

Indiana Department of Natural Resources – Division of Forestry
Draft Resource Management Guides
Ferdinand State Forests
Document Number: HCSF 2019-1

The Indiana State Forest system consists of approximately 158,000 acres of primarily forested land. These lands are managed under the principle of multiple use-multiple benefit to provide forest conservation, goods and services for current and future generations. The management is guided by scientific principles, guiding legislation and comprehensive forest certification standards which are independently audited to help insure long term forest health, resiliency and sustainability.

For management and planning purposes each State Forest is divided into a system of compartments and tracts. In general terms compartments are 500-1,000 acres in size and their subunits (tracts) are 20-200 acres in size. Resource Management Guides (RMGs) are then developed for each tract to guide their management through a 15-25 year management period. There are approximately 1,700 tracts in the State Forest system. During annual planning efforts 50-100 tracts are reviewed and RMGs developed based on current conditions, inventories and assessments.

The RMGs for the following Compartments and Tracts contained in this document are part of tracts under review this year for **Harrison-Crawford State Forest**.

State Forest	Compartment	Tract
Harrison-Crawford	4	6
Harrison-Crawford	4	7
Harrison-Crawford	5	4
Harrison-Crawford	14	9
Harrison-Crawford	31	1

To submit a comment on this document, go to: www.in.gov/dnr/forestry/8122.htm

You must indicate the Document Number, or the State Forest Name, Compartment and Tract numbers in the “subject or file reference” line to ensure that your comment receives appropriate consideration. Comments received within 30 days of posting will be considered and review posted at www.in.gov/dnr/forestry/3634.htm

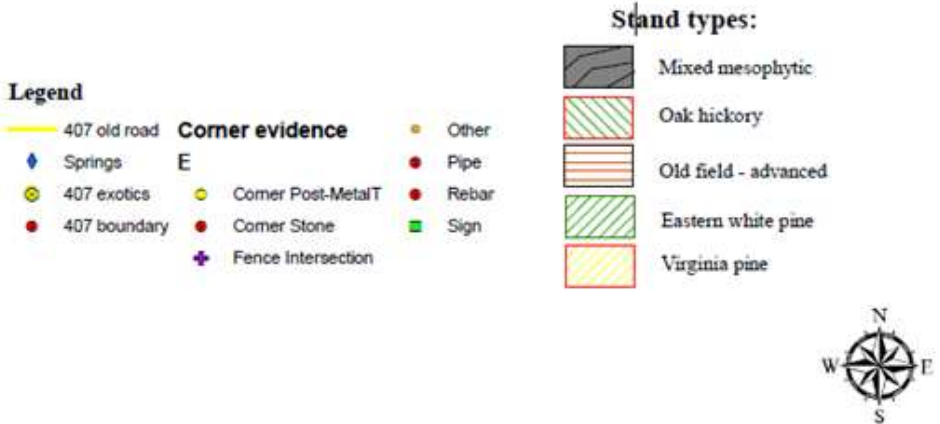
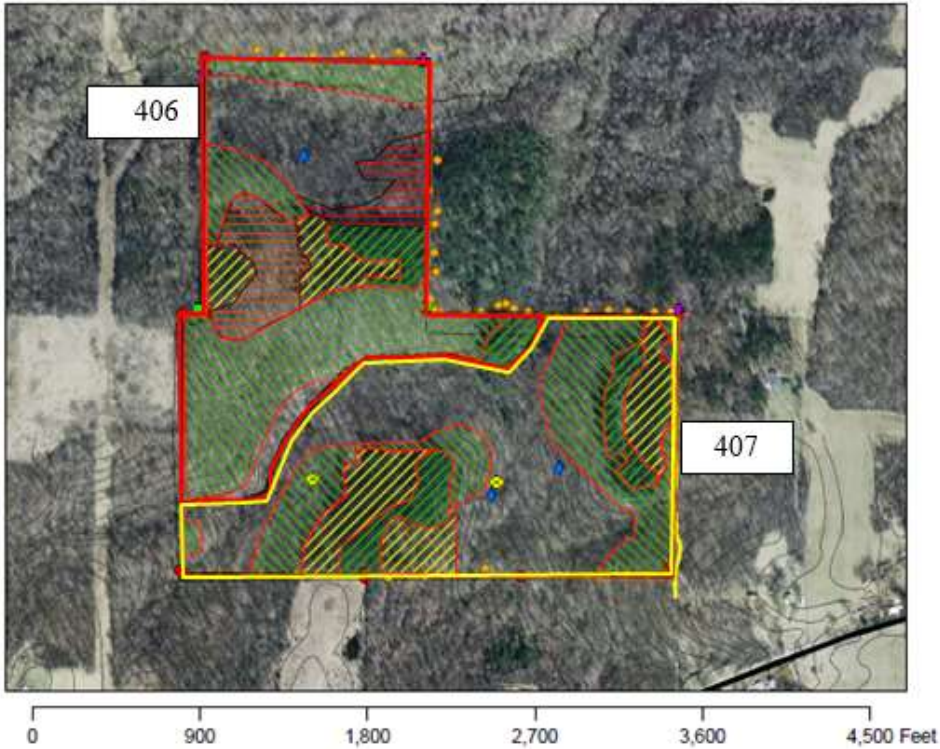
Note: Some graphics may distort due to compression.

(The currently ID'ed tract 406 had been historically ID'ed as tract 407 in the files)

Date: January 24, 2019
(Inventory - October, 2018)
Total Acreage: 59

Forester: Wayne Werne

Tracts 406 & 407



INVENTORY SUMMARY

NUMBER OF STANDS: 5 **Est. growth: 239-289 bd. ft/ac/yr***
PERMANENT OPENINGS: 0.0 ac **Est. cutting cycle: 9-11 yrs***
TOTAL ACREAGE: 59 ac
AVERAGE SITE INDEX: 70-80 (for upland oaks)
AVERAGE BASAL AREA: 146 sq. ft/ac

***Growth** is calculated in a range including and excluding pine volume which appears to have been excluded in the 1989 inventory, but taking into account the 1988 sale volume.

Tract 406 Total Volume

SPECIES	TOTAL	
	per acre	total
American beech	108	6,372
Basswood	142	8,378
Bitternut hickory	394	23,246
Black oak	2,706	159,654
Black walnut	134	7,906
Eastern white pine	1,184	69,856
Largetooth aspen	49	2,891
Mockernut hickory	105	6,195
Northern red oak	1,289	76,051
Pignut hickory	1,014	59,826
Red maple	80	4,720
Shagbark hickory	212	12,508
Sugar maple	244	14,396
Sycamore	744	43,896
Virginia pine	336	19,824
White oak	1,158	68,322
Yellow-poplar	2,741	161,719
TOTAL	12,640	745,760

STAND DETAIL

STAND 1 – Oak hickory

ACREAGE: 25.9

	<u>CUT</u>	<u>LEAVE</u>	<u>TOTAL</u>
VOLUME/ACRE:	6,256	7,969	14,225
TOTAL VOLUME:	162,000	206,400	368,400
BASAL AREA/ACRE:	68.5	63.0	131.5
# TREES/ACRE:	82	57	139

STAND 2 – Mixed mesophytic**ACREAGE: 15.4**

	CUT	LEAVE	TOTAL
VOLUME/ACRE:	5,563	6,866	12,429
TOTAL VOLUME:	85,700	105,700	191,400
BASAL AREA/ACRE:	60.0	84.8	144.8
# TREES/ACRE:	65	121	186

STAND 3 – Old field advanced**ACREAGE: 9.5**

	CUT	LEAVE	TOTAL
VOLUME/ACRE:	3,989	6,491	10,480
TOTAL VOLUME:	37,900	61,700	99,600
BASAL AREA/ACRE:	71.5	57.4	128.9
# TREES/ACRE:	147	53	200

STAND 4 – Eastern white pine**ACREAGE: 3.9**

	CUT	LEAVE	TOTAL
VOLUME/ACRE:	12,347	12,051	24,398
TOTAL VOLUME:	48,200	47,000	95,200
BASAL AREA/ACRE:	80.4	210.4	290.8
# TREES/ACRE:	208	60	268

STAND 5 – Virginia pine**ACREAGE: 4.3**

	CUT	LEAVE	TOTAL
VOLUME/ACRE:	4,172	0	4,172
TOTAL VOLUME:	17,900	0	17,900
BASAL AREA/ACRE:	142.4	0	142.4
# TREES/ACRE:	229	70	299

TRACT BOUNDARIES: This tract is an outlier piece that is far removed from the main body of the state forest. It lies west of the town of Marengo and is surrounded by private land on all but the south boundary, which is a drainage that divides it from tract 407 to the south. The west boundary has modern fencing that was recently erected. The north boundary is generally defined by an old fenceline that has some very old and fallen down barbed wire, but also some newer (but still old) metal T posts that seem to run correctly east-west. Though there is also a pipe and associated Timberlake capped survey rebar on the northwest corner that is noticeably south of where the old fence line is located – by perhaps dozens of feet. The east boundary is generally defined by very old and fallen down fencing along most of its length to a location that had an old state forest boundary sign on the ground. From here, there is an almost imperceptible old fence (defined by occasional fragments and some in trees) that goes along the north line to the east that has been used as the boundary apparently by both the state and neighboring land to the north based on evidence of past management.

The new fenceline on the west boundary seems to be very recently constructed based off of a survey. In addition to the aforementioned capped rebar on the northwest corner by the pipe, there is also a defined jog in the property line about half way down that side that is also marked by two capped survey rebars and fenceposts. The connecting fenceline to the north and south is straight as an arrow. It appears that there had been an old fenceline that had previously been used as the agreed upon boundary, but it diverged from where the new fence is now and a few large trees that now lie on the private side of the new fence have been recently cut. There was also an old state forest boundary sign found on the ground in the vicinity of the jog in the west line.

The northeast corner was defined only by a rough intersection of two old fencelines with no apparent pipe or rebar or stone. The only indication was a heavy railroad tie set as the last post in that north fenceline in the same vicinity. To the south where the line corners and goes back to the east, there was also an old state forest boundary sign found on the ground but no good evidence beyond the intersecting fencelines.

ACCESS: The access for this tract is currently in question. On paper, this tract is landlocked by private property, but there is an access lane to the southeastern corner of tract 407 to the south that may or may not be an actual county road. It is currently a private driveway that dead ends at a house, but continues as the aforementioned abandoned county road bed to the north along the eastern boundary of tract 407 and beyond. The 1989 plan refers to this road as a “public road apparently never assumed by Crawford County.” It is believed that this road bed/driveway was used as an access for the 1988 timber sale that took place in these two tracts, but no evidence of a log yard or cutoff piles exists at that location currently. Legal and forest management access needs to be clarified.

ACQUISITION HISTORY: The land that makes up tracts 406 and 407 was acquired from Joel and Nellie Mills in 1952 for a price of \$11 per acre (deed #131.168).

TRACT DESCRIPTION: This tract was divided into five stands based on cover type and past management. These stands include: oak hickory, mixed mesophytic, and old field that either succeeded naturally to hardwoods, was planted to Virginia pine in some areas, or eastern white pine in other areas. Obviously, some of this area was previously used for farming, and was not only planted to different pine species after, but has also succeeded naturally to some mixture of hardwoods in places. These stands are further described below.

Stand 1 - Oak hickory

This 26-acre stand covered about half the area, and occupied the slopes of the tract that had not been cleared for farming – mostly on the south facing slope of the main ridge of the tract.

The total volume of the stand (14,225 bd. ft/ac) is composed primarily of black oak (5639 bd. ft/ac), northern red oak (2699 bd. ft/ac), and white oak (2401 bd. ft/ac). The remaining 25% of the volume consists of pignut hickory, yellow-poplar, and various other species.

Stand 2 – Mixed mesophytic

This 15-acre stand formed about a quarter of the acreage of the tract, and was found mostly on the north slope of the main ridge down to the drainage where the land had not been heavily degraded by agricultural activities. These areas clearly had higher site productivity than some of the tract. There is a noticeable component of walnut in the valley along the northern drainage on the west side.

The total volume of the stand (12,429 bd. ft/ac) is about half composed of yellow-poplar (5713 bd. ft/ac). Sycamore (2831 bd. ft/ac) and bitternut hickory (1495 bd. ft/ac) make up an additional third of the volume. The remaining 20% of the volume consists of sugar maple, black walnut, pignut hickory, and various other species.

Stand 3 – Old field - advanced

This 10-acre stand is found on the main ridgetop and extending down the hill some distance on the east boundary. It represents areas of former agricultural activity that have grown back to a variety of early successional hardwood with some residual low quality hardwoods from the past era – possibly residual pasture trees.

The total stand volume (10,480 bd. ft/acre) is composed primarily of yellow-poplar (4534 bd. ft/acre), black oak (2095 bd. ft/acre), and pignut hickory (1650 bd. ft/acre). The remaining 20% consists of northern red oak, white oak, and largetooth aspen. Yellow-poplar is obviously the primary hardwood component that has established itself through natural succession in this stand.

Stand 4 – Eastern white pine

This 4-acre stand is found on the east side of the main ridgetop, and represents areas of former agricultural activity that were planted to pines after state acquisition. Like the Virginia pine, the white pine is stagnated from lack of thinning, but remains relatively intact with little windthrow or mortality.

The total stand volume (24,398 bd. ft/acre) is composed overwhelmingly of eastern white pine (22,494 bd. ft/acre), with the remainder being yellow-poplar (1904 bd. ft/acre). This stand has a very high stocking with a high density of tall trees. As with the Virginia pine stand, yellow-poplar is the primary hardwood component that has established itself through natural succession in the stand.

Stand 5 – Virginia pine

This 4-acre stand is also found on the main ridgetop in a couple of pockets, and represents areas of former agricultural activity that were planted to pines after state acquisition.

The total stand volume (4172 bd. ft/acre) is composed entirely of Virginia pine (3192 bd. ft/acre), yellow-poplar (605 bd. ft/acre), and red maple (375 bd. ft/acre). The Virginia pine in

this stand has not suffered the mortality and windthrow that has happened in tract 407 to the south

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

WeD3 Wellston silt loam, 12-18% slopes, severely eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

GIE2 Gilpin silt loam, 18-25% slopes, eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

WeC2 Wellston silt loam, 6-12% slopes, eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

WeC3 Wellston silt loam, 6-12% slopes, severely eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

Bu Burnside silt loam, 1-3% slopes Yellow-poplar SI is 95-105, est. growth is 375-450 bd. ft/ac/yr.

BgF Berks-Gilpin-Weikert complex, 25-75% 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 185-260 bd. ft/ac/yr. for yellow-poplar.

RECREATION: This tract is effectively a landlocked outlier surrounded by private property and has no designated trails. There are wooden ladder crossover points along the pasture fencing and several old deer stands in this tract, both indicating that the neighbors are using the tract for hunting purposes. Other than that, there is likely no recreational use by the public of this particular set of tracts.

WILDLIFE: This tract represents typical upland forest habitat, in addition to a component of some pine, and smaller early successional 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 pine stands, and denser small hardwoods. These stands provide denser cover for bedding areas, especially during the winter months.

Snags were tallied in this inventory for potential uses by wildlife. The following tables summarize guidelines and actual data with regard to the new strategy for consideration of the Indiana bat.

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

# of live trees per acre	Guidelines maintenance	Tract 406 actual present – harvest = residual
12”-18” DBH class	6	47.3 – 32.6 = 14.7
20” DBH and greater	3	21.3 - 9.2 = 12.1
Total	9	68.6 - 41.8 = 26.8

# snags per acre	Guidelines maintenance	Tract 406 actual
6” - 8” DBH class	1	10.2
10”-18” DBH class	2.5	2.7
20” DBH and greater	0.5	0.6
Total	4	13.5

These numbers show that both live tree densities as well as snag densities meet guidelines on this tract. The result for large snags is slightly high considering several other tracts on the state forest that have been inventoried seem to hover in the range of about 0.3 large snags per acre. The vast majority of snags are in the smaller size classes, which makes them less suitable for most nesting or roosting purposes, but some feeding use might be gained from them.

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 harvest 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 pine areas 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 into a permanently nonforested cover type. Creation of regeneration openings and/or conversion of portions of the pine 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.

Since this tract represents a component of contiguous forest in a mixed forest and agricultural landscape, it is possible that forest management activities might disrupt any forest interior species by creating ephemeral 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 and agricultural land.

WATERSHED / HYDROLOGY: All of this tract and the neighboring tract to the south drain into intermittent drainages that converge and eventually flow into Whiskey Run to the north. There was one spring feature that was found in the northern portion of the tract where water flows from rock outcroppings.

Although much of Harrison Crawford State Forest is underlain with karst topography and the associated caves and sinkholes, this tract lies outside most of the karst plain and did not seem to have any caves or open sinkholes. The underlying geology seems to be more sandstone rather than limestone, which explains the lack of karst.

HISTORICAL AND CULTURAL:

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

RARE, THREATENED, OR ENDANGERED SPECIES: A Natural Heritage Database review was completed for this tract. If Rare, Threatened or Endangered species (RTE’s) 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.

EXOTICS: There was very little in the way of exotics found on this tract – no ailanthus was noted. There was some spreading areas of stilt grass within the tract along the drainages. The stilt grass is hard to eliminate, and it is likely that the seed has spread out into the woods in places, and this would be less feasible to control. There are also some areas of multiflora rose in places – especially in the old field stand – and this would be difficult to eradicate by spraying.

SILVICULTURAL HISTORY AND PRESCRIPTION:

General: Utilizing records of the past history of this tract, there was an inventory done in late 1988/early 1989 that showed there to be 5173 total board feet per acre, but that inventory seems to have excluded pine (or possibly it was not merchantable at that time).

In late 1988, there was a timber sale marked and sold that encompassed some of this tract and most of the neighboring tract 407 to the south. This removed 72,300 board feet – mostly northern red oak, black oak, yellow-poplar, and white oak – from tract 406. There is a note in the file that TSI was set up to be performed in 1992.

The 2018 inventory shows between 11,120 (no pine) and 12,640 board feet per acre, and this figures out to a growth rate in the range of 239-289 board feet per acre per year, after dividing the difference by 30 years of growth since the last inventory and accounting for the volume removed in the 1989 sale. This growth rate is very high, and seems accurate based on the size and density of the trees present on the tract.

Number of trees per acre and basal area per acre figures indicate that the hardwood stands are overstocked at between 105% to 120%. Removal of trees tallied as “cut” either via a timber sale or TSI would reduce the stocking levels to about 50-70% stocking. The pine stands are way overstocked with the white pine stand being so far that it doesn’t even register on the page. Thinning would reduce the stocking of the white pine, but the Virginia pine was tallied with the idea of liquidating it and converting the stand to hardwoods, so stocking in that stand would drop to basically zero with the indicated management.

Due to the extremely high volume being carried on the majority of the tract (12,640 bd. ft/ac or 11,120 bd. ft/ac not including pine), and the general condition of the overstory trees in the older hardwood portions of the tract, a medium to heavy level improvement harvest is prescribed and could be undertaken in this tract at any time. A harvest would produce a sale volume of between 285,000 to 340,000 board feet (including pine or not) or about 4833 to 5819 board feet per acre and leave between 400,000 to 450,000 board feet, or between 6821 to 7807 board feet per acre in the residual stand.

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. TSI of pole-size trees may be required for thinning in places, and to open up the understory for potential oak regeneration to take hold or be released. Vines did not seem to be a big problem in this tract, but need to be kept at bay with TSI activities as well. Extensive understory treatment of shade tolerant species will be necessary to encourage oak regeneration where present. Much of the TSI will be targeted at the old field areas where the composition and stocking could be improved from what currently occupies most of this area. Ailanthus needs to be monitored and eliminated when found to be present or establishing itself.

Stand 1: Oak hickory

This 26-acre stand covers about half of the tract, and occupied the more sloping ground on the south side of the ridge that had not been cleared for farming. It contains a very high volume of 14,225 board feet per acre of which 6256 was classified as harvestable and 7969 was classified as residual. This would remove 69 square feet of basal area, which would leave the residual stand with 73 sq. ft. Stocking would drop from 105% to about 50% with the indicated management.

The last harvest in this stand was undertaken 30 years ago. Given the stocking level and 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 all of stands 2 and 3, with some trees from stands 4 and 5 if pine was to be included. Half the harvest volume for stand 1 (6256 bd. ft/ac) would be contained in black oak (3017 bd. ft/ac). Northern red oak (865 bd. ft/ac), yellow-poplar (582 bd. ft/ac), white oak (439 bd. ft/ac) and various other species would make up of the remainder of the harvest volume.

Most of the stand would be harvested under a single tree selection routine with group regeneration openings targeting aggregations of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees. The residual stand should be heavy to black and white oak, with a lesser component of other oak species, as well as mesophytic species.

Post harvest TSI should be performed to treat selected 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 in select areas to favor oak establishment. As always, any ailanthus present should also be treated and eliminated.

Stand 2: Mixed mesophytic

This 15-acre stand contains a very high volume of 12,429 board feet per acre of which 5563 was classified as harvestable and 6866 was classified as residual. This would remove 60 square feet of basal area, which would leave the residual stand with 85 sq. ft. Stocking would drop from about 120% to about 70% with the indicated management.

The last harvest in this stand was 30 years ago. Given stand conditions, stocking level and very 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 all of stands 1 and 3, with some trees from stands 4 and 5 if pine was to be included. The vast majority (85%) of the harvest volume for stand 1 (5563 bd. ft/ac) would be contained in yellow-poplar (3056 bd. ft/ac) and sycamore (1674 bd. ft/ac). The remainder would be contained in bitternut hickory, sugar maple, and American beech.

Post harvest TSI should be performed to treat selected residual cull or small pole-sized trees not cut during the harvest, as well as thin where necessary, complete any regeneration openings, and kill grapevines where present. As always, any ailanthus present should also be treated and eliminated.

Stand 3: Old field - advanced

This 10-acre stand occupies some of the ridgetop area of the tract, and contains a volume of 10,480 board feet per acre of which 3989 was classified as harvestable and 6491 was classified as residual. This would remove 72 square feet of basal area, which would leave the residual

stand with 57 sq. ft. Stocking would drop from about 110% to about 45% with the indicated management. The reduction in stocking in this stand would be because the low grade hardwoods would be targeted for removal here, and old field areas usually have a higher component of residual low grade hardwood trees from the past than naturally forested areas. Additionally, the yellow-poplar component in old field areas is usually not only low grade, but often suffering from drought stress and damage as well.

The majority (62%) of the harvest volume for stand 3 (3989 bd. ft/ac) would be contained in yellow-poplar (2157 bd. ft/ac). The remainder would be contained in white oak, pignut hickory, black oak, and largetooth aspen. This stand would be included with stands 1 and 2 as part of any hardwood sale. Ultimately, this site will completely convert to well formed hardwoods due to recovery of the site from former agricultural activities and erosion. In scattered places, there is some oak regeneration in the understory. Timber harvest and post harvest TSI should concentrate on releasing this oak regeneration – mostly with follow-up TSI.

TSI should be performed to remove any leftover competing trees and allow a new stand of poplar and oak to establish itself and grow here. As always, any ailanthus present should also be treated and eliminated.

Stand 4: Eastern white pine

This 4-acre stand occupies the eastern side of the ridgetop area of the tract, and contains an extremely high volume of 24,398 board feet per acre of which 12,437 was classified as harvestable and 12,051 was classified as residual. This would remove 80 square feet of basal area, but would still leave the residual stand with 210 sq. ft. Both pre and post management stocking levels would be extremely high – off the charts.

The entirety of the harvest volume for stand 4 (12,347 bd. ft/ac) would be contained in eastern white pine. This stand could possibly be included with stand 5 as a separate pine sale, or it could be included with stands 1, 2, and 3 as part of the hardwood sale. There is a definite component of yellow-poplar in this stand, but the overwhelming component is eastern white pine. This stand was tallied with the idea of maintaining the pine stand, but with a heavy component of thinning to release the better trees. TSI should be performed to remove any leftover competing trees. Alternatively, the entire stand could be liquidated to convert it to hardwoods and provide an incentive to cut the pine at all by making it more logistically feasible to harvest it all without trying to thin it.

Stand 5: Virginia pine

This 4-acre stand occupies the central and western tip of the ridgetop area of the tract, and contains a volume of 4172 board feet per acre, which was all tallied as harvest volume. This would remove all 142 square feet of basal area as well. Since this stand consisted primarily of Virginia pine and low grade hardwoods, it was tallied with the idea of regenerating the site to a stand of native hardwoods.

The entirety of the harvest volume for stand 1 (4172 bd. ft/ac) would be contained in Virginia pine (3192 bd. ft/ac), yellow-poplar (605 bd. ft/ac), and red maple (375 bd. ft/ac). This stand could possibly be included with stand 4 as a separate pine sale, or it could be included with stands 1, 2, and 3 as part of the hardwood sale. Ultimately, this site will completely convert to hardwoods due to recovery of the site from former agricultural activities and erosion.

In scattered places, there is some oak regeneration in the understory. Timber harvest and post harvest TSI should concentrate on releasing this oak regeneration – mostly with follow-up TSI. TSI should be performed to remove any leftover competing trees and allow a new stand of poplar and oak to establish itself and grow here.

PROPOSED ACTIVITIES LISTING

Fall 2018	Field inventory
2019	Write management plan
2020	Mark timber sale
2020 / 2021	Sell timber sale
2022 / 2023	Post harvest TSI and regeneration check
2032	Recon & monitor for exotics
2037 / 2038	Inventory for next management cycle

STATE FOREST: Harrison Crawford

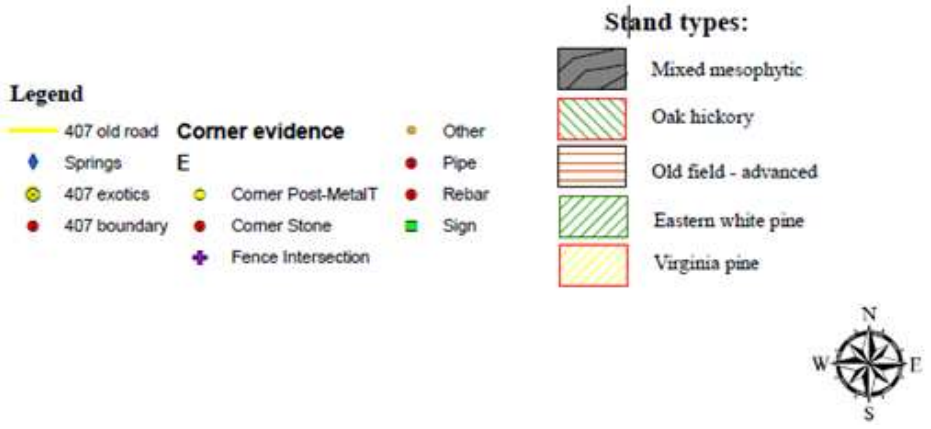
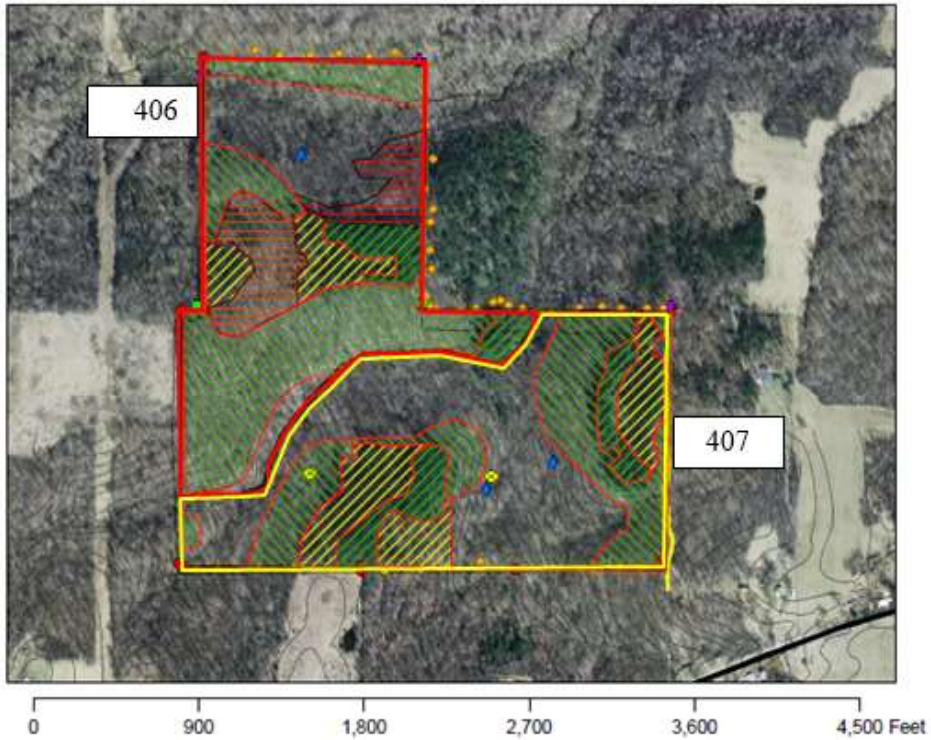
COMPARTMENT: 04 TRACT: 07

(The currently ID'ed tract 407 had been historically ID'ed as tract 406 in the files)

Date: December 31, 2018
(Inventory - October, 2018)
Total Acreage: 63 ac

Forester: Wayne Werne

Tracts 406 & 407



INVENTORY SUMMARY

NUMBER OF STANDS: 4 **Est. growth:** 167-223 bd. ft/ac/yr*
PERMANENT OPENINGS: 0.0 ac **Est. cutting cycle:** 11-15 yrs*
TOTAL ACREAGE: 63 ac
AVERAGE SITE INDEX: 70-80 (for upland oaks)
AVERAGE BASAL AREA: 120 sq. ft/ac

***Growth** is calculated in a range including and excluding pine volume which appears to have been excluded in the 1989 inventory, but taking into account the 1988 sale volume.

Tract 407 Total Volume

SPECIES	TOTAL	
	per acre	total
American beech	143	9,009
Bitternut hickory	205	12,915
Blackgum	20	1,260
Black oak	1,082	68,166
Black walnut	61	3,843
Chinkapin oak	137	8,631
Eastern white pine	1,449	91,287
Northern red oak	657	41,391
Pignut hickory	530	33,390
Sassafras	36	2,268
Shagbark hickory	46	2,898
Sugar maple	625	39,375
Sycamore	380	23,940
Virginia pine	224	14,112
White oak	1,339	84,357
Yellow-poplar	3,009	189,567
TOTAL	9,943	626,409

STAND DETAIL

STAND 1 – Mixed mesophytic

ACREAGE: 29.8

	CUT	LEAVE	TOTAL
VOLUME/ACRE:	3,216	6,065	9,281
TOTAL VOLUME:	95,800	180,700	276,600
BASAL AREA/ACRE:	46.4	58.9	105.3
# TREES/ACRE:	83	80	163

STAND 2 – Oak hickory**ACREAGE: 17.5**

	CUT	LEAVE	TOTAL
VOLUME/ACRE:	3,570	8,240	11,810
TOTAL VOLUME:	62,500	144,200	206,700
BASAL AREA/ACRE:	44.0	78.9	122.9
# TREES/ACRE:	82	81	163

STAND 3 – Virginia pine**ACREAGE: 10.3**

	CUT	LEAVE	TOTAL
VOLUME/ACRE:	4,619	578	5,197
TOTAL VOLUME:	47,600	6,000	53,600
BASAL AREA/ACRE:	121.7	11.3	133.0
# TREES/ACRE:	210	41	251

STAND 4 – Eastern white pine**ACREAGE: 5.4**

	CUT	LEAVE	TOTAL
VOLUME/ACRE:	5,326	7,738	13,064
TOTAL VOLUME:	28,800	41,800	70,600
BASAL AREA/ACRE:	101.7	80.7	182.4
# TREES/ACRE:	146	102	248

TRACT BOUNDARIES: This tract is an outlier piece that is far removed from the main body of the state forest. It lies west of the town of Marengo and is surrounded by private land on all but part of the north boundary, which is a drainage that divides it from tract 406 to the north. The west boundary has modern fencing that was recently erected. The east boundary is basically defined by an old abandoned county road bed with fencing on the state side of said roadbed. The south boundary is generally defined by very old and fallen down fencing along most of its length.

Additionally, there is a scribed cornerstone and rebar on the southeastern corner and another scribed cornerstone with a Crawford County surveyor carsonite post on the southwestern corner. There are also two other stones that were located along this line that likely denote property corners. One is at an intersection of fences about a third of the way across the south boundary from the west, and another is in the woods along the old fallen down fence line about a third of the way across from the east.

At the northeastern corner of this tract is a large uncapped rebar sitting on the east side of the old roadbed that is presumed to be the corner. Across the road from this, (but slightly to the north of what would be the cardinal direction of west) is an old fallen down fence line that generally ran due west until reaching the next corner located on neighboring tract 406. It is obvious that the old fence line was used as the boundary as the trees are noticeably larger on the state side and smaller and more cut over to the north on the private side of the line. The large rebar at the northeastern corner is not capped with a surveyor designation and there is no stone or post at that location. If this is indeed the actual corner, it is offset 15-25 feet to the south of the above

described fence line that has been used as the boundary in the past. There is a more modern steel fence post across the road to the west from this rebar at the edge of the road, but it also does not line up in a cardinal direction, so its significance is unknown.

ACCESS: The access for this tract is currently in question. On paper, this tract is landlocked by private property, but there is an access lane to the southeastern corner that may or may not be an actual county road. It is currently a private driveway that dead ends at a house, but continues as the aforementioned abandoned county road bed to the north along the eastern boundary of this tract and beyond. The 1989 plan refers to this road as a “public road apparently never assumed by Crawford County.” It is believed that this road bed/driveway was used as an access for the 1988 timber sale that took place in this tract, but no evidence of a log yard or cutoff piles exists at that location currently. Legal and forest management access needs to be clarified.

ACQUISITION HISTORY: The land that makes up tracts 406 and 407 was acquired from Joel and Nellie Mills in 1952 for a price of \$11 per acre (deed #131.168).

TRACT DESCRIPTION: This tract was divided into four stands based on cover type and past management. These stands include: mixed mesophytic, oak hickory, and old field that was planted to Virginia pine in some areas and eastern white pine in other areas. Obviously, some of this area was previously used for farming, and was not only planted to different pine species after, but has also succeeded naturally to some mixture of hardwoods in places. These stands are further described below.

Stand 1 – Mixed mesophytic

This 30-acre stand formed about half the acreage of the tract, and was found mostly along the drainages and the lower third of the slopes where they had not been heavily degraded by agricultural activities. These areas clearly had higher site productivity than some of the tract.

The total volume of the stand (9281 bd. ft/ac) is about half composed of yellow-poplar (4079 bd. ft/ac). Sugar maple (969 bd. ft/ac), eastern white pine (817 bd. ft/ac), and sycamore (697 bd. ft/ac) make up an additional quarter of the volume. The remaining 30% of the volume consists of pignut hickory, northern red oak, black oak, and various other species.

Stand 2 - Oak hickory

This 18-acre stand ranked second in land coverage, and occupied the upper slopes of the tract that had not been cleared for farming – mostly in the eastern third of the tract.

The total volume of the stand (11,810 bd. ft/ac) is composed primarily of white oak (4597 bd. ft/ac), black oak (2806 bd. ft/ac), yellow-poplar (1485 bd. ft/ac), and northern red oak (1431 bd. ft/ac). The remaining 13% of the volume consists of pignut hickory, sugar maple, and bitternut hickory.

Stand 3 – Virginia pine

This 10-acre stand is found on the eastern and southern ridgetops and represents areas of former agricultural activity that were planted to pines after state acquisition. Virginia pine is prone to stagnation and windthrow, and in a noticeable portion of the southern area, there were more Virginia pine trees on the ground than standing. As a result, a portion of this area is more successional hardwood than pine, but consisting mostly of species of low timber value, such as sassafras, red maple, and understory beech and dogwood.

The total stand volume (5197 bd. ft/acre) is composed entirely of Virginia pine (2462 bd. ft/acre), yellow-poplar (2157 bd. ft/acre), and black oak (578 bd. ft/acre). Yellow-poplar is obviously the primary hardwood component that has established itself through natural succession in this stand.

Stand 4 – Eastern white pine

This 5-acre stand is also found on the eastern and southern ridgetops, and represents areas of former agricultural activity that were planted to pines after state acquisition. Unlike the Virginia pine, the eastern white pine is still standing for the most part – but still stagnated from lack of thinning.

The total stand volume (13,064 bd. ft/acre) is composed overwhelmingly of eastern white pine (11,040 bd. ft/acre), with the remainder being yellow-poplar (2024 bd. ft/acre). This stand has a very high stocking with a high density of tall trees. As with the Virginia pine stand, yellow-poplar is the primary hardwood component that has established itself through natural succession in the stand.

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

WeD3 Wellston silt loam, 12-18% slopes, severely eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

GIE2 Gilpin silt loam, 18-25% slopes, eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

BgF Berks-Gilpin-Weikert complex, 25-75% 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 185-260 bd. ft/ac/yr. for yellow-poplar.

WeC3 Wellston silt loam, 6-12% slopes, severely eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

Bu Burnside silt loam, 1-3% slopes Yellow-poplar SI is 95-105, est. growth is 375-450 bd. ft/ac/yr.

WeD2 Wellston silt loam, 12-18% slopes, eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

TIB2Tilsit silt loam, 2-6% slopes, 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.

WeC2 Wellston silt loam, 6-12% slopes, eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

RECREATION: This tract is effectively a landlocked outlier surrounded by private property and has no designated trails. There are wooden ladder crossover points along pasture fencing and several old deer stands in this tract, both indicating that the neighbors are using the tract for hunting purposes. Other than that, there is likely no recreational use by the public of this particular set of tracts.

WILDLIFE: This tract represents typical upland forest habitat, in addition to a component of some pine, and smaller early successional 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 pine stands, and denser small hardwoods. These stands provide denser cover for bedding areas, especially during the winter months.

Snags were tallied in this inventory for potential uses by wildlife. The following tables summarize guidelines and actual data with regard to the new strategy for consideration of the Indiana bat.

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

# of live trees per acre	Guidelines maintenance	Tract 407 actual present – harvest = residual
12”-18” DBH class	6	38.2 – 19.0 = 19.2
20” DBH and greater	3	16.1 - 6.3 = 9.8
Total	9	54.3 - 25.3 = 29.0

# snags per acre	Guidelines maintenance	Tract 407 actual
6” - 8” DBH class	1	13.1
10”-18” DBH class	2.5	7.8
20” DBH and greater	0.5	1.6
Total	4	22.5

These numbers show that both live tree densities as well as snag densities meet guidelines on this tract. The result for large snags is unusually high considering several other tracts on the state forest that have been inventoried seem to hover in the range of about 0.3 large snags per acre. The vast majority of snags are in the smaller size classes, which makes them less suitable for most nesting or roosting purposes, but some feeding use might be gained from them.

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 harvest 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 pine areas 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 into a permanently nonforested cover type. Creation of regeneration openings and/or conversion of portions of the pine 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.

Since this tract represents a component of contiguous forest in a mixed forest and agricultural landscape, it is possible that forest management activities might disrupt any forest interior species by creating ephemeral 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 and agricultural land.

WATERSHED / HYDROLOGY: All of this tract and the neighboring tract to the north drain into intermittent drainages that converge and eventually flow into Whiskey Run to the north. There were a couple of spring features that were found in the eastern portion of the tract where water flows from rock outcroppings on steep slopes.

Although much of Harrison Crawford State Forest is underlain with karst topography and the associated caves and sinkholes, this tract lies outside most of the karst plain and did not seem to have any caves or open sinkholes. The underlying geology seems to be more sandstone rather than limestone, which explains the lack of karst.

HISTORICAL AND CULTURAL: Cultural resources may be present on this tract but their location(s) are protected. Adverse impacts to significant cultural resources noted will be avoided during management or construction activities.

RARE, THREATENED, OR ENDANGERED SPECIES:

A Natural Heritage Database review was completed for this tract. If Rare, Threatened or Endangered species (RTE's) 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.

EXOTICS: There were a couple of scattered ailanthus stems located in this this tract but its presence was very limited. These were GPS'ed and painted with pink, so pre-harvest treatment should be easier to be done to eliminate the established seed source.

There are also some spreading areas of stilt grass within the tract along the drainages. The stilt grass is hard to eliminate, and it is likely that the seed has spread out into the woods in places, and this would be less feasible to control. There are also some areas of multiflora rose in places – especially in the old field stand – and this would be difficult to eradicate by spraying.

SILVICULTURAL HISTORY AND PRESCRIPTION:

General: Utilizing records of the past history of this tract, there was an inventory done in late 1988/early 1989 that showed there to be 5537 total board feet per acre, but that inventory seems to have excluded pine (or possibly it was not merchantable at that time).

In late 1988, there was a timber sale marked and sold that encompassed most of this tract and some of the neighboring tract 406 to the north. This removed 144,100 board feet – mostly black oak, yellow-poplar, red oak, and white oak – from tract 407. There is a note in the file that TSI was set up to be performed in 1992.

The 2018 inventory shows between 8270 (no pine) and 9943 board feet per acre, and this figures out to a growth rate in the range of 167-223 board feet per acre per year, after dividing the difference by 30 years of growth since the last inventory and accounting for the volume removed in the 1989 sale. This growth rate is fairly high, and seems accurate based on the size and density of the trees present on the tract.

Number of trees per acre and basal area per acre figures indicate that all stands are stocked at between 90% to 140%. Removal of trees tallied as “cut” either via a timber sale or TSI would reduce the stocking levels to about 50-70% stocking with the exception of stand 3 that would be reduced to about 10% stocking due to intended liquidation of most of the Virginia pine.

Due to the amount of volume being carried on the majority of the tract (9943 bd. ft/ac or 8270 bd. ft/ac not including pine), and the general condition of the overstory trees in the older hardwood portions of the tract, a medium to heavy level improvement harvest is prescribed and could be undertaken in this tract at any time. A harvest would produce a sale volume of between 175,000 to 230,000 board feet (including pine or not) or about 2767 to 3632 board feet per acre and leave between 400,000 to 450,000 board feet plus, or between 6311 to 7176 board feet per acre.

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. TSI of pole-size trees may be required for thinning in places, and to open up the understory for potential oak regeneration to take hold or be released. Vines did not seem to be a big problem in this tract, but need to be kept at bay with TSI activities as well. Extensive understory treatment of shade tolerant species will be necessary to encourage oak regeneration where present. Much of the TSI will be targeted at the old field areas where the composition and stocking could be improved from what currently occupies most of this area. Ailanthus needs to be monitored and eliminated when found to be present or establishing itself. All ailanthus should be killed pre-harvest. There were a couple of spots of ailanthus found in this tract.

Stand 1: Mixed mesophytic

This 30-acre stand contains a very high volume of 9281 board feet per acre of which 3216 was classified as harvestable and 6065 was classified as residual. This would remove 46 square feet of basal area, which would leave the residual stand with 59 sq. ft. Stocking would drop from about 90% to about 50% with the indicated management.

The last harvest in this stand was 30 years ago. Given the stocking level and 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 all of stand 2 with some trees from stands 3 and 4 if pine was to be included. The vast majority (67%) of the harvest volume for stand 1 (3216 bd. ft/ac) would be contained in yellow-poplar (1522 bd. ft/ac) and eastern white pine (626 bd. ft/ac). The remainder would be contained in sycamore, American beech, sugar maple, and various other species.

Post harvest TSI should be performed to treat selected residual cull or small pole-sized trees not cut during the harvest, as well as thin where necessary, complete any regeneration openings, and kill grapevines where present. As always, any ailanthus present should also be treated and eliminated.

Stand 2: Oak hickory

This 18-acre stand covers about a quarter of the tract, and occupied the more sloping ground that had not been cleared for farming on the upper slopes. Mostly, this consisted of west facing slopes. It contains a very high volume of 11,810 board feet per acre of which 3570 was

classified as harvestable and 8240 was classified as residual. This would remove 44 square feet of basal area, which would leave the residual stand with 79 sq. ft. Stocking would drop from 100% to about 62% with the indicated management (fully stocked above the B-line).

The last harvest in this stand was 30 years ago. Given current stand conditions, stocking levels and 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 all of stand 1, with some trees from stands 3 and 4 if pine was to be included. The majority (78%) of the harvest volume for stand 2 (3570 bd. ft/ac) would be contained in black oak (1246 bd. ft/ac), northern red oak (774 bd. ft/ac) and yellow-poplar (748 bd. ft/ac), with white oak and pignut hickory making up of the remainder of the harvest volume.

Most of the stand would be harvested under a single tree selection routine with group regeneration openings targeting aggregations of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees. The residual stand should be very heavy to white oak, with a lesser component of other oak species, as well as mesophytic species.

Post harvest TSI should be performed to treat selected 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 in select areas favor oak establishment. As always, any ailanthus present should also be treated and eliminated.

Stand 3: Virginia pine

This 10-acre stand occupies some of the ridgetop areas of the tract, and contains a volume of 5197 board feet per acre of which 4619 was classified as harvestable and 578 was classified as residual. The prescription would remove remaining pine here as well as the low grade hardwoods. Some black oak would be left as residual, but the stand would basically be regenerated to native hardwood species.

The entirety of the harvest volume for stand 1 (4619 bd. ft/ac) would be contained in Virginia pine (2462 bd. ft/ac) and yellow-poplar (2157 bd. ft/ac). This stand could possibly be included with stand 4 as a separate pine sale, or it could be included with stands 1 and 2 as part of the hardwood sale. Ultimately, this site will completely convert to hardwoods due to recovery of the site from former agricultural activities and erosion.

Sub-merchantable size classes are dominated with red maple, sassafras, white ash, and yellow-poplar. In scattered places, there is some oak regeneration in the understory. Timber harvest and post harvest TSI should concentrate on releasing this oak regeneration – mostly with follow-up TSI.

TSI should be performed to remove any leftover competing trees and allow a new stand of poplar and oak to establish itself and grow here. As always, any ailanthus present should also be treated and eliminated.

Stand 4: Eastern white pine

This 5-acre stand occupies some of the ridgetop areas of the tract, and contains a very high volume of 13,064 board feet per acre of which 5326 was classified as harvestable and 7738 was classified as residual. This would remove 102 square feet of basal area, which would leave the residual stand with 81 sq. ft. Stocking would drop from 140% to about 67% with the indicated management (fully stocked above the B-line).

The entirety of the harvest volume for stand 4 (5326 bd. ft/ac) would be contained in eastern white pine (3302 bd. ft/ac) and yellow-poplar (2024 bd. ft/ac). This stand could possibly be included with stand 3 as a separate pine sale, or it could be included with stands 1 and 2 as part of the hardwood sale. There is a definite component of yellow-poplar in this stand, but the overwhelming component is eastern white pine. This stand was tallied with the idea of maintaining the pine stand, but with a heavy component of thinning to release the better trees. TSI should be performed to remove any leftover competing trees. As always, any ailanthus present should also be treated and eliminated.

PROPOSED ACTIVITIES LISTING

Fall 2018	Field inventory
2019	Write management plan
Summer 2019 - Fall 2019	Basal bark treat ailanthus
2020	Mark timber sale
2020 / 2021	Sell timber sale
2022 / 2023	Post harvest TSI and regeneration check
2032	Recon & monitor for exotics
2037 / 2038	Inventory for next management cycle

Date: January 20, 2016
(Inventory - August, 2015)
Total Acreage: 273.4 ac

Forester: Wayne Werne

Tract 0504

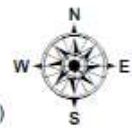


0 1,000 2,000 3,000 4,000 5,000 Feet

Legend

- 0504 yards
- 0504 wetland
- 0504 pond
- 504 boundary
- ▲ 0504 springs
- Fire trails
- Old fencing

- Stand 1: Oak hickory (132 ac)
- Stand 2: Old field advanced (109 ac)
- Stand 3: Mixed mesophytic (14 ac)
- Stand 4: Shortleaf pine (9 ac)
- Stand 5: Red / Virginia pine (9 ac)



INVENTORY SUMMARY

NUMBER OF STANDS: 5 **Est. growth: 161-176 bd. ft/ac/yr****
PERMANENT OPENINGS: 0 ac **Est. cutting cycle: 12-15 yrs**
TOTAL ACREAGE: 273.4 ac
AVERAGE SITE INDEX: 70-80 (for upland oaks)
AVERAGE BASAL AREA: 125 sq. ft/ac

**Growth was calculated by using 2015 volume minus cedar, subtracting the volume of 4576 bd ft/ac from the 1996 inventory and dividing by 19 years of growth. Cedar volume was figured using a different cedar log scale (much more volume from small trees), which was not used in 1996.

TRACT 504 TOTAL VOLUME (bd ft)

SPECIES	TOTAL	
	per acre	total
American beech	31	8,475
Bitternut hickory	13	3,554
Black cherry	25	6,835
Blackgum	13	3,554
Black oak	855	233,757
Black walnut	18	4,921
Chinkapin oak	18	4,921
<i>Eastern redcedar*</i>	282	77,099
Eastern white pine	44	12,030
Mockernut hickory	25	6,835
Northern red oak	320	87,488
Pignut hickory	538	147,089
Post oak	7	1,914
Red elm	9	2,461
Red maple	164	44,838
Red pine	54	14,764
Sassafras	10	2,734
Scarlet oak	33	9,022
Shagbark hickory	138	37,729
Shingle oak	7	1,914
Shortleaf pine	399	109,087
Sycamore	8	2,187
Sugar maple	269	73,545
Virginia pine	122	33,355
White ash	238	65,069
White oak	1,813	495,674
Yellow-poplar	1,734	474,076
TOTAL	7,187	1,964,926

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

Stand Summaries

Stand 1 – Oak Hickory

Acreage: 132.0

	<u>Cut</u>	<u>Leave</u>	<u>Total</u>
Volume/Acre:	2,329	5,638	7,967
Total Volume:	307,400	744,200	1,051,600
Basal Area/Acre:	43.1	74.3	117.4
# Trees/Acre:	62	92	154

Stand 2 – Old Field - Advanced

Acreage: 109.4

	<u>Cut</u>	<u>Leave</u>	<u>Total</u>
Volume/Acre:	3,577	2,733	6,310
Total Volume:	391,300	299,000	690,300
Basal Area/Acre:	74.5	44.3	118.8
# Trees/Acre:	126	78	204

Stand 3 – Mixed Mesophytic

Acreage: 14.3

	<u>Cut</u>	<u>Leave</u>	<u>Total</u>
Volume/Acre:	2,923	4,064	6,987
Total Volume:	41,800	58,100	99,900
Basal Area/Acre:	41.6	59.4	101.0
# Trees/Acre:	44	78	122

Stand 4 – Shortleaf Pine

Acreage: 9.1

	<u>Cut</u>	<u>Leave</u>	<u>Total</u>
Volume/Acre:	4,977	9,942	14,919
Total Volume:	45,300	90,500	135,800
Basal Area/Acre:	125.2	96.7	221.9
# Trees/Acre:	199	88	287

Stand 5 – Red/Virginia Pine

Acreage: 8.6

	<u>Cut</u>	<u>Leave</u>	<u>Total</u>
Volume/Acre:	2,618	352	2,970
Total Volume:	22,500	3,000	25,500
Basal Area/Acre:	178.8	28.0	206.8
# Trees/Acre:	339	108	447

TRACT BOUNDARIES: This tract is an outlying tract, and as such, is surrounded mostly by private property. The western boundary is formed by Whiskey Run Ranch Road as it follows the drainage down the hill to the north. The remaining boundaries on all sides are bounded by private landowners. Due to the number of adjacent ownerships, there are a number of boundary issues and/or concerns. During the running of the boundary line, there appeared to be a possible encroachment on one of the south pieces that may or may not involve a structure that is built on the property line. Additionally, the area on the south part of the eastern boundary seems to perhaps have had a timber cutting encroachment about 10 years ago, but there is no good line evidence here, so it is still unclear as to the extent of this. Refer to one of the included maps as to what evidence was found in various portions of the boundary.

ACCESS: This tract is accessed via Pilot Knob Road and then Whiskey Run Ranch Road. Near the southwestern corner of the tract, a fire trail enters the tract from Whiskey Run Ranch Road and follows the ridgetop to near the center of the tract where a log yard was previously used for the last timber sale.

ACQUISITION HISTORY: The land that makes up this tract was acquired from 3 landowners, but the bulk of the tract was primarily from Thomas and Sarah Bentley in 1953 (deed#131.189) for a price of \$15.50 per acre. The northwestern portion was acquired from Charles and Loretta Jenkins – also in 1953 (deed#131.188) – for a price of \$13.50 per acre. Finally, the smallest central western portion was acquired from Owen and Anna Byrd in 1952 (deed #131.181) for a price of \$13 per acre.

TRACT DESCRIPTION: This tract was divided into five stands based on cover type and past management. These stands include: oak hickory, old field – advanced, mixed mesophytic, shortleaf pine, and red/Virginia pine. The hardwood stands gradated into each other in places where it was hard to tell which type was the more appropriate qualifier. Obviously, much of this area was previously used for farming, and has succeeded back to various forms of hardwood and cedar, which sometimes is distinctly different and sometimes blends in with the surrounding natural hardwoods. These stands will be described in detail below.

Stand 1 - Oak hickory

This 132-acre stand covers about half of the tract acreage, and occupied the more sloping ground across all portions of the tract that had not been cleared for farming. Mostly, this consisted of the east and west facing slopes.

The total volume of the stand (7967 bd. ft/ac) is composed overwhelmingly of white oak (3991 bd. ft/ac), black oak (1118 bd. ft/ac), and pignut hickory (859 bd. ft/ac), with white oak making up fully half of the total stand volume. The remaining 25% of the volume consists of northern red oak, sugar maple, yellow-poplar, shagbark hickory, and various other species. The last timber sale in 1997 removed a lot of white oak, black oak, and poplar, while leaving white oak as the primary residual species. This has led to the current dominance of white oak in the stand over all

other species. The west facing slope in the west half of the tract currently has noticeable good quality to the white oak in the stand.

Stand 2 - Old field – advanced

This 109-acre stand is found primarily on the main central flat ridgetop in the central portion of the tract, and represents former agricultural fields that have succeeded back to a stand of mostly hardwoods with some eastern redcedar mixed in. There were a few smaller areas of this type on the hillsides as well. This stand did represent quite a hodgepodge, with some being primarily a scrubby mix of Virginia pine and red maple and low grade open grown hardwoods, some having a better stand of poplar, while some had a distinct cedar component. A lot of this area had remnant multiflora rosebush in the understory.

Overall this stand was the result of agricultural activity in the past that included plowed fields and grazed areas that either naturally succeeded back to hardwoods or were planted to various pine species that have since fallen apart due to natural mortality leading to further hardwood succession. The areas that are primarily poplar contain reasonable stands, but the other areas are less merchantable due to lack of management over many decades.

The total stand volume (6310 bd. ft/acre) is composed primarily of yellow-poplar (3042 bd. ft/acre), black oak (917 bd. ft/acre), eastern redcedar (583 bd. ft/acre), red maple (365 bd. ft/acre), and pignut hickory (353 bd. ft/acre). The remaining 15% of the volume consists of shortleaf pine, northern red oak, eastern white pine, Virginia pine, and a wide variety of 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.

Clearly yellow-poplar is the dominant volume species in this stand, and many of them look to have suffered drought and ice damage over time in addition to their old field form. These factors would lead one to prescribe a lot of these trees to be removed in any timber sale.

Stand 3 – Mixed mesophytic

This 14-acre stand was found primarily along the drainages in the southeastern portion of the tract. The total volume of the stand (6987 bd. ft/ac) is composed primarily of yellow-poplar (2759 bd. ft/ac), sugar maple (1344 bd. ft/ac), and white oak (905 bd. ft/ac). The remaining 30% of the volume consists of white ash, pignut hickory, northern red oak, and various other species.

Stand 4 – Shortleaf pine

This small 9-acre stand was found in a few locations – two along the southern boundary and one farther north in the central portion of the tract. It covers some of the former agricultural areas that were planted to pine after state acquisition in the 1950's. According to some handwritten planting records, this planting may actually be loblolly pine rather than shortleaf. That would make these stands about 60-65 years old. Unlike the other pine stands, this one has held together well and not suffered the natural mortality, wind, and ice damage that several of the other pine

species stands have. Although, due to lack of thinning over the years, it has stagnated to some extent and could benefit from thinning, as the trees show the potential to grow large in size.

The total volume of the stand (14,919 bd. ft/ac) is very high and is composed overwhelmingly of shortleaf (loblolly) pine (9268 bd. ft/ac), and yellow-poplar (5150 bd. ft/ac). The remaining 3% of the volume consists of red maple and white ash.

Stand 5 – Red/Virginia pine

This small 9-acre stand is found in the northeastern tip of the tract. Once again, it represents an area of former agricultural fields that was planted to these species of pine shortly after acquisition in the 1950's. Unlike the shortleaf/loblolly stand, these pine stands are in poor shape due to natural stagnation and mortality of the red pine and windthrow and ice damage to the Virginia pine.

The total stand volume (2970 bd. ft/acre) is composed primarily of Virginia pine (1410 bd. ft/acre) and red pine (996 bd. ft/acre). The remaining 20% of the volume consists of yellow-poplar, black cherry, and eastern redcedar. 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.

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

WeD3 Wellston silt loam, 12-18% slopes, severely eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

GIE2 Gilpin silt loam, 18-25% slopes, eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

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.

TIB2Tilsit silt loam, 2-6% slopes, 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.

WeD2 Wellston silt loam, 12-18% slopes, eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

Bu Burnside silt loam, 1-3% slopes Yellow-poplar SI is 95-105, est. growth is 375-450 bd. ft/ac/yr.

Hm Haymond silt loam Yellow-poplar SI is 95-105, est. growth is 375-450 bd. ft/ac/yr.

RECREATION: This tract is disjunct and separated from the main body of the property that forms Harrison Crawford State Forest. As such it contains no hiking or horse trails, but does receive a fair amount of use by neighbors and other hunters. By itself, it is fairly sizeable at 273 acres, so it is an attractive area for hunters to seek out. The one access road/fire trail that gives access to the property serves as an ideal conduit for people wanting to gain easy access to the interior portion. There were a number of tree stands noted in this tract indicative of the level of activity received during hunting season.

WILDLIFE: This tract represents typical upland forest habitat, in addition to a component of old field successional habitat, as well as pine and cedar stands. 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 pine and cedar stands. These stands provides denser cover for bedding areas, especially during the winter months.

Snags were tallied in this inventory for potential uses by wildlife. The following tables summarize guidelines and actual data with regard to the new strategy for consideration of the Indiana bat.

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

# of live trees per acre	Guidelines maintenance	Tract 504 actual present – harvest = residual
12”-18” DBH class	6	42.4 – 21.3 = 21.1
20” DBH and greater	3	12.6 - 5.1 = 7.5
Total	9	55.0 - 26.4 = 28.6

# snags per acre	Guidelines maintenance	Tract 504 actual
6” - 8” DBH class	1	17.8
10”-18” DBH class	2.5	7.3
20” DBH and greater	0.5	0.5
Total	4	25.6

These numbers show that both live tree densities as well as snag densities meet guidelines on this tract. The result for large snags is consistent with several other recently completed inventories on other tracts of the forest, where large snag densities are below one per acre, though the

density here is slightly higher than on other tracts where densities seem to hover at about 0.3 per acre. The vast majority of snags are in the smaller size classes, which makes them less suitable for most nesting or roosting purposes, but some feeding use might be gained from them.

Management activities will not intentionally remove snags, with a few exceptions of large recently dead trees or storm damage when possible, so any 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 harvest 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 the pine and 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 into a permanently nonforested cover type. Creation of regeneration openings and/or conversion of portions of some stands 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 and the seasonally wet area found in the central portion of the tract would provide a valuable water source for wildlife during dry periods, and also represents good habitat for reptiles and especially amphibians.

Since this tract represents a component of contiguous forest in a mixed forest and agricultural landscape, it is possible that forest management activities might disrupt any forest interior species by creating ephemeral 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 mixed forest-ag land with some residential development mixed in.

WATERSHED / HYDROLOGY: The majority of the tract contains flat ridgetops, as well as gentle to moderately steep slopes that drain into intermittent drainages that eventually drain into Slick Run Creek bordering this tract on the north. Slick Run Creek drains into the Blue River about 2 miles to the east. This area seems to be high enough in elevation that its bedrock is sandstone rather than limestone for the most part. As such, it does not contain nearly the same amount of karst topography with sinkholes and potential caves that much of the rest of the state forest does.

There are two springs located on this tract – one in the southwestern portion near the corner of the tract and one in the northeastern portion of the tract. They seem to be seasonally flowing in nature. The sinkhole spring in the northeast corner shows some evidence of water source usage by adjoining landowner. There is a small wet area in the very central portion of the tract that was evident by the red maple growing there – probably a seasonally wet area due to presence of either a fragipan or sandstone bedrock that prevents downward drainage. Finally, there is an artificially constructed wildlife pond in the southern portion where the first log yard adjacent to the fire trail is located. This was constructed by the loggers who cut the sale in 1997. These features would be buffered during management activities.

HISTORICAL AND CULTURAL:

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

RARE, THREATENED, OR ENDANGERED SPECIES:

A Natural Heritage Database review was completed for this tract. If Rare, Threatened or Endangered species (RTE's) 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.

EXOTICS: Unlike in many areas of the state forest, there did not seem to be a presence of ailanthus in this tract – none were encountered during the inventory. However, there are areas of multiflora rose present in the formerly old field areas that have now succeeded to primarily poplar and other hardwood trees. These rose areas were noted as a potential problem in the last plan from 1996. Though, since they are shaded by tree canopy, they have diminished in density.

Japanese honeysuckle is also present in some areas, though not an extreme problem. Stilt grass was not noted to be widespread, but is likely present along the roadside and any disturbed areas and will likely creep into the area via the access road.

SILVICULTURAL HISTORY AND PRESCRIPTION:

General: Utilizing records of the past history of this tract, an inventory done in 1996 indicated a total standing volume of 4576 board feet per acre. In 1997, there was a timber sale marked and sold that encompassed the natural hardwoods portion of this tract. This removed 201,600 board feet – mostly white oak, black oak, yellow-poplar, and red oak.

The 2015 inventory shows between 6905 (no cedar) and 7187 board feet per acre, and this figures out to a growth rate of between 161 to 176 board feet per acre per year, after dividing the difference by 19 years of growth since the last inventory and accounting for the timber sale removals. Cedar volume was figured using a different cedar log scale (much more volume from

small trees), which was not used in 1996, and this is why cedar volume is being excluded from growth calculations, as it was probably given marginal volume in 1996.

The growth figures are respectable considering about 40-50% of this tract is quite degraded. It is hoped and assumed that this growth rate can be increased into the future with the continued management and encouragement of vigorous and healthy crop trees, and long-term conversion of the low grade hardwood occupying the old field areas to a better crop of hardwood trees.

Number of trees per acre and basal area per acre figures indicate that the hardwood stands (1-3) are stocked at between 82% to 102%. Removal of trees tallied as “cut” either via a timber sale or TSI would reduce the stocking levels in the native hardwood stands to about 50-60% and much lower in the advanced old field stand due to creation of regeneration openings to remove the heavy presence of declining poplar as well as the cedar. The two pine stands are completely off the charts due to overstocking and removal of trees would reduce the shortleaf pine stand to about 77% stocking and much lower in the red/Virginia pine stand due to targeting for liquidation and conversion into hardwoods.

Due to the stocking levels being carried on the majority of the tract (6905 bd. ft/ac – not including cedar), and the general condition of the overstory trees in the older hardwood portions of the tract, a medium level improvement harvest is prescribed and could be undertaken in this tract at any time. This would produce a sale volume of about 650,000 board feet (not including any pine or cedar) or about 2400 board feet per acre and leave about 1,065,000 board feet of hardwood plus 78,000 board feet of cedar and 170,000 board feet of various pine species or about 3900 board feet per acre of hardwood and about 900 board feet per acre of pine and cedar (according to the cedar log scale).

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. TSI of pole-size trees may be required for thinning in places, and to open up the understory for potential oak regeneration to take hold or be released. Vines did not seem to be a big problem in this tract, but need to be kept at bay with TSI activities as well. Extensive understory treatment of shade tolerant species will be necessary to encourage oak regeneration where present. Much of the TSI will be targeted at the old field areas where the composition and stocking could be improved from what currently occupies most of this area. Ailanthus needs to be monitored and eliminated when found to be present or establishing itself.

Stand 1: Oak hickory

This 132-acre stand covers almost exactly half of the tract, and occupies the more sloping ground across all portions of the tract that had not been cleared for farming. Mostly, this consisted of the east and west facing slopes. The better timber was located on the west facing slope in the western portion of the tract – some containing an excellent white oak stand. It contains a high volume of 7967 board feet per acre of which 2329 was classified as harvestable and 5638 was classified as residual. The prescribed harvest would remove 43 square feet of basal area, which

would leave the residual stand with 74 sq. ft. Stocking would drop from 97% to about 60% with the indicated management (fully stocked above the B-line).

The last harvest covering just a portion of this stand was 20 years ago. Given the stocking level and 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 all of stands 2 and 3, with some trees from stands 4 and 5. The majority (68%) of the harvest volume for stand 1 (2329 bd. ft/ac) would be contained in white oak (861 bd. ft/ac), black oak (410 bd. ft/ac), and white ash (313 bd. ft/ac), with pignut hickory, yellow-poplar, eastern redcedar, and various other species making up of the remainder of the harvest volume.

Most of the stand would be harvested under a single tree selection routine with group regeneration openings targeting aggregations of low-grade trees or multiple large trees growing together. 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 species, as well as mesophytic species.

Post harvest TSI should be performed to treat selected 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 in select areas to favor oak establishment.

Stand 2: Old field - advanced

This 109-acre stand covers another quarter of the tract, and contains a volume of 6310 board feet per acre of which 3577 was classified as harvestable and 2733 was classified as residual. This would remove 75 square feet of basal area, which would leave the residual stand with 44 sq. ft. Stocking would drop quite significantly with the indicated management due to removal of many of the large poplars showing past ice and drought damage - in addition to all the cedar and a lot of the red maple. These figures do include cedar as figured according to the cedar log scale.

Since this stand intermingles with the more merchantable hardwood stands, it would be included along with any timber sale taking place in stands 1 and 3. The majority (81%) of the harvest volume for stand 2 (3577 bd. ft/ac) would be contained in yellow-poplar (2064 bd. ft/ac), eastern redcedar (583 bd. ft/ac), and red maple (248 bd. ft/ac), with black oak, Virginia pine, and various other species making up of the remainder of the harvest volume. Over half of the proposed harvest volume is yellow-poplar by itself, which indicates how prevalent the large declining trees are in this stand. Additionally, the next major component is represented by eastern redcedar due to use of the cedar scale. A separate cedar sale would probably have to be undertaken to achieve optimal management, as most of these cedar would be removed to encourage poplar and the oak regeneration that is usually found in the understory of such stands. Ultimately, this site will completely convert to hardwoods due to recovery of the site from former agricultural activities and erosion.

Much of this stand is dominated with sassafras, white ash, yellow-poplar, red maple, and cedar in the submerchantable to merchantable size classes. In scattered places, there is some oak regeneration in the understory. Timber harvest and post harvest TSI should concentrate on releasing this oak regeneration – mostly with follow-up TSI.

Within the cedar area TSI would remove any leftover competing trees and allow a new stand of poplar and oak to establish itself and grow here.

Stand 3: Mixed mesophytic

This 14-acre stand contains a volume of 6987 board feet per acre of which 2923 was classified as harvestable and 4064 was classified as residual. This would remove 42 square feet of basal area, which would leave the residual stand with 59 sq. ft. Stocking would drop from about 82% to about 50% with the indicated management.

The last harvest in portions of this stand was 20 years ago. Given the stocking level and 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 harvest would include this entire stand as well as all of stands 1 and 2, with some trees from stands 4 and 5. The majority (76%) of the harvest volume for stand 1 (2923 bd. ft/ac) would be contained in yellow-poplar (1388 bd. ft/ac) and white ash (838 bd. ft/ac), with sugar maple and American beech making up the remainder.

Post harvest TSI should be performed to treat selected residual cull or small pole-sized trees not cut during the harvest, as well as thin where necessary, complete any regeneration openings, and kill grapevines where present.

Stand 4: Shortleaf pine

This 9-acre stand contains a very high volume of 14,919 board feet per acre of which 4977 was classified as harvestable and 9942 was classified as residual. This would remove 125 square feet of basal area, which would leave the residual stand with 97 sq. ft. Stocking would drop from off the charts to about 78% with the indicated management.

Since this stand is very overstocked, it should receive a thinning to release the better trees. The overwhelming majority (95%) of the harvest volume for stand 4 (4977 bd. ft/ac) would be contained in shortleaf pine (3297 bd. ft/ac) and yellow-poplar (1442 bd. ft/ac) with white ash making up of the remainder of the harvest volume.

Since smaller pine thinned from larger pine in a small area is not normally considered merchantable, a traditional hardwood sale with the pine included may not be the best way to manage this stand. The options that exist would be to attempt to mark it for thinning and include it with any hardwood sale in stands 1-3, or to attempt to sell it separately to a specialty market in a separate sale, or to TSI the competing smaller trees, or finally to just regenerate the whole stand by cutting all of it. Since this species of pine has held up much better over the years than

the other pine, and is aesthetically pleasing and bordered on the south by several residences on private property, liquidating this stand would not be the first choice. It will either receive some attempt at thinning or be excluded from sale altogether with the exception of some of the hardwood trees contained therein – primarily poplar.

Red/Virginia pine

This 9-acre stand contains a volume of 2970 board feet per acre of which 2618 was classified as harvestable and 352 was classified as residual. This would remove 179 square feet of basal area, which would leave the residual stand with 28 sq. ft. Since this stand was inventoried from the perspective of liquidating the overstocked declining pine as well as the cedar and low grade hardwoods, one might consider this area as a regeneration opening. As such, stocking would drop drastically. These figures do include cedar as figured according to the cedar log scale.

If harvested, the majority (80%) of the volume would be represented by Virginia pine and red pine, with yellow-poplar, eastern redcedar, and black cherry making up the rest. Like the thinning of the shortleaf pine stand, any harvesting in this stand would be undesirable by most hardwood logging operations. Consequently, it could be marked as a regeneration opening with all interior trees available for cutting, or it could be bypassed in any hardwood sale – as it was during the last sale. Ideally though, it would be beneficial to open this area up to more sunlight for hardwood regeneration, and a separate pine/cedar “pulpwood” sale would probably have to be undertaken to achieve optimal management.

PROPOSED ACTIVITIES LISTING

2019-2021	Mark/sell/harvest timber
2020-2022	Post harvest TSI and regeneration check
2020	Recon & monitor for exotics
2025-2030	Inventory for next management cycle

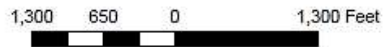
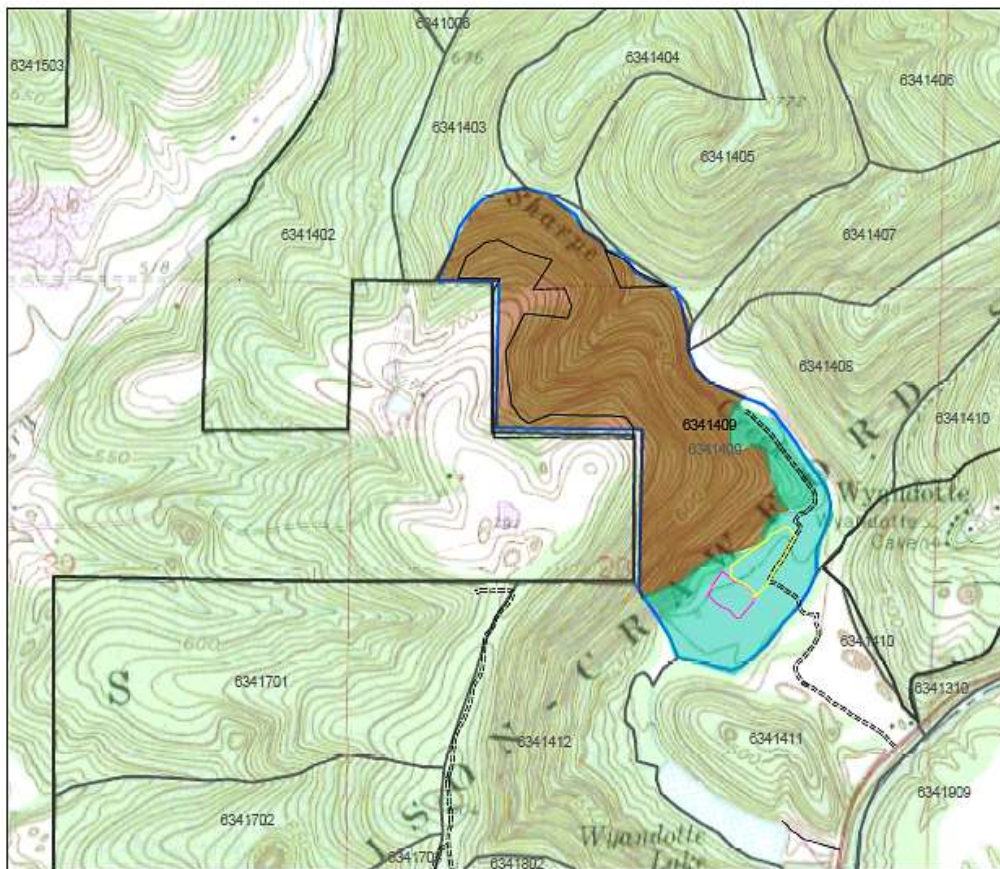
Harrison-Crawford State Forest
Forester: Dwayne Sieg
Management Cycle End Year: 2039
Tract Acreage: 152.4

Compartment 14 Tract 9
Date: January 2019
Management Cycle Length: 20 years

Location

Tract 9 is in Crawford County, mostly in Section 28, but also some in Section 21, T3S, R2E. It lies approximately 3 miles NE of Leavenworth, Indiana.

Harrison-Crawford State Forest
COVER TYPE MAP
Compartment 14 Tract 9
2019



General Description

Tract 9 contains 152.4 acres. This tract is made up of a wide variety of stand types, including species composition, tree size, age, stem quality, stocking levels, and structure. The variety is almost entirely due to past use, mostly while in private ownership. The primary cover type is oak-hickory, followed by mixed hardwoods. The tract contains former field sites, which have reforested through natural succession, but includes a few acres of planted trees. It is >95% in forest cover.

History

The entirety of this tract was purchased in December 1966 as part of the 1,174 acre parcel (that included the Wyandotte Caves) purchased from the Rothrock family. Known prior owners include Sharp and Baker. Previous use of the more gentle sloping and bottomland sites was for agriculture. Visual signs and aerial photo evidence show that much of the farmed land had been gradually abandoned. The last agricultural use would have been just prior to acquisition. Indications are that no less than 30% of the land area of this tract had, at one time, been cleared and used for farming purposes. There have been no managed harvests in this tract since State Forest acquisition. There are some areas that exhibit evidence of high grading and fire damage from many years ago. The first tract inventory was conducted in November 1973 (Winicker). That inventory showed an estimated 1,241 bd.ft./acre. At that time, the tract did not include the bottomland area at the east end (around 36 acres). No planting records have been found, but during the 1970s, autumn olive was planted for wildlife food purposes, either in the open areas of the eastern end of this tract or in the adjacent tract (C14T11). In the spring of 1984, the Division's genetic improvement program planted a 3.3 acre, 2,244 trees, 64 families, white oak progeny test in the bottomland site. That planting received periodic weed control and pruning through the following years, up until the mid 1990s. In the past 10 years, experimentation was done in this planting by Purdue University to study epicormic branching responses. Ca. 1983-84 (no records found), 2.4 acres adjacent to the white oak planting was planted into black walnut. During the late 1980s, the Division of Fish and Wildlife, (former) Forest Wildlife section, provided equipment and operator that reopened some of the naturally succeeding bottomland site for the purpose of providing permanent opening habitat for the wild turkey. During the mid to late 1990s, a couple segments of a horse trail were constructed through this tract. A second tract inventory was done in September 1998 (Hursey). This inventory showed an estimated 5,404 bd.ft./ac. with yellow poplar, white oak, sugar maple and black oak being the top 4 species in volume in that order. Sometime between these first 2 inventories, that bottomland area along the east end had been included in this tract's area. A vine control effort was done along the lower part of Sharps Creek in the early 2000s. In September 2010, a third inventory was performed (Rudolph). The results showed that white oak, yellow poplar, red oak, and black oak were the top 4 species by volume. A fourth inventory was completed in January 2019 (Sieg). This inventory shows that white oak comfortably ranks as the highest in volume, with yellow poplar, red oak, and sugar maple completing the top 4. Noteworthy is the drop of black oak to a distant 6th ranking, reflecting the local over maturity of that species, and its dropping out of the forest over time. This most recent inventory indicates that in the same area covered by the 1973 inventory there is an estimated 10,194 bd.ft. per acre, a volume increase of more than 8 fold over the past 45 growing seasons.

Landscape Context

Looking at a 5 mile zone around this tract, as much as 80% of the landscape is forested, with most of that part of the Harrison-Crawford State Forest. Additionally, O'Bannon Woods State Park is included, as are 9 dedicated Nature Preserves and Wyandotte Cave. The town of Leavenworth and the location of Carefree are within this circle. 2 industries included are Jasper Engines and Mulzer Crushed Stone. The I-64 corridor runs through this zone. The majority of the non-state ground is owned by individuals with single family homes. Residential development has seen only a slow increase in recent times. Most of the open ground is grasslands (hay, pasture, idle) and some row crops. Farming within this zone has seen a slow, but steady decline over the past few decades. The circled area includes a stretch of the Ohio River and a few miles of the lower end of the Blue River, including its confluence with the Ohio. Much of the Dry Run creek watershed lies with the zone.

Topography, Geology and Hydrology

Tract 9 contains slopes from nearly level to very steep. However, the majority of the acreage is moderately sloping. Primary aspect is north, with lesser area having an easterly aspect. The highest elevation of the tract is around 760 feet above sea level, the lowest around 420, giving an overall change in elevation of 340 feet. On the upper slopes (around 550-650 feet elevation), the bedrock is sandstone. Below that, limestone is the prevailing bedrock. Surface rock is very common throughout the tract. Outcroppings are very plentiful in the steep area of the easternmost slope. The tract is part of the Sharps Creek watershed. The name Sharps Creek is somewhat of a misnomer as the channel is dry, except a few days of the year. Sharps Creek feeds into Wyandotte Lake which then drains into the Blue River about .7 mile from tract 9.

There are a number of karst features on this tract, which will be buffered during management activities to protect those resources.

Soils

Corydon stony silt loam, 20-60% slopes (47.2 Acres)

The Corydon series consists of shallow, well drained soils that formed in as much as 20 cm (8 inches) of loess and in the underlying limestone residuum. The Corydon soils are on hills underlain with limestone. Corydon soils are on sloping to very steep hills underlain with limestone. Slope gradients are dominantly greater than 20 percent but range from 6 to 70 percent. Mainly in forest. Some less sloping areas are used for hayland or pasture. Native vegetation is mixed deciduous hardwood forest. Site Index: 71 Black Oak

Tipsaw-Adveville complex, 25-75% slopes (37.6 Acres)

The Tipsaw series consists of moderately deep, somewhat excessively drained soils. They formed in loamy residuum from sandstone with shale and siltstone. The surface is a dark grey very fine sandy loam about 2 inches thick. The subsurface horizon is also a very fine sandy loam about 3 inches thick. The subsoil is 15 inches is a fine sand loam and the last 20 inches is a loam. The bedrock consist of a weakly cemented and moderately cemented sandstone with shale,

siltstone. The mean annual precipitation is about 43 inches, and mean annual temperature is about 54 degrees F. Permeability is moderate or moderately rapid. Site Index: 70 Black Oak

Haymond (33.6 Acres)

The Haymond series consists of very deep, well drained, soils that formed in silty alluvium. These soils are on flood plains and flood-plain steps. They formed in silty alluvium washed dominantly from loess covered hills and till plains. Most areas are used to grow corn and soybeans. Some of the narrow flood plains are used for forest or pasture. The native vegetation is deciduous forest, mainly of beech, elm, hickory, hackberry, buckeye, sugar maple, oak, and sycamore. Site Index: N/A

Wellston Silt Loam (WhfC2, WhfD2, WhfD3) (23.1 Acres)

The Wellston series consists of deep or very deep, well drained soils formed in silty material from loess and from fine-grained sandstone or siltstone and with bedrock at depths of 40 to 72 inches. These soils have moderate permeability. The surface horizon is a silt loam which is 2 inches thick. The subsurface horizon is a silt loam about 8 inches thick. The first portion of the subsoil consists of 11 inches of a silt loam, the next portion consist of 4 inches of a silty clay loam. The last portion of the subsoil is one inch of a clay. The stratum is 9 inches of loam. The bedrock which is at 45 inches from the surface is an acid fine-grained sandstone. Mean annual precipitation is about 40 inches, and mean annual temperature is about 53 degrees F. Well drained. Runoff is medium to rapid. Degree Slope: 0-50% Site Index: 81 N. Red Oak

Gatchel (5.2 Acres)

The Gatchel series consists of very deep, somewhat excessively drained soils on flood plains. Slopes range from 0 to 2 percent. Gatchel soils are on narrow flood plains and alluvial fans of drainage ways that dissect steep and very steep hills. The alluvial sediments washed from areas of interbedded sandstone, siltstone and shale. Most areas are used for woodland or wildlife habitat. A few areas are used for growing corn and soybeans, or hay and pasture. Native vegetation is mixed, deciduous hardwood forest. Site Index: N/A

Haggatt silt loam (5 acres)

The Haggatt series consists of deep, well-drained soils formed in clayey residuum that can be capped with up to 51 cm (20 inches) of loess. They are on hills and in sinkholes underlain with limestone. Haggatt soils are commonly on summits, shoulders and back slopes of hills and sinkholes underlain with limestone. Slopes are typically from 6 to 25 percent, but range from 2 to 25 percent. Most areas are used for hay, pastures or are in forest. Native vegetation is deciduous hardwood forest. Site Index: 68 – White oak

Udorthents soils (.5 acre)

Moderately sloping and strongly sloping. Moderately deep and deep, well drained soils on uplands. They are in excavated areas that formerly were used as sanitary landfills. In a typical profile, the upper 40 inches is mottled gray and yellowish brown shaly silty clay loam. The underlying material is refuse. Available water capacity and permeability are generally moderate.

Surface runoff is rapid. Organic matter content is low. These soils support grasses and pines. They are generally unsuited to woodland. No woodland suitability classification is assigned.

Access

There are 3 principal ways to get to this tract. There are 2 ways coming from SR 62. Each are unimproved gated lanes, one near the intersection of Wyandotte Cave road and the highway, the other utilizes the driveway of the state owned residence near the same intersection. These 2 trails convene just east of the tract and cross Sharps Creek as it enters the tract. Beyond that, the lane again diverges, with the northern one following Sharps Creek and crossing it in multiple places. Both lanes are currently limited to access by 4WD vehicles and require frequent maintenance to make them passable, mostly from encroaching brush and limbs and movement of the stone and gravel in the creek where the trail fords. The third access is by foot, off Becker road, near the west end of the tract. A short access road to connect the tract with Becker road is recommended to be constructed for management purposes. This road would include at least one large culvert or a bridge to cross a deep drainage along its route.

Boundary

The north and east, and part of the southern boundary of this tract is Sharps Creek. There is a somewhat arbitrary northwesterly line running up the slope from the creek that meets the property line, which forms the remainder of the southern and most of the western boundary. A feeder stream that runs into Sharps Creek forms the remaining western boundary. The tract shares over $\frac{3}{4}$ mile of boundary with private property. This line has been visited on multiple occasions over the past couple years. There is a corner stone near the western end of the boundary. Much of the boundary closer to the south portion has been surveyed and marked with yellow painted T posts by the neighbor (James Lahue) in the not too distant past. There is about a $\frac{1}{4}$ mile portion of the boundary near the west part of the tract that is not obvious as to where the line would be. It is guessed that a previous owner of the adjoining property planted an old field into pine and crossed the line with the planting, as the species and size of the pine found on both sides are similar. There are short bits of old fencing in the general area of this boundary, but they appear to likely be convenience fences and not forming the line. A compass line was run through the pine in early 2018 and the results flagged. An unmarked internal corner stone (at the NE corner of the NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec. 28, T3S, R2E) was located in this tract in 2018. Boundary evidence was gps'd and stored in the property GIS.

Wildlife

Tract 9 is expected to host a typical assemblage of wildlife species found in mature upland forests in the region, including whitetail deer, box turtles, pileated woodpeckers, turkeys, gray squirrels, a variety of songbirds, gray fox, coyotes, to name a few. The predominance of oaks and hickories should provide an ample hard mast and habitat for pollinator insect species. Early succession is lacking in the tract, so species dependent on this stage of development would also be lacking. Although an invasive exotic species that should be eliminated for the overall benefit of the local environment, autumn olive does provide soft mast for wildlife, especially birds.

Guidelines for preferred live roost trees (trees/acre)

Number of live trees per acre	Guidelines Maintenance	Tract 1409 Pre Harvest	Tract 1409 Post Harvest
11-19" DBH class	9	53.3	44.3
20" + DBH class	3	13.3	10.3
Total	12	66.6	54.6

The above table shows that live tree densities both pre and post-harvest on this tract will be well within the maintenance guidelines.

Guidelines for snag tree levels (trees/acre)

Number of snags per acre	Guidelines Maintenance	Tract 1409 actual
6-8" DBH class	4	5
10-18" DBH class	3	3.4
20" + DBH class	0.5	.2
Total	7.5	8.6

This data shows that snag densities are above the maintenance level guidelines for the lower 2 diameter classes, but falls short for the largest diameter class. It is likely that additional snags will be created by harvest operations and post-harvest TSI. Management activities will not intentionally remove snags, with a few exceptions, including when a snag poses a physical hazard to field personnel.

Communities

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.

A half-acre area of a blow down (from Hurricane Ike, September 2008?) resulted in the presence of a fair amount of ailanthus coming in. They are sapling in size at this point. A brief look around failed to locate a parent tree. A much larger concern about invasives in this tract would be the pervasive presence of advanced autumn olive in the lowland area along the eastern edge of tract 9 (and adjacent tracts, there). There are areas within this part of the tract where the intensity of the shrubs have made them nearly impenetrable. A concerted effort of mechanical and chemical means would be required to control and reduce the presence of autumn olive, here. Although not nearly as common, multiflora rose is also present throughout this same area. Additionally, individual autumn olive bushes or stems are found lightly scattered throughout the tract.

Recreation

At this point in time, it is likely that hunting is the primary recreation use of tract 9. As described earlier, there is a horse trail running through the eastern side of the tract in a couple places. This trail has seen limited use in recent years. The easternmost segment is in need of repairs to the rutting present in the area approaching Sharps spring, and in general is in need of brush removal. The westernmost segment was observed in the spring of 2018 as having no use or maintenance in recent years. It is reported that subsequent to that, some work has been done through there. A very short segment of the Sharp Valley foot trail runs along the southern boundary of the tract.

Cultural

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.

Tract Subdivision Description and Silvicultural Prescription

Oak-Hickory (40 acres). This cover type is the largest one found in the tract. Primarily, it is found across the more sloping ground. Most of the type was never opened for farming, though it includes a couple smaller areas that had been tilled or pastured adjacent to the property line and furthest up hill. There were signs that small areas had once been more open and presumed pastured. There was evidence that logging had last taken place over this part of the tract as much as 80-100 years ago. Some areas still show that they had received a heavy high graded cut, with lower quality stems dominating the current sub stands. There are pockets showing lingering fire damage to stems which is typical of the property and the region. Conversely, there are areas of this type that host good quality saw timber trees. White oak is the major species, followed by yellow poplar, red, black, scarlet oaks, pignut and shagbark hickories. Only a few ash trees were observed and they were either dead or dying from the emerald ash borer that entered this property < 5 years ago. Also typical is that the understory and second story are dominated by shade tolerants, mainly sugar maple and American beech. It was noted that this undergrowth is quite heavy over much of the type, making visibility limited during the leaf on period.

The two former field sites higher on the slopes and adjacent to the property line were included in this cover type. While they were being farmed, they were actively eroding, both gully and sheet erosion. The northernmost of these fields had been abandoned by 1940 as the aerial photo shows numerous tree crowns. Currently, this site is dominated by red cedar, but succeeding into oak hickory. The other fields were abandoned before the 1958 aerial photo was taken. The middle one is largely planted pine, described earlier. The soils map shows a small area classified as an Udorthents type, which is described as being, more or less, a landfill. It is not known why it was classified as such, though a few old items of trash were observed in a gully in the area mapped as this soil. The remaining of these old field sites have progressed towards an oak-hickory type. Notably, black oak is very common, with most of these trees in the pole to small sawtimber size classes.

The overall current stocking level for this cover type has a basal area of 121 ft²/acre with 165 trees/acre. The Gingrich stocking chart indicates that the type is in the A level or overstocked. Included in this cover type is a sub unit near the eastern end that was labeled as very steep during the inventory. It is probable that these very steep areas would be deferred during a harvest as their grade and the prevalence of surface rock and outcroppings would be limiting for harvesting equipment.

A managed timber harvest is prescribed to accomplish several objectives. Including, reduce stocking to a more optimum level by removing mature, overmature, defective, and lower value trees competing with crop trees. The reduction would improve the vigor of the residual stand. There are past high-graded areas which have better site quality than what can be best utilized by the existing trees there. The group selection silviculture method is therefore prescribed to reach the desired condition of this cover type.

Mixed Hardwoods (37 acres) This type is mostly found in the lowland areas, where there had once been agricultural fields and pastures. Within the type were included a wide variety of species (21 tallied), size, quality, and stocking components. Yellow poplar, by far, is the most represented species in the sawtimber class with around 89,000 bd.ft. or 52% of the total volume. The progression of the abandonment and whether the sites succeeded naturally or were planted dictated these variations. Some of the sites that were earlier abandoned have grown into yellow poplar, with the size varying from poles to large sawtimber. The old aerial photographs show that Sharps Creek banks were narrowly lined with tree growth, even during farming days. Some of the last open ground was planted into white oak and black walnut (see earlier description). There is a band of varying widths along the lower stretch of Sharps Creek that has succeeded into a mixture of e. red cedar, sycamore, yellow poplar, and includes scattered black walnut. The latter two species contain individuals that have reached medium to large sawtimber in size. The eastern area of the mixed hardwood type is the most diverse of the tract. It also contains the most problems with vegetation. See the earlier discussion on autumn olive. The black walnut planting is suffering from an inordinate amount of grape vines that have come in. It, too has had a large influx of autumn olive and invading yellow poplar that is outgrowing the walnuts. Ironically, the autumn olive is probably helping the walnuts' growth by its nitrogen fixing qualities. The desired future condition of the mixed hardwood cover type is to provide a diverse mixture of vigorous native hardwoods, devoid of autumn olive and other exotics, and with grapevines having a minor presence.

The sawtimber size tree areas adjacent to the oak-hickory type is prescribed an improvement and thinning selection harvest. The sawtimber size tree area along Sharps Creek should have vine and autumn olive control work done, along with limited improvement harvesting. Current overall stocking level is at 84% or fully stocked. The inventory indicated that the cover type currently has a stocking level of 75% or fully stocked. Needed removals (largely TSI needs) would reduce stocking to around 51% or understocked. The white oak progeny test's management is controlled by the genetic program, who determines its needs.

Summary Tract Silvicultural Prescription and Proposed Activities

Measures to control the autumn olive in the eastern portion should be undertaken as soon as it could be logistically feasible to do so. An improvement harvest should be prepared for this tract in the next 2-3 years, with an anticipated harvest volume of 500-600MBF. This effort would start with developing an access road coming into the tract from the west. The oak- hickory type would host the majority of management, but the mixed hardwoods type has areas that should also be included to improve the composition and growing conditions there. Since a harvest in this tract would primarily be single tree selection, there will be lower amounts of disturbance to the canopy of the residual stand. Canopy gaps created will be temporary as the remaining crowns grow and fill these gaps in. Most of the tract should retain mature forested habitat characteristics and support those wildlife species using that habitat type. Regeneration openings are expected to be few, so a harvest will unlikely help the presence of the sets of animals needing early succession to thrive. A harvest should release the crowns of many hard mast trees, increasing their vigor, thus increasing their potential to produce more hard mast. Their larger, more vigorous crowns should also aide the habitat needs of the many species of moths and other insects requiring oaks and hickories. This increase in mast production would benefit game species such as squirrels, turkeys, and white tail deer, thus should be helpful to hunters seeking game. Temporary travel and foraging habitat for the Indiana bat and other bat species will be created by the harvest, with those species utilizing skid trails and canopy gaps. Release and thinning will allow residual trees with desirable bark characteristics to grow larger, faster. This increase will provide more potential trees for the Indiana bat's habitat needs. A harvest will utilize BMP standards, thus minimizing hazards to water quality and protect soils from erosion, as well as protecting any karst features that may occur within the affected area. Skid trails would be planned to minimize disturbance to the horse trail segments when crossed.

Post harvest TSI needs should focus on the completion of any regeneration openings started with the harvest. The harvest should accomplish most of the improvement needs in the single tree selection areas of the oak-hickory type. TSI efforts should include vine control throughout the lowland, former field areas, as well as crop tree

Tract Summary Data

Total Trees/Ac. = 167 Overall % Stocking = 92% (B Level-Fully stocked)
BA/A = 108.6 Ft²/Ac. Sawtimber Trees/Ac. = 59.4 Cull Trees/Ac. = 8.7 Trees/Ac.
Present Volume = 8,113 BdFt/Ac. Harvest Volume = 3,980 Bd. Ft. /Ac.
Calculated Annual Growth* = 202 Bd.Ft./Ac./Yr.

*For the same area covered by the first inventory in 1973. Current volume – initial volume ÷ # growing seasons between = Annual growth in volume.

Species/Volume Summary

Species	Total Volume (Bd.Ft.)
Yellow poplar	206,590
N. red oak	195,880
White oak**	305,000
Sugar maple	77,840
Black oak	75,900
American beech	35,550
Scarlet oak	27,890
Pignut hickory	49,310
Shumard oak	45,070
E. Redcedar	23,570
Chinquapin oak	46,580
Bitternut hickory	17,610
White ash	9,040
Shagbark hickory	52,320
Black cherry	9,000
Basswood	4,400
Red elm	3,620
American sycamore	24,940
Black walnut	15,500
Red maple	2,180
Blackgum	4,800
Mockernut hickory	3,800
Totals	1,236,390
Totals per Acre	8,110

Proposed Management Activity Proposed Date

- 2019—Initiate work to control autumn olive (include affected areas of adjoining tracts C14T8, 11, and 12, with emphasis on tract 11). Treat patch of ailanthus.
- 2019—Vine control, thinning, autumn olive control, weeding in black walnut plantation.
- 2019-20—Horse trail maintenance
- 2019-20—Improve forest access into west end of tract
- 2023—Complete first round of autumn olive control efforts.
- 2022-2024—Timber sale and harvest.
- 2024-25—Post harvest TSI.
- 2028—Return to continue needed autumn olive and other invasive controls.
- 2029—Precommercial thinning in black walnut plantation.
- 2035—Crop tree release in any regeneration openings created during harvest.
- 2039—Re-enter for management cycle activities

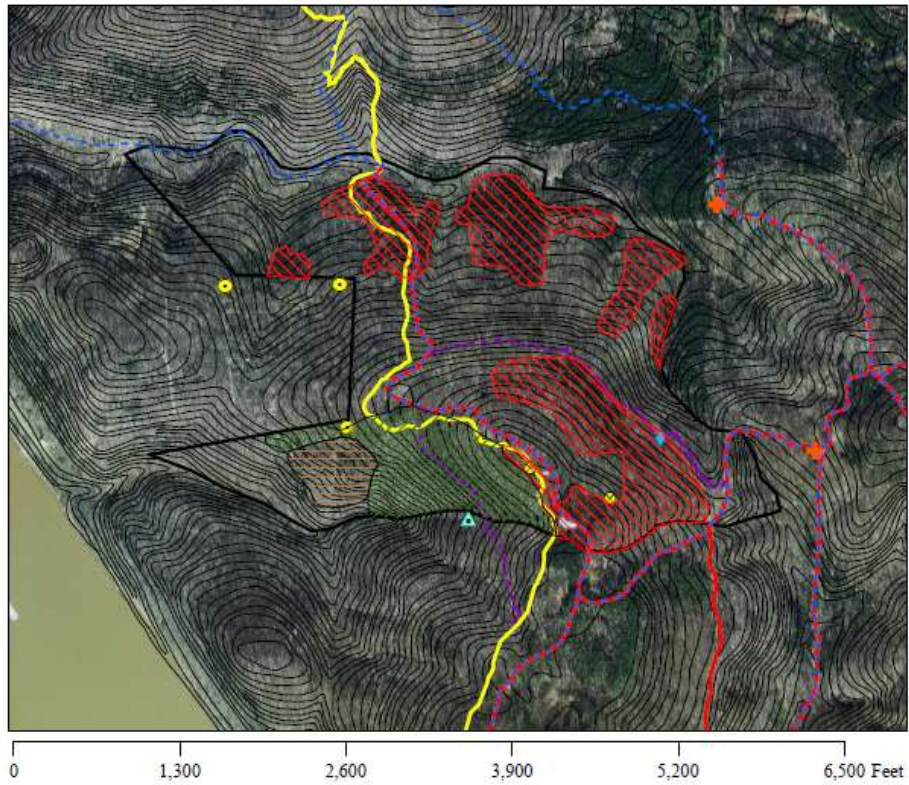
STATE FOREST: Harrison Crawford

COMPARTMENT: 31 TRACT: 01

Date: August 2016 (inventory)
August 2017 (plan draft)

Forester: Wayne Werne

Total Acreage: 215 ac



Legend

- Tract 3101
- Horse Trails
- Adventure Hiking Trail
- Fire Trails
- Illegal horse trail
- Cemetery
- 3101 exotics
- 3101 spring
- 3101 ponds
- 3101 boundary

- Stand 1 - Mixed mesophytic (129 ac)
- Stand 2 - Old field - advanced (56 ac)
- Stand 3 - Oak hickory (24 ac)
- Stand 4 - Rocky south slope (6 ac)



INVENTORY SUMMARY

NUMBER OF STANDS: 4 **Est. growth: 217-249 bd. ft/ac/yr****
PERMANENT OPENINGS: 0.8 ac **Est. cutting cycle: 10-13 yrs**
TOTAL ACREAGE: 215.0 ac
AVERAGE SITE INDEX: 75-85 (for upland oaks) & 90-100 (for poplar)
AVERAGE BASAL AREA: 126 sq. ft/ac

**Growth was calculated on the low end excluding pine and cedar volumes because cedar volume was figured using a different log scale (much more volume from small trees), which was not used in 2000.

Compartment 31 Tract 1 Total Volume

SPECIES	TOTAL	
	per acre	total
American beech	49	10,535
American elm	16	3,440
Basswood	30	6,450
Bitternut hickory	108	23,220
Black cherry	300	64,500
Blackgum	33	7,095
Black oak	85	18,275
Black walnut	65	13,975
Chinkapin oak	322	69,230
<i>Eastern redcedar*</i>	463	99,545
Hackberry	8	1,720
Honeylocust	14	3,010
Northern red oak	832	178,880
Persimmon	20	4,300
Pignut hickory	55	11,825
Post oak	11	2,365
Red elm	37	7,955
Red maple	6	1,290
Sassafras	56	12,040
Shagbark hickory	52	11,180
Shumard oak	318	68,370
Sugar maple	510	109,650
Sweetgum	20	4,300
Sycamore	80	17,200
Virginia pine	54	11,610
White ash	1,317	283,155
White oak	298	64,070
Yellow-poplar	2,815	605,225
TOTAL	7,974	1,714,410

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

STAND DETAIL

STAND 1 – Mixed mesophytic

	<u>CUT</u>	<u>LEAVE</u>	<u>TOTAL</u>
VOLUME/ACRE:	4,720	4,532	9,252
TOTAL VOLUME:	607,000	582,800	1,189,800
BASAL AREA/ACRE:	61.2	70.8	132.0
# TREES/ACRE:	64	112	176

STAND 2 – Old field - advanced

	<u>CUT</u>	<u>LEAVE</u>	<u>TOTAL</u>
VOLUME/ACRE:	3,501	2,109	5,610
TOTAL VOLUME:	194,700	117,300	312,000
BASAL AREA/ACRE:	61.4	48.0	109.4
# TREES/ACRE:	93	91	184

STAND 3 – Oak hickory

	<u>CUT</u>	<u>LEAVE</u>	<u>TOTAL</u>
VOLUME/ACRE:	2,803	3,076	5,879
TOTAL VOLUME:	66,200	72,600	138,800
BASAL AREA/ACRE:	61.2	64.1	125.3
# TREES/ACRE:	90	94	184

STAND 4 – Rocky south slope

	<u>CUT</u>	<u>LEAVE</u>	<u>TOTAL</u>
VOLUME/ACRE:	1,099	1,519	2,618
TOTAL VOLUME:	7,000	9,700	16,700
BASAL AREA/ACRE:	36.7	68.1	104.8
# TREES/ACRE:	70	144	214

TRACT BOUNDARIES: This tract is part of the main body of Harrison Crawford State Forest, and is surrounded by other state forest tracts, except on the west side, which borders private property. The north boundary is formed by Cold Friday Road, which is a slight distance uphill and beyond Cold Friday stream drainage, so there is a narrow sliver of the tract across this semi-major drainage. The east boundary is a drainage that separates tract 3101 from neighboring tract 3102. The south boundary is formed by another couple of drainages that separate this tract from tract 3103 and 3104. The smaller drainage dividing tract 3101 from 3104 is smaller and less discernible.

To the west is a chunk of private inholding. There are two scribed cornerstones that were re-located on the NE and SE corners with state property. The boundary lines in this area are at odd angles – the southern one seems to follow an old roadbed that has the same angle. The in-

holding neighbor confirmed that he had the property line surveyed, and numerous no trespassing signs were seen along its entire length. Though hard evidence beyond the stones was lacking, the north boundary had old fence and fence posts that seemed to be marking the line, and some fence was found along the western portion of the south line. It would be good to get this whole boundary line marked with more permanent posts at some point.

ACCESS: This tract borders Cold Friday Road on the north, and firetrail 308 cuts through the tract and intersects the road. However, this firetrail is more of a horse trail and probably not usable for vehicles – especially where it crosses Cold Friday hollow, as any former crossing there has been washed away to make it almost impassible by any kind of vehicle.

The alternative and more likely way to access this tract is to take firetrail 3A from the second 90 degree turn off of Cold Friday Road and follow it past Greenbrier cemetery to the top of French Hill. This gives access to the central ridgetop of tract 3101, and the fire trail that goes downhill through it to the bottom of the hill.

ACQUISITION HISTORY: The land within this tract was acquired primarily in four acquisitions. The central portion was purchased in 1934 from James Brewster (deed #131.37) for a little over \$5 an acre. The southern portion was purchased in 1939 from Joseph and Ola Pate (deed #131.50) for an unknown sum. The northwest portion was also purchased in 1939 from Jesse and Laura Gibson (deed # 131.62) for an unknown sum. The northeast corner was purchased in 1969 from Wesley and Georgia Lowe (deed # 131.216) for an a little over \$100 per acre.

TRACT DESCRIPTION: This tract was divided into four stands based on cover type and past management. These stands include: mixed mesophytic, old field – advanced, oak hickory, and rocky south slope. Most of this tract had been historically farmed or grazed to some extent, and the different portions of the formerly agricultural areas have gone through succession to varying degrees and reforested to the point where it was difficult to delineate clearly where stand boundaries were.

There were areas of natural forest that were never cleared – in the steeper areas along the drainages and also on the central portion of the north slope – that were mostly designated as mixed mesophytic. A good portion of the formerly farmed areas have transitioned enough into the same basic mixed mesophytic hardwoods that much of these areas were also classified as that same stand type – based on the fact that they were carrying a number of larger trees on many plots.

Portions of the former agricultural areas were more degraded and contained stands of eastern redcedar that grew in naturally and some other areas contained Virginia pine that was planted, but is now mostly either dead or windthrown. These portions of the former agricultural areas were designated as old field – advanced due to the fact that they generally contained a lot less

volume, smaller trees, and had a component of pine and cedar as well as smaller maple and sassafras. These areas also had a number of larger natural poplar and ash present as well.

Additionally, a more traditional oak-hickory stand was present, as well as a small area of south slopes with reduced productivity due to shallower soils and exposed rock. These stands are further described below.

Stand 1 – Mixed mesophytic

This 129-acre stand covers 60% of the area, was found generally throughout the tract and included historically forested areas as well as areas that had been used for agricultural purposes and subsequently allowed to reforest to the point that they were more similar to traditional forest cover rather than old field cover.

The total volume of the stand (9552 bd. ft/ac) is composed primarily of yellow-poplar (3423 bd. ft/ac), white ash (1662 bd. ft/ac), and northern red oak (1085 bd. ft/ac). The remaining 35% of the volume consists of sugar maple, Shumard oak, black cherry, chinkapin oak, and various other species.

Stand 2 - Old field – advanced

This 56-acre stand is found scattered in various places on the ridgetop and north slopes of the tract, and represents former agricultural fields that have succeeded back to a mixture of mostly eastern redcedar with some hardwoods and planted pine as well. Virginia pine appears to have been planted on portions of the ridgetop former agricultural field, but the vast majority is either dead or blown down. Much of this area now consists of medium sized poplar and ash and sassafras. The areas on the slopes that contain cedar must have been more severely eroded, as historical aerial photos shows a more extensively cleared area than is currently occupied by cedar. Delineation of this stand was difficult due to the transition of areas with mostly cedar and smaller poplar and ash to areas with less cedar and larger poplar and ash.

The total stand volume (5610 bd. ft/acre) is composed primarily of yellow-poplar (2271 bd. ft/acre), eastern redcedar (1403 bd. ft/acre) and white ash (558 bd. ft/acre). The remaining 25% of the volume consists of sugar maple, Virginia pine, black cherry, and various other species. It should be noted that the high volume of cedar is due to using a cedar log scale that results in a higher than Doyle volume, and includes trees down to 6” DBH as sawtimber volume.

Stand 3 - Oak hickory

This 24-acre stand covers an area on the southwestern slopes of the southwestern portion of the tract. The transition line between this stand and the mixed mesophytic stand was very closely associated with the adventure hiking trail, and this transition was fairly obvious when the topography broke over from the flatter ridgetop to the south slope.

The total volume of the stand (5879 bd. ft/ac) is composed primarily of white oak (2637 bd. ft/ac), northern red oak (784 bd. ft/ac), white ash (724 bd. ft/ac), and chinkapin oak (619 bd. ft/ac). The remaining 20% of the volume consists of yellow-poplar, blackgum, sugar maple, and post oak.

Stand 4 – Rocky south slopes

This 6-acre stand is found in a small pocket in the southwestern portion of the tract that almost didn't warrant separation into a separate stand. This was because only some of it was truly what has been classified as thin-soiled rocky south slopes in other portions of the forest, while some of it was the result of reforestation of former agricultural areas to small hardwoods.

The total stand volume (2618 bd. ft/acre) is composed primarily of chinkapin oak (909 bd. ft/acre), white ash (556 bd. ft/acre), and eastern redcedar (543 bd. ft/acre). The remaining 25% of the volume consists of northern red oak and black oak. It should be noted that the high volume of cedar is due to using a cedar log scale that results in a higher than Doyle volume, and includes trees down to 6" DBH as sawtimber volume.

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

HgD3 Hagerstown silty clay loam, 12-18% 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.

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

GIE2 Gilpin silt loam, 18-25% slopes, eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd./ft/ac/yr. for yellow-poplar.

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.

WbF Weikert-Berks channery silt loams, 35-60% slopes Virginia pine SI is 45-53, est. growth is 75-100 bd. ft/ac/yr.

Hu Huntington silt loam Yellow-poplar SI is 95-105, est. growth is 375-450 bd./ft/ac/yr. for yellow-poplar.

Hm Haymond silt loam Yellow-poplar SI is 95-105, est. growth is 375-450 bd. ft/ac/yr. for yellow-poplar.

TIB2 Tilsit silt loam, 2-6% slopes, 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.

WeD3 Wellston silt loam, 12-18% slopes, severely eroded Upland oak SI is 70-80, Yellow-poplar SI is 90-100, est. growth is 185-260 bd. ft/ac/yr. for oaks and 335-415 bd. ft/ac/yr. for yellow-poplar.

GuD5 Gilpin silt loam, 6-25% slopes, gullied Virginia pine SI is 53-72, est. growth is 100-200 bd. ft/ac/yr.

ZaD2 Zanesville silt loam, 12-18 % slopes, 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

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.

RECREATION: This tract, in conjunction with the area surrounding it, forms the largest contiguous portion of state owned land that makes up the State Forest, and as such, it probably receives a high level of recreational use. It has a horse trail and the adventure hiking trail that parallel each other down the ridge and traverse the central part of the tract from south to north. As such, it is likely that this particular tract receives a lot of recreational use from both horseback riders and hikers, as well as hunters accessing it from Cold Friday Road. There are a couple of illegal horse trails that cut across the tract that act as alternative routes between existing trails. Trail conditions in this area range from good to poor. Unauthorized and problem trail areas should be addressed through an on-going trail maintenance program.

WILDLIFE: This tract represents typical mesic upland forest habitat, in addition to a component of old field successional habitat, with cedar and pine in places. 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 this is more limited than normal since only about 10% of this tract is dominated with the oak hickory stand type. Another habitat component would come from the advanced old field stand and its cedar component. This stand provides cover and bedding areas, especially during the winter months.

Snags were tallied in this inventory for potential uses by wildlife. The following tables summarize guidelines and actual data with regard to the new strategy for consideration of the Indiana bat.

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

# of live trees per acre	Guidelines maintenance	Tract 3101 actual present – harvest = residual
12”-18” DBH class	6	48.0 – 23.1 = 24.9
20” DBH and greater	3	13.7 - 7.4 = 6.3
Total	9	61.7 - 30.5 = 31.2

# snags per acre	Guidelines maintenance	Tract 3101 actual
6” - 8” DBH class	1	21.5
10”-18” DBH class	2.5	10.4
20” DBH and greater	0.5	0.8
Total	4	32.7

These numbers show that both live tree densities as well as snag densities meet guidelines on this tract. The result for large snags is consistent with several other recently completed inventories on other tracts of the forest, where large snag densities are below one per acre, though the density here is higher than on other tracts where densities seem to hover at about 0.3 per acre. The vast majority of snags are in the smaller size classes, which makes them less suitable for most nesting or roosting purposes, but some feeding use might be gained from them.

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 below target 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 harvest 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 pine and cedar 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 into a nonforested cover type. Creation of openings and/or conversion of pine/cedar areas into openings will create early successional forest 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 perennial 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 along the ridge would provide a valuable water source for wildlife during dry periods, and also represents 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 ephemeral 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.

WATERSHED / HYDROLOGY: The majority of the tract contains gentle to moderately steep slopes that drain into intermittent drainages and Cold Friday Hollow directly, which both shortly drain into the Ohio River about 1/2 mile to the west. This area lies within a karst landscape with underground drainage, and several smaller short caves and open sinks are found scattered throughout. The ridgetop portion may be high enough in elevation that a sandstone caprock layer overlies the limestone over some of the tract.

HISTORICAL AND CULTURAL: 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.

RARE, THREATENED, OR 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.

EXOTICS: There are a few spots of ailanthus that were noted in the southern part of this tract – which is an unusually low number considering how prevalent ailanthus is in other tracts of the forest. These should be treated as soon as possible. There are also some spreading areas of stilt grass within the tract along the horse trails and where trees have blown down from recent windstorms. There is not much to be done about that without substantial cost and effort. There are also some areas of multiflora rose in places, but this is minor.

SILVICULTURAL HISTORY AND PRESCRIPTION:

General: Utilizing records of the past history of this tract, an inventory done in 2000 indicated a total standing volume of 3987 board feet per acre. There was also an inventory apparently done in 1972 as well, but the tract delineations were different back then and the current tract 3101 was part of 3-4 different tracts at that time, making any inventory and growth calculations hard to compare. There are no records in the file of any timber sale taking place since state ownership,

and the approximate standing volume numbers from 1972 show a very low stocking of timber that would indicate it was not merchantable for much of its time in state ownership.

The 2016 inventory shows between 7457 and 7974 board feet per acre (cedar and pine included versus not), and this figures out to a growth rate of between 217 to 249 board feet per acre per year, after taking into account the 16 years of growth since then. Cedar volume was figured using a different cedar log scale (much more volume from small trees), which was not used in 2000, and this is why cedar volume is being excluded from growth calculations, as it was probably given marginal volume in 2000.

The growth figures are fairly high considering the majority of this tract was old field and presumably degraded at one time. Apparently, the poplar and ash that eventually established on much of this area put on quite a bit of growth once it got to merchantable size and continued on through the several droughts that the area has experienced. It is hoped and assumed that this growth rate can be increased into the future with the continued management and encouragement of vigorous and healthy crop trees, and conversion of much of the low grade pine and cedar trees to a better crop of hardwood trees. However, the pending loss of ash due to the current infestation of emerald ash borer will set growth back. This species is a significant component of the tract which is and will be dying out within a few years from now, losing its large contribution to the tract volume.

Number of trees per acre and basal area per acre figures indicate that all stands are fully or overstocked at between 92% to 110%. Removal of trees tallied as “cut” either via a timber sale or TSI would reduce the stocking levels to about 60% stocking or less with the exception of stand 2 that would be reduced to less than 50% stocking due to liquidation of the cedar component. Stocking levels would be reduced to levels at about the B-line for three of the stands and understocked between the B and C-lines for stand 2.

Due to the amount of volume being carried on the majority of the tract (7974 bd. ft/ac), and the general condition of the primarily poplar and ash trees in the hardwood portions of the tract, an improvement harvest is prescribed and could be undertaken in this tract at any time. This would produce a sale volume of between 750,000 to 800,000 board feet (not including cedar) or about 3500 to 3700 board feet per acre and leave between 915,000 to 965,000 board feet plus 100,000 board feet of cedar, or between 4250 to 4500 board feet per acre of hardwood and 460 board feet per acre of cedar (according to the cedar log scale).

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. TSI of pole-size trees may be required for thinning in places, and to open up the understory for potential oak regeneration to take hold or be released. Vines did not seem to be a big problem in this tract, but need to be kept at bay with TSI activities as well. Extensive understory treatment of shade tolerant species will be necessary in targeted areas to encourage oak regeneration where present. Ailanthus needs to be monitored and eliminated when found to be present or establishing itself. There were some ailanthus scattered throughout this tract in places.

Stand 1: Mixed mesophytic

This 129-acre stand covers 60% of the tract, and contains a volume of 9252 board feet per acre of which 4720 was classified as harvestable and 4532 was classified as residual. This would remove 61 square feet of basal area, which would leave the residual stand with 71 sq. ft. Stocking would drop from 110% to about 62% with the indicated management (fully stocked above the B-line). This stand was made up primarily of yellow-poplar and white ash. Since white ash is facing imminent mortality from EAB, and because poplar often suffers from drought stress and mortality, this stand shows a high volume of potential removals to capture the likely mortality, and a consequent drastic reduction in stocking.

There is no record of harvest in this stand during state ownership. Given the stand conditions, species make-up, and high volume of harvestable material and a moderate volume of residual growing stock, the recommendation would be to rank this stand as a high priority for conducting a harvest. Any timber sale would primarily include this entire stand as well as all of stand 2 and 3, with some trees from stand 4. The majority (68%) of the harvest volume for stand 1 (4720 bd. ft/ac) would be contained in white ash (1662 bd. ft/ac) and yellow-poplar (1558 bd. ft/ac). The remainder would be contained in northern red oak, black cherry, eastern redcedar, sugar maple, and various other species.

Post harvest TSI should be performed to treat selected residual cull or small pole-sized trees not cut during the harvest, as well as thin where necessary, complete any regeneration openings, and kill grapevines where present. As always, any ailanthus present should also be treated and eliminated.

Stand 2: Old field - advanced

This 56-acre stand covers about a quarter of the tract, and contains a volume of 5610 board feet per acre of which 3501 was classified as harvestable and 2109 was classified as residual. This would remove 61 square feet of basal area, which would leave the residual stand with 48 sq. ft. Stocking would drop from 93% to about 42% with the indicated management. These figures do include cedar as figured according to the cedar log scale.

Since this stand intermingles with the more merchantable hardwood stands, it would mostly be included with any timber sale taking place in stands 1 and 3. Eastern redcedar would be the primary species to be marked within this younger stand, and it would account for 40% of the harvest volume (1403 bd. ft/ac) due to use of the cedar scale that results in higher volumes for smaller trees. A separate cedar sale could be undertaken to achieve optimal management, as most of these cedar would be removed to encourage poplar and the oak regeneration that is usually found in the understory of such stands. Ultimately, this site will completely convert to hardwoods due to recovery of the site from former agricultural activities and erosion. Yellow-poplar (911 bd. ft/ac) and white ash (558 bd. ft/ac) would account for another 56% of the harvest volume, with Virginia pine, sassafras, and various other species making up the remainder of the harvest volume.

In places, there is oak regeneration in the understory ranging from seedling to sapling size. Timber harvest and post harvest TSI should concentrate on releasing this oak regeneration – mostly within larger openings and follow-up TSI, which would remove any leftover competing trees and allow a new stand of oak and poplar to establish itself and grow here.

Stand 3: Oak hickory

This 24-acre stand occupies a south facing slope in the central southern third of the tract. It contains a volume of 5879 board feet per acre of which 2803 was classified as harvestable and 3076 was classified as residual. This would remove 61 square feet of basal area, which would leave the residual stand with 64 sq. ft. Stocking would drop from 105% to about 55% with the indicated management.

There is no record of timber harvests in this stand during state ownership. Given the stand conditions and moderate volume of both harvestable material and residual growing stock, it should be included with stands 1 and 2 as a medium priority for conducting a harvest. The majority (75%) of the harvest volume for stand 2 (2803 bd. ft/ac) would be contained in white oak (1030 bd. ft/ac), white ash (480 bd. ft/ac), and yellow-poplar (420 bd. ft/ac), with chinkapin oak, blackgum, and red oak making up the remainder of the harvest volume.

Most of the stand would be harvested under a single tree selection routine with group regeneration openings targeting aggregations of low-grade trees or multiple large trees growing together. 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 species, as well as mesophytic species.

Post harvest TSI should be performed to treat selected 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 in select areas to favor oak establishment. As always, any ailanthus present should also be treated and eliminated.

Stand 4: Rocky south slope

This 6-acre stand contains a volume of 2618 board feet per acre of which 1099 was classified as harvestable and 1519 was classified as residual. This would remove 37 square feet of basal area, which would leave the residual stand with 68 sq. ft. Stocking would drop from 92% to about 60% with the indicated management (fully stocked above the B-line). These figures DO include cedar as figured according to the cedar log scale.

Since this stand intermingles with the more merchantable hardwood stands, there would likely be some trees included from here along with any timber sale taking place in the tract. All of the harvest volume tallied in this stand is represented by white ash and eastern redcedar. All of the

cedar was tallied for removal to open this area up to more sunlight. Ultimately, this site should be completely converted to hardwoods due to recovery of the site from former agricultural activities and erosion.

PROPOSED ACTIVITIES LISTING

Summer 2016	Field inventory
Spring 2017	Write management plan
Fall - Winter 2019	Basal bark treat ailanthus
2020 / 2021	Mark timber sale
2020 / 2021	Sell timber sale
2021-23	Post harvest TSI and regeneration check
2026	Recon & monitor for exotics
2032-2033	Inventory for next management cycle