

**Resource Management Guides
Clark State Forest
30-day Public Comment Period**

The Indiana State Forest system consists of approximately 158,000 acres of primarily forested land. These lands are managed under the principle of multiple use-multiple benefit to provide forest conservation, goods, and services for current and future generations. The management is guided by scientific principles, guiding legislation and comprehensive forest certification standards which are independently audited to help insure long term forest health, resiliency, and sustainability.

For management and planning purposes each State Forest is divided into a system of compartments and tracts. In general terms compartments are 300-1,000 acres in size and their subunits (tracts) are 10 - 300 acres in size. Resource Management Guides (RMGs) are then developed for each tract to guide their management through a 15-25 year management period. There are approximately 1,600 tracts in the State Forest system. During annual planning efforts 50-100 tracts are reviewed and RMGs developed based on current conditions, inventories and assessments.

The RMGs listed below and contained in this document are part of the properties annually scheduled forest inventories under review for Clark State Forest.

Compartment 6 Tract 2
Compartment 9 Tract 8
Compartment 14 Tract 1
Compartment 14 Tract 2
Compartment 14 Tract 3

To submit a comment on this document, go to:

<https://www.in.gov/dnr/forestry/state-forest-management/public-comment/submit/>

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 and review posted at:

<https://www.in.gov/dnr/forestry/state-forest-management/public-comment/>

Note: Some graphics may distort due to compression.

Clark State Forest
Forester: Alwine
Total Acreage: 83.9
Management Cycle End Year: 2039

Compartment 6 Tract 2
Date: 1/31/2019
Forested Acreage: 83.9
Management Cycle Length: 20 years

Location

This tract, also known as 6300602, lies within Scott and Clark County approximately 3.5 miles northwest of Henryville, Indiana. More specifically, the tract is located within Sections 26/35, Township 2N, and Range 6E.

General Description

This is an 83.9-acre oak forest located on terrain ranging from gently to extremely steep slopes on knobs. A majority of the tract is located on an east facing slope. There are some large trees present and evidence of past management activity (e.g., wildlife pond, stumps, felled trees, etc.).

History

- Land acquisition in 1903 from Margaret Kline
- Land acquisition in 1929 from James & Lolie Dean
- Land acquisition in 1940 from Amy Weaver
- Inventory/Resource Management Guide completed in 1982 by Frank Ballintyn
- Inventory completed in 1986 for State Forest Inventory Program
- Inventory completed in 2018 by Ryan Bartlett
- Resource Management Guide completed in 2019 by Dustin Alwine

Topography, Geology and Hydrology

The topography is steep. Practically the whole tract has an east facing aspect and the western boundary following a ridgetop. The entire tract is located within the “knobs” of southern Indiana. The tract becomes less sloped near Brownstown Road. The underlying bedrock in this tract is siltstone.

Tract 6300602 is located within the Pigeon Roost Creek Watershed. There is a mapped intermittent stream that runs the eastern boundary of the tract. This stream merges with other intermittent and ephemeral streams until it eventually flows into Pigeon Roost Creek. There are multiple ephemeral streams located within this tract as well that flow off the knobs into the mapped intermittent.

Soils

BcrAW- Beanblossom silt loam, 1 to 3 percent slopes, occasionally flooded, very brief duration- 1.7 acres

This nearly level, deep, well-drained soil is found along alluvial fans and flood plain. It is well suited to trees. Management planning should consider wet times of year. This soil has not been evaluated for site index.

BvoG-Brownstown-Gilwood silt loams, 25 to 75 percent slopes- 37.4 acres

This moderate to very steep, deep, well-drained soil is found side slopes in the uplands. It is well suited to trees. Equipment limitations and erosion hazards are main management concerns that

should be considered during sale layout and implementation of Best Management Practices for Water Quality. Brownstown has a site index of 50 for black oak and gilwood has not been rated.

ConD- Coolville-Rarden complex, 12 to 18 percent slopes- 2.3 acres

These strongly sloping, deep, moderately well drained soils are found on side slopes in the uplands. It is well suited to trees. Erosion hazards are concerns that should be considered during implementation of Best Management Practices for Water Quality. Coolville has a site index of 66 for northern red oak and Rarden has a site index of 71 for black oak.

GgfD- Gilwood-Wrays silt loams, 6 to 18 percent slopes- 11.8 acres

This gently to moderately sloping, moderately deep, well drained complex is found on side slopes of the upland knobs. The hazard of erosion is main management concerns that should be considered when implementing Best Management Practices for Water Quality. Wrays has a site index of 70 for white oak and 90 for yellow poplar and Gilwood has not been evaluated.

GmaG- Gnawbone-Kurtz silt loams, 20 to 60 percent slopes- 24.1 acres

This moderately to very steep, moderately deep, well drained complex is found on side. It is well suited to trees. The hazard of erosion and equipment limitations are main management concerns. These should be considered when planning management activities and implementing Best Management Practices for Water Quality. Kurtz has a site index of 60 for northern red oak and Gnawbone has not been evaluated.

PcrB2- Pekin silt loam, 2 to 6 percent slopes, eroded- .1 acres

This gently sloping, deep, moderately well drained soil is on alluvial terraces. It is well suited to trees and has a site index of 70 for white oak and 85 for yellow poplar.

PcrC2- Pekin silt loam, 6 to 12 percent slopes, eroded- 3.8 acres

This moderately sloping, deep, well-drained soil is found on side slopes adjacent of drainage ways on alluvial terraces. It is well suited to trees and has a site index of 70 for white oak and 85 for yellow poplar.

PcrC3- Pekin silt loam, 6 to 12 percent slopes, severely eroded- 1 acre

This moderately sloping, deep, well-drained soil is found on side slopes adjacent of drainage ways on alluvial terraces. It is well suited to trees and has a site index of 70 for white oak and 85 for yellow poplar.

StaAQ- Steff silt loam, 0 to 2 percent slopes, rarely flooded- 1.9 acres

This nearly level, deep, moderately well drained soil is on bottom land. It is flooded for brief periods, mainly in winter and spring. It is well suited to trees and has a site index of 88 for black oak and 107 for yellow poplar.

Access

Access to this tract is good. The south side is given access by Switchback Road that runs along the southwest border. The northern portion of this tract is accessed from Brownstown Road.

Boundary

Tract 6300602 is bordered by other tracts except for the northwest corner where it shares a boundary with private property. Brownstown Road and Switchback Road run along the northern and southern borders, respectfully. A mapped intermittent stream serves as the eastern boundary between tract 6300603. Other state forest tracts that share boundary lines with 6300602 include: 6300601, 6300608, 6300609, and 6300507.

Ecological Considerations

This tract contains diverse vegetation and wildlife resources conducive to providing habitat for a variety of wildlife species. The high density of oak species provides habitat and food sources for a variety of wildlife. The yellow poplar trees present are also good for pollinators.

A Natural Heritage Database Review was completed for this tract. If Rare, Threatened or Endangered species (RTE's) were identified for this tract, the activities prescribed in this guide will be conducted in a manner that will not threaten the viability of those species.

The Indiana DNR Division of Forestry has developed compartment level guidelines for snag tree retention, an important wildlife feature. Snags are standing dead or dying trees. Snags provide value in a forest in the form of habitat features for foraging activity, den sites, decomposers, bird perching, bat roosts, squirrel caches, and stores a wide variety of invertebrates. As time passes, these snags fall contributing to the nutrient cycling as downed woody debris (DWD). DWD decomposes providing nutrients for remaining and new vegetative growth as well contributing to the complexity of the forest floor.

	Maintenance Level	Optimal Level	Snag Inventory	Above Maintenance	Above Optimal
Snags 5"+	336	587	359	23	-228
Snags 9"+	252	503	359	107	-144
Snags 19"+	42	84	55	13	-29

Inventory data shows snag densities met maintenance levels for all three size classes but not optimal levels. It is important to note that these are compartment guidelines and that even though the estimated tract data does not quite meet all target levels, it is likely that suitable levels are present for these habitat features in the surrounding landscape. Prescribed management will work to increase these snag densities.

Invasive species are located within this tract. Most of them are in the northeastern corner by the intermittent stream and blue multipurpose trail. They include Japanese stiltgrass, Japanese honeysuckle, oriental bittersweet, Asian bush honeysuckle, autumn olive, multiflora rose, and privet. Other spots that have higher than average invasive species densities include where the red multipurpose trail is located and along Switchback Road. There is a wildlife pond just across the boundary in 6300601 where Switchback Road leaves the tract. When the pond was established, it appears autumn olive was planted or invaded the area. These invasives are encroaching 6300602 along that ridgetop. While none were noted during the inventory, *Ailanthus* has been recorded in nearby tracts on the slopes where mortality has occurred.

Japanese stilt grass was observed in the mapped intermittent, especially near Brownstown Road. The multipurpose trails have Japanese stilt grass throughout. Densities of other invasive species including multiflora rose and Japanese honeysuckle were relatively low.

Recreation

Hunting is likely one of the primary recreational uses of this tract. However, sections of the multipurpose trails enter the tracts boundary for short distances. The blue multipurpose trail enters the tract twice on the northeastern side along intermittent stream. The red multipurpose trail enters the southern portion of the tract on the ridgetop. Sections of these trails may be closed or rerouted during active forest management.

Cultural

Cultural resource may be present, but their location is protected. Adverse impacts to significant cultural resources will be avoided during any activities.

Tract Subdivision Description and Silvicultural Prescription

The current forest inventory for this tract was completed by property forester Ryan Bartlett and inventory intern Gary Steffek in 2018. A summary of those results is listed below.

Tract Summary Data	
Total acreage= 83.9 acres	Overall % stocking= 74%
Trees per acre= 87	Present volume per acre= 7,931 BdFt
Basal area per acre= 94 ft ²	Dominant overstory tree= chestnut oak

Due to the homogeneous nature of this tract, it will all be classified into one stand for the purpose of this guide and management prescriptions.

Descriptions:

Dry Oak-Hickory- 83.9 acres

This stand is fully stocked and consists mostly of medium sized chestnut oaks and large yellow poplar. The percent stocking in this stand is approximately 74% which puts stocking well above the B-line. The average tree size was around 16 to 18 DBH with some of the yellow poplar in the upper 20’s. Large poplar is more prevalent near the creek. The midstory of this stand consists mostly of American beech, red maple, and ironwood. Oak regeneration is inadequate. A majority of the overstory trees are mature showing signs of crown decline.

Species	Trees per acre	Basal Area per acre	Volume per acre
Chestnut oak	24	37.6	2,893
Yellow poplar	11	16.4	2,408
White oak	3	6.5	686
Virginia pine	3	5.2	575
Sugar maple	11	7.2	260
Northern red oak	1	2.4	234
American beech	15	5.1	155

Scarlet oak	0.1	1.1	124
Eastern white pine	0.1	0.9	105
Black oak	1	1.3	98
American sycamore	0.1	0.8	85
Red maple	9	3.4	77
Pignut hickory	1	1.1	69
White ash	1	1.1	61
Bigtooth aspen	0.1	0.6	43
Shagbark hickory	0.1	0.4	36
Blackgum	1	0.6	10
Sassafras	1	0.6	7
Black walnut	0.1	0.2	5
American basswood	1	0.2	0
Black cherry	0.1	0.4	0
Ironwood	1	0.1	0
Red elm	2	0.4	0
Total	86.7	93.6	7,931

Summary Tract Silvicultural Prescription and Proposed Activities

Dry Oak-Hickory- 83.9 acres

This cover type has some large, mature stems. It also has a poor midstory and regeneration. The prescribed management should promote oak regeneration while working to lower the stress on current overstory trees. Timber stand improvement (TSI) should be implemented to lower the prevalence of shade tolerant midstory species while making the site more inviting to oak regeneration. One way to achieve this would be to use prescribed fire. A timber harvest would benefit areas where feasible. The harvest would remove an estimated 180,000 – 230,000 bdf t aiming to promote a new cohort of upland oaks while removing declining trees. This would be accomplished through an improvement harvest utilizing single tree selection, group openings or patch cuts, and oak shelterwoods. These silvicultural techniques should be used in unison with TSI. After any harvest, post-harvest TSI should be completed to deaden culls, complete openings, and treat invasive species.

Other management in this tract should be invasive species treatment/monitoring and multipurpose trail maintenance. The Japanese stilt grass along the creek and multipurpose trails should be the focus. The multipurpose trail maintenance should be focused towards minimizing erosion and washout on the trails.

Proposed Management Activity

Proposed Date

Prescribed fire

2022-2023+

Invasive Plants Treatment/Monitoring

2022-2023

Timber Harvest

2023-2024

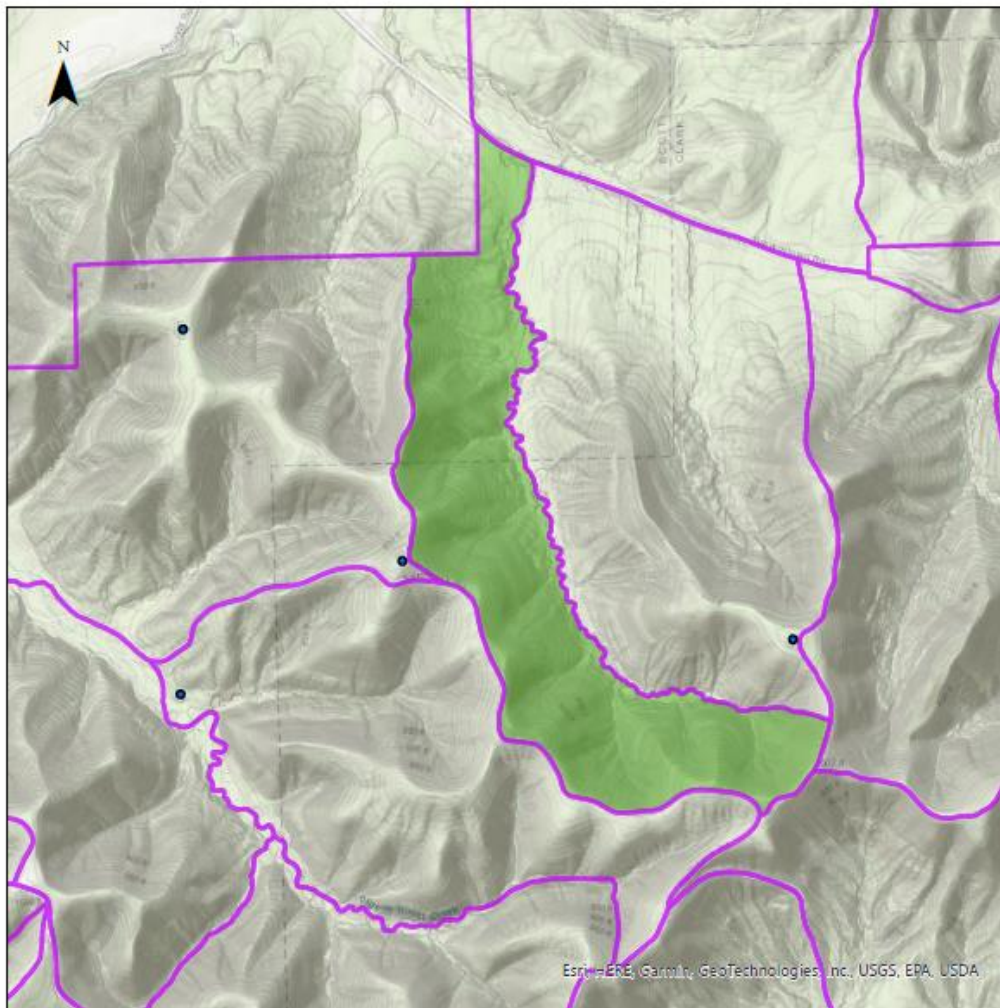
Post-Harvest TSI

1-2 years post-harvest


Re-evaluate Tract


2039


Clark State Forest Compartment 6 Tract 2 Cover Types Map



0 0.13 0.25
Miles

 Dry oak-hickory

 Wildlife Ponds

 Tract Boundary

Clark State Forest
Forester: Alwine and Hanners
Management Cycle End Year: 2041

Compartment: 9 **Tract:** 8
Date: August 2021 **Acres:** 80
Management Cycle Length: 20

Location

Compartment 9 tract 8, also known as 6300908, is located in Monroe Township in Clark County, Indiana. The tract is in sections 10 and 11 of Township 1N, Range 6E. This tract is east of Pixley Knob Road and approximately 3 miles west of Henryville, IN.

General Description

This tract is comprised of three cover types: mesic oak-hickory, dry oak-hickory, and mixed hardwoods. White oak and chestnut oak are the dominant overstory species. Regeneration in this tract is a mix of oaks, maples, and American beech. Invasive species in this tract are present in the flat areas and in the drainages. Since the tract is largely dominated by oaks, the timber management and timber stand improvement will focus on regenerating and promoting oak and hickory species. Two goals for this tract are reducing the shade tolerant understory and opening the canopy to promote shade intolerant species.

History

1924 – Land acquisition from Dunlevy
1927 – Land acquisition from Grubenmann
1987 – Inventory completed for State Forest Inventory Program
2007 – Forest inventory completed, and Management Guide written
2021 – Forest inventory completed by Hanners and Alwine
2022 – Resource management guide written by Hanner and Alwine

Landscape Context

This tract is largely surrounded by other tracts of Clark State Forest. A portion of the south side of the tract is bordered by private property. The surroundings within one mile of this tract are about 95% forested.

Topography, Geology, and Hydrology

6300908 ranges from moderate slopes to steep slopes in the northern portion of the tract. The southern portion of the tract has moderate slopes with some flat ridgetops and drainage flats. The topography is created from fingers off a knob north of the tract.

6300908 is located in the northmost section of the Silver Creek watershed. Right Branch which flows into Blue Lick Creek runs the length of the east boundary of the tract. It then flows into Blue Lick Creek and into Silver Creek. The ephemerals on the western half of this tract flow into Hilltop Run and then into Blue Lick Creek and then Silver Creek.

Soils

BcrAW- Beanblossom silt loam, 1 to 3 percent slopes, occasionally flooded, very brief duration 2.7 acres

This nearly level, deep, well-drained soil is found along alluvial fans and flood plain. It is well suited to trees. Management planning should consider wet times of year. This soil has not been evaluated for site index.

ComC- Coolville silt loam, 6 to 12 percent slopes, 6.1 acres

This moderately sloping, deep, moderately well-drained soil is on side slopes in the uplands. It is well suited to trees. Erosion hazards are concerns that should be considered during implementation of Best Management Practices for Water Quality. This soil has a site index of 66 for northern red oak.

ConD- Coolville-Rarden complex, 12 to 18 percent slopes, 15 acres

These strongly sloping, deep, moderately well-drained soils are found on side slopes in the uplands. It is well suited to trees. Erosion hazards are concerns that should be considered during implementation of Best Management Practices for Water Quality. Coolville has a site index of 66 for northern red oak and Rarden has a site index of 71 for black oak.

GmaG- Gnawbone-Kurtz silt loams, 20 to 60 percent slopes, 54.4 acres

This moderately to very steep, moderately deep, well-drained complex is found on side. It is well suited to trees. The hazard of erosion and equipment limitations are main management concerns. These should be considered when planning management activities and implementing Best Management Practices for Water Quality. Kurtz has a site index of 60 for northern red oak and Gnawbone has not been evaluated.

PcrB2- Pekin silt loam, 2 to 6 percent slopes, eroded, 1.5 acres

This gently sloping, deep, moderately well-drained soil is on alluvial terraces. It is well suited to trees and has a site index of 70 for white oak and 85 for yellow poplar.

Access

Access to this tract is through 6300910 from Pixley Knob Road.. There is parking available close by at the Pixley Knob Trailhead for the Knobstone Trail.

Boundary

This tract is bordered by Clark State Forest on all sides except where it meets private property on the south side of the tract. Tracts that border it include: 6300910 to the west, 6300909 to the north, and 6300905 to the east.

Ecological Considerations

This tract contains diverse vegetation and wildlife resources conducive to providing habitat for a variety of wildlife species. Habitat types include mesic oak-hickory, dry oak-hickory, and mixed hardwoods.

The Indiana DNR Division of Forestry has developed a set of compartment level guidelines for snag tree retention, an important wildlife feature. Snags are standing dead or dying trees. Snags provide value in a forest in the form of habitat features for foraging activity, den sites, decomposers, bird perching, bat roosts, squirrel caches, and stores a wide variety of invertebrates. As time passes, these snags fall contributing to the nutrient cycling as downed woody debris (DWD). DWD decomposes providing nutrients for remaining and new vegetative growth as well contributing to the complexity of the forest floor.

	Maintenance Level	Inventory	Available Above Maintenance
Snags 5”+	316	1,649	1,333
Snags 9”+	237	1,130	893
Snags 19”+	39.5	122	82

Snags in this tract exceeded maintenance levels for all three size classes.

A variety of invasive species were present within this tract. Most of the drainages contain Japanese stilt grass. A few ailanthus were observed along with Japanese honeysuckle, oriental bittersweet, and multiflora rose. Most were found in low densities and should be treated to decrease local seed source and minimize future spread. Japanese stiltgrass should be treated where logistically feasible to minimize spread.

A Natural Heritage Database Review is part of the management planning process. If Rare, Threatened or Endangered communities 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.

Recreation

Likely recreation within this tract includes hunting, wildlife viewing, and foraging opportunities, due to accessibility. The Knobstone Trail runs through two neighboring tracts 6300910 and 6300909.

Cultural

This tract was reviewed for cultural sites during the forest resource inventory. Cultural resources may be present on this tract, but their location(s) are protected. Adverse impacts to significant cultural resources will be avoided during any management or construction activities.

Tract Description and Silvicultural Prescription

The current inventory was completed in the summer of 2021 by foresters Alwine and Hanners. An overview of the inventory results is located in the table below.

Species	Sawtimber Trees	Total Bd. Ft.
White oak	1,717	294,803
Chestnut oak	783	126,510
Virginia pine	190	37,100
Scarlet oak	68	13,772
Black oak	50	12,232
Pignut hickory	74	11,611
Sweetgum	45	7,583
Red maple	35	3,890
American beech	35	2,157
Yellow-poplar	18	2,581
Total	3,015	512,239

For the purpose of this guide and managing this tract, it will be divided into three cover types based on forest composition: mesic oak-hickory, dry oak-hickory, and mixed hardwoods. Below are the cover type descriptions.

Descriptions:

Mesic Oak-Hickory, 51.5 acres

This cover type is dominant representing 64% of the land area within the tract. The cover type is fully stocked at 83%. White oak is the dominant overstory tree making up most of the merchantable volume within the cover type. Patches of light to moderate mortality throughout the area have encouraged advanced oak regeneration. American beech, red maple, sugar maple, and ironwood regeneration were present as well, but oak regeneration consistently dominated the small sunlit openings in this cover type. The best oak regeneration was found towards the ridges and dryer sites. American beech became more prevalent closer to the drainages. Roundleaf greenbrier, viburnum, and lowbush blueberry were observed within this cover type. Japanese honeysuckle and Japanese stiltgrass were observed in low numbers and mainly located closer to drainages.

Trees per acre: 108 Percent stocking: 83
 Basal area: 109 Volume per acre: 8,668

Species	Volume per acre
White oak	5,845

Chestnut oak	1,681
Virginia Pine	600
Pignut hickory	200
Black oak	194
Scarlet oak	148
Total	8,668

Dry Oak-Hickory, 16 acres

This cover type is in the upper limit of understocked at 58% stocking. The low stocking could be attributed to the high pine mortality. Chestnut oak is the dominant tree in this cover type; however, they were relatively small and had poor form. The high mortality has created some canopy gaps with dense regeneration of oak on ridge tops, but openings on the slopes are dominated with maple and beech. Other species regenerating includes red maple and black gum. This cover type had a higher component of invasive species including oriental bittersweet, Japanese stilt grass, and a few ailanthus. The ridge tops were mostly free of invasive species, but the densities increased the further down the slopes near the drainage and in some of the areas of high pine mortality.

Trees per acre: 76 Percent stocking: 58
 Basal area: 72 Volume per acre: 192

Species	Trees per acre (10in+)
Chestnut oak	26
White oak	8
Virginia Pine	4
Scarlet oak	4
Black oak	1
Pignut hickory	3
Total	46

Mixed Hardwoods, 12.5 acres

This cover type was found in the wetter, riparian area of the tract along the southwestern edge of the tract along Right Branch which flows into Blue Lick Creek. The stocking is 64% and fully stocked. Heavy pine mortality was observed creating canopy gaps where maple and beech regeneration was occurring. Most of the regeneration in the cover type was American beech. The invasive species present included Japanese stilt grass, Japanese honeysuckle, and oriental bittersweet. The oriental bittersweet was found thriving in dense pockets overtop the downed pine.

Trees per acre: 163 Percent stocking: 64
Basal area: 87.5 Volume per acre: 1,982

Species	Volume per acre
Sweetgum	768
Red maple	394
Scarlet oak	340
Yellow-Poplar	261
American Beech	218
Total	1,982

Tract Subdivision and Silvicultural Prescription

Mesic Oak-Hickory

Proposed management for this cover type should be focused around enhancing the oak and hickory species. The overstory is currently dominated by oaks while the mid story species are primarily maple and beech. Most plots showed good, advanced oak regeneration in the small openings where light was abundant. There were also scattered, suppressed seedlings present throughout this cover type. The desired future condition is a healthy forest stocked with oak and hickory species being succeeded by oak and hickory species.

A timber harvest is proposed for this cover type. The harvest will work towards the removal of declining stems, releasing trees to achieve objectives, and creating openings for the abundant, suppressed oak regeneration. In areas of especially good oak and hickory regeneration, a shelterwood harvest would be a great method to remove more of the overstory and increase sunlight exposure for the competing oaks. Small openings could also be used where the regeneration is well advanced to completely release the new cohort.

Midstory removal work would be beneficial to lower the presence of shade tolerant species, specifically red maple and American beech. This could be accomplished with a variety of methods including: mechanically with chainsaws, chemically, and/or with the use of prescribed fire. Prescribed fire would likely be the most cost-effective way to accomplish this goal. Along with

the midstory work, invasive species control could be performed. Treating the scattered invasive species would reduce their ability to spread. Post-harvest TSI should work to remove any marked trees remaining post-harvest, treat invasive species, and complete any regeneration openings.

Dry oak-hickory

This cover type will be managed similarly to the mesic oak-hickory cover type. The main difference between these cover types is the overstory component of white oak versus chestnut oak and the lower stocking in this cover type. Since this cover type has a greater component of chestnut oak, regeneration efforts will focus on chestnut oak. The proposed management of this cover type will work to maintain and enhance the oak hickory species to create a fully stocked, self-replacing forest.

Due to the low stocking in this cover type, any harvesting will be relatively light and only occur in conjunction with the rest of the tract. A harvest in this cover type could be focused on removing the remaining declining Virginia pine and releasing trees to achieve desired future condition. In the pockets of high mortality, small openings could be used to complete these existing openings to promote regeneration. Invasive species could be managed as mentioned in the mesic oak-hickory prescription with special attention to areas where openings will be created.

Mixed Hardwoods

This cover type has a very different species composition than the other cover types. It also has a greater concentration of invasive species predominantly along the riparian areas. The desired future condition is a healthy cover type with less invasive species and a mixed overstory of mesic hardwoods.

Timber could be removed from this cover type in conjunction with the rest of the tract. Entry should be minimal and invasive species should be treated prior to and after harvesting operations. Only certification approved chemicals should be used. Work in this cover type should be primarily focused on invasive species removal and reduction, as well as timber stand improvement to remove less desirable shade tolerant species.

Summary Tract Silvicultural Prescription

This tract has an overstory made up of predominately oak species. The regeneration, however, is largely sugar maple and American beech except in scattered patchy areas of abundant light where oak regeneration is dominant. The establishment of these more shade tolerant species, in combination with a lack of disturbance, has made oak regeneration difficult in much of this tract. Where small openings in the canopy are present, white oak seedlings are predominant. However, these areas are very sparse across the tract. The proposed management will focus on creating a forest that is dominated by oak and hickory species and is self-replacing. To achieve this goal, a harvest is prescribed to remove selected trees that will allow more sunlight to reach the forest floor which will encourage oak regeneration and retention. An estimated 115,000 – 155,000 bdf would be removed. Methods used to achieve this goal will be primarily single tree selection and group

selection. Regeneration openings or shelterwoods will be created where there is substantial oak regeneration that would benefit from being released.

Other considerations

Regeneration evaluation – Three to five years after the completion of the timber harvest, a regeneration evaluation will be performed to ensure that desired regeneration is occurring within the harvest area. If deemed unsatisfactory, mitigations will be made.

Timber stand improvement (TSI) – TSI could be performed within two years of timber harvest completion. TSI is prescribed to complete regeneration openings, remove species inhibiting desirable regeneration, and address problem occurrences of invasive species.

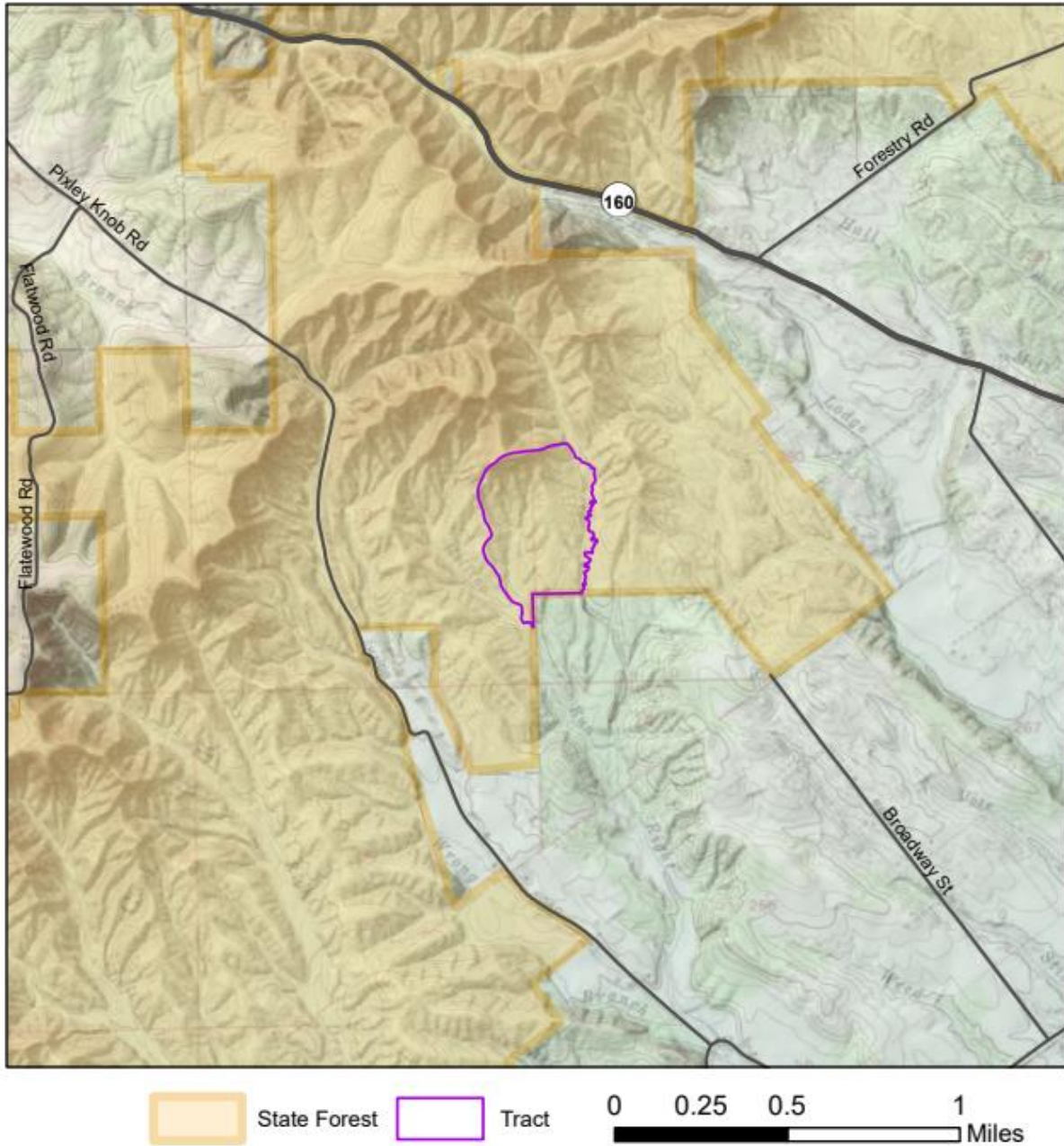
Best management practices (BMP) – During and after completion of the proposed management activity, BMPs will be implemented in order to minimize soil erosion.

Guide revision – This tract should receive another inventory and management guide 20 years following the completion of the inventory.

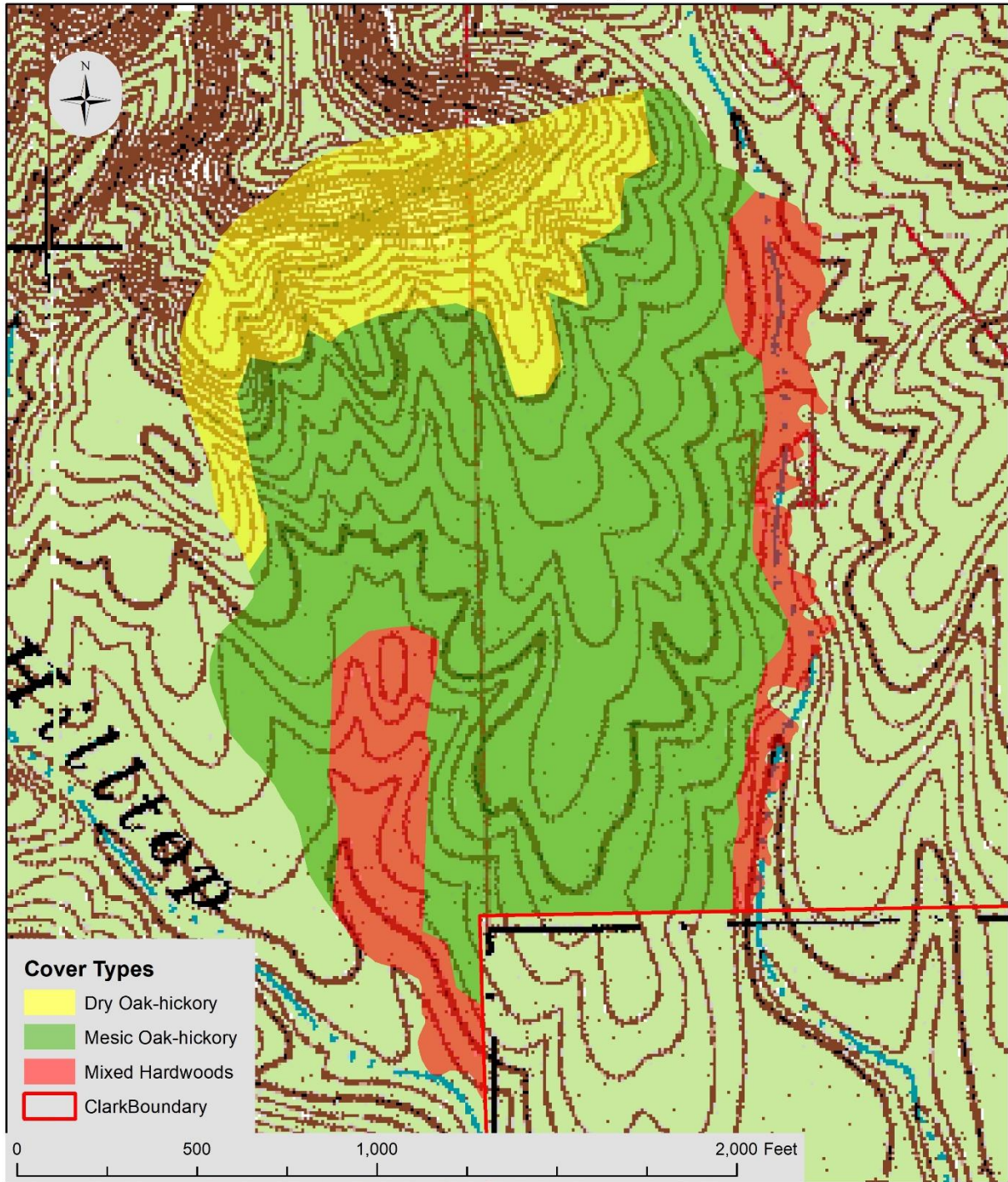
Prescribed fire – A regime of prescribed burns may be started within this tract to reduce the abundance of the shade tolerant species in the midstory and to help control invasive species.

Proposed Management Activity	Proposed Date
Invasive species management	2022-2023
Timber harvest	2023-2026
Post-harvest TSI and invasive species management	Within 2 years post-harvest
Post-harvest regeneration inspection	3-5 years post-harvest
Prescribed fire regime	2025+
Re-evaluate tract	2041

Location Map Compartment 9 Tract 8



Clark State Forest Compartment 9 Tract 8 Cover Type Map



Clark State Forest
Foresters: Alwine and Hanners
Acres: 185
Management Cycle End Year: 2041

Compartment:14 **Tract:** 1
Date: August 2021
Forested Acreage: 185
Management Cycle Length: 20

Location

Compartment 14, tract 1, also known as 6301401, is located in Clark County, Indiana. It is in section 28 of Township 1N, Range 6E. The tract is approximately 4 miles west of Memphis, Indiana and 1 mile north of Deam Lake State Recreation Area.

General Description

This tract is comprised of three cover types: mesic oak-hickory, dry oak-hickory, and mixed hardwoods. The dominant overstory species include white oak and chestnut oak. The dominant regeneration is red maple and American beech, although areas of oak regeneration are present. The oak regeneration is scattered throughout the mesic oak-hickory and dry oak-hickory stands, most of it is seedling sized. There are pockets where the oak regeneration is more advanced and reaches head height, but this is not the norm. The mixed hardwoods cover type used to be dominated by Virginia pine that has all, but a few stems blown down leaving a much younger stand than the rest of the tract. The invasive species are significantly worse in this regeneration area than in the rest of the tract. The Knobstone Trail runs through the middle of this tract along the ridgetop. Invasive species management in this tract should focus in the riparian areas. Since most of this area has an oak dominated overstory, timber management should work to promote and regenerate oak and hickory species. Reducing the shade tolerant understory and creating canopy gaps are two ways to accomplish this goal.

History

- Land acquisition from Taylor in 1940
- Land acquisition from Locke in 1940
- Land acquisition from Hostettler in 1941
- Resource Management Guide written in 1975
- Inventory completed for State Forest Inventory Program in 1986
- Inventory completed in 2009 by Backhaus
- Inventory completed in 2021 by Alwine and Hanners
- Resource Management Guide written in 2021 by Alwine and Hanners

Landscape Context

This tract is bordered by Clark State Forest on three sides. To the northwest, there are privately owned properties consisting of agricultural fields, grazing fields, and residential homes. Within a mile of the tract, approximately 80% of the land is forested. Deam Lake State Recreation Area is located just over a mile south of the tract.

Topography, Geology, and Hydrology

6301401 is made up primarily of one large ridge that starts in the southeast part of the tract and elevates up to the northwest corner of the tract. The ridge then slopes downward to the

southwestern and northeastern boundaries of the tract. The slope in this tract ranges from slight slopes to moderately steep slopes. The steepest portion of this tract is in the northwest corner.

Tract 6301401 is in the southwestern part of the Silver Creek Watershed. There are two mapped intermittent streams within the tract. Bowery Creek is the southern border of the tract. Water from the south half of the tract flows into this waterway. Bowery Creek flows northeast until it runs into Blue Lick Creek which eventually flows into Silver Creek. Water from the north half of the tract flows into Bartle Knob Run. A small portion of this waterway enters the tract on the northern edge. The rest of the water flows out of the tract in ephemerals and enters Bartle Knob Run on private property. Bartle Knob Run also flows east into Blue Lick Creek. During the inventory, a wildlife pond was observed just north of Bowery Run. It was a manmade water feature with a diameter of approximately 40 feet. General riparian management zone (RMZ) guidelines will be implemented in these areas in accordance with the Indiana Logging and Forestry Best Management Practices Field Guide.

Soils

BcrAW- Beanblossom silt loam, 1 to 3 percent slopes, occasionally flooded, very brief duration, 18.9 acres

This nearly level, deep, well-drained soil is found along alluvial fans and flood plain. It is well suited to trees. Management planning should consider wet times of year. This soil has not been evaluated for site index.

ComC- Coolville silt loam, 6 to 12 percent slopes, 10.7 acres

This moderately sloping, deep, moderately well-drained soil is on side slopes in the uplands. It is well suited to trees. Erosion hazards are concerns that should be considered during implementation of Best Management Practices for Water Quality. This soil has a site index of 66 for northern red oak.

ConD- Coolville-Rarden complex, 12 to 18 percent slopes, 62.3 acres

These strongly sloping, deep, moderately well-drained soils are found on side slopes in the uplands. It is well suited to trees. Erosion hazards are concerns that should be considered during implementation of Best Management Practices for Water Quality. Coolville has a site index of 66 for northern red oak and Rarden has a site index of 71 for black oak.

DbrG- Deam silty clay loam, 20 to 55 percent slopes, 18.5 acres

This moderately to very steep, deep, well-drained soil is on side slopes in the uplands. It is suited to trees. Equipment limitations and erosion hazards are concerns that should be considered during sale layout and implementation of Best Management Practices for Water Quality. This soil has not been evaluated for site index.

GmaG- Gnawbone-Kurtz silt loams, 20 to 60 percent slopes, 74.8

This moderately to very steep, moderately deep, well-drained complex is found on side. It is well suited to trees. The hazard of erosion and equipment limitations are main management concerns. These should be considered when planning management activities and implementing Best Management Practices for Water Quality. Kurtz has a site index of 60 for northern red oak and Gnawbone has not been evaluated.

Access

This tract is accessible by foot along the Knobstone Trail. The Knobstone Trail bisects the tract running southeast to northwest. The Knobstone Trail can be accessed from either the Flower Gap Gate, Reed Road, Tree Lane, or from Deam Lake State Recreation Area. A shorter walk can be attained from kicking north of the Cross Country Trail that lays on the ridge south of 6301401. There is no trail from Cross Country Trail into the tract.

Boundary

This tract is bordered by state forest on three sides. It meets private land on the northeast corners. Bowery creek forms the southwest boundary for this tract. State Forest tracts that border it include 6301206 to the west, 6301209 to the south, and 6301403 to the east.

Ecological Considerations

This tract contains diverse vegetation and wildlife resources conducive to providing habitat for a variety of wildlife. Habitat types include oak-hickory, mixed hardwoods, upland oaks, and riparian areas.

The Indiana DNR Division of Forestry has developed compartment level guidelines for snag tree retention, which is an important wildlife feature. Snags are standing dead or dying trees. Snags provide value in a forest in the form of habitat features for foraging activity, den sites, decomposers, bird perching, bat roosts, squirrel caches, and stores a wide variety of invertebrates. As time passes, these snags fall contributing to the nutrient cycling as downed woody debris (DWD). DWD decomposes providing nutrients for remaining and new vegetative growth as well contributing to the complexity of the forest floor.

	Maintenance Level	Inventory	Available Above Maintenance
Snags 5''+	740	3,765	3,025
Snags 9''+	555	2,920	2,365
Snags 19''+	93	220	127

Snags in this tract exceeded maintenance levels for all three size classes by significant margins.

A variety of invasive species were observed in the tract. Japanese stilt grass is present in a lot of the drainages. Japanese honeysuckle was noted in many inventory plots and bittersweet scattered in small patches. Multiflora rose was observed scattered throughout the tract. Most of the invasive species located outside the riparian areas are present in low densities and could be easily controlled. On the lower slope near Bowery Creek, the invasive species are more established with burning bush, autumn olive, and ailanthus. These invasive species, along with the oriental bittersweet, could be treated to lower the local seed source prior to overstory disturbance. Japanese stilt grass could be treated where it is logistically feasible.

A Natural Heritage Database Review is part of the management planning process. If Rare, Threatened or Endangered communities 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.

Recreation

Recreation in this tract is primarily hiking on the Knobstone Trail which runs the length of the ridgetop through the tract. There is also hunting that takes place within the tract and wildlife viewing and foraging are other recreational opportunities available. The section of Knobstone Trail located within this tract will be rerouted for public safety during active management. Once management activities have concluded the trail will return to its original location.

Cultural

This tract was reviewed for cultural sites during the forest resource inventory. Cultural resources may be present on this tract, but their location(s) are protected. Adverse impacts to significant cultural resources will be avoided during any management or construction activities.

Tract Subdivision Description and Silvicultural Prescription

The current inventory was completed in the summer of 2021 by foresters Alwine and Hanners. An overview of the inventory results are located in the table below. During the forest inventory, stems 4 inches in diameter at breast height (DBH) and greater were measured. Plots were established on a random grid and a variable radius plot (10 BAF) was used to tally trees. This tract had 46 plots which is approximately one plot for every four acres. Only merchantable trees larger than 11 inches DBH are included in the volume summaries and listed as “Sawtimber Trees.”

Species	# Sawtimber Trees	Total Bd. Ft.
White oak	3,156	516,030
Chestnut oak	1,536	274,310
Virginia pine	531	120,600
Scarlet oak	338	67,740
Black oak	205	47,920
Pignut hickory	74	17,970
Sweetgum	18	5,110
Red maple	29	3,720
Total	5,887	1,053,400

For the purpose of this guide and the management of this tract, the tract is divided into three cover types based on forest composition they include: mesic oak-hickory, dry oak-hickory, and mixed hardwoods. Below are the cover type descriptions.

Descriptions

Mesic Oak-Hickory, 149 acres

This is a fully stocked cover type at 82% stocking. It makes up most of the land area in the tract. White oak is the dominant overstory species making up over half of the merchantable volume. Many of the species tallied with merchantable volume were common oak species of Clark State Forest, such as chestnut oak, black oak, and scarlet oak. Virginia pine was also a common overstory species. Mortality in this cover type varied greatly. Some areas had low mortality while others displayed moderately high mortality. Most of the mortality in this cover type was Virginia pine

and chestnut oak. Black oak and scarlet oak decline was observed. A majority of the regeneration was shade tolerant species including American beech, red maple, ironwood, and sugar maple. There was ground cover sized oak saplings present throughout the cover type where the density of the shade tolerant species were lower. In pockets, generally closer to the ridgetop, advanced oak and hickory regeneration was present. Other regenerating species included black gum, pignut hickory, Virginia pine, and white ash. Along the ridgetop, greenbrier was very common and at times made walking the area difficult.

Trees per acre: 128	Percent stocking: 82
Basal area: 98	Volume per acre: 5,973 bdf

Species	Volume per acre
White oak	3,430
Chestnut oak	1,036
Virginia pine	700
Black oak	361
Scarlet oak	311
Pignut hickory	135
Total	5,973

Dry Oak-Hickory, 21 acres

Similar to the mesic oak-hickory cover type, this is a fully stocked cover type at ~98% stocking. This cover type has a high basal area. This is primarily due to the dominant species being chestnut oak, which tends to carry a higher basal area than a white oak dominant cover type. There was also a small area in this cover type that was almost purely Virginia pine. Although Virginia pine is native on some ridgetops, it does not generally natively grow in homogenous cover types like this. It is normally on the highest ridgetops in small groups. It grows in homogenous cover types due to past disturbances. Virginia pine growing in homogenous cover types almost always suffers from high mortality as is seen in this stand. And since these trees do not adequately self-thin or establish deep roots, once mortality begins the entire homogenous cover type declines. This was observed in the mixed hardwoods cover type. Looking at aerial photography from 1955 the mortality in this cover type was like that in the mesic oak-hickory cover type. Within the small pocket of Virginia pine, the mortality was especially high. The regeneration in this cover type was more oak dominated than the other cover types, but American beech and red maple dominate the majority of regeneration. In the pine pocket, America beech is primarily the only tree species growing beneath the canopy. Green brier, American dittany, and blueberry were common. Invasive plants in this cover type were like the mesic oak-hickory cover type. A few small bittersweet stems were noted in the Virginia pine pocket. As these trees continue to decline, it will expand.

Trees per acre: 138	Percent stocking: 98
Basal area: 122	Volume per acre: 6,727 bdf

Species	Volume per acre
Chestnut oak	3,781
White oak	1,550
Scarlet oak	732
Virginia pine	664
Total	6,727

Mixed Hardwoods, 15 acres

This cover type encompasses the riparian area of the tract along the southern border. Mortality in this cover type was high, mostly a result of Virginia pine blowdown. Looking at aerial photography from 1955, it was determined this cover type was almost entirely Virginia pine. And as mentioned before, cover types of homogenous Virginia pine do not have good survival rates. Due to the high mortality, most of this cover type is young. Most of the Virginia pine was already on the ground at the time of the inventory. Although inventory data showed 171 trees with diameters 10 inches or bigger (13 trees per acre less than 10 inches or 184 trees per acre), it only had 5 trees per acre with sawtimber volume further showing the young age of this stand. Many of the trees in the cover type were between 10 and 12 inches in diameter. Many of the invasive species in this tract were observed in this cover type, especially around Bowery Creek. The high mortality and good growing conditions allowed the invasive species to become well established. The stream provides a source for invasive plant's seeds to be moved into the tract. As the overstory pine trees died, the additional light allowed these populations to expand.

Trees per acre: 184	Percent Stocking: 68
Basal area: 74	Volume per acre: 1,072 bdf

Species	Trees per acre (10in+)
American beech	62
Red maple	32
Yellow-poplar	30
Sweetgum	15
Shagbark hickory	13
Virginia pine	10
Blackgum	5
Pignut hickory	3
White oak	1
Total	171

Prescriptions

Mesic Oak-Hickory, 149 acres

The proposed management for this cover type is to maintain and enhance the oak and hickory species. The overstory is dominated by oak while the regeneration is mostly shade tolerant species with some small pockets of advanced oak regeneration. This cover type is fully stocked and has moderate to relatively high mortality in some areas. The desired future condition is a healthy cover type stocked with oak and hickory species that is being succeeded by oak and hickory species.

A timber harvest is prescribed. The harvest should target declining stems and releasing trees to maintain the oak-hickory cover type. In a majority of this stand, the regeneration is shade tolerant species. These areas should be selectively thinned. In pockets where there is high mortality, small openings could be used to promote regeneration. In areas with existing oak and hickory regeneration, a shelterwood harvest could be used to improve light to advance saplings and seedlings. Small openings could also be used where the understory is more advanced to release a new cohort of oaks.

Additionally, a midstory removal could be completed to lower the presence of the shade tolerant species while increasing the amount of light for oak and hickory seedlings. This could be done mechanically through chainsaw work, chemically, or by prescribed fire. Prescribed fire would likely be the most cost-effective way to reduce the shade tolerant species. Along with the midstory work, invasive species control could be performed. The post-harvest timber stand improvement (TSI) would remove marked stems remaining post-harvest, treat invasive species, and to complete regeneration openings.

Dry oak-hickory, 21 acres

The proposed management for this cover type is similar to that of the mesic oak-hickory. The main difference is that chestnut oak will likely regenerate rather than white oak. The oak regeneration in this cover type is generally better than that of the mesic-oak-hickory stand, thus harvesting could be more focused on releasing the regeneration already present. The small area of Virginia pine will likely be removed to create a small regeneration opening. If naturally occurring regeneration is not suitable, an enrichment planting could be used.

Mixed hardwoods, 15 acres

This cover type contains areas much younger than the oak-hickory cover types. Thus, the desired future condition is a healthy cover type with an overstory composition of predominantly yellow-poplar, hickory, and maple. This area should be harvested with the oak-hickory cover types. In the areas of new growth, the harvest should be light and focus primarily on salvaging any remaining Virginia pine. The remaining work in this cover type would focus on releasing desired trees through TSI. Shagbark hickory should be given priority in release for their wildlife benefits. Other desired tree species for release would be oaks, pignut hickory, yellow-poplar, and maple.

Many of the invasive species in this tract are found in this cover type close to Bowery Creek. These invasive species should be treated both pre-harvest and post-harvest. Large shrubs, vines, and trees would need to be killed first to help control local seed sources, and the remaining ground cover invasives could be treated afterwards. Post-harvest TSI could be used to finish releasing desired trees, deaden cull trees, and perform a precommercial thinning.

Summary Tract Silvicultural Prescription and Proposed Activities

Overall, the goal for this tract is to promote and sustain the oak-hickory cover types while controlling invasive plants. In the first few years of the management cycle, focus will be controlling invasive species preharvest with a focus on minimizing spread to other areas. A timber harvest is prescribed to promote oak regeneration which would remove an estimated 250,000-310,000 bdft. Following the harvest invasive species follow-up and post-harvest TSI will be implemented. TSI will focus on releasing oak regeneration, and working to reduce the presence of maple, beech, and ironwood regeneration in the oak cover types. A fire regime could be established in the oak cover type to promote a more open midstory forest. Use of prescribed fire would be post-harvest and should occur as needed to control the presence of shade tolerant species. This tract could be burned with adjacent tracts for easy of control and efficiency while sustaining and promoting oak in a larger area.

Other considerations

Regeneration evaluation – Three to five years after the completion of the timber harvest, a regeneration inspection will be performed. This inspection identifies any regeneration or invasive concerns, addressing them as deemed necessary.

Timber stand improvement (TSI) – If needed, TSI should be performed within two years of timber harvest completion. The objective would be to complete regeneration openings, remove species marked for harvest but not removed or trees inhibiting desirable regeneration objectives, and manage invasive species.

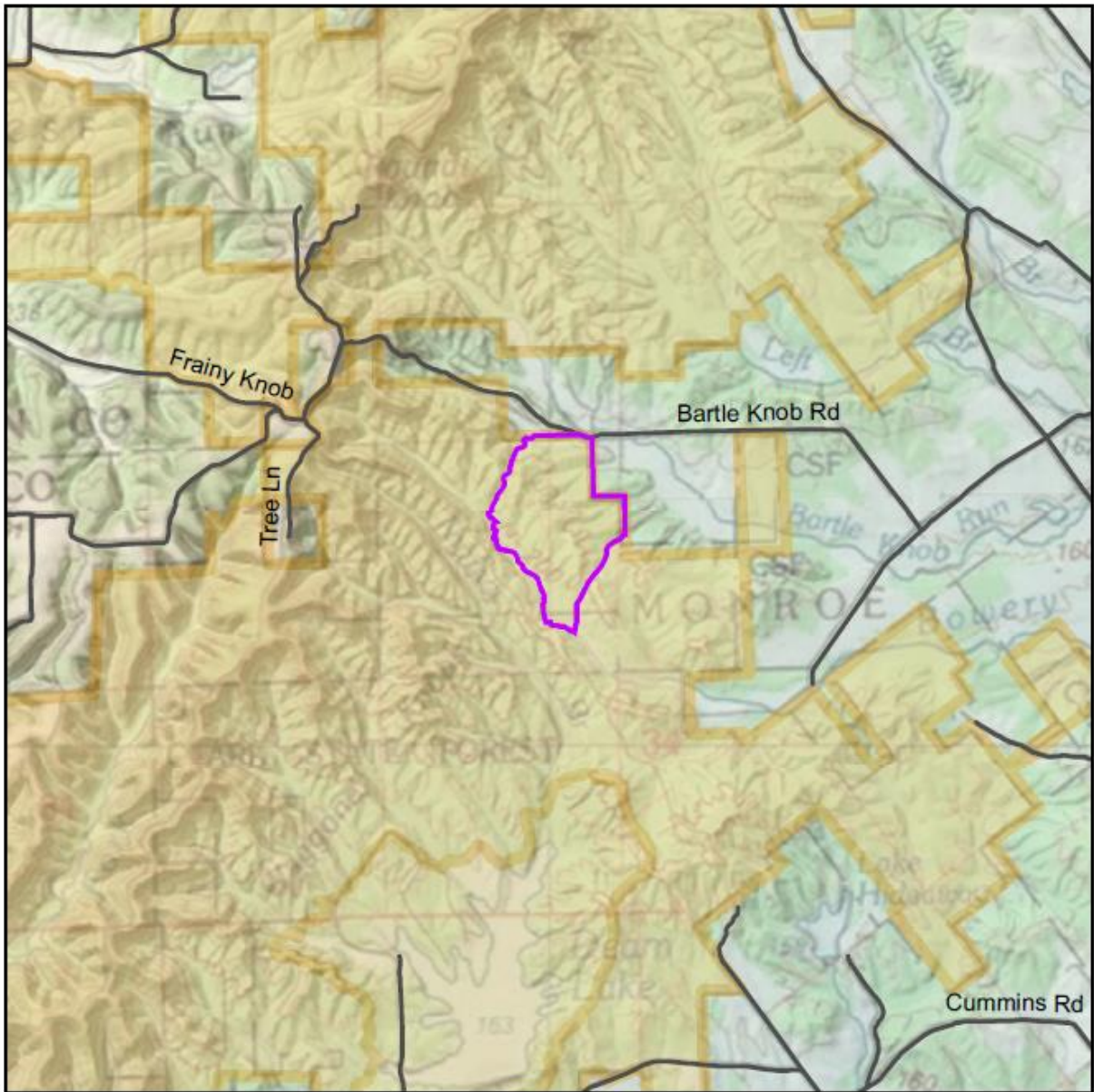
Best management practices (BMP) – During and after completion of the proposed management activity, BMPs will be implemented to minimize soil displacement and protect waterways.

Guide revision – This tract should receive another inventory and a management guide be written 20 years after the completion of this inventory.

Prescribed fire – A regime of prescribed burns may be started within this tract to reduce the abundance of the shade tolerant species in the midstory and to help control invasive species.

Proposed Management Activity	Proposed Date
Invasive species management	2022-2023
Timber harvest	2023-2026
Post-harvest TSI and invasive species management	Within 2 years post-harvest
Post-harvest regeneration inspection	3-5 years post-harvest
Prescribed fire regime	2025+
Re-evaluate tract	2041

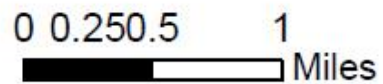
Compartment 14 Tract 1



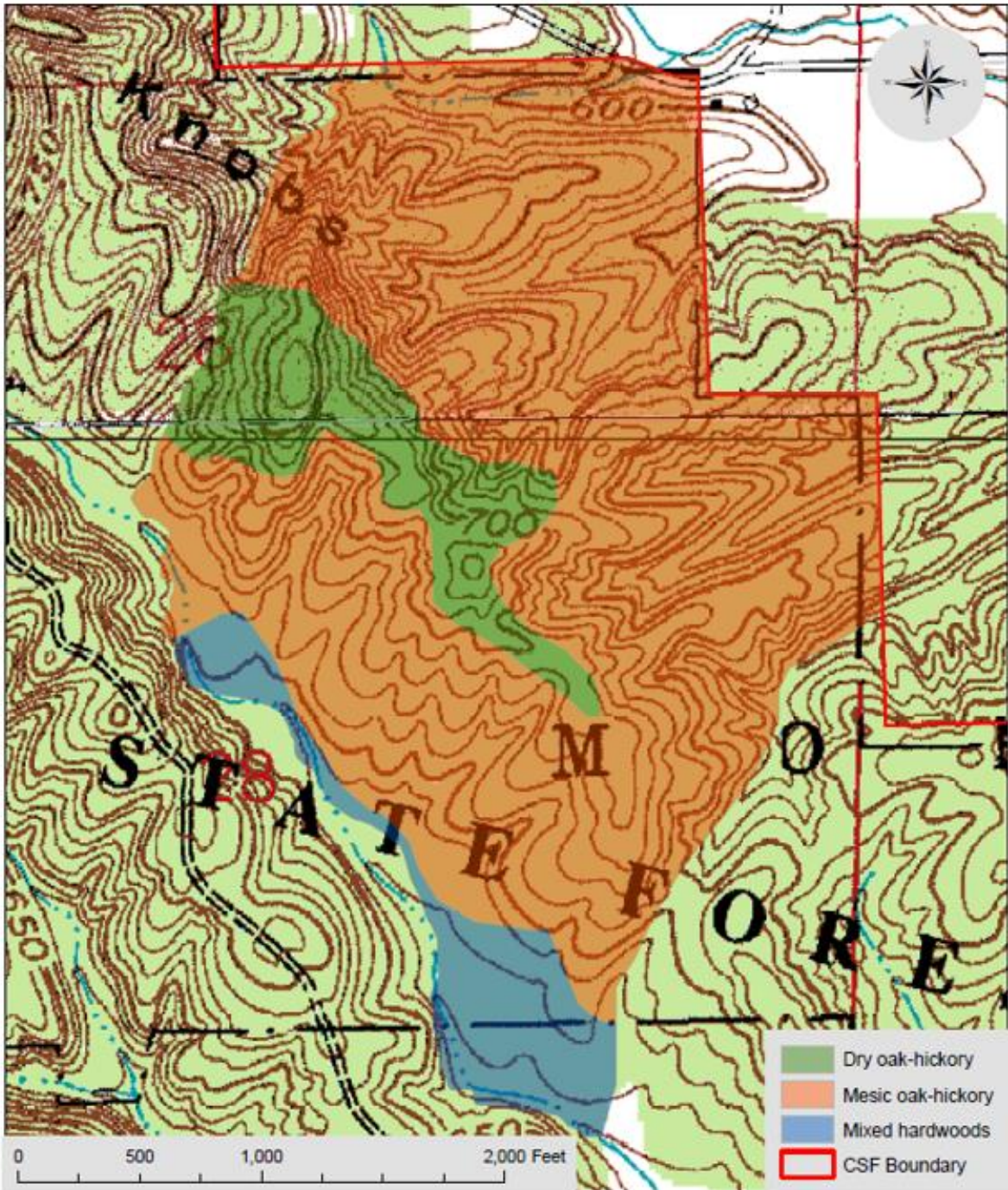
State Forest



Tract



Clark State Forest
Compartment 14 Tract 1
Cover types



State Forest: Clark State Forest
Tract Acreage: 58.1
Forester: Alwine/Bartlett
Management Cycle End Year: 2034

Tract: 6301402 (Compartment 14 Tract 2)
Forest Acreage: 58.1
Date: February 2019
Management Cycle Length: 15

Location

This tract is located in Clark County approximately 4.5 miles southwest of Henryville, Indiana. More specifically, the tract is located in Section 27, Township 1N, and Range 6E.

General Description

This is a variable 58.1-acre tract ranging from oak-hickory to a 20-year-old Virginia pine stand. The entire tract is relatively flat except the southern edge where it turns steeper. A large portion of the tract is infested with multiflora rose, oriental bittersweet, and Japanese honeysuckle.

History

- Land purchased from Henry & Emma Bower in 1943
- Inventory completed by summer students in 1986 for state forest inventory program
- Inventory completed by David Pyle in 1998
- Resource Management Guide completed by David Pyle in 1998
- Timber harvest conducted in 1998; 93,398 BdFt sold to Indiana Pine
- Cruised/inventory completed by Alwine/Bartlett in 2019
- Resource Management Guide completed by Alwine/Bartlett in 2019

Topography, Geology and Hydrology

This tract is relatively flat. The northern portion and southern portion of the tract both slope toward the perennial stream within the tract. The southernmost part of the tract is the start of a knob.

This tract is located within the Blue Lick Creek watershed. The perennial stream located within the tract is Bartle Knob Run. Bartle Knob Run flows to Blue Lick Creek.

Soils

BbhA- Bartle silt loam, 0 to 2 percent slopes, 15.6 acres

This nearly level, deep, somewhat poorly drained soil found on flats on stream terraces. It is well suited to trees. There is a fragipan at about 26 inches which can restrict rooting depth. This soil has a site index of 75 for white oak and 85 for yellow poplar.

BcrAW- Beanblossom silt loam, 1 to 3 percent slopes, occasionally flooded, very brief duration, 10.6 acres

This nearly level, deep, well-drained soil is found along alluvial fans and flood plain. It is well suited to trees. Management planning should consider wet times of year. This soil has not been evaluated for site index.

BfbC2- Blocher, soft bedrock substratum-Weddel silt loams, 6 to 12 percent slopes, eroded, 6.8 acres

This moderately sloping, deep, moderately well drained soil is found on side slopes in the till plains. It is well suited to trees. Erosion hazards are a management concern that should be considered during implementation of Best Management Practices for Water Quality. Blocher has a site index of 76 for northern red oak and 90 for yellow poplar and Weddel has a site index of 70 for northern red oak and 75 for yellow poplar.

ComC- Coolville silt loam, 6 to 12 percent slopes, 3.4 acres

This moderately sloping, deep, moderately well drained soil is on side slopes in the uplands. It is well suited to trees. Erosion hazards are concerns that should be considered during implementation of Best Management Practices for Water Quality. This soil has a site index of 66 for northern red oak.

ConD- Coolville-Rarden complex, 12 to 18 percent slopes, 4.7 acres

These strongly sloping, deep, moderately well drained soils are found on side slopes in the uplands. It is well suited to trees. Erosion hazards are concerns that should be considered during implementation of Best Management Practices for Water Quality. Coolville has a site index of 66 for northern red oak and Rarden has a site index of 71 for black oak.

GmaG- Gnawbone-Kurtz silt loams, 20 to 60 percent slopes, 1.8 acres

This moderately to very steep, moderately deep, well drained complex is found on side. It is well suited to trees. The hazard of erosion and equipment limitations are main management concerns. These should be considered when planning management activities and implementing Best Management Practices for Water Quality. Kurtz has a site index of 60 for northern red oak and Gnawbone has not been evaluated.

PcrB2- Pekin silt loam, 2 to 6 percent slopes, eroded, 11.2 acres

This gently sloping, deep, moderately well drained soil is on alluvial terraces. It is well suited to trees and has a site index of 70 for white oak and 85 for yellow poplar.

StaAQ- Steff silt loam, 0 to 2 percent slopes, rarely flooded, 4 acres

This nearly level, deep, moderately well drained soil is on bottom land. It is flooded for brief periods, mainly in winter and spring. It is well suited to trees and has a site index of 88 for black oak and 107 for yellow poplar.

Access

Access to this tract is adequate. Bartle Knob Road runs the northern boundary of the tract. A soft parking area is present along the road. The tract itself has an old skid trail that leads to the remnants of a log yard.

Boundary

Tract 6301402 is surrounded by private property. The southwest corner of 6301402 connects with the northeast corner of tract 6301403. The western boundary is marked by a fence line while the northern boundary is marked by Bartle Knob Road. The southern boundary line is on

the side of a steep slope and no boundary markers were observed during data the inventory. The eastern boundary is not marked, but a private residence and agricultural field border it.

Ecological Considerations

This tract contains diverse vegetation and wildlife resources (age, type, structure) conducive to providing habitat for a variety of wildlife species. Habitat types include: oak-hickory canopy, mixed hardwood canopy, and riparian areas.

A Natural Heritage Database Review was completed for this tract. If Rare, Threatened or Endangered species (RTE’s) were identified for this tract, the activities prescribed in this guide will be conducted in a manner that will not threaten the viability of those species.

The Indiana DNR Division of Forestry has developed compartment level guidelines for snag tree retention, an important wildlife feature. Snags are standing dead or dying trees. Snags provide value in a forest in the form of habitat features for foraging activity, den sites, decomposers, bird perching, bat roosts, squirrel caches, and stores a wide variety of invertebrates. As time passes, these snags fall contributing to the nutrient cycling as downed woody debris (DWD). DWD decomposes providing nutrients for remaining and new vegetative growth as well contributing to the complexity of the forest floor.

	Maintenance Level	Optimal Level	Inventory Data	Above Maintenance	Above Optimal
Snags 5”+	40	70	85	45	15
Snags 9”+	30	60	85	55	25
Snags 19”+	5	10	11	6	1

Snag data is only for the oak-hickory cover type. The other cover types were younger and snag data was not captured due to most snags were down. Prescribed management in the oak-hickory cover type should maintain or improve current snag levels.

This tract has a heavy presence of invasive species. The invasive plants observed included Japanese honeysuckle, oriental bittersweet, Ailanthus, multiflora rose, and Japanese stilt grass. The densities of the plants vary depending on where you are in the tract, but in certain locations their presence is heavy.

Recreation

Recreational opportunities include hunting, wildlife viewing, and foraging. Hunting is the main recreational use.

Cultural

Cultural resources may be present, but their location is protected. Adverse impacts to significant cultural resources will be avoided during any activities.

Tract Subdivision Description and Silvicultural Prescription

The current inventory was completed February 5, 2019, by foresters Alwine and Bartlett. A summary of those results are below. The mesic oak-hickory cover type was the only cover type where tree data was collected. The remaining 48 acres were reviewed and described below. This tract is divided into five different cover types based on species composition, age, and required management. They are mesic oak-hickory, pine, mixed hardwoods (young), mixed hardwoods, and dry oak hickory.

Mesic Oak-hickory – 10.3 acres

This cover type is almost entirely white oak. There are a few black oaks scattered throughout. Advanced regeneration is primarily pignut hickory and American beech. There are areas that have a high density of white oak regeneration, with the average height being approximately 4'. The average overstory tree has a DBH of 18"-22". Although the trees have large diameters, they have short boles.

Trees per acre	65
Basal area per acre	85 ft ²
Approximate stocking	66%

Species	Bd. Ft. per acre
White oak	5,211
Black oak	168
Total	5,379

This cover type would benefit from a timber harvest utilizing single tree selection to release select trees of high quality, while removing low quality competitors. Group selection or patch cut would be beneficial in areas that show sign of overstory dieback. There are areas with sufficient, desirable regeneration that should be targeted for openings.

The prescribed management is not recommended until invasive species and vine management are performed.

Pine – 8.8 acres

This cover type is young consisting of almost entirely 4"- 6" Virginia pine. There are some small diameter tulip poplar, red maple, and sweetgum scattered throughout. This area was previously declining Virginia pine harvested in 1998. Approximately 93,398 board feet was removed during the harvest. The resource management guide from 1998 indicated excessive pine blowdown recommending the harvest. The expected regeneration for this site was: red maple, tulip poplar, black cherry, and sweetgum. Most of this cover type area returned to Virginia pine.

Invasive species are present on the eastern edge. Oriental bittersweet, Japanese stiltgrass, Japanese honeysuckle, and multiflora rose were observed and should be treated.

Invasive species management and vine control should be conducted in this cover type. Timber stand improvement in the form of thinning out the less desirable species for this site while

releasing healthier stems and desired hardwood species is also prescribed. A prescribed fire in this area would decrease some of the invasives present, while assisting in the establishment of our desired hardwood species by reducing the shade tolerant species.

Mixed hardwoods (young) – 16.4 acres

The young mixed hardwoods cover type is composed of American beech, red maple, American sycamore, blackgum, eastern red cedar, and a few aspens. The site is more mesic, but the trees have poor form. The average DBH is approximately 8” with a few trees being 12”-14”. This cover type is mainly present on the eastern portion of the tract and borders a residence and an agriculture field. This border is heavily occupied with Japanese stiltgrass, oriental bittersweet, multiflora rose, and Japanese honeysuckle.

This cover type should have invasive species management prior to other management activities. Trees should advance a few more years following invasive work before thinning to release desired trees to promote diversity.

Mixed hardwoods – 18.6

This cover type is mostly yellow poplar and sweet gum. The average DBH of overstory trees is 12”-14”. Understory regeneration is almost entirely American beech, with an average DBH of 6”- 8”. Oriental bittersweet, Japanese honeysuckle, multiflora rose, and Japanese stiltgrass are all present, but not as dense as in the young mixed hardwoods. Although there are less invasive species, there is a high density of vines.

Invasive species and vine control are priority in this cover type. In the future, a midstory treatment should be implemented to reduce the density of a shade tolerant species.

Dry Oak-Hickory – 3.9

This cover type occurs on the southern border of the tract. Slopes within this cover type are north facing and steep. The overstory is primarily mature chestnut oak. The area is less than four acres. Since the only access to this site requires crossing a soft-bottomed, perennial stream, no management is prescribed at this time. Future evaluations for invasive species are recommended.

Summary Tract Silvicultural Prescription and Proposed Activities

This tract has a variety of cover types at different stages. The priority for these cover types is treating the invasives present and controlling vines prior to other management activities. After treatment of invasives, a timber harvest would be feasible in the mesic oak-hickory cover type. The harvest would remove between 10,000 – 15,000 bdf focusing on single tree selection to improve spacing and continued health of the tract. Group selection may be used as well in areas where mortality is present to encourage the regeneration and retention of a new cohort. Timber stand improvement should be completed in the younger cover types of mixed hardwoods and pines to thin lesser quality stems and encourage healthy site-specific species composition. Timber stand improvement in the form of a midstory removal of some of the shade tolerant species should also be conducted in both the young mixed hardwood cover type and the mixed hardwood cover type. A prescribed fire would be beneficial as well to encourage desired species composition and decrease the presence of invasives.

Other considerations

Regeneration evaluation

Three to five years after the completion of the timber harvest, a regeneration evaluation will be performed to ensure that desired regeneration is occurring within the harvest area. If deemed unsatisfactory, mitigations will be made.

Timber Stand Improvement (TSI)

A midstory treatment in the mixed hardwood stand to lower the density of shade tolerant species is recommended. Understory beech are approaching a size that is more difficult to perform cut stump treatments, thus a basal bark application is recommended.

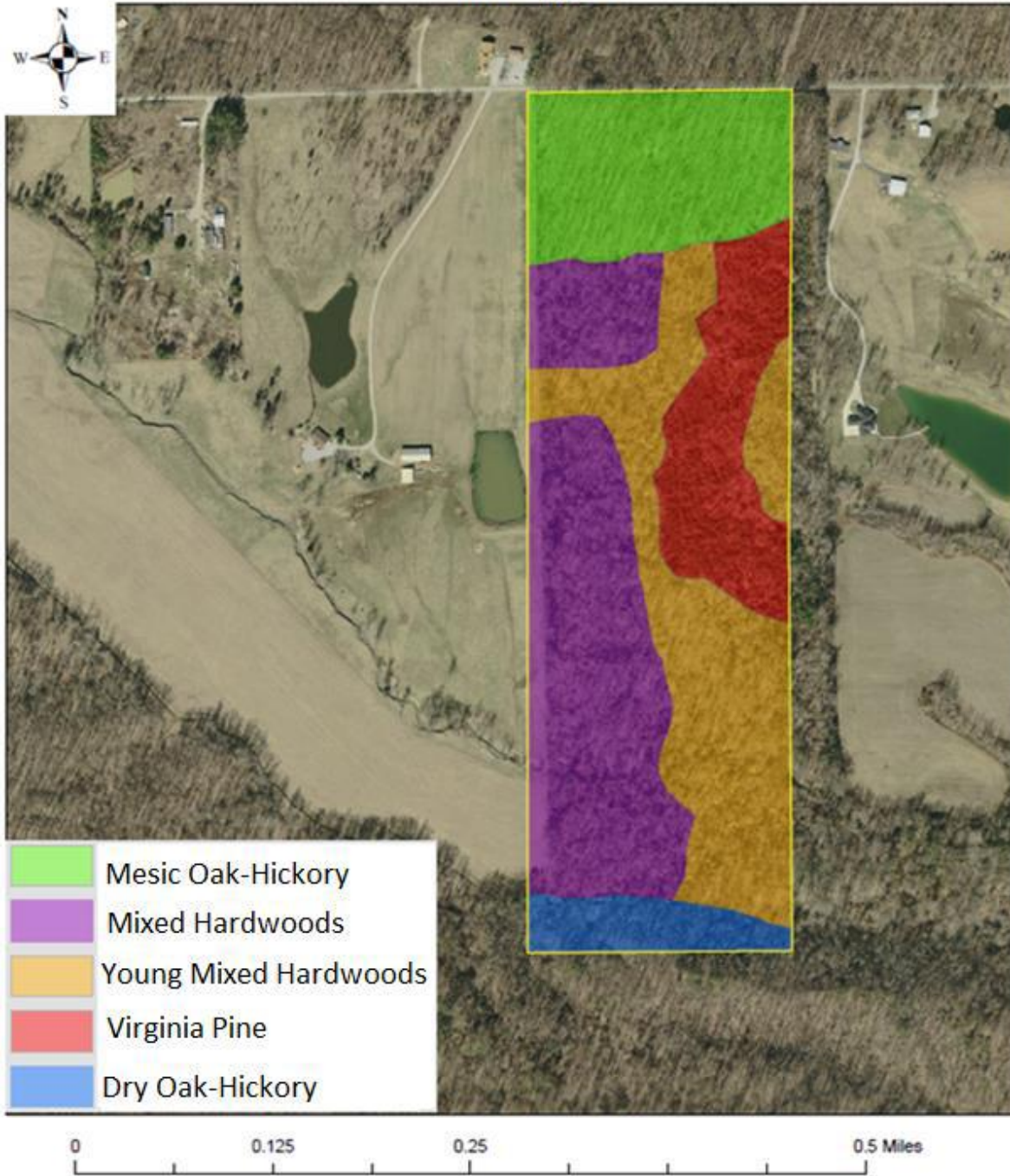
Prescribed burn

A prescribed burn would be beneficial in the mixed hardwood, pine, and oak-hickory stand. The goal of a fire in the mixed hardwood and pine stand is to reduce the density of invasive species, and the goal of a fire in the oak hickory stand is to reduce the amount of shade tolerant regeneration.

Proposed Activities Listing

	<u>Proposed Date</u>
Invasive species management	2022-2024
Timber stand improvement	2022-2024
Timber harvest (mesic oak-hickory)	2024-2027
Post-harvest TSI and invasive species management	Within 2 years post-harvest
Post-harvest regeneration inspection	3-5 years post-harvest
Prescribed fire regime	2027+
Inventory and resource management guide	2034

Clark State Forest
Compartment 14 Tract 2
Cover Types



Clark State Forest
Forester: Alwine and Hanners
Acres: 235 acres
Management Cycle End Year: 2041

Compartment:14 **Tract:** 3
Date: August 2021
Forested Acreage: 235 acres
Management Cycle Length: 20

Location

Compartment 14 tract 3, also known as 6301403, is located within the South half of section 27, T1N, R6E in Clark County, Indiana. The tract is approximately 4 miles west of Memphis, Indiana and 1 mile north of Deam Lake State Recreation Area.

General Description

This tract is comprised of two cover type: mesic oak-hickory and mixed hardwoods. The dominant overstory tree species is white oak. The dominant regeneration in this tract is American beech and red maple. In the mixed hardwoods cover type, a large portion is a young stand caused by high pine mortality. Invasive species are most prevalent in the mixed hardwoods cover type, near Bowery Creek. The Knobstone Trail runs through the southwest portion of the tract. Invasive species management in this tract should focus on treating invasive species around the riparian areas. Since a majority of this area has a white oak dominated overstory, the timber management and timber stand improvement will work to promote and regenerate oak and hickory species. Reducing the shade tolerant understory and creating canopy gaps to allow more light are two ways to accomplish this goal.

History

- Land acquisition from Lawrence in 1940
- Land acquisition from Driedel in 1941
- Management guide written in 1975
- Inventory completed in 1986 for State Forest Inventory Program
- Land acquisition from New Washington State Bank in 1987
- Land acquisition from Howser and Carter in 2008
- Inventory and resource management guide written in 2009
- Inventory completed in 2021 by Alwine and Hanners
- Resource management guide completed in 2021 by Alwine and Hanners

Landscape Context

The land to the south and west of this tract are forested state forest property. A separate forested parcel of state forest, tract 6301402, lies to the northeast. The sections to the north and east of this tract are private property. The private property consists of a mixture of agricultural fields and residential homes. Within a mile of the property, approximately 75% of the land is forested.

Topography, Geology and Hydrology

This tract is comprised of one main ridge that runs from the northwest corner to the southeast corner of the tract. The end of another ridge makes up the southeast portion of the tract. The slope varies from relatively flat in the bottoms to moderately sloped.

Tract 6301403 is located within the Silver Creek Watershed. There are three mapped intermittent streams located within this tract. Bowery Creek runs along the southern edge of the tract. Two unnamed intermittent streams flow from the interior of this tract and eventually flow into Bowery Creek east of the tract. Bowery Creek flows northeast and runs into Blue Lick Creek. Blue Lick Creek flows into Silver Creek. A small portion of the water in this tract flows north through ephemerals into Bartle Knob Run. Bartle Knob Run flows east and eventually runs into Blue Lick Creek as well. General riparian management zone (RMZ) guidelines will be implemented in these areas in accordance with the Indiana Logging and Forestry Best Management Practices Field Guide.

Soils

BbhA- Bartle silt loam, 0 to 2 percent slopes, 1 acre

This nearly level, deep, somewhat poorly drained soil found on flats on stream terraces. It is well suited to trees. There is a fragipan at about 26 inches which can restrict rooting depth. This soil has a site index of 75 for white oak and 85 for yellow poplar.

BcrAW- Beanblossom silt loam, 1 to 3 percent slopes, occasionally flooded, very brief duration, 15.9

This nearly level, deep, well-drained soil is found along alluvial fans and flood plain. It is well suited to trees. Management planning should consider wet times of year. This soil has not been evaluated for site index.

ComC- Coolville silt loam, 6 to 12 percent slopes, 25.8 acres

This moderately sloping, deep, moderately well-drained soil is on side slopes in the uplands. It is well suited to trees. Erosion hazards are concerns that should be considered during implementation of Best Management Practices for Water Quality. This soil has a site index of 66 for northern red oak.

ConD- Coolville-Rarden complex, 12 to 18 percent slopes, 111.5 acres

These strongly sloping, deep, moderately well-drained soils are found on side slopes in the uplands. It is well suited to trees. Erosion hazards are concerns that should be considered during implementation of Best Management Practices for Water Quality. Coolville has a site index of 66 for northern red oak and Rarden has a site index of 71 for black oak.

DbrG- Deam silty clay loam, 20 to 55 percent slopes, 3.6 acres

This moderately to very steep, deep, well-drained soil is on side slopes in the uplands. It is suited to trees. Equipment limitations and erosion hazards are concerns that should be considered during sale layout and implementation of Best Management Practices for Water Quality. This soil has not been evaluated for site index.

GmaG- Gnawbone-Kurtz silt loams, 20 to 60 percent slopes, 77.5 acres

This moderately to very steep, moderately deep, well-drained complex is found on side. It is well suited to trees. The hazard of erosion and equipment limitations are main management concerns. These should be considered when planning management activities and implementing Best Management Practices for Water Quality. Kurtz has a site index of 60 for northern red oak and Gnawbone has not been evaluated.

Access

This tract can be accessed by foot via the Knobstone Trail, which runs through the southeastern part of the tract. Reed Road gives access to the ridge directly south of the tract. Another access point for vehicles is from Flower Gap Road. A gated lane leads to a drivable multipurpose trail that eventually meets up with Reed Road.

Boundary

This tract is bordered by private property on the north, east, and southeast sides. The west and southwest sides border State Forest. The State Forest tracts that border it include 6301401, 6301209, and 6301503 to the west, southwest, and south respectively. The northeast corner of the tract touches the southwest corner of 6301402.

Ecological Considerations

This tract contains diverse vegetation and wildlife resources conducive to providing habitat for a variety of wildlife species. Habitat types include: mesic oak-hickory, mixed hardwoods, and riparian areas.

The Indiana DNR Division of Forestry has developed compartment level guidelines for snag tree retention, an important wildlife feature. Snags are standing dead or dying trees. Snags provide value in a forest in the form of habitat features for foraging activity, den sites, decomposers, bird perching, bat roosts, squirrel caches, and stores a wide variety of invertebrates. As time passes, these snags fall contributing to the nutrient cycling as downed woody debris (DWD). DWD decomposes providing nutrients for remaining and new vegetative growth as well contributing to the complexity of the forest floor.

	Maintenance Level	Inventory	Available Above Maintenance
Snags 5”+	940	3,154	2,214
Snags 9”+	705	2,646	1,941
Snags 19”+	118	335	217

Snags in this tract exceeded maintenance levels for all three size classes. Management in this tract should attempt to maintain snag densities.

Invasive species are present in the tract. The most prevalent is Japanese stilt grass which occurs near the drainages and blue line streams. There are also small, scattered pockets of Japanese honeysuckle, burning bush, multiflora rose, ailanthus, and oriental bittersweet which occur mainly in the mixed hardwoods portion of the tract. Invasive species management should focus on limiting the spread of the Japanese stilt grass beyond the drainages and managing the localized pocket of ailanthus, oriental bittersweet, and burning bush present near Bowery Creek.

A Natural Heritage Database Review is part of the management planning process. If Rare, Threatened or Endangered communities 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.

Recreation

This tract's main recreational use is visitors hiking or back packing on the Knobstone Trail. The Knobstone Trail would be temporarily rerouted out of the tract during active harvest operations. It would return to the original location following management activities. Hunting also occurs within the tract. Multiple deer stands were noted during the inventory as well as one trail camera. Wildlife viewing and foraging are other recreational opportunities available.

Cultural

This tract was reviewed for cultural sites during the forest resource inventory. Cultural resources may be present on this tract, but their location(s) are protected. Adverse impacts to significant cultural resources will be avoided during any management or construction activities.

Tract Subdivision Description and Silvicultural Prescription

The current forest resource inventory was completed in the summer of 2021 by foresters Alwine and Hanners. An overview of the inventory results are located in the table below. Trees larger than 11 inches in DBH and of merchantable quality are included in volume summaries and considered "sawtimber trees."

Species	Sawtimber Trees	Total Bd. Ft.
White oak	6,290	1,173,510
Scarlet oak	491	99,300
Chestnut oak	460	70,710
Black oak	278	61,390
Virginia pine	278	53,440
Yellow-poplar	185	36,990
Sweetgum	134	23,640
Pignut hickory	114	17,100
Red maple	84	12,620
Shagbark hickory	25	2,990
American beech	32	2,730
Sugar maple	32	2,730
Tract Total	8,403	1,557,150

For the purpose of this guide, this tract is divided into two management cover types based on forest composition: mesic oak-hickory and mixed hardwoods. Below are the cover type descriptions.

Descriptions:

Mesic Oak-Hickory, 194 acres

This cover type stretches across the central and northeastern part of the tract encompassing more than 80% of the tract acreage. This cover type is fully stocked at 73%. White oak is the dominant overstory species making up 80% of the merchantable volume within the cover type. The size of

the trees varied depending on their location within the tract with some of the smaller trees being located on the upland sites and the larger trees being found on the lower slopes. The average sawtimber tree had a volume of 185 board feet. The overstory mortality in this cover type was moderate, with most of the declining trees being Virginia pine. There were a few pockets where the chestnut oak was in decline. The regeneration in this cover type varied greatly. Much of the regeneration was dominated by shade tolerant species including American beech, red maple, ironwood, sugar maple, and some hickories. Small ground level oaks were present throughout a majority of the cover type, even where shade tolerant plants were located in the understory. In scattered pockets along the poorer soils of the ridgetop the oak regeneration was advanced without a shade tolerant layer of growth suppressing them. These areas tended to have more of the common upland site species present including hillside blueberry, greenbrier, and American dittany.

Trees per acre: 97	Percent stocking: 73 (fully stocked)
Basal area: 90	Volume per acre: 6,966 bdf

Species	Volume per acre
White oak	5,514
Scarlet oak	467
Chestnut oak	332
Black oak	288
Virginia pine	193
Pignut hickory	80
Sweetgum	49
Red maple	16
Shagbark hickory	14
American beech	13
Total	6,966

Mixed Hardwoods, 41 acres

This cover type varied greatly from the mesic oak-hickory cover type. The dominant tree was sweetgum and yellow poplar. Using a 1955 aerial photo, it was discernable this cover type was primarily Virginia pine at that time. Unfortunately, Virginia pine cover types do not do well as homogenous cover types and tend to suffer from mass blowdown and mortality. These trees do not self-thin well and do not establish strong root systems. During the time of the inventory, most of the Virginia pine had blown down and the stand was regenerating back into mixed hardwoods. Most of the regeneration was American beech, sweetgum, red maple, sugar maple, and yellow poplar.

Trees per acre: 155	Percent stocking: 72
Basal area: 82	Volume per acre: 3,358 board feet

Species	Volume per acre
Yellow-poplar	1,668
Sweetgum	598
Virginia pine	557
Red maple	411
Sugar maple	123
Total	3,357

Silvicultural Prescriptions:

Mesic Oak-Hickory, 194 acres

Proposed management in this cover type would work to help maintain and enhance the oak and hickory species found. The overstory is currently dominated by oaks while the regeneration is mostly shade tolerant with some small pockets of advanced oak regeneration. This cover type is also fully stocked and has moderate to relatively high mortality in some areas. The desired future condition is a healthy cover type stocked with oak and hickory species of all age classes.

A timber harvest is prescribed in this cover type. This harvest should work towards removing declining stems and releasing trees to maintain the oak-hickory cover type. In a majority of this cover type, the regeneration is shade tolerant. The marking through these areas of the cover type should be a selective thinning. In the pockets of high mortality, regeneration openings or patch cuts could be used to promote the regeneration of shade intolerant species. In areas with existing oak and hickory regeneration, a shelterwood style harvest could be used to remove part of the overstory to allow more sunlight to reach the saplings and seedlings. Regeneration openings could also be used where the regeneration is more advanced to release the new cohort of oaks.

Midstory work could be completed to reduce the presence of shade tolerant species while increasing sunlight for oak and hickory seedlings. This could be done mechanically through chainsaw work, chemically, and/or with the use of prescribed fire. Prescribed fire would likely be the most cost-effective way to accomplish these goals. Post-harvest timber stand improvement (TSI) should follow the harvest to remove any marked stems which need removal, treat invasive species, and complete any regeneration openings.

Mixed Hardwoods, 41 acres

The desired future condition for this cover type is a healthy cover type with fewer invasive species and an overstory dominated by species such as yellow-poplar, hickories, and maples. Timber could be removed from this cover type as part of the same harvest as the oak-hickory cover type. Despite the low volume, areas of this cover type would benefit from an improvement harvest. In the areas of new growth, the harvest should be light and focused primarily on salvaging Virginia pine before they succumb to blowdown. In the areas that have less mortality, yellow-poplar, sugar maple, sweetgum, and red maple could be selected as trees to be released.

Many of the invasive species within this tract are found in this cover type close to Bowery Creek. These invasive species should be treated pre-harvest with post-harvest follow-up. Only

certification approved herbicides are to be used. Large shrubs, vines, and trees could be treated first to help control local seed sources and the remaining ground covering invasive species could be treated second. Post-harvest TSI could be used to finish releasing crop trees, deadening culls, and to thin the younger areas of the cover type.

Summary Tract Silvicultural Prescription and Proposed Activities

Overall, the goal is to promote and sustain the cover types that are present, promoting and enhancing the oak-hickory component while controlling invasive species. In the first few years of the management cycle, focus should be controlling invasive species prior to the prescribed timber harvest with a focus on preventing their spread to new areas. A harvest could be implemented to promote oak generation removing an estimated 350,000 - 425,000 bdft. A secondary focus during this harvest, could be to remove the small pocket of Virginia pine with the intention of regenerating the area back to a cover type of mixed Virginia pine and oak species. After the harvest is completed, invasive species control and post-harvest TSI could be implemented. The TSI could be focused on releasing oak regeneration, releasing trees to achieve desired conditions, and decreasing the presence of maple, beech, and ironwood regeneration in the mesic oak-hickory cover type. A fire regime could be established within the tract to promote a more open midstory forest. It could be started post-harvest and could be burned every 5-10 years. This tract could be burned with other surrounding tracts to make a larger burn area.

Other considerations

Regeneration evaluation – Three to five years after the completion of the timber harvest, a regeneration inspection will be performed to ensure that desired regeneration is occurring within the harvest area. If deemed unsatisfactory, mitigations will be made.

Timber stand improvement (TSI) – TSI could be performed within two years of timber harvest completion. TSI is prescribed to complete regeneration openings, remove species inhibiting desirable regeneration, and address problem occurrences of invasive species.

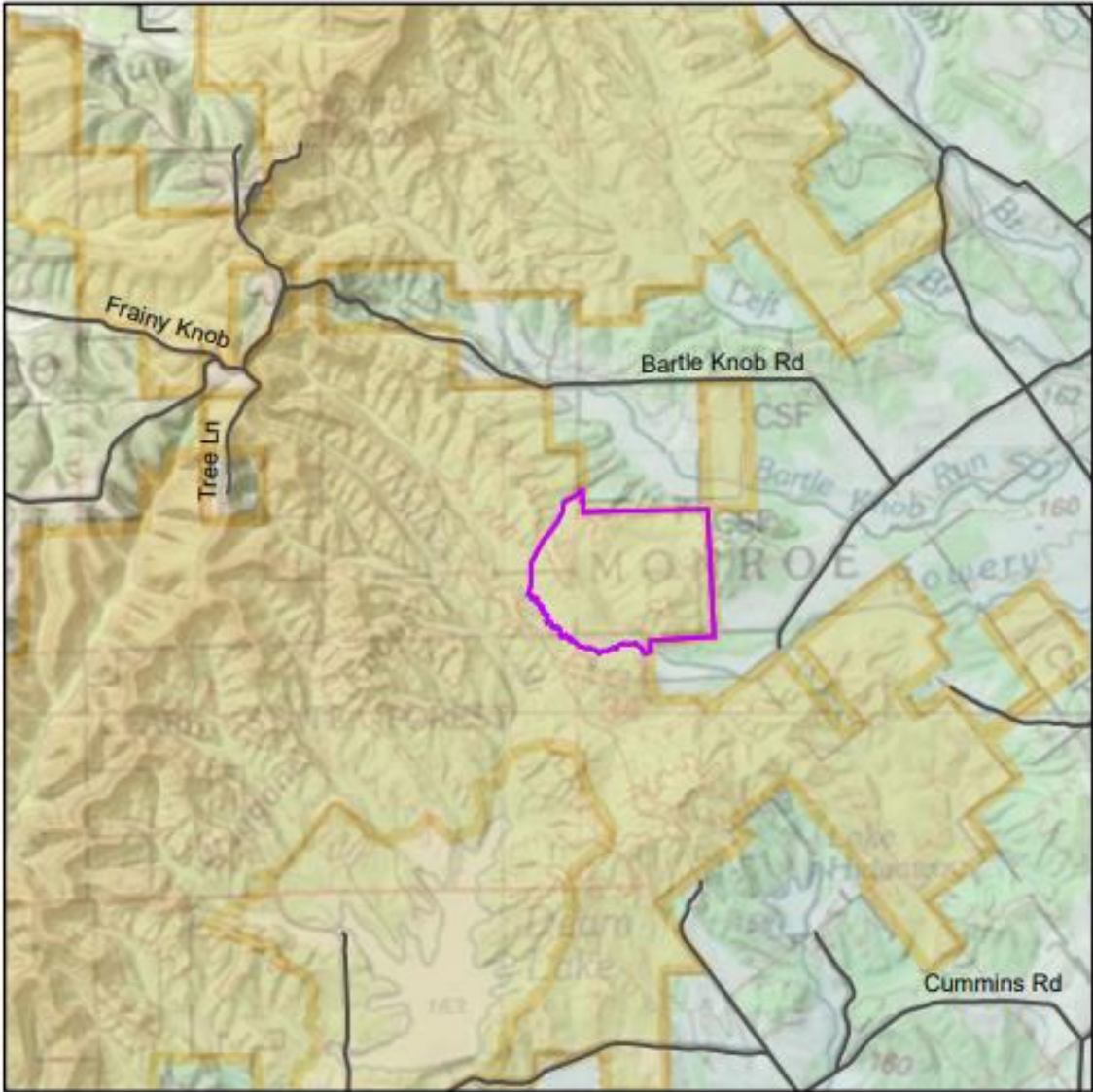
Best management practices (BMP) – During and after completion of the proposed management activity, BMPs will be implemented in order to minimize soil erosion.

Guide revision – This tract should receive another inventory and management guide approximately 20 years following the completion of this inventory.

Prescribed fire – A regime of prescribed fire may be started within this tract to reduce the abundance of shade tolerant species in the midstory and to help control invasive species.

Proposed Management Activity	Proposed Date
Invasive species management	2022-2023
Timber harvest	2022-2025
Post-harvest TSI and invasive species management	Within 2 years post-harvest
Post-harvest regeneration inspection	3-5 years post-harvest
Prescribed fire regime	2025+
Re-evaluate tract	2041

Compartment 14 Tract 3



State Forest



Tract

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Miles

Clark State Forest
Compartment 14 Tract 3
Cover Types

