

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

State Forest: Harrison Crawford
Forester: Elena Wilcoxson
Management Cycle: 20 years

Date: March 14, 2015
Compartment: 21 Tract: 02

INVENTORY SUMMARY

Tract Acreage: 71.3 acres
Number of Stands: 3
Permanent Openings: 0
Average Basal Area: 96.3

Est. Annual Growth: ~193-268 bd ft/acre/yr
Est. Cutting Cycle: ~8-11 years
Site Index: 71 – 81 (upland oaks)

TABLE 1. Tract 2102 Inventory Summary

SPECIES	HARVEST		LEAVE		TOTAL	
	Per acre	Total	Per acre	Total	Per acre	Total
White oak	381	27,165	1,117	79,642	1,498	106,807
Pignut hickory	145	10,339	527	37,575	672	47,914
Shagbark hickory	21	1,497	475	33,868	496	35,365
Northern red oak	0	0	349	24,884	349	24,884
Black oak	605	43,137	201	14,331	806	57,468
Scarlet oak	44	3,137	84	5,989	128	9,126
Sugar maple	526	37,504	75	5,348	601	42,851
Yellow Poplar	404	28,805	51	3,636	455	32,442
Red pine	185	13,191	42	2,995	227	16,185
<i>Eastern red cedar*</i>	35	2,496	29	2,068	64	4,563
Black cherry	15	1,070	0	0	15	1,070
Blackgum	10	713	0	0	10	713
White ash	100	7,130	0	0	100	7,130
TTOTAL	2,471	176,184	2,950	210,336	5,421	386,518

**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*

PART 1 - TRACT INFORMATION

Location

This 71 acre tract is located in Harrison County, Indiana. It is in Section 36 of Township 3S Range 2E and in section 1 of Township 4S Range 2E. The tract is bordered to the west by SR 462 and is approximately nine miles west of Corydon, Indiana.

General Description

This tract is characterized by three distinct cover types, of which Oak Hickory is most dominant. The cover types include Oak Hickory (50.0 acres and 71%), Old Field which includes cedar areas and a red pine plantation (12.7 acres and 18%), and Mixed Mesic Hardwoods (7.8 acres and 11%). The strata will be described briefly below and in more detail in the Management section. See map for a cover type distribution map.

Merchantable Cover Types

Oak Hickory – 50.0 acres

This cover type comprises 71% of the tract acreage and 73% of the merchantable volume in the tract. This cover type is found across the tract. It is dominated by white oak which makes up 29% of the total volume for the cover type with ~81,450 bd ft. All oaks total about 60% of the total volume of the cover type and hickories make up around 22%. The remaining 18% of the cover type consists of other hardwoods including sugar maple, white ash, and yellow poplar.

Old Field – 12.7 acres

The old field cover type includes three separate stand types which are Old Field, Old Field Cedar, and Pine Plantation. The Old Field stand type occurs in the northeast corner of the tract. The Old Field Cedar stand type is found in three separate locations. The central most of these cedar areas contains a home site and looks to be open and eroded in 1940s aerial photos. The Pine Plantation stand type, which is a red pine plantation, is located in the southwest corner of the tract fairly close to 462. The old field cover type, as a whole, encompasses 18% of the tract acreage and 16% of the merchantable volume in the tract. It includes mainly red pine (26%), yellow poplar (20%), and black oak (20%). White oak, sugar maple, pignut hickory, E. redcedar, shagbark hickory, and blackgum were also present within the cover type and made up the remaining 34% of the volume within the cover type.

Mixed Mesic Hardwoods – 7.8 acres

The mixed mesic hardwoods cover type contains 11% of the tract acreage and 12% of the merchantable volume in the tract. This cover type is found primarily to the north of one of the old field cedar stands. It is dominated by white oak which comprises 32% of the total volume of

the cover type, shagbark hickory with 18%, and sugar maple with 17%. Other species making up the remaining 33% of the cover type volume are pignut hickory, yellow poplar, white ash, black oak, and black cherry.

History

The tract was acquired in two separate parcels. The larger of the two, the eastern portion, was acquired February 2, 1944 for \$5,000 from Samuel Breeden (deed 31-0094-30). The smaller, western portion, of the tract was acquired January 16, 1940 for \$1.00 also from Samuel Breeden (deed 31-0076-30).

On May 30, 1985 (sale number 6348507) part of tract 2102 along with parts of tracts 2101, 2103, and 2104 were sold to Coffman and Crosier for \$26,000 (10 cents per foot). This sale area contained 226 acres across the four tracts. The sale volume came to a total of 259,992 board feet. White oak was the largest contributor to this volume with 48,179 bd ft (19% of the total sale volume), black oak was second with 44,676 bd ft and 17% of the total sale volume, and chestnut oak was the third largest with 41,144 bd ft and 16% of the total volume. Other species on this sale included hickory, beech, red oak, poplar, scarlet oak, sugar maple, white ash, black gum, black cherry, chinkapin oak, post oak, basswood, red maple, red elm, A. elm, black locust, sassafras, and black walnut.

Landscape Context

The dominant land uses within a 5 mile radius of the tract are primarily forested lands (some of which is owned by the state and some of which is privately owned) and privately owned residences. The nearest development lies directly north and north west of the tract along 462, which is the western border of the tract. There is also development along Feller Road to the north east of the tract and along Old Forest Road to the south of the tract. These areas of development do not directly border the tract. Additionally, to the west of the tract there is a bison farm owned and operated by the Kintner family.

Topography

The tract is characterized by the ridgeline that is the western border, the tract slopes downward from there. Several small drainages flow down the slopes into a larger drainage that makes up the north eastern border.

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.

Gilpin Silt Loams (GID3, GIE2, and GpF), which cover 53 acres or 75% of the tract. The Gilpin series has moderately deep, well drained soils formed in hard sandstone and shale bedrock. Permeability is moderate. This series is in the woodland suitability group 3o10 or 3r12 with a growth range potential of 185-260 bd ft per acre per year.

Wellston Silt Loam (WeD2 and WeD3) cover 10 acres (15%) of the tract. The Wellston series consists of moderately deep and deep, well drained soils formed in sandstone bedrock. Permeability is moderate. This series is in the woodland suitability group 3o10 with a growth range potential of 185-260 bd ft per acre per year.

Hagerstown Silt Loam (HgD3) covers five acres (7%) within the tract. The Hagerstown series consists of deep and very deep, well drained soils formed in residuum of hard gray limestone. Slope ranges from 0 to 45 percent. Permeability is moderate. It is in the woodland suitability group 1o1 or 1r2 with a growth range potential of 300-375 bd ft per acre per year.

Zanesville Silt Loam (ZaC2) covers 2% of the tract. These deep, well drained soils are formed on sandstone bedrock. The Zanesville series is often characterized by a fragipan in the lower part of the subsoil. Because the fragipan limits permeability, these soils can be characterized by medium to rapid runoff and limited available water capacity.

Haymond Silt Loam (Hm) covers 1% of the tract in the north-east corner. The Haymond series contains deep, well drained soils in bottomlands and in the basins of sink holes. This series can be prone to flooding between December and June.

Soil Concerns

The Gilpin, Wellston, Hagerstown, and Zanesville series are prone to runoff and erosion which could cause water quality concerns. Some of the soils are already eroded due to abuses prior to state ownership. These concerns will be addressed by the use of appropriate BMP's and locating log landings on the best rated areas of the tract. Additionally, the Zanesville series has limited available water capacity as a result of the fragipan and the small area of Haymond series due to its bottomland nature can be prone to flooding between December and June.

Hydrology

The subsurface in this area is limestone. This area has limited Karst hydrology but there are a few small sinkholes and a cave present, which will be buffered during management activities.

Access

The tract can be accessed from 462 which serves as the western border. Additionally the tract could be accessed by hiking in or taking an ATV along the Adventure Hiking Trail which stretches from the tract into 2101 and then crosses 462.

Boundaries

The northern border of the tract is an external property line. Kyle Ferwerda of Corydon, Indiana owns the property on the western half of the northern border of the state forest. Howard and Rose Mary Saylor of Corydon, Indiana own the property on the eastern half of the northern border. The northern property line is the only external border of the tract. 462 makes up the western tract boundary. The southern and eastern tract boundaries are drainages. There is one known corner stone with a t-post that was presumably put in place by the county on the northern property line.

Wildlife

This tract represents typical oak hickory habitat, in addition to components of mixed mesic hardwoods and old field successional habitat, with cedar and smaller hardwoods. Consequently, the tract 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 abundant oaks and hickories in the tract. Another important habitat component would come from the old field cedar stands. These stands provide more dense cover for bedding areas especially from snow or ice during the winter month as well as roosting areas for turkeys and other birds.

Snags were tallied in this inventory for potential uses by wildlife. Numbers below include densities for snags and the twelve species of trees noted “as having relatively high value as potential Indiana bat maternity roost trees”.

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

Number of live trees per acre	Guidelines Maintenance	Tract 2102 Pre Harvest	Tract 2102 Post-harvest
12-18” DBH class	6	40.7	19.2
20” + DBH class	3	8.3	4.7
Total	9	49.0	23.9

Number of snags per acre	Guidelines Maintenance	Guidelines optimal	Tract 2102 actual
6-8” DBH class	1	1	25.3
10 – 18” DBH class	2.5	5	9.5
20” + DBH class	0.5	1	0.8
Total	4	7	10.7

These numbers indicate that both live tree densities and snag densities meet maintenance guidelines. And with the exception of the 20” + snag class all densities meet the optimal guidelines as well. Additionally, it is likely that snags 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 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, has been noted in the area and was found throughout the tract, but seemed to be concentrated along the drainage that is the southern border, along the adventure hiking trail, and there is one pocket in the center of the tract. Additionally *Paulownia tomentosa*, Paulownia or princess tree, was seen alongside the ailanthus. Both these species should be controlled to prevent spread before any planned or unplanned disturbance occurs. *Microstegium vimineum*, Japanese stiltgrass or Nepalese browntop, which should also be controlled was noted along the old road bed and along the drainages which serve as the southern and eastern borders.

Recreation

The Adventure Hiking Trail runs through the tract but is not directly accessible from 462. The trail crosses into the tract from tract 2101 on the western side of the southern border, winds through the tract, half follows an old road bed, passes a cedar stand, and then crosses the drainage serving as the eastern border into tract 2103.

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.

PART 2 - MANAGEMENT PRESCRIPTION

Stratum 1: Oak Hickory – 50.0 acres

Oak Hickory Current condition:

This cover type is found across the tract and comprises 71% of the tract acreage and 73% of the merchantable volume of the tract. This cover type is dominated by medium to large saw timber white, black, and red oak with pignut hickory. The inventory is summarized in Table 3 with species composition detailed in Table 4. Currently the cover type is currently at 80% stocking.

Table 3. Oak Hickory Inventory Summary

STRATUM: Oak Hickory		ACREAGE: 50.0	
	HARVEST	LEAVE	TOTAL
Volume/acre	2,342	3,271	5,614
Volume total	117,100	163,550	280,650
Basal area/acre	51.9	47.9	99.8
Trees/acre	94	46	140

Table 4. Oak Hickory Volume by Species

Species	HARVEST (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (Bd ft/ac)
White oak	425	1,204	1,629
Black oak	748	209	957
Pignut hickory	233	573	806
Sugar maple	481	97	578
N. red oak	0	562	562
Shagbark hickory	34	408	442
Yellow poplar	211	82	293
Scarlet oak	71	135	206
White ash	81	0	81
E. redcedar	57	0	57
TOTAL	2,341	3,270	5,611

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 Blue River Watershed.

Oak Hickory Silvicultural Prescription:

In order to meet the desired future condition, a low intensity improvement thinning is recommended. Because oaks and hickories are the best species for supplying hard mast and the best quality timber group occurring in this cover type, the thinning should aim to perpetuate them.

According to the inventory data, approximately 2,342 bd ft per acre could be removed from this cover type. This would retain approximately 3,271 bd ft per acre on the residual stratum. It is recommended that the thinning removes less volume than the inventory suggests (less than 2,342 bd ft per acre) and retains at least the 3,271 bd ft per acre suggested by the inventory. The use of a single tree selection routine, possibly with a few regeneration openings targeting groups of low-grade trees or multiple large trees growing together, would provide the best means of achieving the desired future condition. When possible, selection should try to 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 will provide a stratum of longer-lived higher-quality white oak that allows for a more broad range of management options in the future. Openings created by group selection areas will be used to ensure there is a supply of oak regeneration and to 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 thinning 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 to treat the understory to eliminate shade tolerant species in favor of oaks and other more desirable species. The girdling of larger cull trees will also help to replace snags as well as increase the downed woody material present and provide habitat to invertebrates and small vertebrates.

Stratum 2: Old Field – 12.7 acres

Old Field Current Condition:

This cover type is found in five pockets spread across the tract. The old field cover type encompasses 18% of the tract acreage and 16% of the merchantable volume in the tract. This cover type is dominated by mature red pine. The edges of these areas have good hardwoods established and in some cases good oak regeneration. The inventory is summarized in Table 5 with species composition detailed in Table 6. Currently, the cover type is at 80% stocking.

Table 5. Old Field Inventory Summary

STRATUM: Old Field		ACREAGE: 12.7	
	HARVEST	LEAVE	TOTAL
Volume/acre	2,419	1,160	3,579
Volume total	30,709	14,745	45,453
Basal area/acre	52.5	44.7	97.2
Trees/acre	97	46	143

Table 6. Old Field Volume by Species

Species	HARVEST (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (Bd ft/ac)
Red pine	768	176	944
Yellow poplar	732	0	732
Black oak	426	295	721
White oak	227	351	578
Sugar maple	224	0	224
Pignut hickory	0	121	121
E. redcedar	0	121	121
Shagbark hickory	0	96	96
Blackgum	42	0	42
TOTAL	2,419	1,160	3,579

Old Field Desired Future Condition:

The objective of this stratum is to convert it to native hardwood species in order to provide multiple economic and ecological services. Potentially the most important of which is to produce a quality hardwood timber stand, dominated by oak and hickory, which would yield hard mast and early to mid-seral habitat for wildlife.

Old Field Silvicultural Prescription:

The cover type should be harvested over two cutting cycles. According to the inventory data, approximately 2,419 bd ft per acre could be removed from this cover type. This would retain approximately 1,160 bd ft per acre on the residual stratum. It is recommended that the first thinning removes less than the recommended 2,419 bd ft per acre. This first thinning should create openings throughout the cover type in areas of oak regeneration and concentrate on thinning around established oaks. Marking should be focused on the removal of red pine and E. redcedar. Removals should try not to include oaks and hickories. This will maintain favorable seed trees and allow oaks and hickories to be established for release during the next cutting cycle.

Stratum 3: Mixed Mesic Hardwoods – 7.8 acres**Mixed Mesic Hardwoods Current Condition:**

The mixed mesic hardwoods cover type contains 11% of the tract acreage and 12% of the merchantable volume in the tract. This cover type is found primarily to the north of one of the old field cedar stands. It is dominated by white oak which comprises 32% of the total volume of the cover type, shagbark hickory with 18%, and sugar maple with 17%. A small amount of yellow poplar which is experiencing severe drought damage is also present. The inventory is summarized in Table 7 with species composition detailed in Table 8. Currently the cover type is currently at 80% stocking.

Table 7. Mixed Mesic Hardwoods Inventory Summary

STRATUM: Mixed Mesic Hardwoods		ACREAGE: 7.8	
	HARVEST	LEAVE	TOTAL
Volume/acre	3,149	4,637	7,786
Volume total	24,562	36,161	60,723
Basal area/acre	53.5	52.5	105.8
Trees/acre	80	48	128

Table 8. Mixed Mesic Hardwoods Volume by Species

Species	HARVEST (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (bd ft/ac)
White oak	452	2,067	2,519
Shagbark hickory	0	1,440	1,440
Sugar maple	1,254	102	1,356
Pignut hickory	0	1,028	1,028
Yellow poplar	700	0	700
White ash	361	0	361
Black oak	273	0	273
Black cherry	109	0	109
TOTAL	3,149	4,637	7,786

Mixed Mesic Hardwoods Desired Future Condition:

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

Mixed Mesic Hardwoods Silvicultural Prescription:

In order to meet the desired future condition, a low intensity improvement thinning is recommended. It would be appropriate to manage for a mixture of mesic species with a component of oak and hickory. The thinning should target species such as white ash, which is threatened by Emerald Ash Borer, and yellow poplar, which has experienced drought stress.

According to the inventory data, approximately 3,149 bd ft per acre could be removed from this cover type. This would retain approximately 4,637 bd ft per acre on the residual stratum. It is recommended that the thinning removes less volume than the inventory suggests (less than 3,149 bd ft per acre) and retains at least the 4,637 bd ft per acre suggested by the inventory. 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 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.

PART 3 - TRACT SUMMARY

Summary of Silviculture throughout the Tract:

With the current condition of the tract an improvement harvest is prescribed. From the current overall stocking of 85% the tract could be reduced to a stocking level as low as 35%. This does drop the tract well below the fully stocked level (see Appendix 6 for a stocking chart). This would produce a sale volume of approximately 176,000 board feet or about 2,471 board feet per acre and leave about 210,000 board feet or 2,950 board feet per acre.

However, due to the current condition of the stand, if a harvest or thinning were to occur it would be recommended that it be a lower intensity improvement thinning. This thinning is expected to harvest somewhat less than suggested for each stand and leave at least the volume suggested by the inventory. This would be accomplished through a single tree selection regime, with a focus on the release of crop trees and the removal of cull trees, in combination with a series of group openings. It is recommended that Timber Stand Improvement (TSI) be undertaken in this tract after the thinning to accomplish a variety of tasks, including completion of any marked openings and control of invasives. Tables 9, 10, 11, and 12 approximate the harvest, leave, and total Volume (per acre and total), Basal Area, and Trees per Acre for each stand.

Table 9. Summary of Volume (bd ft per acre)

Stand	Harvest	Leave	Total
Oak Hickory	2,342	3,271	5,613

Old Field	2,419	1,160	3,579
Mixed Mesic Hardwoods	3,149	4,637	7,786
TOTAL	7,910	9,068	16,978

Table 10. Summary of Total Volume

Stand	Harvest	Leave	Total
Oak Hickory	117,100	163,550	280,650
Old Field	30,709	14,745	45,453
Mixed Mesic Hardwoods	24,562	36,161	60,723
TOTAL	~176,000	~210,000	~386,000

Table 11. Summary of Basal Area (sq ft per acre)

Stand	Harvest	Leave	Total
Oak Hickory	51.9	47.9	99.8
Old Field	52.5	44.7	97.2
Mixed Mesic Hardwoods	53.5	52.5	105.8
Tract	52.5	47.8	100.0

Table 12. Summary of Number of Trees per Acre

Stand	Harvest	Leave	Total
Oak Hickory	94	46	140
Old Field	97	46	143
Mixed Mesic Hardwoods	80	48	128
TOTAL	271	140	411

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.

Wildlife: Snags and coarse woody debris should remain at viable levels in the stratum and should continue to provide diverse habitat for the Indiana bat and other species. The main effect 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 from 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: 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. The 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 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. The Adventure hiking trail will 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.

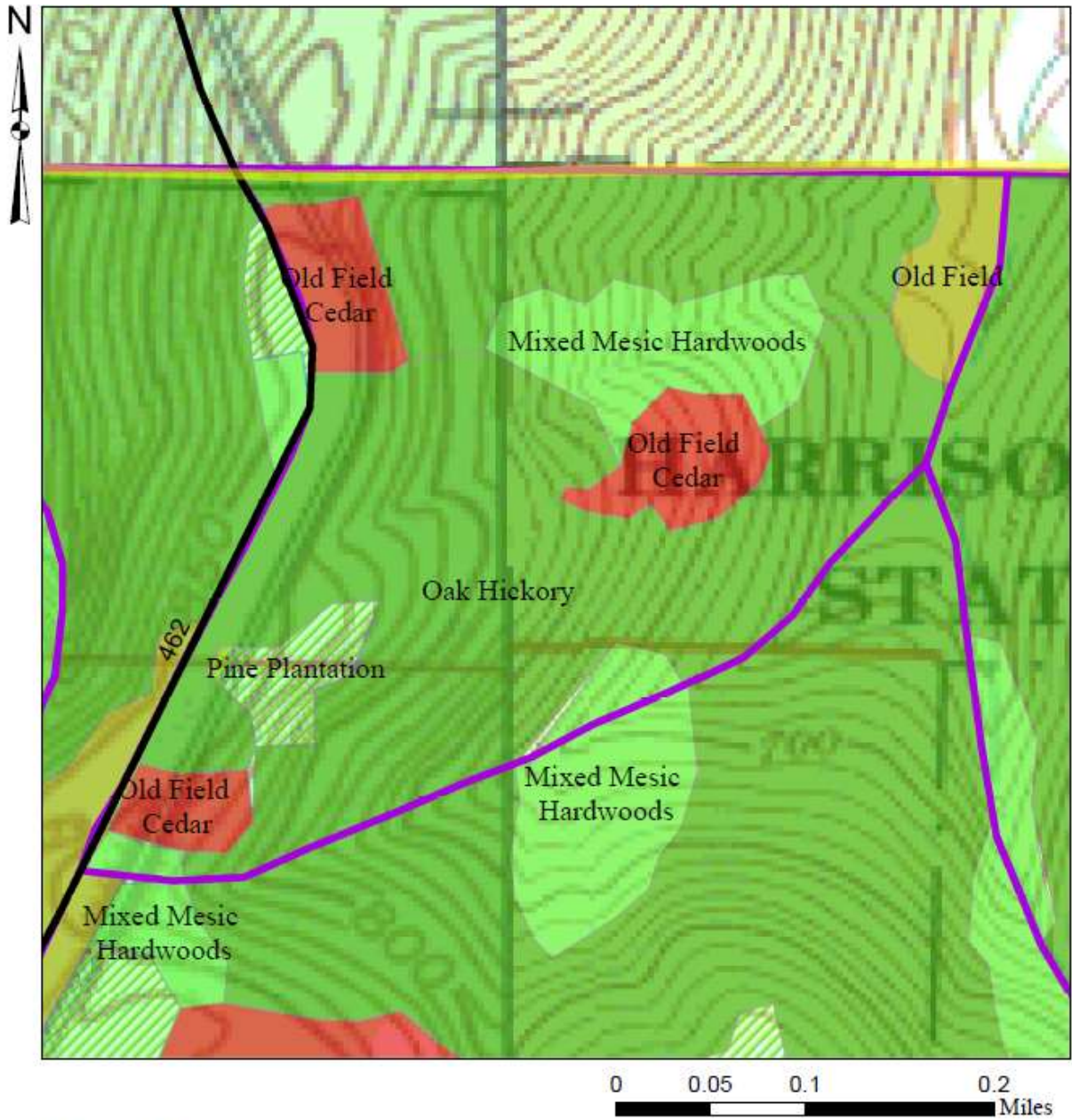
PART 4 - PROPOSED ACTIVITIES LISTING

<u>Proposed Activity:</u>	<u>Proposed Date:</u>
Resource Management Guide	2015
Treat invasives	2015-2017
Mark Thinning	2016-2017
Sell Timber	2017-2018
Post-harvest TSI	Year of thinning or shortly thereafter
Monitor regeneration openings	3-5 years after thinning
Evaluate need for second thinning	As needed
Re-inventory	2035
Write new management plan	2035

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Legend:

- Roads
- Harrison Crawford SF
- Tract Boundaries