RESOURCE MANAGEMENT GUIDE

Harrison-Crawford State Forest	Compartment: 21 Tract: 3
Forester: Dwayne Sieg	Date: July 2008
Management Cycle End Year: 2028	Management Cycle Length: 20 Yrs.

Location
Section 36, T3S, R2E; Section 31, T3S, R3E; Section 1, T4S, R2E; And Section 6, T4S, R3E. Tract is in Harrison Township, Harrison County, Indiana. Tract 3 is about 8-9 miles southwest of Corydon, Indiana.

General Description
Compartment 21, tract 3 is 110.5 acres in size. It is a closed canopy forest with mostly sawtimber size stands. Tract 3 has a forest cover of native hardwood species. The primary cover type is oak-hickory, with a majority of the species within being white, chestnut, black, and red oaks with lesser amounts of hickories, white ash, and sugar maple. There is an above normal amount (for this State Forest) of chestnut oak present with a chestnut oak cover type taking in most of the central ridge top and upper slopes on the north and west slopes. There is a small area of chestnut oak along the southeastern tract border that extends into tract 4 to the south. The mapped mixed hardwood type on the ridge top is naturally succeeded hardwoods of small size, poor form and contains a minor amount of e. red cedar. There is a small area along the intermittent stream on the western edge that was classified as beech maple. Another small area of mixed hardwoods, containing largely yellow poplar, sugar maple, and oaks is near the northeastern corner of the tract. In general, tract 3 is considerably overstocked. This condition may account, in part, for the above normal mortality in the chestnut oak stands. As a side note, the chestnut oak mortality in tract 3 does not compare to that observed in tract 4 to the south. Some very old fire damage was noted in the north central and northeastern portions of the tract.

History
Acquisition history includes 131.105 Doolittle 1940; 131.130 Breeden 1944; 131.149 Brown 1949; 131.260 Funk 1988. The majority of the acreage was acquired during the 1940s. The use of tract 3, prior to State ownership was mostly woodland pasture with a small portion (~3acres) of once tilled ground on the narrow ridge top in the center of the tract. A public roadway once ran through the central part of the tract. This road was never paved, had eroded badly, and is long abandoned. While it was most likely that all of the forested ground in the tract had been cut prior to acquisition, it is known that the Funk acquisition received an unregulated

cut in 1985-86. There were various management activities involving tract 3 prior to the Funk acquisition. Up until then, tract 3 was listed as having 63 acres. An inventory was conducted in September, 1977 (D. Martin) and again in April 1984 (McQuade). No management guide or data analysis was apparently completed for the 1977 inventory. In 1984, a management guide was written for the tract. It prescribed an intermediate harvest over most of the tract. Such a harvest was marked, with marking completed on 4-18-85. The harvest included Compartment 21, tracts 1, 2, and 4. A tract document indicates that tract 3 had 102,062 bd.ft. contained in 378 trees with an additional 56 cull trees marked for sale. White oak comprised the most volume sold, but chestnut oak contributed the most numbers of trees. The stumpage was sold May 30th, 1985 to Coffman and Crosier. The harvest was completed by September 9, 1986. McQuade marked 494 trees for removal through timber stand improvement (TSI) in September 1986. TSI work was performed by prison labor soon after.

The Adventure Trail (hiking) was re routed through these tracts ca. 1989.

Landscape Context

There is considerable variation in the landscape around tract 3. The majority of the use of the land is forest land, both private and that owned by the State of Indiana. The next most common use is agricultural, primarily pasture/hay. A third, but less common use is that for single family residences. This last use is increasing, but at a fairly slow pace. Construction of dwellings is mostly occurring in former agricultural fields. Post Oak-Cedar Nature Preserve and O'bannon Woods State Park are located within a couple miles of the tract.

Topography, Geology and Hydrology

Tract 3 is located on moderately sloping ground with a change in elevation within the tract of about 230 feet. A narrow, short ridge line forms the central part of the tract. Slope aspects are primarily northerly or westerly. Geology should be typical for the immediate region with limestone under much of the tract and capped with sandstone bedrock under the ridge top and upper slopes. There were some karst features noted, particularly near the northeastern edge of the tract. These features were sinkholes or depressions. Although not observed during inventory, it is reported that a named cave (Valentine Pit) is located on the tract.

Soils

Gilpin Silt Loam (GlD2, GlD3, GlE2, GpF) 57.0 ACRES Moderately deep, strongly sloping to steep, well-drained soils. Surface layer is very dark grayish-brown silt loam about 3 inches thick. Subsurface layer is pale brown silt loam about 9 inches thick. Subsoil is about 17 inches thick. Depth to hard sandstone and shale bedrock is about 29 inches. Moderate in organic matter. Available water capacity is low and permeability is moderate. Runoff is rapid to very rapid.
Degree Slope: 12-30 %
Woodland Suitability Group: 3o10 or 3r12
Growth range potential (Upland oaks): **185-260** bd.ft./acre/year
Site Index: **70-80**
Management Concerns: Runoff and erosion

Hagerstown Silt Loam (HaC2, HaD2, HgC3, HgD3, HgE3) 27.8 ACRES Deep, moderately sloping to moderately steep, well-drained soils on uplands. Surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil is about 46 inches thick. The depth to limestone is about 52 inches. Characteristically, this soil is eroded to severely eroded. Moderate in content of organic matter and medium in natural fertility. Available water capacity is moderate or high, and permeability is moderate. Runoff is rapid to very rapid.
Degree Slope: 6-25 %
Woodland Suitability Group: 1o1 or 1r2
Site Index: **85-95** (Upland Oaks)
Growth range potential (Upland oaks)**: 300-375** bd.ft. /acre/year
Management Concerns: Runoff and erosion

Tilsit Silt Loam (TlB2) 9.59 ACRES Deep, gently sloping, modrately well drained soils on uplands. Fragipan in the lower part of the subsoil. Surface layer is dark yellowish-brown silt loam about 8 inches thick. Subsoil is about 38 inches thick. Depth to interbedded shale and sandstone bedrock is about 66 inches. Moderate in content of organic matter and low in natural fertility. Available water capacity is moderate and permeability is very slow. Runoff is medium.
Degree Slope: 2-6 %
Woodland Suitability Group: 3d9
Site Index: **70-80** (Upland Oaks)
Growth range potential (Upland oaks): **185-260** bd.ft./acre/year
Management Concerns: Erosion, wetness early in spring, available water capacity, lack of moisture in mid and late summer if rainfall is below normal.

Corydon Stony Silt Loam (CoF) 8.0 ACRES Shallow, moderately steep to very steep, well-drained, stony soils on uplands. Surface layer is about 3 inches. Subsurface is about 6 inches thick. Subsoil about 9 inches thick. The depth to hard limestone bedrock is about 18 inches. High in organic matter and low in natural fertility. Runoff is rapid or

very rapid. Soil type is characterized by limestone outcrops, with as much as 15% on benches which are deeper than 20 inches to bedrock.
Degree Slope: 20-60 %
Woodland Suitability Group: 3d7
Site Index: **65-75** (Upland oaks)
Growth range potential (Upland oaks): **155-220** bd.ft./acre/year
Management concerns: Runoff and erosion

Crider Silt Loam (CrB2, CrC2, CsB3, CsC3, CtC2) 5.04 ACRES Deep, gently sloping and moderately sloping well-drained soils on uplands. Surface layer is dark-brown silt loam about 8 inches thick. Subsoil is about 62 inches thick. Moderate in content of organic matter and in natural fertility. Available water capacity is high and permeability is moderate. Typically, these soils are eroded. Runoff is medium to rapid.
Degree Slope: 2-12%
Woodland Suitability Group: 1o1
Site Index: **85-95** (Upland Oaks)
Growth range potential (Upland oaks): **300-375** bd.ft./acre/year
Management Concerns: Runoff and erosion

Haymond Silt Loam (Hm) 2.4 ACRES Deep, nearly level, well-drained soils on bottom lands and in basins of sinkholes in uplands. Surface layer is dark-brown about 9 inches thick. Subsoil dark yellowish-brown about 17 inches thick. Underlying material is dark yellowish-brown stratified silt loam that contains less prominent layers of loam. Moderate in content of organic matter. Available water capacity is high, and permeability is moderate. Runoff is slow.
Degree Slope: 0%
Woodland Suitability Group: 1o8
Site Index: (**95-105**- no rating for upland oaks)
Growth range potential (Tulip poplar-no rating for oaks): **375-450** bd.ft./acre/year
Management Concerns: Flooding between December and June

Wellston Silt Loam (WeC2, WeC3, WeD2, WeD3) .62 ACRES Moderately deep and deep, moderately sloping and strongly sloping, well draineds soils on uplands. Surface layer is about 9 inches thick and yellowish-brown. The subsoil is about 31 inches thick. Depth to hard sandstone bedrock is about 40 inches. Moderate in content of organic matter and low in natural fertility. Available water capacity is moderate or high, and permeability is moderate. Runoff ranges from medium to very rapid.
Degree Slope: 6-18 %
Woodland Suitability Group: 3o10
Site Index: **70-80** (Upland oaks)
Growth range potential (Upland oaks): **185-260** bd.ft./acre/year
Management Concerns: Runoff and erosion

Soils on tract 3 deviate somewhat from what is normally found on the State Forest in that there are a higher percentage of productive soils (e.g. Hagerstown) as opposed to the usually more common types (e.g.

Corydon) that are not so productive. For the most part, these soils were not as heavily degraded by former farming practices, with the exception of the old field site on the ridge top and the abandoned public road. The average Site Index is estimated to be 79. Growth estimation can be made by comparing the last 2 inventories. Measured in terms of board feet, the estimated growth for this tract is 163 bd.ft. per acre per year.

Access

Access to tract 3 is obtained by following Old Forest Road to a 60' right of way. This right of way connects with the State Forest property to the east. Once into the body of the property, turn north or left, roughly following an abandoned public roadway to the tract.

Boundary

Property boundary lines form the north and northeast tract boundaries. There is a stone on the section line between sections 36 and 31 on the north line of the property. Much of the angled line at the NE side of the tract is not certain, but it has fencing or fence fragments along it. The deed specifies angle and distance for this line. An intermittent stream separates tract 3 from tract 4 along most of its southern boundary. The south central boundary follows a portion of the section line between Section 1, T4S, R2E and Section 6, T4S, R3E. A short section of the southern boundary is property boundary. This portion of the boundary was surveyed by the IDNR's surveyors in the ca. 1989. A corner monument and some steel 't' posts were installed at that time. The western boundary is a mapped intermittent stream channel that separates tract 3 from 2101 and 2102 to the west. There is a pile of stones at the intersection of the 4 sections that tract 3 is located in. See "Features" map.

Wildlife

A check of the Natural Heritage Database showed no rare or endangered species within the tract boundaries. However, several animal and plant species were noted in the surrounding sections. Animals (mostly cave invertebrates) were associated with Parker's Pit, a privately owned cave that has been observed to also be used by the endangered Indiana bat. Management practices in tract 3 should have no impact on this cave, as it is about ¼ mile away. Better Management Practices (BMPs) are to be followed when harvesting which will protect karst features. Current management guidelines to protect and enhance the bat habitat in the forest will be followed when conducting management. See the "Indiana Bat Habitat Guidelines" report (Appendix) to see how inventory numbers compare to the target numbers

for snag retention. The inventory showed a deficit for snags. While it is current practice to usually leave existing snags when conducting a harvest, a possible way to bring the snag numbers up to reach the target is to artificially create snags by girdling trees, preferably through post harvest TSI. Live cavity trees are also important to wildlife for nests and dens. Refer to the Appendix for target guidelines for live cavity trees. The inventory indicated that the tract is lacking in live cavity trees for diameter classes less than 19" DBH. The tract should have sufficient quantities of live cavity trees in the larger diameter range. It should be pointed out that the inventory might reflect a minimum number of live cavity trees on tract 3. Due to the 'leaf on' season, at least some cavities may have been hidden from view by foliage. Regeneration openings of 1-5 acres might be warranted during a managed harvest. As a side benefit, such openings will provide early succession habitat for several wildlife species, including feeding areas for the Indiana bat.

During a harvest, consider releasing shagbark hickories (particularly larger trees) from neighbors. Increased solar exposure to the hickory boles should improve their desirability by Indiana bats for maternity colony trees.

Wildlife species noted in tract 3 by sight, sign, or sound included pileated woodpecker, coyote, white tail deer, wild turkey, blue jays, box turtles, various songbirds and squirrels.

Communities

The prevailing cover community for tract 3 is upland central hardwood forest. The chestnut oak type with its associated species such as greenbrier has a higher presence in this tract than one would expect to find most other places in the State Forest. The review of the Natural Heritage Database indicated some plant species associated with dry or glade communities were within a mile of the tract and another species that most likely is found in wildlife waterholes. None of these plants were observed during inventory within the tract, as there were not similar sites in tract 3. Guidance from the Division of Nature Preserves will be sought as to provide best enhancement or protection for any such plants if they are found later on. The protected (on IDNR lands) ginseng plant was observed in a limited location in the tract.

There is a pocket of about ¼ acre in size that is infested with the exotic species Tree of Heaven (*Ailanthus altissima*) in the northeast corner of the tract, near the property line. The stems range from seedling/root sprouts to poles in size. No other exotic species were observed in tract 3 during inventory.

Recreation
It is likely that the primary recreational use for tract 3 is hunting, especially deer, squirrel, and turkey. A segment of the Adventure Trail (hiking) runs through the tract. It is known that Valentine Cave is occasionally visited by caving enthusiasts. Another anticipated (legal) recreation use of the tract is for mushroom hunters.

Cultural
Past use of tract 3 prior to purchase by the State was that of various agricultural purposes, including livestock pasturing, fuel wood production, and other timber products. There were no home sites located on the tract and none were indicated in the 1882 or 1906 County Atlases. There is the still obvious abandoned public road bed present.

Tract Subdivision Description and Silvicultural Prescription
The oak hickory cover type (about 80 acres) contains maturing or mature stems with white oak the main species. There is a common occurrence of black oak, red oak, and chestnut oak, with lesser amounts of pignut hickory, and white ash. There are minor numbers of sugar maple and shagbark hickory. The stands within this general type are typically overstocked, with basal area counts commonly exceeding 130 square feet per acre. This portion of tract 3 should receive an improvement harvest. Thin where needed and reduce the stocking levels to a more optimum level. The northeastern portion of this type contains the more productive sites of the tract. Timber size and quality have the best potential, there. The previously described pocket of Ailanthus needs controlled, as soon as possible, with herbicide.

The chestnut oak type (about 24 acres) is found along the ridge top and western upper slope, although another small area is found in a more mesic site along the southeastern border. The type is nearly pure in composition, with low numbers of white and black oaks and pignut and shagbark hickories present. This type is overstocked, even more so than the oak hickory type. There is a noticeable variation in form amongst the chestnut oak stems. Conduct an improvement harvest to provide crown release for better tree stems and thin to reduce stocking.

The 1.5 acre mixed hardwood type in the northeast corner contains a mixture of sawtimber size trees of various species, including yellow poplar, sugar maple, and white oak. Visual signs of drought damage on yellow poplar was noted. A general improvement harvest is recommended.

The small area of mixed hardwoods (old field succession) has little current potential to develop a high quality stand of trees. However, there is a limited amount of second story black oak poles and advanced oak regeneration that would likely be a preferred replacement for the current overstory. A log yard of about ¼ - ½ acre would be constructed in this area. On the portion of this stand with least potential for a log landing, where opportunities occur, remove the poor overstory through harvest or TSI to release the better understory.

Summary Tract Silvicultural Prescription and Proposed Activities

Prescription for these stand types would be similar. Conduct a harvest, reducing the basal area to approximate 80 square feet per acre. Scrutinize black oak trees for vigor, crown balance and position in canopy. In the State Forest, this species has been consistently showing signs of being mature and 'fading' out of the stands. Also closely evaluate yellow poplar trees as many have suffered negative effects of the 1999 and 2007 droughts, including accelerated mortality. Remove trees showing signs of crown dieback, stump 'watersprouts', short branchlets and above normal epicormic sprouting. Release crop trees by removing competitors on 1-3 sides of the tree. Under restrictions currently in place, do not remove shagbark hickories. Release shagbark hickories from crown competition where needed, preferably on their southern side. Favor cavity trees whenever possible without unduly hindering the release of crop trees. Modify marking along the Adventure Trail in a zone about a tree length of either side to aid aesthetics, but still allow for critical management of the trees within this 'buffer'. Minimize the number of skid trails crossing the hiking trail and cross at right angles. There may be opportunities for regeneration openings of 1-5 acres within the tract.

Proposed Activities Listing

Ailanthus control	Summer/fall 2008
Archeological site review	Summer/fall 2008
Mark property boundary	Summer/fall 2008
Road improvement/log yard construction	Fall/winter 2008-09
Mark improvement harvest (with 2104)	Fall/winter 2008-09
Sell est. 400,000 bd.ft.	Spring 2009
Post harvest TSI/opening completion	2011
Crop tree release in openings	2026-2031
Inventory/management guide	2028

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http://www.in.gov/surveytool/public/survey.php?name=dnr_forestry

You **must** indicate "Harrison-Crawford C21 T3" 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.

APPENDIX

Indiana Bat Habitat Guidelines

State Forest: Harrison-Crawford **Compartment Number:** 21 **Tract:** 03
Reference Number: 6452103 **Tract Acres:** 110.5

Live Trees - Entire Tract - Desired Species Only*

	Required	Inventory	Available For Removal
11" DBH+	994.5	3205	2211
20" DBH+	331.5	602	271

Snags - Entire Tract - All Species

9" DBH+	663	424	-239
19" DBH+	110.5	28	-82

***Desired Species Include:** AME, BIH, BLA, BLL, COT, GRA, REO, POO, REE, SAS, SHH, ZSH, SHO, SIM, WHA, WHO

SNAG AND CAVITY TARGET TABLES

Diameter (DBH) Distribution	Target Snag Density: Maintenance-level [a]	Target Snag Density: Optimal
TOTAL minimum of snags per acre **≥ 5"**:	**4**	**7**
Including at least this many snags per acre **≥ 9"**:	3	6
Including at least this many snags per acre **≥ 19"**:	0.5	1

[a] approximates current system-wide density of snags

	Live Cavity Trees per Acre	
Diameter (DBH) Distribution	**Maintenance-level**	**Optimal**
TOTAL minimum cavity trees per acre ≥ 7":	**4**	**6**
Including at least this many cavity trees per acre ≥ 11":	3	4
Including at least this many cavity trees per acre ≥ 19":	0.5	1

REFERENCES CITED

"Forestry Handbook" Northeastern Area, State & Private Forest Service, U.S. Department of Agriculture

"Soil Survey of Harrison County, Indiana" U.S. Department of Agriculture Soil Conservation Service In cooperation with Purdue University Agricultural Experiment Station, February 1975

Nature Serve Explorer-An Online Encyclopedia of Life

Indiana Heritage Database

Soils Harrison County GIS Layer, NRCS

Resource Management Guide, McQuade, 1984

Stocking, Growth, Species, Volume Summary

July 2008

Acres Commercial Forest: 110.5
Acres Noncommercial Forest:
Acres Permanent Openings:
Acres Other:
Acres Total: 110.5

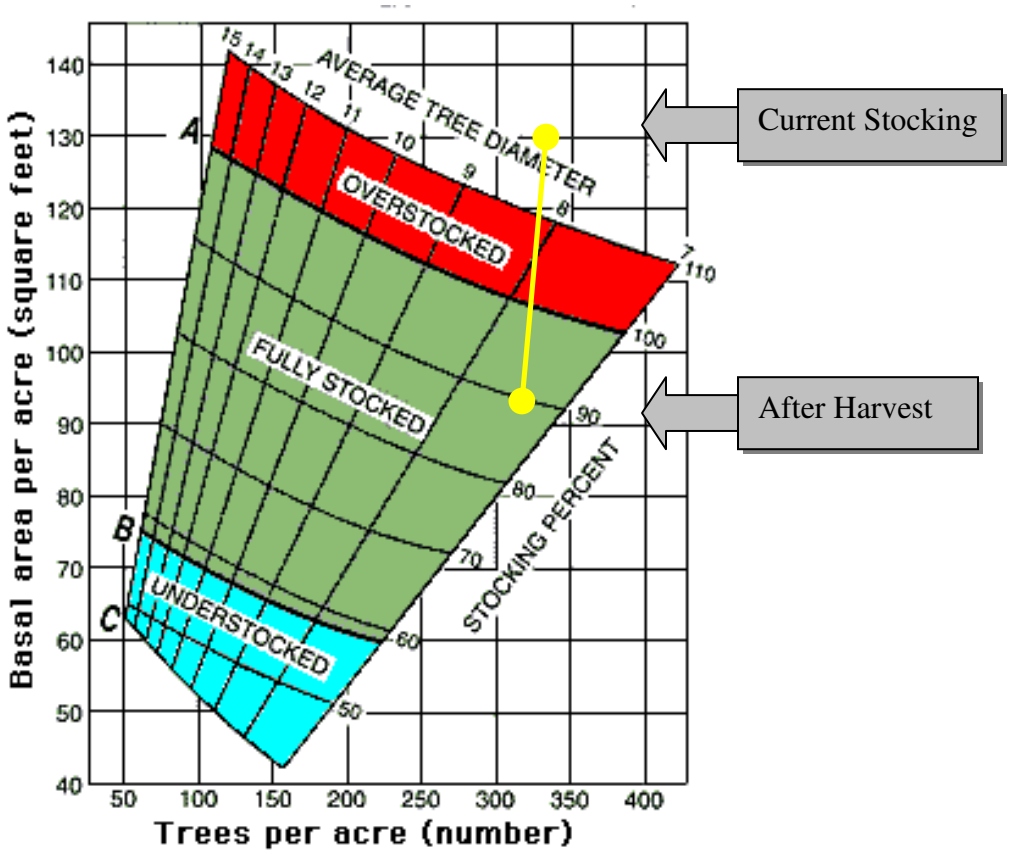
Basal Area ≥ 14 Inches DBH: 82.2
Basal Area < 14 Inches DBH: 44.2
Basal Area Culls: 4.2
Total Basal Area: 130.6
Number Trees/Acre: 340

Average Site Index: 79 Stocking Level: 110+% (A level, overstocked)
Calculated Annual Growth: 163 bd.ft./acre/year

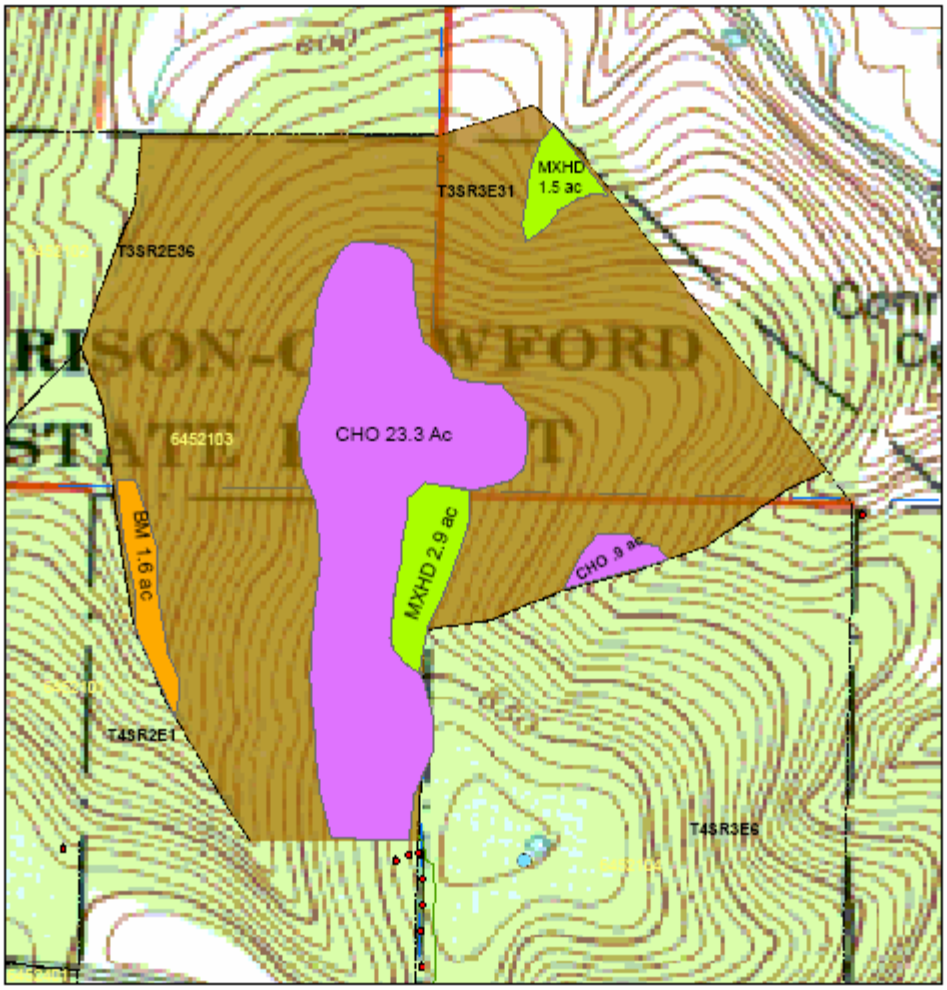
SPECIES	LEAVE VOL.	HARVEST VOL.	TOTAL VOL BD.FT.
American beech	3,350	1,890	5,240
Largetooth aspen	00	1,180	1,180
Bitternut hickory	1,640	00	1,640
Blackgum	3,350	2,410	5,760
Black oak	20,440	79,020	99,460
Chestnut oak	127,510	151,430	278,940
Chinquapin oak	4,480	1,640	6,120
Red oak	83,130	26,030	109,160
Pignut hickory	19,850	30,950	50,800
Yellow poplar	6,560	9,300	15,860
Scarlet oak	00	12,370	12,370
Shagbark hickory	35,940	00	35,940
Shumard oak	00	4,650	4,650
Sugar maple	10,900	8,880	19,780
White ash	3,870	11,470	15,340
White oak	225,300*	58,260	283,560
TOTALS	546,320	399,480	945,800
Per acre	4,940	3,620	8,560

*Includes an estimated 28 trees that contain prime logs

GINGRICH STOCKING CHART
Harrison-Crawford State Forest
Compartment 21, Tract 3
July, 2008



Harrison-Crawford State Forest
2103 COVER TYPE MAP
July 2008 D. Sieg



675 337.5 0 675 Feet

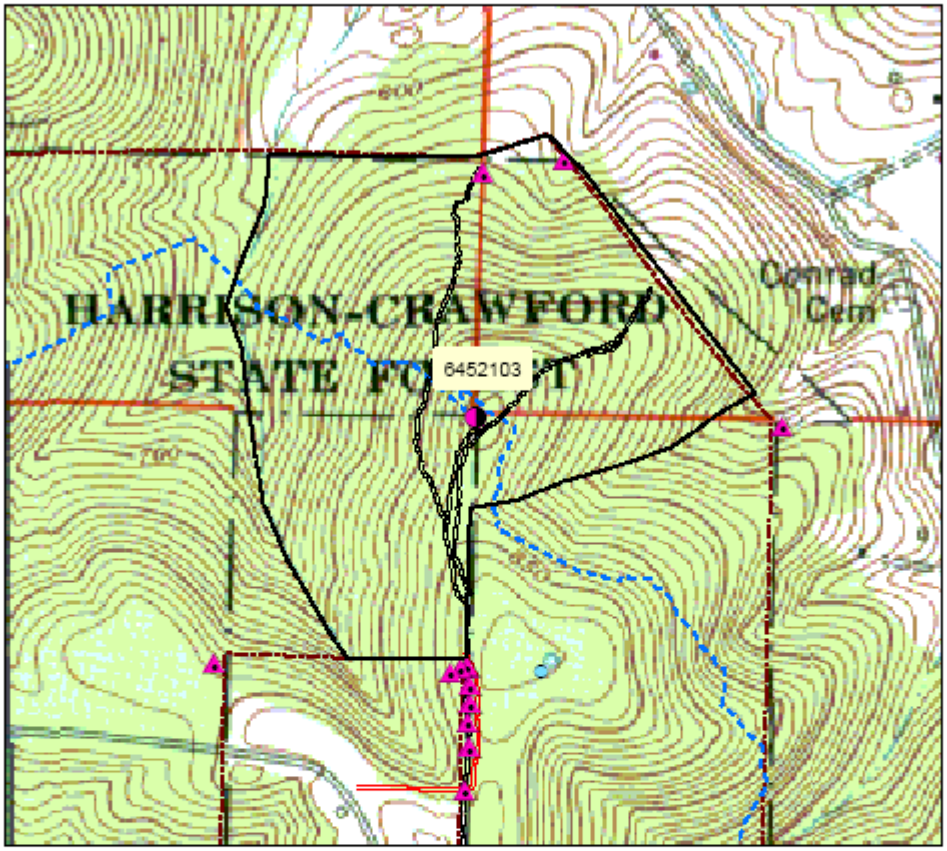
Oak-Hickory 80.3 acres

Chestnut Oak 24.2 acres

Mixed Hardwoods 4.4 acres

Beech-Maple 1.6 acres

Harrison-Crawford State Forest
FEATURES MAP
July 2008 D. Sieg

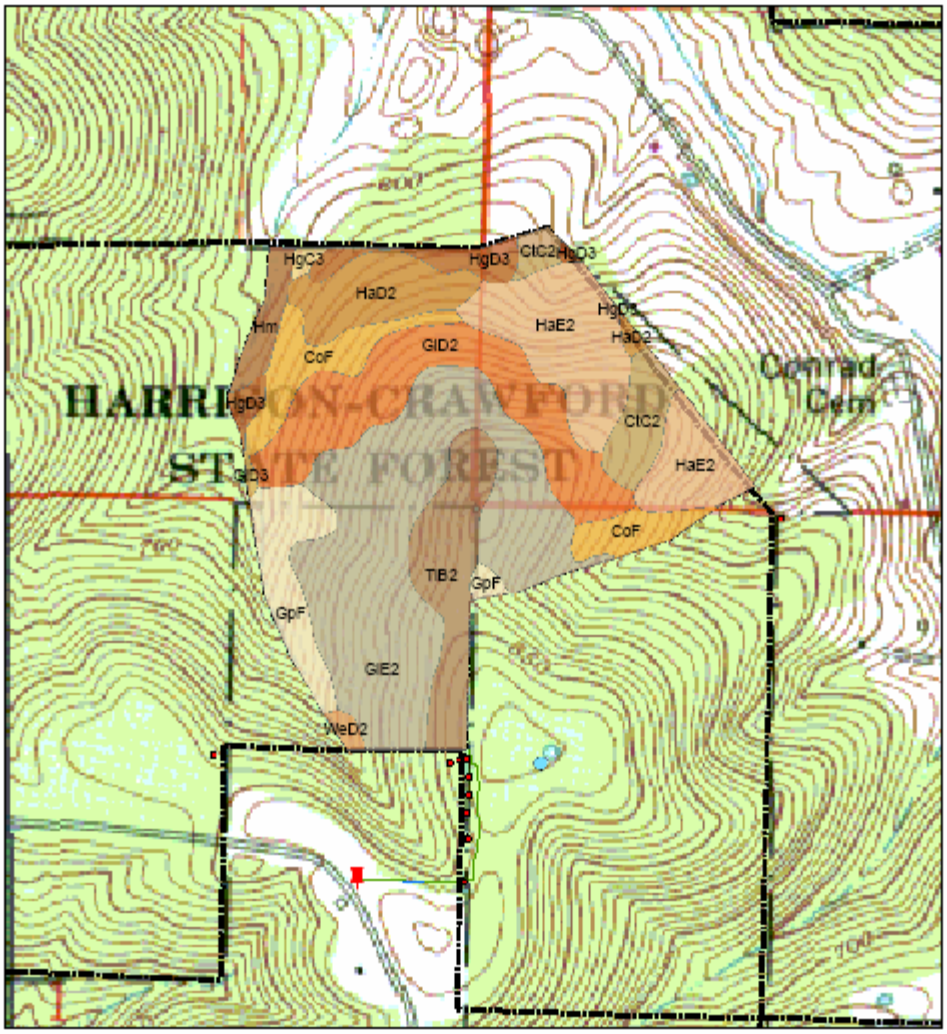


0.1 0.05 0 0.1 Miles

Legend

- Tract Boundary
- Access Lane
- Adventure Trail
- Corner/Boundary Evidence
- Stone Pile
- Abandoned Public Road
- Wildlife Pond
- HCSF Property Boundary

Harrison-Crawford State Forest
SOILS 2103 July 2008 D. Sieg



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