KENTUCKY HEARTWOOD

Protecting the Beauty and Wellbeing of Kentucky's Native Forests

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RE: Ruffed Grouse Habitat Enhancement Project

August 28, 2023

Dear Acting District Ranger Brown and Ms. Taylor,

The following are comments from Kentucky Heartwood regarding the Ruffed Grouse Habitat Enhancement Project. As we discuss below, this project raises a number of questions and concerns which are difficult to address without site-specific information or environmental analysis. The scoping document fails to provide relevant information including how much logging is anticipated, where that logging will occur, or the anticipated timeframe for implementing the project, among other issues. We hope that the Forest Service can correct the analysis and modify the project to address our concerns.

I. Reliance on Categorical Exclusion 6 not appropriate

The Forest Service has stated that the Ruffed Grouse Habitat Enhancement project will be analyzed under a Categorical Exclusion (CE). In response to an email from Kentucky Heartwood, we were informed that Forest Service intends to use Categorical Exclusion 6 (CE-6). While we recognize that recent court decisions have provided exceptional flexibility regarding the agency's use of CE-6, we assert that recent interpretations of the CE are incorrect and that the use of CE-6 for this project runs contrary to the intent, purpose, and language of the CE. Interpretation of CE-6 ("Improvement CE") cannot occur in a vacuum, and further requires discussion of the current Timber Harvest CE. The regulatory history of and litigation related to these CEs provide needed context to understand their intent and lawful scope. As detailed below, this history makes several things clear:

> First, the Improvement CE is not interchangeable with the Timber Harvest CE. The Forest Service intentionally divided these into separate CEs in 1992. They have different purposes, apply to different activities, and have different limitations on their usage.

Second, the Forest Service has always placed limitations on the amount of timber harvest allowed under Timber Harvest CEs. That limitation is now 70 acres. The DBNF cannot avoid this limitation by labelling a timberharvest project as "improvement" and invoking the Improvement CE.

Third, when the Forest Service arbitrarily increased the amount of timber harvest allowed under the 1992 Timber Harvest CE, federal courts invalidated it.[1]

1. History of the Improvement CE (CE-6) and the Timber Harvest CEs

The Improvement CE came into existence in 1992 when the Forest Service decided to divide a 1985 CE for "low-impact silvicultural activities" that were "limited in size and duration" into several separate CEs.[2] The Forest Service did this to provide more "precise, clearly understood categories of actions."[3] The newly separate CEs included:

- CE-4: Timber harvest and salvage harvest. The 1992 Timber Harvest CE allowed 250,000 board feet of timber harvest and 1,000,000 board feet of salvage harvest. Examples included harvesting, salvaging, and thinning.[4]

- CE-6: Improvement of Timber Stand and/or Wildlife Habitat Activities. The Improvement CE incorporated a 1985 CE for fish and wildlife habitat management activities "where there is little potential for displacement of exposed soil, changes in vegetation species composition, or new sources of water pollution."[5] The CE prohibited herbicide usage and allowed no more than one mile of low standard road construction. Example activities included: girdling trees to create snags; thinning or brush control to improve growth or reduce fire hazard including the opening of an existing road to a dense timber stand; prescribed burning to control understory hardwoods in stands of southern pine; prescribed burning to reduce natural fuel build-up and improve plant vigor.[6]

The Improvement CE remains in effect. In 1999, however, a federal court invalidated the 1992 Timber Harvest CE and prohibited its use throughout the nation. The court did so because it found the drastic increases in allowable timber harvest were "a classic example of

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[1] See Heartwood, Inc. v. U.S. Forest Service, 73 F.Supp.2d 962, 975 (S.D. Ill. 1999), aff'd, 230 F.3d 947 (7th Cir. 2000) (invalidating Forest Service's 1992 Timber Harvest CE); Sierra Club v. Bosworth, 510 F.3d 1016 (9th Cir. 2007) (invalidating Forest Service's 2003 hazardous fuels CE).

[2] 56 Fed. Reg. 19718, 19720-21 (Apr. 29, 1991). Examples of activities under the 1985 Low-Impact Silvicultural Activities CE included: firewood sales; salvage, thinning, and small harvest cuts; site preparation; planting and seeding. 50 Fed. Reg. 26078, 26081 (June 24, 1985).

[3] 58 Fed. Reg. at 19721 (Apr. 29, 1991).

[4] 57 Fed. Reg. 43180, 43209 (Sept. 18, 1992).

[5] 56 Fed. Reg. at 19745; see also 50 Fed. Reg. at 26081 (1985 CE for fish and wildlife management activities, such as improving habitat, installing fish ladders, and stocking native or established species).

[6] Id.

an arbitrary decision."[7] Additionally, the Court found the Forest Service failed to show that timber harvests of this magnitude would not have cumulative effects on the environment.[8] Consequently, the Court held the Forest Service's decision to advance the CE was arbitrary and capricious, declared the CE null and void, and enjoined the use of the 1992 Timber Harvest CE nationwide.[9] The Forest Service did not appeal the ruling.

Instead, in 2003, the Forest Service tried to craft a new timber harvest CE. In light of the court ruling in the Heartwood case, the agency proposed a CE "much more limited in scope" than the invalidated 1992 Timber Harvest CE.[10] The new timber harvest CE provided:

- CE-12: Harvest of live trees not to exceed 70 acres. The 2003 Timber Harvest CE allowed timber harvest of 70 acres with no more than .5-mile temporary road construction and prohibited even-aged regeneration harvest or vegetation type conversion. Examples of activities included: Removal of individual trees for sawlogs, specialty products, or fuelwood; and commercial thinning of overstocked stands to achieve the desired stocking level to increase health and vigor.[11] The 2003 Timber Harvest CE is still in effect.

2. Current misuse of the Improvement CE

Now, 20 years after the federal courts soundly rejected the 1992 Timber Harvest CE and 15 years after the Forest Service finalized the 2003 Timber Harvest CE of 70 acres, the DBNF seems to be looking for shortcuts to do more commercial logging, more quickly, and with less public involvement. To that end, the agency wants to re-imagine what activities the Improvement CE and the 2003 Timber Harvest CE might allow. Specifically, to escape the 70-acre limitation in the Timber Harvest CE (as well as the .5-mile limit on temporary roads), the agency is trying to force activities contemplated by Timber Harvest CE into the Improvement CE.

If the agency continues to apply the Improvement CE as if it is an unbounded Timber Harvest CE, the Forest Service risks losing the CE altogether.[12] Doing so pushes the boundaries of the Improvement CE wildly beyond what the agency intended in 1992 and beyond what the law allows.

Moreover, applying the Improvement CE would have cumulative – if not individual – significant impacts. As the Heartwood court explained, federal regulations "allow[] categorical exclusions only for categories of actions that have been found to *not have* individual or

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[7] Heartwood, 73 F.Supp.2d at 975.
[8] Id at 976.
[9] Id at 980.
[10] 68 Fed. Reg. 1026-02, 1027 (Jan. 8, 2003).
[11] 68 Fed. Reg. 44598, 44607 (July 29, 2003).
[12] See Heartwood, 73 F.Supp.2d 962 (invalidating 1992 timber harvest CE); Bosworth, 510 F.3d 1016 (invalidating 2003 hazardous fuels CE).

cumulative effects on the environment."[13] The 1992 Improvement CE analysis did not consider these types of logging activities. The 2003 Timber Harvest CE analysis did not consider timber harvests over 70 acres, whereas all of the proposed CE projects exceed that limit. In short, by misapplying the Improvement CE, the agency cannot show there are no significant cumulative impacts[14]

3. CE-6 does not allow for the use of regeneration harvest methods

The language of CE-6 specifically permits the use of "thinning" as one of several tools for implementing habitat improvement objectives. Recent courts have ruled that "thinning" includes commercial timber harvest, despite the history and apparent intent of the CE. Regardless, "thinning" in this context does not include the use of even-aged (regeneration) methods of timber harvest including shelterwood and seed tree harvests as proposed in this project. In *Mountain Communities for Fire Safety v. Elliott*, 25 F.4th 667, 680 (9th Cir. 2022), the court ruled in favor of the U.S. Forest Service arguing, in part, that "Based on the plain language of CE-6, we hold that it allows for commercial thinning." Accepting the 9th Circuit's reliance on the "plain language" of the CE, the Forest Service has not been granted to implement regeneration harvests under this CE.

Silvicultural definitions in use by the Forest Service are provided in Forest Service Manual Chapter 2470 – Silvicultural Practices under section 2470.5 – Definitions.[15] FSM 2470.5 states that:

> Many of these definitions are taken from the Society of American Foresters' The Dictionary of Forestry (Helms 1998), the recognized source for silvicultural terminology and definitions.

It is reasonable, therefore, to assume that "plain language" in CE-6 relies on these "recognized… silvicultural terminology and definitions.

Under FSM 2470.5, thinning is defined as follows:

> Thinning. An intermediate treatment made to reduce stand density of trees primarily to improve growth, enhance forest health, or to recover potential mortality. Includes crown thinning (thinning from above, high thinning), free thinning, low thinning (thinning from below), mechanical thinning (geometric thinning), and selection thinning (dominant thinning).[16]

[13] Heartwood, 73 F.Supp.2d at 976.
[14] See also Bosworth, 510 F.3d at 1027 (invalidating 2003 hazardous fuels CE because, inter alia, Forest Service failed to conduct reasoned cumulative impacts analysis).
[15] See: Forest Service Manual 2400 – Forest Management, Chapter 2470 – Silvicultural Practices
[16] See: FSM 2470.5 - Definitions

Even-aged and regeneration methods a defined as being distinctly different practices from those encapsulated under "thinning."

> Even-aged Methods. A planned sequence of treatments designed to maintain and regenerate a stand with predominately one age class. The range of tree ages is usually less than 20 percent of the rotation (see clearcutting, seed-tree, shelterwood, and coppice regeneration methods).

Regeneration Method. A cutting procedure by which a new age class is created. The major methods are clearcutting, seed-tree, shelterwood, selection, and coppice. Regeneration methods are grouped into four categories: coppice, even-aged, two-aged, and uneven-aged. [17]Thinning and regeneration methods are similarly differentiated in the Forest Plan[18] and at the project level across numerous projects in the DBNF. In fact, the scoping letter for this project argues that regeneration harvests (shelterwood and seed tree) are specifically needed because thinning activities do not create suitable habitat for ruffed grouse:

> Several hundred acres of salvage treatment was implemented due to ice storm events in the early 2000s. Some of these treatments resulted in young stands while most of the treatments resulted in thinned stands. Thinned stands (of the current age class) do not create the ideal suitable habitat that adult grouse require.[19]

4. CE-6 does not allow for the use of herbicides

The scoping document includes non-native invasive species (NNIS) control in the Purpose and Need, and NNIS eradication among the proposed actions. As the Forest Service is quite aware, herbicide use is often the only practical or effective means of eradication or control of NNIS. Herbicide use for NNIS control is approved and utilized across the DBNF.[20] Control of NNIS prior to, during, and after timber harvest is considered a crucial activity to prevent establishment and spread of NNIS, with pre-treatment utilizing herbicides becoming more frequently used. Absence of effective control measures can result to problematic, even exceptional, infestations of NNIS following timber harvest.

CE-6 allows for projects that "do not include the use of herbicides." And herbicide use is not mentioned in the scoping document. Does the Forest Service intend to use herbicides for the control of NNIS as a component of this project? If herbicides are to be used then the agency may not be able to rely on CE-6 to analyze and approve this project. If herbicides *aren't* to be used then the Forest Service needs to explain what methods will be used for effective NNIS control and eradication, especially in connection to timber harvests.

A second issue relating to the use of herbicides relates to Forest Service management for oak regeneration. We address oak regeneration issues in more detail later in this letter. But it needs

[17] Id.
[18] See: Land and Resource Management Plan for the Daniel Boone National Forest, Appendix A: Glossary, Acronyms, and Scientific Names.
[19] See: Scoping letter for Ruffed Grouse Habitat Enhancement project (note there are no page numbers in the scoping document)
[20] See: Invasive Plant Species Treatment Environmental Assessment, April 2016

to be recognized that the DBNF has begun relying extensively on herbicides for site preparation following timber harvest in order to manage native species that would otherwise outcompete young oak trees. To be successful in recruiting oaks, the modified oak shelterwood system typically requires several stages of midstory and moderate thinning of the canopy in order to establish adequate advance oak regeneration *prior* to removing most of the overstory trees. Absent this careful tending, advance oak regeneration is often too limited and unable to compete with more quickly growing red maples and tulip poplars. The DBNF regularly jumps to the end of the process, skipping the early and necessary steps, and necessitating herbicide use in an attempt to avoid conversion of the site and a loss of oaks.

If the Forest Service plans to use herbicides in this project as a means for site prep, then this may preclude the use of CE-6. If the Forest Service *does not* plan to use herbicides for site prep then the agency needs to describe more clearly how shelterwood and seed tree cuts won't result in conversation of stands to red maple and poplar. Prescribed fire and felling of midstory trees *can* allow for adequate advance oak regeneration to develop, but this takes many years, and it does not appear that the Forest Service plans to wait that long before harvesting overstory trees.

Additionally, the project includes "intermediate silviculture treatments (to) promote oak growth," because some of the stands harvested from 2008-2017 in response to the 2003 ice storm "are regenerating to red maple and tulip poplar species, neither of which provide a primary or substantial food source needed by ruffed grouse." Control of red maple and tulip poplar saplings and poles is most frequently (and effectively) carried out through use of herbicides (basal bark, hack-and-squirt, etc.). This has become the normal and expected practice across the DBNF. Absent herbicides these trees tend to vigorously sprout. Prescribed fire and/or allowing these trees to resprout is an option if herbicides are to be avoided. But herbicide use is the preferred tool for these activities across many projects on the DBNF. Clarity is needed here. If herbicides are to be used then, again, it may preclude the use of CE-6. If herbicides aren't to be used, then the Forest Service needs to describe how they will be successful in meeting the purpose and need for the project.

II. Landslide and slope stability concerns

The project area presents significant landslide and slope stability concerns which need to be addressed in an environmental analysis. Addressing landslide and slope stability issues is required under NFMA, and reliance on a CE is not allowed where "extraordinary circumstances exist." The EA for the 2003 Ice Storm Recovery project, which included the lands in this project area, states:

> **3.2.2.1 Geologic Hazards**
>
> Portions of the Borden Formation located in the project area are known to have high slope stability risk. The areas of high risk are associated with steeper slopes within and

> areas immediately upslope of the Nancy Member of the formation. Disturbance of the vegetation within this area has resulted in mass wasting events (landslides) in the past.[21]

The Finding of No Significant Impact (FONSI) cites the development of project-specific criteria beyond those in the Forest Plan to minimize and mitigate the risk of slope failure.

> The project is designed to respond to unique geologic hazards within the project area to ensure minimal risk.[22]

The FONSI further states that project-specific measures were developed to ensure compliance with National Forest Management Act (NFMA) requirements to "Avoid permanent impairment of site productivity and ensure conservation of soil and water resources."

> These practices avoid permanent impairment of site productivity and ensure conservation of soil and water resources through the implementation of Forest Plan Standards as summarized in Table 1.1-1 of the EA on pages 1-4 to 1-7. These measures have been shown to protect soil and water resources from permanent impairment. **Additionally, the project specifically adopts measures related to tree retention and equipment use in areas with slope stability concerns that are designed to ensure that these areas are not de-stabilized further by the actions in Alternative A** (EA page 1-2).[23] (Emphasis added)

The EA describes those project-specific measures as follows:

> In areas with slope stability concerns (See Figure 3.3), at least 30 square feet of basal area of live trees will be left well distributed across the area. Additionally, commercial harvesting of trees will use cable-yarding systems on steep slope and skid trails will not be constructed within the area with stability concerns.[24]

The scoping document for the Ruffed Grouse Habitat Enhancement project makes no mention of slope stability concerns nor proposes any project-specific measures to mitigate this risk. The 2003 Ice Storm Recovery EA specifically cites concerns relating to "steeper slopes within and areas immediately upslope of the Nancy Member." The Nancy Member is present in the project area as evidenced by Figure 3.3 from the 2003 Ice Storm Recovery EA and geological data available through the Kentucky Geological Survey.

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[21] See: Environmental Assessment for the 2003 Ice Storm Recovery Project at 3-3
[22] See: 2003 Ice Strom Recovery Project Decision Notice and Finding of No Significant Impact (2006), p. 9
[23] Id at 12
[24] See: Environmental Assessment for the 2003 Ice Storm Recovery Project at 1-2

In addition to the Nancy Member, which is mostly present in lower slope positions, a review of LIDAR, satellite, and aerial imagery shows potentially significant slope stability concerns in the upper Borden Formation that similarly need to be addressed. Numerous examples of landslides and other mass wasting can be found beginning at the top of the Borden, often (but not always) at the contact with the Grundy Formation. A presentation from the Kentucky Geological Survey lists the Grundy Formation as 7th among geological formation associated with landslides, and the Borden Formation ranked 11th.[25]

These recognized slope stability issues and the lack of project-specific criteria to mitigate risk make the use of a Categorical Exclusion to approve this project inappropriate.

The following are examples of landslides and mass wasting associated with the upper Borden Formation in and around the project area. Imagery and spatial data are from Google Earth and the Kentucky Geological Survey. The upper portion of the Borden Formation is denoted as "337BRDNU."[26] Landslide occurrences in and around the project area associated with this contact are not limited to the following examples.

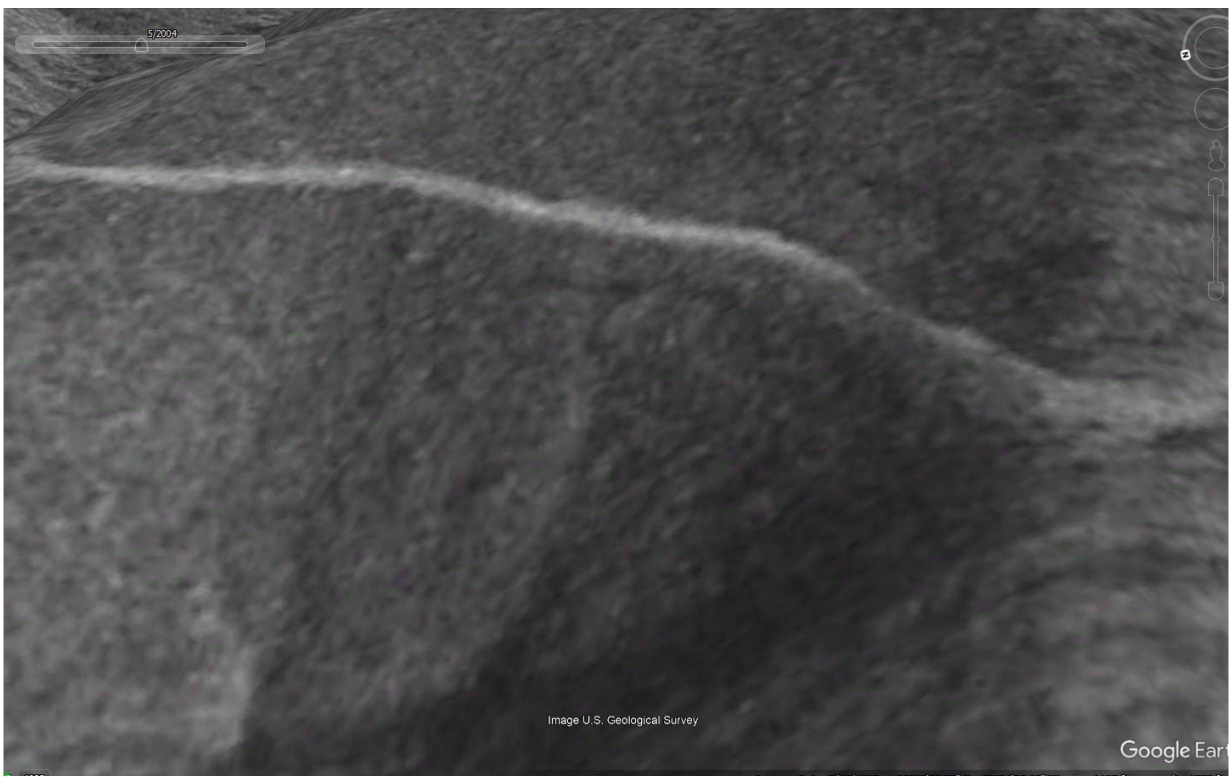

Figure 1: Triangle Mountain landslide "A" prior to mass wasting

[25] See: The Kentucky Geological Survey Landslide Program: An Overview. Matt Crawford, Kentucky Geological Survey. 2015 Geohazards in Transportation, August 4-6, 2015, Huntington, WV.
[26] Data layer represented is the "24K Geological Contacts" (KY24KContacts_WGS84) layer available through the Kentucky Geological Survey kyraster.ky.gov ArcGIS server.

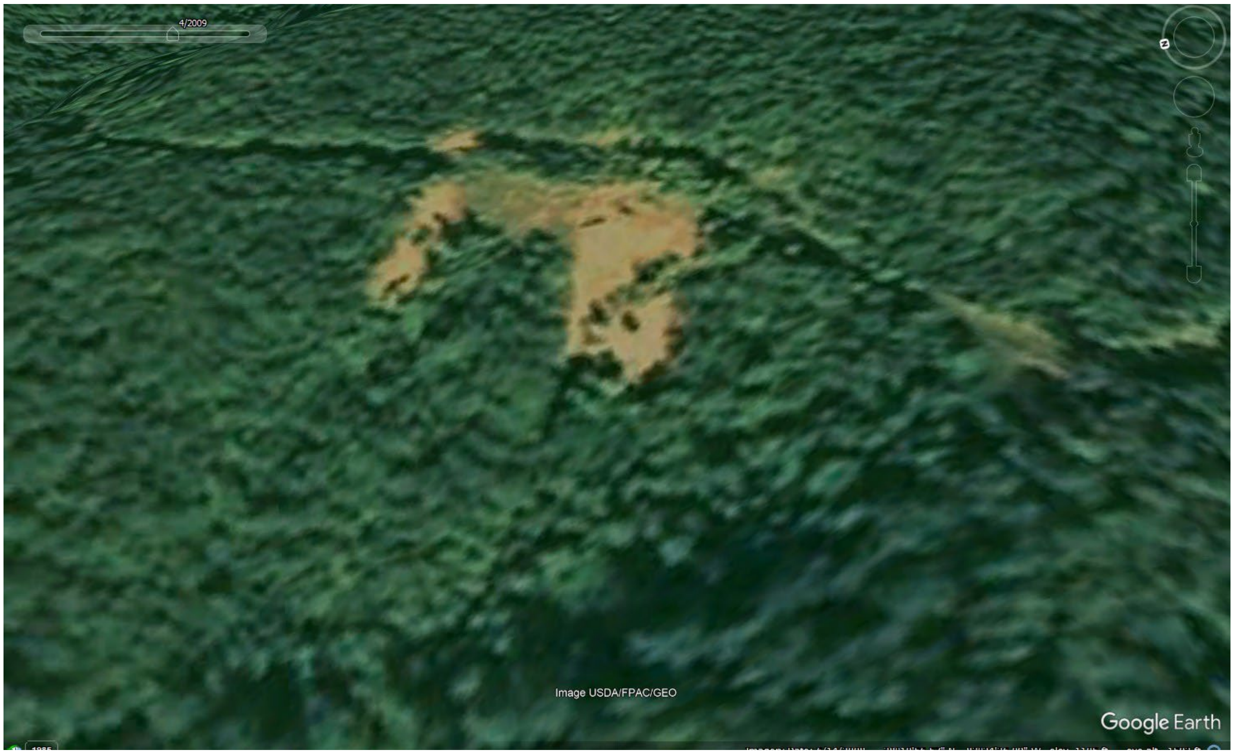

Figure 2: Triangle Mountain landslide "A" (Google Earth 2009 image)

Figure 3: Triangle Mountain landslide "A" (Google Earth 2017 image)

Figure 4: Triangle Mountain landslide "A" (Kentucky Geological Survey image 2019 including contact zone for the upper Borden Formation)

Figure 5: Triangle Mountain landslide "B" prior to mass wasting

Figure 6: Triangle Mountain landslide "B" (Google Earth 2018 imagery)

Figure 7: Triangle Mountain landslide "B" (Kentucky Geological Survey 2019 imagery including location contact zone for upper Borden Formation)

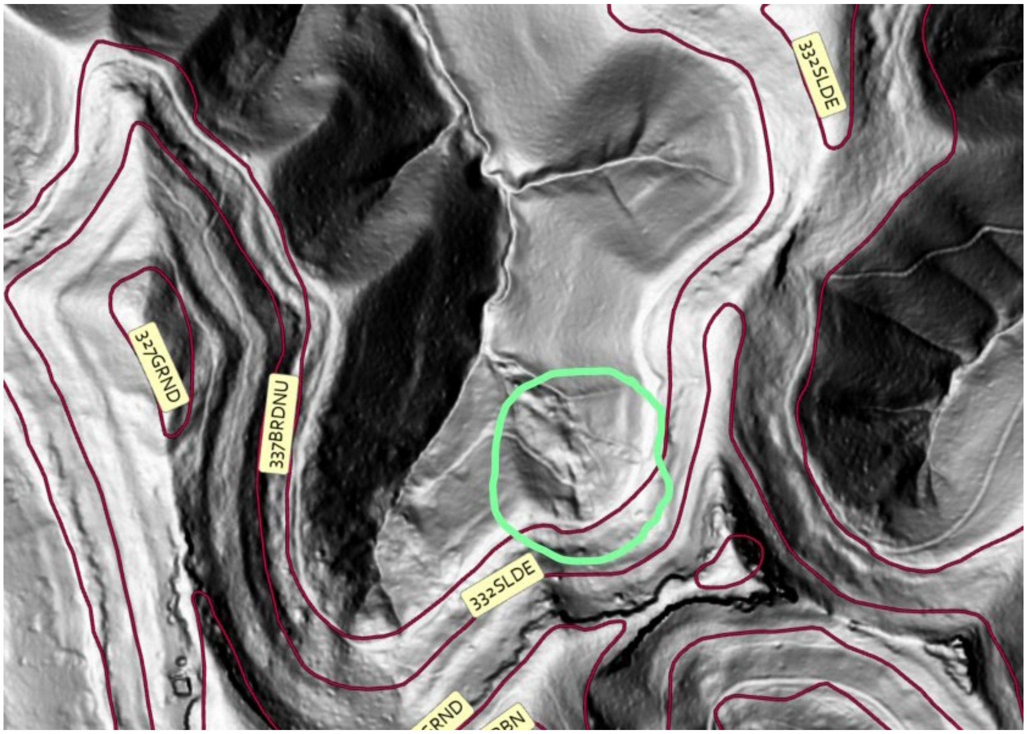

Figure 8: Triangle Mountain landslide "B" (Kentucky Geological Survey LIDAR terrain data including location contact zone for upper Borden Formation)

Figure 9. Location of landslide in project area (before landslide occurrence)

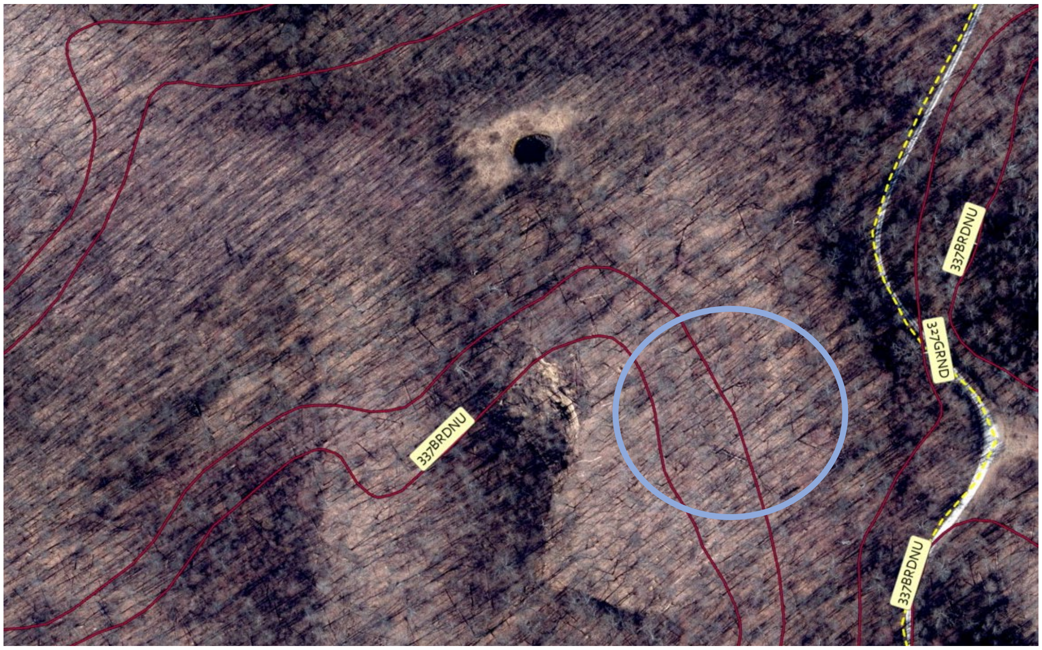

Figure 10. Location of landslide in project area (Kentucky Geological Survey 2019 imagery including upper contact of the Borden Formation)

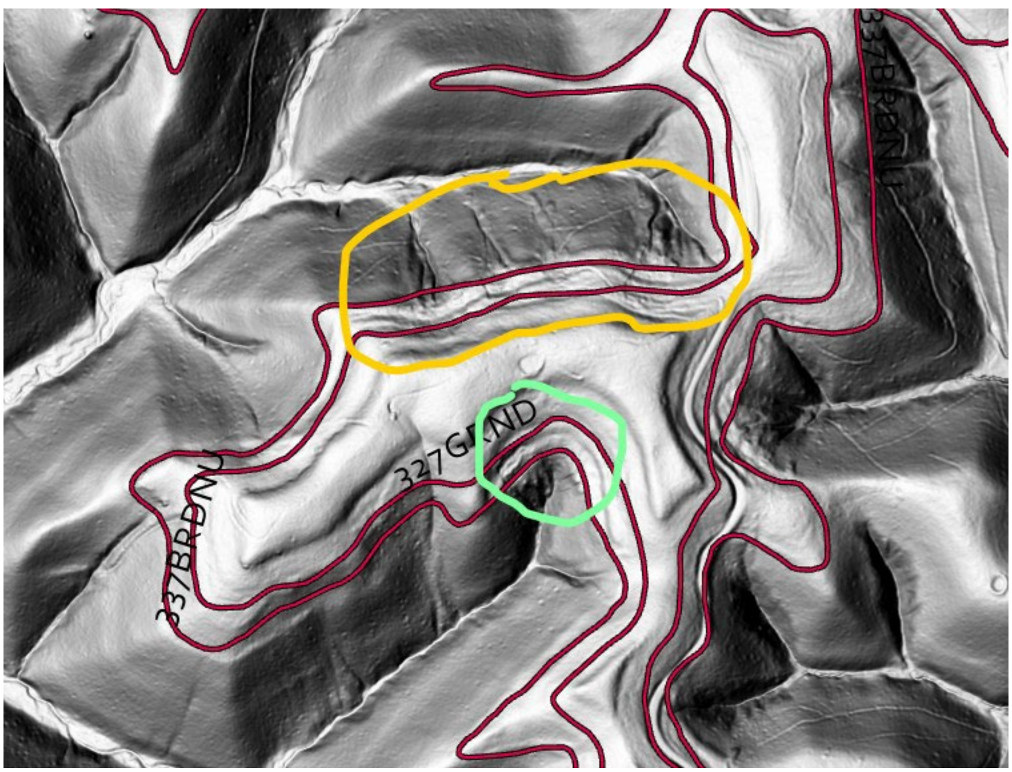

Figure 11. Same area depicted in Figures 10 & 11 using LIDAR showing landslide in Figure 10 (green circle) and evidence of other landslides (yellow circle).

III. Project runs contrary 2003 Ice Storm Recovery analysis and decision

The 2003 Ice Storm Recovery Project was approved in 2006. That project approved 793 acres of commercial harvest and 434 acres of non-commercial thinning within the Ruffed Grouse Habitat Enhancement project area.[27] The scoping document states that project area "was salvage harvested from 2008-2017."

The Purpose and Need for the 2003 Ice Storm Recovery Project stated that "The Forest Service is proposing three projects in the storm-damaged areas to aid in the long-term recovery of the ecosystems located there."[28] The EA further describes how removal of damaged trees was necessary to improve growing conditions and health of remaining trees so that they could so they could "be better prepared" for future stressors:

> **1.1.2 Purpose and Need**
>
> Severely damaged tree removal – The cutting of the severely damaged trees would allow the trees left to have access to more sunlight, water, and minerals in the soil. This should allow the remaining undamaged or moderately damaged trees to grow faster and repair any damage they may have sustained from the storm. This faster growth and repair would allow remaining trees to be better prepared for the next drought or insect infestation (Führer 1998, Gottschalk 1992, Houston 1992, Oak et al 1988). This preparation would minimize the mortality of trees during the next major stress event (Colbert et al 1997, Muzika et al 1998). The cutting of the severely damaged trees would also allow new trees to become established in the areas more quickly by reducing the time severely damaged trees are allowed to capitalize on the available growing space.[29]

The above language was reiterated verbatim in the 2006 DN and FONSI.[30] The FONSI continues with the rationale stating:

> The removal of severely damaged trees and control of non-native invasive plants were chosen after considering the potential effects on residual trees and adjacent stands. **In fact, the rationale for proposing each of these projects was to improve growing conditions for the residual tees and stands**.[31] (Emphasis added)

The EA allocates a great deal of analysis to describing how the salvage and sanitation harvests will support oak communities and reduce the risk of oak decline. The clear language here describes how the purpose of the 2003 Ice Storm Recovery Project was to support the longevity and resilience of the retained "undamaged or moderately damaged trees." Approving

[27] See: Environmental Assessment for the 2003 Ice Storm Recovery Project, Table 1.2-1
[28] Id. at 1-1
[29] Id. at 1-7
[30] See: 2003 Ice Strom Recovery Project Decision Notice and Finding of No Significant Impact (2006), p. 2.
[31] Id. at 12

regeneration harvests to cut these trees now, only a few years after sanitation and salvage harvests were completed, runs contrary to the 2006 DN & FONSI.

The 2006 DN and FONSI also states that:

> Alternative A will not establish a precedent for future actions with significant effects and does not represent a decision in principle about future consideration. **These actions, when completed, will not need additional action in the short-term in order to be successful**.[32] (Emphasis added)

The scoping document, however, describes how follow-up management is needed because stands managed as part of the 2003 Ice Storm Recovery Project "are regenerating to red maple and tulip poplar."

> Additionally, a paralleling purpose of this project would be to enhance, promote, and transition the stands within the project area to oak dominated stands. This area experienced ice storm damage in the early 2000s and was salvage harvested from 2008-2017. Some of the resulting stands are regenerating to red maple and tulip poplar species, neither of which provide a primary or substantial food source needed by ruffed grouse. Intermediate silviculture treatments within these stands would promote oak growth.

Kentucky Heartwood has often pointed out to the Forest Service that timber harvests on the Daniel Boone are having the effect of accelerating a transition to maple and poplar, and reducing oaks in the forest. Our concerns have been regularly rebuffed. Here, the Forest Service is stating that remedial work is needed to avoid this forest type conversion following salvage harvesting in the project area contrary to prior statements that "These actions… will not need additional action in the short term to be successful." The Forest Service needs to take a sober look at how silvicultural systems are being applied and make realistic determinations about likely effects.

IV. Oak silviculture and regeneration failures

The failure to successfully regenerate oaks following timber harvest appears pervasive across the DBNF. Our observations and collected data show that resulting regeneration following even-aged timber harvests have frequently resulted in stands dominated by tulip poplar and red maple (often coppiced, multi-stemmed trees). This pattern was termed "disturbance-mediated accelerated succession" by Abrams decades ago[33]. We brought these concerns to the Cumberland District in our comments on the Commercial Harvest in Beaver Creek Watershed project, but had these concerns rebuffed.

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[32] Id. at 9

[33] Abrams, Mark D. and Michael L. Scott (1989). Disturbance-Mediated Accelerated Succession in Tow Michigan Forest Types. Forest Science, 35(1), March 1989.

It is widely recognized that forest understories in our region have undergone a shift toward shade tolerant species (especially maple spp.), limiting the development of advance oak regeneration and the ability of oaks to dominate a stand following disturbance (anthropogenic or natural). However, it is also widely recognized the even-aged (regeneration) harvests, absent well-developed advance oak regeneration, can effectively eliminate oak as a major component of the stand because they are unable to compete with tulip poplar and red maple in high light environments. This is because oaks (especially white oak) are *mid-tolerant* with regards to their light requirements.

To address this, the modified oak shelterwood system has been developed. This system typically requires several stages of management over years or decades in order to develop adequate advance oak regeneration prior to any major overstory harvest. This process often includes midstory removal along with one or more partial canopy thinnings. Prescribed fire can also be an important component.

> The oak shelterwood method has been developed to culture vigorous oak advance regeneration. It accomplishes this through a well-timed mid-story removal, improving light levels for adequate oak advance regeneration development, followed by a canopy release after the advance regeneration has reached a height where it can compete successfully with co-occurring species. The basic science behind the oak shelterwood method is well-documented.[34]

Across the DBNF we are seeing more and more projects where even-aged harvests are being prescribed to support oak regeneration without first undergoing the necessary preparatory stages. The Forest Service is often jumping to the end of the process with shelterwood or seed tree harvests cutting to a residual basal area of 10 to 20 ft^2/ac. We have reviewed silvicultural prescriptions for harvests in other DBNF Districts that state there is adequate advance oak regeneration despite Common Stand Exam (CSE) data indicating otherwise. The flowchart in the scoping document indicates that confusion about what qualifies as advance oak regeneration. The chart begins with "Is Oak Advance Regeneration Present?" If "Yes," then the next question is "Are seedlings >.25" DRC and >1ft tall?" However, Stringer[35] states that "oak advance regeneration stems should be 3 to 4 feet tall."

It appears that the Forest Service has being doing things backward in order to generate funds (through K-V or stewardship agreements) to support the non-commercial components of management plans and prescriptions. To make up for this, the Forest Service has been relying on herbicides to kill or control competition and, in some cases, prescribing the planting of oaks

[34] Oak Shelterwood: A Technique to Improve Oak Regeneration. Jeff Stringer, Extension Professor of Hardwood Silviculture, Department of Forestry, University of Kentucky. Professional Hardwood Note #2 for Tennessee and Kentucky Published as University of Kentucky's Cooperative Extension publication FOR-100
Published as Southern Regional Extension Forestry publication SREF-FM-005
[35] Id.

depending on available funds. This system is not supported by current science or standards of practice.

Alternatively, research from the University of Kentucky suggests that intermediate-sized group selection with adjacent thinning (i.e., femelschlag or expanding gap silviculture), along with midstory thinning, may be optimal for supporting oak recruitment. We provide here information from a presentation by Dr. John Lhotka of the University of Kentucky.[36] He presents data from Robinson Forest showing that group selection harvests of about 0.4 acres (150 foot gap) result in substantially better oak development after 48 years than larger group harvests of about 1.1 acres (250 foot gap), with the latter resulting in a greater abundance of tulip poplar.

This overabundance of tulip poplar is what has been observed in larger regeneration sites across the DBNF. In this presentation Dr. Lhotka reports, "Dominant and codominant oak density was maximized in 150 ft opening." He also states that "An expanding-gap irregular shelterwood that uses intermediate gap sizes and midstory removal as a preparatory treatment around gaps may represent a novel silvicultural practice for increasing oak regeneration potential within the CHFR (Central Hardwood Forest Region)."

Robinson Forest Gap Size Study - Results

Overstory Trees ha^{-1} by Treatment following 48 Years

Species Group	Opening Size		
	50 ft	150 ft	250 ft
Oak	27.4^{a*}	89.3^{b}	49.5^{b}
Maple	82.2^{a}	51.4^{a}	52.4^{a}
Yellow-poplar	0^{a}	39.3^{b}	50.4^{b}
Hickory	12.1^{a}	4.7^{a}	2.9^{a}
Other Commercial	6.1^{a}	2.7^{a}	4.9^{a}
Other	9.1^{a}	5.4^{a}	3.4^{a}

*Means within a species group that have similar letters are not statistically different ($\alpha = 0.05$)

Figure 12: Overstory trees 48 years following harvest from Lhotka presentation[37]

This same presentation by Dr. Lhotka presents research conducted in Berea College Forest by Drs. Lhotka and Stringer showing that optimal oak regeneration and development occurs in the edge environment just *outside* of harvest areas. They show that oak recruitment is less successful

[36] Formulating an Expanding-Gap Regeneration System for Quercus Dominated Stands, John M. Lhotka, Department of Forestry, University of Kentucky
[37] Id.

within the harvest area than in the 20 m *outside* of the harvest area (in uncut forest). This suggests that intermediate levels of harvest, or smaller harvests with greater spatial distribution (more edge effects), would better assist in recruiting oaks than 20-to-40-acre shelterwood or seed tree harvests.

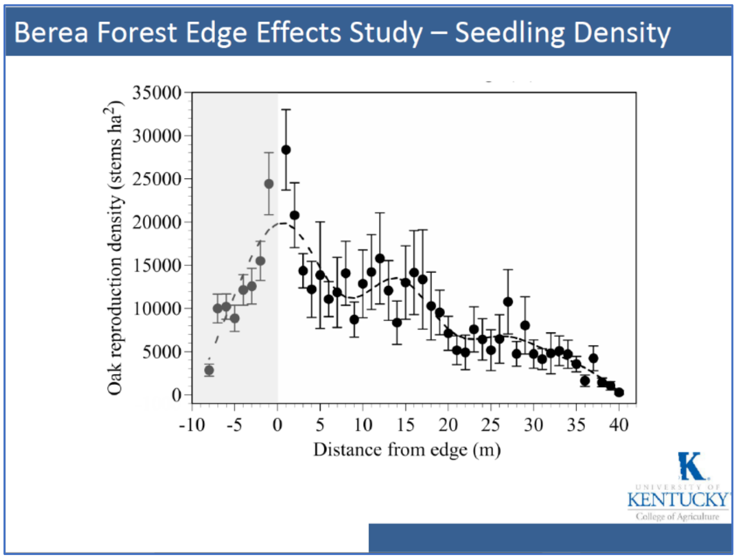

Figure 13. Edge effects and seedling density from Lhotka presentation[38]

Supporting oak communities (especially upland oak) is important, and in many cases does require management. We recognize that these communities often rely on intermediate levels of disturbance that result in partially open canopies. Midstory control to reduce understory shade, limited canopy thinning, and long-term management with prescribed fire are important in restoring the structure and function of upland oak communities.

Group selection harvests (e.g., femelschlag or expanding gap systems), particularly when placed in locations with existing advance oak regeneration, may be very effective and emulate a scale of disturbance consistent with these forests' natural range of variation. These patch-level disturbances can also create a mosaic of young forest and early seral habitat for species like grouse, while also allowing proximity to needed mature forest habitats. It is furthermore a scale of disturbance compatible with management for imperiled forest-dwelling bat species, including Indiana and northern long-eared bats. Major overstory removals are only useful to the extent that timber production and rotational forestry are a goal. We argue that this should *not* be a management objective on national forest lands and that the Forest Service's multiple use mandate can be better met through the aforementioned systems.

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[38] Id.

From a naturalistic and ecological restoration perspective, the above intermediate treatments should be considered for appropriate sites and integrated with natural disturbance. As the understory is managed and advance oak regeneration becomes competitive, stands should become resilient to natural disturbance events, allowing for the ongoing recruitment of oaks. This would be appropriate for many portions of the project area.

Because there are no site-specific actions proposed nor any analysis in an EA based upon specific actions, there is no clarity or reassurance that the Forest Service will manage the area in a way that actually supports oaks over the long-term. With the Forest Service relying on a condition-based management system, a clear set of criteria for where, when, and how to implement timber management activities needs to be presented. The flow chart relating to fire management is not sufficient. Overall, the scoping document is entirely too non-specific, leaving nearly all considerations to discretionary, post-decisional, non-public processes.

V. Ruffed grouse

Ruffed grouse decline has been well-documented. Despite these declines, populations are large enough that the Kentucky Division of Fish and Wildlife Resources (KDFWR) still allows hunting of grouse and there are no efforts to list the species under the Endangered Species Act. The KDFWR has approved a 2023 grouse hunting season from November 1-10 and November 13 through February 29, 2024. The daily bag limit for is 4 birds. While grouse hunters report little success, the allowance of 4 birds per day over 119 days does not comport with the alarm expressed and emphasis on grouse management by the Daniel Boone National Forest in this, and other, projects. There are many imperiled species in severe decline across the forest, and yet we see little concern or effort put toward the recovery of non-game species or species that don't benefit from large-scale logging projects.

The Forest Service has also put forward a mystifying and misleading narrative about grouse in the project area. The scoping document states:

> Additionally, the Kentucky Department of Fish and Wildlife (KDFWR) conducted male drumming surveys across the state from 1996-2016. Several of the drumming survey sites were within the proposed project area. Figure 2. shows the results of the KDFWR's two-decade long survey.

This statement is followed by *Figure 2. Trend in number of drumming male grouse detected during KDFWR surveys, 1996-2016*. This figure appears to be identical to *Figure 1: Individual displaying grouse from Grouse Drumming Survey in Kentucky, 1996-2016* included in the 2015-16 Ruffed Grouse Population Status Report.[39] The Report references survey data in Appendix A. The table in Appendix A includes the locations of survey routes for years 1996 through 2016.

[39] 2015-16 Ruffed Grouse Population Status Report, Kentucky Division of Fish and Wildlife Resources, Prepared by Zak Danks and Cody M. Rhoden.

The survey locations are distributed across the entirety of eastern Kentucky, and none of the survey locations appear to be anywhere near the project area as is represented in the scoping letter. The only location for which we are uncertain is listed as "N. Grouse Demo Area." We can find no reference to where this site might be. Even if this site is in or near the project area, it is only one of the 16 survey locations aggregated to create Figure 2.

But the scoping document describes this figure as being directly representative of conditions in the project area and evidence of a causal relationship between grouse population trends and forest conditions in the project area.

> Interpreting the graph, grouse populations increased when landscape level disturbances took place. There is a sharp increase in drumming detected immediately after the early 2000s ice storm, and a sharp decline in the species population approximately fifteen years post-storm corresponding with the decline in early seral habitat preferred by breeding adult grouse.[40]

The following figure combines the drumming data from the 2015-2016 Ruffed Grouse Population Status Report and data from the Forest Service's FSVeg "Stands" geodatabase, showing "Year of Origin" acres by year.

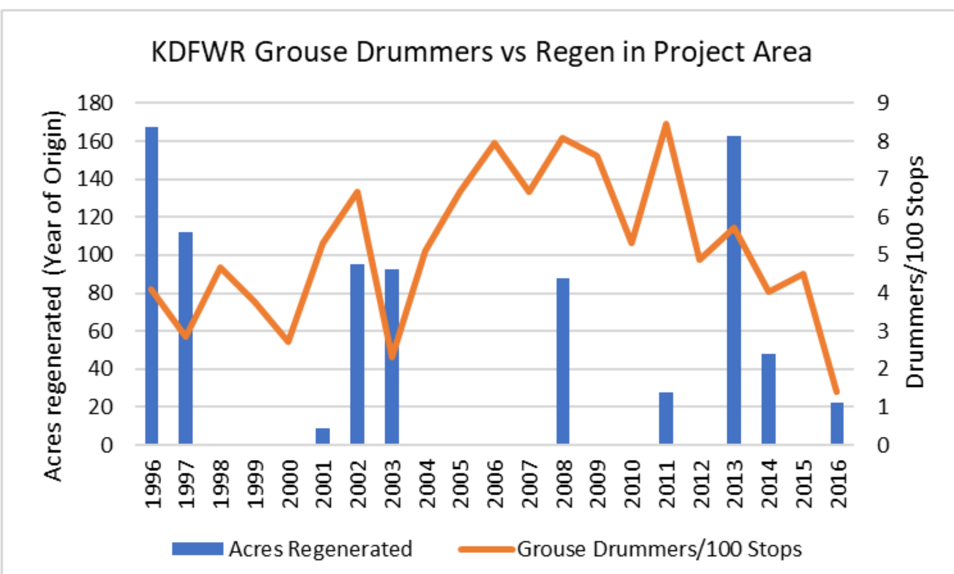

Figure 14. Acres in project area by "Year of Origin" with KDFWR grouse drummer survey data

[40] See: Scoping letter for Ruffed Grouse Habitat Enhancement project (note there are no page numbers in the scoping document)

The scoping document argues that forest disturbances in the project area in the early 2000s are responsible for the upswing in grouse populations starting around 2003. Forest Service data show that approximately 190 acres of forest regenerated between 2002 and 2003. However, those same data show that over 200 acres were regenerated between 2013 and 2014, after which grouse populations continued to plummet. It is at best arbitrary to argue that 190 acres of forest regeneration in the early 2000s led to a population increase while ignoring how populations decreased following a similar pulse of forest regeneration a decade later.

In fact, the project area has experienced an ongoing input of regenerating and thinned forests over the last several decades. The following maps present data from both the R8 FSVeg Stands geodatabase and the national USFS Timber Harvest data layer. Each layer presents different information, and there appear to be some gaps in each data set. Regardless, what is evident is that there has been ongoing timber management that should be resulting in improved grouse populations if the models are correct, but this has not been the case.

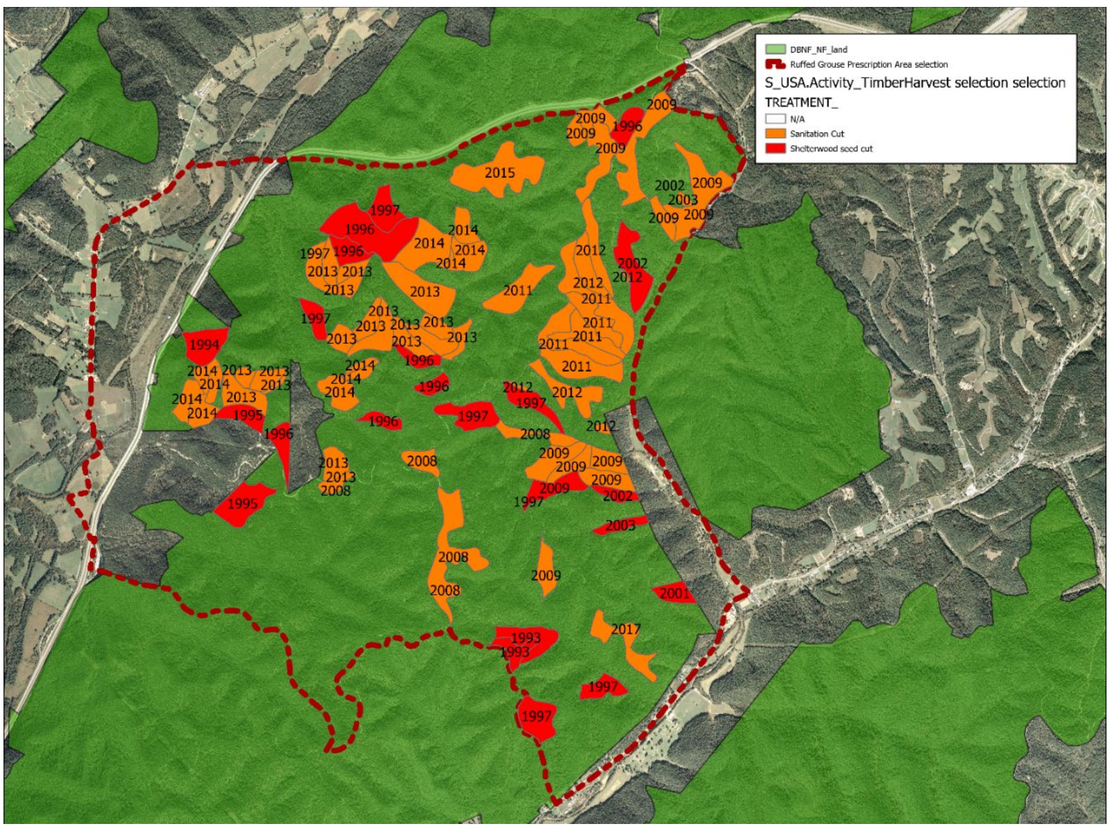

Figure 15. Project area map showing timber harvests by year and treatment derived from USFS Timber Harvest shapefile data[41]

[41] Data accessed from [https://apps.fs.usda.gov/arcx/rest/services/EDW/EDW_TimberHarvest_01/MapServer on August 26](https://apps.fs.usda.gov/arcx/rest/services/EDW/EDW_TimberHarvest_01/MapServer), 2023

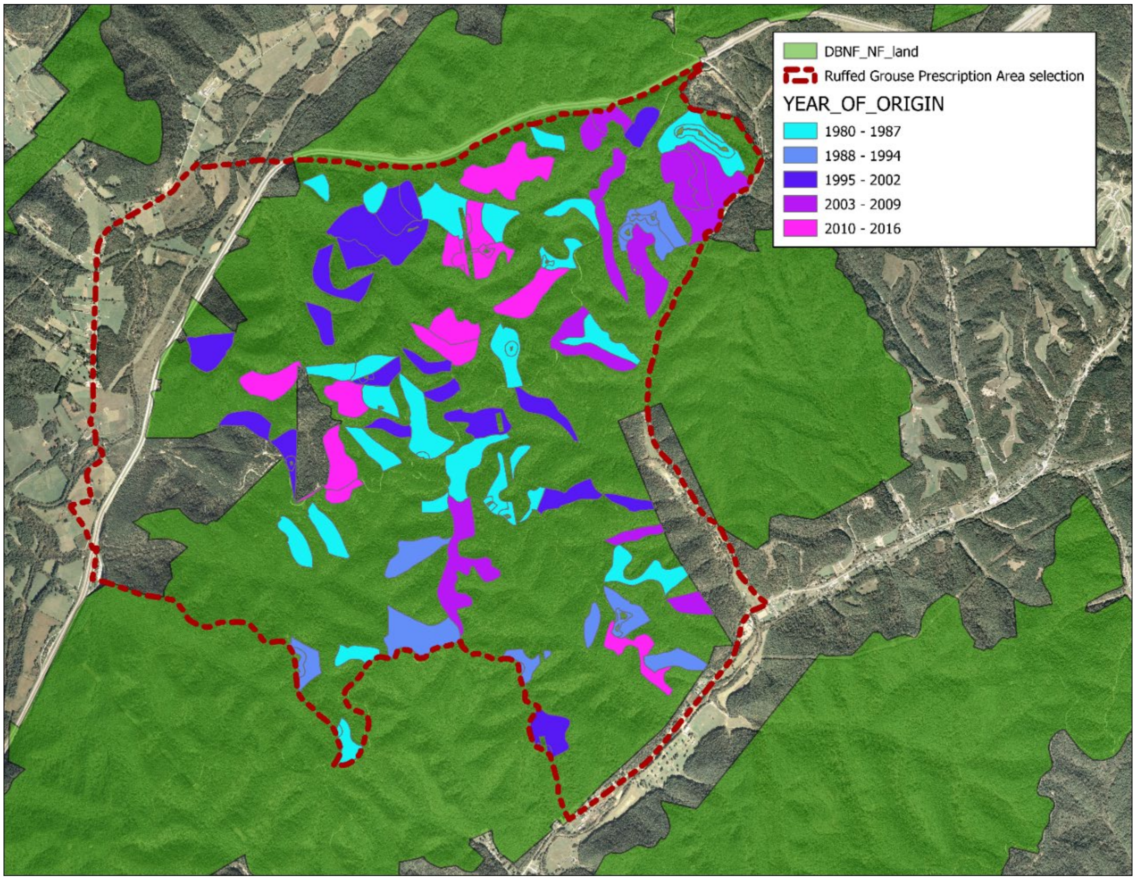

Figure 16. Project area map showing year of origin from 1980 derived from FSVeg data in the USFS Region 8 STANDS geodatabase.

In terms of habitat, the relationship between young poletimber (forests ~15-20 years old) and grouse is well established. However, it has also been shown that reproductive female grouse in the central Appalachians preferentially use mature, closed canopy forests with little understory vegetation along with the presence of larger diameter trees and coarse woody debris for nesting.

It has also been shown that female grouse with young broods are as likely to utilize patches of early successional habitat created from mature forest canopy gaps as they are young forest created by large clearcuts. For example, Jones (2005) states:

> With respect to forest types, broods used mixed oak stands in the 0–5, 6–20, and >80-year age classes. Site conditions were submesic to subxeric with northern red oak and red maple dominant in the overstory and flame azalea, American chestnut sprouts, red maple, serviceberry, and northern red oak, in the midstory (Tables 3.9, 3.10). The 0– 5-year class was represented by use of 3–4-year-old group selection cuts and edges of 2 recently

> harvested irregular shelterwood (i.e., 2-aged) stands. Broods also utilized edges of 6–20-year-old mixed oak clearcuts, but seldom ventured into their interior. [42]

These disturbance patches are consistent with the group selection (e.g., femelschlag and expanding gap) systems described above in our section on oak silviculture. It's also notable that the forest ages between 20 and 80 years were largely avoided. Furthermore, it needs to be noted that the study found that broods "seldom ventured into (the) interior" of clearcuts, suggesting that large group selection harvests or large natural canopy gaps could meet these habitat needs without sacrificing so many other values and the habitat requirements of other species. Canopy gaps in old-growth forests (>140 years), especially on mesic sites, tend to be substantially larger and more frequent than canopy gaps found in ~80 year-old forest – the latter tending toward smaller gaps within a closed, codominant canopy.[43] The implication here is that management for complex old-growth structure on mesic sites may offer long-term habitat benefits for grouse.

The habitat narrative in the scoping document also avoids any discussion on the effects of West Nile Virus (WNV) on grouse populations. The lack of work – or even acknowledgement – of this relationship in Kentucky is stunning. The West Nile Virus PA Game Commission Research Summary describes significant mortality associated with WNV.

> PA grouse populations (as indicated by hunter flush rates) showed steep declines in the initial years of the PA outbreak (2001-2005), followed by weak recovery (Figure 2). When WNV prevalence increased again in 2009-2014, grouse populations again showed steep declines. When corrected for hunter effort (harvest/100 days), grouse harvest declined 45% (2001- 2005) and 28% (2009-2014).[44]

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[42] Jones, Benjamin Colter, "Ruffed Grouse Habitat Use, Reproductive Ecology, and Survival in Western North Carolina. " PhD diss., University of Tennessee, 2005.

[43] See: See Hart, Justin (2016), Gap-Scale Disturbances in Central Hardwood Forests with Implications for Management in Natural Disturbances and Historic Range of Variation," C.H. Greenberg and B.S. Collins (eds). Spring International Publishing 2016.

[44] West Nile Virus PA Game Commission Research Summary

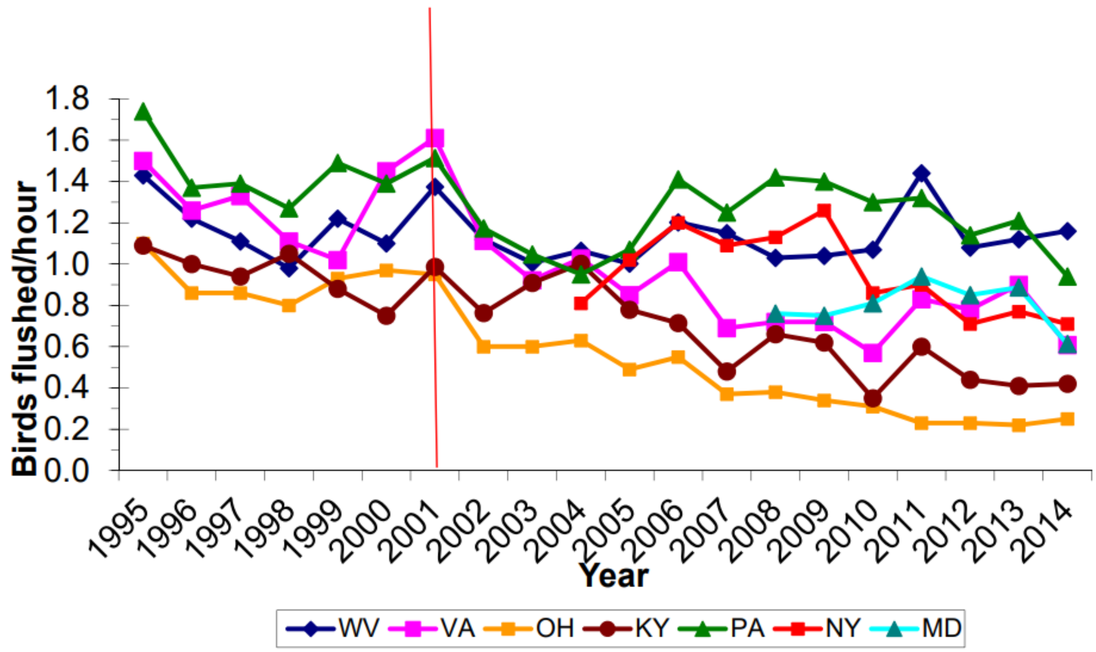

Figure 17. Grouse population trends relative to arrival of WNV in Pennsylvania[45]

Studies indicate that grouse recovery after episodes of WNV is substantially improved when high quality habitat is available. But this does not negate the fact that the 1:1 relationship between heavily logged forests and grouse abundance described in the scoping document is not supported. These are complex issues, and heavy-handed, narrowly-defined management approaches may result in serious impacts while failing to achieve increasing numbers of grouse.

VI. Endangered bats

The project area provides habitat for Indiana bats (*Myotis sodalis*) and northern long-eared bats (*Myotis septentrionalis*), both of which are listed as endangered under the Endangered Species Act (ESA). U.S. Fish and Wildlife Service (USFWS) maps indicate the project area includes either "Known Summer 1 habitat" or "Known Summer 2 habitat" for Indiana bats and "Known Summer 1 habitat" for northern long-eared bats. The project area provides suitable habitat for both species and should be considered occupied during the non-hibernating portions of the year. Consultation with USFWS should occur for both of these species. Further, the change in status for northern long-eared bats from "Threatened" to "Endangered" under the ESA should warrant

[45] Id.

a review and changes to the protective measures afforded the species under the current Forest Plan and 4d rule.

Both species of bats rely on large tracts of mature and interior forest for roosting, foraging, and raising young. Divoll et al. (2022)[46] state that:

> Both *M. sodalis* and *M. septentrionalis* are more likely to occur in closed canopy forest (Ford et al., 2005) and thus may respond negatively to large regeneration harvests (e.g., as predicted by Loeb, 2020); however, they may respond positively to fine-scale disturbances within larger forest patches (e.g., Loeb and O'Keefe, 2006).

While Indiana bats exhibit some tolerance for forest fragmentation and large openings in the forest, northern long-eared bats display little tolerance. Arant (2020)[47], researching bats and habitat use in eastern Kentucky, found that northern long-eared bats avoided areas following harvest, stating "The lack of activity of these bats in harvests, however, suggests they do not actively forage within cuts" (Arant at 71; See also Figure 18 at 46; Table 3 at 48; Figure 19 at 58). Arant hypothesized that *Myotis* species avoided large openings in response to prey availability and exposure to predators. Divoll (2022) found that northern long-eared bats utilized lightly-thinned forest and small patch cuts (0.8 – 4.4 ha, or 2 – 10.8 ac) in a mature forest matrix, but generally avoided large clearcuts. The authors found that habitat use by northern long-eared bats exhibited the following preference: Water > historic thinning > patch cuts > recent thinning > historic openings > clearcut > developed > agriculture. The authors point out that preference for water sources was based on those sources being within a mature forest setting, stating "Supporting this, Huie (2002) showed that bat captures were higher than expected at small ponds within mature forest and lower than expected for small ponds within clearcuts in Kentucky."

An important aside is the use of the term "shelterwood." The DBNF has been using "shelterwood" to refer to regeneration harvests that leave a residual basal area of 10 to 20 ft^2/acre (retaining about 8% to 15% of volume). This deviates from the usage of the term in most forestry literature, as well as the bat studies cited here. For example, Arant (2020) described shelterwood harvests at Robinson Forest and lands managed by The Forestland Group as retaining about 50% of the timber volume. Divoll et al. (2022) state that "Traditionally, shelterwoods are considered regenerative; however, during our study, they were in early stages that more structurally resembled a thinning or selection harvest and, thus, we included them in recent thinnings," and describe the structure as "Canopy intact to partially open; low to moderate stem volume removal." Therefore, any statements that either Indiana or northern long-eared bats would benefit from "shelterwood" harvests based on these or other studies would be misleading at best.

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[46] Timothy J. Divoll, Stephen P. Aldrich, G. Scott Haulton, Joy M. O'Keefe (2022), Endangered Myotis bats forage in regeneration openings in a managed forest, Forest Ecology and Management, Volume 503

[47] Arant, Phil (2020). Effects of Shelterwood and Patch Cut harvests on a Post White-Nose Syndrome Bat Community in the Cumberland Plateau in Eastern Kentucky. University of Kentucky College of Agriculture, Food, and Environment.

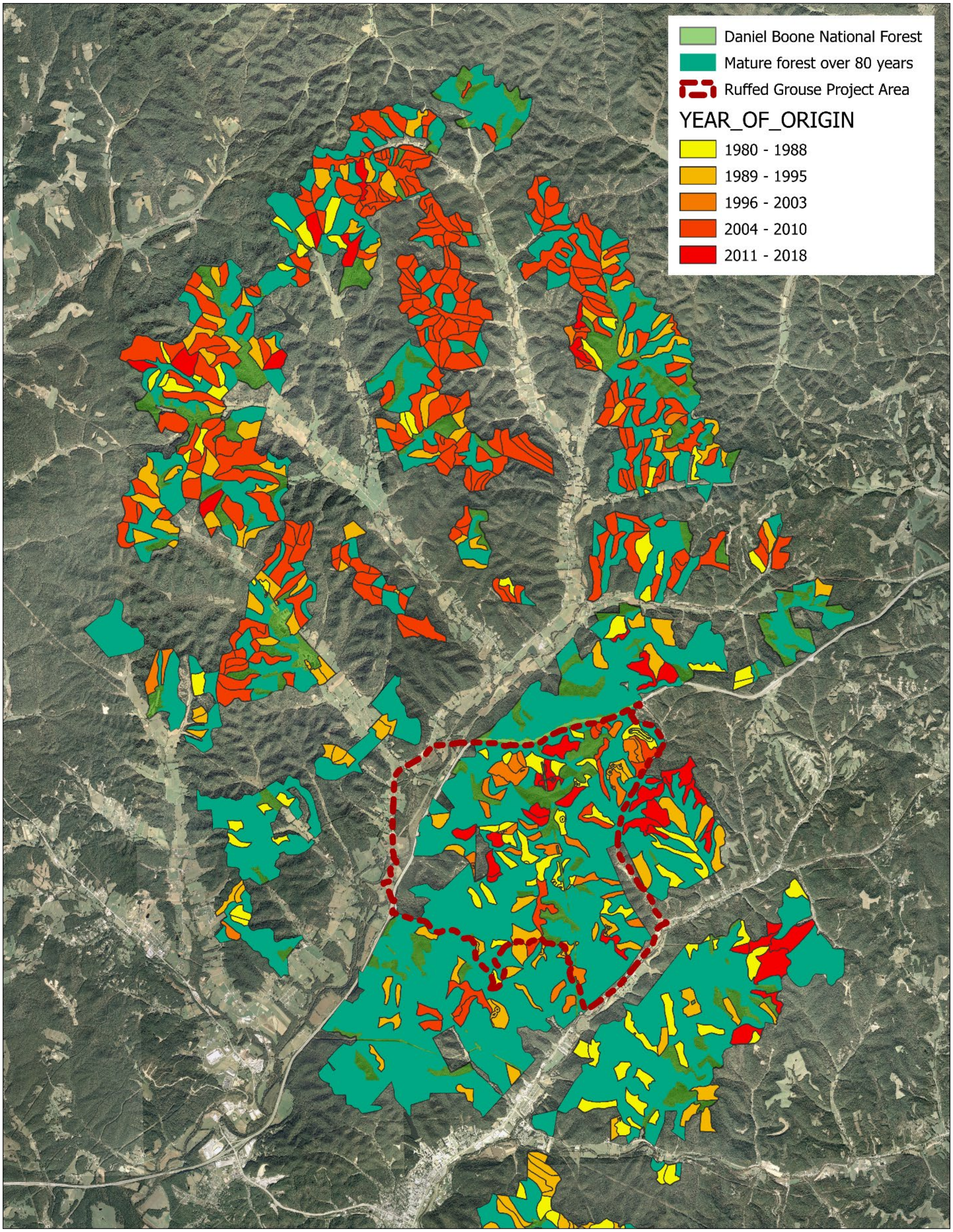

Figure 18. Mature and immature forests in the northern Cumberland District from FSVeg data

The aforementioned investigations and others demonstrate that northern long-eared bats have a high fidelity for summer roosting areas and utilize relatively small home ranges for foraging during summer (and lactating) periods. Silvis (2014) reported that overall colony roosting areas were between 1.3 and 58.8 hectares (3.2 and 145 acres). Divoll (2022) reported that northern long-eared bats foraged within 176 ± 25 hectares (435 ± 62 acres) and only traveled 1.6 km (1 mile) to forage.

The scale, intensity, and distribution of regeneration cuts could lead to significant impacts to northern long-eared and Indiana bats. However, we can't know because the scoping letter provides no specifics on where timber harvest may occur, how much could be harvested, the spatial relationship between harvest areas, nor the timeframe for implementation. Because the northern Cumberland District is highly fragmented with some of the least amount of mature and interior forest in the entire DBNF (See Figure 18 and Figure 19), even-aged harvests of mature forests in the project area could meaningfully degrade important Indiana and northern long-eared bat habitat.

The fact is that the protective measures in the Forest Plan are largely meaningless without surveys – surveys which the Forest Service has repeatedly refused to conduct. The protections afforded to these species during the summer roosting season, including for maternity colonies during pups' non-volant period, are based entirely on protecting "known" colonies and roosts. But without surveys, these colonies and roosts cannot be known, and therefore cannot be protected. We insist that the Forest Service conduct surveys for Indiana bats and northern long-eared bats before approving any timber harvest in the project area.

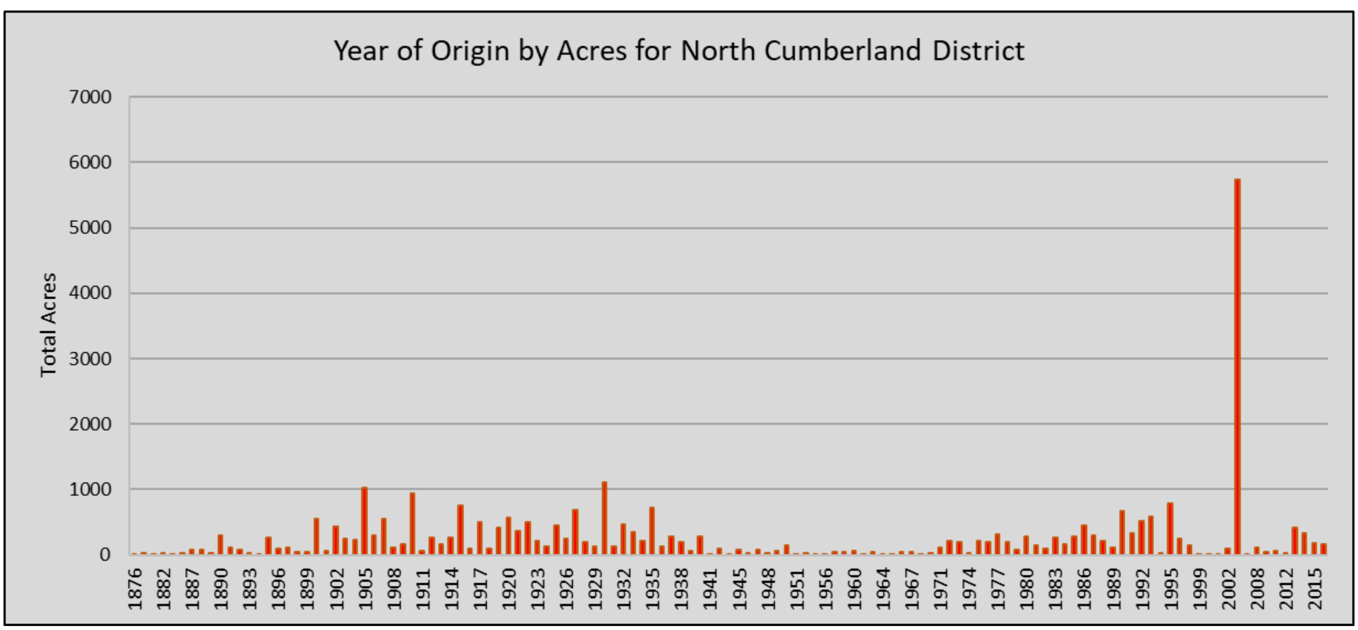

Figure 19. Year of origin data by acres for the northern Cumberland District from FSVeg data

VII. Sheltowee Trace National Recreation Trail

The Sheltowee Trace National Recreation Trail crosses through much of the project area. Many Kentucky Heartwood members hike the Sheltowee Trace, including the section in the project area. Logging along the Sheltowee Trace on upper Elk Lick in the Cumberland District in 2017 and 2019 as part of the 2003 Ice Storm Recovery project created concerns and controversy among STA members and volunteers. While we cannot speak for the Sheltowee Trace Association, it is our understanding that the District Ranger had previously committed to consulting with STA if future logging projects could affect the trail. It is also our understanding that this communication did not happen prior to scoping – which will be the only opportunity to comment on this project. There was also controversy when logging was proposed along the Trace in the London District as part of the Pine Creek project. The proposed action in that project was ultimately modified to better protect the scenic integrity and recreational use of the trail. Those changes occurred because the Forest Service developed the project through an EA, providing specific details, and allowing for review, input, and collaboration toward a better project outcome.

The Forest Plan does not offer specific scenic integrity objectives for the Sheltowee Trace. Instead, the Forest Plan leaves those scenic integrity objectives to the management prescription areas in which it is located in addition to project-specific measures incorporated into project planning. Because no site-specific proposal has been shared with the public there is no way to evaluate the effects this project would have on the Sheltowee Trace and its users. The Forest Service *could* choose to leave unharvested buffers around the trail during project implementation. The Forest Service *could* develop harvest prescriptions that leave a certain number of large canopy trees along the trail. The Forest Service could also removal all overstory trees near the trail, leaving users of the Sheltowee Trace with little shade as they hike this long, dry section – as would be allowed under the 3.H.1. Ruffed Grouse Emphasis Prescription Area. The project, however, leaves all of these decisions to be made at the discretion of the Forest Service during implementation, after the project has been approved.

It is likely that the public, including trail users, will only know which trees are to be cut after they are sold. At that point, according to the Forest Service's own accounting, there is little that can be done to modify a sale to retain trees and protect the trail.

Regarding concerns over large tree retention along the Sheltowee Trace above Elk Lick, District Ranger Kazmierski wrote in 2019:

> It is my recollection, as supported by these e-mails, that I explained to you all that I was willing to look at the 13 trees you all identified as being critical to the trail and seeing what we could do to not cut those 13. I followed through with that and the contractor was only willing to leave five of the thirteen trees. **Once a contract is issued and the marked trees have been paid for, there's very little within my control and all we**

could do is politely ask the contractor to consider leaving some of the trees, which he did.[48] (Emphasis added)

This is a significant issue. The Forest Service cannot responsibly leave addressing these concerns to the discretion of future DBNF officers. The history demonstrates that verbal assurances of protections, collaboration, and communication are not sufficient. The project proposal needs incorporate specific language regarding management along the Sheltowee Trace National Recreation Trail and the protection of trail user experiences and values.

VIII. Carbon emissions

The Forest Service needs to provide a detailed assessment of the net greenhouse gas emissions that can be anticipated from implementing this project. This analysis should include cumulative and scaling effects across timber projects in the DBNF and USFS Region 8, assessing how carbon emissions from this project affect the cumulative ability of the USFS to sequester carbon emissions.

President Biden's Earth Day executive order states: "My Administration will manage forests on Federal lands, which include many mature and old-growth forests, to … retain and enhance carbon storage; conserve biodiversity; …[etc]."[49] Logging mature forests in the project area could result in significant greenhouse gas emissions in opposition to the President's executive order.

In the Comment Consideration for the Jellico IRMS, the Forest Service argued that timber harvest in the Jellico project would result in net carbon sequestration because young trees grow more quickly than old trees, and harvested wood would be sequestered in long-lived wood products. This understanding of forests and carbon budgets is deeply flawed and runs contrary to a growing body of research showing the logging tends to result in significant carbon emissions over multi-decadal timeframes. Because this issue has become increasingly important, we are presenting a brief review of the literature and issues pertaining to forest carbon and logging.

Net ecosystem productivity and carbon sequestration in old-trees

Carbon sequestration in forests is often expressed as "net ecosystem productivity" or NEP. This is the net difference in a forest's uptake of CO_2 through primary production (photosynthesis) and losses through plant and soil respiration, including microbial decomposition. Previous models

[48] Email from Jon Kazmierski to Doug Doerrfeld, Sept. 24, 2019, RE: logging on the ST on upper Elk Lick Fork

[49] Joseph Biden (2022) Executive Order on Strengthening the Nation's Forests, Communities, and Local Economies https://www.whitehouse.gov/briefing-room/presidential-actions/2022/04/22/executive-order-on-strengthening-the-nations-forests-communities-and-local-economies/

assumed that NEP approached zero as forests reached old-growth stages of development. However, these models have been upended.

Luyssaert et al. (2008) conducted a meta-analysis, examining data collected from temperate (70%) and boreal (30%) old-growth forests across the globe. They found that "biomass continues to increase for centuries," contrary to "the commonly accepted and long-standing view that old-growth forests are carbon neutral (that is, that photosynthesis is balanced by respiration)."[50]

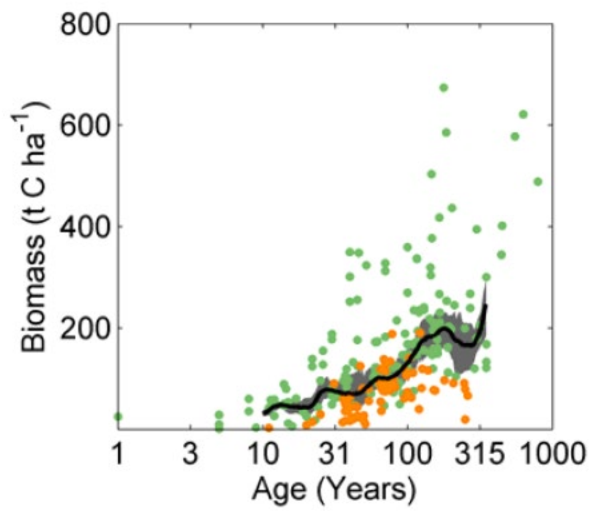

Figure 20. Biomass accumulation and forest age from Luyssaert et al. (2008)

McEwan et al. (2014)[51] assessed disturbance and fire intervals using tree ring data from Lilley Cornett Woods in Letcher County, Kentucky and found that the oldest trees continued to increase in growth rate after more than two centuries.

> "There was some indication that ring widths increased consistently over the life span of the trees sampled here (grey line, Fig. 1b). Individual series exhibited long-term growth patterns characterized by suppression and growth pulses. For example, the oldest tree in the FHC was a *Quercus montana* (top panel, Fig. 2) that exhibited ca. 100 yrs of suppression followed by a growth release that resulted in a step change increase in wth rate. The overall pattern, as evidenced by the individual series (Fig. 2) and the mean for all samples (Fig. 1b), suggests that maximum growth rates for these trees were being achieved near the end of the chronology, after the trees were ca. 200 years old."

[50] Luyssaert et al (2008). Old-growth forests as global carbon sinks. Nature Letters, Vol 455, 11 September 2008
[51] Ryan W. McEwan, Neil Pederson, Adrienne Cooper, Josh Taylor, Robert Watts, and Amy Hruska. Fire and gap dynamics over 300 years in an old-growth temperate forest. Applied Vegetation Science 17 (2014) pp. 312-322.

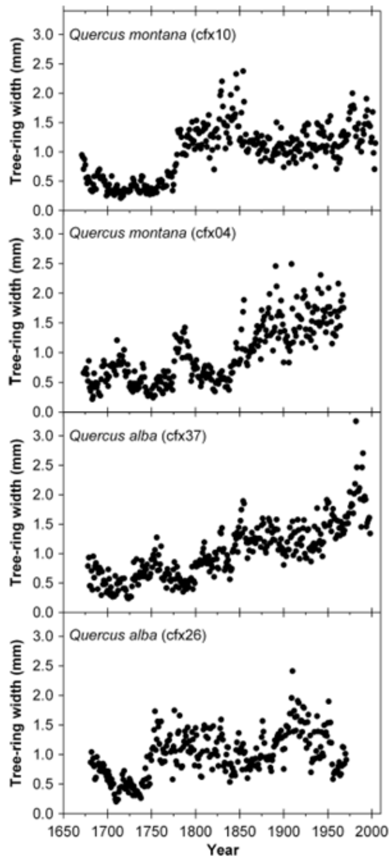

Fig. 2. Long-term growth patterns of the four oldest trees sampled as part of a fire history collection made in an old-growth temperate deciduous forest, central Appalachian Mountains, USA.

Figure 21. Tree ring widths and tree age at Lily Cornet Woods from McEwan et al. 2014

In a newly published study, Au et al. (2022)[52] "examine(d) age-dependent drought sensitivity of over 20,000 individual trees across five continents and show(ed) that younger trees in the upper canopy layer have larger growth reductions during drought."

The article "Tree Growth Never Slows" in Nature (2014)[53] describes work by Stephenson et al. (2014), stating:

> "Many foresters have long assumed that trees gradually lose their vigour as they mature, but a new analysis suggests that the larger a tree gets, the more kilos of carbon it puts on each year.

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[52] Au, Tsun Fung & Maxwell, Justin & Robeson, Scott & Li, Jinbao & Siani, Sacha & Novick, Kimberly & Dannenberg, Matthew & Phillips, Richard & Teng, Li & Chen, Zhenju & Lenoir, Jonathan. (2022). Younger trees in the upper canopy are more sensitive but also more resilient to drought. Nature Climate Change. 10.1038/s41558-022-01528-w.

[53] Tollefson, J. Tree growth never slows. Nature (2014). https://doi.org/10.1038/nature.2014.14536

““The trees that are adding the most mass are the biggest ones, and that holds pretty much everywhere on Earth that we looked,” says Nathan Stephenson, an ecologist at the US Geological Survey in Three Rivers, California, and the first author of the study, which appears in the journal Nature. “Trees have the equivalent of an adolescent growth spurt, but it just keeps going.”

“Stephenson and his colleagues analysed reams of data on 673,046 trees from 403 species in monitored forest plots, in both tropical and temperate areas around the world. They found that the largest trees gained the most mass each year in 97% of the species, capitalizing on their additional leaves and adding ever more girth high in the sky.”

In their paper, Stephenson et al. (2014)[54] state:

“Here we present a global analysis of 403 tropical and temperate tree species, showing that for most species mass growth rate increases continuously with tree size. Thus, large, old trees do not act simply as senescent carbon reservoirs but actively fix large amounts of carbon compared to smaller trees; at the extreme, a single big tree can add the same amount of carbon to the forest within a year as is contained in an entire mid-sized tree. The apparent paradoxes of individual tree growth increasing with tree size despite declining leaf-level and stand-level productivity can be explained, respectively, by increases in a tree’s total leaf area that outpace declines in productivity per unit of leaf area and, among other factors, age-related reductions in population density. Our results resolve conflicting assumptions about the nature of tree growth, inform efforts to understand and model forest carbon dynamics, and have additional implications for theories of resource allocation and plant senescence.”

Carbon emissions from logging and the myth of “long-lived wood products”

While harvested wood products can represent a stable carbon pool until they are disposed of, life cycle analyses have revealed logging overall is not necessarily an effective tool for carbon sequestration as suggested by the Forest Service. Instead, the disposal of tree crowns and limbs (by burning or decay), the decay of root systems, and the accelerated decomposition (respiration) of saw dust and milling waste result in 64% of the carbon being released back into the atmosphere.[55] After wood products are put into landfills and decay, another 16% of the carbon is released. Overall, 80% of the carbon that was once in the forest is released back into the atmosphere over a relatively short time, making logging a large contributor to greenhouse gases

[54] Stephenson, N., Das, A., Condit, R. et al. Rate of tree carbon accumulation increases continuously with tree size. Nature 507, 90–93 (2014). https://doi.org/10.1038/nature12914
[55] Hudiburg, T.W. et al (2019) Meeting GHG Reduction Targets Requires Accounting for all Forest Sector Emissions. Environmental Research Letters 14 (9) https://iopscience.iop.org/article/10.1088/1748-9326/ab28bb

and not a sink. The state of Washington, for example, was found to be underestimating the state's total greenhouse gas emission by 25% by not including all emissions from logging.[56]

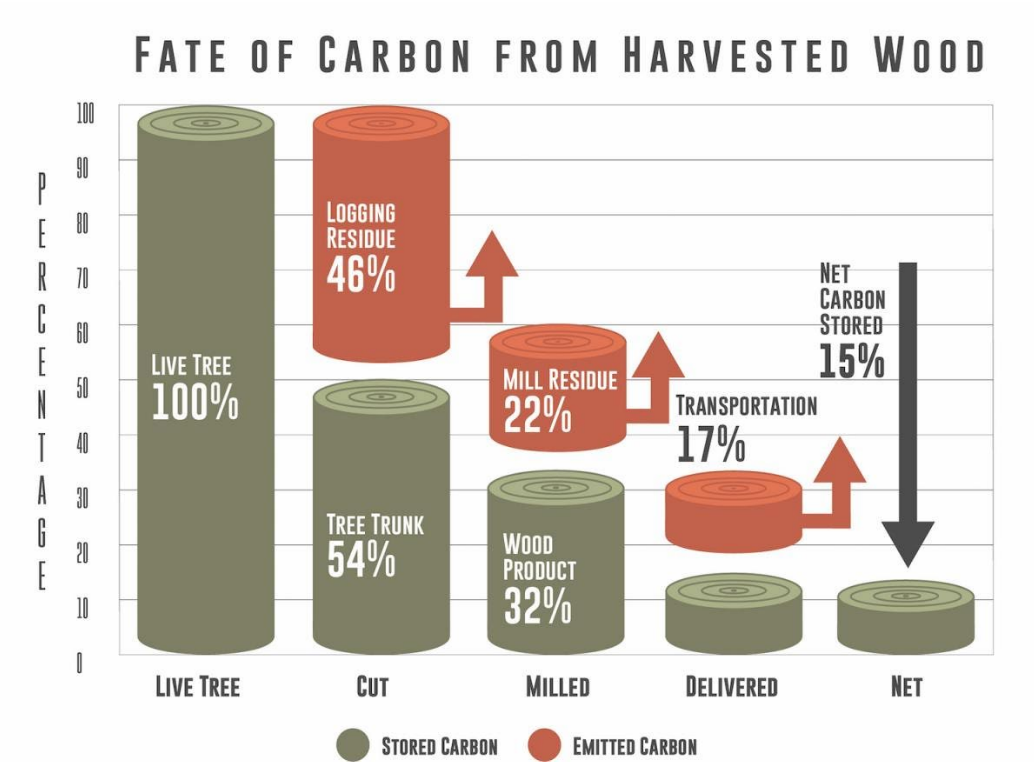

Figure 22. Fate of carbon from harvested wood reprinted from Oregon Wild [57] using data from USFS and peer reviewed studies[58,59]

Several analyses of the forestry sector in Oregon found that roughly a third of the state's total greenhouse emissions can be attributed to logging (not deforestation).[60, 61] This makes logging the single greatest source for greenhouse emissions in Oregon – greater than the state's

[56] Id
[57] C. Legue, J, Gonzales, A. Harris, D. Heiken (2018) Forest Defense is Climate Defense.
[58] Law, B.E. Hudiburg, T. Berner, L.T. and Harmon, M.E. (2018) Land use strategies to mitigate climate change in carbon dense temperate forests. Proceedings of National Academy of Science. 115 (14) https://www.pnas.org/doi/full/10.1073/pnas.1720064115
[59] Smith, James E.; Heath, Linda S.; Skog, Kenneth E.; Birdsey, Richard A. (2006) Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States. Gen. Tech. Rep. NE-343. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 216 p. https://www.nrs.fs.usda.gov/pubs/gtr/ne_gtr343.pdf
[60] Hudiburg, T.W. et al (2019) Meeting GHG Reduction Targets Requires Accounting for all Forest Sector Emissions. Environmental Research Letters 14 (9) https://iopscience.iop.org/article/10.1088/1748-9326/ab28bb
[61] J. Talberth (2017) Oregon Forest Carbon Policy: Scientific and technical brief to guide legislative intervention https://www.angelusblock.com/assets/docs/Oregon-Forest-Carbon-Policy-Technical-Brief-1.pdf

transportation sector and electricity use.[62] These emissions estimates include consideration of the fate of long-term wood products. Hudiberg et al. (2019)[63] state:

> "Methods are often in disagreement over the wood product Life Cycle Assessment (LCA) assumption of a priori carbon neutrality, where biogenic emissions from the combustion and decomposition of wood is ignored because the carbon released from wood is assumed to be replaced by subsequent tree growth in the following decades (EPA 2016). Despite a multitude of analyses that recognize that the assumption is fundamentally flawed (Harmon et al 1996, Gunn et al 2011, Haberl et al 2012, Schulze et al 2012, Buchholz et al 2016, Booth 2018), it continues to be used in mitigation analyses."

Cavender-Bares (2022) suggests that the monetized negative costs of greenhouse gases released by logging are typically greater than the economic value of the timber.[64]

The Forest Service needs to provide an assessment of this project's carbon emissions in line with the most recent and thorough scientific studies. The carbon released through this project's timber harvest objectives will, at best, take many decades or even centuries to be sequestered again by new growth. As we rapidly approach a climatic tipping point these timeframes matter. Although regeneration harvests are not as harmful as deforestation, their climate impacts are not negligible. The Forest Service needs to follow NEPA's hard look requirements and use the most recent and best available science instead of outdated assumptions.

IX. Alternatives

To meet the purpose and need for this project, while also limiting the amount of mature forest lost to create young forest habitat, we suggest the Forest Service place an emphasis on felling or girdling a majority of tulip poplar and red maple trees within stands regenerated (i.e., shelterwood, clearcut, etc.) since about 1980 where oaks and hickories are limited. Figure 1. in the scoping document indicates that over 1,200 acres of these immature forests are available in the project area. It is quite likely that many of these areas have an overabundance of maple and tulip poplar. This would have the effect of releasing oaks and hickories from competition while also creating high quality early seral habitat containing the high stem counts preferred by grouse.

This approach is supported by the Kentucky Ruffed Grouse and Young Forest Strategic Plan 2017-2027, which includes in Objective 1, Strategy 2 to "Use noncommercial practices to perpetuate high-stem-density cover." We have had conversations with members of the Kentucky

[62] https://www.oregon.gov/deq/ghgp/Pages/GHG-Inventory.aspx
[63] Hudiburg, T.W. et al (2019) Meeting GHG Reduction Targets Requires Accounting for all Forest Sector Emissions. Environmental Research Letters 14 (9) https://iopscience.iop.org/article/10.1088/1748-9326/ab28bb
[64] Cavender-Bares, J.M. Nelson, E. Meireles, J.E. Lasky, J.R. Miteva, D.A. et al. (2022) The hidden value of trees: Quantifying the ecosystem services of tree lineages and their major threats across the contiguous US. PLOS Sustainability and Transformation 1(4) https://doi.org/10.1371/journal.pstr.0000010

Chapter of the Ruffed Grouse Society in 2018 who believe that management of stands harvested in the 1980s and 1990s as described here is a viable approach for supporting ruffed grouse.

We also suggest that landscape heterogeneity and oak regeneration be supported through prescribed fire, midstory thinning, and well-sited group selection harvests (e.g., femelschlag or expanding gap). The combination of these methods with the management of immature forests described above should meet all aspects of the stated purpose and need while also preserving the scenic, ecological, and habitat values provided by conserving mature forests in the project area.

Sincerely,

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