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

State Forest: Harrison-Crawford Compartment: 20 Tract: 06
Forester: John Segari Date: __12/12/2013 _
Management Cycle: 20 yrs

INVENTORY SUMMARY

Number of stratas: **4** **Est. Annual Growth: 121 bd. ft/ac/yr**
Permanent Openings: **0.0 ac** **Tract Acreage:** **118**
Average Basal Area: **118 sq. ft/ac** **Site Index: 70-80** (for upland oaks)

Table 1. Tract 2006 Inventory Summary

Species	Harvest		Leave		Total	
	Total	Per acre	Total	Per acre	Total	Per acre
Eastern redcedar*	56,060	475	10,330	88	66,390	563
White ash	44,850	380	0	0	44,850	380
White oak	31,850	270	122,100	1,035	153,950	1,305
Sugar maple	31,350	266	26,260	223	57,610	488
Eastern white pine	30,660	260	16,080	136	46,740	396
Black oak	23,310	198	78,080	662	101,390	859
Yellow poplar	18,310	155	38,990	330	57,300	486
Pignut hickory	14,910	126	28,530	242	43,440	368
Northern red oak	14,570	123	90,390	766	104,960	889
Loblolly pine	9,240	78	17,780	151	27,020	229
Black cherry	4,030	34	0	0	4,030	34
Shumard oak	2,100	18	0	0	2,100	18
Shagbark hickory	0	0	54,120	459	54,120	459
Mockernut hickory	0	0	11,690	99	11,690	99
Chinkapin oak	0	0	7,890	67	7,890	67
Scarlet oak	0	0	6,580	56	6,580	56
Black walnut	0	0	5,600	47	5,600	47
American beech	0	0	5,300	45	5,300	45
Persimmon	0	0	3,030	26	3,030	26
Blue ash	0	0	2,400	20	2,400	20
Largetooth aspen	0	0	1,750	15	1,750	15
Total	**281,240**	**2,383**	**526,900**	**4,465**	**808,140**	**6,849**

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

Location

This tract is located in Harrison County on the main body of the state forest. It is northwest of HWY 462 on the north slope of a ridge between Brown's field and HWY 462. It is in T32 R2E sections 35 and 36.

General Description

This tract covers approximately 118 acres and is entirely forested. There are 4 distinct covertypes all occurring on a northeast – east facing slope. It is dominated by 67 acres of Oak-hickory with 13 acres of Mixed-mesic hardwoods, 28 acres of old field areas, and 10 acres of pine plantations.
These strata will be described briefly below and in more detail in the Management section.

Stratum 1
Oak-hickory
This stratum covers 67 acres or 57% of the tract. It also accounts for 60% of the sawtimber volume of the tract. It is found on the upper and mid slopes of the tract and is dominated by white, northern red, and black oaks of medium quality with a moderate amount of hickories and White ash. This stratum is currently experiencing pockets of mortality.

Stratum 2
Mixed Mesic Hardwoods
This stratum covers 13 acres or 11% of the tract. It accounts for 13% of the sawtimber volume of the tract. It is found in two locations in the tract, the southern end, bordering tract 1908, and the drainage that bisects the tract in the north. It is dominated by medium to good quality yellow poplar and northern red oak.

Stratum 3
Old Field
This stratum covers 28 acre or 24% of the tract and accounts for 20% of the sawtimber volume of the tract. It is found on the lower toe slopes of the tract and is dominated by eastern redcedar but is transitioning to maple, poplar, northern red , and black oak. The cedar is small sawtimber. This covertype contains most of the known caves in the tract.

Stratum 4
Pine Plantations
This stratum occupies 10 acres or 8% of the tract and accounts for 7% of the sawtimber volume of the tract. It has two separate occurrences, one of loblolly and the other of eastern white pine. Both species have low live crown ratios with varying amounts of hardwood regeneration beneath.

History

The majority of this tract is composed of three acquisitions. The first being the southern end in 1934 as tax forfeit, the second being the western portion in 1940 from the Rothrocks, and the third being the northern end in 1968 from the Smoots. Much of the old field and pine areas were still open fields in the 1940 aerial photo. Significant portions of the oak-hickory stratum are also scattered canopy such as pasture land.

This tract has been actively managed since state ownership. There was a compartment level inventory done in 1984. The numbers are at a scale that is of little value to tract level planning. The tract was inventoried and had a plan written in 1993. The guide lists the volume as 5,356 bf/acre and the acreage of commercial forest as 96 with 12.5 of non-commercial (pine) and 2 acres of recreational land. The plan called for a harvest in conjunction with tracts 2005 and 2004, vine control, and thinning the pine stands. The harvest was marked and conducted in 1995. The sale volume was 184,721 bf and the acreage was 126.3, with 73.7 acres being in tract 2006. While volume records were not kept separate, based on a percentage of acres, the likely volume removed from 2006 was 109 Mbf or 928 bdft/acre. There is no record of a pine thinning or the postharvest vine control.

Landscape Context

The natural community classification of this tract is a combination of Dry-mesic upland forest and Mesic upland forest with the mesic upland forest type being found on the lower slopes and drainages. Both communities are abundant in the area.
The dominant land use within a 5 mile radius is forested with pockets of agriculture and grazing. This tract is part of the main body of the State Forest and as such is a smaller piece of a contiguous forest.

Geology, Soils, and Hydrology

The topography of this tract is dominated by a NW oriented ridge with this tract being found on the northeast slope of said ridge. The slopes vary from gentle in the bottomlands and ridgetop to moderately steep in the south.

Soils

Soils in this tract are variable and intergrade within types. The dominant soil series are described below:

<u>CbsD3- Caneyville-Haggatt-Knobcreek complex, 10 to 22 percent slopes, karst, hilly, severely eroded</u>
This moderate to strongly sloping, deep, well drained complex is found on shoulders and side slopes in the uplands and around sinkholes. It is suited to trees. Caneyville has a site index of 71 for black oak and 64 for white oak, Haggatt has a site index of 86 for yellow poplar and 68 for white oak, and Knobcreek has a site index of 76 for northern red oak and 86 for yellow poplar
<u>EbhD2-Ebal-Gilpin-Wellston silt loams, 10 to 22 percent slopes, eroded</u>

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

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

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

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

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

These soils are all listed as suitable for haul roads, logging, and equipment operations by the NRCS. The ridgetop is Deuchars-Apalona-Wellston silt loams, 6 to 12 percent slopes, eroded and is listed as the most suitable area for log landings.

Hydrology

There is no established running water in this tract. The eastern boundary drainage is a mapped intermittent and there is a wildlife pond on the ridgetop in the south. The ridge is known to have karst feature such as caves and sinkholes.

Locations of ponds, caves, and open sinkholes are known and easily avoided and protected with appropriate buffers. Any new features found during the harvest marking should be recorded in the tract file and protected as per the Indiana BMP guide.

Access

Access to this tract is moderate. It is accessed from the east by the Langdon's cave trail or firetrail 102. From the south is reached by a spur road from brown's field. Neither road is currently usable for management. In the past, both roads have accessed harvest operations. Currently both roads should be upgraded to allow all season access. This should be coordinated to access work in tracts 2004 and 2005. Internal access is good with moderate slopes and few if any outcrops to limit movement. There were 2 log yards on the ridgetop in the previous sale that should be reused.

Boundaries

The boundaries of this tract are all internal with state property on all sides. The eastern boundary is a drainage and the western a ridgetop and road. The northern

boundary is firetrail 102 and a ridge. The southern boundary with tract 1908 is an arbitrary line on a hillside.

Wildlife

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

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

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

# of live trees	Guidelines Maintenance	Tract 2006 actual present
11"+ DBH class	1062	4547
20" DBH and greater	354	944

# snags	Guidelines Maintenance	Guidelines optimal	Tract 2006 actual
5" + DBH class	472	826	1742
9"+ DBH class	354	708	836
19" DBH and greater	59	118	142

These numbers show that both live tree densities as well as snag densities meet optimal guidelines on this tract except in the 10-18" DBH class. However, all classes meet maintenance guidelines and it is likely that additional snags in the medium size class will be created by post harvest TSI activities.

Rare, Threatened, and Endangered Species

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

Exotic Species

Ailanthus altissima, tree of heaven, was found in scattered pocket throughout the tract. The occurrences were not large and stems were small, eradication should be feasible. Trees should be relocated and treated to reduce spread. Treatment should occur prior to any harvesting.

Recreation

This tract contains several trails. The Adventure Hiking Trail is located on the upper slopes and the Upper Blue River Trail is located on the ridgetop. Short term impacts will include temporarily rerouting both trails for harvest operations. Long term impacts should be an increase in shading along the AHT as the early successional covertypes mature and decreased trail obstructions through the removal of declining or hazardous trees.

No deer stands were found during inventory but the location and access makes this tract likely to receive pressure during both deer and turkey seasons.

Cultural Resources

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

Management Prescription

Stratum 1: Oak-Hickory

Current condition:

This covertype is found on the upland and upper slopes of the tract and comprises 57% of the area and 60% of the volume of the tract. This covertype is dominated by medium to large sawtimber white, black, and red oak with pignut and shagbark hickory. There are moderate sized pockets of mortality in the midslope position. The inventory is summarized in Table 2 with species composition detailed in Table 3. Currently the covertype is fully stocked at just above the 90% stocked condition.

Table 2. Oak-Hickory Inventory Summary

STRATUM: Oak-Hickory		**ACREAGE: 67**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	2,018	5,222	7,240
Volume total	135,206	349,874	485,080
Basal area/acre	45	62	107
Trees/acre	68	87	155

Table 3. Oak-Hickory Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (Bd ft/ac)
Black cherry	62	0	62
Black oak	291	881	1,172
Black walnut	0	85	85
Blue ash	0	37	37
Chinkapin oak	0	42	42
Eastern redcedar	83	0	83
Largetooth aspen	0	27	27
Mockernut hickory	0	178	178
Northern red oak	171	816	987
Pignut hickory	227	325	552
Scarlet oak	0	100	100
Shagbark hickory	0	661	661
Shumard oak	32	0	32
Sugar maple	183	126	309
White ash	499	0	499
White oak	409	1,898	2,307
Yellow poplar	61	46	107
TOTAL	**2,069**	**4,263**	**6,332**

Desired future condition:

The objective of this stratum is to provide for multiple economic and ecological services specifically a quality hardwood timber stratum, dominated by oak and hickory, while providing hard mast and early to mid-seral habitat for wildlife. The stratum should have 6 acres of early successional habitat and another 5-6 ready for release at the end of the management cycle, 2033.

Silvicultural Prescription:

In order to meet the desired future condition, a harvest is recommended. Oaks and hickories are not only the best species for supplying hard mast but are also the best quality timber group that is occurring in this covertype. According to the inventory data, approximately 2,069 bd ft/ac is tallied for potential harvest. Most of this would be removed under a single-tree selection routine with larger regeneration openings targeting established regeneration or groups of low-grade or multiple large trees growing together. The residual species composition will be similar to that of the current condition. This continues to provide a stratum of longer-lived higher-quality white oak that allows for more management options into the future. Openings should be located to expand existing pockets of mortality. Existing snags should be kept in the openings to provide solar exposure to potential roost trees. These pockets of

mortality already have scattered established oak regeneration that is ready for release. Openings should be large enough to achieve regeneration of desirable species and should coincide with the release of advance regeneration. Overall, 6 acres of 0 sqft BA for regeneration openings, another 5-6 of 55-65 sqft of BA to get some midtolerant regeneration established for release in the next management cycle, and the remaining acres should be thinned to 70-90 sqft of BA. Stocking in this covertype would be reduced from 100% to approximately 60%, still a fully stocked stratum.

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

Stratum 2: Mixed Mesic Hardwoods

Current Condition:
This covertype is found on the south end of the tract and in the northern drainage. It comprises 11% of the area and 13% of the volume. This covertype is dominated by medium to large sawtimber Yellow poplar, sugar maple, and northern red oak with lesser amounts of shagbark, white oak, and white ash. The inventory is summarized in Table 4 with species composition detailed in Table 5. Currently the covertype is fully stocked at just below the 90% stocked condition. This site is a more productive covertype than the oak-hickory.

Table 4. Mixed Mesic Hardwoods Inventory Summary

STRATUM: Mixed Mesic-Hardwoods		**ACREAGE: 13**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	2,466	5,615	8,081
Volume total	32,058	72,995	105,053
Basal area/acre	46	56	102
Trees/acre	58	94	156

Table 5. Mixed Mesic Hardwoods Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (bd ft/ac)
American beech	0	177	177
Black oak	0	474	474
Chinkapin oak	0	225	225
Northern red oak	206	1,339	1,545

Persimmon	0	185	185
Pignut hickory	0	442	442
Shagbark hickory	0	659	659
Sugar maple	544	460	1,004
White ash	742	0	742
White oak	308	313	621
Yellow poplar	666	1,341	2,007
Total	**2,466**	**5,615**	**8,081**

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

Silvicultural Prescription:
In order to meet the desired future condition, a light thinning is recommended. As this site is more productive than the oak-hickory type discussed above, attempting to manage for oak is not practical. It would be more appropriate to manage for a mixture of mesic species such as poplar, sugar maple, and beech while maintaining the more tolerant white oak since these are the best quality timber group that is appropriate to this site. According to the inventory data, approximately 2,466 bd ft/ac is tallied for potential removal. This would leave more than 5,600 bd ft/ac on the residual stratum. The heavier harvesting in this stratum as compared with the oak hickory type is due to the high productivity of the site having larger trees. The majority of the harvest volume is in the form of White ash, sugar maple, and yellow poplar. The imminent onset of emerald ash borer dictates the removal and regeneration of ash before mortality sets in. Targeting the mesic species for thinning allows the midtolerant oak and hickory components to increase in relative basal area and might allow for regeneration that is more diverse when the stratum fully matures. No openings are needed during this management cycle in this stratum. This could change if damage or mortality becomes evident during operation marking.

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

Stratum 3: Old Field

Current Condition:
This covertype is found in 2 locations, the transitional area between the pine and oak-hickory strata and on the ridgetop south of the wildlife pond. It comprises 24% of the area and 18% of the volume. The occurrence on the toeslopes is dominated by a mixture of cedar and scattered wolf trees. These areas are transitioning to moderate to good quality oak-hickory. The upland occurrence is a mixture of poplar, oak, and beech. The inventory is summarized in Table 4 with species composition detailed in Table 5.

Table 6. Old Field Inventory Summary

STRATUM: Old Field		**ACREAGE: 28**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	3,190	2,522	5,712
Volume total	89,320	70,616	159,936
Basal area/acre	46	48	94
Trees/acre	77	149	225

Table 7. Old Field Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (bd ft/ac)
American beech	0	92	92
Black oak	162	480	642
Chinkapin oak	0	55	55
Eastern redcedar	1,929	394	2,323
Eastern white pine	570	0	570
Northern red oak	0	570	570
Sugar maple	398	398	796
Yellow poplar	131	533	664
Total	**3,190**	**2,522**	**5,712**

Desired Future Condition:
The objective of this stratum is to provide for multiple economic and ecological services specifically a quality hardwood timber stratum and wildlife habitat. Twenty percent of the stratum should be in early successional stages at the end of the management cycle with the remaining 80 percent being thinned to release the developing oak-hickory.

Silvicultural Prescription:

This stratum should be included in the harvest operations recommended in the oak-hickory and mesic hardwoods strata. Some removal of "wolf" trees should be undertaken to release developing trees where possible. The majority of volume removal should be in form of 5-6 acres of regeneration openings. Openings should focus on established oak regeneration that is ready to release. Another target would be areas of cedar and poplar that have good oak pole establishment. The poles should be marked with everything else to provide dense stocking of stump sprouts now while they are still small enough to sprout. If left uncut, the poles would likely receive too much damage to provide quality stocking in the future.

Stratum 4: Pine Plantation

Current Condition:
This covertype is found on bottoms near the drainage. It is found in three pockets which comprise 8% of the area and 7% of the volume. This covertype is dominated by medium to large sawtimber white and loblolly pines. The pines are declining with medium to short crowns and many dead stems. The inventory is summarized in Table 4 with species composition detailed in Table 5.

Table 8. Pine Plantation Inventory Summary

STRATUM: Pine Plantation		**ACREAGE: 10**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	2,537	3,444	5,981
Volume total	25,370	34,440	59,810
Basal area/acre	77	72	149
Trees/acre	125	191	316

Table 9. Pine Plantation Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (bd ft/ac)
Eastern white pine	1,598	1,635	3,233
Loblolly pine	939	1,809	2,748
Total	**2,537**	**3,444**	**5,981**

Desired Future Condition:
The objective of this stratum is to provide for habitat diversity and eventual conversion back to native hardwoods. At the end of the management cycle, the stratum should have hardwood establishment ready for release.

Silvicultural Prescription:

This stratum should be thinned to allow more sunlight to reach the ground layer. This should have the effect of establishing midtolerant regeneration. The stratum should have a crown thinning from beneath to approximately 60 Sqft of basal area.

Tract summary

Summary of silviculture throughout the tract:

Due to the current condition of the stratum, a medium level improvement harvest is prescribed. Overall stocking should be reduced from the current 90% to approximately 60%. This is accomplished by a combination of crop tree release, cull removal, and converting the old field area into a hardwood stratum. This would produce a sale volume of approximately 281 MBF or about 2380 board feet per acre and leave about 527 MBF or 4465 board feet per acre. Operations should be coordinated with those in 2005 and 2004 if needed.

Effect of Prescription on Tract properties:

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.

Wildlife: . 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 affect on wildlife will be the reduction of the coniferous component of the stratum. This currently provides a limited amount of thermal cover in the winter for deer and small mammals. The cedar is in decline and will likely die out and this cover lost in the next two decades. No action in this tract would result in the reduction of a hard mast source for small mammals and birds. Managing to recruit newly established or released oaks and hickories will help to ensure that this important food source is available into the foreseeable future.

Wildlife Discussion from Ecological Resource Review: Additionally, management activities involving a timber sale should not affect this habitat long-term due to the continued maintenance of a forested habitat on the tract. Creation of regeneration openings will create early successional habitat that will be beneficial to certain groups of wildlife dependent upon this habitat. 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. Snag counts for all size classes are above optimal guidelines. Management activities will not intentionally remove snags, with a few exceptions of large recently dead trees or storm damage when possible, so the timber sale will not negatively

impact that component significantly. Some snags may be felled during harvest operations if they present a physical hazard to field personnel.

Recreation: Given the limited amount and type of recreation that is carried out on this tract, this resource will be temporarily affected. Hunting opportunities should be improved be 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.

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

Proposed Activities Listing:

Proposed Activity	**Proposed date:**
Treat ailanthus	2014-17
Mark sale	2016-17
Sell timber	2016-18
Post harvest tsi	2018-19
Monitor regeneration openings	2021
Re-inventory	2033
Write new management plan	2033

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Appendix 2
Tract 2006 Topographic Map with Covertypes