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

State Forest: Harrison Crawford
Forester: John Segari
Management Cycle: 20 yrs

Date: February 13, 2014
Compartment: 23 Tract: 09

INVENTORY SUMMARY

Tract Acreage: 94.8 acres
Number of Stands: 3
Permanent Openings: 1.1 acres
Average Basal Area: 97.4 sq. ft/ac

Est. Annual Growth: 120 bd. ft/ac/y
Site Index: 70-80 (for upland oaks)

Table 1. Tract 2309 Inventory Summary

Species	Harvest		Leave		Total	
	Total	Per Acre	Total	Per Acre	Total	Per Acre
White oak	48,470	485	126,090	1,261	174,560	1,746
E. redcedar	38,170	382	46,330	463	84,500	845
Yellow poplar	19,630	196	20,630	206	40,260	403
White ash	18,400	184	2,990	30	21,390	214
Pignut hickory	11,110	111	42,930	429	54,040	540
Black oak	10,410	104	54,470	545	64,880	649
N. red oak	9,940	99	50,370	504	60,310	603
Virginia pine	9,310	93	5,260	53	14,570	146
A. beech	7,900	79	5,440	54	13,340	133
Blackgum	6,110	61	1,100	11	7,210	72
Sugar maple	5,440	54	5,790	58	11,230	112
Basswood	2,760	28	0	0	2,760	28
Scarlet oak	2,100	21	0	0	2,100	21
Chinkapin oak	1,520	15	0	0	1,520	15
Sassafras	1,100	11	0	0	1,100	11
Chestnut oak	0	0	2,640	26	2,640	26
Mockernut hickory	0	0	6,000	60	6,000	60
Shagbark hickory	0	0	30,490	305	30,490	305
Total	**192,370**	**1,924**	**400,530**	**4,005**	**592,900**	**5,929**

**E. redcedar 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 94.8 acre tract is located in Harrison County, Indiana between Bussabarger Rd and Kintner Rd. All of the tract is located in Section 7 of Township 4S Range 3E. The tract is located roughly 7 miles southwest of the town of Corydon, Indiana.

General Description

This tract covers 94.8 acres and includes an approximately 1.1 acre permanent wildlife opening located in the northwest corner of the tract. This tract has seen previous management in the form of a thinning in 1997. There are established skid trails and an old roadbed running down the ridge. There are three cover types in this tract including Oak Hickory, Mixed Mesic Hardwoods, and Old Field. A southeast aspect occupied by 64 acres of oak hickory cover type dominates the tract. The cover types will be described briefly below and in more detail in the Management section.

Merchantable Cover Types

Oak Hickory – 63.9 acres

This cover type comprises 64% of the tract acreage and 73% of the merchantable volume on the tract. This cover type occurs across most of the tract. It is dominated by white oak which makes up 40% of the total volume of the cover type with ~175,000 bd ft. Northern red oak and black oak are the second and third most abundant species. All oaks total about 65% of the volume of the cover type and hickories make up around 20%. The remaining 15% of the cover type consists of other hardwoods including yellow poplar, white ash, A. beech, sugar maple, blackgum, and basswood. A small amount of E. redcedar is also interspersed within the cover type.

Old Field – 30.8 acres

This cover type comprises 31% of the tract acreage and 23% of the merchantable volume on the tract. This cover type encompasses two stand types: Advanced Old Field which can be found along the western border of the tract and Old Field Cedar which is located in the northeastern corner of the tract. This cover type is predominantly E. redcedar with over 85,000 bd ft and 63% of the cover type volume. There is also over 10,000 bd ft of Virginia pine on the tract (11% of the cover type volume). Additionally the cover type includes yellow poplar, black oak, white oak (5% of cover type), white ash, N. red oak, sassafras, and blackgum.

Mixed Mesic Hardwoods – 5.8 acres

Mixed mesic hardwoods cover 6% of the tract acreage which can be found along the drainage which is the southern boundary of the tract. A mere 4% of the merchantable volume on the tract can be attributed to this cover type. Yellow poplar (21% of the cover type volume), A. beech (19%), sugar maple (16%), and N. red oak (12%) make up majority of the volume within the cover type. Other species present include mockernut hickory, black oak, pignut hickory, and black gum.

History

This tract is comprised of 5 main different acquisitions. The initial acquisition was sold by James B. Brewster on Novemeber 28, 1934 for $3,950 (deed 31-0027-30). Then on December 19, 1935 James and Isabell Whitworth sold 174 acres for $1,000 (deed 31-0038-30), part of which is in the tract. August 18, 1939 M. H. and Elizabeth R. Wilbur sold 120 acres for $1.00 (31-0071-30), which makes up the northeast corner of the tract. February 1, 1951 William T. and Ruth Alice Pinaire sold 16 acres for $112 (deed 31-0103-30) which lies along the southern border of the tract. Finally on August 23, 2007 Thomas L. Shields III sold the final piece of the tract which was 12.5 acres to the state for $21,000 (31-0219-30). There are two other acquisitions which have corners within the tract their deed numbers are 31-0049-30 and 31-0050-30.

The 1940 aerial photograph shows the northern half of the tract was largely open at the time while the southern half was forested. The ridge top shows an open pasture and farm to the south and planted pine rows to the north.

This tract had inventories and management plans written in 1973 and 1996. In 1973, the inventory found 89 acres in the tract with only 50 being commercial forest. The remainder was old field and E. redcedar. Volume on the 50 acres of commercial forest was 1,419 bd ft allocated as 878 acceptable growing-stock and 541 unacceptable growing-stock. There was 70 sq ft of basal area. The plans called for some TSI work and recommend a harvest in 10 years. There is no record of the TSI being performed. The 1996 inventory reclassified the majority of the tract, 90 acres, as commercial and 1.1 acre in the northwest corner of the tract as an opening. The tract had 100 sq ft of basal area and had 134 ft of annual growth per acre. The volume was found to be 4,800 bd ft per acre with 3,088 acceptable and 1,712 unacceptable. The plan recommended a harvest of the upper ⅔ of the slope with the lower ⅓ being skipped. The 1996 plan also suggested the cedar and adjacent bottomland species would be merchantable in the next management cycle. There was no regeneration opening marked. The plan recommended focusing on regeneration during the next cycle.

On June 12, 1997 The Freeman Corporation bought 62,169 bd ft for $17,402 (28 cents a foot) all of which came off of 50 acres within 2309. The sale number was 6349704. The top contributing species to the sale volume were white oak with 24,900 bd ft (40% of total volume) and black oak with 20,259 bd ft (33%).

Landscape Context

The dominant land use within a 5 mile radius is a mixture of forests, residential areas, and hayfields. 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 in the drainages. Both communities are abundant in the area.

Topography

This tract is dominated by a southeast facing slope formed by ridges on the west and north sides. Internal access quality is good with few rock ledges or steep areas to limit movement. The

northwest corner of the tract is a semi-flat ridge top where there has historically been a wildlife opening. This opening follows the ridge top and extends onto the adjoining tract, 2307.

Soils

The soils in any forested area are highly variable and those in areas of large topographic relief such as southern Indiana are even more so. The following soils describe the majority of those found in the tract.

CbxD4- Caneyville-Haggatt silty clay loams, 6 to 15 percent slopes, karst, rolling, very severely eroded, very rocky

This gentle to moderately 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 and Haggatt has a site index of 86 for yellow poplar and 68 for white oak.

CcaG- Caneyville-Rock outcrop complex, 25 to 60 percent slopes

This steep to very steep, somewhat deep, well drained complex is found on side slopes in the uplands. It is suited to trees. Erosion hazards and equipment limitations are main management concerns that should be considered during sale planning and implementation of Best Management Practices for Water Quality. Caneyville has a site index of 71 for black oak and 64 for white oak.

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.

EbhD3- Ebal-Gilpin-Wellston silt loams, 10 to 22 percent slopes, severely eroded

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.

As noted in the descriptions, most of these soils are already eroded to some extent, a relic of the land use and clearing prior to State ownership.

Hydrology

This tract drains into a mapped intermittent that in turn drains into Indian Creek. The tract also has several small karst features that do not appear to be open. The distance from Indian creek limits impact of any management to that feature, but karst features in the tract should be catalogued during marking and protected with the use of appropriate buffers as outlined in Indiana BMP manual.

Access

Access to this tract is variable. The tract is accessible from the north via the Adventure Hiking Trail by parking at the crossing of the trail and Old Forest Rd and hiking south. There is access to the south from fire trail 502 (Turkey Ridge) at the very end of Kintner Rd. Access for management is limited to this route.

If a fire trail were to be extended into tract 2309, two options exist. The road through the 2007 Shield acquisition is poorly drained and would be difficult to upgrade. To use this access would require it to be rerouted through the surrounding pines which would present further drainage issues. The other option would be to widen and improve the hillside road located just west of the Shield acquisition. This access was used prior to 2007 and would reduce the amount of work needing to be done on a poorly drained ridge top.

Boundaries

All the tract boundaries are internal boundaries. Different drainages form the northern boundary with tract 2307, the southern boundary with tract 2310, and the eastern boundary with tracts 2306 and 2308. The western boundary with tract 3001 is the road through the 2007 Shield acquisition.
The Penaire deed (31-0103-30) references a stone planted in the ground at the section center. This stone was not observed during the inventory. Effort should be made to relocate the stone.

Wildlife

This tract represents typical upland forest habitat, in addition to a component of old field successional habitat, with cedar and smaller hardwoods there is open grass, pine, and mature hardwoods. Consequently, it likely receives use from a typical assemblage of common game and nongame wildlife species such as white-tailed deer, wild turkey, squirrels, songbirds, snakes, box turtles, and others. Hard mast food sources are provided by the oak hickory stratum, but another habitat component would come from the old field cedar stratum. This stratum provides more dense 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 features. 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 2309 actual present
11"+ DBH class	900	3434
20" DBH and greater	300	630

# snags	Guidelines Maintenance	Guidelines optimal	Tract 2309 actual
5" + DBH class	400	700	1604
9"+ DBH class	300	600	372
19" DBH and greater	50	100	38

These numbers show that both live tree densities as well as snag densities meet guidelines on this tract except in the snag 19"+ DBH class.

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 in the 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 or ailanthus, was found in a few small openings. The ailanthus should be spot treated prior to any harvesting that would cause disturbance or open the canopy.

Rosa multiflora, multiflora rose, were found on the edges of the wildlife opening in the northwest corner of the tract. The multiflora rose patches should either be treated or managed as part of the maintenance of the wildlife opening.

Microstegium vimineum, Japanese stiltgrass, is probably also found along the drainages, fire trails, old logging trails, and old road beds within the tract. Problem occurrences of stiltgrass should be controlled.

All the above are common invasive plants which are widespread throughout the county.

Recreation

This tract currently receives a variety of recreational uses. Hunting is a common occurrence in the tract. Additionally, the Adventure Hiking Trail follows the upper slopes of the tract. The trail is blocked in places by fallen trees as a result of natural mortality. The corridor of the trail should be reopened to reduce the occurrence of trail braiding. Historically, the Turkey Ridge trail followed the ridge top. It was noted at some point that the trail crossed private property, the

Shield property, and it was rerouted. The Shield property was acquired in 2007 and the trail again follows the ridgetop.

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 cover type is found on the upland and upper slopes of the tract and comprises 64% of the area and 73% of the sawtimber volume of the tract. This cover type is dominated by medium to large sawtimber white, black, and red oak with pignut hickory. The inventory is summarized in Table 3 with species composition detailed in Table 4.

Table 3. Oak Hickory Inventory Summary

STRATUM: Oak Hickory		ACREAGE: 63.9	
	CUT (bd ft)	LEAVE (bd ft)	TOTAL (bd ft)
Volume/acre	2,089	4,952	7,041
Volume total	133,696	316,928	450,624
Basal area/acre	39	62	101
Trees/acre	46	100	146

Table 4. Oak Hickory Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (Bd ft/ac)
American beech	97	0	97
Basswood	46	0	46
Blackgum	63	0	63
Black oak	174	704	878
Chestnut oak	0	44	44
Chinkapin oak	25	0	25
Eastern redcedar	42	0	42
Mockernut hickory	0	38	38
Northern red oak	166	717	883
Pignut hickory	185	665	850
Scarlet oak	35	0	35
Shagbark hickory	0	508	508
Sugar maple	0	78	78

White ash	255	50	305
White oak	780	2012	2,792
Yellow poplar	221	136	357
TOTAL	**2,089**	**4,952**	**7,041**

Oak Hickory 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 and providing a natural filter for the Indian Creek Watershed.

Oak Hickory 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 cover type. According to the inventory data, approximately 2,089 bd ft/ac was tallied for potential renmoval. 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 stratum 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 stratum 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 ensure the supply 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.

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.

Stratum 2: Old Field

Current Condition:
This cover type is found on the toe-slopes and comprises 31% of the area and 23% of the sawtimber volume. This cover type is dominated by small to medium E. redcedar. The inventory is summarized in Table 5 with species composition detailed in Table 6. Much of the area has little potential for management at the current time due to a lack of topsoil. The ground

cover throughout many areas is moss hummocks on top of clay. The edges of the area have good hardwoods established.

Table 5. Old Field Stratum Inventory Summary

STRATUM: Old Field		**ACREAGE: 30.8**	
	CUT (bd ft)	**LEAVE (bd ft)**	**TOTAL (bd ft)**
Volume/acre	848	936	1,784
Volume total	18,656	20,592	55,304
Basal area/acre	41	43	85
Trees/acre	131	204	336

Table 6. Old Field Stratum Volume by Species

Species	**CUT (bd ft/ac)**	**LEAVE (bd ft/ac)**	**TOTAL (bd ft/ac)**
Blackgum	0	38	38
Black oak	0	311	311
Eastern redcedar	1,248	1,622	2,870
Northern red oak	0	91	91
Sassafras	38	0	38
Virginia pine	326	184	510
White ash	109	0	109
White oak	58	189	247
Yellow poplar	222	140	362
TOTAL	**2,001**	**2575**	**4,576**

Old Field Desired Future Condition:
The objective of this stratum is to convert to native hardwood species while providing continued filtration for the Indian Creek watershed.

Old Field Silvicultural Prescription:
In order to meet the desired future condition, a limited harvest is recommended. The areas of little to no topsoil should be avoided due to very high potential for erosion. The areas of hardwoods should be thinned to release and encourage those of future quality. The cedar areas adjacent to the hardwoods have larger cedar for potential removal to allow hardwood regeneration to become established.

Stratum 3: Mixed Mesic Hardwoods

Current Condition:
This cover type is found in the drainages and comprises 6% of the area and 4% of the volume. This cover type is dominated by medium to large sawtimber yellow poplar, sugar maple, and American beech. The inventory is summarized in Table 7 with species composition detailed in

Table 8. This stratum is certainly a more productive cover type than the oak-hickory. This stratum is limited in distribution but provides a buffer for the mapped intermittent on the southern boundary of the tract.

Table 7. Mixed Mesic Hardwoods Inventory Summary

STRATUM: Mixed Mesic-Hardwoods		**ACREAGE: 5**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	1,149	3,486	4,635
Volume total	5,745	17,430	23,175
Basal area/acre	28	55	83
Trees/acre	64	97	160

Table 8. Mixed Mesic Hardwoods Volume by Species

Species	**CUT (bd ft/ac)**	**LEAVE (bd ft/ac)**	**TOTAL (bd ft/ac)**
American beech	240	634	874
Blackgum	275	0	275
Black oak	0	390	390
Mockernut hickory	0	438	438
Northern red oak	0	553	553
Pignut hickory	0	349	349
Sugar maple	634	128	762
Yellow poplar	0	994	994
TOTAL	**1,149**	**3,486**	**4,635**

Mixed Mesic Hardwoods 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 and providing a natural filter for the Indian Creek watershed.

Mixed Mesic Hardwoods 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 would not be practical. More appropriate would be to manage for a mixture of mesic species such as poplar, sugar maple, and beech while maintaining the less tolerant oaks and hickories since these are the best quality timber group that is appropriate to this site. According to the inventory data, approximately 1,149 bd ft/ac was tallied for potential removal. This would retain approximately 3,500 bd ft/ac on the residual stratum.

Most of this would be removed under a single tree selection routine with larger group openings targeting groups of low-grade trees or multiple large trees growing together. However, multiple tree selection should be used to encourage higher stem quality in saplings by releasing better

formed individuals of desirable species. When possible, selection should also favor releasing future crop trees. The residual stratum should be slightly heavier to yellow poplar, with a lesser component of sugar maple and white oak, as well as a minor component of other oak species.

TRACT SUMMARY

Summary of silviculture throughout the tract:
Due to the current condition of the stratum, a medium level improvement harvest is prescribed. This is accomplished by a combination of crop tree release, cull removal, and converting the old field area into a hardwood stratum by removing the cedar. This would produce a sale volume of approximately 158 MBF or about 1580 board feet per acre across the tract and leave about 325,930 board feet or 4,130 board feet per acre. Per acre, removals will be higher on the harvested acres. It is recommended that Timber Stand Improvement (TSI) be undertaken in this tract after the harvest to accomplish a variety of tasks, including completion of any marked openings and control of ailanthus.

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.
Snags and coarse woody debris should remain at viable levels in the stratum and should continue to provide valued and diverse habitat for the Indiana bat and other species. 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. This type of cover will be reduced within 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.

Wildlife Discussion from Ecological Resource Review: Additionally, management activities involving a timber harvest 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. 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 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. The Adventure hiking trail will have to be temporarily closed and rerouted to ensure visitor safety during the thinning operation. In the long term, recreation opportunities will remain similar to those found on the tract today.

PROPOSED ACTIVITIES LISTING

Proposed Activity	**Proposed date:**
Resource Management Guide	2015
Treat ailanthus	2016-18
Contact landowners for access	2016-18
Mark sale	2016-18
Sell timber	2016-18
Post harvest TSI	2019-2020
Monitor regeneration openings	2022-2025
Re-inventory	2035
Write new management plan	2035

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Harrison Crawford State Forest
Management Guide- Tract 2309
Appendix 2 - Cover Type Map