USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Eastern Region/Monongahela National Forest November 2025

Biennial Monitoring Evaluation Report for the Monongahela National Forest

Covering Fiscal Years 2020-2024

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Cover photo: Harpers Ferry Job Corp student uses a drip torch to direct the spread of the fire during a prescribed burn on Monongahela National Forest. USDA Forest Service photo by Kelly Bridges.

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Why Monitoring Matters

There is no single correct approach to managing a forest or grassland. Each decision maker must weigh the ecological complexity of the ecosystems, the social and economic contributions of forest lands, changing environmental conditions, diverse public viewpoints, and uncertainty about long-term consequences. Monitoring data is therefore essential. A robust, transparent, and meaningful monitoring program provides information on resources, management impacts, and overall trends in condition. In other words, it offers feedback on whether management objectives are being met.

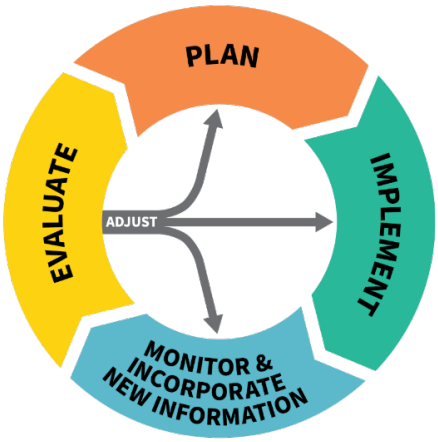
Every national forest or grassland has a land and resource management plan that balances recreation, timber, water, wilderness, wildlife habitat, and other uses. The plan describes a set of desired conditions – a science-based vision of the forest or grassland once plan goals are achieved. It also includes a monitoring framework, organized around a set of questions and indicators designed to track progress toward achieving the desired conditions in the land and resource management plan.

Certain monitoring requirements are set by law, regulation, or policy. Other monitoring responds to specific needs of the national forest or grassland. Every two years, each forest or grassland compiles and evaluates monitoring results in a Biennial Monitoring Evaluation Report (BMER). Decision makers, such as Forest Supervisors and District Rangers, use these BMERs to update their knowledge and assess progress toward the land management plan's desired conditions. Monitoring also strengthens accountability and transparency to the public and partners.

Monitoring questions must address the following topics (per 36 CFR sec 219.12 - Monitoring and Forest Service Manual 1909.12 sec. 32.13 - Content of the Plan Monitoring Program):

1. Status of select watershed conditions.
2. Status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.
3. Status of focal species to assess the ecological conditions.
4. Status of a select set of the ecological conditions to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species and maintain a viable population of each species of conservation concern.
5. Status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.
6. Measurable changes on the plan area related to climate change and other stressors that might be affecting the plan area.
7. Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.
8. Effects of each management system to determine that they do not substantially and permanently impair the productivity of the land.
9. Social, economic, and cultural sustainability must also be addressed in the monitoring plan because sustainability is an inherent part of several of the required monitoring items.

Monitoring reports do not make decisions, but they provide a valuable opportunity to document and share monitoring results. They are a cornerstone of adaptive management, helping determine whether management activities are moving the forest toward the desired conditions, goals, objectives, and outcomes included in the forest plan. If the BMER reveals that we are not quite meeting the mark, then there might be a need to change the land management plan, the management activities, the monitoring plan, or to reassess current conditions and trends. BMERs keep the forest plan up-to-date and are responsive to changing conditions and issues.



The 2006 Monongahela National Forest Land and Resource Management Plan (Forest Plan) is available at: https://www.fs.usda.gov/r09/monongahela/planning/forest-plan. The monitoring chapter (Forest Plan Chapter 4 – Monitoring and Evaluation) is available at: https://usfs-public.app.box.com/s/tpftqwmlwppyyctfmnobqg9fww6xcfjp. Previous monitoring reports and information used to build this monitoring report are available upon request through the contact listed on the inside cover.

Partnerships and Data Sources

The Forest Service accomplishes its mission through partnerships with land management agencies at all levels of government, as well as with nonprofit and for-profit entities, universities, and communities of all sizes. These partnerships reflect the breadth of Forest Service responsibilities, which include:

- Managing the nation's 193 million acres of National Forest System lands to sustain healthy terrestrial and aquatic ecosystems.
- Protecting communities and the global environment from catastrophic wildland fires, climate change, and invasive species.
- Inspiring life-long connections to nature for every American.

Monitoring can be expensive, time-consuming, and labor-intensive. Partnerships play a critical role in achieving monitoring objectives. Key partners include: Northern Research Station; U.S. Forest Service

State, Private, and Tribal Forestry - Forest Health Division; West Virginia Department of Agriculture; West Virginia Department of Environmental Protection; West Virginia Department of Natural Resources; U.S. Fish and Wildlife Service; Natural Resources Conservation Service; West Virginia University; U.S. Geological Survey; Canaan Valley National Wildlife Refuge; Trout Unlimited; The Nature Conservancy; Virginia Polytechnical Institute and State University; U.S. Environmental Protection Agency; National Atmospheric Deposition Program; Colorado State University Cooperative Institute for Research in the Atmosphere; and many more.

In addition to partnerships, existing data sources are utilized including national and regional inventory, monitoring, and research programs; Federal, State, or local government agencies; scientists, partners, and members of the public; and information from Tribal communities.

Report Summary

This BMER documents monitoring activities on the Monongahela National Forest during fiscal years 2020 through 2024. A new template was used to provide a more predictable timeframe for evaluating and responding to monitoring data. It improves communication with the public and decision makers regarding the impact of management actions by grouping questions and indicators into sections and identifying key results for each section. This approach is intended to identify possible adjustments to management and monitoring so that timely progress toward desired future conditions can occur, recognizing that some changes might be realized over time rather than occurring immediately following the report.

For this report, resource specialists answered 26 of the 44 monitoring questions in the Forest Plan (using 52 of the 95 indicators) to determine whether current implementation of land management is moving the Forest toward or maintaining the desired conditions or objectives described in the 2006 Forest Plan. Not all monitoring questions outlined in the Forest Plan Monitoring and Evaluation chapter were answered in this report. For some questions, this was due to the frequency of reporting (5-to-10-year cycle). For others, there was insufficient data or a lack of staffing to collect and analyze data. We will address the status of these monitoring questions in a future monitoring report.

Of the 52 indicators examined, we are meeting Forest Plan objectives or progressing toward our desired conditions in 44 of the monitoring indicators. To move the Monongahela National Forest closer to the desired condition for vegetation and habitat, we need to increase active management of forested stands to reduce fuels and promote regeneration of species like oak. We also need more active management to increase tree species diversity at the landscape scale, expand early successional habitat, and minimize insect and disease outbreaks and impacts. Increasing active management will directly and indirectly increase economic contributions in the Forest's area of influence.

Several monitoring questions and indicators need to be refined to use existing relevant monitoring and data sources, capitalize on existing partnerships, or apply best available science. Additionally, we could develop more meaningful monitoring questions or indicators for assessing recreation and transportation activities.

Recommended amendments to the Forest Plan would bring the plan alignment with currently listed threatened and endangered species and potentially allow the Forest to manage for the recovery of species more effectively. Additionally, it is recommended to assess Forest Plan standards and guidelines during the next Forest Plan revision to address e-bike usage, an important topic as e-bikes gain popularity.

Recommended Changes

The following table tallies our recommended changes based on evaluation of the indicators as they relate to the monitoring questions addressed in this report. Briefly, it provides the overall totals for how many monitoring indicators are meeting the Forest Plan direction, or whether changes to the Forest Plan, management activities, monitoring plan, or new assessments are suggested. Minor adjustments to monitoring questions and indicators enumerated in the table may not be detailed in this report but have been captured for consideration in the next BMER. Additionally, some changes to management activities counted in the table that should be implemented as project-level considerations may not be captured in this report.

Table 1. Adaptive management recommendations for monitoring indicators addressed in this report.

Recommendations	Yes	No	Uncertain
Land Management plan direction met	44	0	8
Change to land management plan	2	50	0
Change to management activities	10	39	3
Change to monitoring plan	13	38	1
Assessment	0	51	1

Forest Supervisor's Certification

This report documents the results of monitoring activities that occurred from Fiscal Year 2020 through Fiscal Year 2024 on the Monongahela National Forest.

I have reviewed the monitoring evaluation results presented in this report, examined the recommended changes to management activities, the monitoring program, and the Forest Plan, and consider the 2006 Forest Plan sufficient to continue guiding land and resource management of the Monongahela National Forest. I plan a deeper examination of the recommended changes through engagement with resource specialists and the Forest Leadership Team, and changes will be addressed as time, staffing, and funding allow.

CYNTHIA SANDENO

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Status of Select Set of Ecological Conditions Contributing to Species Recovery

Monongahela National Forest is one of the most ecologically diverse forests in the National Forest System, due in large part because of its geographic location in the Mid-Atlantic and its mountainous terrain. The Forest contains a wide range of habitat for plant and animal species, from the shale barrens in the east to the red spruce forests at high elevations. The 2006 Forest Plan directs the Forest to provide habitat that contributes to the survival and recovery of species listed under the Endangered Species Act (ESA), and prevent proposed species from becoming listed, while also integrating habitat management with other multiple-use resource objectives. The Forest actively monitors Threatened, Endangered, and Proposed (TEP) species and collects data to better understand species ecology and how management actions influence these species.

Currently, Monongahela National Forest monitors four federally listed vertebrate species, one invertebrate species, and one aquatic species: the Cheat Mountain salamander (*Plethodon nettingi*), Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), rusty-patched bumblebee (*Bombus affinis*) and the candy darter (*Etheostoma osburni*). Two of these species, Cheat Mountain salamander and candy darter, are endemic to the high elevations of the Allegheny Plateau in West Virginia and the Kanawha River basin in West Virginia and Virginia, respectively. Since the last monitoring period, four species were listed as proposed under the ESA: tricolored bat in 2022 (*Perimyotis subflavus*), monarch butterfly in 2024 (*Danaus plexippus*), green floater mussel in 2023 (*Lasmigona subviridis*) and eastern hellbender in 2024 (*Cryptobranchus alleganiensis*).

Monitoring Questions and Key Results

- MQ 36: To what extent is Forest management contributing to the protection and recovery of threatened and endangered species, or the conservation of proposed and candidate species?

Indicators

- Acres of restoration or enhancement of ecological conditions for threatened, endangered, proposed, and candidate species
- Actions that contribute to the recovery of threatened and endangered species or conservation of proposed or candidate species
- Bat species presence, distribution, and demographic information
- Presence and abundance of bat species at maternity caves (Virginia big eared bat) and hibernacula
- Presence and persistence of Cheat Mountain salamander at known sites; presence in new sites

Key Results

- In 2021, running buffalo clover was removed from the list of endangered species signifying conservation actions, such as invasive species control and active management near known populations on national forest system lands, contributed to the delisting of the species.
- In 2021, West Virginia Division of Natural Resources (WVDNR) implemented a long-term Cheat Mountain salamander population monitoring and survey plan in conjunction with relevant partners.

Monitoring activities are planned through at least 2031, a 10-year period matching the U.S. Fish and Wildlife Service (USFWS) recovery plan criteria. Monitoring data have not yet been fully assessed. However, analysis of preliminary monitoring data indicates that at least 52% of monitoring sites are occupied by Cheat Mountain salamander. In addition, Monongahela National Forest has been conducting annual monitoring of Cheat Mountain salamander at the Timberline Mountain study site for nearly 40 years. These survey results show that this population remains stable.

- The Forest has partnered with West Virginia University and the Northern Research Station to quantify microhabitat characteristics relevant to habitat quality for the Cheat Mountain salamander in association with forest management prescriptions occurring on the Monongahela National Forest. In addition, efforts have been made to improve understanding of potential habitat within the Monongahela National Forest. The species range was delineated based on historic occurrence records and suitable habitat. This delineated range was developed by USFWS and is currently being reviewed for project level purposes. A model has also been developed to assist with the identification of highly suitable and moderately suitable habitat. The WVDNR has further developed the dataset from Cheat Mountain salamander known occurrences and the habitat suitability model.
- In 2022, USFWS established an occurrence probability survey protocol for the Cheat Mountain salamander, which the Forest has implemented when practicable to assist the Forest in identifying occupied habitat per the Forest Plan Standard TE58. Based on results, occupied habitat has been avoided when project activities may have an adverse effect on populations or habitat, according to Forest Plan Standard TE59. Application of this protocol is limited to projects with small footprints due to the intensive survey effort requirements and is not practical to implement for vegetation management projects.
- In 2023, the Forest partnered with the George Washington and Jefferson National Forests, Forest Service's Eastern and Southern Regions, and USFWS to develop the Programmatic Biological Opinion for Identified Restoration and Recovery Management Actions of the Monongahela, George Washington, and Jefferson National Forests on the Rusty Patched Bumble Bee, which covers nearly three million acres of National Forest land. This is a proactive conservation program to improve species conservation outcomes, streamline beneficial active management, and serve as a template for more collaborative ESA consultations in the future. Applicable conservation measures and conservation recommendations from the rusty patched bumble bee programmatic consultation are being incorporated into the Forest's vegetation management projects. This will provide long-term, landscape-level habitat improvements, minimize short-term adverse effects to rusty patched bumble bees, and to contribute to rusty patched bumble bee recovery over the long term.
- The Forest applies rusty patched bumble bee data, published annually by USFWS for high potential zones and low potential zones, when conducting project level work. The first high potential zones published in 2021 covered 23,027 acres of the Forest and increased to 175,010 acres in 2024 (Figure 1). The 2024 figure covers approximately 19% of the Forest.

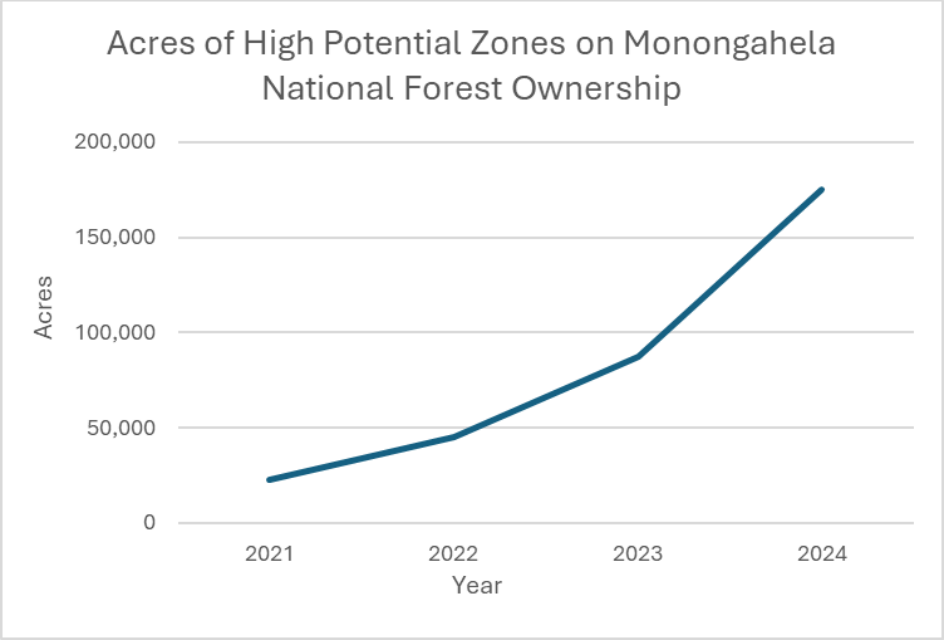


Figure 1. Acres of rusty patched bumble bee classified as "high potential zones."

- Each year the Forest conducts rusty patched bumble bee surveys using contracted and permitted surveyors. The Forest has coordinated with the WVDNR and USFWS to create a comprehensive dataset of the surveys. In the previous monitoring period, an average of 11 rusty patched bumble bees were found per year. This increased to an average of 73 rusty patched bumble bees found per year during this monitoring period (Figure 2).

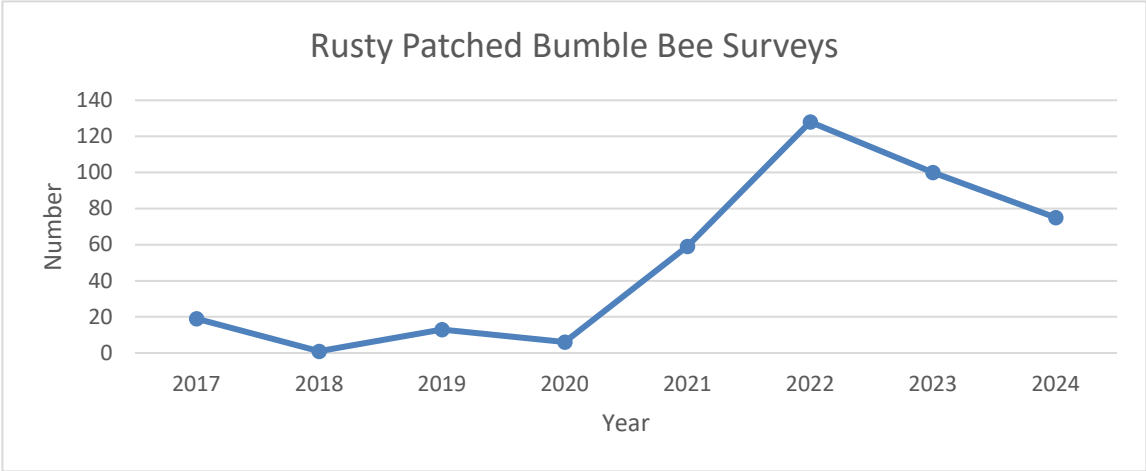


Figure 2. Rusty patched bumble bee survey captures since species listing.

- The Forest continues its annual acoustic monitoring of bat species at 60 long-term monitoring sites across the Forest and within specific proposed project areas. In partnership with Virginia Polytechnical Institute and State University, the acoustic monitoring data was used to create habitat suitability and occupancy probability models to help identify suitable bat habitat. Results showed

that acoustic recording surveys had the highest overall detection rates and are currently the most efficient and informative monitoring effort for the Forest to link bat status with management activities and impacts, positive, or negative. These models will allow for selection of management activities to benefit habitat for bat species of conservation concern where they occur on the landscape, but more importantly, allow a high degree of confidence that other stewardship activities will not have a negative impact on bats. During the monitoring period, approximately 293 acres of the Forest were managed for snag creation to improve roosting opportunities.

- WVDNR continued its annual winter hibernacula bat surveys across the Forest, with bat counts since 2000 through the most recent count in 2024 (Figure 3). These numbers show a decline in bats after 2011 due to the onset of White-Nose Syndrome.

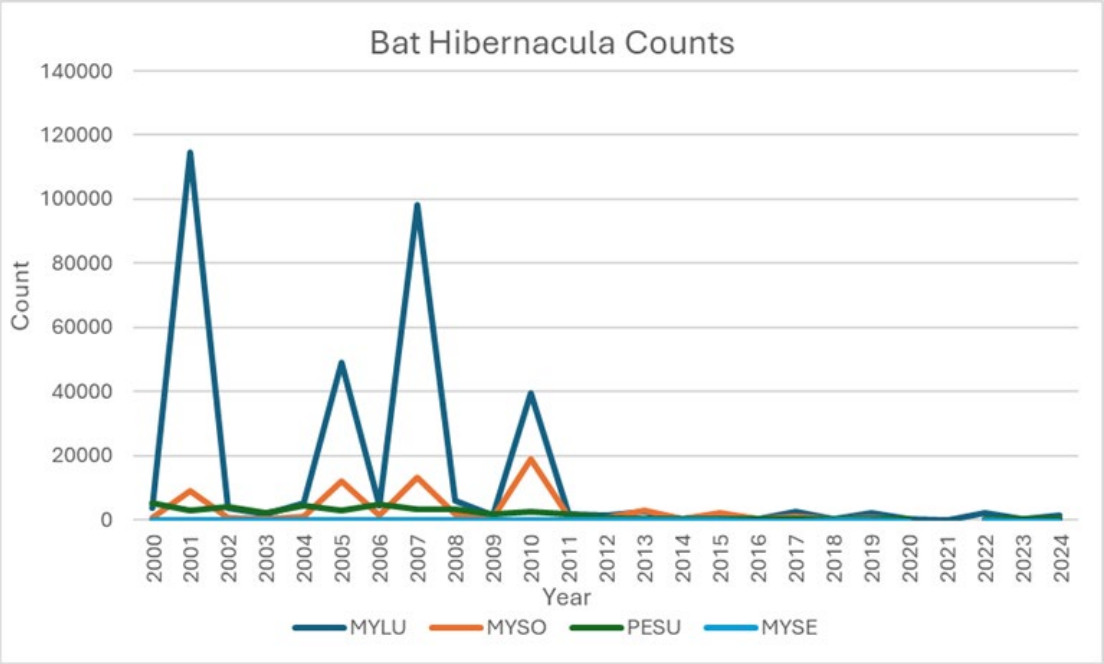


Figure 3. WVDNR Bat Hibernacula Counts (little brown bat – MYLU, Indiana bat – MYSO, tricolored bat – PESU, northern long-eared bat MYSE).

- In 2024, Forest Service Eastern and Southern Regions completed the Biological Assessment for the Bat Conservation Strategy, representing a major milestone in our ongoing interagency collaboration with the USFWS to support bat conservation and ecosystem stewardship for Indiana, northern long-eared, little brown, and tricolored bats, spanning 23 million acres of National Forest System lands. Although not completed until the end of this monitoring period, the Forest can incorporate the BCS into future project planning to utilize the best available scientific information to promote bat conservation and to design projects to contribute to the long-term recovery of these four bat species.
- In 2021, the Forest conducted a forest-wide baseline analysis of the candy darter in coordination with USFWS. Candy darters were detected in all formerly documented stream and river systems on the Forest, except for areas where hybridization with variegate darters (*Etheostoma variatum*) has completely or functionally eliminated them from the ecosystem. Systems with extant pure genetic populations of candy darter included the Gauley River, Williams River, Cranberry River, Cherry River, North Fork Cherry, East Fork Greenbrier, Little River East Fork Greenbrier, West Fork Greenbrier, and Little River West Fork Greenbrier. Collections of hybrids and pure variegate darters occurred in Deer

Creek and downstream sections of West Fork Greenbrier. Candy darters were detected in low densities, but typically were present in most suitable habitat, which is consistent with past monitoring efforts.

- Since the introduction and expansion of variegate darter into candy darter range, candy darter populations have declined in range and extent. Forest management has the potential to both positively and negatively impact candy darter habitat. The Forest has taken a proactive approach to restoring watershed processes which may benefit candy darter as well as incorporating additional Best Management Practices (BMP) and conservation measures into project activity planning which go beyond requirements of the Forest Plan.
- Most management occurs further upstream in the watershed than candy darter habitat; however, improvements to habitat, water quality, and hydrology implemented in the headwaters are expected to have downstream effects for candy darter, hellbender, mussels and other aquatic organisms in larger stream reaches. West Virginia Department of Environmental Protection's Watershed Assessment Branch collected samples at 49 monitoring sites on the Forest, indicating that six of the ten sites are showing improvements in stream sedimentation and embeddedness were located within or slightly upstream of candy darter critical habitat.

Recommendations

- Continue supporting and monitoring efforts for all above-listed species and continue to support partnerships to evaluate recovery actions and how our management practices affect the species.
- Conduct a review to determine necessary updates to the Forest Plan based on species that have been delisted (i.e. West Virginia Northern Flying Squirrel delisted in 2008 and running buffalo clover delisted in 2021), new species that have been listed (i.e., rusty patched bumble bee listed in 2017, candy darter listed in 2018) under the Endangered Species Act. Consideration should be made to protect and enhance habitat while still allowing for management that would benefit the health and resiliency of the Forest and contribute to the implementation of the Forest Plan. Efforts should be made to improve efficiencies for management actions that promote restoration and recovery including 7(a)(1) consultation actions, as well as Forest Plan updates. Current Forest Plan standards and guidelines provide protection measures for some T&E species specifically, such as the bat species, when more recent efforts like the Bat Conservation Strategy represent an updated and more accurate plan for conservation and recovery.
- Consider amending Forest Plan Standard TE59 to allow for short-term impacts to Cheat Mountain salamander populations that would result in habitat improvement and species recovery for long-term (e.g. spruce restoration, restoration of recreation impacts associated with high visitor use, etc.). Using a 7(a)(1) consultation approach for projects that would provide a net benefit to the species would assist the Forest in reaching recovery objectives.
- Conservation measures and BMPs incorporated into project planning for candy darters should be evaluated for efficacy. These measures, along with any needed additions or changes, may then be considered for more comprehensive inclusion into a future programmatic biological opinion and Forest Plan amendments to meet the requirements of both 7(a)(1) and 7(a)(2) consultations. The expectation is that the same conservation measures would also benefit proposed listed aquatic species such as Eastern hellbender and green floater mussel.

Status of Select Ecological Conditions

The purpose of the Forest Plan is to "provide management direction to ensure sustainable ecosystems and resilient watersheds that are capable of providing a sustainable flow of beneficial goods and services to the public." Measuring trends in air quality, soil conditions, water quality, and vegetation health gives us insight into how our management actions are affecting ecological conditions.

Water quality data is collected annually on Forest through efforts of Forest Service staff. Air quality trends are based off regional monitors (some located within the Forest proclamation boundary and others located elsewhere in the state of West Virginia). This makes it difficult to determine the extent to which Forest-level management activities are contributing to air pollution effects because the existing air quality data is too coarse to make conclusions. Likewise, evaluating responses to air pollution versus other factors can be challenging as air quality is impacted by many sources, including sources not located within the Forest.

Monitoring Questions

- MQ 9: To what extent is Forest management contributing or responding to air pollution effects on ecosystems and visibility?
- MQ 10: Are Air Quality Related Values of the Dolly Sods and Otter Creek Wildernesses improving over current adversely affected levels?
- MQ 11: What are the trends in ambient air pollutant concentrations near the Forest?
- MQ 15: Are smoke management practices effective in protecting human health and public safety from potential adverse impacts of prescribed fire emissions?
- MQ 29: Is detrimental soil disturbance occurring with associated land management activities?
- MQ 38: To what extent are Forest management and other external influences, such as acid deposition, beneficially or adversely affecting water quality or quantity?
- MQ 39: To what extent is Forest management beneficially or adversely affecting soil erosion and stream sedimentation processes?
- MQ 40: To what extent is Forest management beneficially or detrimentally affecting the physical conditions of aquatic ecosystems, including riparian ecosystem function and health?
- MQ 35: Are non-native invasive plants located and treated to prevent or limit further spread?
- MQ 2: Are insect and disease populations compatible with objectives for restoring or maintaining healthy forest conditions?

Indicators

- Visibility
- Fine particulates (PM2.5)
- Exceedances of critical loads of air pollution
- Sulfate and nitrate deposition
- NAAQS nonattainment areas

- Soil disturbance class
- Stream water chemistry and temperature data
- Results of National Water Quality BMP monitoring protocol
- Aquatic Ecological Unit Inventory data (habitat composition, biomass, fines, stream bank instability, etc.)
- Acres of wetland and riparian habitat enhanced, miles of stream enhanced, aquatic organism passage improved, acres of sediment sources restored
- Non-native invasive plant species and acres treated
- Acres affected by insect and disease outbreaks

Key Results

- Data collected from the Dolly Sods Interagency Monitoring of Protected Environments (IMPROVE) monitor shows that visibility has been improving but seems to be leveling out in recent years. While improvements are promising, progress is still required to meet the regulation-defined 2064 natural conditions for both the clearest and the most impaired days (Figure 4).

Figure 4. Simulated visibility conditions using WinHaze to compare visibility on the 20% most impaired days of the year in 1994 (left panel) to current 2023 conditions (right panel).

- A Critical Loads Summary (amount of pollution that leads to harmful changes in an ecosystem) was completed in 2023, which determined there are more critical loads exceedances for nitrogen deposition compared to sulfur, which is consistent with the trend in decreasing sulfur deposition.
- Ambient air concentrations of fine particulate matter (PM2.5) are currently meeting the standards set by the National Ambient Air Quality Standards (NAAQS). Sulphur and nitrogen deposition have

remained steady during the monitoring period, having both dropped since the early 2000s and leveled off in the mid-2010s.

- While it is not possible to isolate specific particle contributions from prescribed fire, daily values of the Air Quality Index (AQI) from the closest PM2.5 monitor to the forest (Clarksburg, WV), show only one day since 2019 rated "unhealthy" (in 2023) which likely corresponded to Canadian wildfire smoke. There were no prescribed burns or wildfires on the Monongahela National Forest on the days surrounding the day rated as "unhealthy".
- A small sample of soil disturbance monitoring data (234 points) was collected on seven vegetation management units reflecting only one type of vegetation management. Results show 90 points as Class 0 (38%), 35 points as Class 1 (15%), 49 points as Class 2 (21%), and 47 points as Class 3 (25%). No data was collected from 2020 through 2023 due to staffing vacancies.
- Stream chemistry results indicate generally stable or improving trends. Stream pH improved at 30 sites and declined at 7 sites and acid neutralizing capacity remained generally unchanged (157 sites exhibiting no substantial change, 13 increasing, and 13 decreasing).
- Stream temperatures trended upward from the last monitoring period, with 12 of 14 annually measured sites showing an increase in maximum temperature and 9 of the 14 sites showing an increase in the maximum daily average temperature.
- National Water Quality BMP results improved. "Fully implemented" and "mostly implemented" BMPs increased from 39% to 57%. Implementation "effective" ratings increased from 41% to 50% and "non-effective" ratings decreased from 43% to 27%. Implementation scores of "excellent" increased from 18% to 39% and "poor" decreased from 36% to 23%.
- Aquatic Ecological Unit Inventory (AEUI) collects data on habitat composition, large wood abundance, biomass, fine sediment, and more, several of which serve as indicators for multiple questions. The general ratio of fast (riffle/run) and slow (pool/glide) habitat remained consistent at 67/33% (2006-2019) and 64/36% (2020-2024). Residual pool depth increased at 40 sites and decreased at 88, while large wood abundance increased at 56 and decreased at 44 sites. Stream bank instability and riffle stability index both decreased at substantially more sites than increased, indicating improvements in stream bed and stream bank stability.
- Brook trout spawning gravel samples resulted in more sites with decreased fine sediment less than 1 mm (71 sites) than with increased fine sediment (58 sites). Further, the number of sites with fine sediment < 10% by weight increased from 69 to 73 and the number of sites with fine sediment < 5% by weight increased from 17 to 31 sites. The percentage of sites within the optimal range of fine sediment in spawning gravels increased from 13% to 24% in the current monitoring period.
- Biomass is a surrogate for aquatic ecosystem productivity, stability, and resilience, particularly in smaller, cold-water systems which are typically nutrient limited and more dominated by habitat specialists. Tracking biomass across AEUI sites for all fish species as well as brook trout individually serves as an indicator of cold-water ecosystem health. The average biomass for all species declined notably during the 2020-2024 period in comparison to previous data. Brook trout average biomass per site also declined, but less so proportionally than all species in aggregate. Biomass of all fish species declined at 80% of sites and brook trout biomass declined at 77% of sites (Figure 5).

- Despite the WVDEP embeddedness and sedimentation scores declining at approximately 75% of sites, almost all sites on the Forest remain in the optimal or suboptimal categories

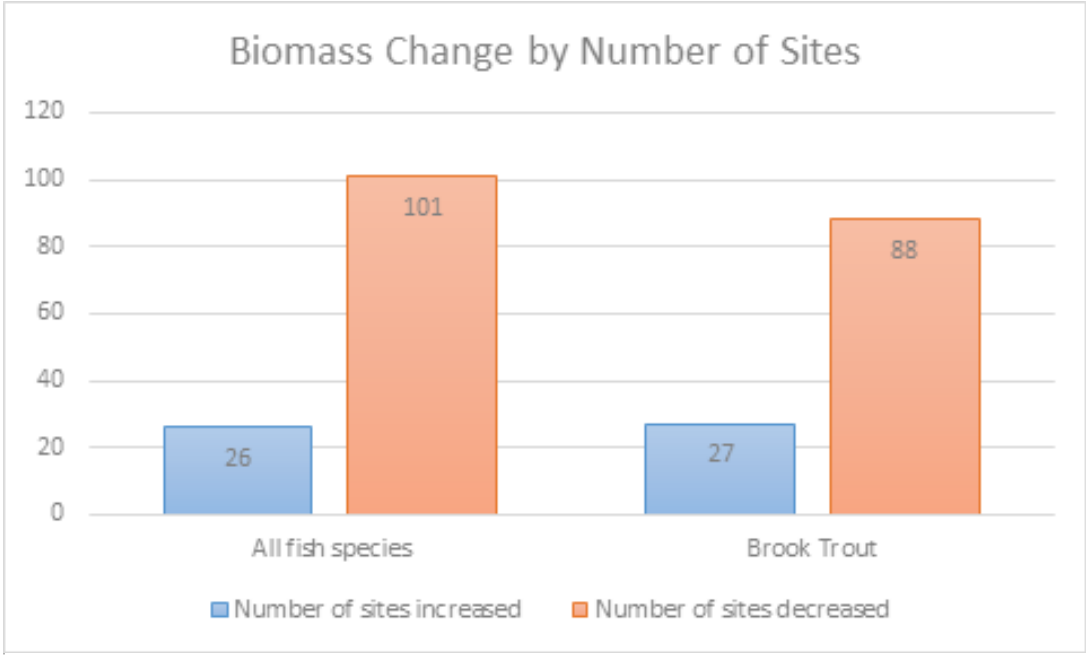


Figure 5. Biomass of all fish species (combined) and for brook trout (individually) monitored during AEUI surveys and averaged.

- Management activities implemented during the monitoring period to support Forest Plan goals and objectives are displayed in Table 2. The 5.5 miles of Forest system road decommissioned (which equates to 14 acres) can be contrasted with the 3.2 miles (equals 8.1 acres) of road construction and reconstruction in the Monongahela National Forest from 2020-2024.

Table 2. Activities with the objective of improving watershed condition, stream condition, and aquatic organism populations, 2020-2024.

Implemented Activity	Unit of Measure	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	Totals
Stream habitat restored or enhanced	Miles	6.9	29.2	34.4	19.9	15.9	106.2
Aquatic organism passage improved	Number of Crossings	4	4	6	3	1	18
Forest system road decommissioned	Miles	2.0	0.7	1.9	0.0	0.9	5.5
Water or soil resources protected or restored (non-system road and trail decommissioned, streambank stabilization)	Acres	375.5	356.5	299.8	511.2	242.6	1785.6
Wetland enhanced	Acres	1.6	14.9	9.4	29.4	26.67	82.0
Riparian/Floodplain enhanced	Acres	348	194	225	308	85	1160

- A total of 1,971 non-native invasive species plant infestations were recorded on the Forest, totaling 3,718 acres. Most of these infestations were small (<.001 acres), with only around 10% of the infestations exceeding one acre.
- A total of 752 infestations were treated across 2,445 acres, including autumn olive, common reed, common St. Johnswort, common viper's bugloss, crownvetch, European privet, Fuller's teasel, garlic mustard, Japanese stiltgrass, Japanese barberry, Japanese spirea, non-native knapweeds, non-native honeysuckles, non-native thistles, multiflora rose, poison hemlock, reed canary grass, and tree-of-heaven. This accounts for 0.3% of total Forest Service lands on the Monongahela National Forest.
- No new insects or disease were detected during this monitoring period, but there was an increase in spongy moth populations in 2022 and 2023. There were no changes in the hemlock woolly adelgid and emerald ash borer populations. Insect and disease damage was observed in every green sale. We expect spotted lanternfly, beech leaf disease, and elongated hemlock scale to appear in the Forest in the future.
- We collected approximately $435,000 in salvage sale funds through 16 timber sale contracts. These funds supported timber stand improvement and timber sale preparation activities associated with insect damage and disease-related tree mortality over the monitoring period.

Recommendations

- Continue to support the operation and maintenance of the Dolly Sods IMPROVE site and the deposition monitors near the Forest to evaluate future trends. Continue to participate in air-related programs such as the Regional Haze Rule and the Prevention of Significant Deterioration program to continue to reduce sulfur and nitrogen deposition. Continue to use Basic Smoke Management Practices and WV Smoke Management Program guidance to continue complying with NAAQS.
- Improve soil disturbance monitoring efforts by increasing the sample size. Results need to better reflect the range of vegetation management across the Forest including pre-treatment and post-treatment sampling. Additional capacity for data collection will be required. During project planning, Forest could continue to identify appropriate design criteria for site-specific conditions. Periods of high precipitation may require greater frequency of inspections by timber sale administrators.
- Continue to train staff and contractors to recognize and document insect and disease occurrences on the Forest and continue working with cooperators (e.g., WV Department of Agriculture, APHIS, and State, Private, and Tribal Forestry). Aerial monitoring has not been employed in recent years and there is a need to collaborate with agencies that collect data.

Visitor Use, Satisfaction, and Progress on Recreation Objectives

Monongahela National Forest is West Virginia's premier recreation destination. The Forest is the largest expanse of public land in the state and contains an estimated 52% of the publicly available recreation land. Numerous dispersed recreation opportunities exist for hiking, backpacking, fishing, hunting, mountain biking, climbing, and kayaking. Monongahela National Forest staff work collaboratively with Forest communities to develop a shared vision that identifies ways to grow conservation and nature-based recreation that will result in environmental and economic gains over the long-term. Together, we are contributing to an environment in which nature, visitors, and local communities and their economies thrive.

Tourism has become an important economic sector in West Virginia, generating $5.1 billion in direct travel spending in 2012, supporting over 46,000 jobs, and producing over $69 million in local tax revenue. Home to a national scenic byway, one national recreation area, eight wilderness areas, hundreds of miles of trails, and some of the darkest skies (great for viewing the stars) in the country, the Monongahela National Forest is an important contributor to the region's economy.

Figure 6. Swimmers enjoying the Lake Sherwood Recreation Area beach.

The Forest Plan identifies a goal of managing a wide spectrum of recreational opportunities, with an emphasis on activities that require a large land area – such as hiking, hunting, mountain biking, and horseback riding – and the facilities to support those uses. Key objectives in the Forest Plan focus on

maintaining recreation sites and facilities to meet all applicable local, state, and national standards for health and safety. Visitor satisfaction is thought to be associated with high quality maintenance as a primary factor. Funding received through Federal infrastructure legislation over the monitoring period was impactful in meeting visitor expectations. Recreation facilities are managed to provide a range of opportunities and development scales in a relatively safe environment. Accessibility is incorporated into facility and program access projects, while maintaining the development scale and setting of the area.

Monitoring Questions and Key Results

- MQ 21: Are Forest facilities and recreation sites safe for employee and public use and enjoyment?
- MQ 22: To what extent is the Forest providing a range of motorized and non-motorized recreation opportunities that incorporate diverse public interests?

Indicators

- Recreation Site Condition Surveys
- Facilities Condition Surveys
- Percent of facilities that meet the requirements for National Protocol for Public Health and Safety
- Miles of National Forest System roads available for public motorized use
- Miles of National Forest System trails
- National Visitor Use Monitoring data
- Total number of recreation opportunities by type available for public use

Key Results

- A total of 243 sites representing 15 opportunity types were available for public use during the monitoring period (Table 3). Most of these sites were managed and maintained by Forest personnel. Concessionaires operated and maintained 27 sites through contracts. Purpose-built mountain bike trails are an additional opportunity, totaling 106 miles (Table 3).
- A good indicator of monitoring results and the sustainability of a trail system is the percentage of trail miles that meet agency standards (Table 4). The Forest has improved the number of trails meeting standard from 0% in 2020 to 33% in 2024. The increase was attributed to improvements in maintenance activities and accurate reporting in the trails database.
- At the end of the monitoring period, 63% of developed recreation sites and facilities were being maintained to standard. The backlog of facility maintenance remains a challenge for the Forest and is a contributing factor to the 37% of sites not maintained to standard.
- Approximately $6.2 million in deferred, non-critical maintenance existed at the end of 2024. The amount is a good reference point for comparing future report data as it can indicate progress toward meeting recreation goals in the Forest Plan. Trailheads have the least maintenance needs ($0 for many sites). Larger, complex sites, such as the Horseshoe Campground and Seneca Rocks Discovery Center have non-critical deferred maintenance over $500,000, each.
- Over the monitoring period $4.6 million from Great American Outdoors Act and other infrastructure initiatives were spent on Monongahela National Forest recreation sites. The funding ranged from $1.6 million for Lake Sherwood Campground rehabilitation to $934,000 for improvements to a mountain bike ride center and trail improvements. These projects support rural economies and increase user satisfaction for recreation sites in the Forest.

- A National Visitor Use Monitoring survey is conducted every 5 years on the Forest. The last report in 2019 identified the total annual visitation number as 732,000. Although an NVUM survey occurred in 2024, the results were not available at the time of this report.

Table 3. Total number of public recreation sites by Ranger District (RD), by type.

Site Type	Cheat RD	Gauley RD	Greenbrier RD	Marlinton RD	Potomac RD	White Sulphur Springs RD	Total
Forest Service operated campgrounds	1	6	2	4	1	2	**16**
Concession (permit) operated campgrounds	2	0	0	0	5	0	**7**
Dispersed camping (shelter)	4	7	2	6	0	1	**20**
Dispersed camping areas	2	3	4	0	2	1	**12**
Cabin rentals	0	0	1	0	0	1	**2**
Trailheads	8	13	35	18	32	7	**113**
Mountain bike trails*	1 mi	22 mi	21 mi	62 mi	0 mi	0 mi	**106 mi**
Picnic sites	2	2	3	5	2	2	**16**
Picnic pavilions	3	4	2	4	1	3	**17**
Observation sites	2	0	2	4	5	0	**13**
Fishing sites	0	1	1	1	2	1	**6**
Swimming sites	0	0	0	0	0	2	**2**
Interpretive sites	1	2	2	1	1	0	**7**
Interpretive/Visitor centers	0	1	0	0	1	0	**2**
Info-fee stations	1	0	0	0	5	1	**7**
Boating Sites	0	0	0	0	0	2	**2**
Total number of sites	26	39	54	44	57	23	**243**

*Note: Mountain bike trail miles are excluded from the totals in the final row of the table.

Table 4. Trail maintenance information for Monongahela National Forest.

Year	Miles Maintained	Miles Meeting Standard
2020	373.69	72.7
2021	168.35	0
2022	236.15	0
2023	394.65	381.35
2024	306.42	309.34

- Over the course of the monitoring period, 38 miles of purpose-built mountain bike trail opportunities were constructed. Beginning in 2024, the Forest identified 735 miles of open, ungated roads where use of e-bikes is allowed (549 miles open year-round and 186 miles open seasonally).
- Trail miles increased over the monitoring period from 789 miles in 2020 to 895 miles in 2024. The Monday Lick trail system accounts for 27 of the newly constructed miles while the additional 79 miles are due to more accurate accounting of existing trails, including geospatial data where it was previously absent from the database.

- In collaboration with Pocahontas County Convention and Visitor Bureau, Snowshoe Mountain Resort, West Virginia University, Pocahontas Trails, West Virginia Division of Parks, the Town of Marlinton, the Green Bank Observatory, and others, the first International Mountain Bicycling Association (IMBA) Designated Ride Center, the Snowshoe Highlands Ride Center, was designated in West Virginia. This designation has proven to grow local economies and foster business growth and new business development in the rural communities embedded withing and around the ride center. Due to strategic investments in the trail systems in the Forest, the IMBA Designated Ride Center was upgraded to a Silver Level in 2020, only the second on the East Coast.

Figure 7. Monitoring and reconnaissance identify structures in need of repair or replacement. The bridge in the photograph represents a high-quality replacement of the previous structure.

- The Forest established the Snowshoe Highlands Area Recreation Collaborative Strategic Plan. The plan is focused on increasing economic opportunities for residents and businesses, promoting collaboration between federal, state, local organizations, private businesses, and tourism organizations. It is also designed to foster an outdoor recreation environment that attracts and keeps an expanding, young workforce that supports local economic growth; and provides healthy recreational opportunities for residents.

Recommendations

- Several of the theme's indicators introduce uncertainty because of the timing of the data collection. For instance, Recreation Site Condition Surveys and Facility Condition Surveys occur only once every five years. The frequency of data collection may not provide sufficient information to determine if maintenance and operations at the sites are meeting management direction for enjoyable and desirable visitor outcomes.
- The indicator 'Percent of facilities that meet the requirements for National Protocol for Public Health and Safety' cannot be reported, as this program or data does not currently exist. In the future, the Forest may use annual regional facility condition index information, if available. Although this data would not be specific to the Monongahela, it would provide data relevant to the Eastern Region.
- In 2024, Class 1 through Class 3 e-bike use was allowed on open roads. During the next Forest Plan revision, develop consistency in management direction as needed for this motor vehicle use. The Forest Service has a long tradition of managing for multiple uses and supporting public access to the land it manages. E-bike technology allows a larger number of people and more diverse users to enjoy their national forests and grasslands in a socially and ecologically responsible way.

Progress Toward Meeting Desired Conditions in the Plan

Forest personnel practice multiple-use natural resource management, providing West Virginia and the surrounding region with wood products, natural gas, a wide range of recreation opportunities, diverse wildlife habitat, all while improving watersheds and protecting unique ecological and wilderness areas. Under the Multiple-Use Sustained-Yield Act of 1960, the Forest and Rangeland Renewable Resources Planning Act of 1974, and the National Forest Management Act (NFMA) of 1976, National Forest System lands are managed for a variety of uses on a sustained yield basis to ensure a continued supply of goods and services.

Forest Plan management direction includes desired vegetation composition objectives in Management Prescription (MP) areas 3.0 (emphasis on vegetation diversity), 4.1 (emphasis on spruce and spruce-hardwood ecosystems), and 6.1 (emphasis on wildlife habitat). Actions proposed during project planning move existing conditions closer to a desired resilient landscape described in the Forest Plan. Resilient and sustainable ecosystems create habitats that benefit a diversity of wildlife species, produce a sustained yield of timber and other forest products, and provide diverse recreation and scenic opportunities.

Monitoring Questions

- MQ 13: How, where, and to what extent are desired fuel conditions being met by lowering Fire Regime Condition Classes 3 and 2?
- MQ 14: How, where, and to what extent is prescribed fire being used to mimic natural processes, or maintain/improve vegetation conditions, or restore natural processes and functions to fire-adapted ecosystems?
- MQ 26: Does management of special forest products, recreation/wilderness, and other special use permits meet Forest Plan and agency direction?
- MQ 33: To what extent are Forest management, natural disturbances, and subsequent recovery processes changing vegetation composition and structure?
- MQ 34: To what extent is the Forest meeting vegetation composition and age class objectives and desired conditions for Management Prescriptions 3.0, 4.1, and 6.1?

Indicators

- Acres treated to reduce risk of catastrophic wildfire
- Acres of prescribed fire implemented
- Number of special use permits processed and administered to standard
- Acres of early successional habitat created
- Acres of stand improvement
- Acres of natural disturbance that change forest stand structure
- Changes in age class and forest types by Management Prescriptions

Key Results

- The Forest achieved 20,150 acres of prescribed fire during this monitoring period (average of 4,030 acres per year) and is on track to meet the Forest Plan objective of treating 10,000 to 30,000 acres with prescribed fire over a ten-year period (Figure 8). This work was completed in coordination with Harpers Ferry Job Corps, one of 24 Civilian Conservation Centers in the country operated by the U.S. Forest Service to train students in wildland firefighting. Students from Harpers Ferry Job Corps assisted on the prescribed burns and wildland fire suppression both on and off the Forest, totaling 5,250 hours on prescribed burns and 1,500 hours on wildfires.
- Prescribed fire on the Forest trended upwards from the last monitoring period (which had averaged 1,839 acres per year). The decrease in 2022-2023 was likely due to a national review of the prescribed fire program, and a temporary pause that resulted from the review.

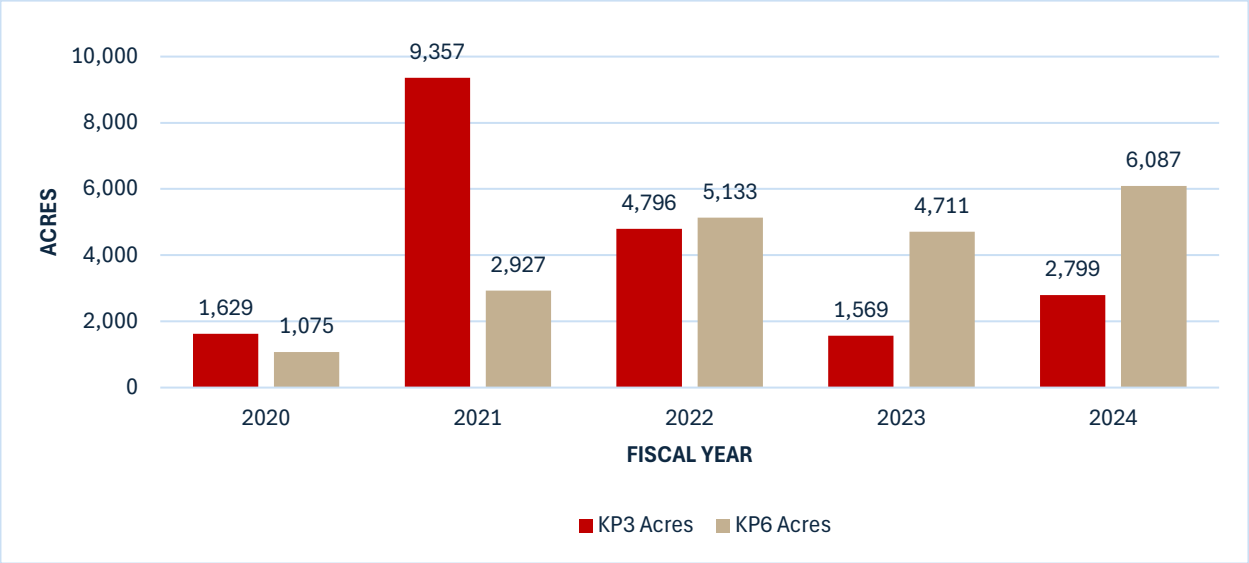


Figure 8. Hazardous Fuel Treatments by year. Hazardous fuels reduction is the primary objective in KP3 treatment (e.g., prescribed fire) and hazardous fuels reduction is a secondary benefit to other resource objectives in KP6 treatment (e.g., mechanical treatment).

- A total of 2,424 forest product permits were issued during this monitoring period, including 983 root permits (e.g., $20 ginseng permits) and 1,282 “dead and downed” permits (e.g., firewood).
- The number of special use permit authorizations has trended upwards during this monitoring period, with a total of 129 authorizations issued. Special use authorizations administered to standard have remained nearly constant in the 75% range, with an increase to 85% in 2024 (Figure 9). The percentage increase is likely attributed to the Forest hiring a full time Special Use Program Manager in 2021 and two additional Realty Specialists in 2023 to focus on permit administration.

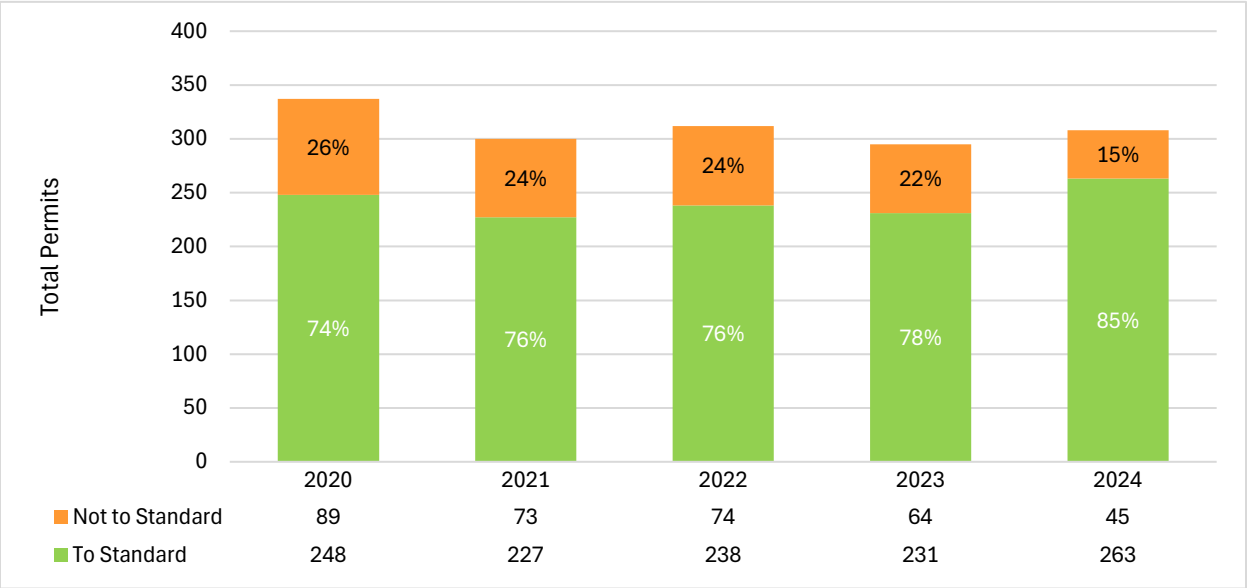


Figure 9. Special Uses administered to standard, by year.

- During the monitoring period, timber harvesting created 3,621 acres of early successional habitat using shelterwood harvest and clear cut harvest, the total of which is less than four percent of the land base in a five-year period (Figure 10).

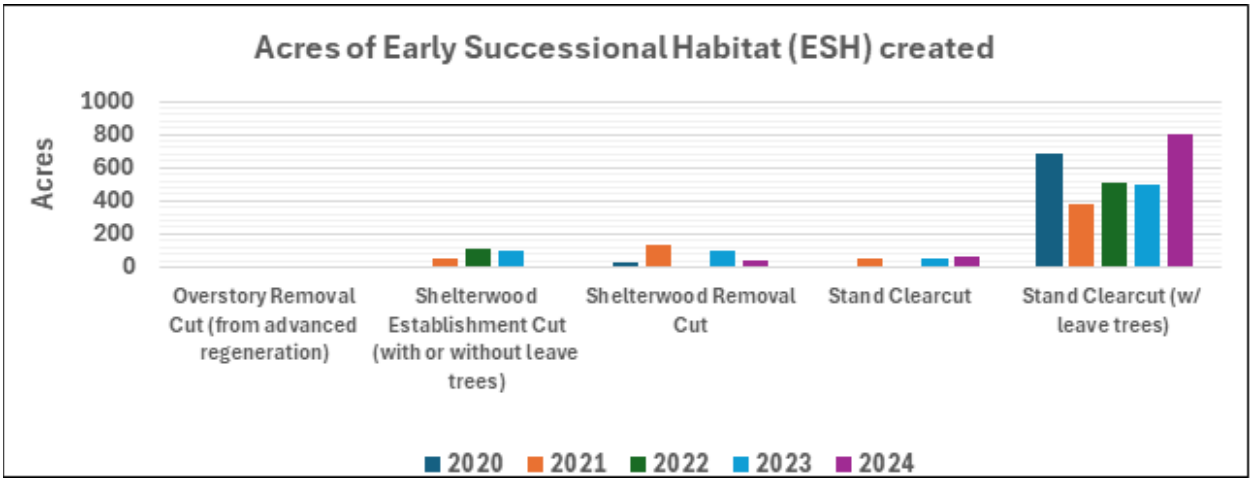


Figure 10. Acres of early successional habitat created through different treatment methods, by year.

- Timber stand improvement occurred on 9,475 acres through activities such as thinning, pruning, vine control, site preparation, crop tree release, fertilization, and control of undesirable vegetation (Figure 11). There were no discernable patterns from year-to-year.

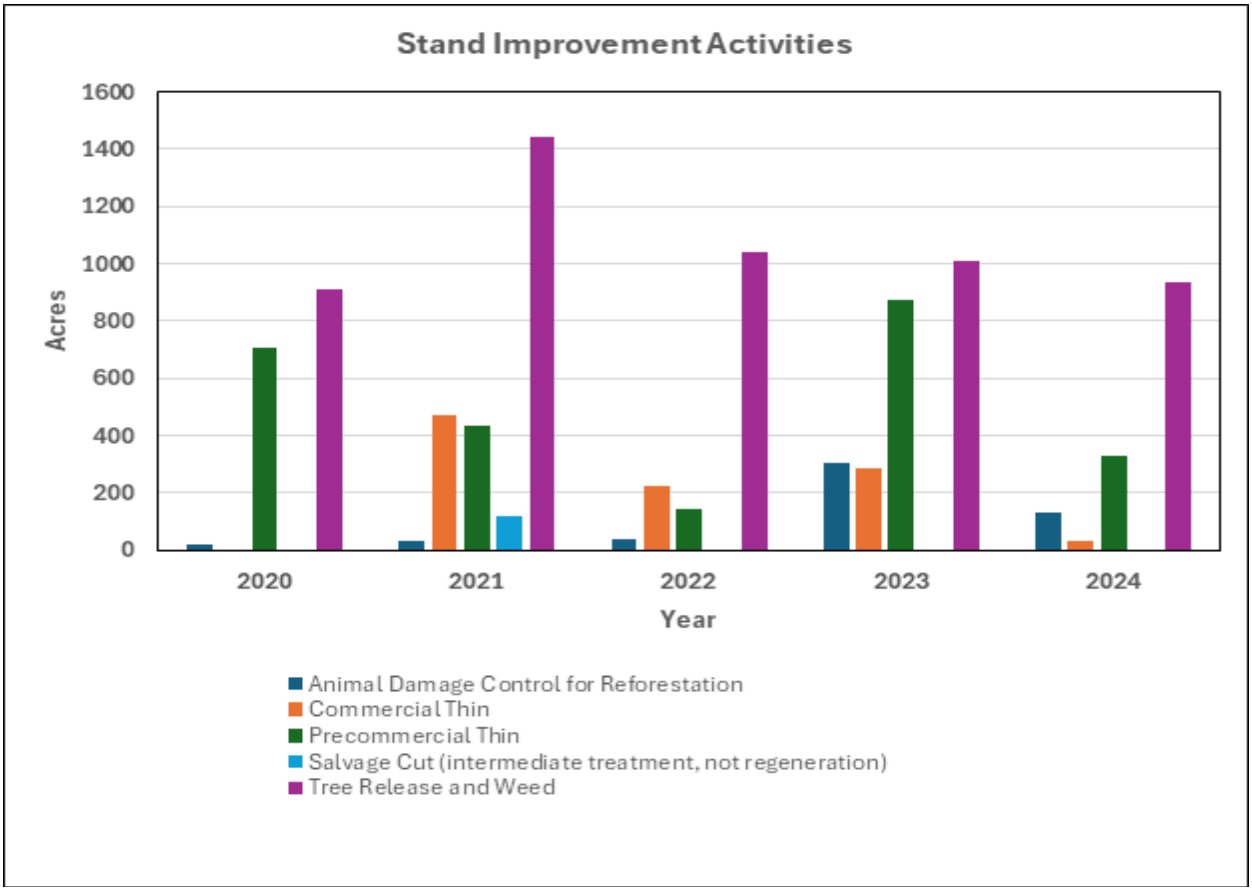


Figure 11. Stand improvement activities, by year.

- Natural disturbance contributed very little to the creation of early successional habitat; only 131 acres were created through heavy wind and hail events.
- Progress was made towards the Forest Plan desired future conditions in certain forest communities and some age classes in MP 3.0, MP 4.1, and MP 6.1. However, there were also cases where the Forest has been moving away from the desired early successional habitat conditions. Of the 4,981 acres treated through timber harvests, 3,621 of those acres (73%) became early successional habitat.
- Most forest management activities are occurring in MP 3.0 – Vegetation Diversity (which comprises 194,600 acres or 21.2 % of the entire Forest). Most prescriptions are Northern Hardwoods, Mixed Cove Hardwoods, and Mixed Oak communities. In Mixed Oak and Pine-Oak communities, the Forest moved closer to desired early successional habitat from 2020 to 2024, by 0.3% and 1.0%, respectively (Table 5). However, for both communities the existing vegetation is well below the minimum desirable percentage by 10% and 4%, respectively. NOTE: 1% of MP 3.0 is equivalent to 1,946 acres.
- For all the forest communities in MP 3.0, the Forest moved further away from desired conditions in older age classes as forests continue to age faster than early successional habitat was created

through regeneration harvests such as clearcuts, seed tree cuts, and shelterwoods, or through natural disturbances.

Table 5. Vegetation conditions in MP 3.0 - Vegetation Diversity during Forest Plan revision (2006), at beginning of the monitoring period (2020), and at the end of the monitoring period (2024), compared to the Forest Plan desired conditions.

Forest Community	Year	Percent of Comm-unity	% Early Successional Age Class (0-19 yrs)	% Early-Mid Successional Age Class (20-39 yrs)	% Mid Successional Age Class (40-79 yrs)	% Mid-Late Successional Age Class (80-120 yrs)	% Late Successional Age Class (>120 yrs)
Conifer	2006	0.8%	5.6%	4.4%	32.8%	50.7%	6.5%
	2020	0.8%	0.0%	1.9%	37.6%	51.5%	9.0%
	2024	0.8%	0.0%	0.0%	35.8%	50.8%	13.5%
	Desired	-	10-20%	10-20%	20-40%	20-40%	10-15%
Northern Hardwoods	2006	11.0%	4.1%	3.2%	31.6%	59.2%	1.9%
	2020	12.7%	0.7%	4.1%	5.0%	83.6%	6.5%
	2024	12.9%	0.5%	4.1%	4.6%	80.4%	10.4%
	Desired	-	12-20%	12-20%	24-40%	24-40%	5-10%
Mixed Cove Hardwoods	2006	62.6%	4.2%	5.6%	33.5%	54.8%	1.8%
	2020	66.3%	2.3%	3.5%	7.2%	82.3%	4.6%
	2024	66.4%	2.3%	4.1%	6.8%	80.2%	6.6%
	Desired	-	12-20%	12-20%	24-40%	24-40%	5-10%
Mixed Oak	2006	22.4%	4.1%	1.6%	31.4%	52.8%	10.1%
	2020	17.5%	1.3%	4.2%	2.1%	72.3%	20.1%
	2024	17.5%	1.6%	4.3%	2.5%	70.0%	21.5%
	Desired	-	12-22%	12-22%	24-40%	24-40%	5-10%
Pine-Oak	2006	0.6%	3.0%	9.9%	63.9%	18.7%	4.6%
	2020	0.2%	7.0%	7.6%	48.0%	15.3%	22.1%
	2024	0.1%	8.0%	0.0%	63.8%	16.9%	11.3%
	Desired	-	12-24%	12-24%	24-40%	24-40%	5-10%

- In MP 4.1 - Spruce and Spruce-Hardwood Ecosystem Management (which comprises 153,600 acres or 16.8% of the entire Forest), Northern Hardwoods, Mixed Cove Hardwoods, and Spruce/Spruce Hardwood/Hemlock are the most abundant forest communities. Management activities moved some stands toward desired age class conditions and others further from desired conditions. Late successional habitats continued to see progress toward a desired increase in late successional forests. From 2020 to 2024, late successional habitat in spruce forests increased 0.8%, Northern Hardwoods increased 2.6%, Mixed Cove Hardwoods increased 2.9% (Table 6). NOTE: 1% of MP 4.1 is equivalent to 1,536 acres.

- In MP 4.1, the Pine-Oak community saw no change and Mixed Oak decreased 68% moving closer to desired conditions. Early, early mid and mid-successional, progress was made toward meeting desired conditions in the Spruce/Spruce-Hardwood/Hemlock community. From 2020 to 2024 the forest community increased by 0.8%.

Table 6. Vegetation conditions in MP 4.1 - Spruce and Spruce Hardwood Ecosystem Management during Forest Plan revision (2006), at beginning of the monitoring period (2020), and at the end of the monitoring period (2024), compared to the Forest Plan desired conditions.

Forest Community	Year	Percent of Comm-unity	% Early Successional Age Class (0-19 yrs)	% Early-Mid Successional Age Class (20-39 yrs)	% Mid Successional Age Class (40-79 yrs)	% Mid-Late Successional Age Class (80-120 yrs)	% Late Successional Age Class (>120 yrs)
Spruce, Spruce-Hardwood, Hemlock	2006	19.2%	7.2%	11.1%	39.9%	32.3%	9.5%
	2020	13.5%	2.8%	13.3%	25.3%	49.2%	9.4%
	2024	12.6%	3.6%	4.8%	29.4%	52.0%	10.2%
	Desired	-	3-8%	3-8%	5-15%	5-15%	60-80%
Northern Hardwoods	2006	37.9%	3.9%	5.6%	36.5%	51.6%	2.4%
	2020	46.4%	0.0%	2.9%	13.3%	75.2%	8.6%
	2024	46.7%	0.0%	1.1%	12.7%	75.0%	11.2%
	Desired	-	15-20%	15-20%	35-45%	15-25%	5-10%
Mixed Cove Hardwoods	2006	36.4%	2.7%	4.6%	38.5%	52.5%	1.7%
	2020	36.5%	0.4%	2.3%	6.8%	86.8%	3.7%
	2024	36.9%	0.4%	2.3%	6.1%	84.6%	6.6%
	Desired	-	15-20%	15-20%	35-45%	15-25%	5-10%
Mixed Oak	2006	0.3%	1.1%	0.0%	24.7%	74.2%	0.0%
	2020	0.2%	0.0%	10.5%	0.0%	0.0%	89.5%
	2024	0.2%	0.0%	2.5%	0.0%	75.9%	21.5%
	Desired	-	10-15%	10-15%	25-35%	20-30%	15-20%
Pine-Oak	2006	1.0%	43.4%	21.6%	35.0%	0.0%	0.0%
	2020	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2024	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Desired	-	15-20%	15-20%	25-35%	20-30%	10-15%

- In MP 6.1 – Wildlife Habitat Emphasis (which comprises 277,600 acres or 30.3% of the entire Forest), Northern Hardwoods and Mixed Cove Hardwood communities make up the largest percentage of the MP 6.1 land base. The Forest moved away from desired conditions in the 0-19 (early successional) and 20-39 (early-mid) age classes for all forest community types (Table 7).
- From 2020 to 2024, early and early mid successional age classes of MP 4.1 in all forest communities advanced into older age classes, moving away from desired conditions. Mid-successional and mid-late successional either moved away from the desired conditions or moved closer to desired percentages but in comparably small increments (e.g., Mixed Cove Hardwoods mid-late successional stands decreased from 79.1% to 76.0%, but the target desired conditions are 20-30%). From 2020 to 2024, there was a decrease in stands between 40 and 120 years old. NOTE: 1% of MP 6.1 is equivalent to 2776 acres.

Table 7. Vegetation conditions in MP 6.1 – Wildlife Habitat Emphasis during Forest Plan revision (2006), at beginning of the monitoring period (2020), and at the end of the monitoring period (2024), compared to the Forest Plan desired conditions.

Forest Community	Year	Percent of Comm-unity	% Early Successional Age Class (0-19 yrs)	% Early-Mid Successional Age Class (20-39 yrs)	% Mid Successional Age Class (40-79 yrs)	% Mid-Late Successional Age Class (80-120 yrs)	% Late Successional Age Class (>120 yrs)
Conifer	2006	0.4%	6.0%	3.3%	33.5%	51.6%	5.6%
	2020	1.3%	0.0%	2.3%	38.5%	45.9%	13.3%
	2024	1.3%	0.0%	1.6%	35.8%	49.1%	13.6%
	Desired	-	15-20%	15-20%	30-40%	20-30%	8-12%
Northern Hardwoods	2006	3.9%	2.4%	2.6%	32.6%	60.1%	2.3%
	2020	5.2%	0.0%	1.8%	5.8%	83.0%	9.4%
	2024	5.3%	0.0%	1.7%	4.2%	79.4%	14.7%
	Desired	-	15-20%	15-20%	30-40%	20-30%	5-10%
Mixed Cove Hardwoods	2006	25.9%	3.9%	5.8%	23.3%	64.0%	3.0%
	2020	26.8%	0.3%	4.2%	8.5%	79.1%	8.0%
	2024	27.0%	0.1%	3.6%	8.1%	76.0%	12.1%
	Desired	-	15-20%	15-20%	30-40%	20-30%	5-10%
Mixed Oak	2006	54.8%	4.1%	3.9%	21.7%	62.4%	7.9%
	2020	52.5%	0.4%	4.4%	4.7%	71.8%	18.7%
	2024	52.4%	0.1%	3.3%	5.1%	65.3%	26.3%
	Desired	-	10-15%	10-15%	25-35%	20-30%	15-20%
Pine-Oak	2006	13.7%	2.7%	8.6%	29.6%	52.8%	6.3%
	2020	12.7%	0.0%	2.1%	13.7%	69.0%	15.1%
	2024	12.7%	0.0%	1.4%	12.3%	63.8%	22.4%
	Desired	-	15-20%	15-20%	25-35%	20-30%	10-15%

Recommendations

- Prescribed fire and mechanical fuel treatments decrease fuel composition, arrangement and loading thus reducing the risk of catastrophic wildfires and should continue to be applied. Areas of highest risk should be identified (i.e., highly valued resource or asset or wildland urban interface) and evaluated for treatment needs within Condition Class 2 and 3 areas.
- Continue to issue and administer special use permits in accordance with regulations and Forest Service directives, and screen applications against the Forest Plan and focus on increasing the number of permits to standard.
- Consider an assessment regarding the sustainability of ginseng permits both in terms of number and cost of permits. Forest Plan Goal LS18 directs the Forest to issue authorizations for uses that protect the environment, among other criteria. A ginseng assessment could determine if plants are being harvested in a manner that aligns with that goal.
- Continue to monitor and report vegetation management activities or disturbance events that have a measurable effect on stand structure, age class, or species composition.
- In MP 3.0, increase the young forest conditions using even-age or two-age regeneration harvests such as clearcuts, shelterwood harvests, or seed tree harvests. Late successional forests (>120 years

old) are close to desired conditions in MP 3.0 forest communities. Therefore, management activities should focus on percentages of mid-successional and mid-late successional forests (40 to 120 years old).

- In MP 4.1, focus management in mid-successional and mid-late successional forests (40 to 120 years old) in the Spruce/Spruce-Hardwood/Hemlock Forest community. Increase even and two-aged regeneration systems such as clearcuts, clearcut with reserves, shelterwoods, seed-tree, and other activities that would create young forests in Northern Hardwood and Mixed Cove Hardwood mid-late successional forests (80 to 120 years old).
- In MP 6.1, focus future management mid and mid-late age classes (40-79 and 80-120 years old) in Northern Hardwood, Mixed Cove Hardwood and Mixed Oak communities. Management through regeneration harvests, such as clearcuts, shelterwoods and seed tree harvests would increase early successional conditions and move the Forest closer to the desired conditions outlined in the Forest Plan.

Effects of Management Activities on the Productivity of the Land

The Forest Plan provides management direction that moves landscape features toward desired condition regardless of the program area. While temporary impacts are expected to occur during project activities, a key outcome of design criteria and monitoring is to avoid substantial and permanent impairment to land productivity. The commercial timber sale program on the Monongahela National Forest is a primary tool for maintaining the health, diversity, and productivity of forests for present and future generations. Monitoring is required to ensure that treated lands are adequately stocked within five years of an even-aged regeneration harvest.

Following an even-aged harvest, stocking surveys are conducted after the first, third, and fifth growing seasons. First- and third-year surveys typically provide early indications of regeneration success or failure and enable the planning for the harvested stands to be certified within the five-year period or, in the case of failure, determine whether replanting will be needed. In naturally regenerated stands, certification can be made after three growing seasons. Planted stands can be certified as adequately stocked five years after harvest.

Monitoring Questions and Key Results

- MQ 6: Are regeneration harvest units adequately restocked after five years?
- MQ 8: Are even-aged harvest units, particularly clearcuts, exceeding the 40-acre size limit established under the NFMA? If they are, is there a need to adjust the size limit to better accommodate Forest Plan management objectives and practices?
- MQ 31: Is timber harvesting sustainable over the long-term and maintained at predictable and dependable levels?

Indicators

- Stocking certification results
- Stocking survey results
- Volume and acres harvested over the period

Key Results

- During the monitoring period, 1,427 acres were surveyed. All but two of these acres were certified as stocked (Table 8).
- For harvests conducted from 2015 to 2019, the Forest certified regeneration harvests within the 5-year NFMA window 85% of the time. This is an improvement from the 72% certification reported in 2019.

Table 8. Stocking certification surveys planned and completed from FY20 to FY24.

Year	2020	2021	2022	2023	2024	Total
Unit Acres surveyed	228	163	694	192	150	1427
Unit Acres certified as stocked	228	163	692	192	150	1425

- On the MNF, a regeneration harvest must be greater than 70% stocked with tree seedlings in the 5-foot height class to be certified. Additional certification requirements can be specified in the silviculture prescription.
- The number of regeneration harvest stands certified (*n*=67) ranged from a low of 6 in 2024 to a high of 33 in 2022, averaging 13 per year.
- Deer browsing may be the most common constraint to timely certification; deer fences and tree cages have been used on the Monongahela to protect planted seedlings and natural regeneration.
- The average size of even-aged regeneration harvests decreased from 31 acres in 2020 to 24 acres in 2024. The regeneration harvest size limit (40 acres) was not met or exceeded. Even-aged regeneration harvests averaged 25 acres from FY15 through FY24.
- Increasing commercial timber harvest shows progress toward meeting desired conditions to provide sustainable and predictable levels of forest products. There has been a 68% increase in volume harvested when comparing 2020 to 2024 (Figure 12). Data collected during this monitoring period indicates the Forest could contribute up to or exceed 140 MMBF for the decade 2020-2030. This is approximately 22% of Forest Plan allowable sale quantity (ASQ) of 630 million board feet (MMBF) for the decade. During a previous monitoring period, annual volume harvested averaged 8.3 MMBF or approximately 1.3% of ASQ.

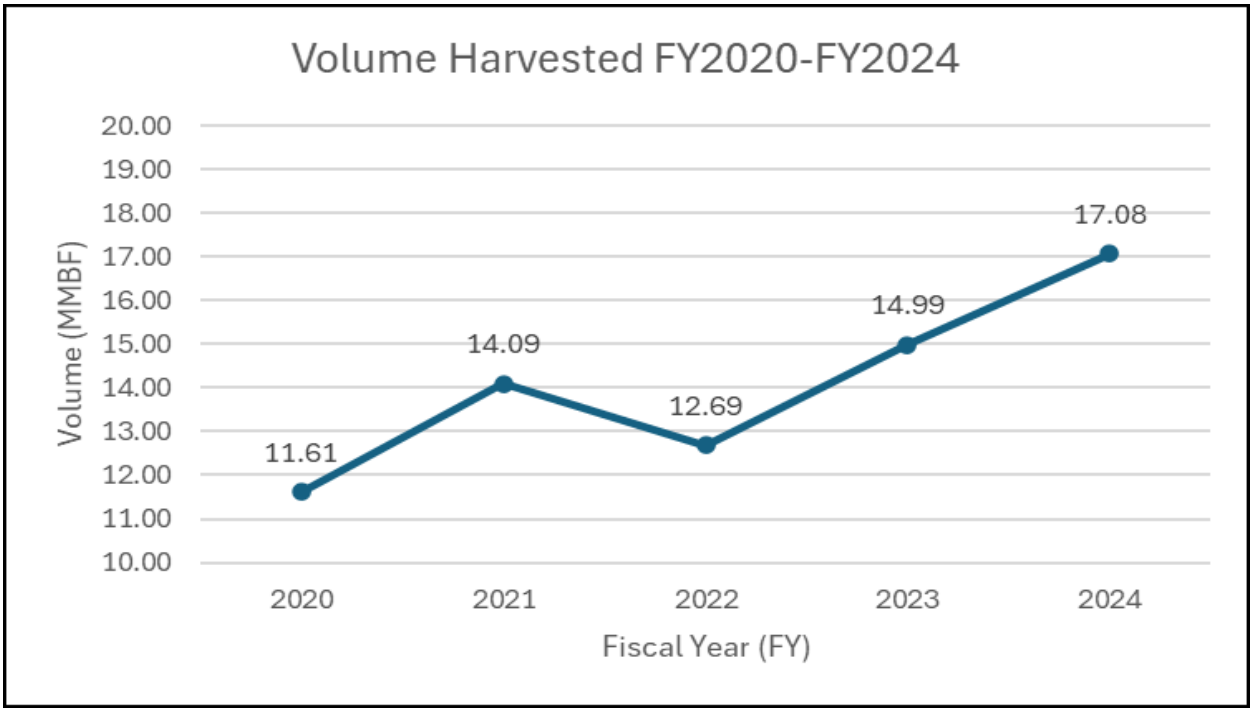


Figure 12. Volume of commercial timber harvested in millions of board feet or MMBF, by year.

- Acres harvested increased by 32% from 2020 to 2024 (Figure 13). Data collected during this monitoring period indicate the Forest could contribute up to or exceed 10,000 acres of timber harvest, and related reforestation and timber stand improvement activities, to contribute toward desired vegetation conditions for the decade 2020-2030. This is approximately 50% of minimum acres identified in Forest Plan Objective TR04 for the decade.

- From 2020 to 2024, conventional harvests have made up 52 of the 58 awarded advertisements. The Forest specifies both conventional harvest and helicopter harvest for timber sales. Helicopter sales facilitate operations on steeper slopes.

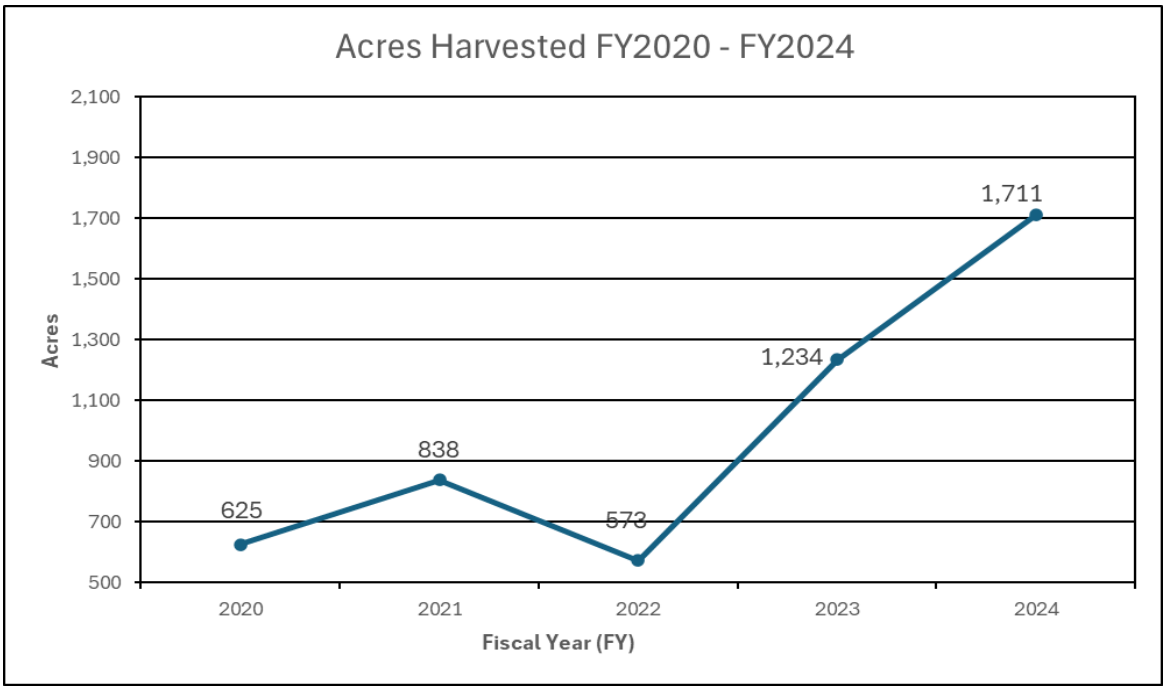


Figure 13. Acres of commercial timber harvest, by year.

- Timber sale advertisements averaged 12 annually, ranging from 7 sales in 2024 to 17 sales in 2023. The average volume per sale was 2.29 MMBF. As sale volume increased throughout the monitoring period, so has timber sale revenue, from $556,166 in 2020 to approximately $1,788,079 in 2024.

Recommendations

- In the next monitoring period, include volume and acres harvested by method as an indicator.
- Improvement is needed to reach 100% stocking success within the 5-year period following a regeneration harvest. Data management needs to be more closely tracked. Documentation at Year 1 is important in achieving successful certification at Year 5 due to having a full range of corrective actions and funding options. Program managers need to emphasize the importance of timely and accurate reporting or stocking and the need for corrective action such as fill-in planting, animal damage control, insect and disease treatments, etc.
- In areas where there is a need to encourage regeneration of shade intolerant species (e.g. oaks), consider increasing the size of even-aged harvest units to achieve objectives.

Social, Economic, and Cultural Sustainability

National forests having sustainable ecosystems and resilient watersheds help provide people and communities with a range of social, economic, and cultural benefits now and into the future. Some benefits, such as roads, have an easily identifiable utility. Others, such as cultural heritage, have tangible forms of value, such as artifacts, buildings, and landscapes, and intangible forms of value that support value systems, beliefs, traditions, and lifestyles.

Management direction for heritage resources in the Forest Plan emphasizes the protection of historic properties, completion of the Forest-wide heritage resources inventory, and evaluation of heritage resources. Additionally, projects are designed to avoid, minimize, or mitigate adverse effects to National Register of Historic Places (NRHP) eligible or unevaluated heritage resources. In-place protection of all identified eligible or unevaluated heritage resources is the minimum requirement. Heritage resources evaluated and determined not eligible for inclusion in the NRHP are afforded no such protection. On the Monongahela National Forest, heritage resources are identified and their eligibility as historic properties are determined as a key part of site evaluations. If warranted, eligible sites are nominated for listing in the NRHP.

Figure 14. HistoriCorps staff and volunteers make preservation repairs at Blue Bend Historic District small pavilion.

The Forest Service maintains roads that provide access necessary for public use and enjoyment, management, and protection of the nation's forests and grasslands. On the Monongahela National Forest system roads support the economic and social health of gateway and rural communities through access for active forest management, fire suppression, grazing, recreation, and other activities. Key management goals in the Forest Plan specify a transportation system that is safe, cost efficient, and minimizes adverse impacts to natural resources, while providing needed road density to achieve multiple use management objectives. Roads are also maintained and operated by other jurisdictions, such as state and local and governments. We work closely with these agencies, as well as the Federal Highway Administration, to manage and maintain access.

Monitoring Questions and Key Results

- MQ 16: Are project-specific mitigation measures being followed as recommended in project designs? If so, are they providing effective protection for heritage resources?
- MQ 17: Are heritage resources being affected in non-project areas from activities such as looting, OHV use, or erosion?
- MQ 27: To what extent is the Forest, in coordination with other public road agencies, providing safe, cost effective, minimum necessary road systems for administrative and public use?

Indicators

- Effects to heritage assets
- Change in site conditions
- Miles of road improved
- Miles of road maintained
- Miles of road decommissioned vs. constructed

Key Results

- During the monitoring period, the number of formal designations as priority heritage assets increased from 29 to 43. The designation requires more frequent condition assessments to highlight and address repair and maintenance needs.
- The Forest adheres to standard heritage resource protection measures established during consultation with West Virginia Division of Culture and History, Advisory Council on Historic Preservation, and sovereign Tribal Nations. For the 77 NEPA decision memos and decision notices signed during this period, protection measures remained effective during project design. For those implemented during the monitoring period, no adverse effects occurred during implementation.
- A total of 97 heritage resources evaluated met criteria as eligible for listing on the NRHP.
- The 2019 monitoring report disclosed adverse effects to heritage resources in non-project areas. The two primary causes in non-project areas were looting and the lack of routine maintenance of priority heritage assets. The Forest improved in both areas over the last five years. Forest Service Law Enforcement collaborated with heritage staff to increase monitoring frequency and improve protocols when investigations are necessary.
- The Forest made progress in Forest Plan goals for preserving, stabilizing and protecting heritage resources during the monitoring period. Over $850,000 in Bipartisan Infrastructure Bill and other infrastructure funds will result in adaptive reuse of the historic Red Oak Fire Lookout Tower, Hopkins Knob Fireman's Cabin, and repair to Blue Bend Recreation Area structures, all of which will improve the sustainability of the structures since rental fees will be used for future maintenance.
- At Stuart Recreation Area, adaptive reuse has been completed at the historic Administrative Cabin, and it is now available as a recreation rental. The work was accomplished with HistoriCorps and Appalachian Forest National Heritage Area.
- The Forest awarded a long-term historic property lease with Ohio-West Virginia Youth Leadership Association to manage daily operations and preservation investments at historic Camp Horseshoe Group Camp and Campground.

- Road maintenance mileage increased by about 40% in the last two years of the monitoring period (Table 9). This was primarily due to the hirings of additional force account equipment operators in early 2023. Road maintenance increased when annualized (681 miles) compared to the last monitoring report.
- Continuing trends from the 2019 monitoring report, the roads improved category continued to be negligible (0.41 mile). Annual average roads decommissioned (1.1 miles) decreased compared to the previous monitoring period (3.8 miles annual average).
- Road construction increased slightly compared to the previous period. However, at least three known permanent roads constructed for timber sales in 2017-2018 were omitted from the data. The database has been updated, and those miles will be counted in the next monitoring report.

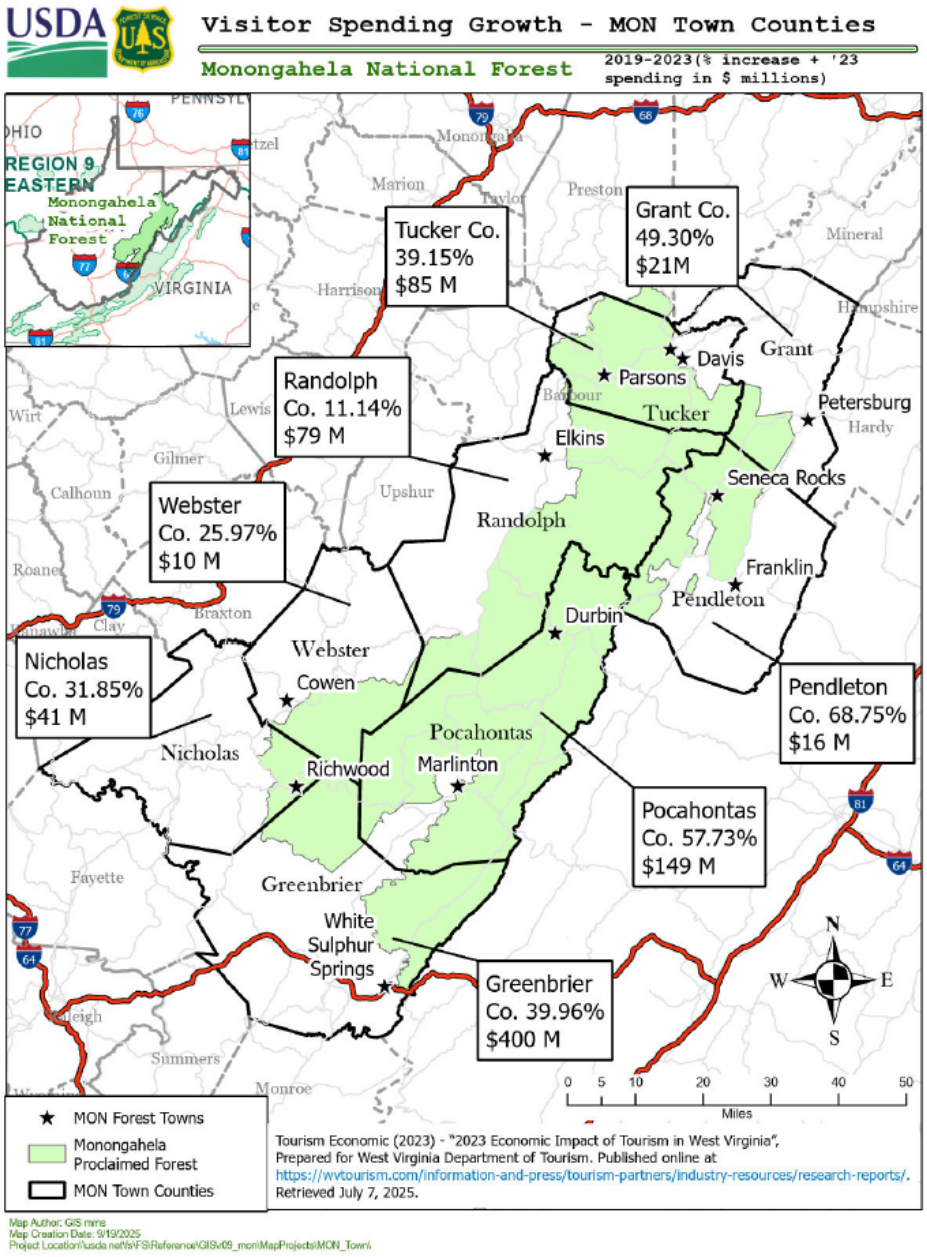
Table 9. Miles of road improved, maintained, decommissioned, and constructed, by year

Actions	2020	2021	2022	2023	2024	Total
Roads Improved	0	0	0	0.41	0	0.41
Roads Maintained	No data	727	647	996	1,036	3,406
Roads Decommissioned	2.0	0.7	1.9	0	0.9	5.5
Roads Constructed	1.05	0	0.71	1.02	0	2.78

Recommendations

- Success was achieved over the monitoring period with partners to safely repair historic structures while maintaining cultural significance. Those alliances should be continued in next management period.
- For roads, it is uncertain whether Forest Plan direction is being met based on the data collected since current indicators do not provide full context for evaluation. Forest Plan monitoring related to the minimum necessary road systems for the management prescriptions in which they occurred will be considered in the future. This may involve changing or adding indicators.
- Evaluating cost efficiency would also benefit from project-level data as well as additional context within the programmatic data. The Travel Management Rule (36 CFR 212.5(b)) mentions long-term funding expectations as one of the main considerations for determining a minimum road system.
- As mentioned in the Forest Plan Environmental Impact Statement, the inability to provide an appropriate level of road maintenance may require the Forest to close roads until user safety and resource protection can be assured. This will be considered during project planning on the Ranger Districts.
- Although no questions or indicators related directly to economics currently exist in the monitoring plan, economic data was available in the April 2025 draft “Economic and Quality of Life Indicators for Monongahela National Forest Counties in West Virginia” report. This report summarizes data collected by the Northeast Regional Center for Rural Development (Pennsylvania State University and West Virginia University) and shows increases in visitor spending over four years with increases as much as 68.75% (Pendleton County) and 400 million dollars spending in 2023 (Greenbrier County).

Figure 15. Visitor Spending Growth from 2019 to 2023 in counties with geographic connection to the Monongahela National Forest (Data source: Northeast Regional Center for Rural Development).



Public Engagement

Why does the Forest Service manage the land?

The mission of the Forest Service is to sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations. Forest management focuses on managing vegetation, restoring ecosystems, reducing hazards, and maintaining forest health. Forests that are over-mature or over-dense often become susceptible to insect and disease outbreaks and can create considerable fuel loading and increased susceptibility of stands to fire.

Want to help?

Spotted lanternfly has the potential to infest over 70 species of trees/vines but prefers the invasive tree-of-heaven. The insect has not been discovered on the Forest at the time of report completion. If you have a spotted lanternfly sighting, please report it to the West Virginia Department of Agriculture at bugbusters@wvda.us or 304-558-2212. Include as much detail about the location, date, and insect activity, and preferably a photo of the insect before trying to kill it. For more information about spotted lanternfly: https://agriculture.wv.gov/divisions/plant-industries/spotted-lanternfly/.

The endangered candy darter species is at risk for hybridization with variegate darters, which has been occurring in some streams on the Monongahela National Forest. In some cases, dams are preventing the upstream spread of variegate darters. Transferring live bait fish from one stream system to another can upset natural fish communities and may lead to the decline of the candy darter. For more information about candy darter:
https://www.fws.gov/sites/default/files/documents/508_candy%20darter%20fact%20sheet.pdf

Figure 16. An adult spotted lanternfly. USDA Forest Service photo by Melody Keena.

Figure 15. An adult candy Darter. USDI Fish and Wildlife Service photo by Travis Brown.