Indiana Department of Natural Resources
Division of Forestry

DRAFT

Resource Management Guide

Harrison-Crawford State Forest **Compartment: 19 Tract: 2**
Dieter Rudolph **Date: October 30, 2009**

Acres Commercial Forest: 144
Acres Noncommercial Forest: 0
Acres Permanent Opening: 1
Acres Other: 0

Acres Total: 145

Basal Area >= 14 inches DBH: 42.26 sqft/ac
Basal Area < 14 inches DBH: 57.62 sqft/ac
Basal Area Culls: 3.93 sqft/ac
Total Basal Area: 99.88 sqft/ac

Number Trees/Acre: 267

Species	Harvest Volume(MBF)	Leave Volume(MBF)	Total Volume(MBF)
Sugar Maple	34.62	91.59	126.21
Eastern Red Cedar	27.71	3.14	30.85
Scarlet Oak	25.79	18.94	44.73
American Beech	17	15.8	32.8
Yellow Poplar	14.54	60.85	75.39
White Ash	14.04	9.89	23.93
White Oak	12.67	37.22	49.89
Chinkapin Oak	9.94	18.84	28.78
Sassafras	8.29	0	8.29
Blackgum	5.58	0	5.58
Northern Red Oak	5.39	5.96	11.35
Blue Ash	4.16	2.49	6.65
Black Oak	4.03	4.47	8.5
Black Cherry	3.7	4.42	8.12
Basswood	2.35	2.44	4.79
Pignut Hickory	1.46	21.2	22.66
Shagbark Hickory	0	38.22	38.22
American Sycamore	0	13.69	13.69
Silver Maple	0	7.95	7.95
Eastern Cottonwood	0	7.43	7.43
Black Walnut	0	5.29	5.29
Bitternut Hickory	0	4.47	4.47
Hackberry	0	1.94	1.94
Chestnut Oak	0	1.46	1.46
Ohio Buckeye	0	1.32	1.32
Total	191.27	379.02	570.29
Total per acre	1.35	2.61	3.96

Location

This tract is located in Harrison County, Indiana. It is mainly in sections 27 and 34 with a small portion in sections 26 and 35, R2E T3S. The tract is the northern half of Greenbriar knob.

History

The designation of Compartment 19, tract 2 has changed over the course of the management unit system, here. Prior to the early 2000s, the tract's bordered a large private inholding on its south side and took in some of the eastern portion of what is now Compartment 19, tract 9.

In 1999, this private inholding was purchased from The Nature Conservancy (TNC). After that time, the boundaries of this and a couple other adjacent tracts were re-delineated to follow topographic features and include the new acquisition. Therefore, older acreages given for tract 2 were different than current. Fortunately, in this regard, there had not been a previous forest inventory of the tract, which prevented confusion and loss of useful numbers.

That area of tract 2 north of the 1999 TNC purchase is made up of 4 previous acquisitions. The small area in Section 26 was bought in 1973 from Leffler. The area adjacent to that in Section 27 was acquired in 1977 from Fisher. A small area next to Blue River came from the St. Meinrad Archabbey in 1973 and the western most portion was purchased from Eaton in 1974. The Eaton and Fisher parcels appear to have received moderate to heavy high-graded cuts just prior to State acquisition (stumps and degraded residual stands observed). It is known that the TNC parcel was heavily cut in 1986 by Patoka Pallet when owned by Cole and was reported that about 10 years prior to that, the same area had been high graded when owned by McClintock.

Since State acquisition, the fire lane running through the tract has been improved to some degree to work towards reliable service access to this tract and Compartment 19, tract 10 adjacent to the north. More work is needed to increase accessibility.

Sizeable pockets of Ailanthus (tree of heaven) had been found, mostly in the TNC parcel, at or near the top of Greenbrier Knob and subsequently treated to control this species, prior to this inventory.

General Description

This tract is mainly a north facing slope with a portion facing east. It is the northern half of Greenbrier Knob and borders the Blue River in areas. The majority of this tract is a Mixed Hardwoods stand, totaling 70 acres. Parts of the slope are steep and rocky while there are also areas that are cliffs. These areas were labeled as a Mixed Steep stand which was 48 acres. These steep areas were along the eastern edge near the Blue River and in the northeast . The remaining stands were all found in small areas, the Oak Hickory stand was in four small pockets totaling 6 acres while the Cedar stand was in one

3 acre pocket. There was a Bottomland Hardwoods stand (8 acres) along the Blue River in the northern boundary next to an Old Field stand (6 acres) also along the Blue River. There were also four major pockets of Ailanthus, mostly along the top of the knob.

Landscape Context

1902 is part of a contiguous body of land owned by the State of Indiana and is surrounded mainly by state land. A section of land to the north across the blue river is privately owned and not forested. A 10 acre private parcel is < ¼ mile south of the tract. The rest of the surrounding land is mostly forested, mainly deciduous, with a white pine stand in southern edge of the tract to the south and various groups or stands of e. red cedar in the vicinity. A section of the northern boundary is defined by the Blue River while the entire eastern boundary is defined by the river. Wyandotte Caves are less than a mile to the northeast of this tract.

Topography, Geology, and Hydrology

This tract is mostly a north facing slope with a small area being an east facing slope. Greenbrier Knob is a somewhat pronounced feature within the surrounding landscape. There is a large elevation change of about 422 feet from the southern boundary (the top of Greebriar Knob) and the northern boundary (the Blue River and its flood plain). Some of these slopes are steep and some are cliffs.

There is evidence of karst activity in the tract, mainly the northeastern finger of the tract. A few large sinkholes were found in this area as well as Greebriar Knob Cave. Due to the presence of sinkholes and caves, protection of underground waterways remains a priority for the area.

Tract 2 is part of the Blue River watershed.

Soils

Bartle Silt Loam (BbhA, BbD2)

The Bartle series consists of very deep, somewhat poorly drained soils that formed in silty alluvium and loess on stream terraces. They are moderately deep to a fragipan. Mean annual precipitation is about 43 inches, and mean annual temperature is about 54 degrees F. The surface horizon is consisted of a brown silty loam plow layer. The next 7 inches is comprised of a yellowish brown silt loam B/E complex. The next 6 inches are made up of a brownish loam silt loam with increasing clay. There are 50 inches left of the pedon which are a yellowish brown silt loam, of various different layers. The substratum starts at 55 inches below the surface.
Degree Slope: 0-4%
Site Index: 75
Growth Range Potential: 342

Baxter Cherty Silt Loam (BeC2, BeD2, BeE2, BeF2, Cbsd3)

The Baxter series consists mainly of deep well drained soils on uplands. These soils formed in loess, as much as 20inches and the underlying material is weathered bedrock. The surface horizon is 2 inches thick of a dark brown silt loam. The subsurface is 6

inches of a yellowish brown silt loam. The subsoil is 70inches of which the first 5 is a yellowish brown friable silty clay loam. The last 65inches is red firm to very firm cherty silty clay loam. The lower part has mottling and id 20-40 percent chert fragments. The available water capacity is high and the permeability is moderate.
Degree Slope: 0-35%
Site Index: 75
Growth Range Potential: 222
Management Considerations: runoff and erosion

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

Elkinsville Silt Loam (ElA, ElB2, ElC2, ElC3) Deep, nearly level to moderately sloping, well-drained soils on terraces. Surface layer is about 12 inches thick. Subsoil is about 50 inches thick. The underlying material is stratified layers of silt or sand and minor amounts of gravel. Moderate in content of organic matter. Available water capacity is high, and permeability is moderate. Runoff is slow to rapid.
Degree Slope: 0-12 %
Woodland Suitability: 1o1
Site Index: 85-95
Growth range potential (Upland oaks): 300-375 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

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

Haymond Silt Loam (Hm) Deep, nearly level, well-drained soils on bottom lands and in basins of sinkholes in uplands. Surface layer is dark-brown about 9 inches thick. Subsoil dark yellowish-brown about 17 inches thick. Underlying material is dark yellowish-brown stratified silt loam that contains less prominent layers of loam. Moderate in content of organic matter. Available water capacity is high, and permeability is moderate. Runoff is slow.
Degree Slope: 0%
Woodland Suitability Group: 1o8
Site Index: (95-105- no rating for upland oaks)
Growth range potential (Tulip poplar-no rating for oaks): 375-450 bd.ft./acre/year
Management Concerns: Flooding between December and June

Markland Silt Loam (MaB2, MaD2, MaF, McD3) Deep, gently sloping to very steep, well drained and moderately well drained soils on terraces. Surface layer is dark grayish-brown silt loam about 3 inches thick. Subsurface layer is dark-brown silt loam about 4 inches thick. Subsoil is about 23 inches thick. The underlying material is yellowish-brown stratified silty clay and silty clay loam that has less prominent layers of silt loam. Moderate or low in content of organic matter and low in natural fertility. Available water capacity is high, and permeability is slow. Runoff is medium to very rapid.
Degree Slope: 2-70%
Woodland Suitability Group: 3r18
Site Index: 70-80 (Upland Oaks)
Growth range potential (Upland oaks): 185-260 bd.ft./acre/year
Management Concerns: Runoff and erosion

McGary Silt Loam (Mg) Deep, nearly level, somewhat poorly drained soils on terraces. Included with it in mapping were a few small areas of gently sloping eroded soils and areas where there is a loess cap more than 14 inches thick. They formed in calcareous lacustrine material. The native vegetation was mixed hardwoods. The surface layer is grayish-brown silt loam about 8 inches thick. The subsoil is about 37 inches thick. The upper 6 inches is grayish-brown and yellowish-brown firm silty clay loam, and the next 16 inches is yellowish-brown and grayish-brown very firm silty clay. The lower 15 inches is gray very firm silty clay that has dark brown mottles. The underlying material is gray silty clay loam.
Degree Slope: 0-2%
Woodland Suitability Group: 3w5
Site Index: 70-80
Growth range potential (Upland oaks): 185-260 bd.ft./acre/year
Management Concerns: Wetness

Pekin Silt Loam (PeA, PeB2) Deep, nearly level and gently sloping, moderately well drained soils on terraces. Fragipan in the lower part of the subsoil. Surface layer is dark brown silt loam about 12 inches thick. Subsoil is about 37 inches thick. Underlying material is stratified silty clay loam, silt loam, loam, and sand. Moderate in content of organic matter. Available water capacity is moderate, and permeability is very slow. Runoff is slow to medium.
Degree Slope: 0-6%
Woodland Suitability Group: 3d9
Site Index: 70-80 (Upland Oaks)
Growth range potential (Upland oaks): 185-260 bd.ft./acre/year
Management Concerns: Erosion, available water capacity, early spring wetness, lack of moisture in in mid and late summer.

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

Zanesville Silt Loam (ZaC2, ZaC3, ZaD2) Deep, moderately sloping and strongly sloping, well-drained soils on uplands. Avery firm fragipan in the lower part of the subsoil. Surface layer is very dark grayish-brown silt loam about 3 inches thick. The subsurface layer is about 5 inches thick and dark yellowish-brown. Subsoil is about 42 inches thick. The depth to sandstone bedrock is about 65 inches Moderate or low in content of organic matter and low in natural fertility. Available water capacity is high, and permeability is very slow. Runoff is medium to rapid.
Degree Slope: 6-18%
Woodland Suitability Group: 3d9
Site Index: 70-80 (Upland Oaks)
Growth range potential (Upland oaks): 185-260 bd.ft./acre/year
Management Concerns: Runoff and erosion. Fragipan limits the available water capacity.

Access

This tract is accessible through the firelane that enters State Forest property near the Fire Tower and goes around the peak of Greenbrier Knob on the east. This road needs significant improvement and crushed stone to make it reliably accessible most of the year. There is also the remnant of an old firelane or skid trail that parts from the main firelane and goes along the top of the knob that could be repaired and utilized.

Boundary

The eastern boundary is defined by the Blue River as well as a portion of the northern boundary. The northern boundary not defined by the river is where the slope gives way to flat land. The southern and western boundary follows the ridgetop from the top in the central southern boundary to the flat land at the northwest and southeast corners.

Wildlife

A Natural Heritage Database review was obtained for this tract. If rare, threatened or endangered species 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.

The presence of cavity trees in the tract is below the maintenance level for all size classes. The tract does meet the minimum requirement for snags for the 5"+ and 9"+ size classes and is off for 19"+ snags by three trees. Furthermore, there are an insufficient number of large legacy trees within this tract. It should be noted that the estimation of cavity trees is likely lower than the actual number due to the inventory being conducted in the summer where the foliage makes it difficult to spot many cavities.

Wildlife species that were noted on this stand were those typical of the area. Evidence of deer, squirrels, chipmunks, and turkey were seen in the area. Many of these species utilize the areas of the tract that border the flat fields to the south, benefiting from the presence of fringe habitat. The presence of oak and hickory species creates a source for hard mast which is beneficial to multiple wildlife species, especially in the Oak Hickory pockets.

Wildlife Habitat Feature (Tract Wide)

Category	Maintenance level	Optimal Level	Inventory	Available Above maintenance	Available Above Optimal
Legacy Trees *					
11"+	1305		4119	2814	
20"+	435		260	-175	
Snags (all species)					
5"+	580	1015	2078	1498	1063
9"+	435	870	453	18	-417
19"+	72.5	145	59	-14	-86
Cavity Trees (all species)					
7"+	580	870	220	-360	-650
11"+	435	580	220	-215	-360
19"+	72.5	145	69	-3	-76

* species include: AME, BIH, BLL, COT, GRA, REO, POO, REE, SHH, ZSH, SIM, SUM, WHA, WHO

Indiana Bat

As management activities are currently only performed in the winter months due to voluntary adherence to seasonal Indiana bat guidelines offered by the USFWS, it is unlikely that direct harm will come to the Indiana bat as they are hibernating in nearby caves at this time. Any skid trails/haul roads created in this tract could improve the habitat for the Indiana bat by improving the canopy foraging conditions due to the reduction of understory clutter. Furthermore, the areas around likely roost trees can be opened up to benefit the bat. Released crop trees and the edge of log yards can increase the solar exposure of roost trees which improves the microclimate and thermal conditions of the roosting areas.

Trees that are ideal for roosting bats such as large snags and large trees that have loose/exfoliating bark can be retained to provide for the Indiana bat. Furthermore, the growth of ideal tree species for the Indiana bat can be managed to promote growth to increase the recruitment of trees into the categories suitable for the Indiana bat.
At the moment this stand contains a surplus of live trees in the diameter classes between 11 and 20 inches in diameter and a deficit in those greater than 20 inches in diameter. Likewise, there is an adequate amount of snags in the 5"+ and 9"+ size class. There are not enough snags in the 19"+ size class to meet the Indiana bat requirements.

Due to not being able to meet the maintenance level in most of the categories listed above, this tract does not offer a quality habitat to the Indiana bat. Snags cannot be created from the large legacy trees in this tract due to their numbers being below the maintenance level. At this time there is no practical way to increase habitat quality for the Indiana bat other than encouraging growth in the stands.

Recreation

This tract contained a firelane commonly used by equestrians, although it is not part of the designated trail system. The Greenbrier Knob Cave offers a recreational opportunity for the local cavers. Also, the presence of deer and turkey offers a site to be used by hunters while the blue river allows for fishing.

Cultural

Cultural resources may be present on this tract but their location is protected. Adverse impacts to significant cultural resources will be avoided during any management or construction activities.

Invasive

Ailanthus was marked as being a problem in this tract. There were areas that young Ailanthus was thick, forming a matt over the forest floor. These areas were delineated with GPS and are mostly found on the peak of Greenbrier Knob. These pockets had been treated in the past and the overstory trees have mostly died, but it needs to be treated again to eradicate the Ailanthus regeneration. Also, throughout the tract were areas with a few Ailanthus sprouts but not as dire as the four marked pockets.

Management Limitations

Most soil types in this tract have a management concern of runoff and erosion while the soils near the flatlands and Blue River have the problem of occasional wetness, especially in the winter months. In order to limit these problems, any management activities on the slopes need to be sure to leave downed dead wood and trees to hold the soil in place. Because of this concern, clearcuts and group selection are impractical along the steeper slopes. The areas with the concern of wetness should limit the use of heavy equipment to the minimum and not during excessively wet periods.

Summary Tract Silvicultural Description, Prescription, and Proposed Activities

Overall, this tract roughly follows a reverse J-shaped curve which is the typical diameter distribution for uneven-aged stands with few trees above 20" in diameter. The type of distribution allows for multiple diameter classes while allowing the young trees the opportunity to succeed into dominance.

<u>Bottomland Hardwoods (8 acres) and Old Field (6 acres)</u>

These stands are both small and not easily accessed due to being mostly surrounded by the Blue River and Mixed Steep stand. These stands both had a low basal area (90sqft/ac and 97.8 sqft/ac respectively) making it unnecessary to thin them at the moment. At this moment, no action is recommended these stands.

<u>Mixed Steep (48 acres)</u>

This stand consists mainly of steep rocky slopes and cliffs. The cliffs were terraced with some larger trees growing along the terraces between drops. However, this sawtimber was not accessible. The stand had 109 sqft/ac in it and a total of 4,190 bf/ac. This volume was made up of multiple small trees along the steep rocky slopes and the better, but unreachable, trees on the terraces. Due to the severity of the slope, limited management is prescribed for this stand.

Mixed Hardwoods (70 acres), Oak Hickory (6 acres), Cedar (3 acres)
These stands were combined due to the small sizes of the Oak Hickory and Cedar stand, making it impractical to manage them individually. The Mixed Hardwoods stand dominated this tract and had 99 sqft/ac with 1,310 bf/ac harvestable (26 sqft/ac) leaving 2,240 bf/ac (73 sqft/ac). The Oak Hickory was denser with 116 sqft/ac and volumes of 1,550 bf/ac removable (41 sqft/ac) leaving 3,230 bf/ac (75 sqft/ac). The cedar stand was the densest with 120 sqft/ac and 9,170 bf/ac, mostly eastern red cedar.

As there is a small market for cedar and this stand is too small to offer a sufficient harvest. Roughly half of the basal area of the Cedar stand is sugar maple and yellow poplar which shows that it is beginning to move towards a hardwood stand. The Oak Hickory stand had higher quality and larger trees than the Mixed Hardwoods stand, making it seem that these pockets were left during the heavy harvest prior to state ownership.

The Mixed Hardwoods stand is still showing signs of the previous heavy harvest, having many of its trees being small in diameter. Overall, quality was good in this stand, offering potential for the future. At this moment, no action should occur in these stands so as to allow for a continuation in the recovery from the heavy harvests. Based on the quality of the trees, these stands would have a potential harvest in 20 years, at which time the basal area should be reaching overcrowded and the individuals in the stand should be a large enough size to make a harvest possible. Selections at that time would most likely target for stand improvement, reversing the effects of the old high grading cuts and regenerating those areas of the stand where existing trees offer little potential for productivity.

TRACT ACCOMPLISHMENT RECORD
Compartment 19, Tract 2

DATE PLANNED	ACTIVITY / REMARKS	DATE COMPLETED
2012	Return to Ailanthus Pockets for Follow Up Treatment. Expand to Remove Individual Trees. Include Vine Control	
2015	Improve Accessibility of Fire Trail	
2020	Re-enter Tract to Inventory and Assess Management Needs	

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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.

Note: Some graphics may distort due to compression.