Indiana Department of Natural Resources
Division of Forestry

DRAFT

Resource Management Guide

Harrison-Crawford State Forest **Compartment: 18 Tract: 5**
Dieter Rudolph **Date: September 25, 2009**

Acres Commercial Forest: 108
Acres Noncommercial Forest: 0
Acres Permanent Opening: 14
Acres Other: 0

Acres Total: 122

Basal Area >= 14 inches DBH: 40sqft/ac
Basal Area < 14 inches DBH: 60.79 sqft/ac
Basal Area Culls: 5.15 sqft/ac
Total Basal Area: 100.78 sqft/ac

Number Trees/Acre: 308

Species	Harvest Volume(MBF)	Leave Volume(MBF)	Total Volume(MBF)
Eastern Red Cedar	44.89	49.25	94.14
Scarlet Oak	42.92	12.47	55.39
White Oak	34.2	144.53	178.73
Black Oak	18.82	31.06	49.88
Pignut Hickory	11.51	8.23	19.74
Yellow Poplar	10.83	0	10.83
Sugar Maple	6.53	6.52	13.05
American Beech	3.61	0.97	4.58
Chinkapin Oak	2.8	6.04	8.84
Black Walnut	2.63	4.67	7.3
White Ash	0	11.58	11.58
Northern Red Oak	0	9.61	9.61
Shagbark Hickory	0	9.34	9.34
Black Cherry	0	2.53	2.53
Total	178.74	296.8	475.54
Total per acre	1.46	2.41	3.87

Location

This tract is located in Crawford County, Indiana. It is in section 33, T3S R2E and section 4 in T4S R2E. Indiana SR62 forms the eastern boundary making access throughout the tract excellent.

General Description

This tract is a long, thin piece of land running northeast/southwest. The east/west width of the tract is minimal, making it easy to access SR 62 from any portion of the tract. The southern half of the tract is a west facing slope reaching a drainage along the western boundary. The northernmost section of the tract is an east facing slope with the peak of the slope occurring within the tract. The southern part of this peak is a gradual slope.

There are four primary stands within the tract; Eastern Red Cedar (11 acres), Field (14 acres), Oak Hickory (71 acres), and Old Field (24 acres). The Old Field and Eastern Red Cedar stands both make up the southern half of the tract, merging into each other making the true boundary of both difficult to distinguish. The Oak Hickory stand makes up most of the northern half with the Field stand occurring near the center of this stand in the flatter area. A powerline also exists on this tract (making up less than an acre). This line is thought to be active but is not definite.

History

The land in this tract was purchased in three segments. A small portion of the northeast corner of the tract was a part of a 288.5 acre parcel purchased from Cole in 1969. The rest of the area in section 33 was a part of 208.5 acre purchase from Engleman in 1972. The house in this purchase was briefly used as a property residence and was torn down in 1974-75. The land in section 4 was part of a 271 acre parcel purchased from Hockman in 1968. A boy scout group planted white pine along SR62, near the south end in the 1970s, with a few of these trees remaining. The former field area near the eastern end of the tract was planted into yellow poplar and possibly autumn olive, also in the 1970s. A managed harvest in 1986 took place in the eastern portion of tract 5 and included the adjoining tract 6. This harvest removed 198,457 bd.ft. in both tracts. A regeneration opening was created at that time along the north central tract boundary. Follow-up TSI was performed in 1988. The former field area near the east end has been periodically mowed to maintain a portion of it as a permanent wildlife opening. A few white pine were planted at that site in the early 1990s to serve as wildlife cover.

Landscape Context

1805 is part of a contiguous body of land owned by the State of Indiana and is almost completely surrounded by state land, all of which is forested. The southern tip borders private property and has a fence line that appears to be within close proximity to the actual line. The majority of the surrounding land is deciduous hardwoods with pockets of cedar and pine plantations. The private property to the southwest of the tract is open with fields and a house. The Blue River is a short distance east of the tract. State Road 62 makes up the western boundary of the tract while a drainage acts as the western boundary.

Topography, Geology, and Hydrology

The eastern boundary for the southern 2/3 of the tract is the high point, making a majority of the tract a west facing slope leading into the drainage along the western boundary. This slope is steeper in the southernmost sections of the tract. The northern 1/3 of the tract is an east facing slope that is relatively steep. The highest elevation is at 760 feet above sea level, near the northeastern end and the lowest elevation around 480 feet at the opposite end of the tract, making an overall change in elevation of 280 feet. The area with the least amount of slope is in the field covertype.

The Blue River is a short distance to the east of this tract while the drainage along the western boundary drains into the Blue River, making this waterway the dominant watershed feature of the area.

There is evidence of a high amount of karst activity in this area. Two named caves were found during the inventory. Two openings in sinkholes were found and marked as caves due to the ease of access to the underground waterways by runoff. Besides these openings, there were a large number of sinkholes of various sizes, one being very large. The more major sinkholes were marked during the inventory.

Soils

Adyeville Very Fine Sandy Laom (AbqE2, AciE)

The Adyeville series consists of moderately deep, somewhat excessively drained soils. Surface Horizon is 9 inches thick. The subsurface horizon then grades into 8 inches of silt loam then with the remaining 60 inches turns into a loam texture type soil. The bedrock consists of moderately cemented sandstone with some siltstone, and shale. The permeability is moderately rapid. The mean annual precipitation is about 43 inches and the mean annual temperature is about 54 degrees F.
Degree Slope: 8-60%
Woodland suitability group: 3o10
Site Index: 70
Growth Range potential: 200
Management Concerns: Runoff and erosion

Apalonia Silt Loam (AgrA. AgrB, AgrC2, AgrC3)

The Apalonia series consists of very deep, moderately well drained soils forms in loess and the underlying residuum from shale with limestone and siltstone. They are moderately deep or shallow to a fragipan. The surface horizon is a silt loam 8 inches thick. The first 8 inches of the subsoil is a silty clay loam. The next 33 inches is a silt loam. The next 11 inches is clay then it turns into a clay loam for 9 inches. The last 21 inches of the subsoil is a loam. The bedrock is weakly cemented shale with moderately and strongly cemented sandstone. The mean annual precipitation is about 43 inches and the mean annual temperature is about 54 degrees F.
Degree Slope: 0-12%
Woodland suitability group: 3d9
Site Index: 60
Growth Range potential: 258
Management Concerns: runoff and erosion

Bartle Silt Loam (BbhA)

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

Corydon Stony Silt (CqyG)
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

Haggatt Silt Loam (HarE2, HarD2) Silty Clay (HafC3, HafD3)
The Haggatt series consists of deep, well-drained soils formed in clayey residuum that can be capped with up to 20 inches of loess. They are on hills and in sinkholes underlain with limestone. The Surface Horizon is a silt loam that is 5 inches thick. The first 11 inches of the subsoil is a silty clay loam. The next 28 inches of the subsoil is clay. The bedrock is fractured, indurated limestone bedrock. Mean annual precipitation is about 43 inches, and mean annual temperature is about 54 degrees F.
Degree Slope: 2-25%
Woodland suitability group: 1o1
Site Index: 68
Growth Range potential: 300
Management Concerns: runoff and erosion

Haymond Silt Loam (HcgAH, Hm)
The Haymond series consists of very deep, well drained, soils that formed in silty alluvium. These soils are on flood plains and flood-plain steps. Slope ranges from 0 to 3 percent. Mean annual air temperature is about 55 degrees F, and mean annual precipitation is about 42 inches. The surface horizon is a brown silt loam plow layer that extends approximately 10 inches. The first subsurface horizon is a dark yellowish brown silt loam that extends to 25 inches. The second subsurface horizon is a yellowish brown silt loam that extends until 44 inches. The stratum is a massive yellowish brown fine sandy loam.

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 (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

Access`

Access to this tract can be gained from SR 62 which runs along the entire eastern boundary of the tract. There are two areas along SR 62 that act as ideal entrances to the tract. The first is a small parking lot used as a trailhead for the horse trail that runs throughout the tract. This parking area is in the southern section of the tract. The second access point is around the north-central section of the tract in the Field stand. This point is where a firelane crosses SR 62 and runs north and west from this point. A third point, utilized for parking, is an old small quarry midway along the road frontage of the tract.

Boundary

The eastern boundary is defined by SR 62, the western boundary (shared with tracts 1 and 6) is a drainage that runs about 2/3 of the tract. The rest of the western boundary is not clearly defined by landscape features. The southern boundary borders private property and seems to be somewhat accurately defined by a fence line. The northern boundary is not clearly defined by landscape features. No surveyor's marks were found throughout the tract.

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 except 19"+. The tract also does not meet the minimum requirement for snags except for the size classes of 5"+. 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.

Other wildlife species noted on this stand were those typical of the area. Evidence of deer, squirrels, chipmunks, raccoons, and turkey were seen in the area. The presence of oak and hickory species creates a source for hard mast which is beneficial to multiple wildlife species.

<u>Indiana Bat</u>

As management activities currently are only performed in the winter months according to voluntary interim Indiana bat guidelines, 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. 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 those greater than 20 inches in diameter. Likewise, there is an adequate amount of snags in the 5"+ size class. There are not enough snags in the 9"+ and 19"+ size class to meet the Indiana bat requirements. Girdling trees to create snags would be an acceptable method to increase the amount of large snags for the bat due to the surplus of 20"+ bat trees per acre.

Wildlife Habitat Feature (Tract Wide)

Category	Maintenance level	Optimal Level	Inventory	Available Above maintenance	Available Above Optimal
Legacy Trees *					
11"+	1098		3688	2590	
20"+	366		691	325	
Snags (all species)					
5"+	488	854	574	86	-280
9"+	366	732	356	-10	-376
19"+	61	122	54	-7	-68
Cavity Trees (all species)					
7"+	488	732	122	-366	-610
11"+	366	488	122	-244	-366
19"+	61	122	101	40	-21

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

Recreation

This tract contained a horse trail that ran nearly the entire north/south length of the tract as well as into the neighboring tract. This horse trail showed evidence of frequent use. Two known caves also exist in the tract, both of which are occasionally explored by cavers. Tract 5's main recreational use is expected to be by hunters. This tract contains the entrance and some of the length of one of the State Forest's 5 designated disabled hunter trails.

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.

Management Limitations

Most soil types in this tract have a management concern of runoff and erosion. In order to limit these problems, any management activities need to be sure to leave downed dead wood and trees to hold the soil in place. The two caves within the tract need to have a buffer placed around them to prevent any management activity from contaminating the underground waterways.

Invasives

Ailanthus was found in a couple spots throughout the tract, the more prominent of them being marked on the map. These occurred mostly in the Oak Hickory stand with some also present in the Field stand. Those found in the Oak Hickory stand had reached the overstory making them of greater concern. Prior to any management activity, this species

should be treated with herbicide in order to prevent its regeneration after reducing competition in the stand.

Summary Tract Silvicultural Description, Prescription, and Proposed Activities

Overall, this tract does not follow a reverse J-shaped curve in terms of diameter distribution. While this type of distribution is typical of an uneven-aged stand, it is likely not the case for this tract due to the vast differences in the stands. The Oak Hickory stand has a more typical distribution but the Cedar, Field, and Old Field stands are all have a greater concentration of smaller trees. The dichotomy between the stands is likely the reason for the tract wide diameter distribution being abnormal. As a result of this fact, the tract needs to be managed on a stand level rather than a tract wide level.

This tract was harvested in 1986 and then had a TSI performed in it in 1987. After these management practices, the tract was inventoried in February of 1988 at which time there was 196,698 bf present. The species with the highest volume was white oak followed by black oak. The last inventory did not show any cedar or pines which both were found in their own stands in this tract. Overall the change in volume between the two inventories was 108 bf/ac/year. The species with the highest growth excluding eastern red cedar was white oak (29 bf/ac/year) and scarlet oak (20 bf/ac/year).

The management activities that follow should be performed in concurrence with those described in the management guide for tract 1806 due to their proximity and similarity in stands.

<u>Cedar (11 acres)</u>

This stand is broken up into two parts, one being on the southern boundary of the tract and the other at the northern point of the lower third of the tract. The Cedar stand is strongly associated with the Old Field stand, merging into it without a clear boundary between the two. The total basal area for this stand is 109.2 sqft/ac with 26.7 sqft/ac being deemed harvestable, leaving 82.5 sqft/ac. The total volume for the stand is 5,650 bf/ac, of which 2,350 is harvestable with 3,310 bf/ac being residual. Over half of this volume and basal area was made up of eastern red cedar (all harvestable volume was eastern red cedar), though hardwood species were found growing in the understory.

The goal for this stand would be to increase the rate of succession to reach a covertype predominantly made up of hardwoods. The proposed activity would be to remove roughly half of the eastern red cedar present. By doing so the stand would have enough residual trees to prevent erosion and runoff while still presenting an opportunity for the other species (oaks, maples, hickories, walnuts, and ashes) in the understory to move into the overstory, creating a mixed hardwood stand. If there is a market for cedar at the time of this thinning then it can be performed as a commercial harvest, though if there are no buyers, the stand should undergo a timber stand improvement to reach this goal.

<u>Field (14 acres)</u>

The Field stand is located in the northern third of the tract and is surrounded by the Oak Hickory stand. Within the field is a firelane which is also used as a horse trail. Also, the

power line described above runs through this a portion of the field. This stand was mostly open with a few patches of small trees within. The trees that were growing in this area included black oak, eastern red cedar, white ash, and yellow poplar creating a total basal area of 38.6 sqft/ac and 330 bf/ac.

Due to the low basal area this stand would be best left alone for the time being. The portion of horse trail that runs through this stand appears to be mowed, making it an area where no tree regeneration will occur. The areas that do have trees were mostly yellow poplar, making it likely that the in the future it will become a yellow poplar stand which will eventually move towards a later successional species at which point it should be revisited to determine the best course of action.

Oak Hickory (71 acres)

Both the largest and most diverse, the Oak Hickory stand takes up most of the northern two thirds of the tract. The stand contained 101.9 sqft/ac and 5,290 bf/ac. Of this, 28.4 sqft/ac and 2,050 bf/ac are harvestable leaving a residual of 73.1 sqft/ac and 3,220 bf/ac. The most prominent species within this stand was white oak with both scarlet oak and sugar maple being about half of the volume and basal area. Other prominent species within this stand were pignut hickory and black oak, the rest of the stand being a combination of other hardwood species and some eastern red cedar.

This stand would benefit from a thinning with the focus on increasing quality growth and regeneration. The main species of focus would be white oak, but other hardwoods should be left in order to avoid a monoculture from occurring. Some species that will be targeted for removal would be eastern red cedar in order to create more opportunity for hardwood regeneration, scarlet oak as many individuals of this species had poor form and multiple defects in the stem, and sugar maple in order to prevent this highly shade tolerant species to become dominant in the overstory.

Old Field (24 acres)

While not as diverse as the Oak Hickory stand, this stand does have a large number of species present. Located in the lower third of the tract, this stand is in close association with the Cedar stand, making it difficult to mark the exact boundaries between the two. Most of the trees within the old field are pole sized while the sawtimber present are all near the minimal diameter for this size class. The basal area for the stand is 98.4 sqft/ac with a volume of 1,850 bf/ac. Of this 16.4 sqft/ac and 500 bf/ac were considered for removal which would leave 81.9 sqft/ac and 1,350 bf/ac. Most of the removable volume came from eastern red cedar.

The goal for this stand would be to increase the growth rate of the hardwood species present with an emphasis on better quality trees. In order to attain this goal, a timber stand improvement should occur. A timber stand improvement would lower the basal area of the stand in order to reduce competition while also removing less desirable species (such as eastern red cedar, and sassafras).

ACTIVITIES SCHEDULER

Date	Description	Date Accomplished
2011-2013	Perform control of Ailanthus	
2014	Timber harvest with tract 6	
2014-16	Cedar harvest	
2035	Inventory	

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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.

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