

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

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 similar to 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, American 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 similar to 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.

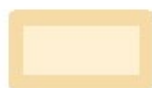
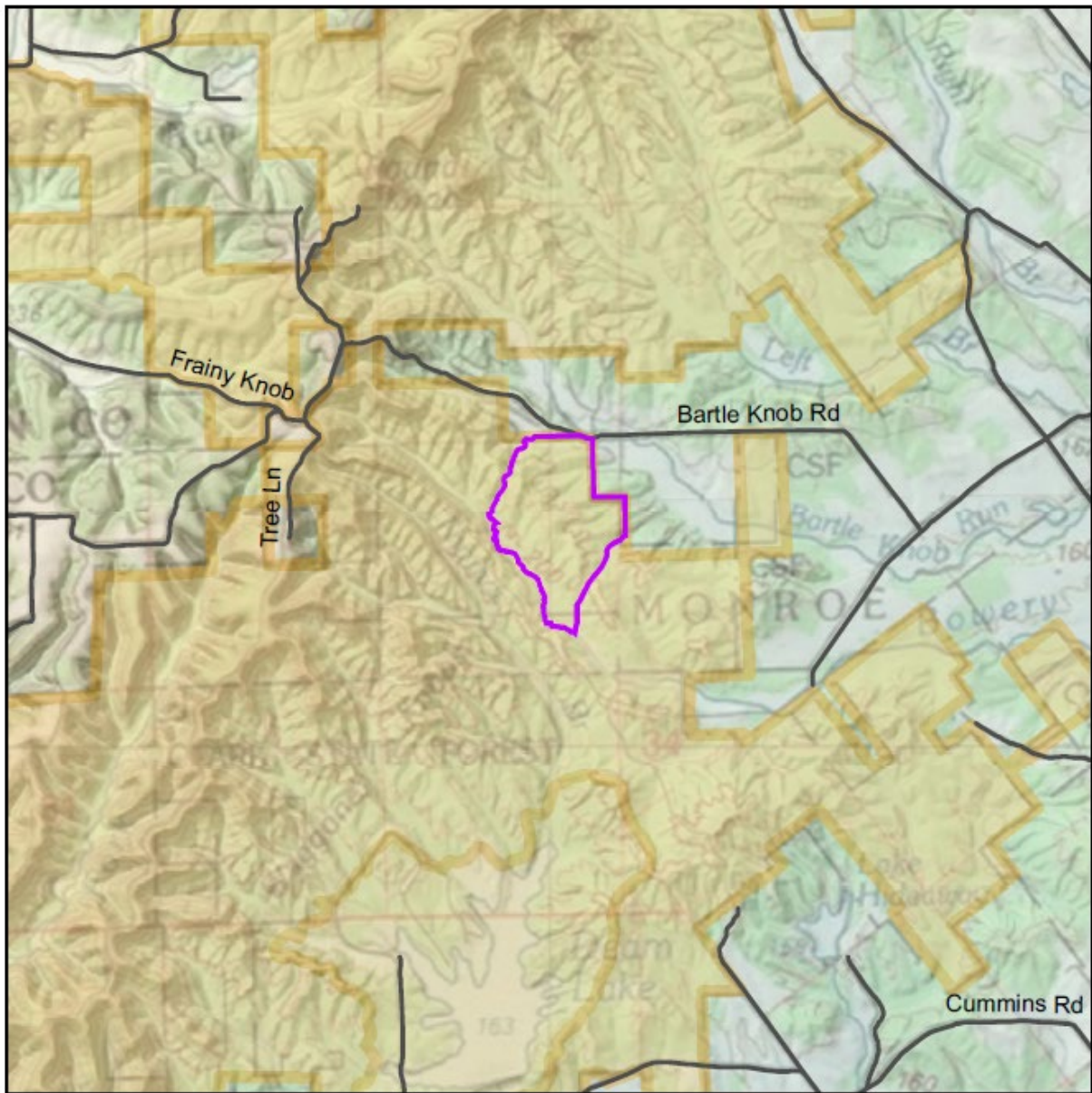
Best management practices (BMP) – During and after completion of the proposed management activity, BMPs will be implemented to minimize soil displacement and protect waterways.

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

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Miles