RESOURCE MANAGEMENT GUIDE

Harrison-Crawford State Forest Compartment: 21 Tract: 4
Forester: Dwayne Sieg Date: July 2008
Management Cycle End Year: 2028 Management Cycle Length: 20 Yrs.

Location
This tract is almost entirely in the W ½, NW ½, Section 6, T4S, R3E. There is less than an acre in the SW ¼, SW ¼, Section 31, T3S, R3E. Tract 4 is in Harrison Township, Harrison County, Indiana. It is about 8-9 miles Southwest of Corydon, Indiana.

General Description
Tract 4 is 90.8 acres in size. It is a fully closed canopy upland Central hardwood forest with mostly sawtimber size stands of trees. The average basal area for tract 4 is 120.8 sq.ft./acre, which indicates a considerably higher stocking level than is considered optimum. There are some residual planted Virginia pine scattered in the mixed hardwood areas on the west central ridge top and the northeastern location near the east property line. The ridge top has a wildlife pond. The south aspect near the center of the tract has up to 10 acres of very dry sites. The upper 3 or so acres are a nearly pure chestnut oak stand, similar to those common in the Knob region of the state. The lower part of this dry area might be described as a limestone glade.

History
Prior to becoming part of the State Forest, tract 4 was part of farming ownerships. The more strongly sloping ground and dry sites were wooded pasture and the more level ground was either tilled or open pasture. State ownership of tract 4 goes back as far as 1934, having one of the earlier acquisitions in its acreage. This parcel was purchased from Zimmerman (131.26). A smaller portion was bought from Doolittle (131.105) in 1940 and the very small piece at the extreme north end came from Breeden (131.130) in 1944. Records of planting pine in this tract were not found in property documentation, but there are 2 areas that contain minor amounts of declining Virginia pine plantings. It is assumed that these trees were planted within a short period (1930s and/or 1940s) after acquisition, which was normally the routine. The next likely management activity was construction of the wildlife pond on the ridge top. Presumably, this pond was built in the 1950s as part of a project by the Division of Fish and Wildlife to reintroduce the wild turkey and enhance water sources for that and other species found on the property. There was a timber inventory conducted in September 1977 (D. Martin), but no management guide was located. A timber harvest was marked in April,

1985 (A. McQuade) that included tract 4, as well as Compartment 21, tracts 1, 2, and 3. Documentation shows that there were an estimated 63,568 bd.ft. contained in 296 trees plus an additional 43 cull trees sold from tract 4 in that sale. This harvest was purchased and logged by Coffman and Crosier. Harvesting was completed by September, 1985. Stump evidence indicates a light harvest and that the marking forester did not mark many trees in the chestnut oak cover type area. Follow up TSI was marked (R. Carr) in January, 1987. 235 trees and 98 vines were marked at that time. Prison labor performed the TSI work soon afterwards. An inventory and management guide were completed ca. January 1987 (R. Carr). A 60 foot right of way that provides direct legal access to tract 4 was purchased in 1988 from Funk (131.260). This access was developed soon after with a graveled road and gate installed.

Landscape Context

Hardwood forest is the predominate land cover around tract 4. This forest cover (within a couple miles) is mostly state ownership, including the Post Oak-Cedar Nature Preserve and the O'bannon Woods State Park. The private property within this distance can be forested or fields (mostly pasture and hay) or single family residences. The construction of new residences is increasing within this area, but at a slow pace.

Topography, Geology and Hydrology

This is a moderately sloping tract. There is an elevation change of about 230 feet within the tract and the highest point is about 880 feet above sea level. Primary aspects are northerly, easterly, and southeasterly. Parent materials are limestone under the lower elevations with a cap of sandstone over the upper slopes and ridge top. No karst features were noted during the inventory. There is an area of about 10 acres in the central part of the tract that contains thin soils with limestone surface rock and minor outcroppings. This tract drains eventually in to the Rock Creek watershed (a channel that only carries water during heavy rain events), which in turn, empties into the Blue River.

Soils

Corydon Stony Silt Loam (CoF) 31.5 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

Gilpin Silt Loam (GlD2, GlD3, GlE2, GpF) 30.4 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

Wellston Silt Loam (WeC2, WeC3, WeD2, WeD3) 14.8 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

Tilsit Silt Loam (TlB2) 11.2 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.

Hagerstown Silt Loam (HaC2, HaD2, HgC3, HgD3, HgE3) 3.0 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

Judging from the timber present, the soils on tract 4 might be better overall that average for the State Forest. Tree heights are tall and the tract is carrying a higher than normal stocking level, both that suggest better soil productivity level. Additionally, the estimated growth rate is much higher (274 bd.ft./acre/year) than average. Growth was estimated comparing this inventory with the previous inventory(1987).

Access
Tract 4 is reached by taking Old Forest Road to the trail head of the right of way. There is a locked gate at the trail head. The right of way leads directly to tract 4. This access route is currently passable, but needs improvement work done to it.

Boundary
The entire east, south, and most of the west boundaries for tract 4 are property lines. The remaining length of the west boundary follows the line between Sections 1 and 6. This section line can be seen on the ground as a segment of an abandoned public road follows the line through most of the length of tract 4's western boundary. This line was surveyed ca. 1989. A concrete corner monument was installed at the property corner on the tract's midway point along this western line. Steel "t" posts were also installed along this western tract/property boundary at the time of the survey. The north tract boundary is a hollow, running in a northeasterly direct, separating tract 4 from tract 3.

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 4 should have no impact on this cave, as it is ½ + 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 slight deficit for snags in the 19" DBH+ range (lacking 5 trees for the 90.8 acre tract), but a surplus in the 9" DBH+ . This abundance of small snags is likely due to the increased chestnut oak mortality. 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 had more than twice the recommended cavity trees per acre in the 2 smallest diameter classes. The number of cavity trees in the largest class exceeds the amount called for the maintenance level, but falls just shy of the optimum level. It should be pointed out that the inventory might reflect a minimum number of live cavity trees on tract 4. 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 or subsequent TSI, consider releasing shagbark hickories (particularly larger trees) from neighbors. Increased solar exposure to the hickory boles should improve their desirability to Indiana bats for maternity colony trees.

Wildlife species noted in tract 4 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 4 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. However, the waterhole should be checked closer to see if that aquatic plant is present and the central dry area might be similar enough to the ones noted elsewhere that an eye should be kept open in case those plants exist there. Harvest activities generally exclude such sites because of the low productivity levels and it is doubtful any recreation facilities such as trails will be planned through this area. 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.

There were individual stems of the tree of heaven (*Ailanthus altissima*) noted along the short access lane into the west side of the tract and in some of the 'openings' created by the chestnut oak mortality. There was a small patch of stilt grass observed further north in the abandoned public road bed.

Recreation
The primary recreational use for tract 4 is probably hunting, particularly deer, turkey, and squirrels. The other main use would be the Adventure Trail that runs from the north central end of the tract through and out the southeastern corner. A third likely use is by gatherers, particularly mushroom hunters.

Cultural
The traces of a former public road are present along much of the western edge of the tract. The 1882 and 1906 County Atlases were reviewed for possible presence of historic features. Cultural resources may be present on the tract but their location is protected. Adverse impacts to significant cultural resources will be avoided during any management or construction projects.

Tract Subdivision Description and Silvicultural Prescription
The cover types and their predominance are: Oak hickory (49%), Chestnut oak (28%), Mixed upland hardwoods (22%) and Beech maple (1%). The oak hickory type is estimated to cover about 50 acres of the tract and is mostly found on the northerly slopes and lower half of the other slopes. Size, height, and form of the trees are better than average for this State Forest. Stocking is high over most the type. A general harvest is recommended for this cover type. Reduce stocking to a more optimum level and release crop trees from competition on 1-3 sides. Chestnut oak (25 acres) comprises a noticeably larger number of the trees on the tract than is normally encountered on the Forest property. Even in the oak hickory cover type, it is an important species over most of that area. There is a sizeable 'pocket' of this type at the northern edge of the tract, going over into tract 3. As previously mentioned, evidence (stumps) indicates that few trees were harvested during the last sale in 1985 in the chestnut oak type. This species has been subject of elevated mortality over the past several years, particularly at the extreme southern end of the tract. Here, there are large patches where almost every chestnut oak tree has died. It is estimated that about 3 acres are heavily affected. Causes are currently suspected to be from environmental stresses, namely the 1999 and 2007 droughts. Linden looper defoliation from about 2004-05 may have contributed to the problem. Mortality in chestnut oak (and to a

lesser degree amongst some of the other oak species) was noticed throughout the tract. High stocking levels may also have added to setting these trees up for mortality. Current stocking levels are off the Gingrich chart (BA averages 187 sq.ft./acre). Thin and improve the chestnut oak stands through a harvest and subsequent TSI. According to the inventory, such efforts would leave the stand (chestnut oak) a little overstocked (~102%), but much closer to optimum. Cultural work should increase the residual stand's ability to withstand environmental stresses better. The areas typed as mixed upland hardwoods were mostly areas that had once been agricultural fields and open pasture, except that area at the very southeastern corner of the tract. There are naturally succeeded hardwoods on these sites, varying in tree size, stocking level, species, and quality. This type takes in all of the nearly level ridge top area and extends into tract 3 to the north. The former field sites need some improvement work to release better quality stems. More of the yellow poplar in tract 4 is found in these latter sites and have shown symptoms of drought stress (1999 and 2007), ranging from short branchlets, root collar or 'water sprouts', above normal epicomic branching, crown die back to complete mortality. Evaluate yellow poplar trees when marking and harvest if showing strong symptoms. There may be cause to create regeneration openings during a harvest in tract 4. Such openings are usually 1-5 acres in size. No portion of tract 4 was precluded from the commercial designation. However, it is felt that it would be many years before commercial products would feasibly be removed from the dry areas in the central part of the stand.

Summary Tract Silvicultural Prescription and Proposed Activities

Conduct a general improvement harvest in tract 4 to reduce stocking to a more optimum level, to release crop trees, to capture volume from mature and overmature trees (notably black oak), to capture volume from drought stressed yellow poplar, and to allow for regeneration of a portion of the tract. Current policy recommends leaving 3 largest diameter trees per acre of a list of species (see appendix for this list under the Indiana bat guidelines). It also recommends not to remove shagbark hickory trees and snags. Snag retention is also called for to enhance habitat for the Indiana bat. The extremely high mortality of the previously described chestnut oak will, therefore, not be salvaged. Modify marking along the Adventure Trail to take aesthetics into consideration. Minimize skid trails crossing and do not use the hiking trail for skid trails.

Proposed Activity Listing

Ailanthus control	Summer/fall 2008
Archeological site review (road/yard)	Summer/fall 2008
Mark property boundary	Summer 2008

Road improvement/log yard construction	Fall/winter 2008-09
Mark improvement harvest (with 2103)	Fall/winter 2008-09
Sell est. 322,000 bd.ft.	Spring 2009
Post harvest TSI/opening completion	2011
Crop tree release in opening(s)	2026-2031
Inventory/management guide	2028

To submit a comment on this document, click on the following link:
http://www.in.gov/surveytool/public/survey.php?name=dnr_forestry

You **must** indicate "Harrison-Crawford C21 T4" 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

Harrison-Crawford State Forest
Compartment 21, Tract 4
July 2008

Acres Commercial Forest: 90.8
Acres Noncommercial Forest:
Acres Permanent Openings:
Acres Other:
Acres Total: 90.8

Basal Area ≥ 14 Inches DBH: 90.0
Basal Area < 14 Inches DBH: 29.3
Basal Area Culls: 1.5
Total Basal Area: 120.8 sq.ft./ac.
Number Trees/Acre: 295

Average Site Index: 75 Stocking Level: 110% (A Level, Overstocked)
Calculated Annual Growth: 275 bd.ft./acre/year

SPECIES	LEAVE VOL.	HARVEST VOL.	TOTAL VOL BD.FT.
Bitternut hickory	4,010	00	4,010
Black cherry	4,010	00	4,010
Black oak	40,480	24,270	64,750
Blackgum	9,340	1,130	10,470
Black walnut	4,410	760	5,170
Chestnut oak	190,740	173,120	363,860
E. red cedar	00	3,080	3,080
Red oak	50,250	13,130	63,380
Pignut hickory	8,870	1,600	10,470
Post oak	7,280	00	7,280
Red elm	1,380	00	1,380
Red maple	00	3,500	3,500
Scarlet oak	00	3,530	3,530
Sugar maple	4,600	2,640	7,240
Virginia pine	00	2,400	2,400
White ash	29,230	9,520	38,750
White oak	176,980	18,450	195,430
Yellow poplar	47,870	65,150	113,020
Totals	579,450	322,280	901,730
Totals/acre	6,380	3,550	10,040

Indiana Bat Habitat Guidelines

Inventory Filename: T:\Tcd_Docs\6452104I.tcd
State Forest: Harrison-Crawford **Compartment Number:** 21 **Tract:** 04
Reference Number: 6452104 **Tract Acres:** 90.8

Live Trees - Entire Tract - Desired Species Only*

	Required	Inventory	Available For Removal
11" DBH+	817.2	2126	1309
20" DBH+	272.4	450	178

Snags - Entire Tract - All Species

9" DBH+	544.8	789	244
19" DBH+	90.8	85	-5

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

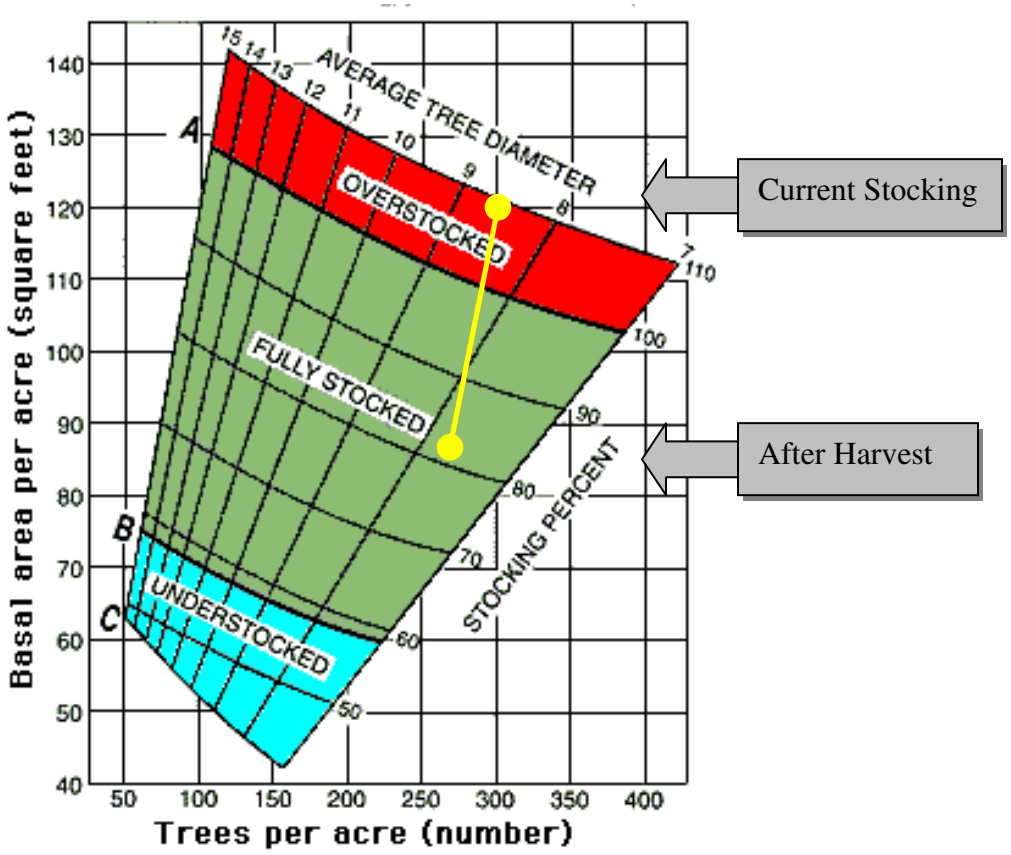
SNAG AND CAVITY TARGET TABLES

	Target Snag Density	
Diameter (DBH) Distribution	**Maintenance-level [a]**	**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

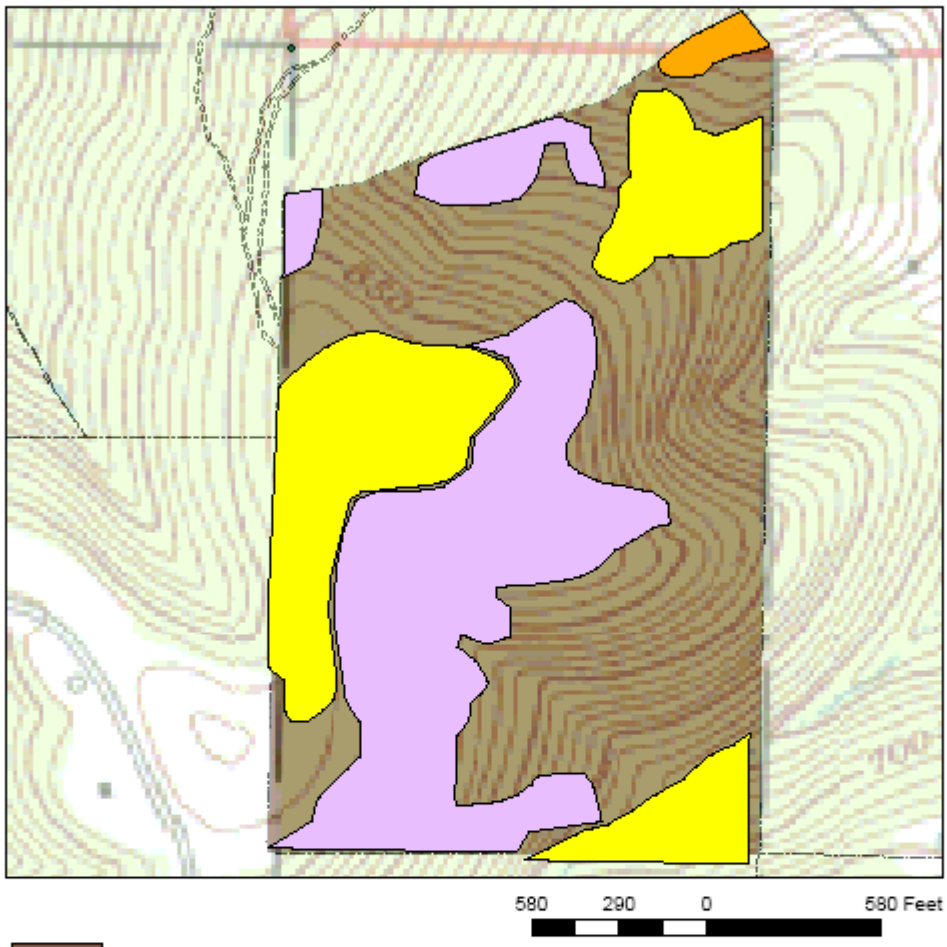
[a] approximates current system-wide density of snags

	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

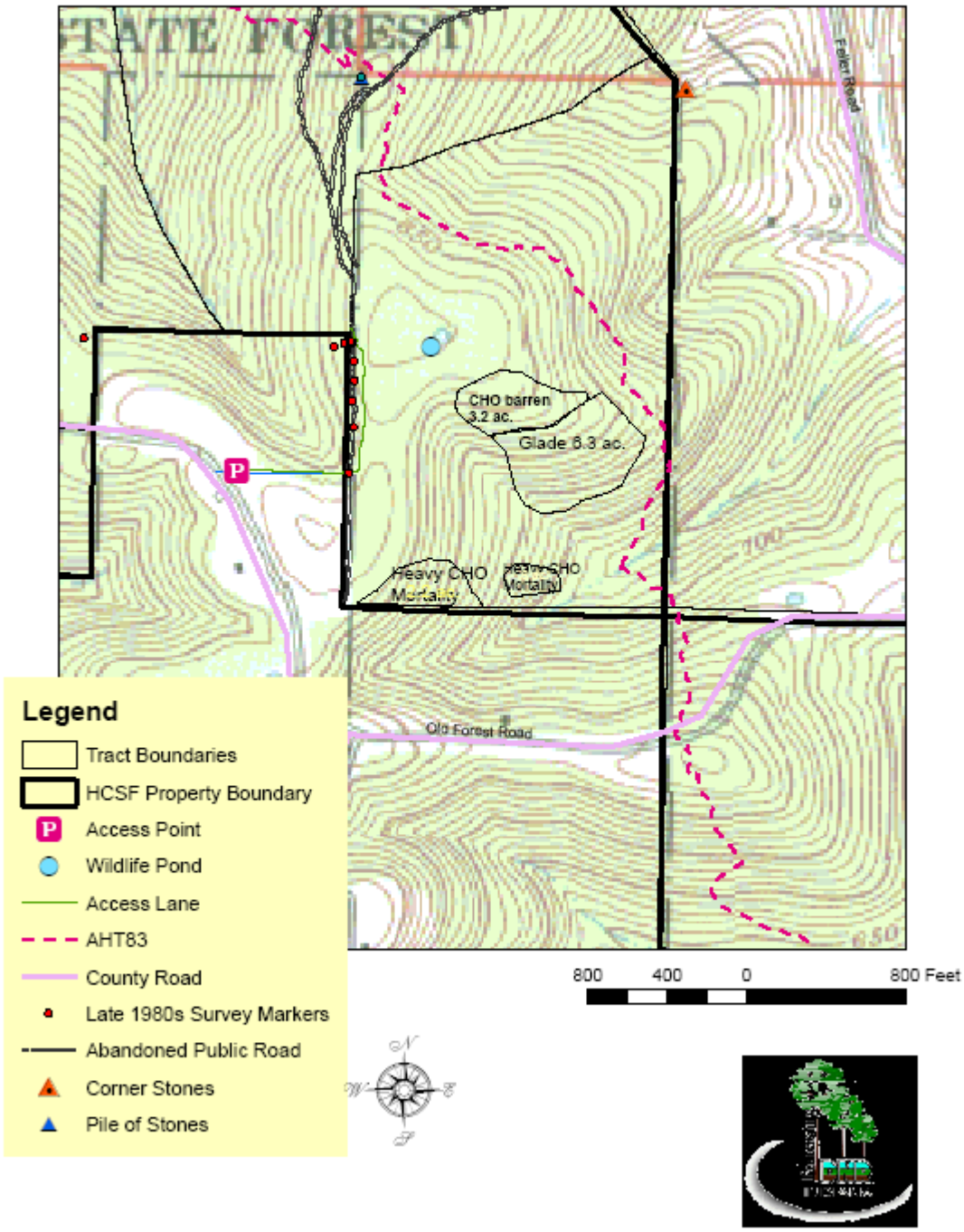
GINGRICH STOCKING CHART
Harrison-Crawford State Forest
Compartment 21, Tract 4
July, 2008



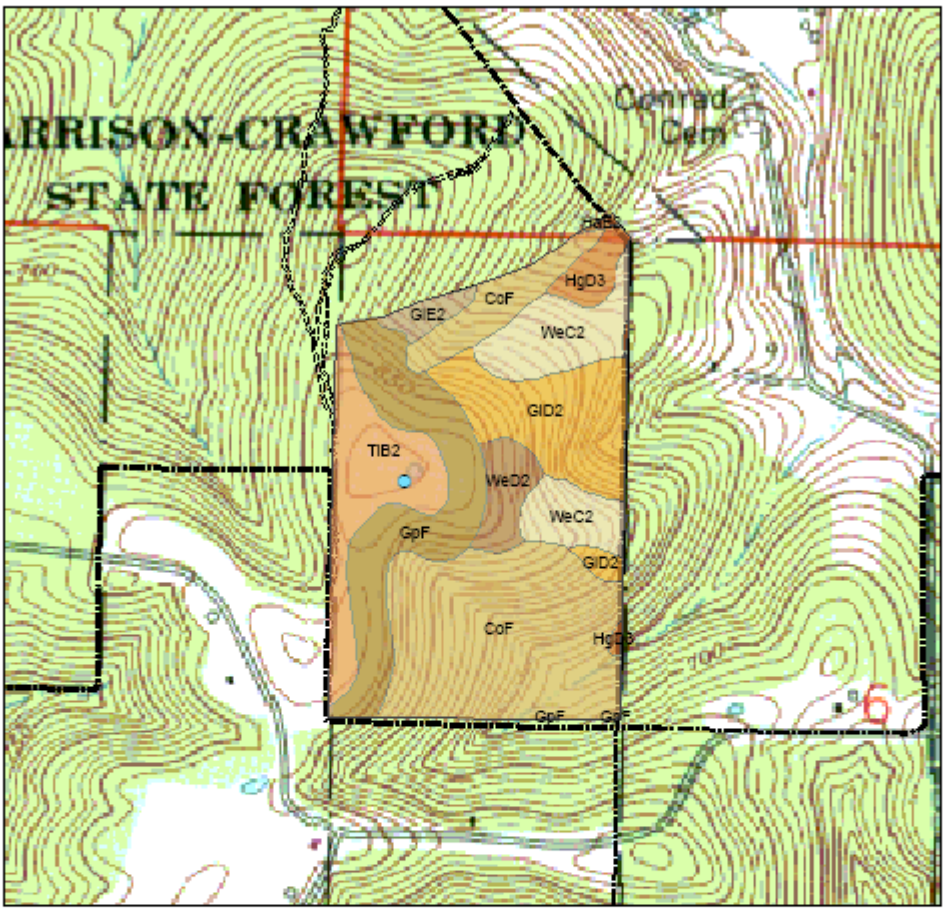
2104 COVER TYPE MAP
July 2008 D. Sieg



Harrison-Crawford State Forest
2104 FEATURES MAP
July 2008 D. Sieg



2104 SOILS MAP
July 2008 D. Sieg



MUSYM	Site_Index	Acres
HaE2	0	0.198
GlE2	0	1.712
TlB2	0	11.177
HgD3	0	2.754
CoF	0	5.15
WeC2	0	6.944
GpF	0	16.013
GlD2	0	12.694
WeD2	0	3.589
WeC2	0	4.222
CoF	0	26.332
GpF	0	0.025

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
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Indiana Heritage Database
Soils Harrison County GIS Layer, NRCS
Resource Management Guide, Carr, 1987