



United States Department of the Interior

FISH AND WILDLIFE SERVICE

West Virginia Field Office
6263 Appalachian Highway
Davis, West Virginia 26260



April 8, 2024

Melissa Thomas-Van Gundy
United States Forest Service
459 Nursery Bottom Road
Parsons, West Virginia 26287

Re: Tier 2 Biological Opinion for Fernow Experimental Forest Long Term Research Project,
Tucker County, West Virginia (FWS File Number 2024-0041874)

Dear Melissa Thomas-Van Gundy:

This document transmits the U.S. Fish and Wildlife Service's (USFWS) Tier 2 biological opinion (Opinion) based on our review of the Fernow Experimental Forest long term research project Tier 2 Biological Assessment (BA), received on January 29, 2024. This project has been assigned the FWS File Number 2024-0041874; all future correspondence should reference this project code.

This Tier 2 Opinion is submitted in accordance with section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). It is based on information provided in the May 2023 framework programmatic biological opinion (PBO), the United States Forest Service (USFS) Tier 2 BA, and other sources of information, as appropriate.

The May 2023 PBO covers certain USFS proposed actions that are likely to contribute to the recovery of the federally listed endangered rusty-patched bumblebee (*Bombus affinis*) on the George Washington, Jefferson, and Monongahela National Forests. The PBO was completed pursuant to the November 2016 USFWS policy on *Streamlined Consultation Guidance for Restoration/Recovery Projects* and associated documents and sets forth a framework for project-level consultations for actions that fit within the framework. The process is as follows: 1) the USFS provides a Tier 2 biological assessment (BA), which includes project specific information and an effects determination for the RPBB, 2) the USFWS ensures that the information submitted is consistent with the PBO, 3) the USFWS provides a Tier 2 Opinion with an incidental take statement for actions that are likely to adversely affect the species.

The USFWS reviewed the Fernow Experimental Forest long term research project Tier 2 BA and concurs with the activity determinations listed in Table 1.

Project History

June 17, 2021: Consultation and concurrence from the WVFO for Virginia big-eared bat (*Corynorhinus townsendii virginianus*), Cheat Mountain salamander (*Plethodon netting*), rusty-patched bumblebee, candy darter (*Etheostoma osburni*), small whorled pogonia (*Isotria medeoloides*), shale barren rock cress (*Arabis serotina*), Virginia spiraea (*Spiraea virginiana*), Indiana bat (*Myotis sodalis*), and northern long-eared bat (*Myotis septentrionalis*). The USFS made no effect determinations for Virginia big-eared bat, Cheat Mountain salamander, rusty-patched bumblebee, candy darter, small whorled pogonia, shale barren rock cress, and Virginia spiraea. May affect likely to adversely affect determinations were made by the U.S. Forest Service for Indiana bat, and northern long-eared bat. The WVFO concurred with this determination on June 17, 2021 and issued an incidental take statement for both species (i.e., Indiana bat and northern long-eared bat). These concurrences and incidental take statements are still valid.

January 29, 2024: The USFS reinitiated consultation for rusty-patched bumblebee, due to new detections within the action area, and submitted the Tier 2 for rusty-patched bumblebee.

Table 1. Description of the proposed action(s), their component activities, timing, the types of rusty-patched bumblebee habitat types likely to be affected, degree of overlap (if any) with a rusty-patched bumblebee high potential zone (HPZ), conservation measures applied, and effects to the rusty-patched bumblebee. For actions that are likely to adversely affect the rusty-patched bumblebee, see the Tier 2 Opinion below.

Action Name	Activity ¹	Use (Nesting, Over-wintering, Foraging) Affected ²	Habitat Type(s) Affected	Duration and Frequency	Action Area and HPZ Overlap ?	Grid # Affected	Recommended Conservation Measures Applied	Required Conservation Measures Applied	Effects Determination ³	Basis for Effects Determination
Fernow Experimental Forest long term research project	Timber Harvest (even-aged and uneven aged silviculture prescriptions	N, O, F	Upland Forest-Closed Canopy	September 1 – March 31 st , annually, 2024-2030	Yes	25337 and 25504	CR8 and CR9	CM1, CM7, CM8, and CM9	LAA	Heavy equipment used for tree harvesting and transport to landings have the potential to directly impact individuals or nests, can cause soil compaction, and introduce nonnative invasive species. Skid trails and log landings impacts can be mitigated by decommissioning skid trails and log landings by planting with native pollinator vegetation. This would provide diverse foraging habitat and natural corridors for genetic diversity or travel. The long-term beneficial effects exceed the direct negative effects of timber management actions.
	Skid road use	N, O, F	Upland Forest-Closed Canopy	September 1 – March 31 st , annually, 2024-2030	Yes	25337 and 25504	CR8 and CR9	CM1, CM7, CM8, and CM9	LAA	Dozing the site to create or re-create a temp road prism can result in direct take of nesting bees, displacement of foraging bees, and temporary loss of vegetation from the roadway reduces foraging opportunities for a growing season.
	Log landings	N, O, F	Upland Forest-Closed Canopy	September 1 – March 31 st , annually, 2024-2030	Yes	25337 and 25504	CR8 and CR9	CM1, CM7, CM8, and CM9	LAA	Dozing the site to create or re-create a log landing can result in direct take of nesting bees, displacement of foraging bees, and temporary loss of vegetation from the site reduces foraging opportunities for a growing season.

¹ Complex actions may be broken into multiple rows to isolate individual components if needed to clarify key details (timing, duration, etc.).

² Overwintering (October 11 - March 14); Nesting and Foraging (March 15 - October 10)

³ LAA – may affect, likely to adversely affect; NLAA – may affect, not likely to adversely affect.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The action that is the subject of this Tier 2 Opinion will be implemented under the programs described in the 2023 PBO. The USFS described the purpose, duration, timing, components, and location of the action in the Tier 2 BA submitted on January 29, 2024.

The action that is the subject of this Tier 2 Opinion is the ongoing implementation of the long term research program of the Fernow Experimental Forest within the Monongahela National Forest from 2024 - 2030. Approximately 405.9 acres of timber harvest are proposed from 2024 – 2030. Based on early 2023 capture estimates, the action does not occur within a currently designated HPZ. However, a capture of a rusty-patched bumblebee occurred during the 2023 field season within the action area (see environmental baseline section) and will place all 405.9 acres of timber harvest within an HPZs once those are established in the spring of 2024. Additionally, skid roads will impact approximately 15.2 acres with an HPZ, and log landings will impact approximately 1.81 acres within an HPZ.

Conservation Measures

Conservation measures are those actions taken to benefit or promote the recovery of a species. These actions will be taken by USFS and serve to minimize or compensate for project effects on the species under review and are included as an integral portion of the proposed action. Since conservation measures are part of the proposed action, their implementation is required under the terms of the consultation. These conservation measures were outlined within the PBO (Appendix C), but are also included here for clarity.

- CM1: If a rusty-patched bumblebee nest is found, it will be avoided during all project activities and the USFWS and USFS will coordinate on appropriate buffers;
- CM7: Include in silvicultural prescriptions design elements or modifications to support rusty-patched bumblebee objectives within HPZs. (For example, seeding log landings to pollinator seed mix, leaving flowering shrubs during site prep, reforestation activities, creating ephemeral ponds, remove pine plantations and convert to rusty-patched bumblebee foraging habitat, etc.);
- CM8: Implement Forest Service BMPs to avoid and minimize spread of NNIS (USFS 2012). (https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5412628.pdf); and
- CM9: Ensure that timber management activities do not affect more than 33% of forested habitat in the portion of the HPZ that is under USFS ownership in any single year to ensure that a sufficient extent of foraging and overwintering habitat remains available within the HPZ and to minimize direct adverse effects to rusty-patched bumblebees.

The PBO also included conservation recommendations, which are not mandatory, but are recommend. Conservation recommendations outlined in the PBO (Appendix C) which are relevant to the proposed action include:

- CR8: Seed decommissioned log landings, retired skid trails, and decommissioned temporary roads with seed mix that will maximize forage for rusty-patched bumblebees after site restoration;

- CR9: Install cut-back borders to enhance value of decommissioned log landings for rusty-patched bumblebee. Cut-back borders are edges that serve as a transition from open to forested habitat. They are typically created within a buffer of up to 300 feet and the edge is designed to have varying structure. These borders are typically created using chain saws or tree girdling to create snags.

ACTION AREA

The action area means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

Long term research projects which include timber harvest, creation and operation of existing skid roads, and the creation and operation of existing log landings within the Fernow Experimental Forest portion of the Monongahela National Forest. Table 1 in the Tier 2 BA (the second table labeled Table 1) lists the locations of proposed actions within the Fernow Experimental Forest as well of the timing of the proposed actions. Figure 1 shows the locations of each action boundary.



Proposed Actions - Fernow Experimental Forest

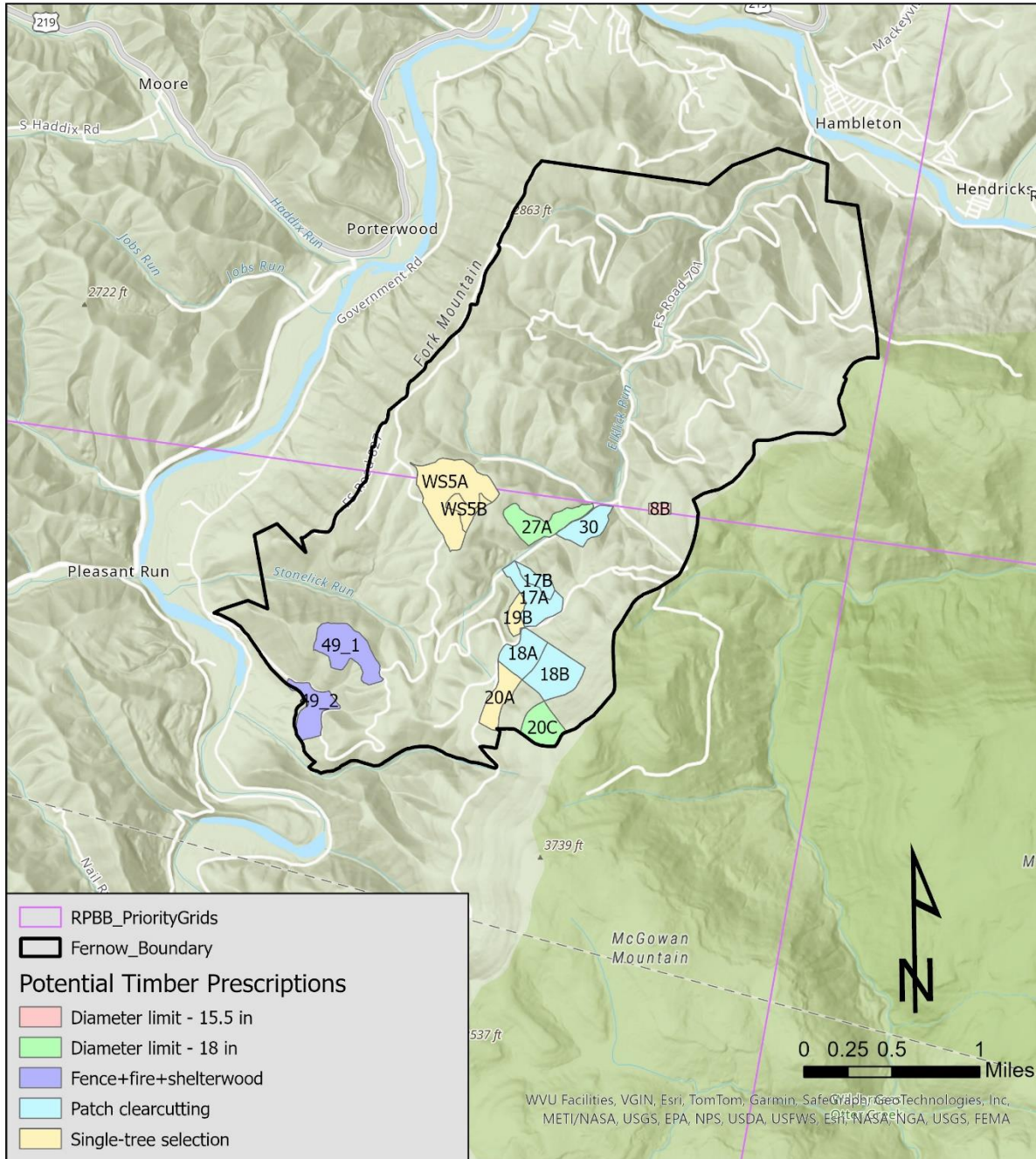


Figure 1. All Fernow Experimental Forest proposed action boundaries. More detailed descriptions of actions within each boundary are given in Table 1 of the BA

STATUS OF THE SPECIES

The 2023 PBO provides a description of the species and its life history, as well as rangewide numbers, reproduction, distribution, conservation needs and threats, and population dynamics, habitat, distribution, and recovery criteria.

While the rusty-patched bumblebee has been observed in a variety of habitats in West Virginia and Virginia, including meadows, fields, woodlands, marshes, agricultural landscapes, and gardens, the vast number of observations have been in habitat dominated by rural mountains and forests. Thus, rusty-patched bumblebee habitat use in the central Appalachian Mountains of West Virginia, Virginia, and Maryland is quite different from habitat use by the species in the Midwest, where rusty-patched bumblebees are found in urban parks and prairies. The rusty-patched bumblebee has the potential to occur throughout the entire state of West Virginia but has been observed most often at high elevations, typically above 2,000 feet, on the ridges, slopes, and valleys of the Allegheny Mountains. In Virginia, the species has the potential to occur throughout most of the state with the exception of southeastern Virginia and the Piedmont Range in southern Virginia where there are no historical records of the rusty-patched bumblebee. The mountains and numerous streams and rivers of the Appalachians create a region of topographic complexity that provides habitat for a diversity of flowering plant communities. The native flowering trees, shrubs, and herbs of West Virginia and Virginia are likely a major part of rusty-patched bumblebee's diet, although the species has been documented using non-native species in both states. In the Appalachian Mountains, the species uses these various native flowering plant communities to fulfill dietary needs in a foraging strategy that appears to differ from how rusty-patched bumblebees forage in other parts of their range. In the heavily forested Appalachian Mountains, the rusty-patched bumblebee has been observed to "follow the bloom" at a local scale (i.e., it forages at optimal flowering locations during certain timeframes, and then changes location as the flowering resources decline in local spots, and another flowering species starts to bloom in a different part of the local landscape.) Initial data reveals the Appalachian Mountain rusty-patched bumblebee population is isolated and genetically unique from populations in the Midwest and elsewhere (pers. comm. M. Hepner, March 24, 2023).

In West Virginia, 260 individual rusty-patched bumblebees have been encountered during survey efforts since the species was listed under the ESA. During the most recent field season in 2023, 43 individuals, representing members from all castes, were encountered in the state. All detections of the species are from the eastern portion of the state. Most observations of the rusty-patched bumblebee are of a single individual or small numbers of bees at each location; therefore, there are no density or abundance estimates for rusty-patched bumblebees.

STATUS CRITICAL HABITAT

No critical habitat has been designated for this species

ENVIRONMENTAL BASELINE

The 2023 PBO provides a description of the environmental baseline relevant to the rusty-patched bumblebee on the three national forests. In this project area, the rusty-patched bumblebee is present, but uncommon. A 2019 survey focused on a pipeline corridor that bisected portions of the Monongahela National Forest and the George Washington National Forest recorded 31 rusty-patched bumblebee observations among a total of 7,244 bumble bee observations (Environmental Solutions and Innovations, Inc. 2019). Surveys of counties near and overlapping

with the Virginia portion of the action area in 2021 recorded 25 rusty-patched bumblebees among the 27,101 bumble bees observed (Orcutt 2022). Only two rusty-patched bumblebees were among the 3,503 bumble bees recorded at roadside survey points during a study conducted in 2021 in and around the action area (Hepner 2021). The surveyors recorded an additional five rusty-patched bumblebees on routes between survey points “in areas of abundant floral resources” (Hepner 2021). In a separate study designed specifically to find rusty-patched bumblebee, Hepner (2021) found an additional 46 rusty-patched bumblebee in the action area. Monongahela National Forest calendar year 2022 rusty-patched bumblebee survey results (Alex Silvis [West Virginia Division of Natural Resources], pers. com. email to Sandie Kilpatrick [USFS] dated 07/10/2023) yielded a total of 91 rusty-patched bumblebee, including 48 female workers, 35 males, 1 queen, and 7 unknowns. The results of Monongahela National Forest contracted and in-house calendar year 2023 rusty-patched bumblebee surveys are currently being processed and will be made available after the calendar year 2023 field season. In the interim, Monongahela National Forest has buffered all 2023 captures by a 2.5 mile buffer in coordination with the West Virginia Division of Natural Resources and the USFWS WV Field Office. These interim buffers are referred to as 2023 Potential High Potential Zones (pHPZ) and included the project analysis. The USFWS 2023 HPZ maps indicate that there are 20 HPZs located within or intersecting the Monongahela National Forest proclamation boundary totaling 112,815 acres (86,995 acres USFS administered) and one (2023-MNF-6) located at an administrative site outside of the proclamation boundary (Appendix D, Figure D-1 of the Tier 2 BA), most of which are not entirely comprised of USFS administered lands. As of the writing of this document, there are 54 pHPZs totaling 211,986 acres present based on calendar year 2023 draft capture data. One hundred and eight (108) Priority Grids intersect the Monongahela National Forest proclamation boundary, 95 of which contain some USFS administered land. Forty rusty-patched bumblebee grids contain some portion of an existing USFWS HPZ and an additional 46 grids contain some portion of pHPZs.

Within the action area, surveys on July 30, 2023 found one male and one worker rusty-patched bumblebee within the Fernow Experimental Forest. The West Virginia Department of Natural Resources has also documented three additional observation of worker rusty-patched bumblebees near the area in 2023 (pers. comm. Rick Doyle [West Virginia Department of Natural Resources] 2024.). Two individuals were observed along CR 4/1 on the West side of the Fernow Experimental Forest, one individual was observed on the East side of the Monongahela National Forest’s Otter Creek Wilderness on Brooklyn Heights Road, and another individual was observed on the South side of the Fernow Experimental Forest on McGowan Mountain Road. All individuals observed were foraging on hydrangea (pers. comm. Rick Doyle 2024).

EFFECTS OF THE ACTION

For a complete description of the effects of the activities that the USFS implements under the forest management programs for the George Washington, Jefferson, and Monongahela National Forests covered under this programmatic consultation, see the 2023 PBO. In the PBO, the USFWS described how the proposed actions are generally implemented and the nature of their likely effects to the rusty-patched bumblebee. The USFS provided additional information

regarding the specific project actions that are subject to this Tier 2 Opinion in the Tier 2 BA template submitted to USFWS on January 29, 2024.

For each proposed action, the USFS provided the information described above. For each action that may affect and is likely to adversely affect the rusty-patched bumblebee, the USFS provided the following additional information in the BA template:

- Purpose of the action:
 - o The purpose of the proposed actions is to continue ongoing research studies on the Fernow Experimental Forest and to maintain the integrity of the Fernow Experimental Forest for long-term research. The need for these specific proposed actions is found in the various study plans that establish the experimental designs, timing of treatments, and study durations. These data represent some of the most complete, continuous long-term records on ecosystem processes in the world. We propose to continue these experiments as designed and continue to gather information about the effects of various silvicultural practices and other disturbances on forest ecosystems in the central Appalachians. We use these data to provide information on basic ecosystem processes in unmanaged and managed forests, on species diversity of plants and animals, and on other ecological parameters. Research results from the Fernow Experimental Forest are used to guide management on private and public lands in the central Appalachian region and contribute to data compilations that have been used in establishing state and federal policies. The Fernow Experimental Forest has many partners and collaborators who rely on the existing studies as framework for basic research and for innovative studies. The proposed activities are based on established study plans with anticipated implementation within the time-frame of this environmental effect's analysis. These studies are summarized below.
 - o Large area comparisons of forest management practices - This study was initiated in 1950 to determine the effects of three uneven-aged silvicultural practices (single-tree selection, diameter-limit, and patch clearcutting) on wood yield and stand growth.
 - o Cutting practice level demonstration sites - This study is similar to the large area comparison study. Smaller areas (five acres each) demonstrate the long-term changes from single-tree selection, diameter-limit, and commercial clearcut harvesting.
 - o Shelterwood harvest-prescribed fire - The main objective of this study that began in 2004 is to determine the effectiveness of prescribed fire and shelterwood harvest to regenerate oak. The practice has been evaluated in the Virginia Piedmont but has not been evaluated on more mesic sites. Secondary objectives include evaluating treatment effects on coarse woody debris, forest floor characteristics, seedbank composition and abundance, herbaceous community, herpetofauna, and arthropod pests of acorns.
 - o Long-term soil productivity study - The effects of air pollution and harvesting on soil resources continue to be an important issue for eastern hardwood forests.

This study utilizes plot-based treatments of a one-time harvest removal (in 1996) and annual fertilization with ammonium sulfate fertilizer to accelerate removal of base cations from the forest, potentially ameliorative liming with dolomitic limestone on a subset of plots, and evaluates the long-term effects of base cation removal on a forest community hypothesized to be sensitive to acidification. By understanding the response of these

- o important forest communities, we can then predict the response of hardwood forests to changing nutrient levels.
- Timing of the action
 - o The proposed actions cover seven years of research activities on the Fernow from 2024 to 2030. Timber harvests and application of fertilizer and lime occur annually. Timber harvesting on the Fernow Experimental Forest is already seasonally restricted to decrease possible negative impacts to endangered bats; all tree-felling activities will be conducted between September 1 and March 31. Skidding of felled trees is usually synchronous with felling activities, but in years with unfavorable weather conditions and other time constraints that prevent the completion of skidding before the March 31 deadline, skidding activities may continue until all felled trees are removed from the unit or until the expiration of the timber sale contract (Table 2).

Table 2. Annual specific details on methods, locations, and years of proposed action on the Fernow Experimental Forest from 2024-2030.

Year	Compartment	Acres	Management Action	Miles of Skid Road	Methods
2024	30	23.01	Patch clearcutting	0.44	Ground-based skidding using existing skid trails; actual area harvested will be much less - 3 to 5 acres per compartment
	18A	28.58	Patch clearcutting	0.33	Ground-based skidding using existing skid trails; actual area harvested will be much less - 3 to 5 acres per compartment
	18B	41.60	Patch clearcutting	1.19	Ground-based skidding using existing skid trails; actual area harvested will be much less - 3 to 5 acres per compartment
2025	49_1	47.03	Shelterwood-final cut	0.48	Ground-based skidding using existing skid trails
	49_2	30.08	Shelterwood-final cut	0.14	Ground-based skidding using existing skid trails
2026	19B	10.76	Single-tree selection	0.36	Ground-based skidding using existing skid trails
2027	27A	34.32	Diameter limit - 18 in	0.95	Ground-based skidding using existing skid trails
2028	8B	5.00	Diameter limit - 15.5 in	0.07	Ground-based skidding using existing skid trails
	WS5B	11.75	Single-tree selection	0.22	Ground-based skidding using existing skid trails
2029	17A	31.35	Patch clearcutting	0.81	Ground-based skidding using existing skid trails; actual area harvested will be much less - 3 to 5 acres per compartment
	17B	11.32	Patch clearcutting	0.31	Ground-based skidding using existing skid trails; actual area harvested will be much less - 3 to 5 acres per compartment
	20A	25.17	Single-tree selection	0.77	Ground-based skidding using existing skid trails
	WS5A	78.21	Single-tree selection	2.27	Ground-based skidding using existing skid trails
2030	20C	27.67	Diameter limit - 18 in	0.33	Ground-based skidding using existing skid trails
Total - timber harvest and skid roads		405.9 acres		11.58 miles	

- Specific components of the action and how they will be carried out:
 - o The proposed action involves using the following silvicultural treatments: diameter-limit cutting treatment on 67 acres, single-tree selection on 126 acres, 25 acres of patch clearcutting (harvest patches totaling three to five acres within 158 acres of non-contiguous units), and final shelterwood harvest removal on 77 acres (Table 1; Fig. 2). The proposed timber management activities affect approximately 405.9 acres or approximately 8.8% of the total area contained within the Fernow Experimental Forest. Other treatments include fertilization of 4 acres with ammonium sulfate fertilizer and additions of dolomitic lime.
 - o For the studies that involve timber harvest, treatments include cutting individual trees according to the silvicultural prescription and removal of the boles from the stand. Ground-based skidding would be used to move the trees to log decks. Only existing skid trails and haul roads would be utilized. After completion of treatments, skid trails and decks would be re-graded, water bars installed, and landings seeded for closure until needed for the next harvest cycle. When feasible, flowering shrubs, such as rhododendron, will be left during felling activities. All management actions would comply with Monongahela National Forest plan standards and guidelines (USDA 2011) or West Virginia's best management practices (BMPs; WV Division of Forestry 2018).
 - o *Diameter-limit Harvest* - Diameter-limit harvesting would occur in compartments 8B, 20C, 27A, and watershed (WS) 2A (approximately 67 acres). With this partial harvesting technique, trees above a specified diameter are removed for forest products. This harvest technique creates an uneven-aged stand structure when applied over decades and is the most common form of timber harvest on private lands in the eastern US. All trees over 17 inches diameter breast height (dbh) from compartments 20C and 27A, and WS 2A and all trees over 15.5 inches dbh from compartment 8B would be removed through harvest. In all areas, cull trees five inches in dbh or greater would be cut and left on the ground and all grapevines would be severed.
 - o *Single-tree Selection Harvest* - The Fernow Experimental Forest would harvest timber via single-tree selection in compartments 8C, 8D, 19B, 20A, WS5A, and WS5B (approximately 126 acres). This single-tree selection harvest is a true uneven-aged silviculture system. This type of harvest creates multiple age classes when applied over time. Under single-tree selection, trees over 11 inches dbh are managed to fit a pre-determined stems per acre distribution based on the ratio between 2-inch dbh classes, the largest diameter managed for, and a target residual basal area in sawlog-sized trees. Parameters for the residual stand are adjusted by site index based on study design. In all areas, cull trees 5 inches dbh or greater would be cut and left on the ground and all grapevines would be severed.
 - o *Patch-clearcutting* - Timber would be removed via patch clearcuts of about 0.4 acre each in compartments 17A, 17B, 18A, 18B, and 30 (approximately 136 acres). With this technique, a young age class is created in a specific area when

the entire overstory and midstory in the 0.4-acre patch is removed. The total area of patch cuts created over seven years is estimated at 15 to 25 acres out of 136 acres total. In each 0.4 acre patch, all stems down to one-inch dbh would be cut and merchantable material removed. In older patches, grapevines would be severed when observed.

- o *Shelterwood Harvest* - In compartment 49 (77 acres), the final overstory removal of the shelterwood harvest would be scheduled in the next seven years. The determination for this harvest would be made after monitoring the conditions of the tree reproduction.
- o *Application of Fertilizer* - Ammonium sulfate fertilizer would be applied to the Long-term Soil Productivity (LTSP) plots (4 acres) every year. Dolomitic limestone would be applied to two acres of the LTSP plots every other year.
- Amount of rusty-patched bumblebee habitat on which ground disturbance is likely to occur when the rusty-patched bumblebee is likely to be present :
 - o 422.86 acres
- Amount of habitat where the availability of rusty-patched bumblebee foraging resources is likely to be reduced, even if temporarily:
 - o 422.86 acres
- Amount of rusty-patched bumblebee habitat likely to be burned when the rusty-patched bumblebee is likely to be present, if any:
 - o 0.0 acres
- Effects to the rusty-patched bumblebee:

Timber harvest, skid road opening and use, and log landing use

Effects to rusty-patched bumblebee foraging resources

Timber management could help increase the abundance of the rusty-patched bumblebee on the Forests by increasing the richness and abundance of floral resources. In their review, Mola et al. (2021b) concluded that forest management aimed at opening forest canopies “to control pests and disease” “is also likely to benefit bumble bees because favorable conditions for flowering are often found in mature forests with canopy gaps.” For example, after a group selection harvest in western Massachusetts, bee abundance within new openings “increased with a metric representing floral richness and abundance” (Roberts et al. 2017). At the landscape scale, bee abundance was “generally positively related to the amount of early-successional habitat” (Roberts et al. 2017). In Southern Rocky Mountain mixed conifer forest, the abundance of bees was negatively correlated with tree basal area and positively correlated with understory plant species richness; bumble bee species were dominant among the bees detected in the study plots (Rhoades et al. 2018). In the central Appalachian Mountains, retired log landings “appear to represent a microhabitat within timber harvests that resemble the ‘meadow-like’ vegetative conditions sought by some forest pollinators,” but can become dominated by non-native and weedy species, unless native species are seeded when the log landings are first retired from use (Lee et al. 2021). The three affected National Forests will seed log landings with species beneficial to pollinators and those that reduce soil erosion. Finally, higher diversity and density of bees has been documented in regenerating timber harvests where the reduced vegetation density has initiated regrowth of plant species that provided “season-wide floral resources” (Mathis et al. 2021).

In some cases, mechanical tree and shrub removal may not produce sufficient changes in understory plant diversity to benefit bumble bees without the addition of prescribed fire or more extensive canopy opening. In multiple studies in North Carolina temperate forest, bee abundances were higher in plots treated both mechanically and with fire than in plots treated only mechanically (Campbell et al. 2007, 2018). The authors suggested that further efforts to reduce overstory canopy may be necessary in thinned plots that are not also burned (Campbell et al. 2018). Attempts to restore oak woodland and savanna conditions in Tennessee also found that a combination of burning and thinning were necessary to achieve significant increases in the abundance and richness of herbaceous plants (Van der Yacht et al. 2020).

Initial increases in foraging resources after mechanical treatments may decline sharply within about 10 years, as woody plants naturally increase in density. Bee use of areas after harvest in the central Appalachian Mountains of Pennsylvania declined heavily after six years, as increases in vegetation density reversed initial increases of understory flowers (Mathis et al. 2021). Declines were most evident among plants species that bloom in late summer (Mathis et al. 2021). In Sweden, the common carder bee (*Bombus pascuorum*) “clearly decreased in abundance” as clear-cuts aged from two to eight years post-harvest (Milberg et al. 2021). In southern Appalachian clearcuts surveyed 17 years after harvest, Elliott et al. (1997) found that the post-clearcutting increases in asters (*Symphyotrichum* spp), goldenrod (*Solidago* spp.), and joe-pye weed (or boneset, *Eupatorium* spp.) had diminished sharply.

The USFS proposes to carry out certain measures to further ensure that timber management activities produce benefits for the rusty-patched bumblebee. The USFS proposes to seed decommissioned log landings and temporary roads with a mix of native wildflower species to increase summer and fall foraging resources for the rusty-patched bumblebee. The USFS also proposes to further enhance the effects of timber management for the rusty-patched bumblebee by felling additional trees along the edges of harvest areas to create ‘cutback borders’ and with other ‘sun-lighting’ practices that expand the area affected by overstory thinning.

Effects of ground disturbance

Ground disturbance associated with heavy equipment use for timber management could result in adverse effects to rusty-patched bumblebees, although only a small proportion of rusty-patched bumblebees in the action area are likely to be exposed each year. Ground disturbance that results in adverse effects to the rusty-patched bumblebee could occur, for example, during the construction or reopening of roads, skid trails, and log landings. Timber management, however, is likely to occur on less than 1 percent of the action area each year (Table 2 PBO) and related ground disturbance is likely to affect only a small percentage of that area. Moreover, some of this activity will occur outside of HPZs or when the rusty-patched bumblebee is unlikely to be present. Effects may be minimal to overwintering queens because timber management activities will take place primarily between spring and early fall.

For individual projects, we think that adverse effects to nesting rusty-patched bumblebees are only likely when ground disturbance exceeds 0.25 acre and when the species is likely to be present in the affected area (see 2.4.1.2.2 PBO). The likelihood of direct effects due to heavy equipment use may vary among harvest methods, which require different numbers of entries for management over a multi-year time period. Therefore, the likelihood and extent of adverse

effects will vary depending on the relative use of the different methods that fall within this silvicultural system. Clearcutting, for example, requires only one entry to remove the trees in a stand. For individual actions, the USFS will add the extent of ground disturbance that is likely to occur over the life of a project when making its effects determination. For example, 'likely to adversely affect' would be the appropriate determination for a project that is likely to result in 0.1 acre of ground disturbance in nesting habitat during the nesting season during each of three anticipated entries into the management area. That would result in a sum disturbance to 0.3 acre and would raise the likelihood of harm to nesting rusty-patched bumblebees above the level considered to be discountable (see 2.4.1.2.2 PBO Potential for Adverse Effects due to Ground Disturbance).

Timber management could also result in localized increases in the extent of non-native invasive species. Ground disturbance and movement of equipment among sites for timber management could introduce non-native invasive species to sites and stress rusty-patched bumblebees by reducing foraging resources. However, the USFS implements measures during timber management to limit the introduction and spread of non-native invasive species, which is expected to reduce the likelihood that adverse effects to the rusty-patched bumblebee will occur in these areas. For example, the USFS has a timber sale contract clause requiring logging equipment to be cleaned before starting to harvest timber on National Forest lands.

CUMULATIVE EFFECTS

Cumulative effects are those effects of future State or private activities, not involving Federal activities, which are reasonably certain to occur within the action area of the Federal action subject to consultation. Except for the possibly minor potential for pesticides applied on private lands to drift into the action area, there are no State or private activities that are reasonably certain to occur within the action area, which is entirely under the jurisdiction of the USFS. State or private activities that may occur on USFS land would typically require approval. Pesticides could drift into the action area when they are used on nearby lands, potentially reducing foraging resources and the potential benefits of the proposed USFS actions in some portions of the Forests (Mola et al. 2021a). Overwintering queens may also be harmed if they contact pesticide residues in the soils (Mola et al. 2021a). In contrast, much of the action area is separated by forest from surrounding private lands. That intervening forest is likely to act as a buffer and greatly minimize drift of pesticides to much of the Monongahela National Forest (Bentrop et al. 2019).

JEOPARDY ANALYSIS AND CONCLUSION

After reviewing the current status of the rusty-patched bumblebee, the environmental baseline for the Tier 2 project action area, the effects of the proposed action, and the cumulative effects, it is the USFWS's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the rusty-patched bumblebee.

The USFWS reached this/these conclusion(s) because:

- A. The proposed action is likely to increase the diversity and abundance of rusty-patched bumblebee foraging resources in the action area.

- B. The proposed action gives full consideration to, and is consistent with, the survival and recovery needs of the rusty-patched bumblebee and the role of the action area in providing for those needs.
- C. There is either a proven track record for successful implementation of the proposed action, or there is a high level of certainty that the proposed action is likely to produce a beneficial impact for the rusty-patched bumblebee.
- D. The amount or extent of incidental take of listed species is likely to be minimized due to the application of relevant conservation measures identified and agreed to by the agencies, as articulated in the 2023 PBO and January 29, 2024 Tier 2 BA.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take⁴ of endangered and threatened species, respectively, without special exemption. Harm is further defined by regulation⁵. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement (ITS).

The measures described below are non-discretionary and must be undertaken by the USFS, as applicable, for the exemption in section 7(o)(2) to apply. The USFS has a continuing duty to regulate the activity covered by this ITS. If the USFS fails to assume and implement the terms and conditions as part of the proposed action the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the USFS must document the progress of the action and its impact on the species as specified in the ITS [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED

This section specifies the amount or extent of take of the rusty-patched bumblebee that the action is reasonably certain to cause. In Table 3 we express the amount or extent of take in terms of a surrogate measure. It is appropriate to use surrogates to describe the extent of incidental in an ITS as long as: 1) the ITS describes the causal link between the surrogate and the take of the listed species; 2) the ITS describes why it is not practical to express the amount or extent of anticipated take or to monitor take-related impacts in terms of individuals of the listed species; and, 3) the ITS sets a clear standard for determining when the level of anticipated take of the listed species has been exceeded.

For the surrogate measures of take in Table 3, the following justifications apply.

1. *Causal link* – The likelihood that rusty-patched bumblebee will actually be harmed or killed will depend on the extent of area affected when the species is likely to be present. In addition, the extent of foraging habitat in which the

⁴ Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct.

⁵ See 50 Code of Federal Regulations 17.3.

availability of foraging resources is reduced or removed is also likely to be related directly to the likelihood and extent of harmful effects to the rusty-patched bumblebee. The rationale and scientific support for these links are articulated in the PBO.

2. *Why it is not practical to express the amount or extent of anticipated take or to monitor take-related impacts in terms of individuals of the listed species* – There will not be a means to determine the number of rusty-patched bumblebees taken because:
 - a. Rusty-patched bumblebee nests below-ground and nest locations are identified only rarely. We are not aware of any records, for example, of rusty-patched bumblebee nests being discovered after being harmed or destroyed by habitat management activities.
 - b. Rusty-patched bumblebee queens overwinter below the soil surface and their locations are rarely discovered.
 - c. We may conclude that take of rusty-patched bumblebees is reasonably certain to occur under certain conditions when 2 acres or more of habitat is removed or disturbed. Environmental variability, the species' abundance in the affected area, and other factors, however, make it impractical to predict or detect the number of rusty-patched bumblebees harmed by the activities. Moreover, above-ground activities that remove or reduce forage availability could affect members of the colony – queens, eggs, and larvae – that are below-ground and whose location is only rarely ascertained. Likewise, although it is reasonable to anticipate reductions in the health of individual rusty-patched bumblebees and reduced productivity of colonies as a result of reductions in foraging resources, evidence of these effects are unlikely to be detected – especially in a manner that would reliably indicate the extent to which they have occurred.
3. *Sets a clear standard for determining when the level of anticipated take of the listed species has been exceeded* – The number of acres of rusty-patched bumblebee habitat affected by conservation practices is consistent with the way that the USFS plans for and tracks implementation of its projects. Using acres of rusty-patched bumblebee habitat affected during certain times when the species is likely to be vulnerable to those effects will allow the USFWS and USFS to track the types of activities that we think are reasonably certain to cause take of the rusty-patched bumblebee and to determine if and when the level of take has been exceeded.

Table 3. Amount or extent and type of anticipated incidental take for the proposed action(s), a description of the incidental take surrogate, and the section of the PBO in which the subject activity’s likely effects to the rusty-patched bumblebee are described.

Project Name	Grid Number(s)	Rationale and Form(s) of Take	Surrogate	Amount or Extent of Incidental Take Anticipated – Use Appropriate Surrogate	PBO Effects Analysis Section(s)
Fernow Experimental Forest long term research project-timber harvest	25337 and 25504	Rusty-patched bumblebees are likely to be present in areas in which timber harvest will occur. Given that timber harvest involves ground disturbance we are reasonably certain that at least one rusty-patched bumblebee will be harmed or killed due to the action. Additionally, we are reasonably certain that timber harvest will result in a temporary decrease in foraging resources.	Acres of rusty-patched bumblebee habitat where ground disturbing or foraging habitat removal activities are sufficiently intense and timed in a manner that would expose foraging or overwintering rusty-patched bumblebees to ground disturbance (see effects of ground disturbance in PBO; Section 2.4.3.2) and/or reduced foraging resources (see effects to foraging resources in PBO; Section 2.4.3.1).	405.9 acres forested habitat	2.4.3
Fernow Experimental Forest long term research project-skid roads	25337 and 25504	Rusty-patched bumblebees are likely to be present in areas in which skid roads will occur. Given that skid road operation involves ground disturbance we are reasonably certain that at least one rusty-patched bumblebee will be harmed or killed due to the action. Additionally, we are reasonably certain that skid roads will result in a temporary decrease in foraging resources.	Acres of rusty-patched bumblebee habitat where ground disturbing or foraging habitat removal activities are sufficiently intense and timed in a manner that would expose foraging or overwintering rusty-patched bumblebees to ground disturbance (see effects of ground disturbance in PBO; Section 2.4.3.2) and/or reduced foraging resources (see effects to foraging resources in PBO; Section 2.4.3.1).	15.2 acres forested habitat	2.4.3
Fernow Experimental Forest long term research project-log landings	25337 and 25504	Rusty-patched bumblebees are likely to be present in areas in which log landings will occur. Given that log landing operation involves ground disturbance we are reasonably certain that at least one rusty-patched bumblebee will be harmed or killed due to the action. Additionally, we are reasonably certain that log landings will result in a temporary decrease in foraging resources.	Acres of rusty-patched bumblebee habitat where ground disturbing or foraging habitat removal activities are sufficiently intense and timed in a manner that would expose foraging or overwintering rusty-patched bumblebees to ground disturbance (see effects of ground disturbance in PBO; Section 2.4.3.2) and/or reduced foraging resources (see effects to foraging resources in PBO; Section 2.4.3.1).	1.81 acres forested habitat	2.4.3

REASONABLE AND PRUDENT MEASURES

The USFWS considers the following Reasonable and Prudent Measure(s) (RPM) to be necessary and appropriate to minimize the incidental take of the rusty-patched bumblebee.

1. Monitoring and Reporting – As outlined in Appendix A of the PBO, the USFS will provide a report to the USFWS by March 31 annually. This report will provide information on any projects that are likely to have resulted in wholly beneficial effects to the rusty-patched bumblebee or that likely provided a net benefit to the species as detailed in this programmatic opinion.

Table 4. Reasonable and prudent measures for each project that is reasonably certain to cause the incidental take of a rusty-patched bumblebee.

Project Name	Reasonable and Prudent Measure (No.)
Fernow Experimental Forest long term research project	USFS worked extensively with USFWS to incorporate conservation measures into the proposed actions that would avoid or minimize incidental take. We could think of no additional measures that would be either necessary or appropriate to apply to this action.

TERMS AND CONDITIONS

The USFS must comply with the terms and conditions of the statement provided below, which carry out any RPM described in the previous section and also include monitoring and reporting requirements. Any taking which is subject to this ITS that is in compliance with the following terms and conditions is not a prohibited taking under the ESA, and no other authorization or permit under the ESA is required.

- 1.1 To monitor the impacts of incidental take, the USFS must report the progress of the activities described in Table 1 and their impacts on the rusty-patched bumblebee to the USFWS as specified below. The USFS will report the progress and impacts for each activity on an annual basis, no later than March 31 of each year, until the project is completed.
- 1.2 The USFS will offer instruction to appropriate personnel who are involved in developing and implementing projects (e.g., project design criteria including Conservation Measures) for inclusion in this programmatic action. This instruction shall inform personnel about:
 - a. The criteria for determining that a project is eligible for such inclusion;
 - b. Developing the information required in the BA Template;
 - c. The required conservation measures; and
 - d. The administrative process for using the PBO and Opinion Template as the mechanism for project-level ESA section 7 compliance.

2. Upon locating an injured or sick rusty-patched bumblebee, initial notification must be made within three working days to the USFWS Minnesota-Wisconsin Ecological Services Field Office (<https://www.fws.gov/office/minnesota-wisconsin-ecological-services/contact-us>) and the Service's Law Enforcement Office in the state in which the specimen was found (contact information is available online at <https://www.fws.gov/program/office-of-law-enforcement/contact-us>). Written notification must be made within five calendar days to the same offices and include the date, time, and location of the discovery, a photograph of the specimen if possible, and any other pertinent information. Care must be taken in handling dead specimens to preserve the biological material in the best possible state. Rusty-patched bumblebee specimens shall be preserved in 70 to 95 percent ethanol (EtOH: not isopropyl alcohol) and placed in a small vial upon collection (dried specimens preserved using standard museum practices are also acceptable) and sent to the following address, unless otherwise directed by USFWS Minnesota-Wisconsin Ecological Service's Field Office:

USDA Agricultural Research Service, Bee Research Laboratory
Attn: Dr. Jonathan Koch
1410 E. 900 N.
Logan, UT 84341

The USFWS only anticipates incidental take of the rusty-patched bumblebee in HPZs. The USFWS carries out geographic modeling each year based on the latest set of rusty-patched bumblebee location records, dated 2007 to present. New records and other factors (e.g., changes to the Geographic Information System software) can cause changes each year in the location and configuration of HPZs. USFWS produces new HPZ maps typically in March or April. To report on the extent and nature of incidental take each year, the USFS will provide the USFWS with the information outlined in the monitoring and reporting plan.

The contact for these reporting requirements is as follows:

USFWS West Virginia Field Office
FW5_WVFO@fws.gov
Phone: (304)866-3858

REINITIATION NOTICE

This concludes formal consultation for the rusty-patched bumblebee on the action outlined above and in the USFS Tier 2 BA. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Tier 2 Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Tier 2 Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions regarding this Tier 2 Opinion or our shared responsibilities under the ESA, please contact Curtis Roth on the WVFO Team at fw5_wvfo@fws.gov.

Sincerely,

Jennifer L. Norris
Field Supervisor
West Virginia Ecological Services

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