Indiana Department of Natural Resources
Division of Forestry

DRAFT

Resource Management Guide

State Forest: Harrison-Crawford
Forester: John Segari

Compartment: 09 Tract: 01
Date: 6/1/2012

INVENTORY SUMMARY

Number of stands: 3
Permanent Openings: 0.0 ac
Tract Acreage: 40
Average Basal Area: 98.5 sq. ft/ac

Est. Annual Growth: 90 bd. ft /ac/yr
Est. Cutting Cycle: 20-25 yrs
*see Appendix 1 for growth and cutting cycle calculations
Site Index: 68 (for upland oaks)

Table 1. Tract 0901 Inventory Summary

Species	Harvest		Leave		Total	
	Total	Per acre	Total	Per acre	Total	Per acre
American beech	3,840.0	96.0	0.0	0.0	3,840.0	96.0
American elm	1,050.0	26.3	0.0	0.0	1,050.0	26.3
Black oak	8,820.0	220.5	7,730.0	193.3	16,550.0	413.8
Eastern redcedar	4,440.0	111.0	0.0	0.0	4,440.0	111.0
Northern red oak	0.0	0.0	5,110.0	127.8	5,110.0	127.8
Pignut hickory	1,050.0	26.3	3,750.0	93.8	4,800.0	120.0
Red maple	6,220.0	155.5	0.0	0.0	6,220.0	155.5
Scarlet oak	3,110.0	77.8	5,520.0	138.0	8,630.0	215.8
Shagbark hickory	0.0	0.0	6,010.0	150.3	6,010.0	150.3
Sugar maple	2,160.0	54.0	2,140.0	53.5	4,300.0	107.5
White ash	20,660.0	516.5	43,040.0	1,076.0	65,100.0	1,627.5
Yellow poplar	14,720.0	368.0	14,790.0	369.8	29,510.0	737.8
Total	66,070.0	1,651.8	88,090.0	2,202.3	155,560.0	3,889.0

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

Context

Location

This tract is located in Crawford County approximately 2.5 miles northeast of Carefree, in the NE ¼ of the SW ¼ of Section 8, Township 3S and Range 2E. It is north of Pierce Rd 1/8th mile east of Schafer Ridge Rd.

General Description

This Tract is 40 acres of mostly uplands. There are 3 covertypes in this tract. These grade into each other and so do not have definite boundaries. It is dominated by upland old-field that is converting to Oak-Hickory. This tract provides a variety of wildlife habitats and hunting opportunities as well as water filtration for Dry Run Creek. These stands will be described briefly below and in more detail in the Management section. See Appendix 2 for a map of stand locations.

Stand 1

Mixed Mesic Hardwoods

This covertype is found on both sides of the drainage, on the western side of the tract, and the northeast facing slope of the southeastern drainage and comprises 12% of the tract's area and 16% of the volume. It is dominated by Yellow poplar (1963 bd.ft. /ac), and White oak (858 bd.ft./ac). The remaining 40% is composed of Sugar maple, Northern red oak, black oak and other hardwoods. The timber in this covertype is medium to poor quality, medium to large sawtimber.

Stand 2

Oak-Hickory

This covertype is found in the north-facing northeast slope and the southwest facing slope in the southwest corner of the tract. It comprises 33% of the tract's area and 59% of the volume. It is dominated by white oak (4999 bd.ft. /ac), black oak (1260 bd.ft. /ac) and shagbark hickory (537 bd.ft. / ac). The remaining 5% is composed of a variety of northern red oak, scarlet oak and red maple. Timber here is medium to good quality sawtimber.

Stand 3

Old-Field Advanced

This covertype is found along the central ridge top and constitutes 55% of the land area but only 26% of the volume. It is dominated by Yellow poplar (664 bd.ft. /ac) and scarlet oak (307 bd. ft. /ac) with lesser amounts of red maple and eastern red cedar. This covertype has low stocking and the majority of the timber is poor to medium quality. The Yellow poplar is low to medium quality and small sawtimber size.

History

This tract was acquired in a single transaction in 1943 (Deed 131.124) from Ed Boman. The deed notes a "dwelling now on the tract." Aerial photos from the 1940's indicate that the central ridge was a pastureland with scattered trees while the southwestern, northwestern, and eastern slopes were forested.

In 1981, a trespass was discovered that removed 27 trees; 19 white oak, 6 black oak, 1 black walnut, and 1 hickory, for an estimated total of 8,812 bd. ft. This is believed to have occurred in 1977. The guilty party was not identified. This tract was last inventoried in 1985. At that time only 20 acres of the tract was considered merchantable with a total volume of 87,864 bd. ft. Thirty-four percent (30,551 bd ft) was black oak, 16% white oak, 14% red oak, and 12% pignut hickory. The remaining 24% was composed of various hardwood species. A single tree selection harvest was conducted in 1985 removing 248 trees totaling 32,855 bd ft, mostly black oak. An opening of approximately 2 acres was installed. The harvest was followed up with a TSI operation in the fall of 1985 removing 283 trees.

Landscape Context

The surrounding landscape in this area of the county is dominated by upland deciduous forests. There is occasional evergreen cover in the form of CCC pine plantations dating from the 1930's and old fields that have reverted to eastern red cedar. The surrounding deciduous forest is usually of younger age classes on private lands. The state holdings in the area likely comprise the most mature age classes with the largest structural diversity in the area.

Topology, Geology and Soils

This tract is dominated by a northwest-southeast oriented ridge running through the central portion of the tract. It is composed of a gentle southwest facing slope, the ridge top, a moderate to steep east slope going down to dry run creek, and a bottomland near and to the east of the creek.

Soils

Tipsaw-Adyeville Complex, 3 acres, 25-75% slopes, TblG,

Tipsaw: Site index for black oak and northern red oak is 70 and annual growth is approximately 684 bd.ft./acre*.

Adyeville: Site index for northern red oak is 64 and annual growth is approximately 516 bd. Ft/ acre*.

Apalona Silt Loam, 8 acres, AgrC2, C3, B (6-12% slopes),

Site index for black oak and white oak is 60 and annual growth is approximately 516 bd.ft./acre*.

Wellston Silt Loam, 29 acres, WhfC2, D2, D3 (12-18% slopes),

Site indices for yellow poplar and northern red oak are 90 and 81, respectively, with annual growth of approximately 1032 and 684 bd.ft./acre*, respectively.

*-Annual growth is based on the NRCS soil series yields, Table 3. These values represent even-aged stands at culmination of Mean Annual Increment and should be viewed as the upper range of possible yields. Actual yields based on consecutive inventories have shown a much lower yield (See page 1).

These soils, as a complex, vary from moderately well-drained to excessively-drained. They are derived from loess and loamy residuum over sandstone, siltstone, and shale deposits. They do not offer rooting layer restrictions with restrictive layers being 40-70+ inches in depth in most spots, See

Appendix 3 for soils map.

Soil concerns

The soils in some areas are steep and easily eroded. Management activities on the slopes will have to be planned to utilize exposed rocks and conserve soil. This will help maintain these deep soils and prevent excess erosion.

Hydrology

This tract drains to Dry Run which eventually enters the Blue River approximately 1 mile downstream. There is also a spring on the west side of the tract. There are no "blue-line" streams on or near this tract

Access

External access to the tract is reasonably good. Pierce Road forms the southern boundary and a turn off is located in the southeast corner. Internal access is also good with the central ridge having a previous skid trail running its length.

Boundaries

This tract is surrounded by private land. The southern boundary is Pierce Road. The southwest corner is monumented by a private survey of the adjacent property performed by Pettitt with a 5/8" rebar located 43ft north of the road centerline. The northwest corner is a found survey stone. This is well monumented with an orange carsonite post by the Crawford county surveyor. The northeast corner is likely evidenced by a fence intersection. The southeast corner is shown in the boundary book to have possible stone found but evidence could not be located during this inventory. The northern boundary is evidenced its full length by metal t posts with occasional barbed wire remnants. The same is found along the western boundary. The eastern boundary is less sure due to the lack of evidence and monumentation at the southeast corner. See Appendix 5 for a map of monument locations.

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 non-game 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 covertype, but another habitat component would come from the old field cedar stand. This stand provides 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 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.

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

# of live trees per acre	Guidelines Maintenance	Tract 0901 present
12"-18" DBH class	6	22
20" DBH and greater	3	4.6

Total	9	26.6

# snags per acre	Guidelines Maintenance	Guidelines optimal	Tract 0901 actual
6" - 8" DBH class	1	1	16
10"-18" DBH class	2.5	5	5
20" DBH and greater	0.5	1	.3
Total	4	7	21.3

These numbers show that live tree densities are above that recommended by the Interim Indiana Bat Management Guide. Snag Densities are more complicated. Snag densities for small and medium size classes (>20" DBH) meet the optimal guidelines. Large snags are just short of meeting the maintenance level. This can be interpreted as there being plenty of small and medium snags but there is a lack of large snags.

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

There are some areas of multifloral rose (*Rosa multiflora*) in places – especially in the old field stand and the oak-hickory stand on the west side of the tract – and this would be difficult to eradicate by spraying. While providing a small hindrance to travel and tree regeneration, this thorny shrub can also increase habitat for small mammals and birds by providing protective cover. Large scale elimination of this species is infeasible and this species declines in abundance the longer the canopy remains closed. Any TSI operations should treat the multiflora rose if possible.

Recreation

Currently, this stand receives hunting pressure from neighbors. This is evidenced by the presence of deer stands within and adjacent to the property boundary. Other recreational uses such as OHV's, hiking, or camping are not evidenced at this time. This tract doesn't offer any unique recreational opportunities that are not currently being offered or managed for in the surrounding area. Hunting is likely the best recreational benefit that can be managed for in this tract and should be encouraged. Control of deer and small mammal populations through hunting will help reduce seed and seedling predation and when combined with other management practices will encourage the establishment and recruitment of hard mast species such as oaks and hickories.

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

Stand 1: Mixed Mesic Hardwoods

Current condition

This covertype is found on both sides of the drainage, on the western side of the tract, and the northeast facing slope of the southeastern drainage and comprises 12% of the tract's area and 16% of the volume. It is dominated by Yellow poplar (1963 bd.ft. /ac), and White oak (858 bd.ft./ac). The remaining 40% is composed of Sugar maple, Northern red oak, black oak and other hardwoods. The timber in this covertype is medium to poor quality, medium to large sawtimber. The inventory is summarized in Table 2**Error! Reference source not found.Error! Reference source not found.** with species composition detailed in Table 3 . Currently the covertype is just below the 92% stocked condition, see Appendix 4.

Table 2. Mixed Mesic Hardwood Inventory Summary

STAND: MIXED MESIC HARDWOODS		**ACREAGE: 5**	
	HARVEST (BD FT)	**LEAVE (BD FT)**	**TOTAL (BD FT)**
VOLUME/ACRE	2,404	2,417	4,821
VOLUME TOTAL	12,020	12,085	24,105
BASAL AREA/ACRE	45	53	98
TREES/ACRE	84	242	326

Table 3. Mixed Mesic Hardwoods volume by Species

Species	**Harvest/acre**	**Leave/acre**	**Total/acre**
American beech	223	0	223
Black oak	442	0	442
Northern red oak	0	537	537
Pignut hickory	0	177	177
Sugar maple	270	268	538
White ash	83	0	83
White oak	158	700	858
Yellow poplar	1228	735	1963
Total	**2404**	**2417**	**4821**

Desired future condition:

The desired future condition for this covertype is to have a stand stocked with a diversity of quality vigorous hardwoods that provide ecological services including water filtration.

Silvicultural Prescription:

In order to reach the desired future condition the area should receive a thinning and possibly a group selection opening. Thinning should focus on releasing longer lived species and higher quality stems. The inventory calls for removing approximately 2\3 of the yellow poplar basal area as well as about 1\2 the sugar maple. This should remove poorly formed or suppressed trees and focus the growth resources of the stand on the residual higher quality trees such as oaks and hickories. The covertype includes an old opening which is currently fully stocked with yellow poplar saplings. This opening should be retained to allow the growth of quality straight stems. If after marking low quality trees out of the stand, 60-80 feet of basal area of quality trees aren't being retained, an opening or larger group selection should used to regenerate the area. Some areas of large oak regeneration are present in this covertype and these should be released whenever possible.

Stand 2: Oak-Hickory

Current condition

This covertype is found in the north-facing northeast slope and the southwest facing slope in the southwest corner of the tract. It comprises 33% of the tract's area and 59% of the volume. It is dominated by white oak (4999 bd.ft. /ac), black oak (1260 bd.ft. /ac), and shagbark hickory (537 bd.ft. / ac). The remaining 5% is composed of a variety of northern red oak, scarlet oak and red maple. Timber here is medium to good quality sawtimber. The inventory is summarized in Table 4 with species composition detailed in Table 5. Currently the covertype is just above the 110% stocked condition, see Appendix 4.

Table 4. Oak-Hickory Inventory Summary

STAND: OAK-HICKORY		**ACREAGE: 13**	
	HARVEST (BD FT)	**LEAVE (BD FT)**	**TOTAL (BD FT)**
VOLUME/ACRE	2,390	4,401	6,915
VOLUME TOTAL	31,070	57,213	89,895
BASAL AREA/ACRE	57	64	122
TREES/ACRE	190	115	305

Table 5. Oak-Hickory volume by Species

Species	**Harvest/acre**	**Leave/acre**	**Total/acre**
Black oak	472	572	1045
Northern red oak	0	73	73
Red maple	62	0	62
Scarlet oak	123	77	200
Shagbark oak	0	537	537
White oak	1732	3142	4999
Total	**2389**	**4401**	**6916**

Desired future condition:

The desired future condition for this covertype is to provide an adequately stocked stand of quality sawtimber that provides hard mast for game and non-game wildlife species. Other multiple uses that are appropriate for this site include hunting.

Silvicultural Prescription:

In order to reach the desired future condition, an improvement thinning should be performed. This should be a combination of single tree and group selections. The stand is currently overstocked and will start experiencing higher rates of mortality during the next cutting cycle if not treated. The thinning should remove trees to release quality crop trees focusing on white oak, hickories, and other oaks, but any good quality healthy tree should be treated as a crop tree. Most of the sugar maple and more tolerant hardwoods should be removed to encourage the maintenance of an oak-hickory species composition. Occasionally groups of trees may need to be removed to increase residual quality or to release existing favorable regeneration. Based on the inventory, stocking should be reduced to 55% to promote the establishment of oak regeneration and remove unacceptable growing stock. This is lower than it should be marked. The stand should be marked down to about 70 feet to retain a mostly fully utilized growing space but open enough to start getting some midtolerants, such as white oak, established.

Stand 3: Old Field Advanced

Current condition

This covertype is found along the central ridge top and constitutes 55% of the land area but only 26% of the volume. It is dominated by Yellow poplar (664 bd.ft. /ac) and scarlet oak (307 bd. ft. /ac) with lesser amounts of red maple and eastern red cedar. This covertype has low stocking and the majority of the timber is poor to medium quality. There is ample oak regeneration in this covertype. The yellow poplar is low to medium quality and small sawtimber size. The inventory is summarized in Table 6 with species composition detailed in Table 7. Currently the covertype is just above the 80% stocked condition, see Appendix 4. However, this is misleading because the chart is for upland oak-hickory not old fields.

Table 6. Old Field Advanced Inventory Summary

STAND: OLD FIELD		**ACREAGE: 22**	
	HARVEST (BD FT)	**LEAVE (BD FT)**	**TOTAL (BD FT)**
VOLUME/ACRE	848	936	1,784
VOLUME TOTAL	18,656	20,592	39,248
BASAL AREA/ACRE	41	43	85
TREES/ACRE	131	204	336

Table 7. Old Field Advanced Volume by Species

Species	**Harvest/acre**	**Leave/acre**	**Total/acre**
Black oak	0	63	63
Eastern red cedar	213	0	213
Pignut hickory	50	112	163
Red maple	265	0	265
Scarlet oak	83	224	307
White oak	0	108	108
Yellow poplar	236	428	664
Total	**847**	**935**	**1783**

Desired future condition:

The desired future condition for this covertype is to provide an adequately stocked Oak-Hickory stand of quality sawtimber that provides hard mast for game and non-game wildlife species.

Silvicultural Prescription:

In order to reach the desired future condition, this area should be converted to oak-hickory. The most efficient and effective way to do this would be to regenerate the stand with a clearcut. The large amount of oak regeneration that is already established would result in a fully stocked oak stand, essentially a one-cut shelterwood. However for the purpose of structural diversity and aesthetics, the better option would be to convert to oak-hickory using several large group selections and then thinning the remaining stand to release the oak. The stand is currently under-stocked but reducing stocking to about 45% will release the existing oak and hickory regeneration. This will involve cutting most of the maple, cedar, and poplar. The thinning should remove trees to take advantage of existing regeneration or release the few quality crop trees focusing on white oak, hickories, and other oaks. Only trees that will provide a quality seed source should be retained. This should be done in scattered areas to provide a gradual transition to oak-hickory while retaining some residual structure for biological diversity.

Effects of Management:

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 110% to approximately 58%. This is accomplished by a combination of crop tree release, cull removal, regeneration openings, and converting the old field area into a hardwood stand by removing the cedar and low quality trees. The area should receive at least 10%, or 2.2 acres of regeneration openings. Regeneration should be concentrated in the old field covertype to convert to native hardwoods. This would produce a sale volume of approximately 66,000 board feet or about 1,650 board feet per acre and leave about 88,00, board feet or 2,200 board feet per acre. 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, girdling cull trees, and controlling vines.

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 and water quality.

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 Discussion from Ecological Resource Review: 1.1 Additionally, 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. There may be some conversion of cedar or the old field area to temporarily open areas that will be allowed to succeed into native hardwoods, and this would change the character of the tract over time, but will not change it into a permanently non-forested cover type. Creation of regeneration openings and/or conversion of portions of the old field area into 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 should be no disruption of any potential travel corridors by forest management activities. The riparian habitat on this tract, in the context of the surrounding landscape, does represent a special component that would be used more preferentially or exclusively by wildlife for traveling or dispersion. 1.3 Since this tract represents a component of contiguous forest, it is possible that forest management activities might disrupt forest interior species by creating edge habitat for generalist species to "invade" the area. This would possibly occur if regeneration openings were put in place that offered a habitat preferred by such generalist species which might move in and start using such habitat. In the context of the surrounding landscape, this tract represents a medium- sized chunk of forest in a matrix of surrounding forest land.

Indiana Bat

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

# of live trees per acre	Guidelines Maintenance	Tract 0901 actual present	–	harvest = residual
12"-18" DBH class	6	22	12.2	10
20" DBH and greater	3	4.6	1	3.6
Total	9	26.6	13.2	13.6

# snags per acre	Guidelines Maintenance	Guidelines optimal	Tract 0901 actual
6" - 8" DBH class	1	1	16
10"-18" DBH class	2.5	5	5
20" DBH and greater	0.5	1	.3
Total	4	7	21.3

Harvest levels advised in this plan will maintain those live tree densities. Snag Densities are more complicated. It is likely that additional snags in the medium size class will be created by post harvest TSI activities as there are approximately 3 trees averaging 13.2" DBH per acre inventoried as culls. These cull trees may or may not be harvested and those not harvested will be girdled in post harvest TSI creating a diversity of snag diameters and species. 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 only be temporarily affected. Hunting opportunities will be reduced temporarily but should be improved by 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.

Another management plan will need to be written in 2022. And another inventory will need to be performed in 2022.

Proposed Management Activity	**Proposed date:**
Improvement harvest and conversion of old field	2012-2013
Post-harvest TSI	2014
Inventory and new plan	2022

Appendix 1
Growth Calculations:

Growth calculated as follows:

1983 inventory		117,154 bd ft	or	2928 bd ft/acre
Harvest removals 1985		32855 bd ft	or	821.75 bd ft /acre
1986 volume				2107.5 bd ft/acre
2012 inventory				4361 bd ft/ acre
Growing seasons	26	Area	40	acres

Estimated growth = [2012 volume - (1983 volume – 1985 harvest volume)]/ Growing seasons

Growth = [4361-(2928-821.8)]/26
Growth = 86 bd. ft. /acre/yr

*Volumes exclude Eastern red cedar due to different scales being used, current scales assign more volume and inclusion would result in an inflated growth estimate.

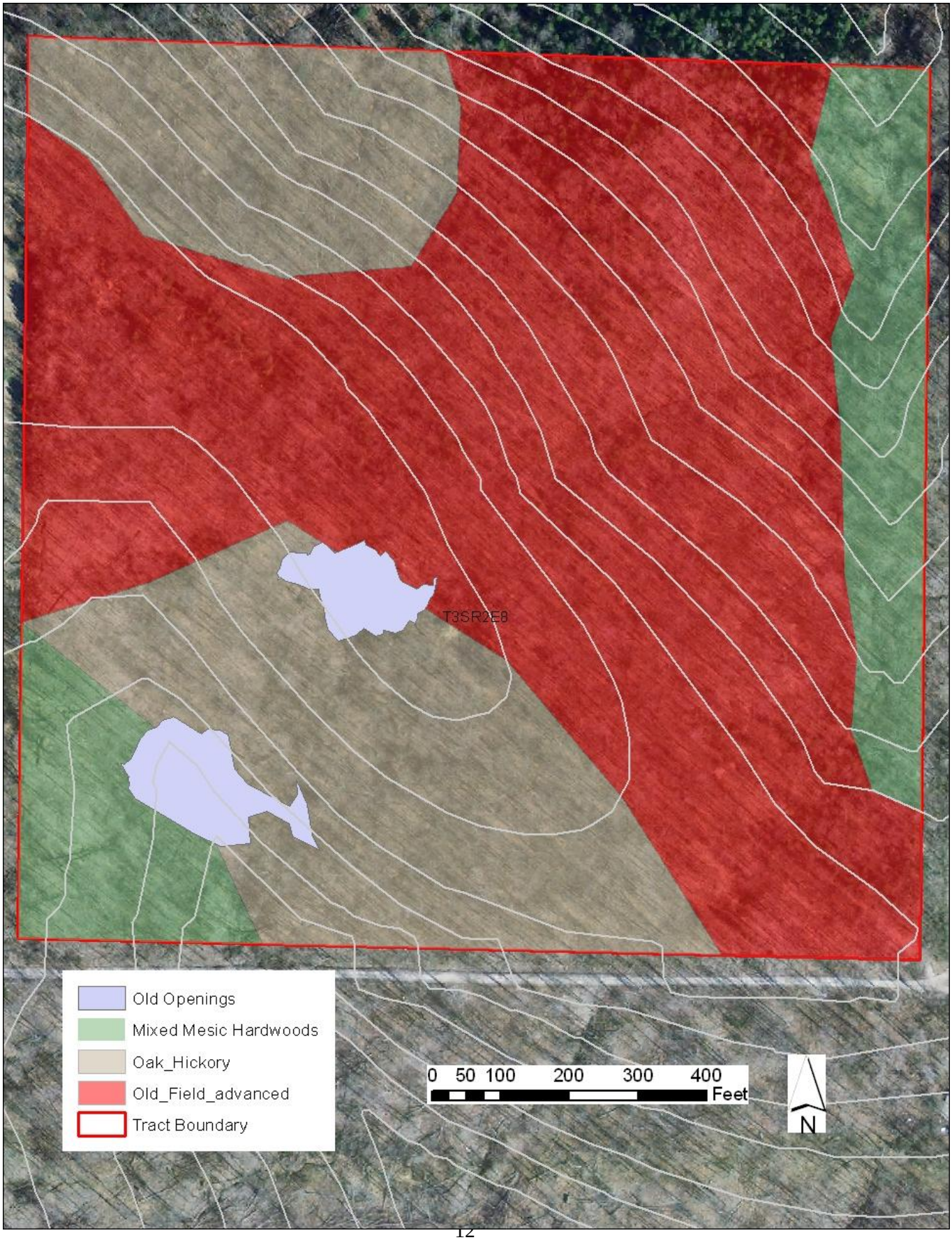
Cutting cycle calculated as the length of time required to reach a merchantable sale volume. Merchantable volume is assumed to be 1500 – 2000 bd. ft/ac.

CC = 1500 / (.8)*(annual growth)
CC = 1500 / (.8)*(86) = **22 years**

CC = 2000 / (.8)*(annual growth)
CC = 2000 / (.8)*(86) = **29 years**

Range of Cutting Cycle Length **= 22-29 years**

Appendix 2
Covertype Locations



Appendix 3
Soils:

Appendix 4
Stocking Chart:

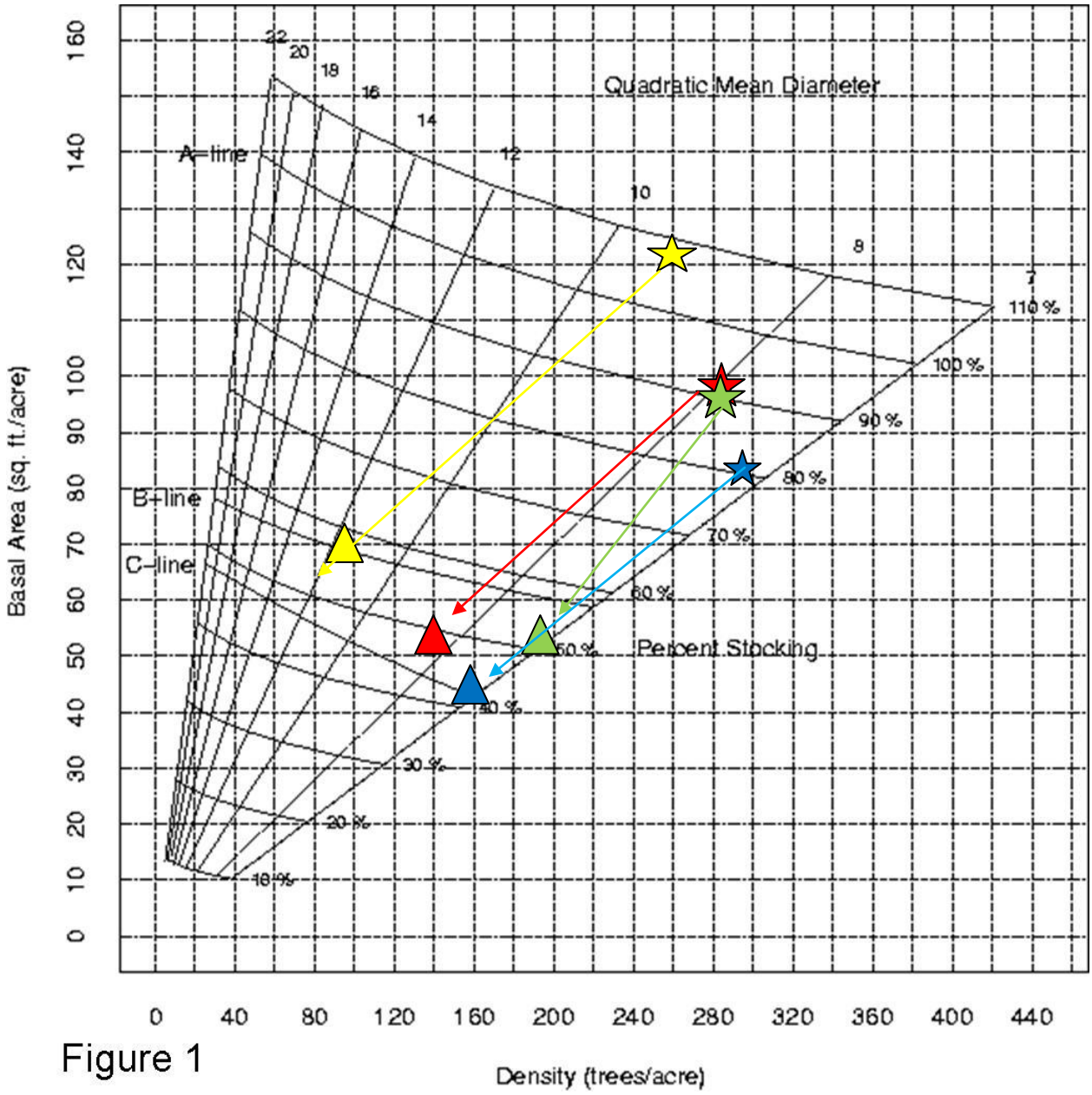


Figure 1

☆ **Indicates the current stocking condition**

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

Indicates the Tract Total

Indicates the Oak-Hickory

Indicates the Mixed Mesic Hardwood

Indicates the Old Field

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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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