Monongahela National Forest

Administrative Correction 19
August 24, 2011
Updates on Climate Change

Under the 2000 Planning Rule (36 CFR 219.31), the following administrative corrections and additions may be made at any time, are not plan amendments or revisions, and do not require public notice or the preparation of an environmental document under Forest Service NEPA procedures:

(1) Corrections and updates of data and maps;
(2) Updates to activity lists and schedules as required by § 219.30(d)(1)-(6);
(3) Corrections of typographical errors or other non-substantive changes; and
(4) Changes in monitoring methods other than those required in a monitoring strategy.

CORRECTIONS

Forest Plan Table of Contents, page i

Change: Corrected pagination. Deleted MP 5.1 reference.

Rationale for Change: Pagination changed slightly due to other Forest Plan corrections. MP 5.1 areas no longer exist on the Forest following changes from Public Law 111-11.

Forest Plan Table of Contents, page ii

Change: Add the following at the end of the table:

Appendix F – Climate Change and the Forest Plan……F-1

Rationale for Change: This update reflects the current emphasis of the Forest Service to respond to potential effects from climate change.

Forest Plan Chapter I, page I-5, Organization and Structure of the Forest Plan

Change: Add the following at the end of this section:

Appendix F – Climate Change and the Forest Plan
Describes how Forest Plan prescriptions, direction, and monitoring respond to climate change.

Rationale for Change: This update reflects the current emphasis of the Forest Service to respond to potential effects from climate change.

Forest Plan Chapter I, page I-8, third paragraph

Change: Add the following sentence to the end of the paragraph: Climate change may also affect land and vegetation productivity, species distribution, and other resources.

Rationale for Change: This update reflects the current emphasis of the Forest Service to respond to potential effects from climate change.

Forest Plan Chapter II, page II-6

Forest Integrated Desired Conditions, Second Paragraph, Second Bullet Statement: Are dynamic in nature and resilient to natural and man-caused disturbances.

Change to: Are dynamic in nature and resilient to natural and man-caused disturbances and changes, including climate change.

Rationale for Change: This update reflects the current emphasis of the Forest Service to respond to potential effects from climate change.

Forest Integrated Desired Conditions, Third Paragraph, First Bullet Statement: Soils are productive and in a condition that promotes vegetative growth, hydrologic function, long-term nutrient cycling, and erosional stability.

Change to: Soils are productive and in a condition that promotes vegetative growth, hydrologic function, long-term nutrient cycling, erosional stability, and carbon sequestration.

Rationale for Change: This update reflects the current emphasis of the Forest Service to respond to potential effects from climate change, including the promotion of carbon sequestration.

Forest Plan Chapter II, page II-7

Forest Integrated Desired Conditions

Change: Add the following bullet statement to the list of statements:

- The Forest continues to provide a positive response to climate change by growing trees that absorb carbon dioxide and produce oxygen, by storing carbon in above-ground vegetation and below-ground roots and soil nutrients, and by promoting sustainable operations that conserve resources and reduce our environmental imprint.

Rationale for Change: This update reflects the current emphasis of the Forest Service to respond to potential effects from climate change, including the promotion of carbon sequestration.

Appendices Table of Contents

Change: Add Appendix F, Climate Change and the Forest Plan to the list of appendices.

Rationale for Change: This update reflects the current emphasis of the Forest Service to respond to potential effects from climate change.

Forest Plan Appendices

Change: Add Appendix F, Climate Change and the Forest Plan, including Appendix divider.

Rationale for Change: This update reflects the current emphasis of the Forest Service to respond to potential effects from climate change.

The above additions are updates of new information regarding climate change. This new information would not result in a substantive change in the plan components. No substantive changes in Forest Plan outputs, services, and expectations are anticipated from this correction. No significant changes in management prescriptions or management direction are proposed.

Corrected pages i, ii, I-5, I-8, II-6, II-7, the Appendices Table of Contents, Appendix F Divider, and Appendix F are attached.

Monongahela National Forest

2006 Land and Resource Management Plan

Table of Contents

Chapter IV – Monitoring and Evaluation Plan
Presents a plan for monitoring and evaluating the effects of management practices, and describes how the Plan will be amended or revised in the future.

Chapter V - Glossary
Includes definitions of key terms, and commonly used acronyms.

Appendix A – Vegetation Management Practices
Describes forest types, harvest methods, and silvicultural treatments the Forest uses.

Appendix B – Old Growth
Describes existing old growth, defines old-growth characteristics, and identifies the distribution of potential old growth areas on the Forest.

Appendix C – Analysis of the Management Situation Summary
Describes the Need For Change in management direction for selected resources, the current condition of those resources, and how the Plan addresses the Need For Change.

Appendix D – Management Indicator Species
Describes the revised list of MIS on the Forest and the disposition of MIS from the 1986 Plan.

Appendix E – Communication Sites
Describes the communication and electronic sites on the Forest and designates their users.

Appendix F – Climate Change and the Forest Plan
Describes how Forest Plan prescriptions, direction, and monitoring respond to climate change.

LOCATION AND DESCRIPTION OF THE FOREST

The Monongahela National Forest is located in east central West Virginia (see Figure I-1), in portions of Barbour, Grant, Greenbrier, Nicholas, Pendleton, Pocahontas, Preston, Randolph, Tucker, and Webster Counties. The Forest has over 921,000 acres within the Allegheny Mountains of the Appalachian System. The Supervisor's Office is located in Elkins, West Virginia, and the Forest is divided into four Ranger Districts: Cheat-Potomac, Greenbrier, Gauley, and Marlinton-White Sulphur Springs. District offices are in Parsons, Petersburg, Bartow, Richwood, Marlinton, and White Sulphur Springs, West Virginia. The Forest is an administrative unit of the Eastern Region (Region 9) of the Forest Service, U.S. Department of Agriculture. The Regional Forester's office is in Milwaukee, Wisconsin.

The Forest is regarded as a special place by many who visit or live nearby. American Indians lived here for thousands of years, at first hunting and gathering and then later in agricultural-based villages. Three hundred years ago, the Allegheny Mountains represented the American frontier to European settlers eager for a fresh start in a new land. These mountains and their resources provided the lumber and coal to house and fuel a growing nation teeming with immigration and opportunity. However, logging methods used during the late 1800s and early

The geology of the Forest provides the setting for 40-50 natural gas wells, which are a regionally important and a valuable natural gas resource. It is expected that future leasing and development will continue to discover and produce natural gas for public use. In addition, there is a natural gas storage field located beneath the Forest that serves an important role in making natural gas available to eastern U.S. population centers in times of high demand.

Headwaters of six major river systems are within the Forest boundary, and water is an important resource for both on-Forest and off-Forest users. The steep slopes of the Monongahela give rise to nearly 600 miles of coldwater streams that become the Tygarts Valley, Potomac, Cheat, Greenbrier, Elk, and Gauley Rivers. More than 90 percent of the high-quality trout waters in West Virginia are said to be within the Forest boundary.

The Forest receives some of the highest acid deposition rates in the country because of its location downwind from coal-fired power plants the Ohio River Valley. This deposition has raised management concerns relating to loss of aquatic species from stream acidification, and to changes in soil chemistry, which could impact the productivity of Forest soils. Climate change may also affect land and vegetation productivity, species distribution, and other resources.

The Monongahela contains an estimated 52 percent of the publicly available recreation land in West Virginia and draws users from local areas, across the State, and surrounding States. Recreation opportunities range from hiking on over 800 miles of trails, angling in high-quality trout streams or on small warm-water impoundments, hunting, nature watching, camping in both primitive and developed settings, visiting historical and cultural sites, rock climbing, caving, and driving for pleasure. Mountain biking occurs on Forest roads, many trails, and on former railroad grades. Auto touring attractions include the 43-mile Highland Scenic Highway, and spectacular fall leaf color. The national importance of the recreation resource has been recognized with Spruce Knob-Seneca Rocks National Recreation Area, eight Wildernesses, three Scenic Areas, a National Scenic Highway, a National Recreation Trail, and two visitor centers.

Economic contributions to the local and national economy from the Monongahela include receipts, fees, and employment opportunities from timber harvest, mineral development, livestock grazing, recreation, and special uses, and the availability of products such as firewood and medicinal plants. One of the other important economic contributions to the local economy is to serve as the backdrop for local businesses, tourism, and guiding services, and as an added attraction for those coming to ski or golf in the area.

Our management philosophy is based on the belief that public land in the Appalachians is scarce and precious. As surrounding population centers expand, the Monongahela National Forest will become increasingly rare and valuable as a place of ecological, historic, cultural, and economic importance in the region. We believe we should manage the Forest for its special features, and in ways desired by today's public and future generations.

Changes, including increased development, are expected to continue on private lands around the Forest, and these changes will likely create more demand for, and impacts on, Forest resources. To meet this challenge, the Forest will protect or restore soil and water resources, use vegetation management to sustain healthy forests and diverse wildlife habitat, contribute to the recovery of

Forest Integrated Desired Conditions

The desired condition for the Forest is to care for the land and serve people through the maintenance and restoration of productive and sustainable ecosystems. The Forest continues to cooperate, coordinate, and consult with a variety of agencies, organizations, and government entities to achieve mutual benefits from Forest resource management. The Forest features a broad array of landscapes and opportunities, from wilderness areas where natural conditions predominate, to concentrated development areas where conditions have been highly altered to meet specific resource needs or concerns. Specific uses, practices, or activities on the Forest are adjusted as needed to reduce impacts to natural resources or to reduce conflicts between users.

Ecosystems on the Forest:

- Have ecological and watershed integrity, meaning they have a viable combination of all the diverse elements and processes needed to sustain systems and to perform desired functions,

- Are dynamic in nature and resilient to natural and man-caused disturbances and changes, including climate change,

- Have a range of vegetative composition and structure that provide habitat for native and desired non-native plant, wildlife, and aquatic species, and

- Are managed in an environment of public and interagency trust, and cultural and socio-economic sustainability.

Ecosystems have the following physical, biological, social, and economic components and conditions:

- Soils are productive and in a condition that promotes vegetative growth, hydrologic function, long-term nutrient cycling, erosional stability, and carbon sequestration. Streams and lakes provide clean water, appropriate temperatures, and a variety of connected habitats to support native and desired non-native aquatic species.

- Terrestrial and aquatic communities are within desired conditions for composition, structure, patterns, and processes. Vegetation forms a diverse network of habitats and connective corridors for wildlife, and provides snags, coarse woody material, and soil organic matter.

- Habitats support species diversity, with emphasis on maintaining or restoring populations of game and non-game wildlife and fish; TEP and sensitive species; and rare plant communities. Riparian areas connect upland and aquatic habitats, and promote stable and diverse stream channel conditions. Existing non-native invasive species populations are not expanding and new invader species are not becoming established.

- Fire is used to manage vegetation where needed to enhance ecosystem resiliency in fire-adapted communities and lower hazardous fuel levels.

- Recreational settings range from semi-primitive to developed, offering a wide spectrum of opportunities and uses. Facilities--such as roads, trails, campgrounds, and administrative sites--are constructed, reconstructed, or eliminated as needed to provide a balance of safe, effective, and environmentally responsible recreational opportunities. Visitors enjoy a variety of special attractions, including the National Recreation Area, Wilderness, Scenic Areas, The Highland Scenic Highway, recreational complexes, historic landmarks, and Botanical Areas. People have the opportunity to explore and learn about cultural heritage. Significant cultural sites are preserved and accessible.

- Forest ecosystems provide a variety of sustainable products and services for current and future generations. Timber, range, wildlife, water, recreation, minerals, and special use programs offer opportunities for economic development, and contribute to local community needs, while maintaining ecological integrity.

- The Forest continues to provide a positive response to climate change by growing trees that absorb carbon dioxide and produce oxygen, by storing carbon in above-ground vegetation and below-ground roots and soil nutrients, and by promoting sustainable operations that conserve resources and reduce our environmental imprint.

Sites Homestead – Near Seneca Rocks

Forest Plan Appendices

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Changes to the Forest Plan Appendices Since 2006

Appendix F – This appendix is new. It describes how the Forest Plan addresses climate change.

Appendix F

Climate Change and the Forest Plan

Table of Contents

Changes to the Forest Plan Appendices Since 2006

Appendix F – This appendix is new. It describes how the Forest Plan addresses climate change.

Forest Plan and Climate Change Crosswalk Tables

There are many ways in which Forest Plan prescriptions, direction, and monitoring would provide benefits related to counteracting effects or trends commonly described for climate change. Virtually all of these ways fall under the *Adaptation* or *Mitigation* strategies described in the "Forest Service Strategic Framework for Responding to Climate Change" (USDA FS 2008). The tables below indicate connections between Forest Plan components and the following potential beneficial effects that correspond to the Strategic Framework strategies:

1) Maintain, restore, or enhance ecosystem resiliency *(facilitated adaptation/mitigation)*
2) Promote carbon sequestration *(mitigation)*
3) Promote air or water quality, cooler temperatures, moister conditions *(facilitated adaptation)*
4) Reduce or prevent NNIS establishment and spread *(facilitated adaptation)*
5) Retain or promote biological diversity *(facilitated adaptation)*

Forest Plan Management Prescriptions and Climate Change

Management Prescription	Management Emphasis	Connection to Climate Change
3.0 – Vegetation Diversity (196,900 acres or 21% of Forest)	Age class diversity, sustainable timber, variety of habitat and forest scenery	1), 5)
4.1 – Spruce and Spruce-Hardwood Ecosystem Restoration (155,700 acres or 17% of Forest)	Active and passive restoration of spruce-hardwood communities, spruce research, recovery of T&E and other rare species	1), 2), 3), 4)
5.0 – Designated Wilderness (116,500 acres or 13% of Forest)	Preserve wilderness attributes and natural environment	2), 3), 5)
5.1 – Recommended Wilderness (0 acres or 0% of Forest)	Maintain wilderness attributes and natural-appearing environment	2), 3), 5)
6.1 – Wildlife Habitat Emphasis (286,400 acres or 31% of Forest)	Enhance wildlife habitat through vegetation management, active restoration of oak communities	1), 5)
6.2 – Backcountry Recreation (96,400 acres or 10% of Forest)	Variety of non-motorized recreation opportunities in a semi-primitive setting and largely natural environment	2), 3), 5)
8.0 – Special Areas (73,600 acres or 8% of Forest)	Preservation of unique ecosystems or areas for scientific or recreational purposes, research areas, biodiversity	1), 2), 3), 5)
• 8.1 – SKSR National Recreation Area (57,200 acres)	A variety of recreational settings and opportunities; conservation of scenic, scientific, historic and other values	2), 5)
• 8.2 – National Natural Landmarks (2,460 acres)	Preservation of nationally significant ecological and geological natural areas	2), 3), 5)
• 8.3 – Scenic Areas (2,470 acres)	Preservation of outstanding beauty and visual quality areas for public enjoyment	2), 3), 5)
• 8.4 – Ecological Areas (3,080 acres)	Preservation of rare ecosystems to enhance biodiversity and provide for scientific or recreation activities	2), 3), 5)
• 8.5 – Research Areas (6,840 acres)	Areas set aside for research purposes, includes Fernow Experimental Forest	1), 2), 5)
• 8.6 – Grouse Management Areas (8,570 acres)	Establish and maintain habitat suitable for ruffed grouse and other species that need an early successional component in habitat	1), 5)

Forest Plan Management Direction and Climate Change Connections

The following tables, presented by resource area, provide a variety of examples of how Forest-wide management direction in the Plan is connected to adaptation and mitigation strategies for addressing potential effects from climate change.

Air Quality (p. II-8)

Management Direction Type, Number and Description	Connection to Climate Change
Goal AQ01 - Improve and maintain air quality and Air Quality Related Values (AQRVs) through a cooperative working relationship with agencies managing air quality, while achieving management goals and objectives. a) Review, evaluate, and provide recommendations on Prevention of Significant Deterioration (PSD) permits that may affect current class I area AQRVs. b) Provide comments to air quality agencies on regulatory efforts that impact air quality in Dolly Sods and Otter Creek class I areas. c) Participate in regional planning organizations and efforts that are examining ways to reduce impacts to visibility and other AQRVs in Class I areas of the region.	3) Promote improved air quality, cooler temperatures, and moisture retention.
Objective AQ02 - Reduce air pollution impacts to the AQRVs of the class I areas on the Forest to improve AQRV conditions over current adversely affected levels.	3) Promote improved air quality, cooler temperatures, and moisture retention.
Standard AQ04 - Conduct management activities (including permitted activities) in a manner that does not result in a significant contribution to a violation of National Ambient Air Quality Standards, a violation of applicable provisions in the State Implementation Plan, or an adverse impact to AQRVs in Dolly Sods and Otter Creek Wildernesses.	3) Promote improved air quality, cooler temperatures, and moisture retention.

Soils (pp. II-9 through II-11)

Management Direction Type, Number and Description	Connection to Climate Change
Goal SW01 - Maintain, restore, or improve soil quality, productivity, and function. Manage soil disturbances from management activities such that they do not result in long-term loss of inherent soil quality and function.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration
Standard SW03 - Disturbed soils dedicated to growing vegetation shall be rehabilitated by fertilizing, liming, seeding, mulching, or constructing structural measures as soon as possible, but generally within 2 weeks after project completion, or prior to periods of inactivity, or as specified in contracts. Rip compacted sites when needed for vegetative re-establishment and recovery of soil productivity and hydrologic function. The intent is to minimize the time that soil is exposed on disturbed sites or retained in an impaired condition.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration
Standard SW03 - Erosion prevention and control measures shall be used in program and project plans for activities that may reduce soil productivity or cause erosion.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration
Standard SW08 - Management actions that have the potential to contribute to soil nutrient depletion shall be evaluated for the potential effects of depletion in relation to on-site acid deposition conditions.	1) Maintain, restore, or enhance ecosystem resiliency

Guideline SW11 - Soil stabilization procedures should take place as soon as practical after earth-disturbing activities are completed or prior to extended periods of inactivity. Special revegetation measures may be required.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration 4) Reduce or prevent NNIS est. and spread
Guideline SW14 - Mulch should be applied on severely eroded areas, or areas with high potential for erosion, such as new road cut and fill slopes.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration
Guideline SW15 - Topsoil should be retained to improve the soil medium for plant growth on areas to be disturbed by construction. Topsoil should be salvaged from an area during construction and stockpiled for use during subsequent reclamation, or obtained from an alternate site. On some areas, soil material may have to be added to obtain vigorous plant growth. Soil to be used for this purpose should have chemical tests made to determine its desirability for use.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration
Guideline SW19 - Management activities that may result in accelerated erosion and loss of organic matter should have one or more of the following practices applied to mitigate potential effects: a) Limiting mineral soil exposure, b) Appropriately dispersing excess water, c) Ensuring sufficient effective groundcover, d) Stabilizing disturbed soils through revegetation, mulching, or other appropriate means, e) Preventing or minimizing excessive compaction, displacement, puddling, erosion, or burning of soils, and f) Preventing or minimizing the initiation or acceleration of mass soil movement (e.g., slumps, debris flows, or landslides).	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration 4) Reduce or prevent NNIS est. and spread

Water Quality and Hydrology (p. II-11)

Management Direction Type, Number and Description	Connection to Climate Change
Goal SW20 - Manage watersheds to sustain healthy aquatic systems, achieve desired conditions, and meet state designated water uses.	1) Maintain, restore, or enhance ecosystem resiliency
Standard SW23 - Logging and construction equipment shall not be washed in stream courses, nor shall material from washed equipment be allowed to drain into surface waters.	4) Reduce or prevent NNIS establishment and spread

Stream Channels, Lakes, and Wetlands (pp. II-11 through II-14)

Management Direction Type, Number and Description	Connection to Climate Change
Goal SW29 - Maintain or restore riparian and floodplain function, including floodwater retention and storage.	1) Maintain, restore, or enhance ecosystem resiliency
Goal SW30 - Maintain surface and ground water sources to support healthy riparian and aquatic habitats, wetlands, channel function, and downstream uses.	1) Maintain, restore, or enhance ecosystem resiliency
Goal SW31 - Maintain, enhance, or restore vegetation conditions that provide: a) Ecological functions of riparian, wetland, and aquatic ecosystems. b) Canopy conditions that regulate riparian and stream temperature regimes for native and desired non-native fauna and flora. c) Natural recruitment potential for large woody debris and other sources of nutrient inputs to aquatic ecosystems. d) Bank and channel stability and structural integrity.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration 3) Promote air or water quality, cooler temperatures, moister conditions

e) Habitat and habitat connectivity for aquatic and riparian-dependent species and upland species that use riparian corridors. f) Buffers to filter sediment.	
Standard SW34 - No programmed timber harvest shall occur within the channel buffers identified in the table in SW37. Tree removal from the buffers may only take place if needed to meet aquatic or riparian resource management needs, or to; a) Provide habitat improvements for aquatic or riparian species, or threatened, endangered, sensitive, and locally rare species; b) Provide for public or worker safety; c) Construct or renovate an approved facility; d) Construct temporary road, skid road, or utility corridor crossings; e) Conduct aquatic or riparian-related research, or f) Allow for cable yarding.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration 3) Promote air or water quality, cooler temperatures, moister conditions
Standard SW36 - When stream crossing structures are removed, stream channels shall be restored to their near-natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces). Disturbed soil shall be stabilized.	1) Maintain, restore, or enhance ecosystem resiliency
Standard SW39 - Use no-till cultivation methods for wildlife opening maintenance within channel buffers.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration
Standard SW40 - Skid trails and landings shall not be constructed within 100 feet of perennial, intermittent, and ephemeral channels except at crossings or when location outside the 100-foot zone pose a greater risk to aquatic or riparian resources. The 100-foot filter strip may be modified based on site-specific conditions such as soil type, slope, and stability.	1) Maintain, restore, or enhance ecosystem resiliency 3) Promote air or water quality, cooler temperatures, moister conditions
Standard SW41 - Corralling or overnight tethering of horses or other livestock is not allowed within 100 feet of stream courses or lakes. Existing corral sites may be maintained until alternative sites are developed, provided impacts to water quality and stream channels are mitigated.	1) Maintain, restore, or enhance ecosystem resiliency
Standard SW42 - New trails, campsites, and other recreational developments shall be located, constructed, and maintained to minimize impacts to channel banks and other riparian resources.	1) Maintain, restore, or enhance ecosystem resiliency 3) Promote air or water quality, cooler temperatures, moister conditions
Standard SW43 - Channel buffers shall not be available for commercial mineral material development.	1) Maintain, restore, or enhance ecosystem resiliency 3) Promote air or water quality, cooler temperatures, moister conditions
Standard SW44 - New roads are allowed within channel buffers but are restricted to essential crossings. Construction of roads parallel to the channel shall be avoided within the channel buffer.	1) Maintain, restore, or enhance ecosystem resiliency 3) Promote air or water quality, cooler temperatures, moister conditions
Standard SW45 - New roads within the channel buffer shall be designed to minimize impacts on aquatic and riparian resources.	1) Maintain, restore, or enhance ecosystem resiliency
Guideline SW50 - Maintained wildlife openings and associated access routes identified as degrading riparian or aquatic conditions should be mitigated or closed and restored. New wildlife openings within channel buffers may occur where needed to provide habitat for riparian species, or TEP, RFSS, or locally rare species, and where maintenance for these openings and their access routes can be achieved without degrading riparian or aquatic conditions.	1) Maintain, restore, or enhance ecosystem resiliency 3) Promote air or water quality, cooler temperatures, moister conditions 4) Reduce or prevent NNIS establishment and spread 5) Retain or promote biodiversity
Guideline SW51 - Ground disturbance should be avoided within seeps, vernal pools, bogs, fens, and other wetlands during project	1) Maintain, restore, or enhance ecosystem resiliency

implementation. These areas should be managed to protect wet soils and rare plants and provide wildlife watering sources using the following protection: a) No new system roads or skid roads should be located within these areas except at essential crossings. Such crossings should be designed to minimize disturbance to the extent practical. b) Logs should not be skidded through these areas. Keep slash and logs out of them. c) Where available, a canopy of 60-100 percent crown closure should be maintained within and adjacent to these areas, unless a more open canopy is needed for TEP species or RFSS management. d) Mast trees or shrubs may be planted in seeps if mast plants are currently lacking.	2) Promote carbon sequestration 3) Promote air or water quality, cooler temperatures, moister conditions 4) Reduce or prevent NNIS establishment and spread 5) Retain or promote biodiversity
Guideline SW52 - Cable yarding that crosses channel buffers should avoid or mitigate adverse effects to the stream channel. Crossing should be at as near a right angle as possible, with full suspension preferred. Trees cut within channel buffers to provide cable corridors may be left on site for woody debris recruitment and erosion control.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration 3) Promote air or water quality, cooler temperatures, moister conditions
Guideline SW53 - Use existing fire barriers, such as streams, roads, and trails for control lines where possible.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration
Guideline SW54 - Hand lines, wet lines, or black lines should be used where appropriate within channel buffers to minimize soil disturbance from fire suppression or control.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration
Guideline SW55 - New trails should not be located within channel buffers except at crossings, to control access to water bodies, or when location outside the buffer would pose greater risk to aquatic or riparian resources.	1) Maintain, restore, or enhance ecosystem resiliency
Guideline SW56 - Designated livestock stream crossings and watering points should be located, sized, and maintained to minimize impacts to aquatic and riparian resources.	1) Maintain, restore, or enhance ecosystem resiliency 4) Reduce or prevent NNIS est. and spread
Guideline SW57 - Improvements that invite concentrated livestock use—such as feed troughs, corrals, or salt/mineral blocks—should be located at least 100 feet from a channel, lake, or wetland.	1) Maintain, restore, or enhance ecosystem resiliency 4) Reduce or prevent NNIS est. and spread
Guideline SW58 - Watering troughs should be used where feasible to protect aquatic and riparian resources.	1) Maintain, restore, or enhance ecosystem resiliency
Guideline SW59 - Where private minerals are explored or developed within channel buffers, work with mineral developers to minimize disturbance to aquatic and riparian resources.	1) Maintain, restore, or enhance ecosystem resiliency 4) Reduce or prevent NNIS est. and spread
Guideline SW61 - Work with special use permittees to mitigate effects from their operations to soil, water, and aquatic resources within channel buffers.	1) Maintain, restore, or enhance ecosystem resiliency 4) Reduce or prevent NNIS est. and spread
Guideline SW62 - Stream crossing construction on temporary and permanent roads should be completed as soon as practical, with mitigation as needed to minimize the potential for sedimentation.	1) Maintain, restore, or enhance ecosystem resiliency

Fire Management (pp. II-15 through II-16)

Management Direction Type, Number and Description	Connection to Climate Change
Goal FM03 - Reduce wildfire risk to communities, municipal water supplies, and at-risk federal land by maintaining or restoring fire-resilient forest stands.	1) Maintain, restore, or enhance ecosystem resiliency
Goal FM04 - Maintain or restore late successional stands to a pre-fire suppression condition consistent with management prescription	2) Promote carbon sequestration

emphasis and desired conditions.	
Goal FM08 - Design and implement prescribed fire projects so that emissions do not hinder the state from meeting air quality standards and attaining visibility goals.	3) Promote air or water quality, cooler temperatures, moister conditions
Objective FM09 - Over the next 10 years use prescribed fire on 10,000 to 30,000 acres. Emphasize use in areas to reduce hazardous fuels and fire risk to property or investments, and/or in areas to maintain, restore, or enhance wildlife habitat or other ecosystem components.	1) Maintain, restore, or enhance ecosystem resiliency
Standard FM12 - A prescribed burning plan must be prepared and approved prior to using prescribed fire as a management tool. The plan shall address protection or maintenance of TEP species and habitat, cultural resources, watershed resources, air quality, private property, and other resources or investments as needed or appropriate.	1) Maintain, restore, or enhance ecosystem resiliency 5) Retain or promote biological diversity
Guideline FM20 - After a fire is controlled, rehabilitate those areas that have the potential to adversely affect soil, water, or other resources. Fire lines should be revegetated and water-barred, where necessary, to prevent erosion. Water diversions may be used to keep sediment out of channels.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration

Vegetation (pp. II-18 through II-20)

Management Direction Type, Number and Description	Connection to Climate Change
Goal VE01 - Provide vegetative diversity through a mix of natural and maintained openings, wetlands, and early, mid, and late successional forests to support a wide variety of habitats, forage, scenery, recreational settings, and socio-economic opportunities.	1) Maintain, restore, or enhance ecosystem resiliency 5) Retain or promote biological diversity
Objective VE02 - Maintain or create age class diversity on suitable timberlands to provide for sustainable timber production and a variety of structure and wildlife habitat. Treat an estimated 20,000 to 40,000 acres over the next decade to move toward desired age class conditions.	1) Maintain, restore, or enhance ecosystem resiliency 5) Retain or promote biological diversity
Objective VE03 - Treat an estimated 4,000 to 12,000 acres over the next decade on lands not suited for timber production to help restore ecosystems and enhance wildlife habitat.	1) Maintain, restore, or enhance ecosystem resiliency
Guideline VE04 - Use lands unsuited for timber production (MPs 5.0, 6.2, 5.1, portions of 8.0) as patches of potential old growth. In MPs with suitable timberlands (MPs 3.0, 6.1, portions of 4.1), identify potential old growth areas based on management direction and emphasis, as well as information on delineating potential old growth in Appendix B.	2) Promote carbon sequestration
Goal VE07 - Maintain or restore rare plant communities or individual populations to contribute to the biodiversity of the Forest.	1) Maintain, restore, or enhance ecosystem resiliency 5) Retain or promote biological diversity
Standard VE12 - Allow collection of RFSS plants only for research or scientific purposes.	5) Retain or promote biological diversity
Standard VE13 - For management actions that have been identified by the Forest as likely to cause a negative effect on RFSS populations, negative effects shall be avoided or minimized to the maximum extent practical while still accomplishing the purpose of the project or action. Unavoidable negative effects shall be mitigated to the extent practical and consistent with the project purpose.	1) Maintain, restore, or enhance ecosystem resiliency 5) Retain or promote biological diversity
Guideline VE14 - Rare communities should be identified during project analysis. Management actions should avoid rare communities	1) Maintain, restore, or enhance ecosystem resiliency

unless management is necessary to maintain, enhance, or restore a particular community. Conservation and management measures for rare communities should be determined on a case-by-case basis.	5) Retain or promote biological diversity
Goal VE19 - Manage NNIS with an Integrated Pest Management approach, using prevention, education, eradication, containment, and control strategies in a coordinated effort that includes potentially affected resources, users, funding sources, and activities. a) Work to prevent new infestations of NNIS, with emphasis on areas where species have a high probability for establishment and spread. b) Work with WVDNR, utility companies, and special use operators to control NNIS in openings, rights-of way, and other use areas. c) During project-level analysis, identify and map areas of non-native invasive plants. Identify areas with extensive infestations where precautionary measures are necessary when planning and implementing management activities. d) Develop a Forest Non-native Invasive Species Management Plan in coordination with county, state, and federal agencies, including USFWS. e) Provide training to field-going personnel for detecting evidence of NNIS with potential for broad-scale vegetation impacts. f) Use the Forest-wide database and map library of NNIS and susceptibility to develop site-specific Integrated Pest Management approaches and strategies to manage these species.	1) Maintain, restore, or enhance ecosystem resiliency 4) Reduce or prevent NNIS est. and spread 5) Retain or promote biological diversity
Standard VE22 - Projects that may contribute to the spread or establishment of noxious weeds shall be designed to include measures to reduce the potential for spread and establishment of noxious weed infestations.	1) Maintain, restore, or enhance ecosystem resiliency 4) Reduce or prevent NNIS est. and spread 5) Retain or promote biological diversity
Guideline VE25 - Special use permits should include language where appropriate to reduce the risk of NNIS invasion and spread.	4) Reduce or prevent NNIS est. and spread
Goal VE26 - Use Integrated Pest Management methods to minimize or prevent the development of pest problems (includes all pests, e.g., insects, disease, vegetative, or animal). Provide training to field-going personnel for detecting evidence of insect or disease activity.	1) Maintain, restore, or enhance ecosystem resiliency 4) Reduce or prevent NNIS est. and spread
Standard VE32 - Unless specifically registered for aquatic use, ground application of pesticides shall be conducted such that they do not enter surface waters, wetlands, or sink holes.	1) Maintain, restore, or enhance ecosystem resiliency 5) Retain or promote biological diversity

Threatened, Endangered, and Proposed Species (pp. II-22 through II-24)

Management Direction Type, Number and Description	Connection to Climate Change
Goal TE01 - Provide habitat capable of contributing to the survival and recovery of species listed under the ESA. Provide habitat that may help preclude Proposed species from becoming listed.	5) Retain or promote biological diversity
Goal TE04 - Within watershed-level planning units, identify TEP species habitat and opportunities to maintain, restore, or enhance habitat conditions. Design and implement management actions at the project level to address opportunities and provide for ecological conditions, population viability, reproductive needs, and habitat components for TEP species.	1) Maintain, restore, or enhance ecosystem resiliency 5) Retain or promote biological diversity
Goal TE29 - Manage naturally occurring tree species composition to provide a continuous supply of suitable roost trees and foraging habitat for Indiana bat. Achieve vegetative diversity that maintains or improves Indiana bat habitat. Where consistent with management	2) Promote carbon sequestration 5) Retain or promote biological diversity

prescription emphasis, use a variety of silvicultural methods to create desired age class diversity.	
Objective TE30 - Provide a continuous supply of suitable roost trees by maintaining a minimum of 50 percent of each primary range on NFS lands in any combination of mid successional (40-79 years), mid to late successional (80-120 years), and late-successional (>120 years) age classes.	2) Promote carbon sequestration 5) Retain or promote biological diversity
Standard TE31 - Management of vegetation 5 inches dbh or greater may only be implemented if activities: a) Maintain or improve Indiana bat or other TEP or Sensitive species' habitat, or b) Address public or worker safety concerns, or c) Achieve research objectives.	2) Promote carbon sequestration
Standard TE36 - Maintain a component of large over-mature trees, if available, in all uneven-aged harvest units to provide suitable roosting habitat.	2) Promote carbon sequestration

Wildlife and Fish (pp. II-29 through II-31)

Management Direction Type, Number and Description	Connection to Climate Change
Goal WF01 - Provide habitat diversity that supports viable populations of native and desired non-native wildlife and fish species, including Management Indicator Species (MIS), game species, and furbearers, and keeps RFSS from a trend toward federal listing. a) During watershed or project-level analysis, identify and prioritize opportunities to maintain or restore habitat for RFSS, Birds of Conservation Concern, and other species of interest. b) Within watershed-level planning units, maintain, enhance, or restore representative examples of habitats that would be expected under unmanaged conditions, to the extent allowed by land ownership patterns, existing conditions, and management prescription emphasis.	1) Maintain, restore, or enhance ecosystem resiliency 5) Retain or promote biological diversity
Goal WF04 - Manage cold water streams to maintain or restore suitable habitat and native aquatic communities. a) During watershed or project-level analysis, identify and prioritize opportunities to improve water temperature and other habitat conditions. b) Restore connectivity in currently fragmented habitat where the risk of genetic contamination, predation, or competition from undesired fish species is not a concern. c) Use stream improvement structures where desirable to maintain or improve pool/riffle ratios, stream cover, and bank stability.	1) Maintain, restore, or enhance ecosystem resiliency 3) Promote air or water quality, cooler temperatures, moister conditions 5) Retain or promote biological diversity
Objective WF08 - Actively restore aquatic and riparian habitat conditions in 30-50 miles of stream over the next 10 years. Activities that restore or improve the natural structure and function of channel and riparian conditions may include the installation of instream structures, large woody debris loading, riparian fencing, riparian planting, and bank and channel stabilization.	1) Maintain, restore, or enhance ecosystem resiliency 3) Promote air or water quality, cooler temperatures, moister conditions 5) Retain or promote biological diversity
Objective WF09 - Maintain at least 50,000 acres of mid-late and late successional (>80 years old) mixed mesophytic and cove forest to meet habitat needs for cerulean warbler, a Management Indicator Species.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration 5) Retain or promote biological diversity
Objective WF10 - Maintain at least 150,000 acres of 50-150 year old oak and pine-oak forest in MPs 3.0 and 6.1 to meet habitat needs for	1) Maintain, restore, or enhance ecosystem resiliency

wild turkey, a Management Indicator Species.	2) Promote carbon sequestration 5) Retain or promote biological diversity
Objective WF11 - Maintain at least 20,000 acres of mid-late and late successional (>80 years old) spruce forest to provide optimum habitat for West Virginia northern flying squirrel, a Management Indicator Species. The long-term objective is to increase mid-late and late successional spruce forest to at least 40,000 acres.	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration 5) Retain or promote biological diversity
Objective WF12 - Maintain at least 560 miles of coldwater stream habitat capable of supporting wild, naturally producing brook trout, a Management Indicator Species.	1) Maintain, restore, or enhance ecosystem resiliency 3) Promote air or water quality, cooler temperatures, moister conditions
Standard WF13 - For management actions that have been identified by the Forest Service as likely to cause a negative effect on RFSS or Birds of Conservation Concern populations, negative effects shall be avoided or minimized to the maximum extent practical while still accomplishing the purpose of the project or action. Unavoidable negative effects shall be mitigated to the extent practical and consistent with the project purpose.	5) Retain or promote biological diversity
Standard WF14 - For protection of cold water fisheries, apply the following to the channel buffers of perennial trout streams (stocked and native) during the period of October 1 to June 1: a) Potential sediment-producing ground disturbance exceeding two consecutive days shall only be initiated after consultation with a Forest fisheries biologist. b) Sediment-producing ground disturbance during this period shall employ additional erosion control measures and seeding or mulching, applied concurrently with the activity.	1) Maintain, restore, or enhance ecosystem resiliency 3) Promote air or water quality, cooler temperatures, moister conditions

Forest Plan Monitoring and Climate Change

This table displays monitoring items in the Forest Plan Monitoring Matrix (Chapter IV) and how they are connected to beneficial effects related to climate change *(facilitated adaptation)*.

Monitoring Item Number and Description	Connection to Climate Change
3. Are insect and disease populations compatible with objectives for restoring or maintaining healthy forest conditions?	1) Maintain, restore, or enhance ecosystem resiliency
4. To what extent is the Forest managing undesirable occurrences of fire, insect and disease outbreaks through prevention, suppression, and integrated pest management?	1) Maintain, restore, or enhance ecosystem resiliency
6. Are the effects of Forest management, including prescriptions, resulting in significant changes to productivity of the land?	1) Maintain, restore, or enhance ecosystem resiliency
7. Are harvested lands adequately restocked after five years?	1) Maintain, restore, or enhance ecosystem resiliency
9. Are even-aged harvest units, particularly clearcuts, exceeding the 40-acre size limit established under the NFMA?	1) Maintain, restore, or enhance ecosystem resiliency 2) Promote carbon sequestration
10. To what extent is Forest management moving toward desired habitat conditions for MIS and species associated with MIS habitats?	5) Retain or promote biodiversity
11. To what extent is Forest management contributing or responding to air pollution effects on ecosystems and visibility?	3) Promote air quality
12. Are Air Quality Related Values of the Dolly Sods and Otter Creek Wildernesses improving over current adversely affected levels?	3) Promote air quality
13. What are the trends in ambient air pollutant concentrations near the Forest?	3) Promote air quality
16. 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?	1) Maintain, restore, or enhance ecosystem resiliency
31. Is soil detrimental disturbance associated with land management activities below the 15% soil productivity loss threshold?	1) Maintain, restore, or enhance ecosystem resiliency
32. Is acid deposition affecting soil productivity loss and if so, is it affecting land sustainability?	1) Maintain, restore, or enhance ecosystem resiliency
34. To what extent is the Forest providing a range of vegetative communities that address diverse public interests and needs while contributing to ecosystem sustainability and biological diversity?	1) Maintain, restore, or enhance ecosystem resiliency 5) Retain or promote biodiversity
35. To what extent are Forest management, natural disturbances, and subsequent recovery processes changing vegetation composition and structure?	1) Maintain, restore, or enhance ecosystem resiliency
37. Are non-native invasive plants located and treated to prevent or limit further spread?	3) Reduce or prevent NNIS est. and spread
38. To what extent is Forest management contributing to the protection and recovery of threatened and endangered species?	5) Retain or promote biodiversity
39. To what extent is Forest management contributing to the conservation of sensitive species and maintaining or restoring their habitat conditions?	5) Retain or promote biodiversity
40. To what extent are Forest management and other external influences, such as acid deposition, beneficially or adversely affecting water quality or quantity?	1) Maintain, restore, or enhance ecosystem resiliency
43. To what extent is Forest management influencing the viability of native and desired non-native species, or otherwise affecting species composition and habitat productivity?	5) Retain or promote biodiversity
44. To what extent is management on Forest lands influencing populations of terrestrial or aquatic non-native species that threaten native ecosystems?	3) Reduce or prevent NNIS est. and spread

Forest Service Strategic Framework for Responding to Climate Change

The Forest Service Strategic Framework for Responding to Climate Change (2008) includes seven key goals that will help the agency carry out its mission of sustaining forests for present and future generations under a changing climate. This section examines existing or potential connections between these goals and the Forest Plan for the Monongahela National Forest (MNF).

1. Science – Will be used to advance our understanding of the environmental, economic, and social implications of climate change and related forest adaptation and mitigation activities.

National Forests are not mandated to specifically conduct research. However, the MNF does have research areas on the Forest, and we have collaborated on many research projects in the past. Collaborators include the Northern Research Station, West Virginia University, Marshall University, Virginia Tech University, USDA Forest Health Protection, and others. We are looking forward to working with the Northern Institute of Applied Carbon Science and other researchers on climate change issues and strategies in the near future. We intend to continue benefitting from scientific studies and research activities that provide opportunities to incorporate appropriate science into our Forest Plan and our management practices over time to help address climate change related issues and concerns.

2. Adaptation – Will enhance the capacity of forests to adapt to the environmental stresses of climate change and maintain ecosystem services.

The Forest Plan has management direction and prescriptions that are designed to maintain or enhance the capacity of our forest to adapt to environmental stresses, including climate change. Monitoring and evaluation in the Forest Plan can also play a key role in adaptive management related to climate change and maintaining ecosystem services. The monitoring and evaluation process can be used to change Forest Plan direction and management practices as needed.

3. Mitigation – Will promote the management of forests to reduce the buildup of greenhouse gases, while sustaining the multiple benefits and services of these ecosystems.

The Forest Plan has management direction and prescriptions that promote carbon sequestration and tree regeneration that would help reduce greenhouse gases. Sustainable operations (see #6, below) that would reduce emissions and conserve energy have also been identified in a Forest Sustainability Action Plan, which was developed in 2008 and is now being implemented independent of the Forest Plan.

4. Policy – Will integrate climate change, as appropriate, into Forest Service policies, program guidance, and communications.

The MNF does not set policy for the agency. However, the Forest Plan is an essential part of program guidance for the Forest, and opportunities to integrate climate change into the Plan will likely come from agency policy changes in the future.

5. Sustainable Operations – Will reduce the environmental footprint of Forest Service operations and be a leading example of a green organization.

The Forest completed a Sustainability Action Plan in 2008 that should help us reduce our environmental footprint. This Sustainability Action Plan is being implemented independent of the Forest Plan, as Forest Plans do not normally address day-to-day business or administrative actions of a Forest.

6. Education – Will advance awareness and understanding of principles and methods for sustaining forests, and sustainable resource consumption, in a changing climate.

There may be educational opportunities through incorporating climate change information into Forest planning documents and other Forest literature. However, many of our opportunities in this arena would likely come in training for Forest employees, and public outreach programs that the Forest already participates in, such as outdoor education classes, fishing derbies, public presentations, and volunteer teaching.

7. Alliances – Will establish, enhance, and retain strong alliances and partnerships with federal agencies, state and local governments, tribes, private landowners, NGO's, and international partners to provide sustainable forests for present and future generations.

The Forest Plan describes consultation, cooperation, and coordination relationships and opportunities with current partners on pages II-2 through II-4. We value these relationships and the many agreements and mutual benefits they have fostered. For example, we are now part of the Central Appalachian Spruce Restoration Initiative—along with the Northern Research Station, Fish and Wildlife Service, West Virginia Division of Natural Resources, The Nature Conservancy, and West Virginia University—a group that is pooling resources to restore spruce-hardwood ecosystems. We are also working with the Native Seed Bank of West Virginia to collect and store seed from native plants on the Forest for future adaptation needs. Another recent collaborative effort concerns the forming of Cooperative Weed and Pest Management Areas with the State, The Nature Conservancy, Appalachian Forest Heritage Area, the George Washington-Jefferson National Forest, Northeastern State and Private Forestry Office, Northern Research Station, US Fish and Wildlife Service, WV Department of Agriculture, WV Division of Forestry, WV Division of Natural Resources, WV Native Plant Society, WV Rivers Coalition, WV Tree Farm Committee, West Virginia University, and other partners.