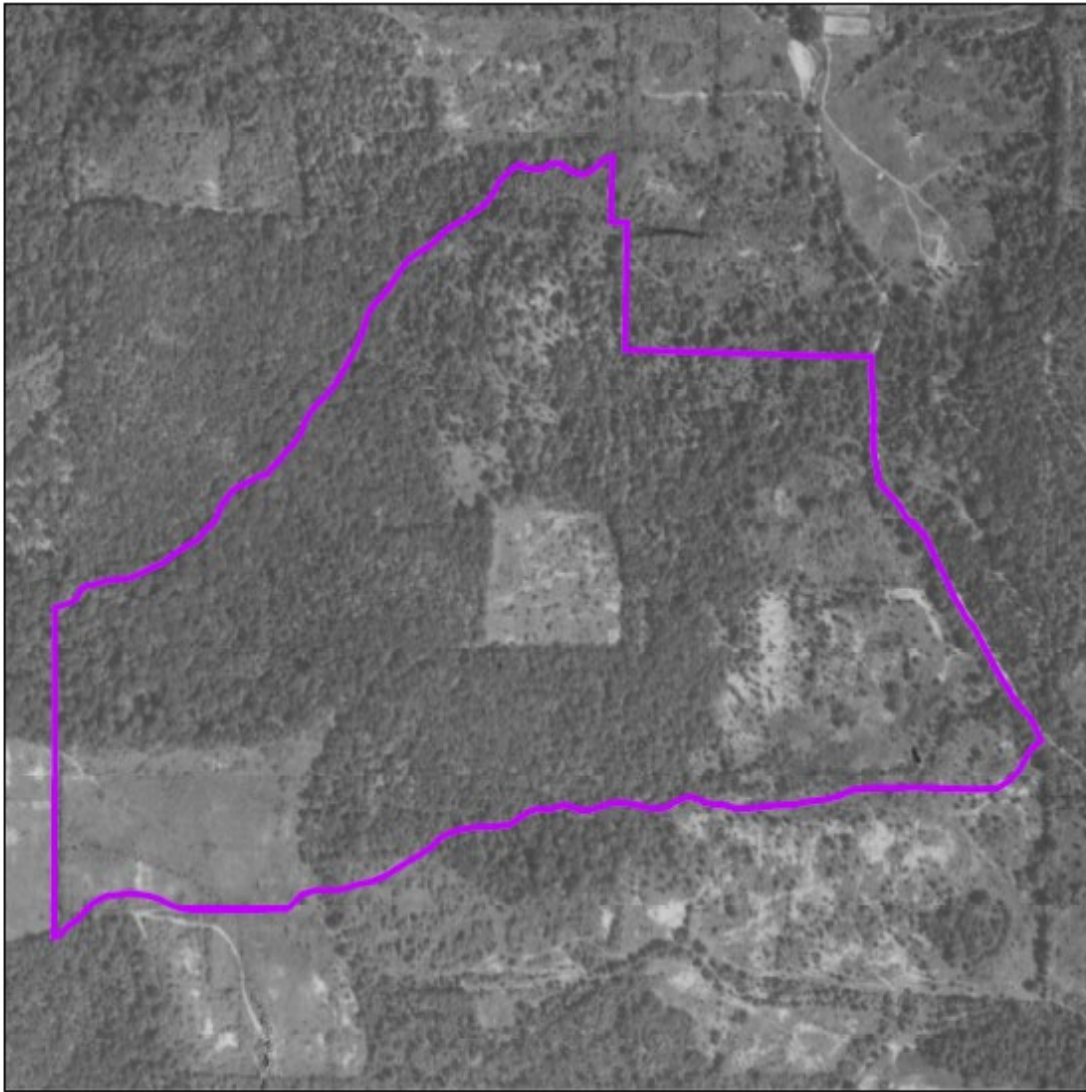
Harrison-Crawford State Forest Compartment 23 Tract 07 Cover Types Map



0 0.13 0.25
Miles

- Cover Types**
- Mixed Hardwoods
 - Mesic Oak-Hickory
 - Conifer
 - Non-forest

Harrison-Crawford State Forest
Compartment 23 Tract 7
Historical Aerial Photography



0 500 1,000 2,000 Feet

Basemap is a 1940 aerial photo.

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RESOURCE MANAGEMENT GUIDE

Harrison Crawford State Forest

Compartment: 23

Tract: 10

Wayne Werne

Date: 8/15/2023

Acres: 110

Management Cycle End Year: 2043

Management Cycle Length: 20 Years

Location

Tract 10, also known as 6342310, is in section 7, T4S, 3E, in Harrison County, approximately 6 miles southwest of Corydon, Indiana. It can be accessed off Kintner Road.

General Description

The tract consists of mesic oak-hickory, conifer (in separate stands of old field cedar areas and planted Virginia pine), mixed hardwood, and non-forested (but reforesting) cover types with most of the acreage being mesic oak-hickory. The areas currently covered in cedar were previously open farmland as evidenced by the 1940's aerial photos. The tract is primarily located on north and east aspects and some relatively flat areas as well.

History

- 1936 - Majority of tract acreage was purchased from Albert Kingston.
- 1936 - Western portion of tract was purchased from FG and Lizzie Godfrey.
- 1951 - Remaining northern portion was purchased from William and Alice Pinaire.
- 1973 - Forest inventory and short management guide completed by Steve Winicker showing estimated volume of tract at 1,345 board feet (bdft) per acre.
- 1991 - Timber sale conducted in this tract along with tract 6342311 totaling 167,000 bdft, made up primarily of black oak, chestnut oak, northern red oak, and white oak. An estimated 64,000 bdft was from tract 6342310. Sale was sold to Phil Etienne for \$0.21 per foot.
- 2010 - Forest inventory and management guide completed by Christine Martin showing 4,860 bdft per acre of hardwoods and 1,245 bdft per acre of cedar totaling 6,105 total bdft per acre on this tract.
- 2023 - Forest inventory and management guide completed.

Landscape Context

The landscape surrounding this tract is primarily hardwood forest with some agricultural crop and pastureland found on nearby private lands. Some residential housing is located to the west along Kintner road, but the area is rural in nature with little additional development.

Topography, Geology, and Hydrology

This tract contains mostly gently sloping hillsides with a northeasterly aspect. There are some relatively flat areas on the western tip on the ridgetop and along the drainage on the eastern side of the tract that also contain a series of sinkholes. Karst topography underlies this area, which leads to numerous closed and occasional open sinkholes being present. The watershed of this tract drains to the north and east into intermittent drainages that empty into Indiana Creek a short

distance to the south. Located in the tract are various karst features which will be buffered according to the 2022 Best Management Practices field guide.

Soils

The following soils are found on the tract in approximate order of importance.

HaD2 Hagerstown silt loam, 12-18% slopes, eroded Upland oak SI is 85-95, Yellow-poplar SI is 90-105, est. growth is 300-375 bd. ft/ac/yr. for oaks and 335-450 bd. ft/ac/yr. for yellow-poplar.

CsC3 Crider soils, 6-12% slopes, severely eroded Upland oak SI is 85-95, Yellow-poplar SI is 90-105, est. growth is 300-375 bd. ft/ac/yr. for oaks and 335-450 bd. ft/ac/yr. for yellow-poplar.

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Access

Access to this tract is via fire lane 502 off Kintner Road up the hill through tract 6343001 to where it tees into a recently maintained fire lane to the north along the ridgetop. This fire lane runs north-south along the ridgetop and touches the western tip of tract 6342310. There is also a log yard at the southwestern corner of this tract that was used for a timber sale in neighboring tracts 2311 and 2312.

Boundary

The northern boundary of this tract is an intermittent drainage that separates it from tract 6342309 to the north. The western boundary is a short section of fire lane that divides it from tract 6343001 to the west. The southern boundary is a downward sloping ridge delineated by an old skid trail used by a neighboring timber sale that divides it from tract 6342311 to the south. And the eastern boundary is a more substantial intermittent drainage that flows south to Indian Creek beyond which is private property to the east.

Ecological Considerations

This tract represents typical upland forest habitat, in addition to a component of old field successional habitat, with cedar, some pine, and smaller hardwoods. Consequently, it likely receives use from a typical assemblage of common game and nongame wildlife species such as white-tailed deer, wild turkey, squirrels, songbirds, snakes, box turtles, and others. Hard mast food sources are provided by the oak hickory stand, but another habitat component would come

from the advanced old field stands with cedar, pine, and denser small hardwoods. These stands provide denser cover for bedding areas, especially during the winter months.

The Division of Forestry has developed compartment level guidelines for important wildlife structural habitat features such as snags, which are standing dead or dying trees. Snags provide value to a stand in the form of habitat features for foraging activity, den sites, decomposers, bird perching, and bat roosting. Snags eventually contribute to the future pool of downed woody material. Downed woody debris provides habitat for many species and contributes to healthy soils.

Snags	Maintenance Level	Inventory	Available Above Maintenance
5"+ DBH	440	2783	2343
9"+ DBH	330	876	546
19"+ DBH	55	99	44

Current assessments indicate the abundance of these habitat features meet or exceed recommended maintenance levels in all diameter classes.

A Natural Heritage Database Review is part of the management planning process. If Rare, Threatened, or Endangered communities were identified for this area, the activities prescribed in this guide will be conducted in a manner that will not threaten the viability of those species.

Recreation

The Adventure Trail skirts through a short stretch of the western tip of this tract. Based on field observations there is likely unauthorized horse riding on this section of Adventure Trail. It was noted that unauthorized horse trails were identified nearby, which are being addressed. Numerous deer stands were found on this tract indicating a persistent use of this area for hunting.

Cultural

Cultural resources may be present, but their location(s) is protected. Adverse impacts to significant cultural resources will be avoided during any activities.

Tract Subdivision Description and Silvicultural Prescription

There are four cover types/stands in this tract consisting of mesic oak-hickory, conifer, mixed hardwoods, and non-forested. Their descriptions and management recommendations are outlined below.

Stand 1: Mesic Oak-Hickory – 72.9 acres

This stand covers about 2/3 of the tract and occupies the more sloping ground generally in the middle of the tract that had not been cleared for farming in the past.

The total volume of the stand (11,498 bdf/acre) is composed primarily of white oak (3,897 bdf/acre), black oak (2,115 bdf/acre), northern red oak (1,505 bdf/acre), and pignut hickory

(1,371 bdft/acre). The remaining 15% of the volume consists of yellow-poplar, chestnut oak, sugar maple, white ash, and various other species.

Of the 11,498 bdft per acre an estimated range of 4,000 – 5,000 bdft per acre is harvestable. This would remove an estimated 65 square feet of basal area, which would leave the residual stand with 71 square feet of basal area. Stocking would drop from 110% to an estimated 60% with the following management recommendations.

The desired future condition of this area is a healthy vigorous stand of predominantly oak and hickory species to continue to produce hard mast food sources for wildlife and quality hardwoods. To accomplish this, dying, declining, and/or low-quality trees would be selected for harvest to allow the most vigorous and best quality trees to remain and continue to grow and reseed the area. Group or patch cut openings created from harvesting would allow for the less shade tolerant species to establish a new cohort of seedlings for the future. Retaining shade intolerant tree species (like oak and hickory) while minimizing transition to shade tolerant species (like beech and maple) would be the goal here. Ideally, creating enough sunlight to allow advancement, establishment, and recruitment of oak species into the understory.

Since the last harvest in this stand was 32 years ago, and because it also currently contains a high volume of both harvestable material and residual growing stock, the recommendation would be to rank this stand as a medium to high priority for conducting a harvest. Any timber sale would primarily include this entire stand as well as trees from the other stands in this tract. The majority (72%) of the harvest volume for stand 1 would be contained in black oak, white oak, northern red oak, chestnut oak, and pignut hickory with yellow-poplar, sugar maple, white ash, and various other species making up of the remainder of the harvest volume. A timber sale in this stand would produce a range of between 290,000 to 365,000 board feet total.

Most of the stand would be harvested under a single tree selection routine with larger group or patch cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should favor releasing future crop trees. The residual stand should be heavier to white oak, with a lesser component of other oak and hickory species, as well as mesophytic species. Application of a prescribed burn primarily in this stand would help reduce the shade tolerant under and midstories that are dominating many of our forest understories in the absence of disturbance. Use of fire during the dormant season on a 3-5 year cycle would improve conditions and aid in regenerating and recruiting the more fire tolerant oaks and hickories.

Post harvest timber stand improvement (TSI) should be performed to reduce any residual cull or small pole-sized trees not removed during the harvest, as well as thin where necessary, complete any regeneration openings, and treat the understory to reduce shade tolerant species in favor of oaks and other more desirable species. Any ailanthus present should also be treated.

Stand 2: Conifer – 27.5 acres

This stand could be further divided into two distinctly different stands. The major cover type (23.7 acres) is old field cedar, which consists of previously cleared areas in the east and north used for agricultural purposes that has regrown back to mostly cedar, but also some hardwood

components. The other minor cover type is a small stand (3.8 acres) of Virginia pine which was planted in another previously cleared agricultural area on the western tip of the tract. No inventory plots fell within the Virginia pine stand, so the numbers presented here only represent the old field cedar stand, but all parameters would be noticeably different with the larger densely stocked pine versus the smaller cedar intermixed with small hardwoods.

The total stand volume (8,983 bdf/acre) is composed primarily of eastern redcedar (6,442 bdf/acre) and yellow-poplar (1,395 bdf/acre). The remaining 13% of the volume consists of black oak, Shumard oak, American beech, and chinkapin oak. It should be noted that the volume of cedar is figured using a cedar log scale that results in a higher than Doyle volume and includes trees down to 6" DBH as sawtimber volume.

Of the 8,983 bdf per acre an estimated range of 5,000 – 7,000 bdf per acre is harvestable. This would remove an estimated 96 square feet of basal area, which would leave the residual stand with 48 square feet of basal area. Stocking would drop from 130% to an estimated 40% with the indicated management. The drastic reduction in stocking and volume is a direct result of removing the major component species of cedar intentionally to open the area up for hardwood regeneration. These figures do include cedar as figured according to the cedar log scale. A timber sale in this stand would produce a range of between 150,000 to 195,000 board feet total – but mostly cedar according to the cedar scale rather than the Doyle log scale.

The desired future condition of this area is a healthy vigorous stand of predominantly hardwood species to promote more mast producing species for wildlife and continue to produce quality hardwoods. Currently it contains an abundance of cedar, which is overstocked and transitioning out due to mortality from overcrowding and being overtopped by the hardwoods in the stand. The cedar is shading the understory, preventing recruitment and establishment of new hardwoods. Therefore, it is proposed to mostly liquidate the cedar and pine to favor hardwoods that have already established – many of which are desirable oak species. This proposed management will also have the added effect of creating early successional (i.e., young forest) habitat where mostly open areas interspersed with hardwood trees would be the resultant cover for about a decade. Eventually, the area would transition to a native hardwood stand of larger trees with natural succession. In the meantime, the early successional vegetation would provide diversity of habitat to many species of wildlife that utilize this type of habitat. Transitioning this stand to a temporarily more open habitat would also allow for more shade intolerant species like oak and hickory to potentially regenerate here, though yellow-poplar would likely be the dominant hardwood regenerating. The cedar could be included with a tract wide harvest or sold separately as a cedar harvest.

The vast majority (92%) of the harvest volume for stand 2 would be contained in eastern redcedar, with a few scattered hardwoods making up the remainder. Much of the harvest volume tallied in this stand is represented by eastern redcedar due to use of the cedar scale. A separate cedar sale could be undertaken to achieve optimal management, as most of the cedar would be removed to encourage poplar and oak regeneration that is usually found in the understory of such stands. Ultimately, this site should be completely converted to hardwoods due to recovery of the site from former agricultural activities and erosion. Timber harvest and post-harvest TSI should concentrate on releasing any oak regeneration – mostly with follow-up TSI. Finally, TSI would

reduce any remaining trees competing with desired residual trees and allow a new stand of poplar and oak to be establish. Any ailanthus present should also be treated and eliminated.

Stand 3: Mixed hardwoods – 7 acres

This stand was found in a couple of pockets along the drainage forming the north boundary of the tract. The total volume of the stand (6,518 bdf/acre) is composed primarily of sugar maple (1,417 bdf/acre), yellow-poplar (1,325 bdf/acre), and eastern redcedar (839 bdf/acre). The remaining 45% of the volume consists of pignut hickory, northern red oak, blackgum, black oak, and various other species.

Of the 6,518 bdf per acre an estimated range of 3,000 – 4,000 bdf per acre is harvestable. This would remove an estimated 67 square feet of basal area, which would leave the residual stand with 43 square feet of basal area. Stocking would drop from about 90% to an estimated 40% with the indicated management. These figures do include cedar as figured according to the cedar log scale.

The desired future condition of this area is a healthy, vigorous, and diverse stand of mixed mesophytic species adapted to the site to continue producing quality hardwoods. To accomplish this, dying, declining, and/or low-quality trees would be selected for harvest to allow the most vigorous and best quality trees to remain and continue to grow and reseed the area. Group or patch cut openings created from harvesting would allow for the less shade tolerant species to establish a new cohort of seedlings for the future.

Since the last harvest in portions of this stand was 32 years ago, and because it currently contains a high volume of harvestable material, the recommendation would be to rank this stand as a medium to high priority for conducting a harvest. The majority of harvest volume for stand 3 would be contained in sugar maple, eastern redcedar, and pignut hickory. The remaining 45% would be contained in blackgum, American beech, and various other species. A timber sale in this stand would produce a range of between 21,000 to 28,000 board feet total. Most of the stand would probably be harvested under a single tree selection routine with larger openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees.

Post harvest TSI should be performed to reduce any residual cull or small pole-sized trees not removed during the harvest, as well as thin where necessary, complete any regeneration openings, and reduce vines where present. Any ailanthus present should also be treated.

Stand 4: Non forested – 2.6 acres

This stand is technically classed as “non forested” but is a formerly open wildlife area that is transitioning to a young forest. It is in the southwestern tip of the tract and is surrounded by the formerly described planted Virginia pine. Historically, this whole section of the ridgetop was cleared for agriculture and later planted to pine, with some of that area either cleared or maintained as a semi-permanent wildlife opening. Since the maintenance of these wildlife openings across the forest was ceased almost 30 years ago, these areas are now growing back to early successional hardwoods.

This small stand is dominated with submerchantable and pole sized yellow-poplar with some white ash and northern red oak mixed in, as well as some Virginia pine from the neighboring stand. There were no merchantable trees tallied in this stand during the inventory. The desired future condition of this area would be either to include it as part of a regeneration opening along with the adjacent Virginia pine during a timber sale, and potentially to be used as a log yard location. Or the area could be allowed to continue to grow into a mature hardwood stand as it currently is doing. Some TSI could be accomplished in this area to favor the oaks, and the better-quality stems of other species, as well as control any invasive species establishing in the area.

The current forest resource inventory was completed in July 2023 by Wayne Werne. A summary of the estimated tract inventory results is in the table below.

Tract Summary Data (trees >11”DBH):

Species	# Sawtimber Trees	Total Bd. Ft.
American beech	33	4,950
Bitternut hickory	21	1,760
Black cherry	54	2,640
Blackgum	55	5,610
Black oak	540	194,480
Chestnut oak	307	48,620
Chinkapain oak	66	8,470
Eastern redcedar	1932	106,040
Northern red oak	463	135,190
Pignut hickory	876	123,860
Sassafras	21	2,640
Scarlet oak	4	2,200
Shagbark hickory	101	12,320
Shumard oak	24	7,590
Sugar maple	408	40,040
Sycamore	7	2,640
White ash	107	25,740
White oak	1010	339,360
Yellow-poplar	538	95,480
Total:	6567	1,158,630

Summary Tract Silvicultural Prescription and Proposed Activities

Since the last harvest in this stand was 32 years ago, and because it also currently contains a high volume of both harvestable material and residual growing stock, the recommendation would be to rank this stand as a medium to high priority for conducting a harvest. Due to the current condition of the stand, an improvement harvest is recommended and could be undertaken as early as this year. Overall tract volume would be reduced 35-50% depending on whether the cedar component is included in a hardwood timber sale or not. A marked sale in this tract would produce an approximate total volume of between 350,000 to 450,000 board feet of hardwood and 50,000 to 100,000 board feet of cedar if it were included.

Utilizing numbers from the last inventory in 2010, this tract has shown a very high growth rate of

approximately 340 board feet per acre per year over the last 13 years, indicating its productivity potential. With the application of the proposed management, this tract should continue to exhibit high and potentially greater growth and productivity by favoring the healthiest and best quality trees for a residual stand, while removing the declining trees.

Most of the tract would probably be harvested under a single tree selection routine with larger group or patch cut openings targeting groups of low-grade trees or multiple large trees growing together. The old field cedar areas would be harvested under a group selection or shelterwood to remove the cedar and encourage the hardwoods. When possible, selection should also favor releasing future crop trees. The residual stand should be heavier to white oak, with a lesser component of other oak and hickory species, as well as mesophytic species. Application of a prescribed burn would help reduce the shade tolerant under and midstories present, and aid in regenerating and recruiting the more fire tolerant oaks and hickories.

Post harvest TSI should be performed to eliminate any residual marked cull or small pole-sized trees not cut during the harvest, as well as thin where necessary, complete any regeneration openings, and treat the understory to eliminate shade tolerant species in favor of oaks in areas where regeneration is present and other more desirable species. Any ailanthus present should also be treated.

Due to the proximity and similar stand types, this harvest could occur at the same time as tract 6342309 and possibly 6342307. This would minimize entry into the area for management activities to ensure the least effect on recreation, wildlife, hydrology, and other concerns mentioned in this plan.

Management activities will not intentionally remove snags, with a few exceptions of large recently dead trees or storm damage when possible, so the timber sale will not negatively impact that component significantly. Creation of more snags in this size class could be undertaken by girdling large cull trees in a post-harvest TSI operation.

Additionally, management activities involving a timber sale should not affect this habitat long-term from the perspective of any wildlife utilizing it due to the maintenance of a forested habitat on the tract. There may be some conversion of cedar or the old field area to temporarily open areas that will be allowed to succeed into native hardwoods, and this would change the character of the tract over time but will not change it permanently to a non-forested cover type. Creation of regeneration openings and/or conversion of portions of the old field area into openings will create early successional habitat that will be beneficial to certain groups of wildlife dependent upon this habitat. Likely, early successional habitat created with such management will also benefit a wider segment of wildlife species that preferentially utilize such habitat for feeding and cover more so than later successional stage habitat.

Since this tract does not border a major stream, there should be no disruption of any potential travel corridors by forest management activities. The habitat on this tract in the context of the surrounding landscape does not represent any special component that would be used more preferentially or exclusively by wildlife for traveling or dispersion, as riparian habitat might be, or as forest in a non-forested landscape might be. The small ponds found nearby on neighboring

tracts would provide a valuable water source for wildlife during dry periods, and also represent good habitat for reptiles and especially amphibians.

Since this tract represents a component of contiguous forest, it is possible that forest management activities might disrupt any forest interior species by creating edge habitat for generalist species to “invade” the area. This would possibly occur if regeneration openings were put in place that offered a habitat preferred by such generalist species which might move in and start using such habitat. In the context of the surrounding landscape, this tract represents a large chunk of forest in a matrix of surrounding forest land.

BMP will be followed throughout the harvest to ensure any management activities impact to soils is limited. Soil disturbance will largely be confined to the log yard and main skid trails. The BMPs will also ensure water quality is not permanently affected, and implementation of these BMPs will be contractually required of loggers.

Snags and coarse woody debris will remain at viable levels for wildlife after harvest and the harvest will not adversely affect the wildlife.

During the harvest, part of the Adventure trail would have to be shut down. However, under current restrictions, this closure would only occur from November 16th to April 1st and would not affect most of the spring, summer, and fall recreation. Hunting opportunities should be improved by the maintenance of early successional habitat and the recruitment of hard mast producers such as oak and hickory which provide food sources for a wide variety of native wildlife.

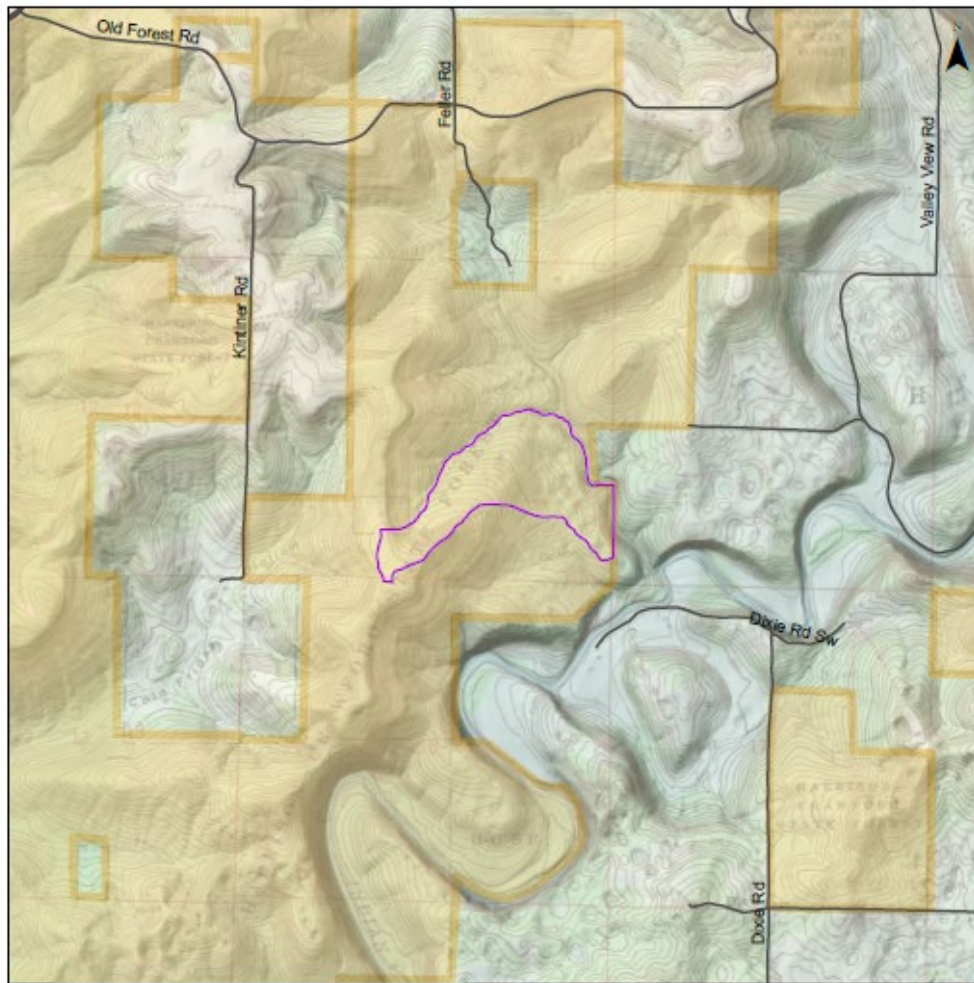
Once the harvest is complete, post-harvest TSI should be conducted and then the stand should be revisited for regeneration opening and post-harvest checks in 3-5 years to ensure proper regeneration and growth is occurring. In about 20 years, the stand should be revisited for another inventory and a new management guide can be created.

Proposed Activities Listing

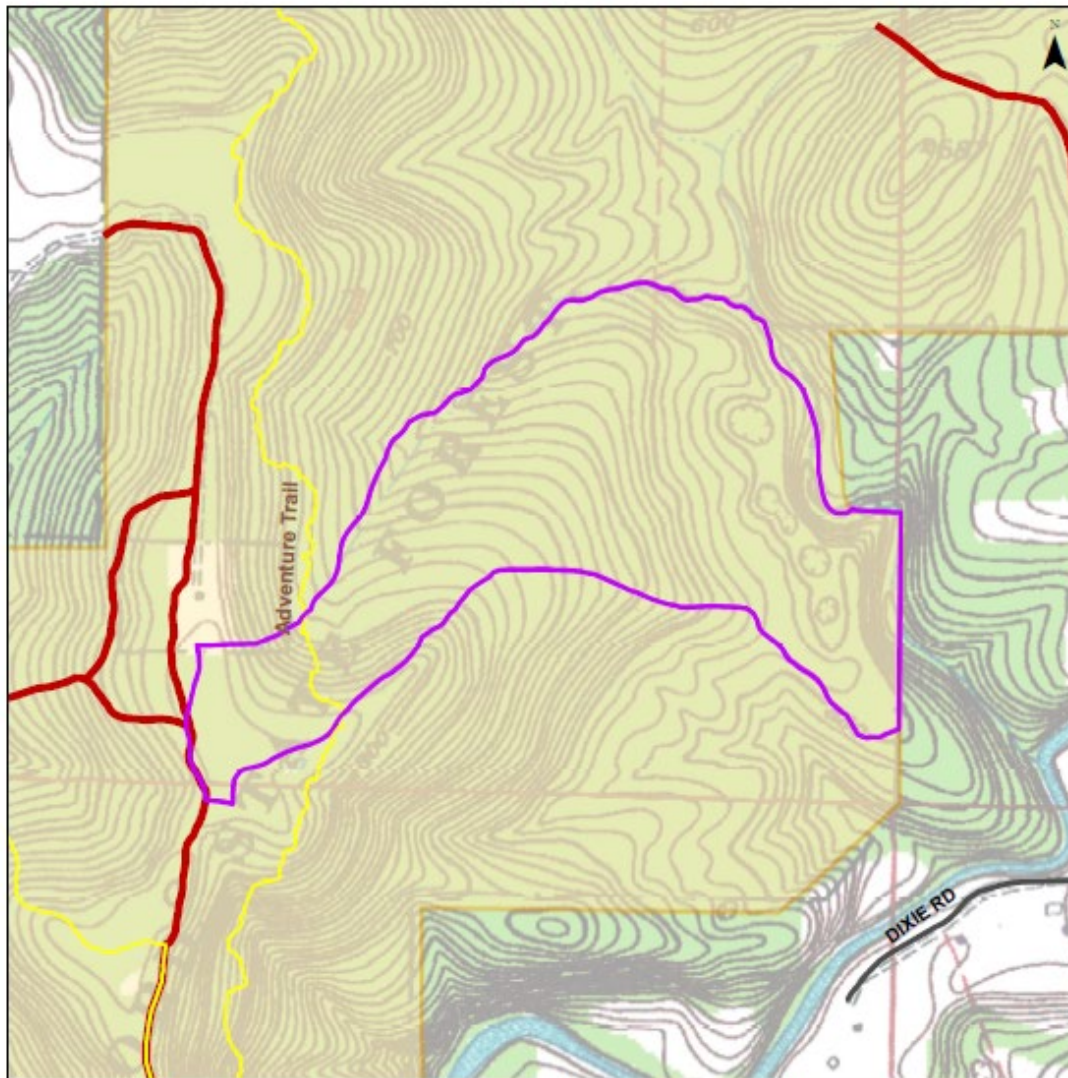
<i>Proposed Management Activity</i>	<i>Proposed Date</i>
Management Guide	2023
Mark Harvest	2023-2025
Sell Timber	2024-2025
Possible prescribed burn	2024-2025
Post harvest TSI	2025-2026
Monitor regeneration openings	Three to five years after harvest
Re-Inventory	2043
Write new Management Plan	2043

Maps

Harrison-Crawford State Forest Location Map Compartment 23 Tract 10



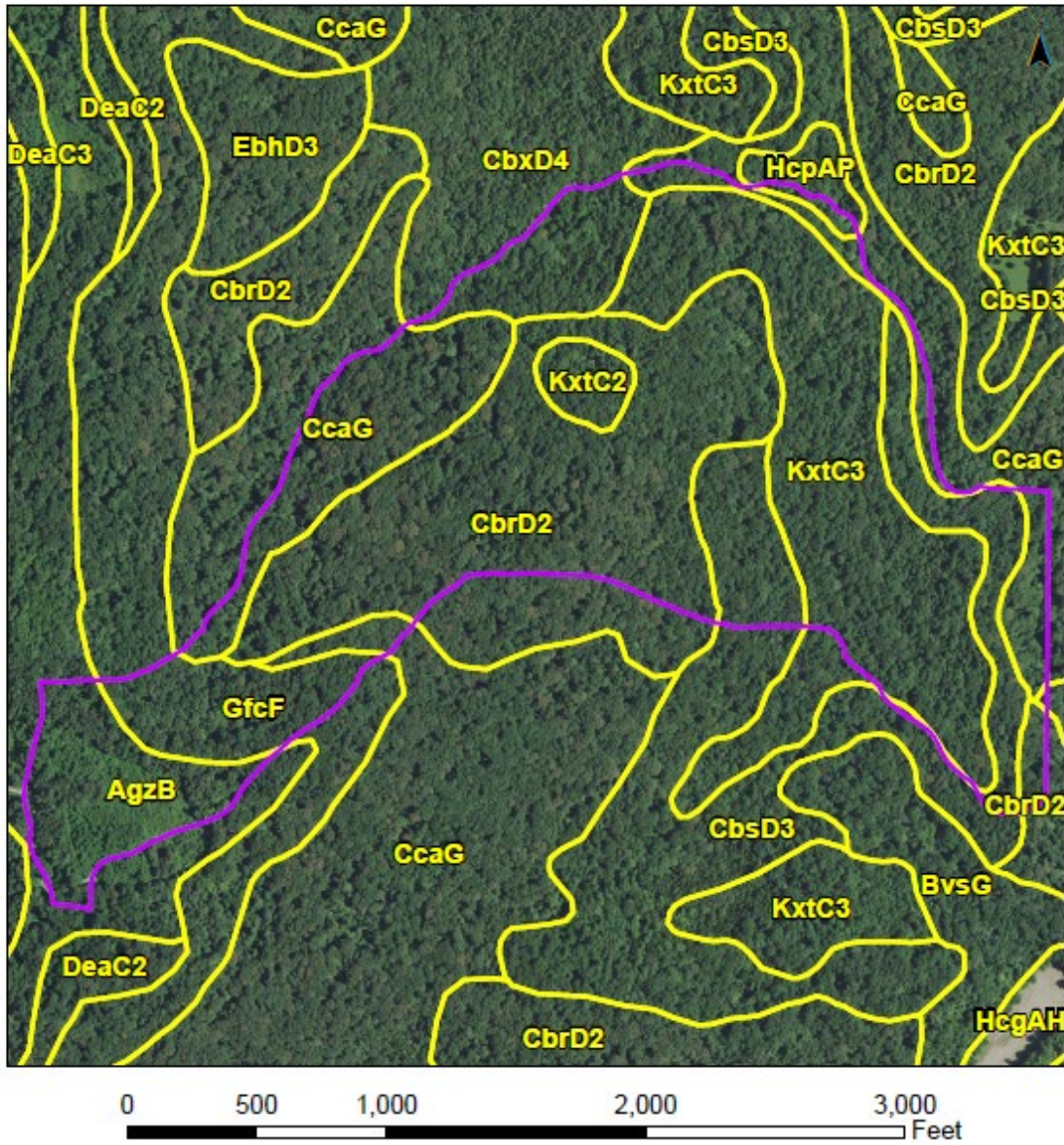
Harrison-Crawford State Forest
Compartment 23 Tract 10
Tract Map



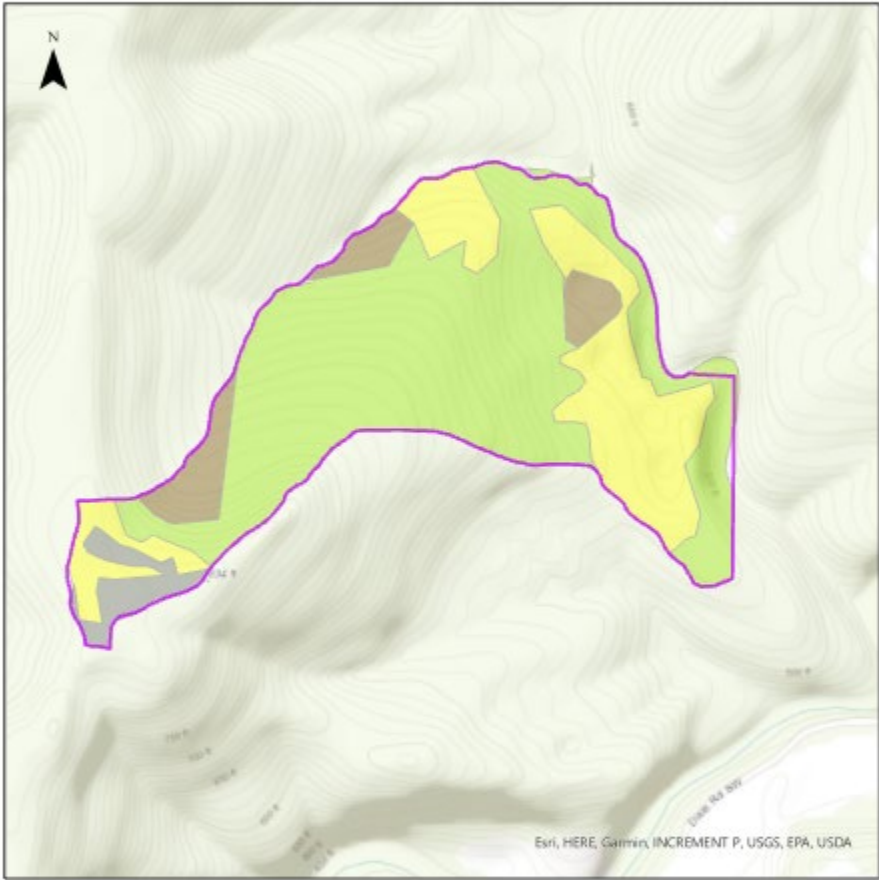
0 0.25 0.5
Miles

- Recreation Trail
- Fire Lane
- Tract boundary
- State Forest

Harrison-Crawford State Forest Compartment 23 Tract 10 Soils Map



Harrison-Crawford State Forest
Compartment 23 Tract 10
Cover Types Map



- Cover Types
- Mesic Oak-Hickory
 - Mixed Hardwoods
 - Conifer
 - Non-forest

**Harrison-Crawford State Forest
Compartment 23 Tract 9
Resource Management Guide (repost)
November 7, 2023**

This Harrison-Crawford State Forest RMG was previously posted for a 30-day public comment period. Because 5 or more years has elapsed since the last comment period with no prescribed management activities initiated, the original RMG is being reposted for public comment. The tract has been reviewed and any amendments to the original RMG addressed below.

Link to original RMG:

https://www.in.gov/dnr/forestry/files/fo-HCSF_C23T9_02132014.pdf

Compartment 23 Tract 9 (repost)

Identified as 6342309 https://www.in.gov/dnr/forestry/files/compmaps/fo-HC_CT_Boundaries.pdf

Since the original inventory and resource management guide for this tract was completed in 2014, a reassessment was completed in anticipation of upcoming management activities. Very little has taken place to change the conditions of this tract in the ensuing years since the original guide was formulated. There has been some (but not substantial) natural mortality of standing trees dying and some windthrow mortality noted as well. The 1.1-acre wildlife opening noted in the plan located at the northwestern corner of the tract is no longer open and has grown back into an area of small early successional tree species.

One thing of note that has occurred is the decline and death of the white ash component of the tract. Although there are still some live ash trees present, the emerald ash borer (EAB) has moved through the general area and has caused many of the ash trees present to decline or die. Smaller regenerating ash all seem unaffected as of yet due to size and lack of preference by the EAB, but most larger trees have been affected. There are some scattered trees around the forest that might show some resistance to EAB because they still have full live crowns while other surrounding ash have been killed by EAB.

On this tract, that mortality would have resulted in a decrease of standing volume of white ash, which in 2014 was recorded as about 21,000 board feet total, of which 18,000 had been tallied as harvest volume, and 3,000 had been tallied as residual. Likely most of both categories of ash will be much reduced. The other impact of this mortality is that snags in larger size classes will have increased as well. Prior to the EAB killing wave, there were already sufficient numbers of snags in small size classes as recommended for habitat for use by the Indiana bat and slightly below target numbers for the largest size class, but this addition of dead ash trees will further increase those snag densities on this tract.

Another change on this tract in the last 9 years since the original inventory would be the increase in standing volume due to growth of the stand in the absence of any harvest removals. The

estimated growth rate based on previous inventories was estimated to be 120 board feet per acre per year. Using this estimation, and assuming it remained constant, this would have added about 100,000 board feet to the total volume of the tract. If one assumes all the ash from the original inventory period died, this results in an estimated overall gain of 80,000 board feet across this tract. The impact of this overall increase in volume from growth would be that the tract would possibly have a higher harvest volume once marked for a timber sale, and a higher residual volume after any such timber sale.

Additionally, the limited access noted in the 2014 plan has been improved from the south, extended the fire trail originating off Kintner Road and opening it up farther along the ridgetop to the north to directly give access to tract 6342309 on the west side of the tract. This was done in 2022 to give better timber sale access to neighboring tract 6343001.

An ecological review was completed for this amended RMG.

**Indiana Department of Natural Resources
Division of Forestry
DRAFT
RESOURCE MANAGEMENT GUIDE**

State Forest: Harrison Crawford
Forester: John Segari
Management Cycle: 20 yrs

Date: February 13, 2014
Compartment: 23 Tract: 09

INVENTORY SUMMARY

Tract Acreage: 94.8 acres
Number of Stands: 3
Permanent Openings: 1.1 acres
Average Basal Area: 97.4 sq. ft/ac

Est. Annual Growth: 120 bd. ft/ac/y
Site Index: 70-80 (for upland oaks)

Table 1. Tract 2309 Inventory Summary

Species	Harvest		Leave		Total	
	Total	Per Acre	Total	Per Acre	Total	Per Acre
White oak	48,470	485	126,090	1,261	174,560	1,746
E. redcedar	38,170	382	46,330	463	84,500	845
Yellow poplar	19,630	196	20,630	206	40,260	403
White ash	18,400	184	2,990	30	21,390	214
Pignut hickory	11,110	111	42,930	429	54,040	540
Black oak	10,410	104	54,470	545	64,880	649
N. red oak	9,940	99	50,370	504	60,310	603
Virginia pine	9,310	93	5,260	53	14,570	146
A. beech	7,900	79	5,440	54	13,340	133
Blackgum	6,110	61	1,100	11	7,210	72
Sugar maple	5,440	54	5,790	58	11,230	112
Basswood	2,760	28	0	0	2,760	28
Scarlet oak	2,100	21	0	0	2,100	21
Chinkapin oak	1,520	15	0	0	1,520	15
Sassafras	1,100	11	0	0	1,100	11
Chestnut oak	0	0	2,640	26	2,640	26
Mockernut hickory	0	0	6,000	60	6,000	60
Shagbark hickory	0	0	30,490	305	30,490	305
Total	192,370	1,924	400,530	4,005	592,900	5,929

**E. redcedar volume was calculated using a special cedar scale that counts volume in trees 6" DBH and larger, which results in high volumes for strata of small trees.*

Location

This 94.8 acre tract is located in Harrison County, Indiana between Bussabarger Rd and Kintner Rd. All of the tract is located in Section 7 of Township 4S Range 3E. The tract is located roughly 7 miles southwest of the town of Corydon, Indiana.

General Description

This tract covers 94.8 acres and includes an approximately 1.1 acre permanent wildlife opening located in the northwest corner of the tract. This tract has seen previous management in the form of a thinning in 1997. There are established skid trails and an old roadbed running down the ridge. There are three cover types in this tract including Oak Hickory, Mixed Mesic Hardwoods, and Old Field. A southeast aspect occupied by 64 acres of oak hickory cover type dominates the tract. The cover types will be described briefly below and in more detail in the Management section.

Merchantable Cover Types

Oak Hickory – 63.9 acres

This cover type comprises 64% of the tract acreage and 73% of the merchantable volume on the tract. This cover type occurs across most of the tract. It is dominated by white oak which makes up 40% of the total volume of the cover type with ~175,000 bd ft. Northern red oak and black oak are the second and third most abundant species. All oaks total about 65% of the volume of the cover type and hickories make up around 20%. The remaining 15% of the cover type consists of other hardwoods including yellow poplar, white ash, A. beech, sugar maple, blackgum, and basswood. A small amount of E. redcedar is also interspersed within the cover type.

Old Field – 30.8 acres

This cover type comprises 31% of the tract acreage and 23% of the merchantable volume on the tract. This cover type encompasses two stand types: Advanced Old Field which can be found along the western border of the tract and Old Field Cedar which is located in the northeastern corner of the tract. This cover type is predominantly E. redcedar with over 85,000 bd ft and 63% of the cover type volume. There is also over 10,000 bd ft of Virginia pine on the tract (11% of the cover type volume). Additionally the cover type includes yellow poplar, black oak, white oak (5% of cover type), white ash, N. red oak, sassafras, and blackgum.

Mixed Mesic Hardwoods – 5.8 acres

Mixed mesic hardwoods cover 6% of the tract acreage which can be found along the drainage which is the southern boundary of the tract. A mere 4% of the merchantable volume on the tract can be attributed to this cover type. Yellow poplar (21% of the cover type volume), A. beech (19%), sugar maple (16%), and N. red oak (12%) make up majority of the volume within the cover type. Other species present include mockernut hickory, black oak, pignut hickory, and black gum.

History

This tract is comprised of 5 main different acquisitions. The initial acquisition was sold by James B. Brewster on November 28, 1934 for \$3,950 (deed 31-0027-30). Then on December 19, 1935 James and Isabell Whitworth sold 174 acres for \$1,000 (deed 31-0038-30), part of which is in the tract. August 18, 1939 M. H. and Elizabeth R. Wilbur sold 120 acres for \$1.00 (31-0071-30), which makes up the northeast corner of the tract. February 1, 1951 William T. and Ruth Alice Pinaire sold 16 acres for \$112 (deed 31-0103-30) which lies along the southern border of the tract. Finally on August 23, 2007 Thomas L. Shields III sold the final piece of the tract which was 12.5 acres to the state for \$21,000 (31-0219-30). There are two other acquisitions which have corners within the tract their deed numbers are 31-0049-30 and 31-0050-30.

The 1940 aerial photograph shows the northern half of the tract was largely open at the time while the southern half was forested. The ridge top shows an open pasture and farm to the south and planted pine rows to the north.

This tract had inventories and management plans written in 1973 and 1996. In 1973, the inventory found 89 acres in the tract with only 50 being commercial forest. The remainder was old field and E. redcedar. Volume on the 50 acres of commercial forest was 1,419 bd ft allocated as 878 acceptable growing-stock and 541 unacceptable growing-stock. There was 70 sq ft of basal area. The plans called for some TSI work and recommend a harvest in 10 years. There is no record of the TSI being performed. The 1996 inventory reclassified the majority of the tract, 90 acres, as commercial and 1.1 acre in the northwest corner of the tract as an opening. The tract had 100 sq ft of basal area and had 134 ft of annual growth per acre. The volume was found to be 4,800 bd ft per acre with 3,088 acceptable and 1,712 unacceptable. The plan recommended a harvest of the upper $\frac{2}{3}$ of the slope with the lower $\frac{1}{3}$ being skipped. The 1996 plan also suggested the cedar and adjacent bottomland species would be merchantable in the next management cycle. There was no regeneration opening marked. The plan recommended focusing on regeneration during the next cycle.

On June 12, 1997 The Freeman Corporation bought 62,169 bd ft for \$17,402 (28 cents a foot) all of which came off of 50 acres within 2309. The sale number was 6349704. The top contributing species to the sale volume were white oak with 24,900 bd ft (40% of total volume) and black oak with 20,259 bd ft (33%).

Landscape Context

The dominant land use within a 5 mile radius is a mixture of forests, residential areas, and hayfields. The natural community classification of this tract is a combination of Dry-Mesic upland forest and Mesic Upland forest with the mesic upland forest type being found in the drainages. Both communities are abundant in the area.

Topography

This tract is dominated by a southeast facing slope formed by ridges on the west and north sides. Internal access quality is good with few rock ledges or steep areas to limit movement. The

northwest corner of the tract is a semi-flat ridge top where there has historically been a wildlife opening. This opening follows the ridge top and extends onto the adjoining tract, 2307.

Soils

The soils in any forested area are highly variable and those in areas of large topographic relief such as southern Indiana are even more so. The following soils describe the majority of those found in the tract.

CbxD4- Caneyville-Haggatt silty clay loams, 6 to 15 percent slopes, karst, rolling, very severely eroded, very rocky

This gentle to moderately sloping, deep, well drained complex is found on shoulders and side slopes in the uplands and around sinkholes. It is suited to trees. Caneyville has a site index of 71 for black oak and 64 for white oak and Haggatt has a site index of 86 for yellow poplar and 68 for white oak.

CcaG- Caneyville-Rock outcrop complex, 25 to 60 percent slopes

This steep to very steep, somewhat deep, well drained complex is found on side slopes in the uplands. It is suited to trees. Erosion hazards and equipment limitations are main management concerns that should be considered during sale planning and implementation of Best Management Practices for Water Quality. Caneyville has a site index of 71 for black oak and 64 for white oak.

GfcF- Gilpin-Tipsaw-Ebal complex, 18 to 35 percent slopes, stony

This moderately sloping to steep, somewhat deep, somewhat to moderately well drained complex is found on side slopes of uplands and benches. It is well suited to trees. Gilpin has a site index of 80 for northern red oak and 95 for yellow poplar, Tipsaw has a site index of 70 for black oak, and Ebal has a site index of 80 for black oak.

EbhD3- Ebal-Gilpin-Wellston silt loams, 10 to 22 percent slopes, severely eroded

This moderate to strongly sloping, deep, moderately well drained soil is found on shoulders and side slopes on uplands and benches. It is well suited to trees. Ebal had a site index of 80 for black oak, Gilpin has a site index of 95 for yellow poplar, and Wellston has a site index of 81 for northern red oak.

CbrD2-Caneyville-Haggatt-Knobcreek silt loams, 10 to 22 percent slopes, karst, hilly, eroded

This moderate to strongly sloping, deep, well drained complex is found on shoulders and side slopes in the uplands and around sinkholes. It is suited to trees. Caneyville has a site index of 71 for black oak and 64 for white oak, Haggatt has a site index of 86 for yellow poplar and 68 for white oak, and Knobcreek has a site index of 76 for northern red oak and 86 for yellow poplar.

As noted in the descriptions, most of these soils are already eroded to some extent, a relic of the land use and clearing prior to State ownership.

Hydrology

This tract drains into a mapped intermittent that in turn drains into Indian Creek. The tract also has several small karst features that do not appear to be open. The distance from Indian creek limits impact of any management to that feature, but karst features in the tract should be catalogued during marking and protected with the use of appropriate buffers as outlined in Indiana BMP manual.

Access

Access to this tract is variable. The tract is accessible from the north via the Adventure Hiking Trail by parking at the crossing of the trail and Old Forest Rd and hiking south. There is access to the south from fire trail 502 (Turkey Ridge) at the very end of Kintner Rd. Access for management is limited to this route.

If a fire trail were to be extended into tract 2309, two options exist. The road through the 2007 Shield acquisition is poorly drained and would be difficult to upgrade. To use this access would require it to be rerouted through the surrounding pines which would present further drainage issues. The other option would be to widen and improve the hillside road located just west of the Shield acquisition. This access was used prior to 2007 and would reduce the amount of work needing to be done on a poorly drained ridge top.

Boundaries

All the tract boundaries are internal boundaries. Different drainages form the northern boundary with tract 2307, the southern boundary with tract 2310, and the eastern boundary with tracts 2306 and 2308. The western boundary with tract 3001 is the road through the 2007 Shield acquisition.

The Penaire deed (31-0103-30) references a stone planted in the ground at the section center. This stone was not observed during the inventory. Effort should be made to relocate the stone.

Wildlife

This tract represents typical upland forest habitat, in addition to a component of old field successional habitat, with cedar and smaller hardwoods there is open grass, pine, and mature hardwoods. Consequently, it likely receives use from a typical assemblage of common game and nongame wildlife species such as white-tailed deer, wild turkey, squirrels, songbirds, snakes, box turtles, and others. Hard mast food sources are provided by the oak hickory stratum, but another habitat component would come from the old field cedar stratum. This stratum provides more dense cover for bedding areas, especially during the winter months. The cedar especially might provide cover from snow or ice, as well as roosting areas for turkeys and other birds.

Snags were tallied in this inventory for potential uses by wildlife. The following tables summarize guidelines and actual data with regard to the Indiana bat habitat features. Numbers below include only the species and genera “that collectively include the overwhelming majority of maternal roosts”.

Guidelines for preferred density of live and dead trees for use by Indiana bat:

# of live trees	Guidelines Maintenance	Tract 2309 actual present	
11"+ DBH class	900	3434	
20" DBH and greater	300	630	

# snags	Guidelines Maintenance	Guidelines optimal	Tract 2309 actual
5" + DBH class	400	700	1604
9"+ DBH class	300	600	372
19" DBH and greater	50	100	38

These numbers show that both live tree densities as well as snag densities meet guidelines on this tract except in the snag 19"+ DBH class.

Rare, Threatened, and Endangered Species

A Natural Heritage Database Review is part of the management planning process. If Rare, Threatened or Endangered species were identified for in the area, the activities prescribed in this guide will be conducted in a manner that will not threaten the viability of those species.

Exotic Species

Ailanthus altissima, tree of heaven or ailanthus, was found in a few small openings. The ailanthus should be spot treated prior to any harvesting that would cause disturbance or open the canopy.

Rosa multiflora, multiflora rose, were found on the edges of the wildlife opening in the northwest corner of the tract. The multiflora rose patches should either be treated or managed as part of the maintenance of the wildlife opening.

Microstegium vimineum, Japanese stiltgrass, is probably also found along the drainages, fire trails, old logging trails, and old road beds within the tract. Problem occurrences of stiltgrass should be controlled.

All the above are common invasive plants which are widespread throughout the county.

Recreation

This tract currently receives a variety of recreational uses. Hunting is a common occurrence in the tract. Additionally, the Adventure Hiking Trail follows the upper slopes of the tract. The trail is blocked in places by fallen trees as a result of natural mortality. The corridor of the trail should be reopened to reduce the occurrence of trail braiding. Historically, the Turkey Ridge trail followed the ridge top. It was noted at some point that the trail crossed private property, the

Shield property, and it was rerouted. The Shield property was acquired in 2007 and the trail again follows the ridgetop.

Cultural Resources

Cultural resources may be present, but their location(s) are protected. Adverse impacts to significant cultural resources will be avoided during management or construction activities.

MANAGEMENT PRESCRIPTION

Stratum 1: Oak Hickory

Current condition:

This cover type is found on the upland and upper slopes of the tract and comprises 64% of the area and 73% of the sawtimber volume of the tract. This cover type is dominated by medium to large sawtimber white, black, and red oak with pignut hickory. The inventory is summarized in Table 3 with species composition detailed in Table 4.

Table 3. Oak Hickory Inventory Summary

STRATUM: Oak Hickory		ACREAGE: 63.9	
	CUT (bd ft)	LEAVE (bd ft)	TOTAL (bd ft)
Volume/acre	2,089	4,952	7,041
Volume total	133,696	316,928	450,624
Basal area/acre	39	62	101
Trees/acre	46	100	146

Table 4. Oak Hickory Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (Bd ft/ac)
American beech	97	0	97
Basswood	46	0	46
Blackgum	63	0	63
Black oak	174	704	878
Chestnut oak	0	44	44
Chinkapin oak	25	0	25
Eastern redcedar	42	0	42
Mockernut hickory	0	38	38
Northern red oak	166	717	883
Pignut hickory	185	665	850
Scarlet oak	35	0	35
Shagbark hickory	0	508	508
Sugar maple	0	78	78

White ash	255	50	305
White oak	780	2012	2,792
Yellow poplar	221	136	357
TOTAL	2,089	4,952	7,041

Oak Hickory Desired future condition:

The objective of this stratum is to provide for multiple economic and ecological services specifically a quality hardwood timber stratum, dominated by oak and hickory, while providing hard mast and early to mid-seral habitat for wildlife and providing a natural filter for the Indian Creek Watershed.

Oak Hickory Silvicultural Prescription:

In order to meet the desired future condition, a harvest is recommended. Oaks and hickories are not only the best species for supplying hard mast but are also the best quality timber group that is occurring in this cover type. According to the inventory data, approximately 2,089 bd ft/ac was tallied for potential removal. Most of this would be removed under a single tree selection routine with larger regeneration openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees. The residual stratum should be slightly heavier to white oak, with a lesser component of other oak and hickory species, as well as a minor component of mesophytic species. This provides a stratum of longer-lived higher-quality white oak that allows for more management options into the future. Openings created by group selection areas will be used to ensure the supply of oak into the future as well as maintain the presence of early seral habitat. Openings should be large enough to achieve regeneration of desirable species and should coincide with the release of advance regeneration when possible.

Uneven aged management requires that trees in all size classes be removed during harvesting to ensure regeneration. Given that many of these will be un-merchantable, post-harvest TSI will be needed to ensure that poorly-formed, low-quality trees are removed and treat the understory to eliminate shade tolerant species in favor of oaks and other more desirable species. The girdling of large cull trees will also help to replace snags as well as increase the downed woody material present and provide invertebrate and small vertebrate habitat.

Stratum 2: Old Field

Current Condition:

This cover type is found on the toe-slopes and comprises 31% of the area and 23% of the sawtimber volume. This cover type is dominated by small to medium E. redcedar. The inventory is summarized in Table 5 with species composition detailed in Table 6. Much of the area has little potential for management at the current time due to a lack of topsoil. The ground

cover throughout many areas is moss hummocks on top of clay. The edges of the area have good hardwoods established.

Table 5. Old Field Stratum Inventory Summary

STRATUM: Old Field		ACREAGE: 30.8	
	CUT (bd ft)	LEAVE (bd ft)	TOTAL (bd ft)
Volume/acre	848	936	1,784
Volume total	18,656	20,592	55,304
Basal area/acre	41	43	85
Trees/acre	131	204	336

Table 6. Old Field Stratum Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (bd ft/ac)
Blackgum	0	38	38
Black oak	0	311	311
Eastern redcedar	1,248	1,622	2,870
Northern red oak	0	91	91
Sassafras	38	0	38
Virginia pine	326	184	510
White ash	109	0	109
White oak	58	189	247
Yellow poplar	222	140	362
TOTAL	2,001	2575	4,576

Old Field Desired Future Condition:

The objective of this stratum is to convert to native hardwood species while providing continued filtration for the Indian Creek watershed.

Old Field Silvicultural Prescription:

In order to meet the desired future condition, a limited harvest is recommended. The areas of little to no topsoil should be avoided due to very high potential for erosion. The areas of hardwoods should be thinned to release and encourage those of future quality. The cedar areas adjacent to the hardwoods have larger cedar for potential removal to allow hardwood regeneration to become established.

Stratum 3: Mixed Mesic Hardwoods

Current Condition:

This cover type is found in the drainages and comprises 6% of the area and 4% of the volume. This cover type is dominated by medium to large sawtimber yellow poplar, sugar maple, and American beech. The inventory is summarized in Table 7 with species composition detailed in

Table 8. This stratum is certainly a more productive cover type than the oak-hickory. This stratum is limited in distribution but provides a buffer for the mapped intermittent on the southern boundary of the tract.

Table 7. Mixed Mesic Hardwoods Inventory Summary

STRATUM: Mixed Mesic-Hardwoods	ACREAGE: 5		
	CUT (bd ft)	LEAVE (bd ft)	TOTAL (bd ft)
Volume/acre	1,149	3,486	4,635
Volume total	5,745	17,430	23,175
Basal area/acre	28	55	83
Trees/acre	64	97	160

Table 8. Mixed Mesic Hardwoods Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (bd ft/ac)
American beech	240	634	874
Blackgum	275	0	275
Black oak	0	390	390
Mockernut hickory	0	438	438
Northern red oak	0	553	553
Pignut hickory	0	349	349
Sugar maple	634	128	762
Yellow poplar	0	994	994
TOTAL	1,149	3,486	4,635

Mixed Mesic Hardwoods Desired Future Condition:

The objective of this stratum is to provide for multiple economic and ecological services specifically a quality hardwood timber stratum, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife and providing a natural filter for the Indian Creek watershed.

Mixed Mesic Hardwoods Silvicultural Prescription:

In order to meet the desired future condition, a light thinning is recommended. As this site is more productive than the oak-hickory type discussed above, attempting to manage for oak would not be practical. More appropriate would be to manage for a mixture of mesic species such as poplar, sugar maple, and beech while maintaining the less tolerant oaks and hickories since these are the best quality timber group that is appropriate to this site. According to the inventory data, approximately 1,149 bd ft/ac was tallied for potential removal. This would retain approximately 3,500 bd ft/ac on the residual stratum.

Most of this would be removed under a single tree selection routine with larger group openings targeting groups of low-grade trees or multiple large trees growing together. However, multiple tree selection should be used to encourage higher stem quality in saplings by releasing better

formed individuals of desirable species. When possible, selection should also favor releasing future crop trees. The residual stratum should be slightly heavier to yellow poplar, with a lesser component of sugar maple and white oak, as well as a minor component of other oak species.

TRACT SUMMARY

Summary of silviculture throughout the tract:

Due to the current condition of the stratum, a medium level improvement harvest is prescribed. This is accomplished by a combination of crop tree release, cull removal, and converting the old field area into a hardwood stratum by removing the cedar. This would produce a sale volume of approximately 158 MBF or about 1580 board feet per acre across the tract and leave about 325,930 board feet or 4,130 board feet per acre. Per acre, removals will be higher on the harvested acres. It is recommended that Timber Stand Improvement (TSI) be undertaken in this tract after the harvest to accomplish a variety of tasks, including completion of any marked openings and control of ailanthus.

Effect of Prescription on Tract properties:

Landscape: Landscape forest patterns will remain similar to the current situation due to this tract being kept in a forested condition.

Soils: The management activities prescribed in this plan should have minimal impact on soils in this tract. Some soil disturbance is likely during harvesting but this should be confined to landings and main skid trails. These areas should be properly closed out according to Indiana's BMPs to minimize the impact of management on soils.

Hydrology: Hydrology should not be permanently affected by management on this tract. Water quality and yield should not be altered if BMPs are followed during harvest. Snags and coarse woody debris should remain at viable levels in the stratum and should continue to provide valued and diverse habitat for the Indiana bat and other species. The main affect on wildlife will be the reduction of the coniferous component of the stratum. This currently provides a limited amount of thermal cover in the winter for deer and small mammals. This type of cover will be reduced within the tract. Managing to recruit newly established or released oaks and hickories will help to ensure that this important food source is available into the foreseeable future.

Wildlife Discussion from Ecological Resource Review: Additionally, management activities involving a timber harvest should not affect this habitat long-term due to the continued maintenance of a forested habitat on the tract. Creation of regeneration openings will create early successional habitat that will be beneficial to certain groups of wildlife dependent upon this habitat. Likely, early successional habitat created with such management will also benefit a wider segment of wildlife species that preferentially utilize such habitat for feeding and cover more so than later successional stage habitat.

Recreation: Given the limited amount and type of recreation that is carried out on this tract, this resource will be temporarily affected. Hunting opportunities should be improved by the maintenance of early successional habitat and the recruitment of hard mast producers such as oak and hickory to provide deer and small mammal browse. The Adventure hiking trail will have to be temporarily closed and rerouted to ensure visitor safety during the thinning operation. In the long term, recreation opportunities will remain similar to those found on the tract today.

PROPOSED ACTIVITIES LISTING

<u>Proposed Activity</u>	<u>Proposed date:</u>
Resource Management Guide	2015
Treat ailanthus	2016-18
Contact landowners for access	2016-18
Mark sale	2016-18
Sell timber	2016-18
Post harvest TSI	2019-2020
Monitor regeneration openings	2022-2025
Re-inventory	2035
Write new management plan	2035

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Harrison Crawford State Forest Management Guide- Tract 2309 Appendix 2 - Cover Type Map

