Indiana Department of Natural Resources
Division of Forestry
DRAFT

RESOURCE MANAGEMENT GUIDE

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

Compartment: 13 Tract: 07
Date: March 11, 2013

INVENTORY SUMMARY

Number of stands: 5
Permanent Openings: 0.0 ac
Average Basal Area: 107 sq. ft/ac
Est. Annual Growth: 190 bd. ft/ac/yr*
Tract Acreage: 195
Site Index: 70-80 (for upland oaks)

Table 1. Tract 1307 Inventory Summary

Species	Harvest		Leave		Total	
	Total	Per acre	Total	Per acre	Total	Per acre
White oak	81,320	417.03	262,670	1,347.03	343,990	1,764.05
Yellow poplar	77,380	396.82	131,580	674.77	208,960	1,071.59
Chestnut oak	51,630	264.77	71,610	367.23	123,240	632.00
Sugar maple	48,830	250.41	36,030	184.77	84,860	435.18
Black oak	48,580	249.13	76,280	391.18	124,860	640.31
White ash	45,150	231.54	5,960	30.56	51,110	262.10
Northern red oak	31,700	162.56	83,110	426.21	114,810	588.77
Eastern red cedar*	28,490	146.10	17,020	87.28	45,510	233.38
Pignut hickory	21,650	111.03	25,850	132.56	47,500	243.59
Blackgum	14,100	72.31	0	0.00	14,100	72.31
Chinkapin oak	7,470	38.31	27,450	140.77	34,920	179.08
Mockernut	6,870	35.23	7,370	37.79	14,240	73.03
Bitternut hickory	4,190	21.49	4,850	24.87	9,040	46.36
Blackjack oak	0	0.00	1,880	9.64	1,880	9.64
Black walnut	0	0.00	8,750	44.87	8,750	44.87
Large-tooth aspen	0	0.00	2,790	14.31	2,790	14.31
Post oak	0	0.00	10,870	55.74	10,870	55.74
Red maple	0	0.00	3,160	16.21	3,160	16.21
Scarlet oak	0	0.00	8,630	44.26	8,630	44.26
Shagbark hickory	0	0.00	15,820	81.13	15,820	81.13
Shingle oak	0	0.00	5,720	29.33	5,720	29.33
Shumard oak	0	0.00	16,330	83.74	16,330	83.74

Total	**467,360**	**2,396.72**		**823,730**	**4,224.26**		**1,291,090**	**6,620.97**

** 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.*

Location

This tract is located in Crawford County, Jennings Township, T3S R2E S22 and 27. It is on the east side of Wyandotte Cave Rd.

General Description

The tract totals 195 acres. There are 5 distinct cover types: Oak-Hickory, Chestnut oak, Mixed mesic hardwoods, Old Field advanced, and Old Field young. The Oak-Hickory and Chestnut oak cover types comprise the majority of the acreage, 46% and 23% of the acreage, respectively. Several caves and karst features are located in the tract as well as several horse and hiking trails.

These cover types will be described briefly below and in more detail in the Management section. See Appendix 2 for a map of stand locations.

Stratum 1

Oak-Hickory

This stratum comprises 46% of the land area and 55% of the total sawtimber volume of the tract. It is currently fully stocked with 7,878 bdft/acre and 117 sqft/acre of basal area. It occurs on the east and north facing slopes of the tract. This stratum is dominated by white, black, and northern red oaks with a strong yellow poplar component. Timber quality is medium to good with better quality on the north slope. There are 19 species of canopy trees noted in this stratum, making it an average central hardwood stand as far as diversity is concerned. Almost all of the Karst features in the tract are found in this stratum.

Stratum 2

Chestnut oak

This stratum comprises 23% of the land area and 19% of the sawtimber volume of the tract. It is currently overstocked with 5,429 bdft/acre and 127 sqft/acre of basal area. It occurs on the south facing slope of the tract and is dominated by short-boled poorly formed chestnut, white, and chinkapin oaks. Timber quality varies from very poor to medium with better quality on the lower slopes where the transition to Oak-Hickory occurs. This stratum has many areas with dense greenbriar indicating poor soil development.

Stratum 3

Mixed Mesic Hardwoods

This stratum comprises 9% of the land area and 11% of the sawtimber volume of the tract. It is currently fully stocked with 8,658 bdft/acre and 111 sqft/acre of basal area. It occurs on the north slope and associated drainage of the tract. It is dominated by sugar maple, yellow poplar, white oak, and northern red oak with lesser amounts of various other hardwoods. The timber quality varies from good to very good. The trees are large but declining. Part of this area was a salvage area in 2006. During the preliminary recon of the tract, American chestnut sprouts were found in the salvage gaps.

Stratum 4

Old Field Advanced

This stratum comprises 14% of the land area and 10% of the sawtimber volume of the tract. It is currently fully stocked with 4,990 bdft/acre and 94 sqft/acre of basal area. It occurs on

the ridge top and is very heterogeneous. It ranges from declining short-boled yellow poplar to falling apart aspen stands to cedar. Timber quality ranges from poor to fair. Much of the yellow poplar is in decline and giving way to a mixture of oak and maple.

Stratum 5
Old Field Young
This stratum comprises 8% of the land area and 2% of the sawtimber volume of the tract. It is currently fully stocked with 1571 bdft/acre and 97 sqft/acre of basal area. It occurs below the Oak-Hickory stratum in a level area near the intermittent on the east end of the tract. It is almost entirely Eastern red cedar. The cedar is slowly being overtopped by scattered yellow poplar and sugar maple.

History

Most of this tract was acquired as part of the "Wyandotte Cave" acquisition in 1966 (Deed 131.206). Several acres along the eastern side were purchased in 1987 from Saltsgaver. This tract has a long history of management by the state. Portions were harvested immediately prior to state acquisition. Don Martin reconnoitered it in 1974. At that time, it was noted to have potential to produce timber but operations should be postponed for another 20-30 years to allow significant volume to accumulate. In 1992, a recon showed the need for a thinning. Inventory files show the tract to be 190 acres with a total of 481,468 bdft. A harvest was marked and sold in 1995. This harvest combined 1307 and 1308. The portion of 1307 that was included was the east-facing slope, 45.9 acres. The harvest totaled 105,663 bdft with 46,731 coming from 1307. The tract was subsequently effected by a straight-line wind storm in May 2006. The majority of the damage was in the old field area on the top of the ridge. A salvage operation was marked in Oct 2006. Tract 1307 was paired with salvage operations in 1308, and 1301. This operation removed 75 trees totaling 18,921 bdft of salable timber.

Landscape Context

The dominant land use within a 5-mile radius is mostly mature hardwood forest with some farmland and early successional habitat. This tract is near the Wyandotte Cave visitor center. The cave has been closed as a tourist attraction for several years. Landscape patterns in this area of the county have been stable for a while with little development pressure.

Geology, Soils, and Hydrology

This tract encompasses a variety of aspects. It is dominated by an east west oriented ridge with associated north, south and east slopes. Topography ranges from level to moderately steep.

Soils

Soils vary by topography with less developed and less productive soils found higher on the slopes and more productive better-developed soils found on the toe slopes and bottoms. There are nine soil series found in the this tract, however, 90% of the acreage is described by the following 5:

Wellston silt loam, 6 to 12 percent slopes, eroded
This moderately sloping, well drained soil is on narrow ridge tops and on side slopes of the uplands. It is well suited to trees. This soil has a site index of 71 for northern red oak and 90 for yellow poplar.

Apalona silt loam, 6 to 12 percent slopes, eroded
This moderately sloping, deep, moderately well drained soil is found on sideslopes in the uplands. It is well suited to trees. A fragipan is present at 20 to 40 inches below soil surface that restricts drainage. Erosion hazards are main management concern that should be considered during implementation of Best Management Practices for Water Quality. This soil has a site index of 60 for white and black oak.
Gatchel loam, 0 to 2 percent slopes, occasionally flooded, very brief duration
This nearly level, deep, somewhat excessively drained soil is found on flood plains and alluvial fans. It is well suited to trees and has not been evaluated for site index.
Adyeville silt loam, 18 to 25 percent slopes, eroded
This strongly sloping to steep, somewhat deep, somewhat excessively drained soil is on side slopes of upland hills and benches. It is suited to trees. Erosion hazards are main management concern that should be considered during implementation of Best Management Practices for Water Quality. This soil has a site index of 64 for white oak.
Crider silt loam, 6 to 12 percent slopes, eroded
This moderately sloping, deep, well drained soil is on narrow and broad convex ridgetops of the uplands. It is well suited to trees. This soil has a site index of 88 for northern red oak and 97 for yellow poplar.

Soil concerns

Soils are generally productive loams with the less productive soils being found south facing slope. These slopes are steeper and have an increase risk of erosion so BMP's will be important.

Hydrology

The tract drains to intermittent stream on the south and east borders. These intermittent streams join to form a perennial waterway that joins the Blue River approximately 1 ¼ mile downstream. While the waterway is mapped as a perennial stream it has not been observed to have water except during high rainfall events.

The Karst features are plentiful and due to the limestone layers on the hill. There are 4 named caves in or on the border of the tract. These include Nose Hole, Lost Pack Hole, Easter Pit, and Hole Above Easter Pit. None of these are in locations likely to receive sedimentation during a harvest. However, all BM's should be followed to ensure protection of local water supplies.

Access

Both internal and external access are good for this tract. The main external access is Fire trail 903 coming from Wyandotte Cave Rd. During both previous harvest operations, this trail was used for access to a wildlife opening that is used as the log yard. Further use of this fire trail will require upgrading and stone work.. It is currently wet and somewhat sunken. Internal access is via well established skid trails and ridges.

Boundaries

The boundaries of this tract are relatively simple. It was surveyed in the 80's by Vollmer from the Division of Engineering and again in the early 2000's by this division's surveyor, Ballantyn. The north, east, and south boundaries are all unnamed drainages. The west boundary is S. Wyandotte Cave Rd. The northwest corner has a private property in-holding. It is monumented by Bernsten monuments at the northeast and southeast corners. The

western corners are supposed to monumented by railroad spikes in the road but these were not recovered during the inventory.

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 stand, but another habitat component would come from the old field cedar stand. This stand provides denser cover for bedding areas, especially during the winter months. The cedar especially might provide cover from snow or ice, as well as roosting areas for turkeys and other birds.

Snags were tallied in this inventory for potential uses by wildlife. The following tables summarize guidelines and actual data with regard to Indiana bat habitat strategies. Numbers below include the 12 species noted "as having relatively high value as potential Indiana bat maternity roost trees" by the USFWS. There are many other trees of various species present on the tract.

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

# of live trees	Guidelines Maintenance	Tract 1307 actual present
12"+ DBH class	1755	5586
20" DBH and greater	585	919

# snags	Guidelines Maintenance	Guidelines optimal	Tract 1307 actual
5" + DBH class	780	1365	3607
9"+ DBH class	585	1170	1611
19" DBH and greater	98	1985	280

These numbers show that both live tree densities as well as snag densities meet optimal guidelines on this tract.

Rare, Threatened, and Endangered Species

A Natural Heritage Database Review is part of management planning. 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.

American chestnut stump sprouts were noted during initial recon of the tract. While mature trees are rare to nonexistent, stump sprouts are common and persist for decades of continual resprouting and thus do not require special attention. Bruce Wakeland, a representative of the Am. Chestnut Foundation has inquired about taking scion woods from these sprouts for grafting.

Exotic Species

Ailanthus altissima, tree of heaven, was found in some of the gaps and on the north slope near the road. The infestation wasn't large but should be taken care of before becoming a problem.

Recreation

This tract receives a moderate amount of recreational activity. A length of the Wyandotte Cave Horse trail follows the ridge line, then turns north, and goes into tract 1302. There are no facilities or amenities available. The majority of trail users start from the privately owned horse camp north of the tract. There are also signs of hunting use.

Cultural Resources

Cultural resources may be present this tract, but if present their location(s) are 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 cover type is found on the north and east facing slopes of the tract and comprises 46% of the area and 55% of the volume of the tract. This cover type is dominated by medium to large sawtimber white, black, and northern red oak with yellow poplar. There are several gaps of various sizes that are the result of a 2006 wind event. The stratum appears to be healthy with only minor crown problems. There is good stratification of the canopy which indicates moderate competition between canopy trees. The inventory is summarized in Table 2 with species composition detailed in Table 3. The cover type is currently above the 85% stocked condition.

Table 2. Oak-Hickory Inventory Summary

STRATUM: Oak-Hickory		**ACREAGE: 90**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	2,888	4,989	7,877
Volume total	259,920	449,010	708,930
Basal area/acre	43	61	104
Trees/acre	40	76	117

Table 3. Oak-Hickory Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (Bd ft/ac)
Bitternut hickory	0	28	28
Blackgum	85	0	85

Black oak	334	671	1,005
Chestnut oak	299	241	540
Chinkapin oak	22	85	107
Eastern red cedar	55	0	55
Mockernut hickory	80	85	165
Northern red oak	81	651	732
Pignut hickory	180	228	408
Post oak	0	20	20
Scarlet oak	0	100	100
Shagbark hickory	0	62	62
Shumard oak	0	189	189
Sugar maple	263	117	380
White ash	288	69	357
White oak	655	2,052	2,707
Yellow poplar	546	390	936
Total	**2,888**	**4,988**	**7,876**

Desired future condition:

The objective of this stand is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by oak and hickory, while providing hard mast and early to mid-seral habitat for wildlife and providing a natural filter for local groundwater. By the end of this management cycle, 2033, this stratum should be maintained entirely as Oak-Hickory and have at least 8 acres of mid-tolerant regeneration that is ready for release through regeneration openings.

Silvicultural Prescription:

In order to meet the desired future condition, a harvest is recommended. Oaks and hickories are not only the best species for supplying hard mast but are also the best quality timber group that is occurring in this covertype. According to the inventory data, approximately 2,888 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. When possible, selection should also favor releasing future crop trees. The residual stand 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 stand 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 advanced regeneration when possible. Stocking in this cover type would be reduced from 85% to approximately 60%, still a fully stocked stand.

Uneven-aged management requires that trees in all size classes be removed during harvesting to ensure regeneration. Given that many of these will be un-merchantable, post harvest TSI will be needed to ensure that poorly-formed, low-quality trees are removed and treat the understory to eliminate shade tolerant species in favor of oaks and other more desirable species. The girdling of large cull trees will also help to replace large snags as well as increase the downed woody material present and provide invertebrate and small vertebrate habitat. TSI should occur in 2 stages. Post-harvest TSI should focus on finishing openings and girdling culls. In 2023, the tract should be assessed for regeneration. If at least 8 acres of developing oak and hickory regeneration isn't present, then enough acres of understory

removal should be prescribed and completed to establish regeneration for the next management cycle.

Stratum 2: Chestnut oak

Current Condition:

This cover type is found on the south-facing slopes of the ridge and comprises 23% of the area and 19% of the volume. This cover type is dominated by small to medium size poor to fair quality Chestnut and white oaks with lesser amounts of other dry site species such as chinkapin, post and northern red oaks. The inventory is summarized in Table with species composition detailed in Table . Currently the cover type is just above the 100% stocked condition. This site is certainly a less productive cover type than the oak-hickory. The trees have short boles and the ground layer is dominated by greenbriars and poison ivy. This stratum likely has the oldest trees in the stand, though not necessarily very large.

Table 4. Chestnut Oak Inventory Summary

STRATUM: Chestnut Oak		**ACREAGE: 44**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	1,959	3,470	5,429
Volume total	86,196	152,680	238,876
Basal area/acre	49	78	127
Trees/acre	55	117	172

Table 5. Chestnut Oak Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (bd ft/ac)
Blackjack oak	0	52	52
Black oak	192	0	192
Chestnut oak	712	1403	2115
Chinkapin oak	154	554	708
Eastern red cedar	64	0	64
Northern red oak	303	98	402
Post oak	0	252	252
Shingle oak	0	158	158
White oak	406	818	1224
Yellow poplar	127	136	264
Total	**1,959**	**3,470**	**5,429**

Desired Future Condition:

The objective of this stand is to provide for multiple economic and ecological services specifically while providing hard mast and mid to late-seral habitat for wildlife and providing a natural filter for the drainage below. At the end of the management cycle, 2033, this stratum should be maintained as oak-hickory with a similar composition as is currently found. Approximately 2.5 acres, 5%, of early-successional (high stem count) cover should be available.

Silvicultural Prescription:
In order to meet the desired future condition, a thinning is recommended. No action would result in an increase in the amount of beech and poorly formed maple in the stand. As this site is less productive than the oak-hickory type discussed above, maintenance of oak should be considerably easier. According to the inventory data, approximately 1,959 bd ft/ac should be removed from this cover type. This would leave more than 3,000 bd ft/ac on the residual stand. Removals should focus on trees of poor form or those competing with those of better form.

Most of the removals will be on the upper slopes and will be under a single tree selection routine with larger group openings targeting patches of established oak and hickory regeneration. Stocking in this cover type would be reduced from 108% to approximately 65%, still a fully stocked stand.

The target for this stratum should be 2.5 acres of regeneration openings. Locations should favor established regeneration but are not limited to such.

Stratum 3: Mixed Mesic Hardwoods

Current Condition:
This cover type is found on the toe of the north slope and drainage and comprises 9% of the area and 11% of the volume. This cover type is dominated by medium to large sawtimber Yellow poplar, sugar maple, white oak, and northern red oak. The inventory is summarized in Table 6 with species composition detailed in Table 7. Currently, the cover type is just above the 90% stocked condition**Error! Bookmark not defined.**. This site is certainly a more productive cover type than the oak-hickory. The large poplar and maple are of good quality. There are several openings in this cover type but this type contributes to late successional habitat within the tract. This area was hit hard by the wind event in 2006 and subsequently received the majority of the salvage operation for the tract in the following harvest. Dominant regeneration in this stratum is sugar maple and beech.

Table 6. Mixed Mesic Hardwoods Inventory Summary

STRATUM: Mixed Mesic-Hardwoods		**ACREAGE: 26**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	3,076	5,582	8,658
Volume total	52,292	94,894	147,186
Basal area/acre	45	66	111
Trees/acre	56	88	144

Table 7. Mixed Mesic Hardwoods Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (bd ft/ac)
Bitternut hickory	154	89	243
Black oak	311	252	563
Black walnut	0	321	321

Eastern red cedar	284	0	284
Northern red oak	359	725	1,084
Pignut hickory	0	131	131
Shagbark hickory	0	386	386
Sugar maple	963	879	1,842
White ash	747	0	747
White oak	0	1,477	1,477
Yellow poplar	259	1,322	1,581
Total	**3,077**	**5,582**	**8,659**

Desired Future Condition:
The objective of this stand is to provide for multiple economic and ecological services specifically a quality hardwood timber stand, dominated by mid- and late-seral species, while providing hard mast and mid to late-seral habitat for wildlife. At the end of the management cycle, 2033, this stratum should be maintained as a mixed hardwood stand with greater structural diversity including more pole and sapling structure. The stand should be heavier to oak than currently but still maintaining a diversity of tolerant species.

Silvicultural Prescription:
In order to meet the desired future condition, a light thinning is recommended. No action would result in an increase in the amount of beech and poorly formed maple in the stand. As this site is more productive than the oak-hickory type discussed above, attempting to manage for oak would be futile. More appropriate would be to manage for a mixture of mesic species such as poplar, sugar maple, and beech while maintaining the more tolerant white oak since these are the best quality timber group that is appropriate to this site. According to the inventory data, approximately 3,077 bd ft/ac should be removed from this cover type. This would leave more than 5,582 bd ft/ac on the residual stand. The heavier harvesting in this stand as compared with the oak hickory type is due to the high productivity of the site. The majority of the harvest volume is in the form of sugar maple and white ash. Its removal will allow more growing space and resources for other species such as poplar and sugar maple. The natural thinning created by the salvage operation has already established quality regeneration of some poplar, maple, and cherry. Further thinning through the prescribed operation will ensure that these stems continue straight into the canopy and not develop poor form through loss of apical dominance.

Most of this would be removed under a single tree selection. 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 stand should be slightly heavier to white oak and poplar. This provides a stand of longer-lived higher-quality poplar, sugar maple, and white oak that allows for more management options into the future. Stocking in this cover type would be reduced from 93% to approximately 60%, still a fully stocked stand.

The prevalence of rot prone species such as poplar, maple and beech means that a higher density of cavity trees is found in this stratum. Care should be taken to ensure that these trees are kept where possible to maintain structural diversity in habitat.

Stratum 4: Old Field Advanced

Current Condition:
This cover type is found on the ridge top and upper portion of the east-facing slope and comprises 14% of the area and10 % of the volume. This cover type is dominated by medium sawtimber Yellow poplar that is in decline from drought. The inventory is summarized in Table 8 with species composition detailed in Table . There are pockets of large-tooth aspen, cedar and moderate to good stocking of oak regeneration. Many of the trees were open grown when the field was converting to forests and are therefore poorly formed and short.

Table 8. Old Field Advanced Inventory Summary

STRATUM: Old Field Advanced		**ACREAGE: 27**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	2,008	2,982	4,990
Volume total	54,216	80,514	134,730
Basal area/acre	38	56	94
Trees/acre	46	104	150

Table 9. Old Field Advanced Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (bd ft/ac)
Blackgum	215	0	215
Black oak	138	366	504
Eastern red cedar	432	0	432
Largetooth aspen	0	88	88
Northern red oak	123	117	240
Pignut hickory	193	83	276
Red maple	0	99	99
White oak	320	505	825
Yellow poplar	587	1,724	2,311
Total	**2,008**	**2,982**	**4,990**

Desired Future Condition:
The objective of this stand is to provide a quality hardwood timber stand, dominated by early to mid-seral species. At the end of the management cycle, 2033, this stratum should be converted from old-field to a fully stocked stand of dense hardwood regeneration with pockets of mature trees for structure. Regeneration should consist of a variety of hardwood species but should include a large proportion of oaks and hickories as well as large-tooth aspen, poplar, maple, and others.

Silvicultural Prescription:
In order to meet the desired future condition, a harvest is recommended. The stratum has developed over time from the abandonment of a field. The natural course of succession would result in a fully stocked stand in several decades. However, stocking would consist of a large amount of poorly formed and undesirable trees. The early establishing poplar and cedar has nursed a high density of natural regeneration that can be released to establish higher stocking and better quality. According to the inventory data, approximately 2,008 bd ft/ac should be removed from this cover type. This would leave almost 3,000 bd ft/ac on the

residual stand. The majority of the harvest volume is in the form of the declining poplar and cedar. Its removal will allow more growing space and resources for the established hardwood regeneration to thrive.

Most of this would be removed with larger group openings targeting groups of low-grade trees or pockets of oak regeneration. Pockets of multiple large trees growing together should be retained as residual structure. While this residual structure may slow the growth of the new stand of trees, it will provide for perch trees for turkey and raptors.

Several large openings will be created along with smaller ones for a diversity of edge structures. Openings should occupy more than 10 acres in total to ensure full conversion and stocking of the future stand. Visual buffers can be maintained in the trail corridor. This will necessitate post-harvest TSI to ensure that the openings are completed and the cull trees are removed. Many of these culls can be girdled and left standing to provide for additional snags for the benefit of bats and other wildlife.

Stratum 5: Old Field Young

Current Condition:
This cover type is found on the toe-slopes of the east slope and comprises 8% of the area and 2% of the volume. This cover type is dominated by small to medium poor quality eastern red cedar. The inventory is summarized in Table with species composition detailed in Table . Currently the cover type is just above the 100% stocked condition. There is some yellow poplar starting to ascend the canopy but other than that the area has little to no regeneration established. The ground layer is moss, ferns, and spice bush. There are few if any openings in this cover type.

Table 10. Old Field Young Inventory Summary

STRATUM: Old Field Young		**ACREAGE: 16**	
	CUT (bd ft)	**LEAVE** (bd ft)	**TOTAL** (bd ft)
Volume/acre	0	1,571	1,571
Volume total	0	25,136	25,136
Basal area/acre	0	98	98
Trees/acre	0	300	300

Table 11. Old Field Young Volume by Species

Species	CUT (bd ft/ac)	LEAVE (bd ft/ac)	TOTAL (bd ft/ac)
Eastern red cedar	0	1251	1251
Sugar maple	0	146	146
Yellow poplar	0	174	174
Total	**0**	**1571**	**1571**

Desired Future Condition:
The objective for this stand is to provide water filtration and stream buffering for the adjacent intermittent stream while providing coniferous wildlife cover. Over time, the stand should be converted to native hardwoods. At the end of the management cycle, 2033,

the stratum should still be dominated by eastern red cedar but with desirable hardwoods established beneath. The hardwood regeneration should be nearing need for overstory release.

Silvicultural Prescription:
In order to meet the desired future condition, TSI is recommended. TSI operations should focus on girdling cedar trees to allow some of the light resource to transition to the ground layer to increase regeneration. Canopy closure should remain at 60-70% to discourage poorly formed stems from getting a foothold. This thinning should help the cedar to increase in diameter over the current management cycle and possibly become merchantable for the next management cycle. The next cycle should focus on removing some of the cedar to transition to hardwoods.

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 87% to approximately 60%. This is accomplished by a combination of crop tree release, cull removal, and converting the old field area into a hardwood stand by the use of large openings. This would produce a sale volume of approximately 400,000 – 500,000 board feet or about 2540 board feet per acre and leave about 325,930 board feet or 4130 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 and control of ailanthus. The tract should be checked for additional TSI in 2023.

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. There is an established network of skid trails from the previous sale and the salvage operation. Re using these trails will minimize additional disturbance. 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 stand and should continue to provide habitat for the Indiana bat. The main affect on wildlife will be the partial loss of the coniferous component of the stand. This currently provides a limited amount of thermal cover in the winter for deer and small mammals. This type of cover will be permanently lost from the stand over time. However, the cedar would likely have died out and this cover lost in the future without management action. 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 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. 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 The riparian corridor near the old-field young stratum likely has high wildlife travel value. The current management prescription should continue to improve this area. Thinning the cedar through TSI should increase both the diameter of residual trees and the insect availability in the area. These actions should make the area more desirable for local endangered species and increase ground level foraging for wildlife in the travel corridor.

Indiana Bat

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

# of live trees per acre	Guidelines Maintenance	Tract 1307 present	Planned Harvest	Planned Residual
11"+ DBH class	1755	5586	1987	3599
20" +DBH and greater	585	919	327	592

As noted above, snag counts for all size classes 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 live tree densities will also not be below the recommended levels.

Numbers above include the 12 species noted "as having relatively high value as potential Indiana bat maternity roost trees" by the USFWS. There are many other trees of various species present on the tract.

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.

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Proposed Activities Listing:

Proposed Activity	**Proposed date:**
Treat ailanthus	2013
Mark sale	2013
Sell timber	2014
Post harvest tsi	2015/2016
Monitor regeneration openings	2020
Regeneration check	2023
Re-inventory	2033
Write new management plan	2033