Indiana Department of Natural Resources – Division of Forestry

DRAFT

RESOURCE MANAGEMENT GUIDE

State Forest: Harrison-Crawford Compartment: 23 Tract:04
Forester: John Segari Date: __9/17/2012 _
Management Cycle 20 years

INVENTORY SUMMARY

Number of strata: 2
Permanent Openings: 0.0 ac
Tract Acreage: 56.1
Average Basal Area: 112 sq. ft/ac
Est. Annual Growth: 158 bd. ft/ac/yr*
Est. Cutting Cycle: 15.8 yrs*
Site Index: 80 (for upland oaks)

*Growth calculations are detailed in Appendix 1

Table 1. Tract 2304 Inventory Summary

Species	Harvest		Leave		Total	
	Total	Per acre	Total	Per acre	Total	Per acre
White oak	29,800	532	38,210	682	68,010	1,214
Yellow poplar	23,960	428	26,720	477	50,680	905
Sugar maple	16,210	289	9,800	175	26,010	464
Black oak	12,260	219	37,420	668	49,680	887
Northern red oak	11,530	206	28,590	511	40,120	716
Pignut hickory	8,730	156	33,920	606	42,650	762
Eastern redcedar*	7,670	137	0	0	7,670	137
White ash	5,110	91	2,120	38	7,230	129
American beech	1,520	27	0	0	1,520	27
Chinkapin oak	1,480	26	2,140	38	3,620	65
Shagbark hickory	0	0	4,650	83	4,650	83
Sassafras	1,200	21	0	0	1,200	21
Scarlet oak	990	18	4,660	83	5,650	101
Red maple	910	16	0	0	910	16
Black gum	800	14	0	0	800	14
Black walnut	0	0	1,280	23	1,280	23
Shumard oak	0	0	4,270	76	4,270	76
Total	**123,450**	**2,204**	**192,500**	**3,438**	**315,950**	**5,642**

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

Location

This tract is located in Harrison County. It is found in T42 R3E Sections 5, 6, and 7. It is approximately 5 miles Southwest of Corydon, IN. It is south of Old Forest Rd. and east of Feller Rd.

General Description

This tract is 56 acres, all forested, with 2 covertypes. It is mostly oak-hickory, 36 acres, with the ridge top being old field advanced, 20 acres. The old field consists of early successional old field with a more advanced component as it grades into the oak hickory.
These types will be described briefly below and in more detail in the Management section. See Appendix 2 for a map of strata locations.

Stratum 1
Oak-Hickory
This covertype occupies approximately 64% of the land area but accounts for 75% of the volume. It is located on the hill slope and bottoms of the tract. It has areas of different quality throughout with three acres being old regeneration openings. The timber is generally medium quality and small to medium size sawtimber with scattered larger individuals. It is 64% oaks by volume (mostly white oak), 15% hickories, and the remainder is yellow poplar and other hardwoods. The regeneration openings have regenerated to ailanthus and yellow poplar.

Stratum 2
Old Field Advanced
This covertype occupies about 35% of the tract and accounts for about 25% of the volume. It is found on the ridge top. It has components of dense cedar but has mostly small sawtimber poplar, oak, and hickory with scattered wolf trees.

History

This tract was acquired in three parts, each corresponding to the different PLSS sections. Section 6 was acquired in 1935 from James Brewster (Deed # 131.37) along with many other parcels. Section 7 lands were acquired in 1939 from the Doolittles (131.60). Section 5 acres were acquired in 1941 from the Kraft family (131.111).

This tract was inventoried once before, in 1973. At this time it was found to have 1,444 bd ft/acre total. This was followed by a managed sale that included parts of 2302 and 2306 in 1986. The volumes are not broken out in the record for each tract but the total volume equates to 1,977 bd ft/acre. The goals of this harvest were to remove over mature and decadent trees. At this time three regeneration openings were created. A research study was installed by Purdue to evaluate the effectiveness of red oak plantings. This research was abandoned and is no longer ongoing.

Landscape Context

The dominant land use within a 5 mile radius is a mixture of crop fields, farms and forests.
This tract is part of a larger contiguous forest. While there are nearby fields much of the area is forested.

Geology, Soils, and Hydrology

The tract is composed of a northwest facing slope with a portion of the level hilltop.
See Appendix 2 for a topographical map.

Soils

The following soils account for 97% of the area of the tract:
Gilpin Silt Loam- 30% - Sandstone/shale derived,
Tilsit Silt Loam- 30% - Sandstone derived
Corydon Stony Silt Loam- 17% - Limestone derived
Wellston Silt Loam- 11% - Sandstone derived
Hagerstown Silt Loam- 9% - Limestone

Soils vary by slope position but are generally silt loams, well drained, with bedrock between 20 and 60 inches deep. They are medium productivity soils with moderate organic matter. See Appendix 3 for soils map.

Soil concerns

Soil concerns are not limiting but include compaction on flats and lowlands and erosion on the steep slopes. These concerns are adequately addressed by following Indiana's BMP's.

Hydrology

This tract drains to the private property to the west and then into Indian Creek about 1 mile down from the private property. There is one medium sized sinkhole on the southwest end of the upper flat. This may have a small cave associated on the south side of it. There is also a created wildlife pond on the hill top. This is not in tract 2304 but should still be considered when making management decisions. Avoiding these areas with skid trails and following appropriate BMP's will mitigate any concerns involving the karst features found here.

Access

External access is medium quality. A previous sale to the north in tract 2302 has resulted in a passable road leading from the edge of the tract to Old Forest Rd. There is another old road/atv trail that forms the southeastern boundary and leads out to private property. This trail could be connected to a trail in 2308 that would provide a connecting road from Bussabarger Rd. to Old Forest Rd.

Boundaries

The tract has four un-monumented boundaries. The northwest boundary is the most obvious being a drainage. The southeast boundary is the ridgeline going down to the property corner in the southwest. There is a road/atv trail on the north boundary which is an external boundary. It is unclear if this road is the actual boundary. There are "No Trespassing" signs on the north side of the road. The west boundary is an external boundary that has a plow line running next to a field. There is no other monumentation.

The northern and western boundaries need to be cleared up before any management activities take place.

Wildlife

This tract represents typical upland forest habitat, in addition to a component of old field successional habitat, with cedar and smaller hardwoods. Consequently, it likely receives use from a typical assemblage of common game and nongame wildlife species such as white-tailed deer, wild turkey, squirrels, songbirds, snakes, box turtles, and others. Hard mast food sources are provided by the oak-hickory stratum, but another habitat component would come from the old field cedar stratum. This stratum 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. The cedar is in proximity to a wildlife pond on the ridge top.

Snags were tallied in this inventory for potential uses by wildlife. The following tables summarize guidelines and actual data with regard to the new strategy for consideration of the Indiana bat. The categories of optimal and maintenance guideline numbers were broken down by size class subcategory, but are inclusive of size classes above that. In other words, the maintenance guideline for number of snags in the 6" class and larger was 4 per acre, but of that number, 0.5 per acre should be 20"+ and 3 should be 10'-18" or greater. This was done because larger trees are more valuable and less common, and were given the greater importance when calculating total guideline numbers. **Live tree numbers only consider the 14 species of trees that the Bloomington Field office of the USFW service has identified as Indiana bat roost trees.**

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

# of live trees per acre	Guidelines Maintenance	Tract 2304 actual present
12"-18" DBH class	6	20
20" DBH and greater	3	5
Total	9	25

# snags per acre	Guidelines Maintenance	Guidelines optimal	Tract 2304 actual
6" - 8" DBH class	1	1	0
10"-18" DBH class	2.5	5	2.5
20" DBH and greater	0.5	1	.6
Total	4	7	3.1

These numbers show that live tree densities meet maintenance guidelines. Snag densities meet maintenance levels for medium and large sizes but fall short for optimal, except in the smallest diameter classes. However, it is likely that additional snags in all size class will be created by post harvest TSI activities.

Rare, Threatened, and Endangered Species

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.

Exotic Species

Ailanthus altissima, tree of heaven, was found in the old openings. These need to be controlled soon to release the poplar and cherry that has regenerated.

Recreation

This tract does not currently have any established recreational facilities or amenities. There are some trails going in from adjoining property and the area is likely used for hunting by local residents as there were several deer stands. Due to the limited size and slopes this area has very limited potential for developed recreation.

Cultural Resources

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 Prescription

Stratum 1: Oak-Hickory

Current condition:
This covertype occupies approximately 64% of the land area but accounts for 75% of the volume. It is located on the hill slope and bottoms of the tract. It has areas of different quality throughout with three acres being old regeneration openings. The timber is generally medium quality and of small to medium size. It is 64% oaks (mostly white oak), 15% hickories, and the remainder is yellow poplar and other hardwoods. The regeneration openings have regenerated to ailanthus and yellow poplar. These openings are considered fully stocked, about 90% if the ailanthus is included about 75% if not. The openings are fairly large but yielded no oak regeneration. This site is too productive to maintain oak as a climax species without management that will target oak regeneration. The inventory is summarized in Table 2 with species composition detailed in Table 3. Currently the covertype is just above the 115% stocked condition, see appendix 4.

Table 2. Oak-Hickory Inventory Summary

STRATUM: Oak-Hickory		**ACREAGE: 36**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	3,229	4,626	7,855
Volume total	106,557	152,658	259,215
Basal area/acre	61	60	121
Trees/acre	89	245	334

Table 3. Oak-Hickory Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (Bd ft/ac)
American beech	52	0	52
Black oak	360	899	1259
Black walnut	0	44	44
Chinkapin oak	51	0	51
Northern red oak	397	985	1382
Pignut hickory	227	796	1023
Shagbark hickory	0	82	82
Shumard oak	0	147	147
Sugar maple	511	251	762
White ash	176	73	249
White oak	967	1219	2186
Yellow poplar	444	174	618
Total	**3229**	**4626**	**7855**

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.

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. Much of the yellow poplar is dying out due to the drought. According to the inventory data, approximately 3,229 bd ft/ac should be removed from this covertype. 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. Selection should also favor releasing future crop trees. The residual 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 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. Stocking in this covertype would be reduced from 115% to approximately 60%, still stocked a bit low enough to allow some intolerant regeneration but hopefully discourage poplar.

The previous regeneration openings need attention. The ailanthus needs to be treated. The ailanthus removal will result in a thinning and crop tree release. These openings have moved to a more mesic species composition. Once the invasives are controlled the openings should be allowed to advance naturally until they become merchantable. Once merchantable, they should be thinned as part of the oak hickory stratum.

Stratum 2: Old Field Advanced

Current Condition:
This covertype occupies about 35% of the tract and accounts for about 25% of the volume. It is found on the ridge top. It has components of dense cedar but has mostly small sawtimber poplar, oak, and hickory. The inventory is summarized in Table 4 with species composition detailed in Table 5. Currently, the covertype is just below the 100% stocked condition, see Appendix 4. This area is currently in an advanced state of early succession and is transitioning to an oak hickory covertype. The poplar is dying out but there is little regeneration to take its place. The hickories and oaks are of medium quality and will likely take up any vacated canopy space where they are present.

Table 4. Old Field Inventory Summary

STRATUM: Mixed Mesic-Hardwoods		**ACREAGE: 20**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	3,565	4,079	7,644
Volume total	93,770	107,280	201,050
Basal area/acre	57.2	53.2	110.4
Trees/acre	92	246	338

Table 5. Old Field Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (bd ft/ac)
Black gum	38	0	38
Black oak	88	546	634
Chinkapin oak	0	103	103
Eastern redcedar	370	0	370
Pignut hickory	104	424	528
Red maple	44	0	44
Sassafras	58	0	58
Scarlet oak	48	225	273
Shagbark hickory	0	109	109
Sugar maple	65	121	186
White oak	82	135	217
Yellow poplar	534	1045	1579
Total	**1431**	**2708**	**4139**

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 early to mid-seral species. The stratum should be more densely stocked with quality hardwoods but still provide the dense cedar component.

Silvicultural Prescription:
In order to meet the desired future condition, a harvest is recommended. No action would result in the continued dominance of poorly formed scattered trees. According to the inventory data, approximately 1,431 bd ft/ac should be removed from this covertype. This would leave more than 2,700 bd ft/ac. Areas of cedar should be maintained if possible to allow for habitat diversity.

Marking should be a combination of single tree selection and group shelterwood. Areas that have quality trees or existing oak and hickory dominance should receive single tree selection focused on releasing future crop trees. Areas that are dominated by either undesirable species or poor quality canopy trees should be heavily thinned favoring oaks and hickories as leave trees or receive gaps of approximately one tree height. The reason for favoring oak and hickory is the limited dispersal distance of their seeds. Beech, maples, and poplars will seed in without management assistance. This should provide for a variety of species in a new stratum. The residual should have similar species dominance as is currently found but will have a higher average quality. Stocking in this covertype would be reduced from 100% to just below the 60% mark ("B-line"), a slightly understocked condition. Bringing the stratum to a slightly understocked condition will allow some regeneration to get established. Care must be taken to not thin to the point of reducing residual quality through epicormic sprouting. During the next cutting cycle, the overstory should be removed to provide for a fully stocked stratum of oak and hickory. Occasional residuals regardless of quality should also be maintained to provide for structural diversity.

Tract summary

Summary of silviculture throughout the tract:

Due to the current condition of the stand, a medium level improvement harvest could be undertaken in this tract at anytime. Overall stocking should be reduced from the current 105% to approximately 60%. This is accomplished by a combination of crop tree release, cull removal, and converting portions of the old field area into quality hardwoods through single tree selection and group shelterwood cuts. This would produce a sale volume of approximately 123,000 bd ft or about 2,200 bd ft\acre and leave about 192,500 board feet or 3,440 bd ft\acre.
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 success of the shelterwood areas will require the completion of the cutting in these areas. The girdling of large cull trees will also help to replace any large snags that are accidentally felled during harvest operations. 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.

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: Wildlife in this tract should not be adversely affected. No rare threatened or endangered species will be adversely affected during the planning period. Snags and coarse woody debris should remain at viable levels in the stratum and should continue to provide habitat for the Indiana bat. The main 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 permanently reduced but not eliminated from the stratum. 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: 1.1 Management activities involving a timber sale should not affect this habitat long-term from the perspective of any wildlife utilizing it due to the maintenance of a forested habitat on the tract. The old field area does have a cedar component that will over time be reduced. This will result in a loss of thermal cover. The cedar is not very dense and is already being overtopped by hardwoods. 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.

1.2 There are no real riparian areas that will be adversely affected by the recommendations of this plan. This tract, and compartment as a whole, represents a minor component of a larger

contiguous forest. As such, it is not likely utilized more by wildlife than the surrounding area. The habitat on this tract in the context of the surrounding landscape does not represent a special component that would be used more preferentially or exclusively by wildlife for traveling or dispersion, as riparian habitat might be, or as forest in a non-forested landscape might be. This travel may be disrupted in the short-term but long-term, the area will remain forested and provide dispersal and travel corridors into the future.

Indiana Bat

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

# of live trees per acre	Guidelines Maintenance	Tract 2304 present	Planned Harvest	Planned Residual
12"-18" DBH class	6	20	15	5
20" DBH and greater	3	5	3	3
Total	9	25	17	8

Live tree numbers only consider the 14 species of trees that the Bloomington Field office of the USFW service has identified as Indiana bat roost trees.

As noted above, snag counts for all size classes but the smallest are above the maintenance levels. 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. The table above shows that large live tree densities will not be below the recommended levels. The smaller trees are harvestable below the recommended levels so this will require the reserving of lower quality and poorly formed trees in the pole to small sawtimber class when marking to be sure to meet the recommendations.

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	2013
Mark sale	2013
Sell timber	2013
Post harvest tsi	2014/2015
Monitor regeneration openings to determine shelterwood removal	2025
Re-inventory	2031
Write new management plan	2031

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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.

Appendix 1
Tract 2304 Growth Calculations

Growth is calculated as the amount of merchantable saw log volume that the tract generates between two reference dates. This tract was inventories in 1973, had a reduction volume through a harvest in 1986, and was again inventoried in 2012. The harvest in 1986 included two adjacent tracts, so we don't have precise amount of volume that was removed from this tract. We can instead look at the total volume sold and the number of acres and find an average volume per acre of removals.

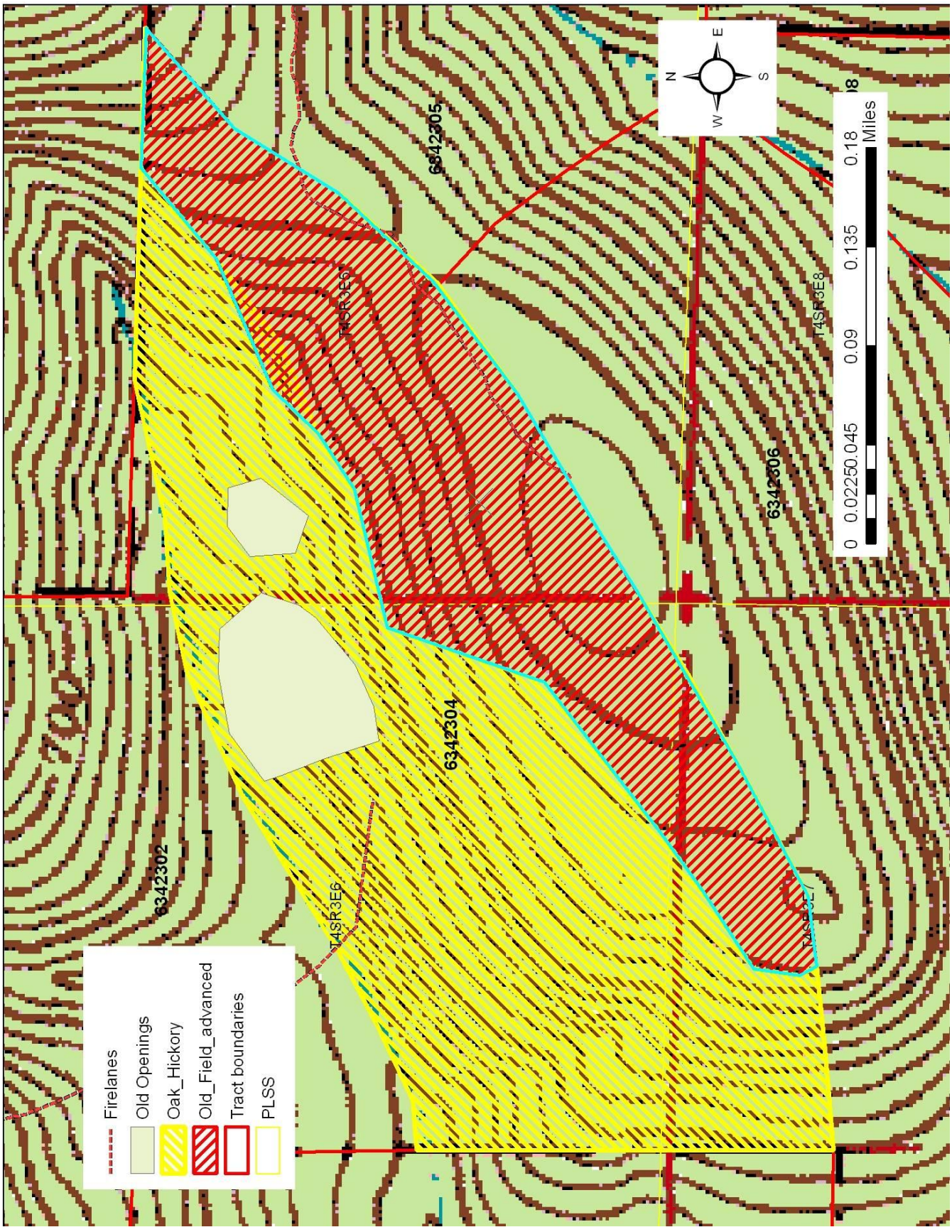
1973 inventory	1445 bdft/ac
1986 harvest	1977 bdft/ac
2012 inventory	5640 bdft/ac

Annual growth is (2012 volume - 1973volume + 1986volume) / (2012-1973)
Growth = 158 bd ft/acre/year

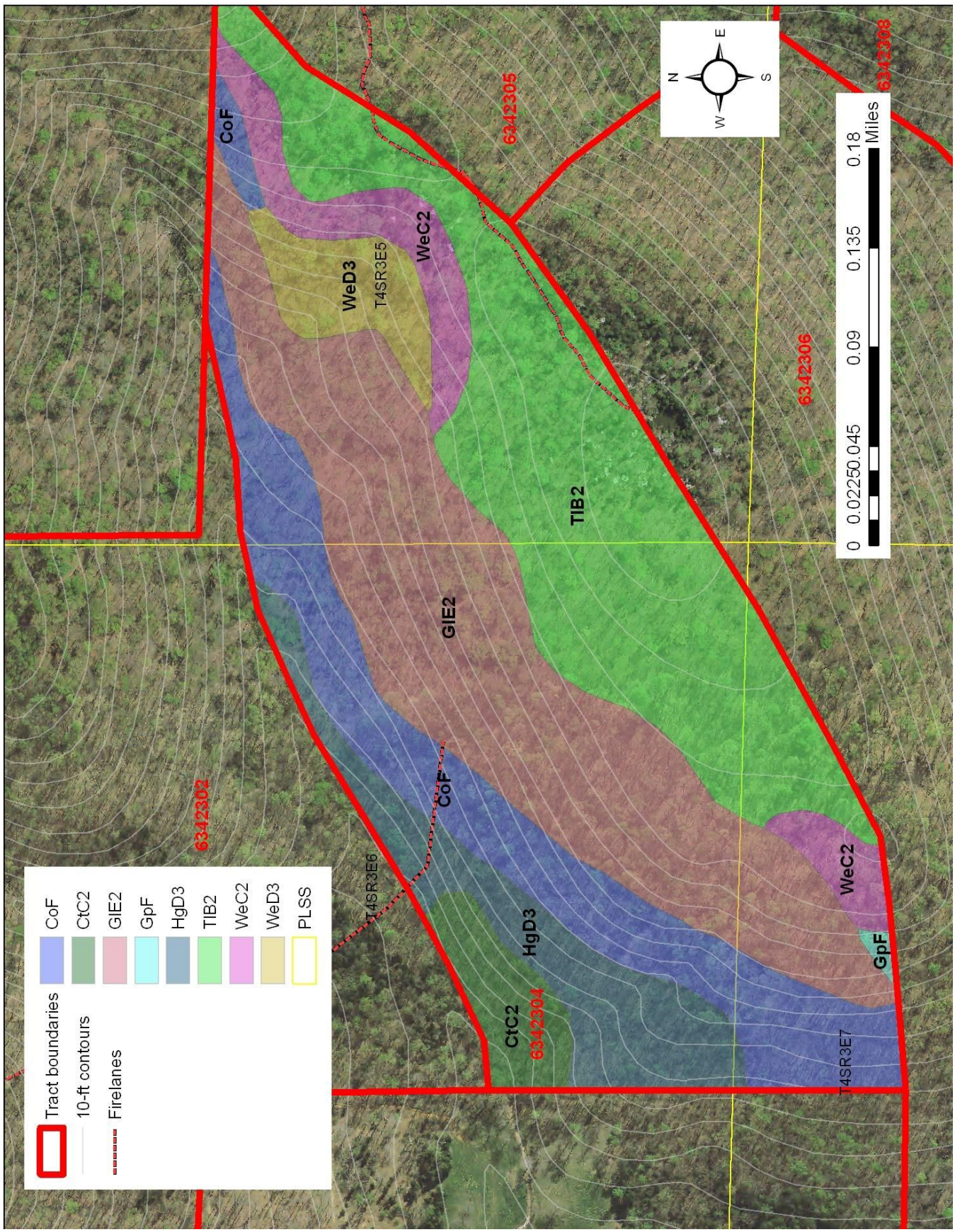
Cutting cycle is the amount of time it takes to generate a merchantable sale. In our region a sale needs to be approximately 2000 bdft/acre to generate interest.

Cutting cycle is 2000 bdft /(158(annual growth)*.8(Accounts for 20% annual mortality))
Cutting cycle = 15.8 years

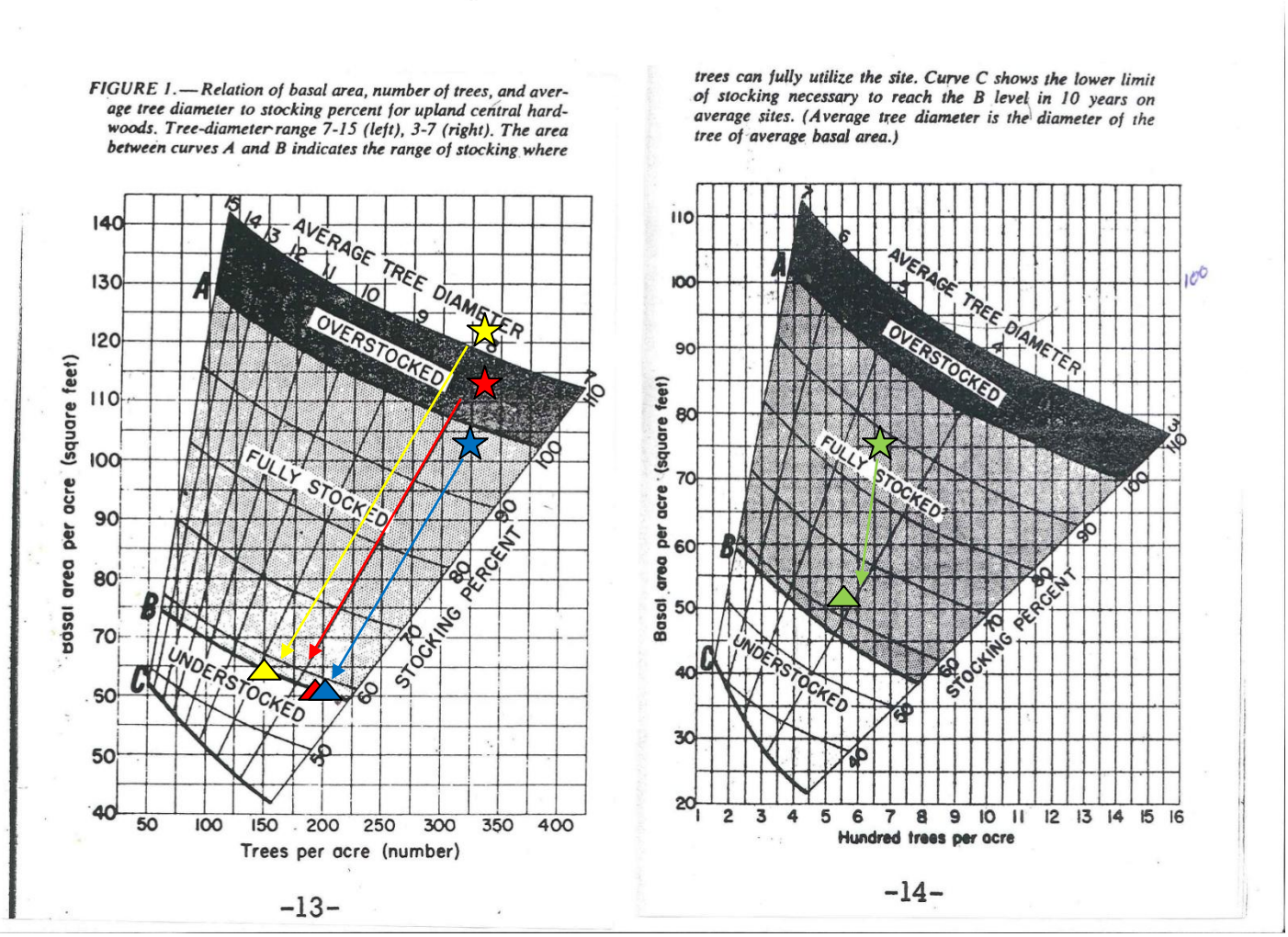
Appendix 2
Tract 2304 Type Locations



Appendix 3
Tract 2304 Soils (2011)



Appendix 4
Tract 2304 Stocking Chart



☆ **Indicates the current stocking condition**

△ **Indicates the proposed (post harvest) condition**

Indicates the Tract Total

Indicates the Oak-Hickory covertype

Indicates the Old Field Advanced covertype

Indicates the Regeneration Openings (removal of ailanthus and crop tree release)