Indiana Department of Natural Resources
Division of Forestry

Indiana Department of Natural Resources

Resource Management Guides
Harrison-Crawford State Forest
30-day Public Comment Period: November 16, 2020 – December 15, 2020

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 300-1,000 acres in size and their subunits (tracts) are 10 - 300 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 1,600 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 listed below and contained in this document are part of the properties annually scheduled forest inventories under review for Harrison-Crawford State Forest.

Compartment 7 Tract 4
Compartment 11 Tract 7
Compartment 16 Tract 4
Compartment 16 Tract 6
Compartment 20 Tract 5

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

You must indicate the State Forest Name, Compartment number and Tract number 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 http://www.in.gov/dnr/forestry/3634.htm.

State Forest: Harrison Crawford | Compartment: 7 | Tract: 4
Forester: E. Crosier | Date: February 11, 2020 | Acres: 80
Management Cycle End Year: 2040 | Management Cycle Length: 20 years

Location

The tract, also known as 6340704, is located 6.5 miles southwest of Corydon in Washington Township in Harrison County, Indiana. The tract encompasses the east half of the southeast quarter of section 29 in T4S R3E. Dixie Road is located west of the tract and Lickford Bridge Road is located south of the tract.

General Description

The acreage of this tract is approximately 80 acres. There are five distinct cover types on this tract: Mesic Oak-Hickory, Dry Oak-Hickory, Mixed Hardwoods, Conifer (called Old Field here), and Plantations.

704 Stand Acreages and Volumes

Stand	Acres	Percent of Acreage	Volume	Percent of Volume
Mesic Oak-Hickory	6	8%	67,200	8%
Dry Oak-Hickory	7	8%	63,500	8%
Mixed Hardwoods	34	43%	407,100	49%
Old Field	27	34%	178,700	22%
Plantations	6	7%	106,160	13%
Total	**80**	**100%**	**822,660**	**100%**

Values are rounded approximates

History

Baxley-Bliss Cemetery 1834-1944

This cemetery has 16 scribed headstones and 8 sandstone markers (most of which have footstones) surrounded by a partial metal fence under the shade of a large black oak. The first burial here occurred in 1834 when 35 year old Mary Baxley, wife of Barnabas Baxley who is buried to her left, was buried there. The final burial occurred in 1944 when Catherine A. Bliss, daughter of Job Madison and Catherine A. Baxley, who are also buried there, was buried. At the time of the inventory, the cemetery was in remarkably good shape, no stones were leaning, broken, or fallen. However, two loose footstones were noted set to the right side of the cemetery. One was scribed with the initials L.H.B. this footstone presumably belongs to Lewis Henry Baxley the only individual in the cemetery with those initials. The other footstone bears no scribing.

Acquisition 1951

The tract was acquired in a single parcel. On July 28, 1951 the tract was acquired from Charles Raymond and Savilla Mae Bliss.

Salvage Timber Harvest 1996

In March 1996, a tornado went through the north half of the tract damaging much of the timber. A salvage harvest was subsequently undertaken. 322,087 board feet were sold to C&C Logging in harvest number 6349701.

Timber Stand Improvement (TSI) 2005

TSI was undertaken in 2005 to control invasive species including the ailanthus and paulownia in the northern third of the tract.

Landscape Context

The dominant land uses within a 5 mile radius of the tract are agricultural and forestlands. There is more development near Corydon (6.5 miles northeast of the tract). Within 11 miles the towns of Leavenworth and Carefree, the Ohio River, O'Bannon Woods State Park (2,000 acres), and numerous Nature Preserves (1,800 acres) can all be found.

Topography, Geology and Hydrology

The tract is made up largely of a flat ridgetop which slopes gently down in the northwest and southeast corners of the tract. Several small drainages converge into a larger drain in the northwest corner of the tract. This area has karst hydrology typical of much of the area, potentially with springs, sinkholes, and caves being common. These features will be avoided, buffered or otherwise treated to minimize adverse impacts during management activities.

Soils

The tract has 25 acres (31%) across the lower slopes covered in Caneyville complex. These soils are described as karst, hilly, eroded, and well drained. There are 18 acres (23%) covered in Ebal-Gilpin-Wellston silt loams, they cover the upper slopes. These soils are characterized by 10 to 22 percent slopes, are eroded or severely eroded, and are well drained. There are also Apalona-Zanesville silt loams, covering the hilltop of the tract. They include 15 acres and 19% of the tract. These soils have 2 to 6 percent slopes and are moderately well drained. Additionally, Deuchars-Apalona-Wellston silt loams, Gilpin-Tipsaw-Ebal complex, and Haymond silt loam are also present in lesser quantities across the tract.

Boundary

The tract is bounded on all sides by private property. The closest public road is Lost Valley Lane which branches to the north off Lickford Bridge Road. The property line on all sides was denoted with old fence posts and barbed wire. There was a stone at the southwest corner of the tract. Excavation by the western neighbor at that location either removed or buried (could possibly still be there) the stone sometime in the past 20 years. There is/was a stone along the western line at the quarter mile mark. It was in the side of an ephemeral and when last observed (ca. 1990s) was leaning from erosion eating away at its mounting. The property line was marked with orange paint or orange flagging at the time of the inventory.

Access
Currently, there is no developed access to this tract.

Ecological Considerations
This tract represents typical oak-hickory and mixed mesic habitat, in addition to a component of old field successional habitat, with cedar and smaller hardwoods. Consequently, it likely receives use from a typical assemblage of common game and nongame wildlife species such as white-tailed deer, wild turkey, squirrels, songbirds, snakes, box turtles, and others. Hard mast food sources are provided by the abundant oaks and hickories in the tract.

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

	Maintenance Level	Inventory	Available Above Maintenance
Snag 5”+ DBH	320	2,182	1,862
Snag 9”+ DBH	240	1,006	766
Snag 19”+ DBH	40	118	78

Inventory data for Compartment 7 Tract 4 shows snags exceed recommended maintenance levels in all diameter classes.

Ailanthus and paulownia were noted in abundance in several locations including those scattered along the southwestern edge of the tract, those on the south side of the tract where there is a heavy infestation on the neighbor, and there is an overstory of ailanthus and paulownia through much of the north third of the tract. Some of the outlying or largest ailanthus and paulownia were treated at the time of the inventory. Multiflora rose and autumn olive was noted scattered across the tract, predominately in the old field and plantations. Garlic Mustard and Japanese Stilt Grass were noted in the tract and Japanese Stilt Grass is prevalent along the old roadbeds and 4-wheeler paths. These are common species prevalent throughout the county.

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

Recreation
Recreation on this tract is limited because access is undeveloped. The most prominent recreational activity occurring is likely hunting.

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

Tract Subdivision Description and Silvicultural Prescription
Cover type 1 – Mesic Oak-Hickory – 6 acres
This cover type includes 6 acres and is found across 8% of the tract acreage. This stand covers the mid to upper slopes scattered across the tract. 8% of the volume found on the tract is located within this cover type. The most abundant species is black oak which comprises 48% of the volume (32,580 board feet) within the cover type, White pine is the second most common species making up 19% of the volume (12,870 board feet), and shagbark hickory is third with 13% of the volume (8,680 board feet). Other less common oak and hickory species included post oak, white oak, and pignut hickory. The mid-story (pole sized timber) is dominated by persimmon, pignut hickory, and sugar maple. The understory is dominated by sugar maple, black gum, and shagbark hickory.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by oak and hickory, while providing hard mast and early to mid-seral habitat for wildlife.

Given current stand conditions and stocking, and to facilitate the desired future condition an improvement harvest is prescribed over the next 2-5 years. Oaks and hickories are not only the best species for supplying hard mast but are also the best quality timber group that is occurring in this stand. A harvest could remove between 25,000 – 100,000 board feet from this cover type. Most of this would be removed under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees of timber and wildlife value. The residual stand is expected to be slightly heavier to white oak, with a lesser component of other oak and hickory species, as well as a minor component of mesophytic species. This provides a stand of longer-lived higher-quality white oak that allows for more management options into the future. Openings created by group or patch-cuts will be used to help recruit oak into the future as well as maintain the presence of early seral habitat. Openings should be large enough to achieve regeneration of desirable species and should coincide with the release of advance regeneration when possible.

Under uneven aged management trees in all size classes are thinned during management operations to promote stand development and regeneration. Given that many of these will be un-merchantable, post-harvest TSI is prescribed to thin poorly-formed, low-quality trees, and treat the understory to reduce shade tolerant species where appropriate in favor of oaks and other more desirable species. The select girdling of medium to large low value trees may also be undertaken to recruit larger snags and provide habitat. TSI will also be needed to control invasive species that are present on the tract.

Cover type 2 – Dry Oak-Hickory – 7 acres

This cover type includes 7 acres and is found across 8% of the tract acreage. This stand covers the upper slopes and is located predominately in the southeast corner of the tract. 8% of the volume found on the tract is located within this cover type. The most abundant species is black oak which comprises 27% of the volume (16,920 board feet) within the cover type, white oak is the second most common species making up 22% of the volume (13,880 board feet), and yellow poplar is third with 17% of the volume (10,650 board feet). The mid-story (pole sized timber) is dominated by white ash although sugar maple and black oak were also present. The understory is dominated by American beech, black gum, Eastern red cedar, sugar maple, and white ash.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by oak and hickory, while providing hard mast and early to mid-seral habitat for wildlife.

Given current stand conditions and stocking, and to facilitate the desired future condition an improvement harvest is prescribed over the next 2-5 years. Oaks and hickories are not only the best species for supplying hard mast but are also the best quality timber group that is occurring in this stand. A harvest could remove between 20,000 – 90,000 board feet from this cover type. Most of this would be removed under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees of timber and wildlife value. The residual stand is expected to be slightly heavier to white oak, with a lesser component of other oak and hickory species, as well as a minor component of mesophytic species. This provides a stand of longer-lived higher-quality white oak that allows for more management options into the future. Openings created by group or patch-cuts will be used to help recruit oak into the future as well as maintain the presence of early seral habitat. Openings should be large enough to achieve regeneration of desirable species and should coincide with the release of advance regeneration when possible.

Under uneven aged management trees in all size classes are thinned during management operations to promote stand development and regeneration. Given that many of these will be un-merchantable, post-harvest TSI is prescribed to thin poorly formed, low-quality trees, and treat the understory to reduce shade tolerant species where appropriate in favor of oaks and other more desirable species. The select girdling of medium to large low value trees may also be undertaken to recruit larger snags and provide habitat. TSI will also be needed to control invasive species that are present on the tract.

Cover type 3 – Mixed Hardwoods – 34 acres

This cover type includes 34 acres and is found across 43% of the tract acreage. This stand covers the northern third of the tract and there are several small scattered pockets along drainages elsewhere. This cover type holds 49% of the volume found on the tract. The most abundant species is yellow poplar which comprises 39% of the volume (160,350 board feet) within the cover type, sugar maple is the second most common species making up 24% of the volume (95,960 board feet), and black oak is third with 7% of the volume (27,670 board feet). Other less

common species include black walnut, white oak, American beech, American sycamore, shagbark hickory, white ash, scarlet oak, Northern red oak, blue ash, and chinkapin oak. The mid-story (pole sized timber) is dominated by sugar maple and yellow poplar. The understory is dominated by sugar maple, American beech, sassafras, and ailanthus.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife.

Given current stand conditions and stocking, and to facilitate the desired future condition an improvement harvest is prescribed over the next 2-5 years. A harvest could remove between 150,000 – 250,000 board feet from this cover type. Most of this would be removed under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection would also favor releasing future crop trees of timber and wildlife value. The residual stand will maintain a variety of mesic species. 65% of the proposed harvest volume, within this cover type, would come from non-oak and hickory species, such as sugar maple and white ash.

Cover type 4 – Old Field – 27 acres

This cover type is found across 27 acres encompassing 34% of the tract acreage. This stand covers the flat portions of the tract predominately located in the center of the tract. This stand includes 22% of the volume found on the tract. The most abundant species is yellow poplar which comprises 65% of the volume (116,870 board feet) within the cover type, white ash is the second most common species making up 8% of the volume (15,070 board feet), and red maple is the third most common species making up 8% of the volume (14,940 board feet). The mid-story (pole sized timber) is dominated by sugar maple, sassafras, and persimmon. The understory is dominated by sugar maple.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife.

To meet the desired future condition, the Eastern red cedar and the lower grade hardwoods should be removed from this cover type to release existing mid-story oaks and hickories. The use of single tree selection or a regeneration opening may be used to remove the cedar and less desirable hardwoods.

Cover type 5 – Plantations – 6 acres

This cover type is found across 7% of the tract acreage. This stand is found in three distinct pockets on the flats in the western central portion of the tract. The southern two plantations are made up of mature or over-mature white pine. The most abundant species across this stand is white pine which comprises 88% of the volume (93,520 board feet) within the cover type. The mid-story (pole sized timber) is dominated by white pine, black oak, and persimmon. The understory is dominated by American beech, sugar maple, and white ash.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife.

To meet the desired future condition, the overstory pines and lower grade hardwoods should be removed from this cover type to release existing mid-story oaks and hickories. The use of single tree selection or a regeneration opening may be used to remove the pines and less desirable hardwoods.

The current forest resource inventory was completed on 2/11/2020 by Forester Elena Crosier. A summary of the estimated tract inventory results are located in the table below.

Tract Summary Data (trees >11"DBH):

Total acres= 80	Gingrich stocking= 89%
Total trees per acre= 184	Present volume per acre= 10,246 bd. ft.
Basal area per acre= 112	Projected harvest volume per acre= 5,250-5,750 bd. ft.

Species	**# Sawtimber Trees**	**Total Bd. Ft.**
Yellow Poplar	720	288,490
Sugar Maple	404	110,170
Black Oak	236	97,430
Eastern White Pine	227	88,660
White Oak	90	42,750
Shagbark Hickory	95	30,580
Black Walnut	60	26,810
White Ash	42	24,260
American Beech	35	20,490
Scarlet Oak	22	13,990
Red Maple	50	13,830
Northern Red Oak	21	13,550
American Sycamore	20	12,180
Post Oak	42	10,380
Pignut Hickory	29	6,680
Blackgum	33	6,650
Blue Ash	16	3,360
Persimmon	16	3,360
Chinkapin Oak	14	3,240
Eastern Red Cedar	32	1,590
Boxelder	32	1,240
Total	**2,236**	**819,690**

Summary Tract Silvicultural Prescription and Proposed Activities

Due to the current condition of the stand, an improvement harvest is recommended and could be undertaken in this tract at any time. Overall tract volume would be reduced 40-60%. Most of this would occur under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple matured trees growing together. It is recommended that TSI be undertaken in this tract prior and after the harvest to accomplish a variety of tasks, including completion of any marked openings, snag recruitment and control of invasive species.

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

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

Hydrology should not be permanently affected by management on this tract. Water quality and yield should not be altered if BMPs and buffers are followed during harvest. BMP use will be contractually required of management operators.

Wildlife in this tract should not be adversely affected. Snags and coarse woody debris should remain at viable levels in the stratum and should continue to provide habitat for the Indiana bat and other species.

Given the type and amount of recreation that is carried out on this tract, impacts will be minimal. Hunting opportunities should be improved by the maintenance of early successional habitat and the recruitment of hard mast producers such as oak and hickory to provide deer and small mammal browse.

Proposed Management Activity	*Proposed Date*
Management Guide	2020
Gain Access	2020-2022
Treat Invasive Species	2020-2022
Mark Harvest	2020-2022
Sell Timber	2021-2024
Post Harvest TSI	One to two years after harvest
Treat Invasive Species	One to three years after harvest
Monitor regeneration openings	Three to four years after harvest
Re-Inventory	2040
Write new Management Plan	2040

Harrison-Crawford State Forest
Compartment 7 Tract 4
Cover Types Map

State Forest: Harrison Crawford | Compartment: 11 | Tract: 7
Forester: Elena Wilcoxson | Date: March 14, 2018 | Acres: 49
Management Cycle End Year: 2038 | Management Cycle Length: 20 years

Location

The tract, also known as 6341107, is located in Harrison County, Indiana on the county line between Harrison and Crawford counties. The tract is located in section 11 of T3S R2E. The tract is located approximately 6 miles northeast of the town of Leavenworth, Indiana, 5 miles east of Carefree, Indiana, 8 miles northwest of Corydon, Indiana, and the tract is just over a mile north of I-64. The Blue River serves as the northern and eastern boundary of the tract.

General Description

The acreage of this tract is approximately 49 acres. There are two distinct cover types: Mesic Oak-Hickory and Mixed Hardwoods. In addition to the 49 acres, which were inventoried and analyzed, there is an additional 4.5 acres covered by the Blue River. This area is identified as water on the cover type map. The table below details the acreage and volume of a given cover type.

1107 Stand Acreages and Volumes

Stand	Acres	Percent of Acreage	Volume	Percent of Volume
Mesic Oak-Hickory	19	28%	112,710	34%
Mixed Hardwoods	25	72%	218,410	66%
Total	**49**	**100%**	**331,120**	**100%**

Values are rounded approximates

History

Acquisition 1970 to 2014

The tract was acquired in two parcels. On September 8, 1970 the northern portion of the tract was acquired from Gerald and Kathryn Williams (includes Rothrock's Mill in tract 509). On June 24, 2014 the southern portion (majority) of the tract was acquired from The Nature Conservancy.

Private Ownership Prior to 2014

At the time of inventory stumps were observed, probably from a sale in the late 1980s, based on the amount of decay that was observed. It seems as if, at a minimum, the stumps could be found across most of the ridge top and across the first shelf to the east (current mesic oak-hickory cover type). Currently a large portion of the sawtimber in this area is sugar maple and a good deal of the pole sized timber is sugar maple, yellow poplar, or sassafras. This indicates the area was most likely high-graded at the time of the last harvest.

Aerial Photography 1940 to 1958

Aerial photography from 1940 through 1958 shows majority of the tract is forested although there is open ground on the western side of the tract.

Landscape Context

The dominant land uses within a 5-mile radius of the tract are agricultural and forestlands. There is more development near I-64 and along SR-66 (west of the tract) and SR-62 (south of the tract). The tract is just over a mile north of I-64. Additionally, within 6 miles the towns of Leavenworth and Carefree, the Ohio River, O'Bannon Woods State Park (2,000 acres), and numerous Nature Preserves can all be found. The Blue River serves as the northern and eastern boundary of the tract.

Topography, Geology, and Hydrology

The tract is comprised of an east facing slope which has a somewhat flat ridgetop to the west and meets the Blue River on the east side. There are several small drainages running through the tract to the Blue River. The largest of these serves as the southern tract boundary, it too flows into the Blue River. The Blue River is a well-known and popular recreation waterway and ecological resource. This area also has karst hydrology typical of much of the area, with springs, sinkholes, and caves being common. These features will be avoided, buffered or otherwise treated to minimize adverse impacts during management activities.

Soils

The tract has 16 acres (33%) covered in Corydon Stony Silt Loam across the lower side of the bluffs of the tract, this is the most prevalent soil type. There are 15 acres (32%) covered in Wellston Silt Loam majority of which is located on the ridge top. There are 11 acres (23%) covered in Gilpin Silt Loam majority of which is located on the upper side of the bluffs. Additionally, Haymond Silt Loam is also present.

Corydon Stony Silt Loam (CoF) Shallow, moderately steep to very steep, well-drained, stony soils on uplands. Surface layer is about 3 inches. Subsurface is about 6 inches thick. Subsoil about 9 inches thick. The depth to hard limestone bedrock is about 18 inches. High in organic matter and low in natural fertility. Runoff is rapid or very rapid. Soil type is characterized by limestone outcrops, with as much as 15% on benches which are deeper than 20 inches to bedrock.
Degree Slope: 20-60 %
Woodland Suitability Group: 3d7
Site Index: 65-75 (Upland oaks)
Growth range potential (Upland oaks): 155-220
Management concerns: Runoff and erosion

Wellston Silt Loam (WeC2, WeC3, WeD2, WeD3) Moderately deep and deep, moderately sloping and strongly sloping, well draineds soils on uplands. Surface layer is about 9 inches thick and yellowish-brown. The subsoil is about 31 inches thick. Depth to hard sandstone bedrock is about 40 inches. Moderate in content of organic matter and low in natural fertility. Available water capacity is moderate or high, and permeability is moderate. Runoff ranges from medium to very rapid.
Degree Slope: 6-18 %
Woodland Suitability Group: 3o10
Site Index: 70-80 (Upland oaks)
Growth range potential (Upland oaks): 185-260 bd.ft./acre/year
Management Concerns: Runoff and erosion

Gilpin Silt Loam (GlD2, GlD3, GlE2, GpF) Moderately deep, strongly sloping to steep, well-drained soils. Surface layer is very dark grayish-brown silt loam about 3 inches thick. Subsurface layer is pale brown silt loam about 9 inches thick. Subsoil is about 17 inches thick. Depth to hard sandstone and shale bedrock is about 29 inches. Moderate in organic matter. Available water capacity is low and permeability is moderate. Runoff is rapid to very rapid.
Degree Slope: 12-30 %
Woodland Suitability Group: 3o10 or 3r12
Growth range potential (Upland oaks): 185-260 bd.ft./acre/year
Site Index: 70-80
Management Concerns: Runoff and erosion

Access

This tract could be accessed from the south through 6341101 via the existing fire trail in 6341103. However, this would necessitate the crossing of a sizeable drainage. This tract could also be accessed via an easement in the northwest corner of the tract. The easement branches to the south off of Rothrock's Mill Road and runs approximately 360 feet along an established farm lane to the edge of a field. This stretch of the easement is on flat ground and would need minimal work to be suitable for use during resource management activities. The easement then runs approximately 470 feet across the field before entering the forest on the other side. The easement then follows the farm lane approximately 1,120 feet to the edge of a second field. This stretch of the easement would be the most challenging to develop. It is characterized by eroded stretches, high banks, seepy hillsides, several drainage crossings, loose stones, and exposed bedrock. From there the easement runs approximately 1,450 feet along the northern edge of the second field to the western boundary of 6341107 (also the State Forest boundary). The entire easement is approximately 3,400 feet (0.6 miles) in length.

Boundary

The tract is bounded to the west by the western boundary of T3S R2E Section 11 (also the county line between Harrison and Crawford counties). The northern and eastern boundary (part of which is also the property boundary) is the Blue River. The southern boundary of the tract is a drainage which separates the tract from 6341101 to the south.

Ecological Considerations

This tract represents typical oak-hickory and mixed mesic habitat. 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 abundant oaks and hickories in the tract.

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

	Maintenance Level	Inventory	Available Above Maintenance
Snag 5"+ DBH	196	190	-6
Snag 9"+ DBH	147	190	43
Snag 19"+ DBH	24	60	35

Inventory data for Compartment 11 Tract 7 shows snags exceed recommended maintenance levels in all diameter classes except 5"+ snags.

Ailanthus, Multiflora Rose, and Garlic Mustard were noted scattered across the tract. Measures to control the Ailanthus should be taken while its presence is at a manageable. One Autumn Olive plant was also noted on the banks of the Blue River at the time of the inventory.

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

Recreation

This tract does not currently have any established recreational trails, facilities, or amenities. The area is likely used for hunting by local residents. The Blue River, which makes up the northern and eastern boundary of the tract, is a well-known and popular recreation waterway and ecological resource.

Cultural Resources

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

Tract Subdivision Description and Silvicultural Prescription

Cover type 1 – Mesic Oak-Hickory – 19 acres

This cover type is found across 28% of the tract acreage, it covers majority of the ridge top located on the western side of the tract above the slopes leading down to Blue River which is the eastern boundary of the tract. 34% of the volume found on the tract is located within this cover type. 35% of the volume within this cover type is made up of oak and hickory species. The most abundant species is sugar maple which comprises 40% of the volume (44,620 board feet) within the cover type, white oak is the second most common species making up 18% of the volume (19,730 board feet), and pignut hickory is third with 12% of the volume (13,960 board feet). Other less common oak and hickory species included scarlet oak, shagbark hickory, bitternut hickory, black oak, and chinkapin oak.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by oak and hickory, while providing hard mast and early to mid-seral habitat for wildlife.

In order to meet the desired future condition, the tract could use an improvement harvest. Oaks and hickories are not only the best species for supplying hard mast but are also the best quality timber group that is occurring in this stand. An improvement harvest could remove between 40,000 – 100,000 board feet from this cover type. Most of this would be removed under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees of timber and wildlife value. Removals could target less desirable species such as sugar maple, yellow poplar suffering from drought stress, ash suffering from the effects of Emerald Ash Borer, and black oak which are reaching the end of their natural lifespan. The residual stand is expected to be slightly heavier to white oak, with a lesser component of other oak and hickory species, as well as a minor component of mesophytic species. This provides a stand of longer-lived higher-quality white oak that allows for more management options into the future. Openings created by group or patch-cuts will be used to help recruit oak into the future as well as maintain the presence of early seral habitat. Openings should be large enough to achieve regeneration of desirable species and should coincide with the release of advance regeneration when possible. It is estimated that 5-15% of the stand acreage may have regeneration opening treatments.

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

Cover type 2 – Mixed Hardwoods – 25 acres

This cover type is found across 72% of the tract acreage, it covers the slopes between the Blue River and the oak-hickory cover type on the ridge top. This cover type holds 66% of the volume found on the tract. The most abundant species is yellow poplar which comprises 13% of the volume (29,200 board feet) within the cover type, American sycamore is the second most common species making up 14% of the volume (36,650 board feet), and basswood is third with 7% of the volume (16,050 board feet). Other less common species include scarlet oak, Northern red oak, sugar maple, American beech, mockernut hickory, white ash, chinkapin oak, shagbark hickory, black oak, and pignut hickory. The mid-story (pole sized timber) is dominated by sugar maple as is the understory.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife.

To meet the desired future condition, the tract could use an improvement harvest. An improvement harvest could remove between 50,000 – 120,000 board feet from this cover type. Most of this would be removed under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees. The residual stand should maintain a variety of mesic species. Similarly to the mesic oak-hickory cover type, removals would target less desirable species such as yellow poplar and ash. Openings created by group or patch-cuts will be used to help recruit oak into the future as well as maintain the presence of early seral habitat. Openings should be large enough to achieve regeneration of desirable species and should coincide with the release of advance regeneration when possible. It is estimated that 5-15% of the stand acreage may have regeneration opening treatments.

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

The current forest resource inventory was completed on 3/14/2018 by Forester Elena Wilcoxson. A summary of the estimated tract inventory results are located in the table below.

Tract Summary Data (trees >11”DBH):

Total acres= 49	Gingrich stocking= 77%
Total trees per acre= 133	Present volume per acre= 7,299 bd. ft.
Basal area per acre= 92	Projected harvest volume per acre= 2,500-3,500 bd. ft.

Species	# Sawtimber Trees	Total Bd. Ft.
Yellow Poplar	216	87,100
Sugar Maple	384	70,390
American Sycamore	28	28,340
White Oak	119	25,500
Scarlet Oak	61	23,340
Pignut Hickory	70	20,030
American Beech	45	17,000
Basswood	53	15,580
Northern Red Oak	37	12,810
Shagbark Hickory	80	11,930
Mockernut Hickory	41	9,720
White Ash	27	9,710
Chinkapin Oak	35	9,360
Black Oak	27	6,660
Bitternut Hickory	4	4,920
Blackgum	9	2,880
Black Cherry	17	2,380
Total	**1,253**	**357,650**

Due to the current condition of the stand, an improvement harvest is recommended and could be undertaken in this tract at any time. Overall tract volume would be reduced 30-50%. Most of this would occur under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple matured trees growing together. An oak shelterwood is possible if conditions are observed during the timber marking process. It is recommended that TSI be undertaken in this tract after the harvest to accomplish a variety of tasks, including completion of any marked openings, snag recruitment and control of invasive species.

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

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

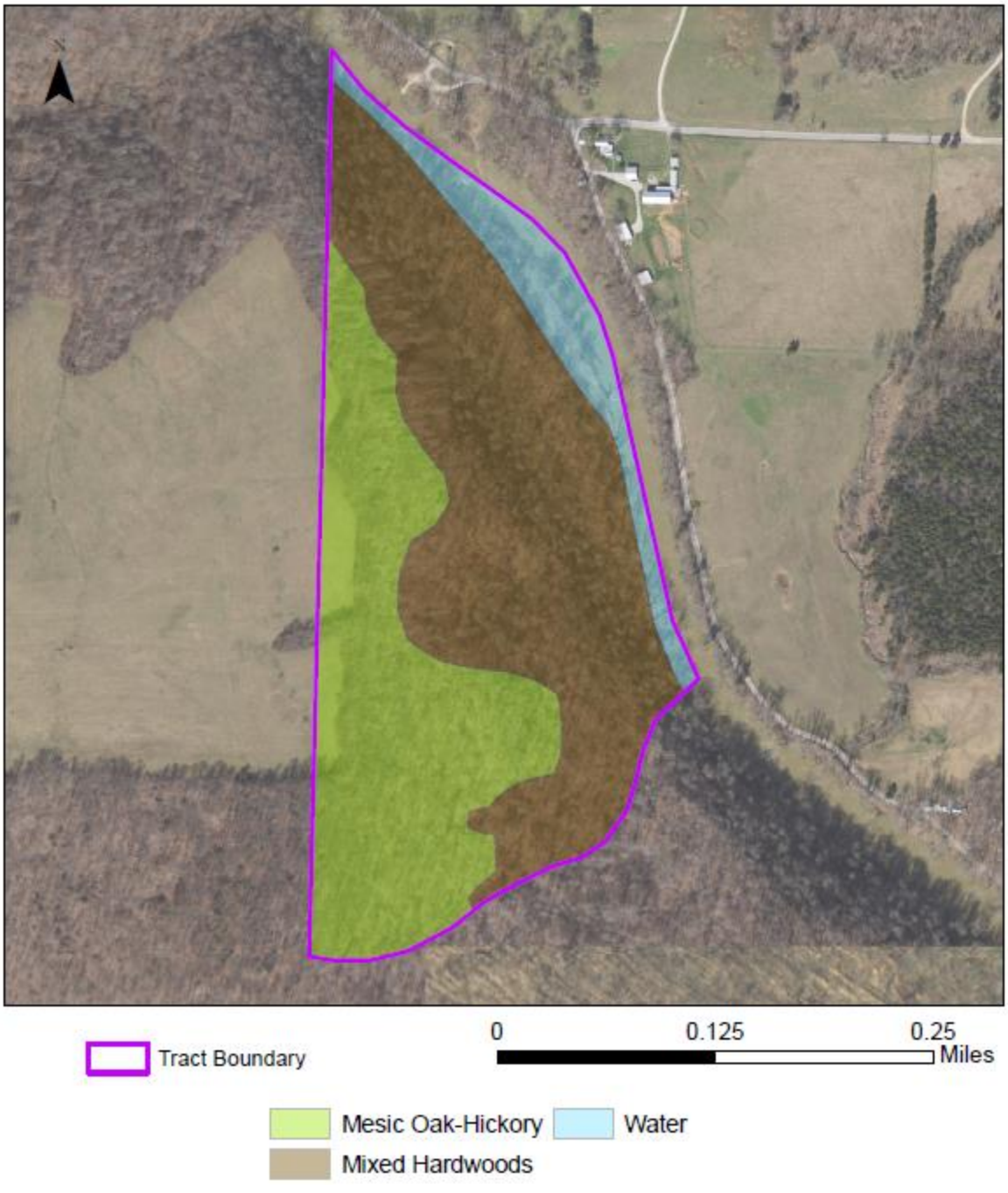
Hydrology should not be permanently affected by management on this tract. Water quality and yield should not be altered if BMPs and buffers are followed during harvest operations. BMP use will be contractually required of management operators.

Wildlife in this tract should not be adversely affected. Snags and coarse woody debris should remain at viable levels in the stratum and should continue to provide habitat for the Indiana bat and other species.

Given the type and amount of recreation that is carried out on this tract, impacts will be minimal. Hunting opportunities should be improved by the maintenance of early successional habitat and the recruitment of hard mast producers such as oak and hickory to provide deer and small mammal browse.

Proposed Management Activity	*Proposed Date*
Management Guide	2018
Gain Access	2018-2020
Treat Invasive Species	2018-2020
Mark Harvest	2018-2020
Sell Timber	2019-2023
Post Harvest TSI	One to two years after harvest
Treat Invasive Species	One to three years after harvest
Monitor regeneration openings	Three to four years after harvest
Re-Inventory	2038
Write new Management Plan	2038

Harrison-Crawford State Forest
Compartment 11 Tract 7
Cover Types Map



State Forest: Harrison Crawford | Compartment 16 | Tract: 4
Inventorying Forester: E. Wilcoxson | Date: October 23, 2017 | Acres 138
Management Cycle End Year: 2037 | Management Cycle Length: 20 years

Location

Compartment 16 Tract 4, also known as 6341604, is located in Crawford County, Indiana. The western portion of the tract is located in section 36, T3S, R1E and the eastern portion of the tract is located in section 31, T3S, R2E. The tract is located approximately 1-mile northwest of the town of Leavenworth, Indiana and 2 miles southeast of Carefree, Indiana. The tract is south of I-64 and east of SR-66.

General Description

The acreage of this tract is approximately 138 acres. There are three distinct cover types: oak hickory (72.2 acres, 52% of tract area), mixed mesic hardwoods (62.3 acres, 45%), and old field early successional (3.3 acres, 2%). The oak hickory cover type within this stand is found predominantly on the south facing slope in the center of the tract. The mixed mesic hardwoods are found on the north facing slopes throughout the tract. And in the southeast corner there is a small section along a creek bed which falls into the old field early successional cover type. These cover types will be described in more detail in the subdivision description and silvicultural prescription section. See Appendix 1 for a map of cover type locations.

History

The tract was acquired in two parcels. The western portion of the tract (the portion in section 36) was purchased March 14, 1953 from Clarence and Gretchen Voyles. The eastern portion of the tract (the portion in section 31) was acquired as a part of a 264-acre acquisition purchased July 24, 1939 from Lou M. Clark.

On May 18, 1989 (sale number 6348905) timber on tract 1604 was sold to Messmer Logging for $48,650 ($0.19 per board feet). The sale area encompassed the majority of the tract. The sale contained a total of 248,509 board feet. Black oak was the largest contributor to this volume with 36,423 board feet (15% of total sale volume), Northern red oak was second with 34,818 board feet (44%), and white oak was third with 33,978 board feet (14%). Other species in this sale included yellow poplar, American beech, sugar maple, pignut hickory, white ash, scarlet oak, black cherry, chinkapin oak, blackgum, black walnut, shagbark hickory, red maple, hackberry, red elm, and sassafras. See Table 1 for a summary of the volume from the 1989 timber sale.

Bob Carr writes in the SF200 from 1989 the following marking objectives:
“The March 1989 cruise indicated an improvement cut was needed in this tract. Weeding, crown thinning, and thinning from below comprise the cutting methods used to reduce stand density and concentrate growth on better stems. White oak, red oak, black oak, and occasionally black walnut were favored species when present in good form. Some thinning was done in stands of yellow poplar. Group selection was used to regenerate over mature and decadent stands of American beech. Three other small regeneration openings were marked; two where the removal

of culls and defective trees left only poor-formed tolerants [shade] and one as a possible yarding area for a logging demonstration. Expected regeneration species include yellow poplar, white ash, and black cherry."

Table 1. 1989 Timber Sale Compartment 16 Tract 4

Species	Number of Trees	Number of Culls	Volume
Black Oak	162	25	36,423
Northern Red Oak	131	6	34,818
White Oak	185	14	33,978
Tulipwood	121	15	28,946
American Beech	119	89	24,016
Sugar Maple	143	24	21,365
Pignut Hickory	114	18	18,286
White Ash	76	10	14,441
Scarlet Oak	60	7	12,355
Blackgum	36	6	4,996
Shagbark Hickory	28	2	4,851
Black Cherry	19	2	2,145
American Sycamore	6	2	2,058
Black Walnut	15	0	1,845
Red Maple	11	3	1,820
Chinkapin Oak	8	2	1,103
American Elm	6	2	1,035
Red Elm	6	4	951
Post Oak	9	0	866
Eastern Red Cedar	17	46	798
Basswood	3	2	481
Sassafras	3	1	438
Hackberry	1	0	255
Miscellaneous	2	8	239
TOTAL	**1,281**	**288**	**248,509**

Landscape Context

The dominant land uses within a 5-mile radius of the tract are agricultural and forestlands. There is some development along Dry Run Road, east of the tract, and more so near the interstate (to the north of the tract) and along SR-66 (west of the tract). The sewage treatment plant for the town of Leavenworth is within ¼ mile south of the tract. The tract also is in close proximity to Tower Quarry, which spans over a hundred acres, has been owned and operated by Mulzer Crushed Stone Inc. since 1983 (quarry was opened ca. 1973-74). East of the tract, along Dry Run Road, lies the 750-acre Leavenworth Barrens Nature Preserve. The Ohio River, the Blue River, Interstate 64, and the towns of Leavenworth and Carefree are all within 3 miles of the tract.

Topography, Geology and Hydrology

The northern portion of the tract is made up of a north-east facing ridge crossed by multiple drainages and the southern portion of the tract is made up of a south facing slope. The very south west portion of the tract includes several drainages which run into the southern boundary of the tract (also the property boundary).

This area has karst hydrology typical of much of the area, with springs, sinkholes, and caves being common. These features will be avoided, buffered, or otherwise treated to minimize adverse impacts during management activities.

Soils

Most of tract 4 has soils in the Tipsaw Very Fine Sandy Loam (64 acres, 46%) and Wellston Silt Loam series (52 acres, 38%) which cover majority of the slopes. The tract also contains Apalonia Silt Loam (7 acres, 5%), Corydon Silty Loam (10 acres, 7%), and Gatchel Loam (3 acres, 2%).

Tipsaw Very Fine Sandy Loam (TbIG)

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
Degree Slope: 20-70%
Woodland Suitability: 3r12
Site Index: 70
Growth Range potential: 342
Management Concerns: runoff and erosion

Wellston Silt Loam (WhfD2, WhfD3)

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 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%
Woodland suitability group: 3o10
Site Index: 80
Growth Range potential: 342

Management Concerns: runoff and erosion

Access
This tract has no road frontage and there is no developed service road. Currently, the best option for access is from Tower Rd through adjacent tract 2 utilizing an existing service road.

Boundaries
The majority of the tract's boundaries are State Forest boundaries. The eastern boundary of the tract is a sizeable drainage which separates it from tract 2.

Ecological Considerations
This tract represents typical oak hickory and mixed mesic habitat, in addition to a component of old field successional habitat, with cedar and smaller hardwoods. Consequently, it likely receives use from a typical assemblage of common game and nongame wildlife species such as white-tailed deer, wild turkey, squirrels, songbirds, snakes, box turtles, and others. Hard mast food sources are provided by the abundant oaks and hickories in the tract.

In concert with various agencies and organizations, the Division of Forestry has developed compartment level guidelines for an important wildlife structural habitat features: snags. Snags were tallied in this inventory and summarized in the following table.

Guidelines for snag tree levels (trees/acre)

Number of snags per acre	Guidelines Maintenance	Guidelines optimal	Tract 4 actual
6-8" DBH class 1	1	0.0	
10-18" DBH class	2.5	5	3.2
20" + DBH class	0.5	1	1.2
Total	**4**	**7**	**4.4**

These numbers show large snag densities are within guidelines on this tract. It is likely that additional snags in the small and medium size classes 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.

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.

Ailanthus altissima, tree of heaven or ailanthus, was found within the tract on the western border (private property). Measures to control this species should be taken while the species is still in a manageable stage in the area.

Recreation
This tract does not currently have any established recreational trails, facilities, or amenities. The area is likely used for hunting by local residents. Due to the proximity to the interstate and the Mulzer Quarry the tract has very limited potential for developed recreation.

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

Tract Subdivision Description and Silvicultural Prescription

INVENTORY SUMMARY

Tract Acreage: 138 acres
Number of Stands: 3 stands
Permanent Openings: 0 acres
Average Basal Area: 86.3 ft²/acre
Est. Annual Growth: 124 bdft/acre/yr
Est. Cutting Cycle: 20 years
Site Index: 70-80 (upland oaks)

Tract 4 Inventory Summary

SPECIES	Per acre	Total
White oak	2,203	303,930
Yellow-poplar	1,200	165,570
Northern red oak	802	110,710
Black oak	781	107,780
Sugar maple	506	69,840
Pignut hickory	505	69,650
American beech	409	56,500
White ash	399	55,030
American sycamore	152	21,050
Black walnut	102	14,130
Mockernut hickory	77	10,690
Shagbark hickory	70	9,640
Basswood	34	4,720
Blackgum	31	4,300
Black cherry	25	3,500
Scarlet oak	22	3,080
TOTAL	**7,318**	**1,010,120**

Cover Type 1 – Oak Hickory – 72.2 acres
This cover type is found across 52% of the tract acreage and holds 53% of the volume found on the tract. 86% of the volume within this cover type is made up of oak and hickory species. The

most abundant species is white oak which comprises 44% of the volume (238,730 board feet) within the cover type, black oak is the second most common species making up 17% of the volume (93,320 board feet), and Northern red oak is third with 14% of the volume (74,370 board feet). Other less common oak and hickory species included scarlet oak, shagbark hickory, pignut hickory, and mockernut hickory.

Cover Type 2 – Mixed Mesic Hardwoods – 62.3 acres
This cover type is found across 45% of the tract acreage and holds 44% of the volume found on the tract. The most abundant species is yellow poplar which comprises 30% of the volume (133,760 board feet) within the cover type, white oak is the second most common species making up 18% of the volume (79,860 board feet), and sugar maple is third with 10% of the volume (43,060 board feet). Other less common species include black oak, Northern red oak, pignut hickory, American beech, and white ash.

Cover Type 3 – Non-Merchantable Cover Types
The old field early successional cover type within this tract is currently non-merchantable. In addition to this area being inaccessible at this time, the soils are probably wet, and it is in close proximity to the creek bed. This cover type, for the near future, would be better suited to providing its own unique wildlife opportunities and water filtration but could potentially benefit from Timber Stand Improvement (TSI) in the future.

Tract Summary – 138 acres

The area of this tract is approximately 138 acres. There are three distinct cover types: oak hickory (72.2 acres, 52%), mixed mesic hardwoods (62.3 acres, 45%), and old field early successional (3.3 acres, 2%). The oak hickory cover type within this tract is found predominantly on the south facing slope in the center of the tract. The mixed mesic hardwoods are found on the north facing slopes throughout the tract. And in the southeast corner there is a small section along a creek bed which falls into the old field early successional cover type.

Inventory Summary

	TOTAL (bd ft)
Volume per acre	7,318
Volume total	1,010,120
Basal area/acre	86.2
Trees/acre	94

Cover Type 1: Oak Hickory

Current condition:
The oak hickory cover type within this tract is found predominantly on the south facing slope in the center of the tract. This cover type is found across 52% of the tract acreage and holds 53% of the volume found on the tract. This cover type is dominated by decent sawtimber white, black, and red oak with pignut hickory. The inventory is summarized in table 2.

Table 2. Oak Hickory Volume by Species

Species	TOTAL (bd ft/ac)
American beech	159
American sycamore	129
Black oak	1,293
Black walnut	57
Blackgum	66
Northern red oak	1,030
Pignut hickory	670
Scarlet oak	47
Shagbark hickory	57
Sugar maple	236
White ash	296
White oak	3,307
Yellow poplar	126
Total	**7,473**

Desired future condition:

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by oak and hickory, while providing hard mast and early to mid-seral habitat for wildlife.

Silvicultural Prescription:

To meet the desired future condition, the tract could use an improvement harvest. Oaks and hickories are not only the best species for supplying hard mast but are also the best quality timber group that is occurring in this cover type. According to the inventory data, between 200,000 – 275,000 board feet should be removed from this cover type. Most of this would be removed under a single tree selection routine with larger regeneration openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees. The residual stand should be slightly heavier to white oak, with a lesser component of other oak and hickory species, as well as a minor component of mesophytic species. This provides a stand of longer-lived higher-quality white oak that allows for more management options into the future. Openings created by group selection or patch-cuts will be used to promote the presence of oak into the future as well as maintain the presence of early seral habitat. Openings should be large enough to achieve regeneration of desirable species and should coincide with the release of advance regeneration when possible. Stocking in this cover type would be reduced from the current 70% to approximately 40%. This seemingly drastic drop in stocking would result from the removal of less desirable species such as beech, the removal of ash suffering from the effects of Emerald Ash Borer, the removal of yellow poplar suffering from

drought stress, and the removal of oaks (predominantly black oak) which are reaching their end of their natural lifespan.

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

Cover Type 2: Mixed Mesic Hardwoods

Current Condition:

The mixed mesic hardwoods are found on the north facing slopes throughout the tract. This cover type is found across 45% of the tract acreage and holds 44% of the volume found on the tract. The most common species are yellow poplar, white oak, sugar maple, and American beech. The cover type is summarized in Table 3 with species composition. Currently the cover type is just below the 65% stocked condition.

Table 3. Mixed Mesic Hardwoods Volume by Species

Species	TOTAL (bd ft/ac)
American beech	668
Basswood	68
Black cherry	51
Black oak	341
Black walnut	151
Mockernut hickory	155
Northern red oak	632
Pignut hickory	377
Shagbark hickory	86
Sugar maple	691
White ash	518
White oak	1,282
Yellow poplar	2,147
Total	**7,167**

Desired Future Condition:
The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife.

Silvicultural Prescription:
In order to meet the desired future condition, the tract could use an improvement harvest. According to the inventory data, between 150,000 – 250,000 board feet should be removed from this cover type. Most of this would be removed under a single tree selection routine with larger regeneration openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees. The residual stand should maintain a variety of mesic species. Stocking in this cover type would be reduced from the current 65% to approximately 30%. Similarly, to the oak hickory cover type, this seemingly drastic drop in stocking would result from the removal of a large amount of yellow poplar suffering from drought stress. Almost half the proposed harvest volume, within this cover type, would be yellow poplar.

Cover Type 3: Old Field Early Successional
Current Condition:
In the southeast corner of the tract there three acres next to a creek bed which falls into the old field early successional cover type. This cover type consists almost wholly of American sycamore, yellow poplar, and sugar maple with an understory of Eastern red cedar. The inventory is summarized in Table 4 with species composition. Currently the cover type is just below the 95% stocked condition.

Table 4. Old Field Early Successional Volume by Species

Species	TOTAL (bd ft/ac)
American sycamore	3,300
Sugar maple	1,773
Yellow poplar	2,408
Total	**7,481**

Desired Future Condition:
The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife.

Silvicultural Prescription:
Currently, this cover type is best suited to providing its own unique wildlife opportunities and water filtration. Additionally, it is operationally limiting to harvesting and should be avoided

and allowed to naturally develop. An inventory at the next management cycle will reassess cultural needs to properly develop this stand.

Summary Tract Silvicultural Prescription and Proposed Activities

Due to the current condition of the tract, a medium level improvement harvest could be undertaken at any time. Overall stocking should be reduced from the current ~65% to ~35. Most of this would be harvested under a single tree selection routine with larger regeneration openings targeting groups of low-grade trees or multiple large trees growing together. It is recommended that TSI be undertaken in this tract after the harvest to accomplish a variety of tasks, including completion of any marked openings and control of invasive species.

Tables 10, 11, 12 detail the harvest, leave, and total Volume, Basal Area, and Trees per Acre for oak and hickory species combined and all other species combined. Looking at these tables helps explain why the stocking level would drop as low as it would after the recommended harvest. The tables show that only 32% of the trees on the tract are oak or hickory, but they contribute 61% of the volume on the tract, an amount that is quite large. Thus, when the other species, which contribute more to the number of trees per acre and less to the volume on the tract, are removed by the sale it leads to a significant decrease in the tract's stocking.

Effect of Prescription on Tract Properties:

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

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

Hydrology: Hydrology should not be permanently affected by management on this tract. Water quality and yield should not be altered if BMPs are followed during harvest. BMP use will be contractually required of management operators.

Wildlife: Wildlife in this tract should not be adversely affected. No rare threatened or endangered species will be adversely affected during the planning period. Snags and coarse woody debris should remain at viable levels in the stratum and should continue to provide habitat for the Indiana bat. The main effect on wildlife will be the reduction of the coniferous component of the stratum. This currently provides a limited amount of thermal cover in the winter for deer and small mammals. This type of cover will be permanently reduced from the tract. Managing to recruit newly established or released oaks and hickories will help to ensure that this important food source is available into the foreseeable future. Regeneration openings, such as prescribed have been shown to be of less an issue from nest predators and generalist species as compared to hard edges such as public roadways, utility corridors and crop field edges. Placement of

regeneration openings away from hard edges can minimize these potential impacts. The prescribed activity will promote wildlife diversity and enhance habitat structural components.

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

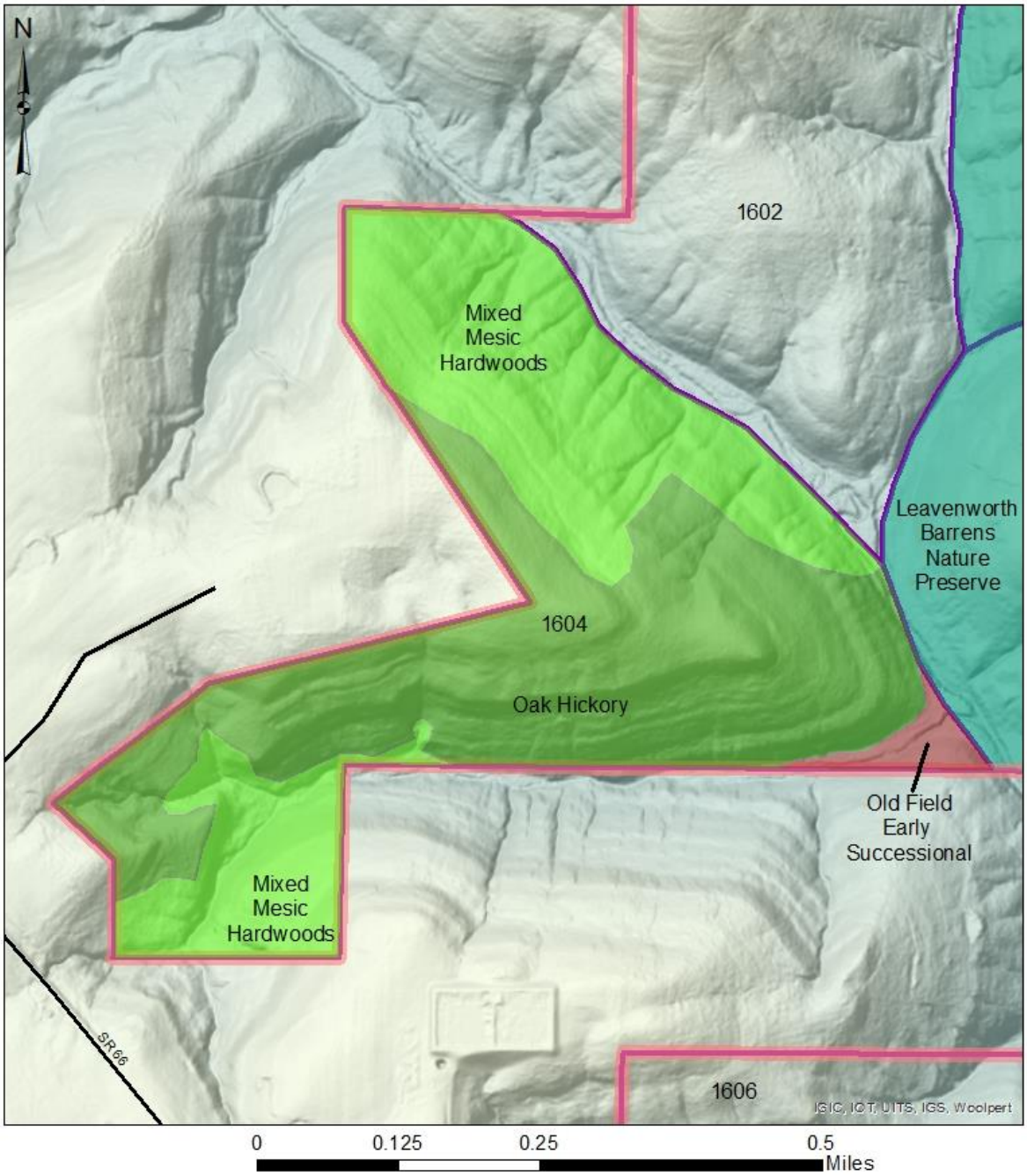
Recreation: Given the limited amount of recreation (majority of which is hunting) that is carried out on this tract, it will only be minimally and temporarily affected. Hunting opportunities should be improved by the maintenance of early successional habitat and the recruitment of hard mast producers such as oak and hickory to provide deer and small mammal browse.

Proposed Activity	**Proposed Date**
Management Guide	2017
Resolve access issues	2017 - 2019
Treat Invasive species	2017 - 2019
Mark Timber Harvest	2017 - 2019
Sell Timber	2018 - 2020
Post Harvest TSI	One to two years after harvest
Treat Invasive species	One to three years after harvest
Monitor regeneration openings	Three to four years after harvest
Re-Inventory	2037
Write new Management Plan	2037

Harrison-Crawford State Forest

Indiana Department of Natural Resources
Division of Forestry

Appendix 1 - Cover Types



State Forest: Harrison Crawford | Compartment: 16 | Tract: 6
Forester: Elena Wilcoxson | Date: March 14, 2018 | Acres: 67
Management Cycle End Year: 2038 | Management Cycle Length: 20 years

Location

The tract, also known as 6341606, is in Crawford County, Indiana. The tract is located in the south half of the southwest quarter of Section 31 T3S R2E. The tract is located approximately 1-mile northwest of the town of Leavenworth, Indiana and 2 miles southeast of Carefree, Indiana. The tract is south of I-64 and east of SR-66.

General Description

The acreage of this tract is approximately 67 acres. Within the tract, there are four distinct cover types: Mesic Oak-Hickory, Mixed Hardwoods, Conifer (called Old Field here), and Bottomland Hardwoods.

History

Acquisition 1939

The tract was acquired in one parcel September 18, 1939 from Emile J. and Kathleen Bahr.

Aerial Photography 1940 to 1958

Aerial photography from 1940 and 1958 shows a seven acre field in the center of the tract surrounded by forest.

Management Plan 1990

In June 1990, forester Mike Bowden wrote a management guide for 1606. He describes tract 6 at that time by saying, “The commercial section of the tract is mainly oak-hickory with a maple-beech understory. The non-commercial areas are either old fields with Eastern red cedar, tulipwood, and oak seedlings, or in areas of immature hardwoods (oak, hickory, tulipwood). The majority of the commercial acreage is located on the slopes, while the non-commercial acreage is located on the flatter areas. There are several steep slopes which in the past were heavily eroded and one intermittent stream which flows through the tract. These two areas require special considerations when managing this tract for timber.” In 1990 at the time of the last inventory, white oak, black oak, Northern red oak, and yellow poplar were the most dominant species on the tract. This is still the case to some degree, white oak, yellow poplar, and black oak contribute most of the volume to the tract at this point in time. The 1990 inventory called for 265,389 board feet to be left and 102,534 board feet to be harvested. Thus a total of 367,924 board feet (4,716 board feet per acre) was present on the tract in 1981.

Harvest 1991

July 18, 1991, a sale with 81,855 board feet in tract 6 was sold to Cletus Cash for $12,750. Mike Bowden was the marking forester. 52 acres across the tract were marked. The sale number was 6349102.

Landscape Context
The dominant land uses within a 5-mile radius of the tract are agricultural and forestlands. There is some development along Dry Run Road, east of the tract, and more so near the interstate (to the north of the tract) and along SR-66 (west of the tract). The sewage treatment plant for the town of Leavenworth is within a tenth of a mile off the northwest corner of the tract. The tract is also in close proximity to Tower Quarry, which spans over a hundred acres and was opened ca. 1973-1974. East of the tract, along Dry Run Road, lies the 750-acre Leavenworth Barrens Nature Preserve. The Ohio River, the Blue River, I-64, and the towns of Leavenworth and Carefree are all within 3 miles of the tract.

Topography, Geology, and Hydrology
Because the tract has square boundaries which follow north-south and east-west lines rather than topographical features, it includes parts of several hillsides with varying degrees of slope and aspect. The northern half of the tract consists mainly of a south facing slope and a flat ridge top (old field cover type). In the northeast corner of the tract this ridge slopes abruptly down to meet Texas Creek. There is another sizeable drainage running roughly east-west in the southern half of the tract. Several ridges with small drainages slope down to this larger drainage.

The most notable hydrological feature on this tract is Texas Creek, which flows through the northeastern corner of the tract. There is another sizeable drainage running roughly east-west in the southern half of the tract. Several ridges with small drainages slope down to this larger drainage. This area has karst hydrology typical of much of the area, potentially with springs, sinkholes, and caves being common. These features will be avoided, buffered, or otherwise treated to minimize adverse impacts during management activities.

Soils
The tract has 30 acres (45%), across most of the hillsides, covered in Tipsaw Very Fine Sandy Loam this is the most prevalent soil type. There are 21 acres (32%) covered in Wellston Silt Loam predominately on the slopes immediately adjacent to the ridge tops. There are 16 acres (23%) covered in Corydon Stony Silt majority of which is located around the drainage in the southern half of the tract. Additionally, Adyeville Very Fine Sandy Loam, Apalonia Silt Loam, and Gatchel Loam are also present.

<u>Tipsaw Very Fine Sandy Loam (TbIG)</u>
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 consists 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
Degree Slope: 20-70%
Woodland Suitability: 3r12
Site Index: 70

Growth Range potential: 342
Management Concerns: runoff and erosion

Wellston Silt Loam (WhfC2, WhfD2, WhfD3)
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 form 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%
Woodland suitability group: 3o10
Site Index: 80
Growth Range potential: 342
Management Concerns: runoff and erosion

Corydon Stony Silt (CgyG)
The Corydon series consists of shallow, well drained soils that formed in as much as 8 inches of loess and in the underlying limestone residuum. The Corydon soils are on hills underlain with limestone. The surface horizon is 8 inches of a silt loam. The subsoil is 9 inches of clay. The bottom of the profile is unweathered bedrock. Mean annual precipitation is about 44 inches, and mean annual air temperature is about 54 degrees F.
Degree Slope: 20-60%
Woodland suitability group: 1o8
Site Index: 64
Growth Range potential: 258
Management Concerns: runoff and erosion

Access
Currently there is no developed access into this part of the State Forest. When the area was harvested in 1991 the area was accessed from the neighboring property to the east. One of the skid trails used at that time is still discernible.

Boundary
The tract makes up the south half of the south west corner of section 31 of T3S R2E. The tract is bounded to the west by the section line between Section 36 of T3S R1E and Section 31 of T3S R2E (section the tract is in). The tract is bounded to the north by the quarter quarter section line, to the east by the quarter section line, and to the south by the section line between Section 6 of T4S R2E and Section 31 of T3S R2E (section the tract is in). All of the boundary line for this tract was ran in March 2018 using orange flagging and GPSed.

Ecological Considerations

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

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

	Maintenance Level	Inventory	Available Above Maintenance
Snag 5"+ DBH	268	1,632	1,364
Snag 9"+ DBH	201	642	441
Snag 19"+ DBH	33.5	96	62

Inventory data for Compartment 16 Tract 6 shows that snags exceed recommended maintenance levels in all diameter classes.

Ailanthus was noted along the northern boundary of the tract, near Texas Creek, and in the southwest corner in a drainage. Measures to control this species should be taken while the species is still in a manageable stage in the area. Multiflora rose and Japanese honeysuckle were noted scattered across the tract. A thick periwinkle infestation was present along the drainage in the southern portion of the tract. Japanese stilt grass and wineberry were also noted at the time of the inventory.

Recreation

Recreation on this tract is limited due to access. The most prominent recreational activity occurring is likely hunting.

Cultural

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

Tract Subdivision Description and Silvicultural Prescription

<u>Stand 1 – Mesic Oak-Hickory – 47 acres</u>

This cover type is found across 70% of the tract acreage, it covers majority of the tract with the exception of the areas around the drainages and five acres on the ridgetop which has grown back to an old field stand dominated by cedar. 69% of the volume found on the tract is located within this cover type. 86% of the volume within this cover type is made up of oak and hickory species.

The most abundant species is white oak which comprises 56% of the volume (236,370 board feet) within the cover type, black oak is the second most common species making up 9% of the volume (37,040 board feet), and Northern red oak is third with 6% of the volume (27,020 board feet). Other less common oak and hickory species included chinkapin oak, scarlet oak, pignut hickory, post oak, and shagbark hickory.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by oak and hickory, while providing hard mast and early to mid-seral habitat for wildlife.

To meet the desired future condition, the tract could use an improvement harvest. Oaks and hickories are not only the best species for supplying hard mast but are also the best quality timber group that is occurring in this stand. An improvement harvest could remove between 125,000 – 200,000 board feet from this cover type. Most of this would be removed under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees. The residual stand should be slightly heavier to white oak, with a lesser component of other oak and hickory species, as well as a minor component of mesophytic species. This provides a stand of longer-lived higher-quality white oak that allows for more management options into the future. Openings created by group selection will be used to help recruit oak into the future as well as maintain the presence of early seral habitat. Openings should be large enough to achieve regeneration of desirable species and should coincide with the release of advance regeneration when possible. It is estimated that 5-15% of the stand acreage may have regeneration opening treatments.

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

<u>Stand 2 – Mixed Hardwoods – 14 acres</u>

This cover type is found across 21% of the tract acreage, it is situated in the southern half of the tract and can be found along the drainages. This cover type holds 15% of the volume found on the tract. The most abundant species is black oak which comprises 14% of the volume (13,010 board feet) within the cover type, American beech is the second most common species making up 11% of the volume (10,380 board feet), and chinkapin oak is third with 10% of the volume (9,350 board feet). Other less common species include sugar maple, white oak, Shumard oak, mockernut hickory, American elm, yellow poplar, scarlet oak, Ohio buckeye, and black walnut.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife.

To meet the desired future condition, the tract could use an improvement harvest. An improvement harvest could remove between 25,000 – 75,000 board feet from this cover type. Most of this would be removed under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection would also favor releasing future crop trees of timber and wildlife value. The residual stand will maintain a variety of mesic species. Similar to the oak hickory stand, regeneration openings may occur on 5-15% of the mixed hardwoods stand acreage.

Stand 3 – Old Field – 5 acres

This cover type is found in the center of the tract on top of the ridge and includes 7% of the tract acreage and holds 15% of the volume found on the tract. The most abundant species inventoried was Eastern red cedar which comprises 56% of the volume (50,870 board feet) within the cover type, scarlet oak is the second most common species making up 15% of the volume (13,280 board feet), and black oak is third with 8% of the volume (7,620 board feet). Other less common species include yellow poplar, pignut hickory, white oak, and black cherry.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife.

In order to meet the desired future condition, the Eastern red cedar and the lower grade hardwoods could be removed from this cover type to release existing mid-story oaks and hickories. The use of single tree selection or group opening may be used in order to remove the cedar and less desirable hardwoods. An improvement harvest could remove between 25,000 – 75,000 board feet from this cover type. When possible, selection would also favor releasing future crop trees of timber and wildlife value.

Stand 4 – Bottomland Hardwoods – 1 acre

This cover type is found in the northeast corner of the tract where it is closest to Texas Creek. The area is dominated by American sycamore and yellow poplar. The desired future condition of this cover type is to provide for multiple economic and ecological services including a diverse hardwood timber stand, wildlife habitat, and a buffer to Texas Creek. Given current stand conditions invasive species management or TSI could be performed.

The current forest resource inventory was completed on 3/14/2018 by Forester Elena Wilcoxson. A summary of the estimated tract inventory results are located in the table below.

Tract Summary Data (trees >11”DBH):

Total acres= 67	Gingrich stocking= 82%
Total trees per acre= 131	Present volume per acre= 10,047 bd. ft.
Basal area per acre= 102	Projected harvest volume per acre= 4,000-5,000 bd. ft.

Species	# Sawtimber Trees	Total Bd. Ft.
White Oak	704	249,870
Yellow Poplar	206	104,820
Black Oak	108	52,080
Eastern Red Cedar	292	36,520
Scarlet Oak	94	27,930
American Sycamore	42	27,830
Northern Red Oak	74	24,510
Chinkapin Oak	119	23,680
White Ash	89	23,150
Pignut Hickory	90	17,340
Sugar Maple	70	15,370
American Beech	24	11,400
Post Oak	70	10,240
Shagbark Hickory	66	10,020
Blue Ash	58	8,080
Shumard Oak	4	6,110
Mockernut Hickory	19	5,550
Ohio Buckeye	34	4,710
Black Walnut	45	4,400
American Elm	11	3,740
Black Cherry	19	2,790
Total	**2,238**	**673,140**

Summary Tract Silvicultural Prescription and Proposed Activities

Due to the current condition of the stand, an improvement harvest is recommended and could be undertaken in this tract at any time. Overall tract volume would be reduced 30-50%. Most of this would occur under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple matured trees growing together. It is recommended that TSI be undertaken in this tract after the harvest to accomplish a variety of tasks, including completion of any marked openings, snag recruitment and control of invasive species.

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

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

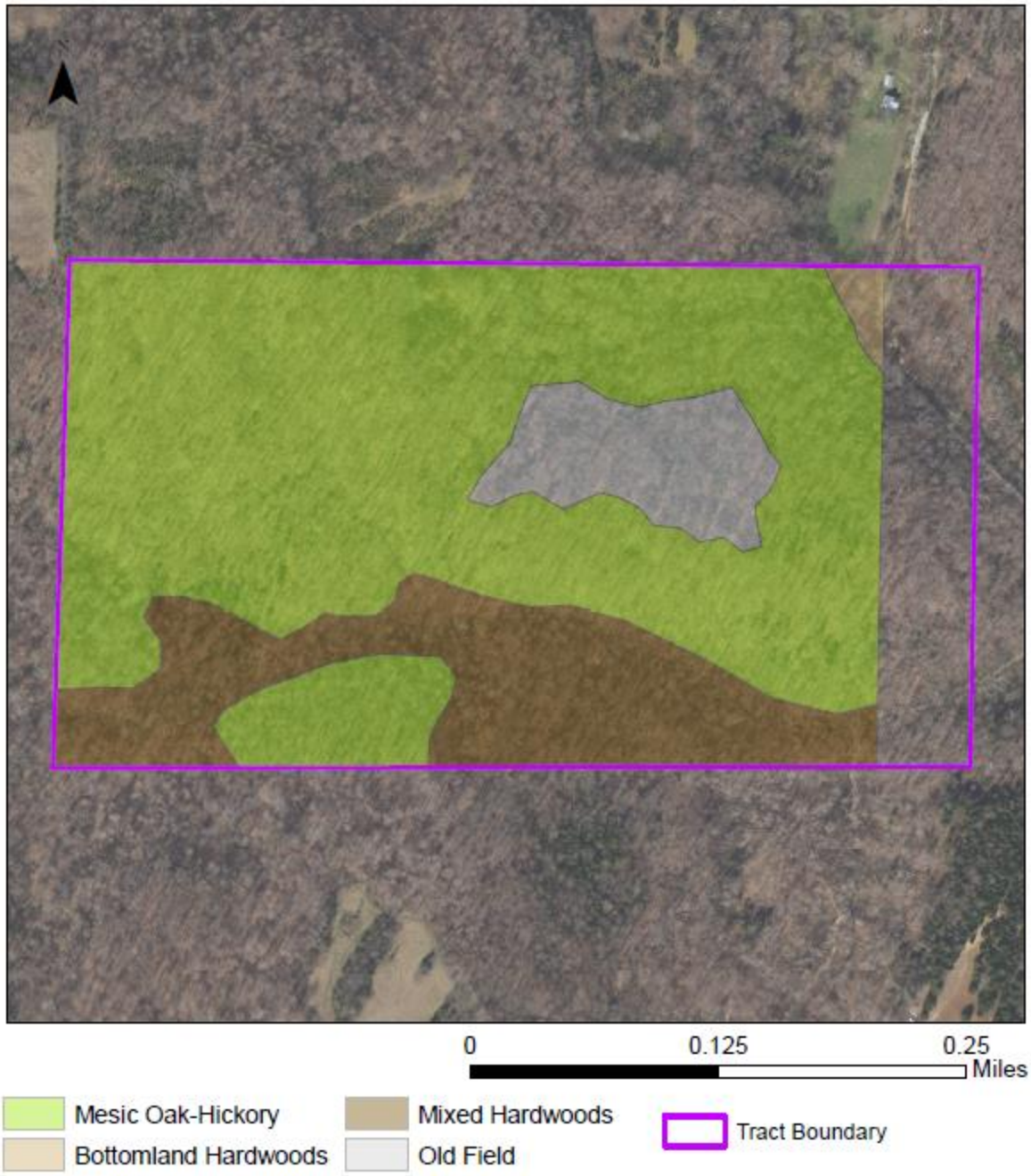
Hydrology should not be permanently affected by management on this tract. Water quality and yield should not be altered if BMPs are followed during harvest. BMP use will be contractually required of management operators.

Wildlife in this tract should not be adversely affected. Snags and coarse woody debris should remain at viable levels in the stratum and should continue to provide habitat for the Indiana bat and other species.

Given the type and amount of recreation that is carried out on this tract, impacts will be minimal. Hunting opportunities should be improved by the maintenance of early successional habitat and the recruitment of hard mast producers such as oak and hickory to provide deer and small mammal browse.

Proposed Management Activity	*Proposed Date*
Management Guide	2018
Gain Access	2018-2020
Treat Invasive Species	2018-2020
Mark Harvest	2018-2020
Sell Timber	2019-2021
Post Harvest TSI	One to two years after harvest
Treat Invasive Species	One to three years after harvest
Monitor regeneration openings	Three to four years after harvest
Re-Inventory	2038
Write new Management Plan	2038

Harrison-Crawford State Forest
Compartment 16 Tract 6
Cover Types Map



State Forest: Harrison Crawford | Compartment: 20 | Tract: 5
Forester: E. Crosier | Date: September 20, 2019 | Acres: 92
Management Cycle End Year: 2039 | Management Cycle Length: 20 years

Location

Compartment 20 Tract 5, also known as 6342005, is located in Harrison County, Indiana. The tract is located in sections 26 and 35 of T3S R2E. The tract is located approximately 4 miles northeast of the town of Leavenworth, Indiana, 5 miles southeast of Carefree, Indiana, and 7.5 miles west of Corydon, Indiana. The tract is bordered on its northwest side by the Blue River.

General Description

The acreage of this tract is approximately 88 acres. There are six distinct cover types on this tract: Mesic Oak-Hickory, Mixed Hardwoods, Conifer (called Old Field here), Dry Oak-Hickory, Rocky Steep, and Water. There are a total of 35 acres (39% of the tract acreage) contained within Greenbrier Knob Nature Preserve and a total of 53 acres (61% of the tract acreage) outside the Nature Preserve on the tract.

Tract 5 Stand Acreages and Volumes

Stand	Acres	Percent of Acreage	Estimate Volume	Percent of Volume
Mesic Oak-Hickory	30	33%	252,230	43%
Mixed Hardwoods	27	29%	227,790	39%
Old Field	5	6%	11,000	2%
Dry Oak-Hickory	10	11%	41,130	7%
Rocky Steep	16	17%	54,910	9%
Water	4	4%	0	0%
Total	92	**100%**	587,060	**100%**

Values are rounded approximates

History

Acquisition 1940 to 1999

The tract was acquired in 4 parcels. February 21, 1940 the southeastern portion of the tract was acquired from William, Albert, and Lena A. Rothrock. November 12, 1968 part of the eastern edge of the tract was acquired from William and Elsie Smoots. November 13, 1972 the largest portion of the tract, the northern portion, was purchased from Peter G. and Ruth M. Hanson. July 31, 1999 the southern portion of the tract was acquired from The Nature Conservancy.

Management Plan 1993

In 1993, forester Matthew S. Fallon wrote a management guide for tract 2005. At that time pignut hickory, white oak, white ash, Northern red oak, and yellow poplar were the most dominant species by volume on the tract. This is still largely the same across the tract with white oak, sugar maple, pignut hickory, chinkapin oak, and Northern red oak being the most dominant species. In the 1993 management guide Fallon writes, “The tract is almost completely oak/hickory cover type. White and red oak dominate the north; chinkapin and post oak take over to the south. Poplar, white ash, black walnut, sugar maple and some black cherry are associated species

especially in moister areas along drainages. A patch of open ground and early successional species (Eastern red cedar, redbud, dogwood, red elm, blackberries) lies in the northeast corner. What is present on the southern slope (Chinkapin oak, post oak, blackjack oak, eastern red cedar, sugar maple) is short, deformed, scrubby and of little value. A cliff face runs along the west side of the tract down to the river that is non-merchantable. Regeneration overall is short and a little sparse, but mainly oak and hickory, sugar maple, and some white ash. With the exception of the southern slope the timber looks healthy and vigorous."

Timber Harvest 1995

January 27, 1995, a sale including Compartment 20 Tracts 4, 5, and 6 was sold to DMI Furniture Co. for $60,100. Dwayne Sieg and Dan Shaver were the marking foresters. 126 acres across the 3 tracts were marked. The sale number was 6349501. It was written about the harvest, "Silvicultural method was mostly an intermediate improvement harvest with some thinning." The below table details the volume by species sold during the 1995 harvest.

1995 Harvest of Compartment 20 Tracts 4, 5, and 6

Species	Number of Trees	Number of Culls	Volume
N. Red Oak	142	13	45,984
Black Oak	132	13	34,775
White Oak	186	40	32,453
White Ash	80	40	41,118
Sugar Maple	97	59	10,879
Pignut Hickory	63	29	9,007
Yellow Poplar	47	17	8,949
Chinkapin Oak	57	8	7,767
Shagbark Hickory	30	11	3,638
Black Cherry	19	0	3,361
Black Walnut	23	2	2,943
Black Hickory	12	5	2,299
Basswood	6	5	2,166
Blue Ash	9	2	1,572
American Beech	10	0	1,484
Scarlet Oak	5	0	689
Hackberry	4	0	642
Blackgum	2	1	639
Largetoothed Aspen	5	2	631
Misc.	3	3	285
Shingle Oak	2	0	259
Sassafras	1	1	150
Chestnut Oak	1	0	71
Total	**936**	**251**	**211,761**

Landscape Context

The dominant land uses within a 5 mile radius of the tract are agricultural and forestlands. There is more development near I-64 (1.5 miles north of the tract), along SR-66 (west of the tract), and along SR-62 (north of the tract). Additionally, within 7 miles the towns of Leavenworth and Carefree, the Ohio River, O'Bannon Woods State Park (2,000 acres), and numerous Nature Preserves (1,800 acres) can all be found. Additionally, part of the tract is encompassed within the Greenbrier Knob Nature Preserve. The tract is bordered to the west by the Blue River.

Topography, Geology and Hydrology

The tract is made up entirely of a single slope majority of which is west facing. The hill slopes relatively gently down to meet the Blue River to the west. The slope is bounded to the north and south by sizeable drainages which are the tract boundary. A noticeable shelf runs the length of the hillside, it follows above the southern drainage, wraps around the slope, and continues along above the northern drainage. This area has karst hydrology typical of much of the area, with springs, sinkholes, and caves being common. These features will be avoided, buffered or otherwise treated to minimize adverse impacts during management activities.

Soils

Tract 2005 has 48 acres (53%) covered in Corydon Stony Silt Loam, it covers the mid and lower slopes uphill from the Blue River. There are 20 acres (21%) covered in Hagerstown Silt Loam, majority of which is located near the ridge top at the northern end of the tract. There are 14 acres (15%) covered in Wellston Silt Loam, which is located near the ridge top at the southern end of the tract. Additionally, Pekin Silt Loam, Gilpin Silt Loam, and Haymond Silt Loam are also present.

Corydon Stony Silt Loam (CoF) Shallow, moderately steep to very steep, well-drained, stony soils on uplands. Surface layer is about 3 inches. Subsurface is about 6 inches thick. Subsoil about 9 inches thick. The depth to hard limestone bedrock is about 18 inches. High in organic matter and low in natural fertility. Runoff is rapid or very rapid. Soil type is characterized by limestone outcrops, with as much as 15% on benches which are deeper than 20 inches to bedrock.
Degree Slope: 20-60 %
Woodland Suitability Group: 3d7
Site Index: 65-75 (Upland oaks)
Growth range potential (Upland oaks): 155-220
Management concerns: Runoff and erosion

Hagerstown Silt Loam (HaC2, HaD2, HgC3, HgD3, HgE3) Deep, moderately sloping to moderately steep, well-drained soils on uplands. Surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil is about 46 inches thick. The depth to limestone is about 52 inches. Characteristically, this soil is eroded to severely eroded. Moderate in content of organic matter and medium in natural fertility. Available water capacity is moderate or high, and permeability is moderate. Runoff is rapid to very rapid.
Degree Slope: 6-25 %
Woodland Suitability Group: 1o1 or 1r2
Site Index: 85-95 (Upland Oaks)
Growth range potential (Upland oaks): 300-375 bd.ft. /acre/year
Management Concerns: Runoff and erosion

Wellston Silt Loam (WeC2, WeC3, WeD2, WeD3) Moderately deep and deep, moderately sloping and strongly sloping, well draineds soils on uplands. Surface layer is about 9 inches thick and yellowish-brown. The subsoil is about 31 inches thick. Depth to hard sandstone bedrock is about 40 inches. Moderate in content of organic matter and low in natural fertility. Available water capacity is moderate or high, and permeability is moderate. Runoff ranges from medium to very rapid.
Degree Slope: 6-18 %
Woodland Suitability Group: 3o10
Site Index: 70-80 (Upland oaks)
Growth range potential (Upland oaks): 185-260 bd.ft./acre/year
Management Concerns: Runoff and erosion

Access
Fire lane 102, which comes off of SR-462 just south of Feller Road, can be used to access 2003, 2004, 2006, and 2008 before running through 2005 for which it is the only access.

Boundary
The tract is bounded to the north and to the south by two sizeable drainages, to the west by the Blue River, and to the east the top of the ridge forms the tract boundary.

Ecological Considerations
This tract represents typical oak-hickory and mixed mesic habitat, in addition to a component of old field successional habitat, with cedar and smaller hardwoods. Consequently, it likely receives use from a typical assemblage of common game and nongame wildlife species such as white-tailed deer, wild turkey, squirrels, songbirds, snakes, box turtles, and others. Hard mast food sources are provided by the abundant oaks and hickories in the tract.

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

	Maintenance Level	Inventory	Available Above Maintenance
Snag 5”+ DBH	352	1,773	1,421
Snag 9”+ DBH	264	1,257	993
Snag 19”+ DBH	44	93	49

Inventory data for Compartment 20 Tract 5 shows that snags exceed recommended maintenance levels in all diameter classes.

It is important to note that these are compartment guidelines and that even though the estimated tract data does not quite meet all target levels, it is likely that suitable levels are present for these habitat features in the surrounding landscape. The prescribed management will maintain or enhance the relative abundance of these features.

Ailanthus was noted in several locations along the Adventure Trail and Upper Blue Horse Trail. Many individuals were treated at the time of inventory including a large pocket with several 10+ inch individuals within the Nature Preserve on the furthest west point of the shelf which runs the west side of the tract. Multiflora rose was noted scattered across the tract and burning bush was seen. Autumn olive was noted in several locations but was more concentrated in the old field. Bush honeysuckle was also present in the old field. Garlic Mustard and Stilt Grass were noted along the Blue River and stilt grass was prevalent along the Upper Blue River Horse Trail. Much of the graveled portion of the Upper Blue Horse Trail was treated with approved herbicide following certification standards. These are common species prevalent throughout the county.

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

Recreation

Several recreational trails run through this tract including the Upper Blue River Horse Trail and the Adventure Hiking Trail and the area is likely used by hunters. Additionally, Stage Stop Campground (currently closed) is across the Blue River from this tract.

Cultural

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

Tract Subdivision Description and Silvicultural Prescription

<u>Stand 1 – Mesic Oak-Hickory – 30 acres</u>

This cover type is found across 22% of the tract acreage, 14 acres of which is located on Greenbrier Knob Nature Preserve and will not be a part of this silvicultrual prescription. 16 acres of the mesic oak-hickory stand is located outside the Nature Preserve. This stand covers the upper slopes on the east side of the tract. 43% of the volume found on the tract is located within

this cover type. 90% of the volume within this cover type is made up of oak and hickory species. The most abundant species is white oak which comprises 63% of the volume (158,000 board feet) within the cover type, pignut hickory is the second most common species making up 11% of the volume (28,000 board feet), and Northern red oak is third with 6% of the volume (6,000 board feet). Other less common oak and hickory species included shagbark hickory, black oak, and chinkapin oak. The mid-story (pole sized timber) is dominated by sugar maple although blue ash, shagbark hickory, pignut hickory, chinkapin oak, and white ash were also present. The understory is dominated by sugar maple but redbud and American beech were are also present.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by oak and hickory, while providing hard mast and early to mid-seral habitat for wildlife.

Given current stand conditions and stocking, and to facilitate the desired future condition an improvement harvest is prescribed over the next 2-5 years. Oaks and hickories are not only the best species for supplying hard mast but are also the best quality timber group that is occurring in this stand. An improvement harvest could remove between 100,000 – 150,000 board feet from this cover type. Most of this would be removed under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees of timber and wildlife value. The residual stand is expected to be slightly heavier to white oak, with a lesser component of other oak and hickory species, as well as a minor component of mesophytic species. This provides a stand of longer-lived higher-quality white oak that allows for more management options into the future. Openings created by group and patch-cuts will help recruit oak into the future as well as maintain the presence of early seral habitat. Openings should be large enough to achieve regeneration of desirable species and should coincide with the release of advance regeneration when possible. It is estimated that 5-15% of the stand acreage may have regeneration opening treatments.

Under uneven aged management trees in all size classes are thinned during management operations to promote stand development and regeneration. Given that many of these will be un-merchantable, post-harvest timber stand improvement (TSI) is prescribed to thin poorly-formed, low-quality trees, and treat the understory to reduce shade tolerant species where appropriate in favor of oaks and other more desirable species. The select girdling of medium to large low value trees may also be undertaken to recruit larger snags and provide habitat. TSI will also be needed to control invasive species that are present on the tract.

<u>Stand 2 – Mixed Hardwoods – 27 acres</u>

This cover type is found across 30% of the tract acreage, 5 acres of which is located on Greenbrier Knob Nature Preserve and will not be included in the silvicultural prescription. 22 acres of the mixed hardwoods stand is located outside the Nature Preserve. This stand covers the north end of the upper slopes on the east side of the tract as well as the mid and lower slopes in the northwest corner of the tract. This cover type holds 39% of the volume found on the tract. The most abundant species is sugar maple which comprises 14% of the volume (32,480 board feet)

within the cover type, white oak is the second most common species making up 13% of the volume (29,560 board feet), and white ash is third with 11% of the volume (25,270 board feet). Other less common species include basswood, yellow poplar, black oak, scarlet oak, American sycamore, and pignut hickory. The mid-story (pole sized timber) is dominated by sugar maple, although chinkapin oak, yellow poplar, and eastern red cedar were also present. The understory is dominated by sugar maple.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife.

Given current stand conditions and stocking, and to facilitate the desired future condition an improvement harvest is prescribed over the next 2-5 years. An improvement harvest could remove between 10,000 – 30,000 board feet from this cover type. Most of this would be removed under a single tree selection routine with larger group and patch-cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection would also favor releasing future crop trees of timber and wildlife value. The residual stand will maintain a variety of mesic species. Similar to the oak hickory stand, regeneration openings may occur on 5-15% of the mixed hardwoods stand acreage. 65% of the proposed harvest volume, within this cover type, would come from non-oak and hickory species, such as sugar maple and white ash. Ash has been severely impacted after the introduction of Emerald Ash Borer into the area in ~2016. It is likely ash throughout the tract will essentially disappear from the tract rapidly.

Stand 3 – Old Field – 5 acres

This cover type is found across 6% of the tract acreage, all of which is located outside Greenbrier Knob Nature Preserve. This stand encompasses the northeast corner of the tract and holds 2% of the volume found on the tract. The most abundant species is white ash which comprises 73% of the volume (8,040 board feet) within the cover type, and Eastern red cedar is the second most common species making up 27% of the volume (2,950 board feet). The mid-story (pole sized timber) is dominated by Eastern red cedar, yellow poplar and sugar maple. The understory is dominated by sugar maple and Eastern red cedar.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife.

In order to meet the desired future condition, the Eastern red cedar and the lower grade hardwoods should be removed from this cover type to release existing mid-story oaks and hickories. The use of single tree selection or group and patch-cut openings may be used in order to remove the cedar and less desirable hardwoods.

Stand 4 – Dry Oak-Hickory – 10 acres

This cover type is found across 11% of the tract acreage, 1 acre of which is located on Greenbrier Knob Nature Preserve and will not be a part of the silvicultural prescription. 9 acres of the dry

oak-hickory stand is located outside the Nature Preserve. This stand covers the upper slopes near the southern end of the tract. 7% of the volume found on the tract is located within this cover type. The most abundant species is post oak which comprises 32% of the volume (11,960 board feet) within the cover type, white oak is the second most common species making up 28% of the volume (10,390 board feet), and chinkapin oak is third with 23% of the volume (8,550 board feet). The mid-story (pole sized timber) is dominated by sugar maple and Eastern red cedar. The understory is dominated by sugar maple and white ash.

The objective of this cover type is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by oak and hickory, while providing hard mast and early to mid-seral habitat for wildlife.

Given current stand conditions and stocking, and to facilitate the desired future condition an improvement harvest is prescribed over the next 2-5 years. Oaks and hickories are not only the best species for supplying hard mast but are also the best quality timber group that is occurring in this stand. An improvement harvest could remove between 50,000 – 10,000 board feet from this cover type. Most of this would be removed under a single tree selection routine with larger group or patch-cut openings targeting groups of low-grade trees or multiple large trees growing together. When possible, selection should also favor releasing future crop trees of timber and wildlife value. The residual stand is expected to be slightly heavier to white oak, with a lesser component of other oak and hickory species, as well as a minor component of mesophytic species. This provides a stand of longer-lived higher-quality white oak that allows for more management options into the future. Openings created by group selection areas will be used to help recruit oak into the future as well as maintain the presence of early seral habitat. Openings should be large enough to achieve regeneration of desirable species and should coincide with the release of advance regeneration when possible. It is estimated that 5-15% of the stand acreage may have regeneration opening treatments.

Under uneven aged management trees in all size classes are thinned during management operations to promote stand development and regeneration. Given that many of these will be un-merchantable, post-harvest TSI is prescribed to thin poorly-formed, low-quality trees, and treat the understory to reduce shade tolerant species where appropriate in favor of oaks and other more desirable species. The select girdling of medium to large low value trees may also be undertaken to recruit larger snags and provide habitat. TSI will also be needed to control invasive species that are present on the tract.

<u>Stand 5 – Rocky Steep – 16 acres</u>

This cover type is found across 6% of the tract acreage, all of which is located on Greenbrier Knob Nature Preserve and is not included in the prescribe management recommended for this tract. This stand encompasses the slopes above Blue River along the northwest side of the tract and holds 9% of the volume found on the tract. The most abundant species is chinkapin oak which comprises 37% of the volume (20,280 board feet) within the cover type, scarlet oak is the second most common species making up 13% of the volume (7,040 board feet) and black walnut is third

with 10% of the volume (5,650 board feet). The mid-story (pole sized timber) is dominated by Northern red oak, chinkapin oak, and sugar maple. The understory is dominated by sugar maple.

The current forest resource inventory was completed on 9/1/19 by Forester Elena Crosier. A summary of the estimated tract inventory results are located in the table below.

Tract Summary Data (trees >11"DBH):

Total acres= 92	Gingrich stocking= 79%
Total trees per acre= 159	Present volume per acre= 6,870 bd. ft.
Basal area per acre= 92	Projected harvest volume per acre= 2,500-3,000 bd. ft.

Species	# Sawtimber Trees	Total Bd. Ft.
White Oak	627	222,900
Sugar Maple	209	50,970
Pignut Hickory	188	49,320
Chinkapin Oak	186	47,350
Northern Red Oak	100	37,330
White Ash	64	35,760
Yellow Poplar	31	22,930
Basswood	61	21,630
Black Oak	69	21,620
Scarlet Oak	45	19,320
Post Oak	90	16,890
American Sycamore	28	14,270
Shagbark Hickory	42	13,710
Chestnut Oak	36	8,170
Mockernut Hickory	26	7,550
Amrican Beech	8	5,410
Black Cherry	8	5,300
Eastern Redcedar	102	5,070
American Elm	4	5,040
Blue Ash	16	4,040
Black Walnut	13	4,010
Bitternut Hickory	12	2,280
Total	**1,965**	**620,870**

Summary Tract Silvicultural Prescription and Proposed Activities

Due to the current condition of the tract, an improvement harvest is recommended and could be undertaken at any time. Overall tract volume would be reduced 20-40%. Most of this would occur under a single tree selection routine with larger group and patch-cut openings targeting groups of low-grade trees or multiple matured trees growing together. It is recommended that

TSI be undertaken in this tract after the harvest to accomplish a variety of tasks, including completion of any marked openings, snag recruitment and control of invasive species.

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

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

Hydrology should not be permanently affected by management on this tract. Water quality and yield should not be altered if BMPs are followed during harvest. BMP use will be contractually required of management operators.

Wildlife in this tract should not be adversely affected. Snags and coarse woody debris should remain at viable levels in the stratum and should continue to provide habitat for the Indiana bat and other species.

Given the type and amount of recreation that is carried out on this tract, this resource will be temporarily affected. Horse trails may be temporarily closed and the Adventure Hiking Trail may be temporarily closed or re-routed in this area. Hunting opportunities should be improved by the maintenance of early successional habitat and the recruitment of hard mast producers such as oak and hickory to provide deer and small mammal browse.

Proposed Management Activity	*Proposed Date*
Management Guide	2019
Improve Access	2019-2021
Treat Invasive Species	2019-2021
Mark Harvest	2019-2021
Sell Timber	2020-2023
Post Harvest TSI	One to two years after harvest
Treat Invasive Species	One to three years after harvest
Monitor regeneration openings	Three to four years after harvest
Re-Inventory	2039
Write new Management Plan	2039

Harrison-Crawford State Forest
Compartment 20 Tract 05
Cover Types Map