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Forest Service

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Allegheny National Forest

Draft Supplemental Environmental Impact Statement

To Accompany the 2007 Land and Resource Management Plan and Final Environmental Impact Statement

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SEIS Table of Contents

List of Tables

List of Figures

SUMMARY

Purpose and Need

The Allegheny National Forest (ANF, Forest) needs to provide reasonable and necessary access for the development of reserved and outstanding mineral rights while mitigating effects to National Forest System (NFS) resource values for which the Forest was established. This will be accomplished by incorporating design criteria (standards and guidelines, S&Gs) in the 2007 Allegheny National Forest Land and Resource Management Plan (Forest Plan) to be employed in the authorization and implementation of site-specific reserved and outstanding private (pvt) oil and gas development (OGD) proposals.

The 2007 Forest Plan was administratively appealed, resulting in the Chief of the Forest Service directing the Regional Forester for the Forest Service Eastern Region to provide for public notice and comment on the application of S&Gs to pvt OGD, and changes in the 2800 section of the Forest Plan. The Chief also instructed the Regional Forester to clarify the ANF's authority to manage oil and gas activities and to more fully document the cumulative effects of pvt OGD on air quality (USDA-FS 2008).

The purpose of this analysis is to address the Chief's instructions, which creates the needs for action listed below (USDA-FS 2008).

1. There is a need to provide public notice and an opportunity for comment on application of the S&Gs defined in the Forest Plan (USDA-FS 2007b, pp. 53–168) to pvt OGD.
2. There is a need to better describe the ANF's legal authority to determine the reasonable and necessary use of surface resources when applied to pvt oil and gas rights, and to incorporate clear language that defines the roles and responsibilities of the Forest Service, Commonwealth of Pennsylvania, and private mineral owners in this Supplemental Environmental Impact Statement (SEIS), the Forest Plan and Record of Decision (ROD). There is also a need to distinguish between reserved and outstanding rights and how the management of these distinct mineral estates may vary depending upon language in individual deeds or the Secretary of Agriculture's rules and regulations.
3. There is a need to evaluate and disclose potential cumulative effects on ANF and regional air quality from pvt OGD emissions of methane and hydrogen sulfide and emissions from vehicles and equipment used in pvt OGD.

Proposed Action

In response to the Chief's three instructions, the following proposed action is made:

Apply the design criteria found on pages 53 through 168 of the 2007 Forest Plan to pvt OGD.

To determine whether or not the S&Gs are appropriate, it will be necessary to clarify the roles and responsibilities held by the Forest Service, the Commonwealth of Pennsylvania, and private mineral owners in regard to the protection of surface resources during pvt OGD by replacing applicable sections in the ROD, Forest Plan, FEIS, and Appendix F of the FEIS.

It will also be necessary to supplement section 3.2.3–Air Resources in the FEIS (USDA-FS 2007a, pp. 3-52–3-63) to fully evaluate the potential cumulative effects on air quality in the ANF and surrounding region from pvt ODG emissions of methane and hydrogen sulfide and emissions from vehicles and equipment used in pvt OGD.

Scope of Analysis

Items within the Scope of Analysis

The analysis will focus on the direct, indirect and cumulative effects associated with the application of S&Gs contained within each alternative with respect to potential effects to surface resources resulting from pvt OGD. The analysis of S&Gs and discussion of differences between alternatives will be made with an underlying understanding of what these direct,

indirect, and cumulative effects are; however, whether or not pvt OGD may occur is not the subject of this analysis. The analysis will address the significant issues raised in scoping. Additional information will be provided regarding air quality.

Items Outside the Scope of Analysis

The question of whether or not the development of reserved and outstanding oil and gas rights should occur on the ANF is outside the scope of the analysis since the Forest Service cannot deny reasonable and necessary access to private property rights.

Information will be provided in this document that clarifies the roles and responsibilities of the Forest Service, Commonwealth of Pennsylvania and private mineral owners. The SEIS will not include a legal analysis, as that is not the proper role of an SEIS, and the legal issues are currently before the courts. The analysis will focus on the potential environmental effects of S&Gs, which the Forest Service has the legal authority to implement.

Information will be provided in the SEIS, Appendix C that clarifies the administrative and process related tasks associated with pvt OGD; however there will be no analysis of these tasks, since the proper focus of an environmental impact statement (EIS) is on the potential environmental effects of the proposed action.

Decision to be Made

The decision to be made is what set of S&Gs will be applied to the exercise of reserved and outstanding mineral rights, to ensure reasonable and necessary access while mitigating effects to NFS resources through protecting, enhancing, and restoring ecosystems.

Public Involvement

The NOI to conduct an SEIS was published in the Federal Register on February 27, 2009 and identified March 27, 2009 as the end of the scoping period. A correction was published on March 10, 2009, which indicated March 30, 2009 as the end of the scoping period.

Public meetings were held March 9, 10, and 11, 2009 in Warren, Bradford and Clarion, PA, respectively. The purpose of the meetings was to provide information on what a Forest Plan is, what the process for completing an SEIS is, and how the public could provide comments and be involved in the process.

Public meetings were held April 27, 28, and 29, again in Warren, Bradford and Clarion, PA to present preliminary issues and alternatives.

Noon-time conference calls were held on March 25, May 5 and June 9, 2009 to provide additional opportunity for public involvement, especially for those who were unable to attend the meetings. Questions received on conference calls were attached to the public meeting notes and posted to the ANF website.

Posts made to the ANF website can be found at: http://www.fs.fed.us/r9/forests/allegheny/projects/supp_eis/pub_meetings/index.php.

Cooperating Agencies and Relationship to Other Government Agencies

The following federal agencies were invited to become cooperating agencies for this analysis: the US Environmental Protection Agency, Region III (EPA); the US Bureau of Land Management – Eastern States (BLM); and the US Fish and Wildlife Service (USFWS) – State College Field Office, Northeast Region. The EPA and the BLM are cooperating agencies in this analysis. The USFWS is participating to fulfill Endangered Species Act requirements.

County government officials have expressed interest in maintaining open and active participation in the development of the SEIS. County officials provided response to the NOI and participated in public meetings held in March and April 2009. They were invited to designate a representative to work with us in a government-to-government relationship in an effort to facilitate coordination and have been involved in this capacity.

Development of Issues

The disposition of comments yielded three significant issues and the indicator measures to

be used to evaluate differences between alternatives:

1. *Water Quality*: Concern was expressed that S&Gs as proposed are more restrictive than necessary to protect the water resources from increased sedimentation resulting from pvt OGD (i.e., road building and timing of erosion control measures). Specifically, the issue was raised that as proposed the S&Gs go beyond what is required by Pennsylvania Best Management Practices (BMPs), which were designed to ensure protection of water resources. Conversely, concern was expressed that certain methods of road construction result in increased sedimentation and therefore should not be permitted (e.g. construction during the winter).

Indicator measures:

- Kinds of riparian areas where S&Gs are applied (descriptive)
- Miles of perennial and intermittent streams where wider buffers are applied (quantitative)
- The number of riparian dependent wildlife, plant, and aquatic species that are at risk for increased viability concerns which results in decreased viability outcomes (quantitative)

2. *Visual resources*: Concern was expressed that S&Gs as proposed do not adequately address concerns related to visual quality associated with special areas or special features on the forest (areas with higher levels of scenic integrity, or features such as the North Country National Scenic Trail).

Indicator measures:

- Percent of the ANF where S&Gs strive to maintain high Scenic Integrity Levels (quantitative)

3. Reclamation: Concern was expressed that the S&Gs as proposed do not adequately address concerns related to the need for short and long term reclamation needs.

Indicator measures:

- Acres of the ANF where successful revegetation is required within 60 days of the beginning of the next growing season (quantitative)
- Percent of roads where measures to restrict or limit the introduction or spread of non-native invasive plants via human caused activity exist (quantitative)

In addition, review of comments identified several resource areas where additional discussion will be provided in the SEIS: economics, fragmentation, noise, climate change, seasonal access restrictions, and effects related to development of Marcellus shale.

Description of Alternatives

Alternative 1 – No Action - The No Action Alternative is the continuation of management direction pertaining to pvt OGD. The instructions issued by the Chief of the Forest Service (USDA-FS 2008) state that until actions are taken to provide public notice and an opportunity for comment on application of S&Gs in the Forest Plan (USDA-FS 2007b, pp. 53–168) to pvt OGD, authority to apply the 2007 Forest Plan S&Gs is suspended. Implementation of this alternative would result in an amendment to the Forest Plan S&Gs for pvt OGD.

Alternative 2 – Proposed Action – The Proposed Action is the management direction contained in the 2007 Forest Plan. All S&Gs are applicable to pvt OGD.

Alternative 3 (Preferred Alternative, Environmentally Preferred Alternative) – Alternative 3 includes only those Forest Plan S&Gs specific to pvt OGD (instead of all S&Gs as included in Alternative 2). S&Gs are clarified through rewording and consolidation to be more specific to pvt OGD. S&Gs pertaining to already established state and federal requirements are removed. S&Gs related to the use of pit run material for road surfacing and well pad construction are removed. S&Gs related to federal OGD are removed since the SEIS pertains only to reserved and outstanding pvt OGD activities. S&Gs for all other activities

(e.g. vegetation management) remain unchanged from the Forest Plan.

S&Gs are added in response to issues regarding visual resources and reclamation. S&Gs are added that emphasize maintaining visual quality along the North Country National Scenic Trail (NCNST). S&Gs that require more attention to interim and final reclamation needs are added. S&Gs are added for the potential development of Marcellus shale. Implementation of this alternative would result in an amendment to the Forest Plan S&Gs for pvt OGD.

Alternative 4 – Alternative 4 includes only those Forest Plan S&Gs specific to pvt OGD (instead of all S&Gs as included in Alternative 2). S&Gs are clarified through rewording and consolidation to be more specific to pvt OGD. S&Gs pertaining to already established state and federal requirements are removed. S&Gs related to the use of pit run material for road surfacing and well pad construction are removed. S&Gs related to federal OGD are removed since the SEIS pertains only to pvt OGD activities. S&Gs for all other activities (e.g. vegetation management) remain unchanged from the Forest Plan.

S&Gs are modified or deleted in response to issues regarding water quality and reclamation. Most S&Gs regarding visual resources are removed. S&Gs are added for the potential development of the Marcellus shale. S&Gs have been modified to conform with Pennsylvania Best Management Practices as defined by the Pennsylvania Department of Environmental Protection (PADEP) and other State agencies (Department of Conservation and Natural Resources (DCNR), Pennsylvania Game Commission (PGC), and Pennsylvania Fish and Boat Commission (PFBC) that define measures to minimize effects to species included in the Pennsylvania Natural Heritage Program (PNHP). Implementation of this alternative would result in an amendment to the 2007 Forest Plan S&Gs for pvt OGD.

Changes in S&Gs regarding water quality include defining narrower buffer distances for riparian areas, and eliminating vernal pools and seeps from consideration for riparian buffers. S&Gs for wilderness trout stream and remote trout stream protection have been removed. S&Gs for road system design allow for different surfacing materials than Alternative 2 and 3. S&Gs designed to protect WL habitats for Regional Forester Sensitive Species and to limit activity during nesting periods have been removed. If species are found, contact with appropriate state agencies would occur to determine if additional measures might be needed to minimize impacts to species.

Alternatives Considered but Eliminated from Detailed Study

Purchase or acquisition of mineral rights – One of the goal statements included in the Forest Plan is to acquire surface and subsurface rights from willing sellers within the ANF proclaimed boundary where it benefits the long term management of the ANF (USDA-FS 2007b, p. 15). No additional analysis is necessary.

Offset effects associated with pvt OGD by limiting ANF activities – The FEIS, as supplemented by this Draft SEIS, did not identify any resource concerns that require offsets in ANF activity to maintain long term productivity across the landscape.

Reduction of effects by limiting where OGD can occur (to protect existing and potential wilderness, and roadless areas) – In order to limit development within special areas on the ANF, purchase or acquisition of mineral rights would need to occur. The ANF lacks the legal authority to deny reasonable or necessary access to reserved and outstanding minerals. This would constitute a taking of private property and thus was not considered in detail.

Reimburse operators to offset additional cost of development associated with application of the S&Gs – This is an administrative decision and not a plan decision. Costs associated with pvt OGD are the burden of the developer. There is no authority to spend appropriated funds for this kind of reimbursement.

Comparison of Alternatives

This section contains a comparison of how each alternative addresses the significant issues by displaying the indicator measures identified in

chapter 1. A brief statement is made for each alternative to show how it responds to the measure. More discussion can be found in chapter 3.

Summary Table 2-1. Comparison of Issues

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Water Quality				
Kinds of riparian areas where S&Gs are applied	- Perennial and intermittent streams - Floodplains and wetlands - Spring seeps	- Perennial and intermittent streams - Water bodies, wetlands, springs, seeps, and vernal pools	- Perennial and intermittent streams - Water bodies, wetlands, springs, seeps, and vernal pools	- Perennial and intermittent streams - Water bodies, wetlands, and springs.
Miles of perennial and intermittent streams where wider buffers are applied.	1468 miles	2504 miles	2504 miles	1468 miles
The number of riparian dependent wildlife, plant, and aquatic species that are at risk for increased viability concerns which results in decreased viability outcomes	Reduced species viability due to no protection for vernal ponds and narrow riparian buffers : 14 riparian species (3 animals, 11 plants)	Reduced species viability due to long term habitat disturbance and increased human activity: 1 riparian species (animal)	Reduced species viability due to long term habitat disturbance and increased human activity: 1 riparian species (animal)	Reduced species viability due to no protection for vernal ponds, narrow riparian buffers, and increased risk of sedimentation: 8 riparian species (3 animals, 5 plants) and 19 aquatic species (19 animals)
Visual Resources				
Percent of the ANF where S&Gs strive to maintain high Scenic Integrity Levels?	0	24%	24%	0
Reclamation				
Acres of the ANF where successful revegetation is required within 60 days of the beginning of the next growing season.	381,499 acres	516,843 acres	516,843 acres	381,499 acres
% of roads where measures to restrict or limit the introduction or spread of non-native invasive plants via human caused activity exist	0	100%	100%	0

Chapter 1

Purpose and Need for Action

CHAPTER 1. PURPOSE AND NEED FOR ACTION

1.1 Purpose and Need

The Allegheny National Forest (ANF, Forest) needs to provide reasonable and necessary access for the development of reserved and outstanding mineral rights while mitigating effects to National Forest System (NFS) resource values for which the Forest was established. This will be accomplished by incorporating design criteria (standards and guidelines, S&Gs) in the 2007 Allegheny National Forest Land and Resource Management Plan (Forest Plan) to be employed in the authorization and implementation of site-specific reserved and outstanding private (pvt) oil and gas development (OGD) proposals.

The 2007 Forest Plan was administratively appealed, resulting in the Chief of the Forest Service directing the Regional Forester for the Forest Service Eastern Region to provide for public notice and comment on the application of S&Gs to pvt OGD, and changes in the 2800 section of the Forest Plan. The Chief also instructed the Regional Forester to clarify the ANF's authority to manage oil and gas activities and to more fully document the cumulative effects of pvt OGD on air quality (USDA-FS 2008).

The purpose of this analysis is to address the Chief's instructions, which creates the needs for action listed below (USDA-FS 2008).

1. There is a need to provide public notice and an opportunity for comment on application of the S&Gs defined in the Forest Plan (USDA-FS 2007b, pp. 53–168) to pvt OGD.
2. There is a need to better describe the ANF's legal authority to determine the reasonable and necessary use of surface resources when applied to pvt oil and gas rights, and to incorporate clear language that defines the roles and responsibilities of the Forest Service, Commonwealth of Pennsylvania, and private mineral owners in this Supplemental Environmental Impact Statement (SEIS), the Forest Plan and Record of Decision (ROD). There is also a need to distinguish between reserved and outstanding rights and how the management of these distinct mineral estates may vary depending upon language in individual deeds or the Secretary of Agriculture's rules and regulations.
3. There is a need to evaluate and disclose potential cumulative effects on ANF and regional air quality from pvt OGD emissions of methane and hydrogen sulfide and emissions from vehicles and equipment used in pvt OGD.

1.2 Proposed Action

In response to the Chief's three instructions, the following proposed action is made:

Apply the design criteria found on pages 53 through 168 of the 2007 Forest Plan to pvt OGD.

To determine whether or not the S&Gs are appropriate, it will be necessary to clarify the roles and responsibilities held by the Forest Service, the Commonwealth of Pennsylvania, and private mineral owners in regard to the protection of surface resources during pvt OGD by replacing applicable sections in the ROD, Forest Plan, FEIS, and Appendix F of the FEIS.

It will also be necessary to supplement section 3.2.3–Air Resources in the FEIS (USDA-FS 2007a, pp. 3-52–3-63) to fully evaluate the potential cumulative effects on air quality in the ANF and surrounding region from pvt ODG emissions of methane and hydrogen sulfide and emissions from vehicles and equipment used in pvt OGD.

1.3 Scope of Analysis

1.3.1 Background

This analysis will address information needed to fulfill the three instructions received from the Chief of the Forest Service (USDA-FS 2008). The Forest Plan was affirmed, with the exception of S&Gs for the development of reserved and outstanding oil and gas rights. The analysis documented within the FEIS pertaining to S&Gs for management actions such as vegetation management, recreation, etc., was found to be adequate and is therefore not a part of this SEIS.

The fundamental change pertinent to pvt OGD between the draft and FEIS for the Forest Plan was the application of all S&Gs to pvt OGD. This included S&Gs in the 2800 section, as well as all other S&Gs in the Forest Plan. This was considered to be a substantial change between the draft and final Forest Plan, hence the Chief's decision to require additional public involvement. Until such time that the process requirement for public notice, comment and review of the application of S&Gs is completed, the Chief reinstated the 2800 section of the 1986 Forest Plan to pvt OGD. All other activities occurring on the ANF are being done in accordance with the S&Gs in the 2007 Forest Plan. Publication of the Notice of Intent (NOI) on February 27, 2009 initiated these process requirements, which are being completed through conducting the analysis documented in the SEIS. Issues raised by the public in response to the NOI will be the focus of this analysis.

The clarification of roles and responsibilities of the Forest Service, Commonwealth of Pennsylvania and private mineral owners can be found in SEIS, Appendix C. Appendix C will disclose the ANF's legal authority to determine the reasonable and necessary use of surface resources when reserved and outstanding oil and gas rights are exercised, thus serving as the basis for development of S&Gs and will replace all but the federal minerals portion of the FEIS, Appendix F.

The air quality analysis is supplemented to evaluate and disclose potential cumulative effects on ANF and regional air quality from pvt OGD emissions of methane and hydrogen sulfide and emissions from vehicles and equipment used in pvt OGD.

1.3.2 Items within the Scope of Analysis

The analysis will focus on the direct, indirect and cumulative effects associated with the application of S&Gs contained within each alternative with respect to potential effects to surface resources resulting from pvt OGD. The analysis of S&Gs and discussion of differences between alternatives will be made with an underlying understanding of what these direct, indirect, and cumulative effects are; however, whether or not pvt OGD may occur is not the subject of this analysis. The analysis will address the significant issues raised in scoping. Additional information will be provided regarding air quality.

1.3.3 Items Outside the Scope of Analysis

The question of whether or not the development of reserved and outstanding oil and gas rights should occur on the ANF is outside the scope of the analysis since the Forest Service cannot deny reasonable and necessary access to private property rights.

Information will be provided in this document that clarifies the roles and responsibilities of the Forest Service, Commonwealth of Pennsylvania and private mineral owners. The SEIS will not include a legal analysis, as that is not the proper role of an SEIS, and the legal issues are currently before the courts. The analysis will focus on the potential environmental effects of S&Gs, which the Forest Service has the legal authority to implement.

Information will be provided in the SEIS, Appendix C that clarifies the administrative and process related tasks associated with pvt OGD; however there will be no analysis of these tasks, since the proper focus of an environmental impact statement (EIS) is on the potential environmental effects of the proposed action.

1.4 Decision to be Made

The decision to be made is what set of S&Gs will be applied to the exercise of reserved and outstanding mineral rights, to ensure reasonable and necessary access while mitigating effects to NFS resources through protecting, enhancing, and restoring ecosystems.

1.5 Public Involvement

The NOI to conduct an SEIS was published in the Federal Register on February 27, 2009 and identified March 27, 2009 as the end of the scoping period. A correction was published on March 10, 2009, which indicated March 30, 2009 as the end of the scoping period.

Public meetings were held March 9, 10, and 11, 2009 in Warren, Bradford and Clarion, PA, respectively. The purpose of the meetings was to provide information on what a Forest Plan is, what the process for completing an SEIS is, and how the public could provide comments and be involved in the process. Handouts were provided that showed the timeline for the project and an explanation of what standards and guidelines are. Questions were received from those in attendance. A summarized version of the questions, the powerpoint presentation, and handout materials were posted to the ANF website following the meetings.

Public meetings were held April 27, 28, and 29, again in Warren, Bradford and Clarion, PA to present preliminary issues and alternatives. The presentation described the process used to evaluate comments received in response to scoping and to identify the preliminary issues and alternatives. A copy of the powerpoint presentation, a description of the preliminary issues and alternatives, and a table providing a comparison of standards and guidelines in the four alternatives were available as handouts. Questions were received from those in attendance. A summarized version of the questions and the handout materials were posted to the ANF website. Discussion on the alternatives included the question on whether there is a need for a Forest Plan amendment. If an alternative other than the proposed action is selected, an amendment to the Forest Plan would be needed since it would constitute a change to the original 2007 Record of Decision and the Forest Plan.

Noon-time conference calls were held on March 25, May 5 and June 9, 2009 to provide additional opportunity for public involvement, especially for those who were unable to attend the meetings. Questions received on conference calls were attached to the public meeting notes and posted to the ANF website.

Posts made to the ANF website can be found at:
http://www.fs.fed.us/r9/forests/allegheny/projects/supp_eis/pub_meetings/index.php.

1.6 Cooperating Agencies and Relationship to Other Government Agencies

The following federal agencies were invited to become cooperating agencies for this analysis: the US Environmental Protection Agency, Region III (EPA); the US Bureau of Land Management – Eastern States (BLM); and the US Fish and Wildlife Service (USFWS) – State College Field Office, Northeast Region. The EPA and the BLM are cooperating agencies in this analysis. The USFWS is participating to fulfill Endangered Species Act requirements.

EPA – EPA personnel have provided technical assistance on the air quality analysis and on identifying potential effects associated with development of Marcellus shale.

BLM – BLM personnel have provided technical review of draft documents.

County government officials have expressed interest in maintaining open and active participation in the development of the SEIS. County officials provided response to the NOI and participated in public meetings held in March and April 2009. They were invited to designate a representative to work with us

in a government-to-government relationship in an effort to facilitate coordination and have been involved in this capacity.

1.7 Forest Plan Direction and Relationship to Other Documents

The Forest Plan was revised in 2007. The accompanying Final Environmental Impact Statement (FEIS) analyzed impacts that occur as a result of implementation of Alternative C(m). At present, the 2007 Forest Plan provides management direction for all activities, with the exception of pvt OGD, on the Allegheny National Forest. In accordance with, the Chief's instructions, the management direction provided in the 1986 Forest Plan currently applies to pvt OGD.

The analysis contained within the FEIS was found to be adequate, with the exception of projecting air emissions associated with OGD. The SEIS will incorporate the FEIS by reference and will supplement effects discussions related to OGD for the issues raised in this analysis, as well as supplement the air quality analysis in accordance with the Chief's instructions.

The Forest Plan provides programmatic direction for the development of site specific projects that will occur during the life of the plan. Additional environmental analysis will be required to analyze the site specific affects of those proposals.

A site specific analysis has been initiated that will assess the potential impacts associated with proposed private OGD on the ANF for the next three year period. The Notice of Intent for the project was published in the Federal Register on June 22, 2009.

This analysis and any resulting plan amendment are conducted under the authority of the National Environmental Policy Act. The Allegheny National Forest Supervisor will use the procedures of the planning regulation in effect before November 9, 2009 (the "1982 Planning Rule"), which were also used to prepare the 2007 Revised Forest Plan, and will determine whether this is a significant amendment.

1.8 Development of Issues

Forty-eight (48) individual letters and 1 form letter (original plus 4 copies) were received. Letters included general opinions, comments on authorities and roles of the Forest Service relative to development of private oil and gas rights, comments on particular resource issues (132 comments), and comments on suggested changes to S&Gs (233 comments).

Letters received in response to scoping were evaluated to determine the significant issues used to develop alternatives and to identify indicator measures to be addressed in this analysis. Comments were sorted to determine if they were issues, then issues were sorted to determine if they were significant. Issues were determined to be non-significant if they fell into one of the categories listed below.

- Beyond the scope of the proposed action
- Irrelevant to the decision to be made
- Already decided or required by law, regulation or policy
- Conjectural in nature or not supported by scientific evidence

The disposition of comments yielded three significant issues and the indicator measures to be used to evaluate differences between alternatives:

1. Water Quality: Concern was expressed that S&Gs as proposed are more restrictive than necessary to protect the water resources from increased sedimentation resulting from pvt OGD (i.e., road building and timing of erosion control measures). Specifically, the issue was raised that as proposed the S&Gs go beyond what is required by Pennsylvania Best Management Practices (BMPs), which were designed to ensure protection of water resources. Conversely, concern was expressed that certain methods of road

construction result in increased sedimentation and therefore should not be permitted (e.g. construction during the winter).

Indicator measures:

- Kinds of riparian areas where S&Gs are applied (descriptive)
- Miles of perennial and intermittent streams where wider buffers are applied (quantitative)
- The number of riparian dependent wildlife, plant, and aquatic species that are at risk for increased viability concerns which results in decreased viability outcomes (quantitative)

2. Visual resources: Concern was expressed that S&Gs as proposed do not adequately address concerns related to visual quality associated with special areas or special features on the forest (areas with higher levels of scenic integrity, or features such as the North Country National Scenic Trail).

Indicator measures:

- Percent of the ANF where S&Gs strive to maintain high Scenic Integrity Levels (quantitative)

3. **Reclamation**: Concern was expressed that the S&Gs as proposed do not adequately address concerns related to the need for short and long term reclamation needs.

Indicator measures:

- Acres of the ANF where successful revegetation is required within 60 days of the beginning of the next growing season (quantitative)
- Percent of roads where measures to restrict or limit the introduction or spread of non-native invasive plants via human caused activity exist (quantitative)

In addition, review of comments identified several resource areas where additional discussion will be provided in the SEIS: economics, fragmentation, noise, climate change, seasonal access restrictions, and effects related to development of Marcellus shale.

Chapter 2

Alternatives

CHAPTER 2. ALTERNATIVES

2.1 Introduction to the Alternatives

This chapter describes and compares the four alternatives considered in the SEIS. Alternative 1, the No Action alternative, continues the management direction pertaining to pvt OGD contained in the 1986 Forest Plan. Alternative 2, the Proposed Action, includes S&Gs as described in the Forest Plan. Alternatives 3 and 4 modify or supplement elements of the Forest Plan S&Gs in response to the issues developed for this analysis. A complete listing of all S&Gs contained within each of the alternatives can be found in Appendix B.

2.2 Description of Alternatives

Alternative 1 – No Action - The No Action Alternative is the continuation of management direction pertaining to pvt OGD. The instructions issued by the Chief of the Forest Service (USDA-FS 2008) state that until actions are taken to provide public notice and an opportunity for comment on application of S&Gs in the Forest Plan (USDA-FS 2007b, pp. 53–168) to pvt OGD, authority to apply the 2007 Forest Plan S&Gs is suspended. Implementation of this alternative would result in an amendment to the Forest Plan S&Gs for pvt OGD.

Alternative 2 – Proposed Action – The Proposed Action is the management direction contained in the 2007 Forest Plan. All S&Gs are applicable to pvt OGD.

Alternative 3 (Preferred Alternative, Environmentally Preferred Alternative) – Alternative 3 includes only those Forest Plan S&Gs specific to pvt OGD (instead of all S&Gs as included in Alternative 2). S&Gs are clarified through rewording and consolidation to be more specific to pvt OGD. S&Gs pertaining to already established state and federal requirements are removed. S&Gs related to the use of pit run material for road surfacing and well pad construction are removed. S&Gs related to federal OGD are removed since the SEIS pertains only to reserved and outstanding pvt OGD activities. S&Gs for all other activities (e.g. vegetation management) remain unchanged from the Forest Plan.

S&Gs are added in response to issues regarding visual resources and reclamation. S&Gs are added that emphasize maintaining visual quality along the North Country National Scenic Trail (NCNST). S&Gs that require more attention to interim and final reclamation needs are added. S&Gs are added for the potential development of Marcellus shale. Implementation of this alternative would result in an amendment to the Forest Plan S&Gs for pvt OGD.

Alternative 4 – Alternative 4 includes only those Forest Plan S&Gs specific to pvt OGD (instead of all S&Gs as included in Alternative 2). S&Gs are clarified through rewording and consolidation to be more specific to pvt OGD. S&Gs pertaining to already established state and federal requirements are removed. S&Gs related to the use of pit run material for road surfacing and well pad construction are removed. S&Gs related to federal OGD are removed since the SEIS pertains only to pvt OGD activities. S&Gs for all other activities (e.g. vegetation management) remain unchanged from the Forest Plan.

S&Gs are modified or deleted in response to issues regarding water quality and reclamation. Most S&Gs regarding visual resources are removed. S&Gs are added for the potential development of the Marcellus shale. S&Gs have been modified to conform with Pennsylvania Best Management Practices as defined by the Pennsylvania Department of Environmental Protection (PADEP) and other State agencies (Department of Conservation and Natural Resources (DCNR), Pennsylvania Game Commission (PGC), and Pennsylvania Fish and Boat Commission (PFBC) that define measures to minimize effects to species included in the Pennsylvania Natural Heritage Program (PNHP). Implementation of this alternative would result in an amendment to the 2007 Forest Plan S&Gs for pvt OGD.

Changes in S&Gs regarding water quality include defining narrower buffer distances for riparian areas, and eliminating vernal pools and seeps from consideration for riparian buffers. S&Gs for wilderness trout stream and remote trout stream protection have been removed. S&Gs for road system design allow for different surfacing materials than Alternative 2 and 3. S&Gs designed to protect WL habitats for Regional Forester Sensitive Species and to limit activity during nesting periods have been removed. If species are found, contact with appropriate state agencies would occur to determine if additional measures might be needed to minimize impacts to species.

2.3 Alternatives Considered but Eliminated from Detailed Study

A variety of comments suggested elements to consider as alternatives or parts of alternatives. The comments for alternative development focused on purchase or acquisition of mineral rights, reduction of effects by limiting ANF activities, reduction of effects by limiting where pvt OGD can occur (to protect existing and potential wilderness, and roadless areas), and reimbursement to operators to offset additional cost of development associated with application of S&Gs. These were not developed as full alternatives or considered in detail for the reasons listed below.

Purchase or acquisition of mineral rights – One of the goal statements included in the Forest Plan is to acquire surface and subsurface rights from willing sellers within the ANF proclaimed boundary where it benefits the long term management of the ANF (USDA-FS 2007b, p. 15). No additional analysis is necessary.

Offset effects associated with pvt OGD by limiting ANF activities – The FEIS, as supplemented by this Draft SEIS, did not identify any resource concerns that require offsets in ANF activity to maintain long term productivity across the landscape.

Reduction of effects by limiting where OGD can occur (to protect existing and potential wilderness, and roadless areas) – In order to limit development within special areas on the ANF, purchase or acquisition of mineral rights would need to occur. The ANF lacks the legal authority to deny reasonable or necessary access to reserved and outstanding minerals. This would constitute a taking of private property and thus was not considered in detail.

Reimburse operators to offset additional cost of development associated with application of the S&Gs – This is an administrative decision and not a plan decision. Costs associated with pvt OGD are the burden of the developer. There is no authority to spend appropriated funds for this kind of reimbursement.

2.4 Comparison of Alternatives

This section contains a comparison of how each alternative addresses the significant issues by displaying the indicator measures identified in chapter 1. A brief statement is made for each alternative to show how it responds to the measure. More discussion can be found in chapter 3.

Table 2-1 Comparison of Issues

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Water Quality				
Kinds of riparian areas where S&Gs are applied	- Perennial and intermittent streams - Floodplains and wetlands - Spring seeps	- Perennial and intermittent streams - Water bodies, wetlands, springs, seeps, and vernal pools	- Perennial and intermittent streams - Water bodies, wetlands, springs, seeps, and vernal pools	- Perennial and intermittent streams - Water bodies, wetlands, and springs.
Miles of perennial and intermittent streams where wider buffers are applied.	1468 miles	2504 miles	2504 miles	1468 miles
The number of riparian dependent wildlife, plant, and aquatic species that are at risk for increased viability concerns which results in decreased viability outcomes	Reduced species viability due to no protection for vernal ponds and narrow riparian buffers : 14 riparian species (3 animals, 11 plants)	Reduced species viability due to long term habitat disturbance and increased human activity: 1 riparian species (animal)	Reduced species viability due to long term habitat disturbance and increased human activity: 1 riparian species (animal)	Reduced species viability due to no protection for vernal ponds, narrow riparian buffers, and increased risk of sedimentation: 8 riparian species (3 animals, 5 plants) and 19 aquatic species (19 animals)
Visual Resources				
Percent of the ANF where S&Gs strive to maintain high Scenic Integrity Levels?	0	24%	24%	0
Reclamation				
Acres of the ANF where successful revegetation is required within 60 days of the beginning of the next growing season.	381,499 acres	516,843 acres	516,843 acres	381,499 acres
% of roads where measures to restrict or limit the introduction or spread of non-native invasive plants via human caused activity exist	0	100%	100%	0

Chapter 3

Affected Environment And Environmental Consequences

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

Chapter 3 describes the physical, biological, and social resources of the environment that may be affected by the alternatives presented in Chapter 2, as well as the effects that the alternatives may have on those resources. Affected environment and environmental effects have been combined into one chapter to give the reader a more concise and connected depiction of what the resources are and what may happen to them under the different alternatives. The environmental effects analysis forms the scientific and analytic basis for the comparison of alternatives that appears at the end of Chapter 2.

Administrative processes that apply to initiating site-specific analysis for pvt OGD are contained in Appendix C. Roles and responsibilities for the Forest Service, the Commonwealth of Pennsylvania, and private developers are also included.

For the Forest Plan, estimated projections on the number of wells that could be developed during the planning period were disclosed in the FEIS, Appendix F. The annual average amount of 512 new wells (for the planning period 2005 – 2020) will be used as a starting point for the effects analysis in this SEIS (see Appendix C for additional discussion on estimates of future pvt OGD). Actual numbers of approved wells since 2005 has exceeded the average; however, due to the cyclic nature of the oil and gas industry, it would be speculative at best to attempt to predict how development might differ from the projections used in the FEIS. The purpose of the projection is to provide a comparative basis for differences in S&Gs between alternatives so the decision maker has adequate information upon which to make an informed decision.

The discussion provided here will provide a comparative analysis of four sets of S&Gs as defined in alternatives (see Appendix B). It will address the direct and indirect effects associated with the application of S&Gs for pvt OGD. The discussion will address issues identified through scoping and will be made in consideration of the development steps outlined in Appendix C for both shallow and deep well drilling, and an understanding of the environmental impacts associated with that development. The differences between alternatives are based upon the specific S&Gs included in an alternative that were designed to minimize or mitigate impacts to surface resources. There are many references to relevant sections of Chapter 3 of the FEIS. Discussion provided here supplements the FEIS.

In most instances, S&Gs are the same, whether for shallow or deep well drilling. Regardless of the kind of OGD, Forest Plan goals and objectives remain intact, and the distribution of acres by MA is the same.

The four alternatives being considered in this analysis identify varying approaches to necessary and reasonable access for pvt OGD, and each have accompanying levels of measures that either minimize or mitigate impacts associated with pvt OGD. Additional site specific analysis using the appropriate level of NEPA is needed before project-level decisions are made.

3.2 Physical Environment: Direct, Indirect, and Cumulative Effects

3.2.1 Soil Resources

Affected Environment

The affected environment for soils on the ANF is described in the FEIS (USDA-FS 2007a, pp.3-7–3-10), and is incorporated by reference. Soils are described in terms of soil nutrients, soil erosion, and soil compaction, puddling, and rutting.

Direct and Indirect Effects

Introduction to Effects

Soil Erosion

Soil erosion (soil loss) is composed of two distinct phases: (1) the detachment of soil particles from the land surface by some mechanism, usually water or wind, and (2) transport from the original site to another location, again by water or wind. Once the particle stops moving (deposition) it becomes sediment, such as in a water body or soil on another piece of land. Erosion can move soil just a few fractions of an inch or many miles. The most critical part of this process is protecting the soil from the eroding forces of water and wind. Ground cover, generally in the form of vegetation, the roots of that vegetation in the upper soil layers, and other cover such as organic matter and rock particles, protects the soil from detachment, either by linear forces such as flowing water or wind, or by rainfall. In simple terms, any activity that breaks down this protective cover will expose the soil to erosion. Management actions that minimize this detachment (and transport) of soil are preferable. Soil erosion equates to losses in soil productivity corresponding to losses in soil structure, soil permeability, soil depth, water holding capacity, and soil fauna habitat. In addition, eroded soil may become sediment in wetlands, lakes and streams negatively affecting water quality and aquatic habitat.

Site development (including construction of access roads, well pads, tank batteries, and other infrastructure) has the potential to cause accelerated erosion, eliminating protective soil cover and exposing it to detachment by rainfall impact and overland flow. While soil erosion is more likely during initial construction, erosion can also occur during maintenance and periodic site rehabilitation. These periodic but temporary increases in erosion are generally preferable to not maintaining a site and causing continued high rates of soil loss. Mitigations to maintain protective cover or prevent overland flow such as improved drainage and more resistant surfacing can reduce surface erosion or reduce sedimentation of downstream water bodies (Weaver and others 1995, p. 120). In areas susceptible to mass soil movement (landslides, slumps) changes in runoff, infiltration, plant roots, and weight on a hillside can reduce slope stability, particularly during wet weather.

Soil Compaction, Puddling and Rutting

The weight and movement of equipment can compact, puddle, and rut soils often resulting in a loss of productivity. Compacted soils are denser and have less air space. This reduces water infiltration, and increases runoff. Soil rutting is the displacement and compaction of soil by moving equipment. Rutting in the downslope direction can lead to gully development as flowing water is channeled down the ruts

Access roads, well pads, tank batteries and other infrastructure developed for pvt OGD have been committed to long-term use and long-term effects to the soil resource These impacted areas contribute more runoff and sediment to streams than the adjacent undisturbed areas. Most developed sites would require rehabilitation once their useful lifespan is complete. The intensity of rehabilitation, including timing, depth, restored cover, topsoil storage and reuse, drainage, and similar factors are critical in determining how well the site will return to some level of productivity.

Effects Common to all Alternatives

Road miles and number of wells for pvt OGD are anticipated to be the same in all alternatives.

Soil Compaction, Puddling, and Rutting

Soil compaction occurs when forest land is converted to road corridors, well pads, and other sites associated with pvt OGD. This impact is not expected to vary by alternative as new well development is expected to remain constant across all alternatives. Hydrologic effects will vary by alternative as a result of different road planning and design standards. An additional source of soil compaction could potentially

result from the use of ATV/OHVs on unhardened surfaces. Alternatives 1, 2 and 3 restrict the use of these vehicles to approved roads and trails. Alternative 4 does not include this requirement, thus Alternative 4 has a higher risk for soil compaction from unapproved ATV/OHV use.

Effects by Alternative

Soil Erosion

Alternative 1–This alternative has risk for erosion due to fewer restrictions on locations for pvt OGD (including construction of access roads, well pads, tank batteries, and other infrastructure) and new soil disturbance. While there are limitations on development on wet soils, no S&Gs limit site development or road construction on slopes greater than 40 percent during periods of extremely wet weather and during spring thaw. There are fewer S&Gs for erosion control and timing requirements for completion of treatments are not included. There are no S&Gs pertaining to the long term maintenance of facilities, or interim and final reclamation measures, except at stream crossings. At stream crossings, this alternative requires interim and final reclamation on sections of roads that could affect water quality, but doesn't specify a timeframe for final reclamation to be completed. The guideline specifies interim reclamation should be done concurrently with the activity. In Alternative 1, sites will have cover removed and open to erosive forces for longer time periods than in other alternatives.

Alternatives 2–This alternative has less potential for soil erosion because S&Gs provide direction on pvt OGD locations and on how much new disturbance might occur. S&Gs limit development from occurring on slopes greater than 40 percent, in areas prone to landslide and on wet soils. Site development and road construction is restricted during periods of extremely wet weather and during spring thaw. There is greater emphasis on actions taken to minimize soil erosion by stockpiling topsoil for site reclamation. Timing requirements for stabilization (30 days) and successful revegetation (60 days or within 60 days of the beginning of the next growing season when construction occurs in fall or winter) provide prompt erosion control. Emphasis on long term maintenance of facilities ensures continued protection of soil resources and minimization of off site movement of soil. S&Gs for road decommissioning provide for reestablishment of forest land uses.

Alternative 3–Alternative 3 offers the best protection from accelerated rates of soil erosion due to the features mentioned in Alternative 2 plus emphasis on interim and final reclamation requirements that will return the sites to a productive status more quickly. Greater emphasis on transportation planning should result in roads being located on better sites for construction thus facilitating better road design and improved road maintenance, thus reducing the potential for soil erosion.

Alternative 4–This alternative has a higher risk of soil erosion than Alternatives 2 and 3. S&Gs emphasize the need to limit the amount of surface disturbance, however limitations on development on slopes greater than 40 percent, in areas prone to landslides and on wet soils are not included. There are no S&Gs that limit site development or road construction during periods of extremely wet weather or during spring thaw. There are S&Gs for erosion control seeding but timelines for successful revegetation are included only for High-Quality or Exceptional Value watersheds. Cold water fisheries are not included in the timing requirement, thus there is greater potential for increased erosion. Buffers are specified only around streams located on USGS quad sheets as well as wetlands greater than one acre. This will allow equipment activity and resulting erosion near more water bodies and adjacent fragile soils. There are no S&Gs on the use of ATV/OHVs. If these vehicles are used on unapproved locations (i.e., cross country, user-created trails with no mitigations for effects to soil or water resources), additional compaction and increased erosion is likely to occur.

Cumulative Effects

Cumulative effects for soils will consider areas included within the proclamation boundary of the ANF. Future pvt OGD on ANF and private land within the proclamation boundary leads to long-term commitments of land area for the surface occupancy of access roads, well pads, tank batteries, and other infrastructure. There is the potential for 14,560 acres of additional land clearing to occur by 2020 (SEIS Appendix C, Table C-6). Additional roads associated with this development could add 2,800 miles of pvt OGD roads within the proclamation boundary. These roads in combination with existing and future NFS roads as well as municipal roads total 7,368 miles within the proclamation boundary and will contribute to accelerated erosion from both the roadbed and excess runoff creating gullies. These areas will also experience long-term compaction.

Marcellus Shale Development

Generally, the effects to soil resources from pvt Marcellus shale development are expected to be quite similar as those described for direct and indirect effects, however the size of the area impacted would be larger and the duration of effects could be longer. S&Gs designed to protect soil resources, which vary by alternative, would yield similar kinds of variability in result when applied to pvt Marcellus shale development.

3.2.2 Water Resources

Affected Environment

The affected environment for water resources on the ANF is described in the FEIS (USDA-FS 2007a, p.3-22 through 3-31), and is incorporated by reference. Water resources are described in terms of watersheds, surface water, and consumptive water uses. The riparian corridor is also described.

There are 2,126 miles of mapped streams within the ANF proclamation boundary, and there are 1,468 miles on FS lands. Due to mapping omissions and seasonal changes the amount of unmapped perennial and intermittent streams is estimated to be 1,500 miles as digitized from historic maps within the proclamation boundary, and 1,074 miles on NFS lands (USDA-FS 2007a).

Protected water uses are designated by the PADEP for all state waters. A GIS analysis was used to determine the acreage of land draining to the four protected uses within the proclamation boundary, which are, exceptional value (EV), high quality cold-water fisheries (HQ-CWF), cold-water fisheries (CWF) and warm-water fisheries (WWF). Within the proclamation boundary, 51,805 acres are EV, 494,389 acres are HQ-CWF, 152,675 acres are CWF, and 41,098 are WWF.

Direct and Indirect Effects

Introduction to Effects

Water Quality

Sediment, along with the attached nutrients and metals, entering streams is one of the principle concerns from pvt OGD. Erosion is generated and sediment is delivered primarily from disturbed areas where mineral soil has been exposed, compaction has occurred, and water has been concentrated (Stuart and Edwards 2006). Sediment that enters streams can impact its physical characteristics. Sediment deposited in a stream reduces its water holding capacity during higher runoff events. As a result, water overflows the streambanks, causing accelerated erosion of the streambank, increased sediment delivery and a wider and shallower stream. Sediment can fill the pools of a stream, a place where larger game and non-game fish and other aquatic organisms often take refuge. The Forest-wide Roads Analysis Report (USDA-FS

2003) discusses current conditions of roads and provides additional detail of effects to water quality from roads.

Indirect effects of pvt OGD on water quality may include an increase in sediment delivery to streams associated with road use during the well construction period and during the well maintenance period. Where streams are sufficiently close to a road, airborne particles from heavy truck traffic can be blown from the road into the water and runoff from roads and ditches can carry eroded sediment to the streams. An effective mitigation is to place high quality durable surfacing material, resistant to erosion, on road segments within 300 feet of streams to reduce the risk of sedimentation (Scheetz and Bloser 2008; Trieu 1999; USDA-FS 1995a, p. 39; Swift 1984). Additional mitigations on roads to protect water quality include ensuring that runoff from roads is diverted frequently and directed into an effective filtering area instead of into streams and wetlands (e.g. seeps and springs) (Scheetz and Bloser 2008).

On-forest monitoring of hydrologic connectivity of roads and streams conducted from 1993 to1994 revealed that sections of filter strips were not always effective in keeping sediment from reaching streams (Table 3-1) (USDA-FS 1994). This visual assessment of filter strips was conducted on eight NFS roads that parallel streams. A total of 128 sites along the eight roads were evaluated. The filter strip widths were variable as a roads distance from a stream would vary based on topography and landform, and the stream would meander. The sites were grouped into 100 foot categories in the table. As Table 3-1 depicts, a high percentage of sites within 100 feet of a stream were contributing sediment. Although the percentage of sites contributing sediment decreases the further from the stream a road is, there were still a number of drainage sites contributing sediment. In a number of cases where sediment had not reached a stream, it was close enough that over time it is likely to enter the stream. Based on this data, it was determined that roads within 300 feet of streams have the greatest risk of contributing sediment to streams.

Table 3-1. Summary of Road Drainage Sites Contributing Sediment to Streams During Filter Strip Effectiveness Surveys on the ANF (1993-1994)

Filter Strip (ft)	Sediment Reaching Stream (# sites)		Total Sites	Percent Contributing Sediment
	Yes	No		
1-100	48	7	55*	87
101-200	19	21	40*	48
201-300	6	9	15	40
301-400	7	4	11	64
401+	1	4	5	20

* One site had no record whether sediment was reaching the stream, and is not recorded in this table.

Reasons for ineffectiveness include narrow buffers, poor placement of cross drains that lead directly to the main channel (or to a seep or spring that led to a stream), placement of cross drains on steep slopes without adequate energy dissipaters, and contributing runoff from adjoining roads (USDA-FS 1995a, p. 39). In many cases, additional crossdrains were needed to disperse the ditch runoff on to the forest floor, as opposed to directing the ditch flow into stream channels and seeps or springs.

Two local studies support the conclusion that a high quality surfacing material reduces the amount of sediment eroded from the road surface and the potential to contribute to the streams when compared to native pit run surfacing. Trieu (1999) conducted an assessment of effects related to limestone surfacing on physical, chemical, and biological stream responses conducted in 1995 and 1996 on NFS roads. This study showed considerable reductions in turbidity in areas where limestone surfacing had been applied, as well as reductions in inorganic suspended solids (Trieu 1999). In this study, road runoff samples were

analyzed in the fall of 1995 and the fall of 1996 at five culverts on a section of FR 133. Three of the five culverts were analyzed for runoff from pit run surfacing the first year and runoff from limestone surfacing (applied to same section of road) the second year. The other two culverts were analyzed both years for traveled pit-run surface, and the condition remained the same for both years. At the three culverts where limestone was applied, sediment concentrations were on average eight times higher and sediment yield was on average 3.8 times higher than that of the pit run surfacing (Trieu 1999). Penn State University has monitored two separate driving surface aggregates (DSA) on a road in Potter County, PA (Scheetz and Bloser 2008). Compared to their respective native surfaces, limestone DSA reduced sediment by 73 percent after one month and 86 percent after one year, while sandstone DSA reduced sediment by 76 percent after one month and 93 percent after one year (Scheetz and Bloser 2008).

Sediment concentrations have been assessed from two streams on the ANF since 2000. The first stream, Grunder Run, is located in a 3,171 acre watershed that is dominated by pvt OGD, dirt and gravel roads, and off-highway vehicle trails. Approximately 84 percent of the drainage (2,657 acres) is managed by the Forest Service. There are 5.4 miles of mapped stream, one stone pit, and 455 recorded oil and gas wells in the drainage. There has been no timber harvest activity on NFS land since 2000 in this drainage, but some activity is currently being planned. The road density for all jurisdictions increased to 10.59 mi/mi^2, with a slight increase in the road density to 1.05 mi/mi^2 within 300 feet of a mapped stream (Table 3-2). Many of the non-system roads in the Grunder Run watershed used for pvt OGM were constructed in the early 1980's by private lease holders.

Hedgehog Run, the second stream, is primarily located in the Allegheny NRA and has almost no land-disturbing activity where NFS land is located in the 2,758 acre watershed. This watershed has 6.8 miles of perennial and intermittent streams and 27 recorded oil and gas wells (7 that are know to be active and 20 of unknown status). The road density for all jurisdictions is currently 2.0 mi/mi^2, with a decrease in road density to 0.02 mi/mi^2 within 300 feet of a mapped stream (Table 3-2).

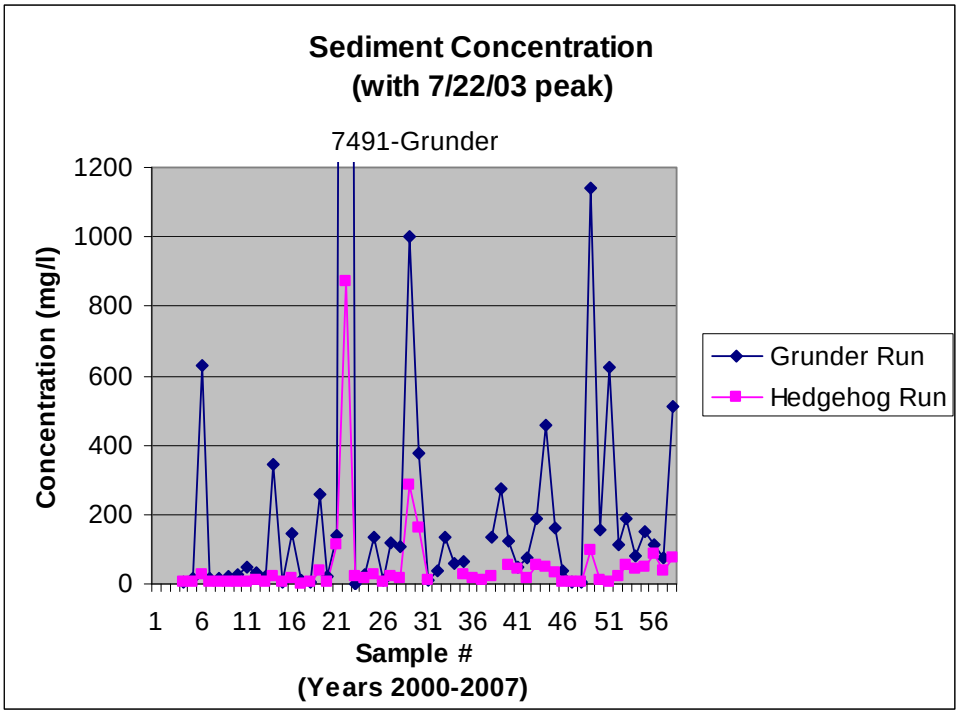
Table 3-2. Comparison of Road Densities within the Grunder Run and Hedgehog Run Drainages, based on GIS.

Drainage	Year	Acres	All jurisdiction on all ownerships		All jurisdiction within 300' of a stream on all ownerships		FS roads on all ownership (miles)	FS roads within 300' of a stream (miles)
			Total Miles	Road density (miles/mile^2)	Total Miles	Road density (miles/mile^2)		
Grunder Run	Oct. 2006	3,171	44.03	8.89	4.52	0.91	0.90	0.00
	April 2009		52.4	10.59	5.2	1.05	4.2*	0.00
Hedgehog Run	Oct. 2006	2,758	9.00	2.09	0.21	0.05	1.03	0.00
	April 2009		8.6	2.00	0.1	0.02	1.0	0.00

* This is not a result of new road construction, but rather a correction.

A visual display of sediment concentrations from the 2000 through 2007 data is depicted in Figure 3-1. The graph shows total concentration, consisting of fines (<0.62mm) and sands (>0.62mm-2mm).

Figure 3-1. Sediment concentration from water samples taken from Grunder Run and Hedgehog Run, 2000–2007.



The data suggests a higher input of sediment particles less than 2mm in size results from streams with hydrologically connected dirt and gravel roads and motorized off-highway vehicle trails, when compared to natural conditions. As would be expected, the Grunder Run watershed, with many sections of dirt and gravel roads and trails being hydrologically connected to streams (including stream crossings), resulted in the highest level of sediment concentration during runoff events. Grunder Run on average contributes 13 times the amount of sediment that Hedgehog Run contributes. Hedgehog Run has considerably less sediment moving through its system because of limited ground-disturbing activities, and the amount of sediment is presumed to consist of natural input only. The dirt and gravel roads are associated with roads used by pvt OGD. Buffers used during Forest Service timber harvesting operations are preventing sediment from reaching streams, and as Table 3-2 depicts there are no NFS roads within 300 feet of streams in either the Grunder Run or Hedgehog Run watersheds. Motorized off-highway vehicle trails within 300 feet of a stream have been surfaced with higher quality stone to address runoff concerns.

Pvt OGD in riparian corridors or on steep slopes adjacent to riparian corridors can affect water quality. Site development within riparian corridors can reduce shade from vegetation and increase temperature and deliver sediment and nutrients to streams. Lynch and others (1985) found that a 100 foot buffer between logging activity (e.g. roads, skid trails, and log landings) and wetlands and streams removed an average of 75 to 80 percent of suspended sediment in stormwater; reduced nutrients to acceptable levels; and maintained water temperatures within 1 degree Celsius of their former mean temperature. A summary of supporting literature by Wenger (1999) found that a buffer of 197 feet is necessary to remove 94 percent of total suspended sediment, and that over time buffers become less effective and may need to be as wide as 328 feet. Wenger (1999) suggests that 100 feet on perennial and intermittent streams, which

includes their entire floodplain extent, should ensure high water quality and support good habitat for native aquatic organisms. This buffer needs to be extended on steep slopes adjacent to streams; however, Cohen and others (1987) found that buffers are ineffective on slopes greater than 40 percent. Wenger (1999) also states that an absolute minimum width would be 30 feet on all streams including intermittent streams and that a buffer of 50 feet plus 2 feet for each percent of slope may be a good compromise with some potential risk of sedimentation. Lynch and Corbett (1990) found that buffers from streams (i.e. 50 feet from intermittent and 100 feet from perennial streams plus additional distance for slope) were necessary to protect aquatic life and other Commonwealth of Pennsylvania protected water uses. A minimum of a 100 foot buffer should also be applied to wetlands, seeps, springs, and vernal pools to protect the water temperature and to reduce introduction of sediment and nutrients (Wenger 1999; Semlitsch and Bodie 2003; Calhoun and deMaynadier 2004). Fischer and Fischenich (2000) stress the importance of applying buffers to headwater streams, because once sediment, nutrient, or other pollutant has reached the stream channel a buffer provides little benefit.

In addition to water quality, wider stream and wetland buffers (i.e. greater than 300 feet) benefit wildlife and flora (Fischer and Fischenich 2000 and Wenger 1999; also see Plant and Animal section). The PA Bureau of Forestry applies a 200 foot buffer to Wilderness Trout Streams and Class A Trout streams, as well as to vernal pools, to protect their wildlife values (PA DCNR 2003).

Stream and wetland buffers minimize the chance of contamination if an accidental spill were to occur (see Appendix C, p. C-5). The greater the distance that exists between a spill and a water resource will decrease the chance of contamination and offers more time for containment.

Minimizing the number of stream and wetland crossings and using proper mitigations would reduce chances of hydrologic connection and effects to water quality. As described above in the description of Forest hydrologic connectivity monitoring, effectiveness of buffer distances is negated if there is a hydrologic connection to the stream. Stream crossings, wetland crossings, and the approaches of roads to these areas are the source of the majority of sediment contribution to streams and wetlands (Swift 1988). This is particularly important for crossing 1st order streams that are encountered and crossed most frequently. These streams are a direct link to the stream channel, so if sediment enters these channels, it is in the system and will have downstream effects. Minimizing the number of stream and wetland crossings that remove riparian vegetation will also reduce the overall effect on stream shading and water temperatures. Roads can intercept groundwater and bring this water to the surface or divert springs and seeps in ditch lines, which allows the water to warm. Reducing the number of roads that parallel streams within the riparian corridor will also protect water temperature.

Unauthorized use of ATV/OHMs and user-developed trails cause the most degradation to streams when users cross streams with unstable banks and bottoms, create ruts and compaction in floodplains and wetlands, and ride on steep slopes. A study of the effects of ATV trails on stream characteristics was completed on the Ouachita NF where ATVs have designated trails and a developed network of unauthorized trails. Results indicated that embeddedness, percentage of sands and fines, and pool-depth parameters had declined and had significant pool-volume decreases as compared to reference streams (Chin and others 2004). It was not determined what caused the degradation, but the undesignated trails and lack of stream crossing structures are suspected.

Decommissioning of roads near streams and wetlands will decrease sediment reaching these areas once vegetation has recovered. In order for these improvements to occur, the road must be properly restored to minimize erosion and sedimentation.

To reduce the risk of pollution of streams and wetlands from spills, storage tanks should also be located in the uplands away from these areas and any direct connections to streams and wetlands.

Water Quantity

New pvt OGD has the potential to modify streamflow regime in watersheds. Compacted areas have the potential to alter surface and subsurface flow patterns and have a longer-lasting effect where hydrologic connectivity exists between road drainage and the stream network. Wemple and others (1996) found that road segments hydrologically connected to the channel network in Oregon increase flow routing efficiency that may be observed as increases in peak flows. Such changes in the streamflow regime can result in channel modification where channels are susceptible to such influences. Mitigations to protect water quantity include "disconnecting" road runoff from streams by adding frequent cross-drains on roads, directing runoff into an effective filtering area instead of into streams and wetlands, minimizing the number of stream and wetland crossings, and keeping roads at least 30 to 100 feet from streams (Wenger 1999, Fischer and Fischenich 2000).

In addition to changes in natural drainage from roads, installation of stream crossings can affect channel morphology and streamflows and migration of aquatic species. Road crossings can influence stream channels by delivering sediment and other pollutants to the drainage network, by constricting channel widths and floodplain functions, by modifying the movement of water, wood, organic and inorganic sediments, and by modifying the movement and passage of aquatic organisms. Variables that affect the level of influence road crossings have on stream channels and their biota include the type of crossing, the width of the crossing relative to the bankfull width of the channel, the stability of the channel above and below the crossing, the level of road use, and the frequency of drainage structures on the road. Stream crossings, especially culverts, often constrict the natural width of the channel, which can create areas of deposition upstream of the pipe, restrict the movement of wood and sediment through the pipe, and increase channel scour below the pipe. Increased velocity of water through the culvert can prevent aquatic organisms from getting through the structure and downstream scour holes can present a "jump" barrier organisms cannot overcome.

Pvt OGD in riparian corridors can affect water quantity by compacting soils or constricting floodplains. To allow for flood water and compacted surface runoff adsorption, streams should be buffered 60 to 450 feet because riparian areas promote floodplain storage due to backwater effects, intercept overland flow and increase travel time, resulting in reduced flood peaks (Fischer and Fischenich 2000).

Where roads are decommissioned at stream crossings, streams banks and their associated floodplains will be restored to natural conditions and allow for the passage of flood flows. Decommissioning of roads near streams and wetlands will also decrease runoff from roads and allow for more water to infiltrate into the soil.

Groundwater

Most of the effects of surface activities, as limited S&Gs, would pertain to shallow groundwater in the saturated zone of fractured rock or deep soils. Except in cases such as karst topography or similar areas, surface waters such as rivers, lakes, and wetlands are the intersection of shallow groundwater with the surface. Impacts to surface water directly affect ground water and vice versa. These effects can be characterized similarly to surface water quality and quantity. Water that falls on the land can return to the atmosphere via evaporation or transpiration via plants, run off the surface to a water body, or infiltrate the soil via gravity. Some minor changes in subsurface storage occur as well. Activities that encourage rapid runoff rather than keeping water on-site will increase supplies of surface waters while reducing water available for entry to shallow groundwater systems. Improper disposal or spills of waste waters (brine), drilling fluids, and other wastes can allow polluted surface water to percolate into the soil and can affect ground water quality (USDA-FS 2007d). The development and production of oil and gas can affect adjacent or nearby aquifers by creation of artificial pathways between oil and gas reservoirs and adjacent aquifers. The Commonwealth of Pennsylvania has requirements for casing of wells and plugging of wells to prevent the contamination of groundwater.

Analysis by Alternative

Water Quality

Effects of alternatives on water quality generally concern three types of parameters: (1) sediment, (2) nutrients and chemicals, and (3) temperature. A considerable proportion of the sediment effects tie directly to effects on the soil resource since eroded soil eventually is deposited in water bodies near or downstream from the erosion source. Nutrients can come from material leached from the soil, mobilized by fire, carried into water on soil particles, or from surface application for management or other reasons. Chemicals may come from mechanical surface activities, such as vehicle fuels and lubricants, spills from drilling or storage facilities or pipelines, or other chemical sources. Temperature changes generally result from loss of shade or changes in the amount of cool groundwater entering water bodies.

Alternative 1–Water quality faces a risk of degradation under this alternative, due to limited buffers to protect against soil erosion from uplands and channels. While all wetlands, springs and seeps receive some protection, vernal pools receive no consideration. There are limited S&Gs for erosion control, with a lack of direction on use of slopes over 40 percent and use of organic debris to control soil loss. There are no S&Gs pertaining to long-term maintenance of facilities or interim or final reclamation measures: however, Pennsylvania BMPs would apply. Interim and final reclamation measures, such as revegatating a site within 60 days of the beginning of the next growing season, would apply to all HQ-CWF and EV watersheds or 381,499 acres of NFS lands, while 135,344 acres of CWF and WWF watersheds would not have this requirement. At stream crossings, this alternative requires interim and final reclamation on sections of roads that could affect water quality, however a specific timeframe for completion of final reclamation isn't provided, while it is stated that interim reclamation should occur concurrently with the activity. At stream crossings, a high quality surfacing material or other material should be used to reduce sedimentation. Lack of topsoil salvage and reuse will slow site reclamation.

Eroded soil material has the highest likelihood of carrying nutrients and chemicals into water bodies. Less effective S&Gs pose a likelihood that chemicals used in pvt OGD will enter nearby waters, either from pvt OGD facilities or the vehicles used to transport chemicals. ATV/OHV use is not permitted cross-country, thus avoiding potential runoff to streams. S&Gs restricting public use of pvt OGD right-of-ways do not exist, which could lead to accelerated erosion and sedimentation. While this alternative requires plugging abandoned wells in accordance with PADEP standards, no time limits for these actions are specified. Water temperatures would likely be higher due to S&Gs that allow closer access to water bodies and no protection for vernal pools. S&Gs state that roads should be constructed outside of the riparian area, built where there is an effective filter strip between the road and stream, and surfaced with a type of stone that minimizes sediment. A buffer distance for wells of 100 feet would apply to 1,468 miles of streams shown on the current USGS topographic map within the ANF (PA-DEP 1985); the 1,036 miles of stream on the ANF not shown on the USGS topographic map would receive minimal buffers. The minimal buffer distance for roads and all streams would be beyond the riparian area. Buffers would be narrower than in Alternatives 2 and 3; however, unlike Alternative 4 they would protect the riparian area for all stream miles on the ANF.

S&Gs require a design that accommodates fish passage but not the passage of other aquatic organisms, organic matter, or sediment. This can lead to under-designed crossings that promote accelerated channel scour or deposition. No guidance is evident for intake of water for use in pvt OGD.

Alternative 2–Water quality faces a low risk of degradation under this alternative. S&Gs for erosion control, side-slope equipment limitations, use of organic materials to cover exposed soil, long-term maintenance, final reclamation measures, topsoil storage and reuse, and aggressive road decommissioning will lead to limited increases in sediment entering streams and wetlands. The time period for successful revegetation would apply to all 516,843 acres of NFS lands. The use of a high quality durable surfacing material within 300 feet of streams will reduce the delivery of fine sediment to streams and wetlands. This

alternative provides strong guidance to promote passage of all aquatic organisms, organic matter, and sediment at road crossings.

Controlled erosion will result in fewer nutrients being transported to water bodies on soil particles. This alternative does not pose restrictions on pvt OGD infrastructure or on infrastructure location. Provisions for barriers or gates to pvt OGD right-of-ways are absent, leading to and increased risk of erosion from public use. Effects to wetlands, springs, seeps, and vernal pools are minimized through designation of buffers and restricting activity in these areas. There is a guideline for the intake of surface water.

Wider buffers around water bodies will maintain water temperatures, trap sediment and nutrients, and protect water quality. These effective buffers for OGD would apply to all 2,504 miles of stream on the ANF, and not just those shown on the USGS topographic maps.

Alternative 3–Water quality faces the lowest risk of degradation under this alternative. Standards for erosion control, side-slope equipment limitations, use of excessive organic materials, long term maintenance, topsoil storage and reuse, and site reclamation will limit the introduction of sedimentation into water bodies. The time period for successful revegetation would apply to all 516,843 acres of National Forest lands. The use of a high quality durable surfacing material within 300 feet of streams will reduce the delivery of fine sediment to streams and wetlands. Shutdown during wet weather will help prevent compaction and puddling and limit accelerated erosion. Wetlands, springs, seeps, and vernal pools receive the highest protection levels in this alternative. This alternative provides guidance to promote passage of all aquatic organisms, organic matter, and sediment at road crossings.

This level of sediment control will limit introduction of nutrients and chemicals via attachment to eroded soil particles. This alternative places greater emphasis on transportation planning and design of developments. ATV/OHV use is limited to approved corridors. Requirements for well closure and site reclamation include a 1-year time frame, minimizing long-term sediment sources. Protection of water intakes, including screening, is the most stringent, both for surface and ground waters. Road design and maintenance should be effective in decreasing sedimentation due to consideration given to road location, avoiding steep slopes, and use of durable surfacing material. Limiting public access to pvt OGD right-of-ways and facilities should also reduce potential for sedimentation due to decreased use.

Wider buffers around water bodies will maintain water temperatures, trap sediment and nutrients, and protect water quality. These effective buffers for OGD would apply to all 2,504 miles of stream on the ANF, and not just those shown on the USGS topo maps.

Alternative 4–Within the 13 percent watershed (that area of the ANF that drains directly to the Allegheny River between Kinzua and Tionesta Dams, see aquatics section), S&Gs applicable to protecting the mussels in the Allegheny River remain in place and will provide protection to aquatic invertebrates in tributary streams as well as the river itself; therefore, the effects to water quality will be the same in the 13 percent watershed as in Alternatives 2 and 3.

For portions of the ANF outside of the 13 percent watershed, the following discussion applies.

This alternative has the highest potential for water quality impacts because there are less effective S&Gs for site development, no restrictions for ATV/OHVs, and fewer water resources considered. There is a risk of moving sediment, nutrients and chemicals into receiving waters because stabilization is not required within specific timelines, roads would not be surfaced with high quality material within 300 feet of streams, and fewer streams and wetlands have sufficient buffer widths. This alternative offers no restrictions for fueling or equipment storage or oil storage tanks, increasing the risk of chemical pollution. It allows road construction of slopes greater than 40 percent and offers no S&Gs on the use of ATV/OHVs when managing pvt OGD. The time period for successful revegetation within 60 days of the beginning of the next growing season in interim or final reclamation measures would apply to all HQ-CWF and EV watersheds or 381,499 acres of NFS lands, while 135,344 acres of CWF and WWF watersheds would not have this requirement. No S&Gs exist to protect roads and water bodies during

periods of exceptional wetness when resources are most vulnerable. The lack S&Gs related to topsoil salvage and reuse is expected to hamper speedy site recovery. This alternative provides guidance to promote passage of all aquatic organisms, organic matter, and sediment at road crossings.

Smaller buffer widths along streams, wetlands, and other water bodies that would be applied to fewer water resources has the potential to result in increased water temperatures and water quality degradation. For well sites, the effective buffer distance of 100 feet would only apply to the 1,468 miles of stream on ANF lands shown on the most current USGS topographic map (PA-DEP 1985), while the 1,036 miles of stream on ANF lands not shown on USGS topographic maps would receive minimal buffers. For all 2504 miles of streams on the ANF, parallel roads could be built as close as 25 feet plus 2 feet for each percent of slope. This buffer distance is the bare minimum of what is recommended for maintaining water quality (Wenger 1999). Compaction and direct effects would occur to more riparian areas and floodplains. Springs not shown on the USGS topographic map, seeps and vernal pools receive no specific attention in this alternative and therefore are expected to be impacted by pvt OGD. Since springs and seeps are prevalent on the ANF, effects to these resources would provide a direct link to stream sedimentation. Providing protection only for wetlands greater than 1 acre ignores many small but critical wetlands across the Forest.

Water Quantity

The effects of alternatives on water quantity encompass both the amount (volume) of water in a water body and the timing of that water in the system. Key factors that influence runoff volume and timing are relative to the extent and degree of surface disturbance and the proximity of that disturbance to a receiving water body. The volume issue centers on the amount of water that runs off the land surface into water bodies or is available from ground water. The timing of that quantity of water is equally important since it addresses when the water will pass through the system and how quickly. Water may be available early or later in the season, and speed of runoff affects flood peaks and duration of those peaks.

Effects of actions on water quantity are more subtle than those for water quality but differences between alternatives do exist. Most effects result from the time water has to percolate into the soil before reaching a water body, largely influenced by the distance between a disturbance and the receiving water. Shorter distances and smaller buffers can lead to a greater proportion of runoff entering a water body as well as allowing that water to reach the water body more quickly, resulting in earlier and higher flood peaks. Alternatives that allow more soil compaction, puddling and rutting will promote more and quicker water runoff. Similarly, alternatives with limited reclamation will promote more runoff over a longer period of time.

Alternative 1–Increased runoff volumes, flood peaks, and runoff are most likely in this alternative because smaller stream and wetland buffers will allow runoff easier access to water bodies, as will less effective control of runoff from roads. Higher likelihoods of compaction, puddling, and rutting will promote higher volumes and rates of runoff. Less effective reclamation S&Gs will extend the length of time soil is exposed to runoff.

Alternatives 2 and 3–These alternatives are essentially identical in terms of effects to water quantity. Runoff rates, volumes, and peaks will be less affected due to decreased opportunities for compaction, rutting, and accelerated runoff. Aggressive site reclamation will promote water infiltration and moderate flood peaks. Restrictions on road design and runoff protection will allow infiltration of water into soils and shallow groundwater. Wider stream and wetland buffers will reduce potential for changes to water quantity.

Alternative 4–Within the 13 percent watershed (that area of the ANF that drains directly to the Allegheny River between Kinzua and Tionesta Dams–see aquatics section), S&Gs applicable to protecting water quantity would apply and have the same effects as Alternatives 2 and 3.

For areas outside of the 13 percent watershed, increased runoff volumes, flood peaks, and runoff are likely due to less effective S&Gs. Smaller stream and wetland buffers will allow runoff easier access to water bodies, as will less effective control of runoff from roads. The absence of buffers for springs, seeps, and wetlands less than 1 acre that are not shown on USGS quad maps would increase runoff and decrease storage in these areas. Higher likelihoods of compaction, puddling, and rutting would promote higher volumes and rates of runoff. Less effective reclamation S&Gs will extend the length of time soil is exposed to runoff. This would be most evident in the 135,344 acres of CWF and WWF watersheds because successful revegetation would not be required within 60 days of the next growing season.

Groundwater

Alternative 1–This alternative would likely have impacts on shallow groundwater, both in terms of quality and quantity. The changes in surface water quality would be reflected in groundwater quality due to the interaction of these waters, particularly at low flow levels. While sediment and temperature would not likely be of concern, any chemicals in surface water could easily enter groundwater and reduce the quality of those waters. Groundwater quantity could decrease as surface waters that would otherwise infiltrate the soil would instead runoff to downstream locations.

Alternatives 2 and 3–These alternatives will have essentially the same affect on groundwater in terms of quality and quantity. S&Gs would provide protection from contamination and preserve water quality, particularly during periods of low flow. Similarly, measures that prevent or slow surface runoff will allow water to infiltrate the soil surface and percolate to shallow groundwater, increasing subsurface supplies for future use.

Alternative 4– This alternative will likely result in affects to both groundwater quality and quantity. Decreased buffers and allowance of equipment in more stream corridors would increase the likelihood of contamination of surface waters and groundwater, particularly from oil, grease and other chemicals used in pvt OGD. The absence of buffers for springs, seeps, and wetlands less than 1 acre that are not shown on USGS quads would increase potential effects to ground water. Higher rates of surface runoff due to less stringent S&Gs would promote movement of waters downstream rather than on-site infiltration and movement to shallow groundwater supplies.

Cumulative Effects

The cumulative effects section for water resources on the ANF is described in the FEIS (USDA-FS 2007a p.3-48 through 3-51) and is incorporated by reference. The cumulative effects analysis area for watersheds and riparian resources is the 15 watersheds within the proclamation boundary. These watersheds encompass 1,400,350 acres, but only 740,600 acres will be analyzed. Water quality is believed to be comparable inside and outside the proclamation boundary because the four-county area has similar forest cover and pvt OGD development rates are assumed to be the same as within the proclamation boundary. The time frame analyzed is from 1986 to 2020.

Pvt OGD has the potential to have impacts to water resources from past, present, and predicted future development. Increased runoff occurs from compacted soils and could cause changes to streamflow volumes and timing of flows. Some level of sediment from roads would reach streams and wetlands impacting the physical characteristics of water resources to some degree. Where BMPs are applied properly, these effects should be short term until sites are stabilized and fully revegetated. Active maintenance of site development will be required to prevent long-term effects to water resources.

The analysis below highlights projected pvt OGD within the proclamation boundary. To analyze cumulative effects for development levels, the following assumptions were made: 1) housing and commercial development levels are static or only slightly increasing and will not be considered, 2) rates of pvt OGD on NFS lands are equal to development on private and other public lands, 3) stone pits will

have a minor effect on water resources and will not be considered because they are located in areas away from streams and riparian areas, and 4) motorized trails are only predicted on FS lands.

From 1986 to 2005, there were 180 miles of new road or existing corridor added to the ANF transportation system and 1,123 miles of pvt OGD roads constructed on the ANF, and 528 miles of pvt OGD roads constructed on private land within the proclamation boundary (FEIS Table 3-17, p. 3-74; SEIS Appendix C, Table C-3). By 2020, an additional 85 miles of potential new NFS roads will be constructed, 1,920 miles of potential new pvt OGD roads on NFS lands, and 859 miles of potential new pvt OGD roads on private lands will be constructed (FEIS Table 3-17, p. 3-74; SEIS Appendix C Table C-4 and C-6). There will be a difference in water and riparian resource effects between alternatives due to the variation in S&Gs as described in the effects discussion. All alternatives will combine with pvt OGD and double the magnitude of development over levels that occurred between 1986 to 2005. Where these roads are hydrologically connected to streams in these watersheds and mitigations are insufficient or not maintained, increased runoff and erosion could lead to channel scour, excessive sedimentation, and deposition.

Along with pvt OGD roads, there will be sedimentation and increased runoff to streams and riparian areas from well pads where they are in close proximity to these areas. From 1986 to 2005, it is estimated that 4,493 well pads were constructed on the ANF and 2,087 well pads on private land (SEIS Appendix Table C-2). There is a potential for 7,680 pvt OGD well pads on the ANF and 3,520 well pads on private lands to be added in the next 15 years (2005 to 2020) within the proclamation boundary (see Appendix C, Table C-6). Although spills are rare within the proclamation boundary, with increases in OGD there is higher potential for spills to reach stream channels and wetlands. The quantity of the spill that reached stream and wetland systems would determine the extent of damage to water resources and the length of time for recovery, but this cannot predicted in this analysis (Appendix C).

Pvt OGD will result in effects to water quality with additional road and well pad construction. Pennsylvania Best Management Practices (BMPs) set guidelines for road and well pad construction for pvt OGD to control erosion and sedimentation (PA DEP 2001). Oil and gas operators are required to develop and implement erosion and sedimentation plans for their developments, which are approved by the PADEP. These plans outline the BMPs used to minimize erosion and prevent sedimentation of streams and wetlands. Providing buffers from streams and wetlands and controlling erosion and sedimentation from roads, particularly at stream crossings, would help protect water resources. BMPs protect channel condition and water quality if installed correctly and maintained.

Marcellus Shale Development

All applicable S&Gs will be employed in the development of the Marcellus shale. Although the intensity, duration and scale of development is greater, the S&Gs, Pennsylvania BMPs and stormwater controls would be applied at the appropriate levels to control effects from sedimentation and runoff. Higher standards of road building would be utilized to handle the high traffic levels. PADEP would regulate water withdrawal and water discharge in the Allegheny River basin. The Commonwealth's anti-degradation policy requires that at a minimum, existing water uses and level of water quality necessary to protect the existing uses shall be maintained and protected.

Differences between alternatives would be similar to effects for shallow well drilling. There are additional S&Gs in Alternatives 3 and 4 that specifically address deep well development. Additional site specific analysis will be needed to determine the full extent of measures needed to mitigate or minimize effects associated with this activity.

3.2.3 Air Resources

The Chief's instructions include a requirement to supplement section 3.2.4–Air Resources of the FEIS (USDA-FS 2007a, pp. 3-52–3-63) to fully evaluate the potential cumulative effects on air quality within the ANF and surrounding region from pvt OGD emissions of methane and hydrogen sulfide and from vehicles and equipment used in pvt OGD. Information provided here will supplement the affected environment section by providing additional information on ozone (USDA-FS 2007a, p. 3-54), and providing new information on methane and hydrogen sulfide. The direct and indirect effects discussion and cumulative effects discussion (USDA-FS 2007a, pp. 3-55–3-63) will be supplemented with information on emissions from vehicles and equipment used in pvt OGD.

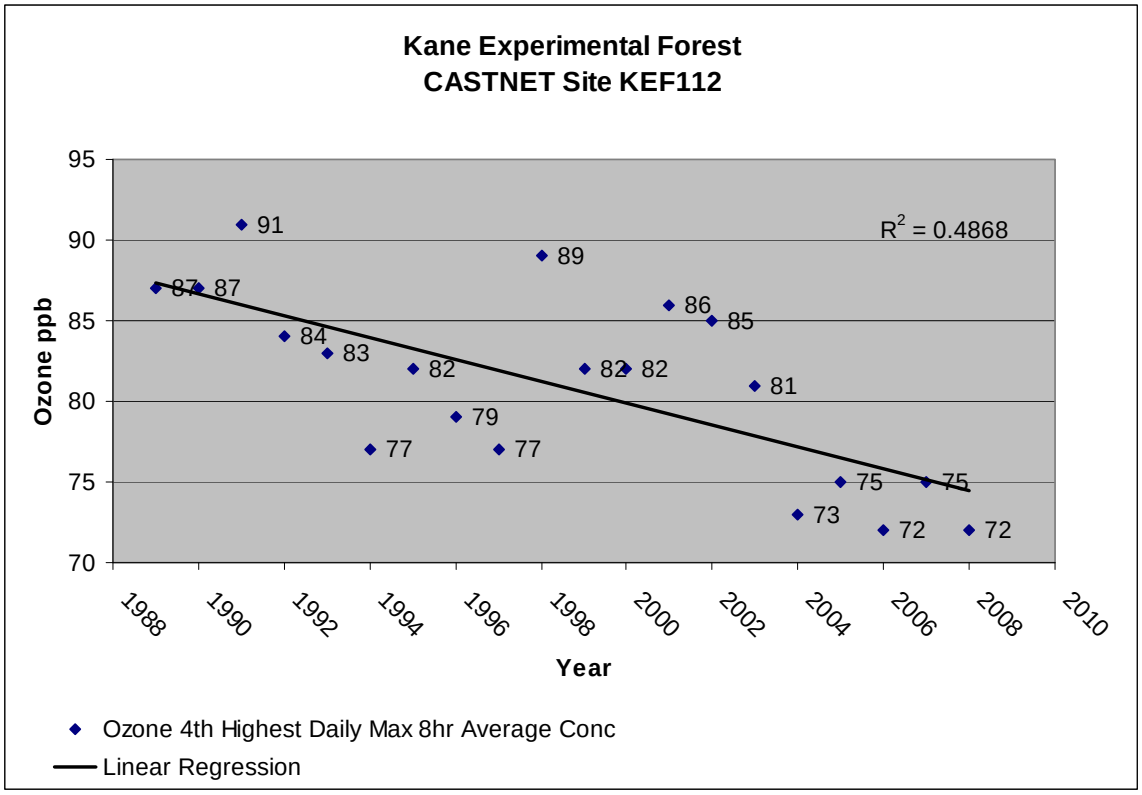
Affected Environment

Ozone

The Clean Air Act, last amended in 1990, requires the EPA to set National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for pollutants considered harmful to public health and the environment. The EPA has set NAAQS for six principal pollutants, called "criteria" pollutants. Ozone is one of the criteria pollutants and is discussed in the FEIS (USDA-FS 2007a, p.3-54). Since publication of the FEIS, the EPA has lowered the primary ozone standard throughout the US to 75 parts per billion (ppb) for an 8-hour average (effective May 27, 2008). By reducing ozone standards in 2008, the EPA has reported that benefits will include preventing cases of bronchitis, aggravated asthma, nonfatal heart attacks, and premature deaths (PA DEP 2009). To attain this standard, the 3-year average of the fourth highest daily maximum 8-hour average ozone concentration measured each year at each monitor within an area must not exceed 75 ppb. Due to the changing of this ozone standard, and newly available ozone biomonitoring data, ozone pollution is reviewed in more depth as part of this SEIS.

The only long-term ozone monitor on the ANF is located at the Kane Experimental Forest (KEF), in Elk County, Pennsylvania. PADEP does not have a long term ozone monitor in the four counties that the ANF is within. The ozone monitor at the KEF (Site ID KEF112) is part of a national program called Clean Air Status and Trends Network (CASTNET), which is administered and operated by the EPA with assistance from the Northern Research Station of the US Forest Service. Figure 3-2 illustrates decreasing ozone concentrations from 1989 through 2008 at KEF112. Linear regression analysis of these data shows an R^2 value of 0.49. In statistical terms, the linear regression shown in Figure 3-1 may be interpreted to mean there is approximately a 49 percent chance of predicting another data point in this figure based on existing data points. Ozone concentrations at KEF112 did not exceed the 2008 EPA ozone standard of 75 ppb from 2004 through 2008.

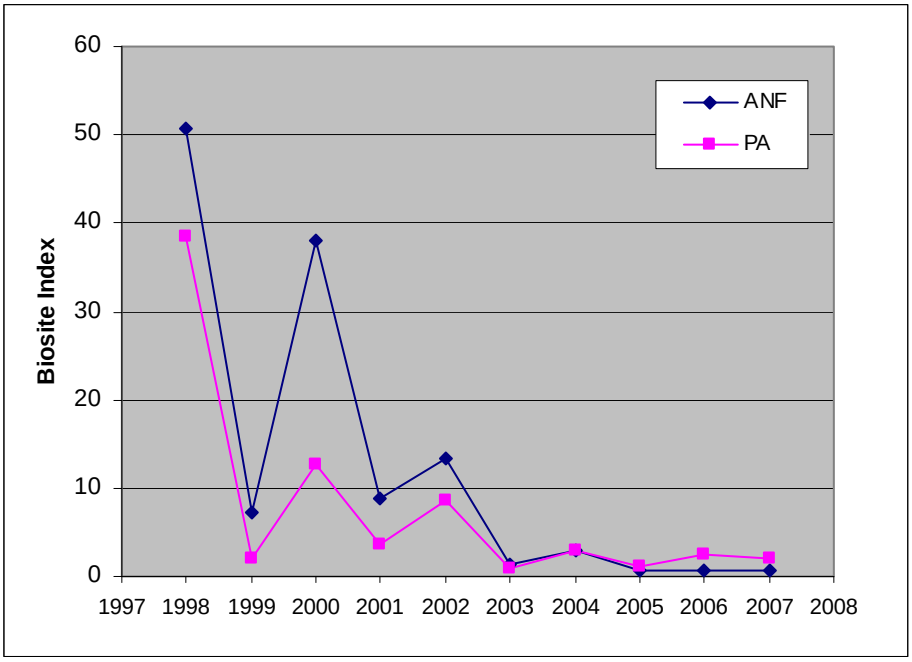
Figure 3-2 Ozone concentrations at CASTNET site KEF 112 from 1989 through 2008



The ANF is also part of a national ozone biomonitoring program, which was implemented by the Forest Inventory and Analysis and Forest Health Monitoring programs of the US Forest Service. The ANF joined this biomonitoring program in 1998 and continued through 2007. Ozone-sensitive bioindicator plants on the ANF include *Prunus serotina* (black cherry), *Prunus pensylvanica* (pin cherry), *Rubus allegheniensis* (blackberry), *Asclepias spp.* (common milkweed), *Liriodendron tulipifera* (yellow poplar), *Apocynum androsaemifolium* (spreading dogbane), *Fraxinus americana*(white ash), and *Sassafras albidum* (sassafras) (Smith 2009). Visible injury response can be used to detect and monitor ozone stress in the forest environment (Coulston and others 2003).

There is an overall downward trend in ozone injury conditions over the 10-year sampling period, although there are fluctuations in the biosite index value, some of which can be explained by drought conditions, such as in 1999 (Figure 3-3). During a drought, ozone uptake by plants is prevented when the leaf stomates, which allow for the exchange of gases with the atmosphere, are closed. This effectively reduces foliar injury response of ozone sensitive species. In 1998, just over half of the sampled plants on the ANF showed some symptoms of ozone injury, while just over one-third of the plants showed some symptoms of ozone injury in 2000. In 1999, 2001, and 2002, less than 10 percent of the sampled plants were injured and the percent injured dropped off to less than 3 percent for the years 2003–2007. Data collected for this time period throughout Pennsylvania followed similar trends, as shown in Figure 3-3 (Smith, 2009). Inventoried sites within the ANF ranged from 4 to16 sites per year, and the number of plants evaluated ranged from 213 to1,831 per year. Inventoried sites in Pennsylvania ranged from 48 to 134 sites per year, and the number of plants evaluated ranged from 2,229 to 11,147 per year (Coulston 2009).

Figure 3-3 Biosite Index for the ANF and Commonwealth of Pennsylvania (1998–2007)



Source: Smith 2009

The ANF is also concerned with air quality in the surrounding region, and whether it can be determined if emissions from the ANF have an effect on this surrounding area, or whether the surrounding area has an effect on air quality in the ANF. The PADEP measures ozone in some of the counties surrounding the ANF. Currently, of the eight Pennsylvania counties abutting the four county ANF area, only Erie County is recommended as an 8 hour ozone nonattainment area using the 2008 EPA standards. This exceedance of the ozone standard in Erie County is likely due to emissions from the City of Erie, with a population of over 100,000. Clearfield County has been considered a nonattainment county at different times in the past; however, due to the county's current ozone concentrations the state expects the EPA to designate the county as within attainment by 2010 (PADEP 2009). Chautauqua County, New York, north of the ANF, also exceeds the 2008 NAAQS primary standard for ozone (US EPA 2009c). This exceedance is likely due to emissions from the City of Jamestown, with a population of over 30,000. The effect of the ozone from these cities on the ANF would depend on weather conditions, as well as the quantity of ozone precursors in the atmosphere. It is uncertain if emissions from the ANF have an affect on these two non-attainment areas; however, from 2004 through 2008, ozone concentrations at KEF112 did not exceeded the 2008 EPA ozone standard of 75 ppb. Pennsylvania ozone levels are attributable to local influences and, to a more significant extent, to ozone and ozone precursors transported from outside Pennsylvania from states to the south and west (PADEP 2009).

Methane

Methane (CH_4) is the primary component of natural gas. Methane is a greenhouse gas that remains in the atmosphere for approximately 9 to 15 years and is over 20 times more effective at trapping heat in the atmosphere than carbon dioxide (CO_2) over a 100-year period. Methane is emitted from a variety of natural and human-influenced sources. Human-influenced sources include landfills, natural gas and petroleum systems, agricultural activities, coal mining, stationary and mobile combustion, wastewater treatment, and certain industrial processes (USEPA 2007).

OGD is a significant source of global methane emissions and accounts for approximately 18 percent of the total human made sources. The US contributes 12 percent of the worldwide emissions from oil and

natural gas systems (USEPA 2009d). For these reasons, the EPA has implemented voluntary programs that promote profitable opportunities for reducing emissions of methane from natural gas, petroleum and other industries (USEPA 2007). Total national methane emissions in 2005 were more than 11 percent lower than emissions in 1990, in spite of economic growth over that time period (USEPA 2007). Methane emissions from natural gas systems declined 19 percent from 1990 through 2007, due to improvements in technology and management practices and replacement of old equipment. Due to industry efforts to reduce emissions and a decline in domestic oil production, methane emissions from petroleum systems have declined by 15 percent (USEPA 2009b).

In natural gas and petroleum systems, methane losses occur during the production, processing, storage, transmission, and distribution of natural gas. Because natural gas is often found in conjunction with oil, the production, refinement, transportation, and storage of crude oil can also be a source of methane emissions (USEPA 2007).

Methane release to the atmosphere during the field production phase of pvt OGD consists primarily of fugitive emissions (non fuel combustion emissions) and emissions from pneumatic devices. Fugitive emissions from oil and natural gas systems are often difficult to quantify accurately. This is largely due to the diversity of the industry, the large number and variety of potential emission sources, the wide variations in emission control levels, and the limited availability of emission source data. Currently the oil and gas industry: has systems that have high reliability where most associated gas is conserved; has equipment that is generally well maintained and high-quality components are used; and is highly regulated and these regulations are generally well enforced (IPCC, 2006). The estimate of fugitive methane emissions from natural gas systems in 1990 was 129.6 teragrams of carbon dioxide equivalents (Tg CO2 Eq.), while in 2007 the emissions were down to 104.7 Tg CO2 Eq. The estimate of fugitive methane emissions from petroleum systems in 1990 was 33.9 Tg CO2 Eq., while in 2007 these emissions were down to 28.8 Tg CO2 Eq. (USEPA 2009b). In 2007, emissions from field production of natural gas accounted for approximately 21 percent of methane emissions from natural gas systems (USEPA 2009b).

Mobile sources include all transportation sources identified in the US inventory, including non-transportation sources such as construction and mining equipment, agricultural equipment, and vehicles used off-road, as well as other sources (USEPA 2009b). From 1990 through 2007, mobile source methane emissions declined by 52 percent, due largely to control technologies employed in on-road vehicles since the mid 1990s.

Methane is not one of the six criteria pollutants as defined by the EPA. Emissions of methane are not regulated in the United States; therefore, no adequate emission test data are available. The emission pathways of methane are also highly complex, creating a level of uncertainty associated with emission factors (USEPA 2009b).

Methane emissions on the ANF are not currently monitored or analyzed by the EPA, PADEP, or Forest Service. The PADEP exempts pvt OGD, including wells and associated processes, from the air quality permitting process (P.L. (1959) 2119). The national EPA data above is the best data currently available for the ANF.

The ANF realizes a need for methane concentration monitoring and has partnered with the US Department of Energy, through the National Energy Technology Laboratory (USDOE 2009) to measure ambient methane concentrations on many of the roads within the ANF in 2009. Through this partnership the ANF is anticipating a better understanding of methane emissions within the Forest.

Hydrogen Sulfide

Hydrogen Sulfide (H_2S) occurs naturally in crude petroleum and natural gas. Hydrogen Sulfide is a flammable, colorless gas with a characteristic odor of rotten eggs. Exposure to low concentrations of hydrogen sulfide may cause irritation to the eyes, nose, or throat. It may also cause breathing difficulty for some asthmatics. Brief exposures to high concentrations of hydrogen sulfide (greater than 500 parts per

million (ppm)) can cause a loss of consciousness and possibly death. Hydrogen sulfide remains in the atmosphere for about 18 hours. No health effects have been found in humans exposed to typical environmental concentrations of hydrogen sulfide (0.00011-0.00033 ppm). Hydrogen sulfide has not been shown to cause cancer in humans (USDH 2006). Hydrogen sulfide is heavier than air and may accumulate in low-lying areas. Active monitoring for hydrogen sulfide gas and good planning and training programs for workers are the best ways to prevent injury and death (OSHA 2008).

Anthropogenic release of hydrogen sulfide can result during the extraction of oil and natural gas; however, 90 percent of the sources that emit hydrogen sulfide into the air are natural. Approximately 15 to 25 percent of natural gas in the US may contain hydrogen sulfide. The nearest major hydrogen sulfide-prone areas to the ANF are in Ohio, Michigan, and an area comprising of portions of Illinois, Indiana, and Kentucky (Skrtic 2006).

Hydrogen sulfide is not one of the six criteria pollutants as defined by the EPA and is not regulated by that agency (Skrtic 2006). The Occupational Safety and Health Administration (OSHA 2008) has standards for workers' exposure levels to hydrogen sulfide. OSHA standards for hydrogen sulfide for acceptable ceiling concentration is 20 ppm and the acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift is 50 ppm for a maximum of 10 minutes once only if no other measureable exposure occurs (OSHA 2008). Pennsylvania's ambient hydrogen sulfide standards include 0.005 ppm for a 24-hour average duration and 0.1 ppm for a 1-hour average duration. However, Pennsylvania does not conduct routine monitoring of ambient hydrogen sulfide concentrations (Skrtic 2006).

Hydrogen sulfide emissions on the ANF are not currently monitored or analyzed by the EPA, PADEP, or Forest Service. There is no data available for hydrogen sulfide concentration on the ANF.

Direct and Indirect Effects

The direct and indirect effects discussion (USDA-FS 2007a, pp. 3-55 – 3-62) is supplemented with the following information on emissions from vehicles and equipment used in pvt OGD.

Pvt OGD emissions are expected to be constant across all alternatives. The ANF S&Gs have no effect on emissions produced from pvt OGD.

Oil and Gas Development Emissions from Vehicles and Equipment

This analysis is based on the analysis used in the FEIS and describes the area potentially affected by the mobile and area sources of pollution from pvt OGD activities within the ANF. The analysis area and time period are the same as were used in the FEIS. The analysis area with a radius of 50 kilometers (31.07 miles) from the ANF boundary is used to describe the effects of emissions from the ANF on regional air quality. Figure 3-2 in the FEIS is a map of the ANF with the analysis area circled (USDA-FS 2007a, p. 3-56). This 50 km area includes all of the four counties (Warren, Forest, McKean, and Elk) that the ANF is within. In addition, this area includes large portions of the counties that abut this four county area.

Estimated emissions from possible pvt OGD were developed using basic assumptions based on typical OGD about the type of equipment likely to be used, the number of hours per day equipment will operate, and the number of days per year operation will occur. Using these assumptions, an estimate of the hours of operation for each piece of equipment was derived and multiplied by an emissions factor for that type of equipment (Farr 2008). The assumptions for rate of pvt OGD used for the analysis can be found in Appendix C of this document.

Table 3-4 shows the emissions within the region and four-county area and the relative increases from ANF activities and pvt OGD between Decade 1 (2005) and Decade 2 (2020). These increases in emissions may degrade air quality in the regional and the four-county area. In 2005, the base number of

8,000 existing wells was used. The anticipated average number of new wells is 512 per year for the 15 year period that is being reviewed. This average increase in the number of wells translates to an average increase in emissions in the ANF from pvt OGD of approximately 4.6 percent annually, or approximately a 100 percent increase in emissions over the entire 15 year period due to the almost doubling of the number of wells on the Forest. This, however, does not consider any improved efficiencies which would reduce vehicle and equipment emissions over the years. This percent increase is similar for the four county area emissions and regional emissions. The increases of these pollutants, volatile organic compounds (VOC), particulate matter (PM), nitrogen oxides (NO_X), and carbon monoxide (CO) may cause detrimental air quality impacts. There may be an increase in ozone as a result of the increases in VOC and NO_X ; however, the amount of ozone increase is not known.

Table 3-4 Estimated Future Air Pollutant Emissions from Private OGD Annually on the ANF – Comparion against Regional and Four-county Pollutant Data

		ANF Management Emissions (Tons per Year)		Total Regional Emissions (Tons per Year)	Percent ANF Management of Total Regional Emissions		Four County Emissions (Tons per Year)	Percent ANF Management of 4 County Emissions	
		Decade			Decade			Decade	
	Pollutant	1	2		1	2		1	2
3-1 OGD only T	VOC	5,939	11,564	63,380	9.37	18.25	12,047	49.30	95.99
	PM	134	258	27,770	0.48	0.93	5,322	2.52	4.85
	NO_x	1,064	1882	223,110	0.48	0.84	11,188	9.51	16.82
	CO	16,142	30,328	1,157,352	1.39	2.62	66,765	24.18	45.42

Source: Farr 2008

The four counties in which the ANF is located are currently in attainment of all NAAQS. However, for the counties within 50 km of the ANF, Butler and portions of Armstrong and Indiana County (all in Pennsylvania) are in nonattainment status for PM less than 2.5 microns. Eight counties (Erie, Mercer, Butler, Armstrong, Indiana, and Clearfield, Pennsylvania, and Chautauqua and Erie, New York) are in nonattainment status for 8 hour ozone standards (USEPA 2009a).

Wet deposition data from two NADP sites, one within the ANF and one approximately 50 km away from the forest, were reviewed for the FEIS (USDA-FS 2007a). Data from KEF and another site in Chautauqua County, New York correlate with national trends in pollution. Sulfate deposition has decreased at a steady rate at both stations while ammonium and nitrate have remained relatively constant. Precipitation pH has increased indicating that acidity has decreased. These trends have occurred primarily since the Clean Air Act amendments of 1990 (USDA-FS 2007a, p.3-62).

Ozone data was more thoroughly reviewed for this SEIS. Ozone concentrations measured at KEF illustrate a reduction in ozone over a 20 year period. The most recent 5 years of data also demonstrate that ozone concentrations have not exceeded the new 2008 EPA standards. A recently completed 10 year study of ozone injury to sensitive plants in the ANF and around Pennsylvania demonstrates that foliar injury due to ozone has decreased over this10 year period.

Methane and hydrogen sulfide are not criteria pollutants as defined by the EPA and their emissions on the ANF have not been monitored by the EPA, PADEP, or Forest Service. Nationally, total methane emissions were more than 11 percent lower in 2005 than they were in 1990, and methane emissions from natural gas systems have declined 19 percent from 1990 to 2007 (USEPA 2009b).US GHG Inventory Report) The ANF understands the need for methane concentration monitoring and in the summer of 2009 the NETL is scheduled to monitor ambient methane on many of the roads in the ANF. The nearest major

hydrogen sulfide prone area to the ANF is in Ohio. Pennsylvania does have an ambient hydrogen sulfide standard, however, the Commonwealth does not have a routine monitoring program.

Cumulative Effects

Table 3-14 in the FEIS is a cumulative effects table (USDA-FS 2007, p. 3-63) that displays emissions occurring from prescribed burning, timber harvest, all terrain vehicles and off highway motorcycles on the ANF. While reviewing information for preparation of the SEIS, an error was discovered. Data from FEIS Table 3-11 (USDA-FS 2007, p. 3-59) was used for emissions produced in prescribed burning activities. Values for PM2.5, rather than values for PM10 were incorporated in FEIS Table 3-14. Table 3-5, below, corrects this error. In Table 3-6, which follows, emissions occurring from pvt OGD have been added to display cumulative effects from prescribed burns, timber harvest, ATV/OHV use, and pvt OGD. The increase from the FEIS cumulative emissions to the SEIS cumulative emissions is due to the emissions associated with the projected number of wells to be developed between Decade 1 (2005) and Decade 2 (2020), including the level of emissions occurring from small engines associated with well pumping and maintenance vehicles operating in developed areas.

Table 3-5 Estimated Corrected Cumulative Future Annual Air Pollutant Emissions from Prescribed Burns,Timber Harvests, All Terrrain Vehicle, Off Highway Motorcycle Use on the ANF.

		ANF Management Emissions (Tons per Year)		Total Regional Emissions (Tons per Year)	Percent ANF Management of Total Regional Emissions		Four County Emissions (Tons per Year)	Percent ANF Management of 4 County Emissions	
		Decade			Decade			Decade	
	Pollutant	1	2		1	2		1	2
Alt. A	VOC	337	342	63,380	0.53	0.54	12,047	2.80	2.84
	PM	104	104	27,770	0.38	0.38	5,322	1.95	1.95
	NO_x	226	227	223,110	0.10	0.10	11,188	2.02	2.02
	CO	2,267	2,272	1,157,352	0.20	0.20	66,765	3.40	3.40
Alt. B	VOC	325	330	63,380	0.51	0.52	12,047	2.70	2.74
	PM	181	185	27,770	0.65	0.67	5,322	3.40	3.48
	NO_x	215	215	223,110	0.10	0.10	11,188	1.92	1.92
	CO	3,032	3,084	1,157,352	0.26	0.27	66,765	4.54	4.62
Alt. Cm	VOC	292	297	63,380	0.46	0.47	12,047	2.42	2.47
	PM	180	178	27,770	0.65	0.64	5,322	3.38	3.35
	NO_x	187	187	223,110	0.08	0.08	11,188	1.67	1.67
	CO	2,900	2,878	1,157,352	0.25	0.25	66,765	4.34	4.31
Alt. D	VOC	166	170	63,380	0.26	0.27	12,047	1.38	1.41
	PM	105	105	27,770	0.38	0.38	5,322	1.97	1.97
	NO_x	91	91	223,110	0.04	0.04	11,188	0.82	0.82
	CO	1,618	1,621	1,157,352	0.14	0.14	66,765	2.42	2.43

Source: USDA-FS 2007a, pp. 3-59 and 3-63

Table 3-6 Estimated Cumulative Future Annual Air Pollutant Emissions from Prescribed Burns, Timber Harvests, All Terrain Vehicle, Off Highway Motorcycle Use, and Private OGD on the ANF– Including Regional and Four County Pollutant Data

		ANF Management Emissions (Tons per Year)		Total Regional Emissions (Tons per Year)	Percent ANF Management of Total Regional Emissions		Four County Emissions (Tons per Year)	Percent ANF Management of 4 County Emissions	
		Decade			Decade			Decade	
	Pollutant	1	2		1	2		1	2
Alt. A	VOC	6,276	11,906	63,380	9.90	18.79	12,047	52.10	98.83
	PM	238	362	27,770	0.86	1.30	5,322	4.47	6.80
	NO_x	1,290	2,109	223,110	0.58	0.95	11,188	11.53	18.85
	CO	18,409	32,600	1,157,352	1.59	2.82	66,765	27.57	48.83
Alt. B	VOC	6,264	11,894	63,380	9.88	18.77	12,047	52.00	98.73
	PM	315	443	27,770	1.13	1.60	5,322	5.92	8.32
	NO_x	1,279	2,097	223,110	0.57	0.94	11,188	11.43	18.74
	CO	19,174	33,412	1,157,352	1.66	2.89	66,765	28.72	50.04
Alt. Cm	VOC	6,231	11,861	63,380	9.83	18.71	12,047	51.72	98.46
	PM	314	436	27,770	1.13	1.57	5,322	5.90	8.19
	NO_x	1,251	2,069	223,110	0.56	0.93	11,188	11.18	18.49
	CO	19,042	33,206	1,157,352	1.65	2.87	66,765	28.52	49.74
Alt. D	VOC	6,105	11,734	63,380	9.63	18.51	12,047	50.68	97.40
	PM	239	363	27,770	0.86	1.31	5,322	4.49	6.82
	NO_x	1,155	1,973	223,110	0.52	0.88	11,188	10.32	17.63
	CO	17,760	31,949	1,157,352	1.53	2.76	66,765	26.60	47.85

Source: Farr 2008

This analysis was conducted using the same measurement units used in the original analysis completed for the FEIS, thus emissions calculated for pvt OGD have been added to those previously calculated with the corrections mentioned above. Table 3-5 shows there were minor differences in emissions between Alternatives Cm, B and A, and that Alternative D has the least emissions. Table 3-6 shows the same relative differences between alternatives, although higher levels of emissions occur in all alternatives due to pvt OGD. This analysis does not provide sufficient detail to determine whether or not these levels of emissions would lead to ambient non-attainment levels of the NAAQS, which are measured at various averaging times set by state and federal agencies. If NAAQS are exceeded, regulatory state and federal agencies (PADEP and EPA) will determine the needed changes. The ANF will comply with the direction set forth by these agencies, if needed.

This analysis indicates air emissions will be increasing over the life of the Forest Plan, primarily due to pvt OGD. The regional air emission levels from ANF activities were projected under full implementation. The contribution from pvt OGD is constant across all alternatives.

In the FEIS there is discussion in the air resources section about a threshold of 5 percent being chosen for emission comparison. No source was found for why this was considered meaningful and therefore it was not used in this analysis.

Development of Marcellus shale is occurring in Pennsylvania; however, it is not occurring on the ANF. Pvt Marcellus OGD would result in increased emissions due to the greater scale of development, which would include greater equipment use and a longer duration of development activity. On a national scale, shale gas producers must comply with the Clean Air Act Amendments of 1990, and EPA established National Emissions Standards for Hazardous Air Pollutants (NESHAP), which are nationally uniform

standards to control specific air emissions. Shale gas operators will also have to comply with the new rules passed in 2007, the Stationary Spark Ignition Internal Combustion Engine new source performance standards, as well as the Reciprocating Internal Combustion Engine NESHAP rules, both of which regulate new and refurbished engines regardless of horsepower rating (USDOE 2009).

3.2.4 Transportation

Affected Environment

The purpose of the proposed action is to establish S&Gs to help mitigate the effects of pvt OGD on NFS resources, including transportation. The existing transportation system on the ANF is a mix of NFS roads and private roads. Pvt OGD activities utilize existing NFS roads when possible, but additional roads are needed for access to individual well sites. Primary concerns related to transportation resources are transportation planning, design of roads, and long term maintenance needs.

Transportation Planning

Transportation planning provides an opportunity to assess current access to an area and to determine what improvements, additions, or deletions are needed to provide access necessary to meet management objectives. Generally, a goal of transportation planning is to minimize the effects associated with the transportation system, while mitigating surface impacts and minimizing cost. Integral to this process is identifying other resource concerns where mitigation of effects could be made. In some instances this requires modifying road locations to avoid or minimize effects, in others; roads can be designed to minimize effects. For example, constructing a stream crossing to minimize total miles of road could have more environmental impacts to water resources and potentially higher costs. Construction of a longer road segment to avoid the stream crossing could be less costly and have fewer effects on water resources, although other NFS resources could be impacted.

When designing a transportation system for OGD, it is necessary to provide access to each well location. For wells grids with equal spacing in the X and Y direction, the number of road segments needed to access all possible well locations is the same, regardless of the layout. Minor shifts to avoid areas of environmental concern would result in negligible changes in total road system length. For this analysis, miles of additional road will be assumed to be constant across all alternatives. While some differences in road miles may occur as a result of addressing S&Gs, they are expected to be minor and will be more appropriately addressed during project level analysis.

Design of Roads

Road design is the application of the design standards to the site-specific conditions where roads are located. Environmental conditions, including soils, hydrology, topography, and road grade determine the features to be included in the road design. Choices can be made regarding the kind of surfacing to be used, the water control devices to be installed, and erosion and sedimentation actions. Construction costs are directly related to the location of the road corridor and the choice of design standards. For example, roads constructed on steep side slopes use more excavation and more water control devices to intercept surface and subsurface flow which makes them more costly to build than roads located on gentle side slopes.

Long-term Maintenance

Long term maintenance is necessary to ensure that other resource values are not impaired over time. As use of facilities occurs, road surfacing deteriorates and requires periodic maintenance or replacement. Water control devices require periodic cleaning and replacement. Road maintenance costs are directly related to the location, design and initial construction, as well as intensity and season of use. For example, increased potential for run-off or mass movement and a need to maintain higher cut and fill

slopes makes roads constructed on steep side slopes more costly to maintain than roads located on gentle side slopes.

Road Costs

Total road costs are a direct result of road location, design standards and long-term maintenance needs. Roads that are located on the plateau or on gentle side slopes, on well-drained soils, with no stream crossings are less expensive to build than roads that are located on steep side slopes, or on poorly drained soils with stream crossings. Roads on the plateau or gentle side slopes can be constructed without designing cut and fill slopes, require fewer water control devices and less surfacing than roads on steeper slopes. Roads on poorly drained soils require more water control devices and more surfacing. Stream crossings and roads within 300 feet of streams require a more complex design (to accommodate the stream crossing) and more durable surfacing. Similarly, long-term maintenance is generally more expensive on roads located on steep slopes or on wetter soils.

Average road construction costs for local NFS roads (traffic service level D, maintenance level 3) located on the plateau or gentle side slopes, on well-drained soils, with no stream crossings are $35,000 per mile. This assumes an application of 6 inches of pit run surfacing. Typically, roads constructed for pvt OGD utilize more than 6 inches of surfacing, with estimates of an additional $10,000 per mile construction cost. Additional costs are incurred for construction within 300 feet of streams. Average road costs within 300 feet of streams are higher due to the need to use more durable surfacing (limestone), additional excavation costs for poorer soils, utilize more water control devices, and additional costs for clearing, grubbing and seeding. Estimates for road costs within 300 feet of streams are $105,000. Therefore, to determine the total average cost per mile for the road system, one must consider the proportion of road system that falls within 300 feet of streams. This varies by alternative and will be addressed in direct and indirect discussions below.

On the ANF, approximately 14 percent of the non-system roads (private roads) used for pvt OGD are located within 300 feet of streams. On private lands, approximately 18 percent of the roads used for pvt OGD are located within 300 feet of streams.

Direct and Indirect Effects

Introduction to Effects

The greatest impact to the natural landscape and its incumbent resources from pvt OGD occurs from road construction and site development. S&Gs are designed to mitigate these effects, but there are differences in potential effects defined by each alternative. Resource effects associated with the application of S&Gs for roads are discussed in other sections of Chapter 3. Discussion here will focus on differences by alternative with respect to transportation planning, design of roads, long term maintenance needs, and road costs.

Effects from Each Alternative

The following table displays differences between alternatives for the primary components associated with road management. A summary comparison of the alternatives follows the table.

Table 3-7 Comparison of S&Gs Related to Transportation Components by Alternative

Primary Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Resource Coordination				
Gates	OGD gated not for public use	Guided by Travel Mgt. Plan	Closed Immediately	NA
Concern Level 1 & 2	NA	Avoid entrances / mitigate	Avoid entrances / mitigate	NA
Design	NA	Minimum Standards for purpose of road	Minimum Standards for purpose of road	NA
Snowmobiling	NA	Maintain 3" base	Maintain 3" base	NA
Construction				
Layout	Minimum width to carry traffic	Maximize efficiency – Minimize disturbance	Maximize efficiency – Minimize disturbance	**NA**
Visuals	Located to minimize visual effects	Blend into landscape to extent practical	Blend into landscape to extent practical	NA
Surfacing	Sufficient stone to carry traffic	NA	Durable material	Durable material
Surfacing within 300' of streams	Effective filter strips (distance not defined)	Use High quality surfacing	Use High quality surfacing	NA – except Use High quality surfacing in 13% area
Clearing Width	NA	Minimize	Minimize	Minimize
Final Shaping	NA	Rough in appearance on D level roads	Rough in appearance on OGD roads	NA
Waste Materials	NA	NA	Disposed under FS approval	NA
Natural Revegetation	NA	Use natives where needed Erosion control	Use natives where needed Erosion control	Use natives where needed Erosion control
Aesthetic Design	NA	Modify when needed	Modify when needed	NA
Road Grades	2-8% with 200' steeper pitches to 15%	2-8% with 200' steeper pitches to 15%	2-8% with 200' steeper pitches to 15%	Up to 10% with with steeper pitches to 20%
Reconstruction	NA	To a higher standard to reduce effects on existing alignments	Should follow existing corridor alignments	Should follow existing corridor alignments
Maintenance	NA	Apply appropriate mtnc.	Apply appropriate mtnc.	Inspection weekly basis of BMP's repair when needed
Use	OGD gated not for public use	NA	OGD gated not for public use	OGD gated not for public use
Decommissioning	NA	Complete 6 prescribed levels	Complete 6 prescribed levels	Complete 6 prescribed levels

Alternative 1 has limited emphasis on transportation planning, but does require that surface disturbance and road widths are kept to a minimum. Consideration of visual effects would occur during road system design. S&Gs specify that road grades should be between 2 and 8 percent, with steeper grades allowed on short pitches less than 200 feet. Road design is addressed by requiring sufficient stone for capacity of vehicles. Road maintenance is not addressed. Currently, approximately 14% of the private roads system for pvt OGD is located within 300 feet of streams. Alternative 1 would likely result in the similar patterns of transportation planning, thus the weighted average cost per mile for the transportation system is $102,540 per mile

Alternatives 2 and 3 emphasize transportation planning by requiring that road design be commensurate with road needs and that layout maximize the efficiency of the road system while minimizing effects to other resources. Road widths are to be kept to a minimum. Consideration of visual effects would occur during road system design. S&Gs specify that road grades should be between 2 and 8 percent, with steeper grades allowed on short pitches less than 200 ft. Road design is addressed by requiring high quality surfacing within 300 feet of streams, including the 13 percent area of the ANF that drains directly into the Allegheny River (mitigation for the threatened and endangered clubshell and riffle shell mussels) (see water quality and wildlife sections for additional discussion on effects to water and wildlife from roads). Road maintenance is addressed by requiring appropriate maintenance on pvt OGD roads. Road decommissioning is also required when roads are no longer needed for access. With greater emphasis on transportation planning and S&Gs for water quality, the weighted average cost per mile for road construction is estimated to be $97,200 per mile, assuming that 10 percent of the road system is likely to be found within 300 feet of streams.

Alternative 4 does not emphasize transportation planning, thus increasing the likelihood that transportation system design will not result in maximizing the efficiency of the road system while minimizing effects to other resources. Durable surfacing materials are required, including a high quality surfacing for roads in the 13 percent subsection that drains directly into the Allegheny River (see water quality and wildlife sections for additional discussion on effects to water and wildlife from roads). Road maintenance is required and incumbent upon the mineral owner to perform weekly inspections to determine whether repairs are needed. Road decommissioning is required when roads are no longer needed for access. With less emphasis on transportation planning, it is likely that road system proportions will be similar to that found on private property, thus the weighted average cost per mile for road construction is estimated to be $107,000 per mile, assuming that 18 percent of the road system is likely to be found within 300 feet of streams.

Cumulative Effects

The cumulative effects boundary is the area included in the proclamation boundary of the ANF. Road development associated with NFS management activities and pvt OGD continues to occur on NFS and private lands. Using road data contained in the FEIS (Tables 3-15, 3-16, and 3-17) (USDA 2007a, pp. 3-68; 3-71; 3-74), Table 3-8 shows road development projection for all alternatives.

Table 3-8 Transportation System Projections within the Proclamation Boundary by 2020

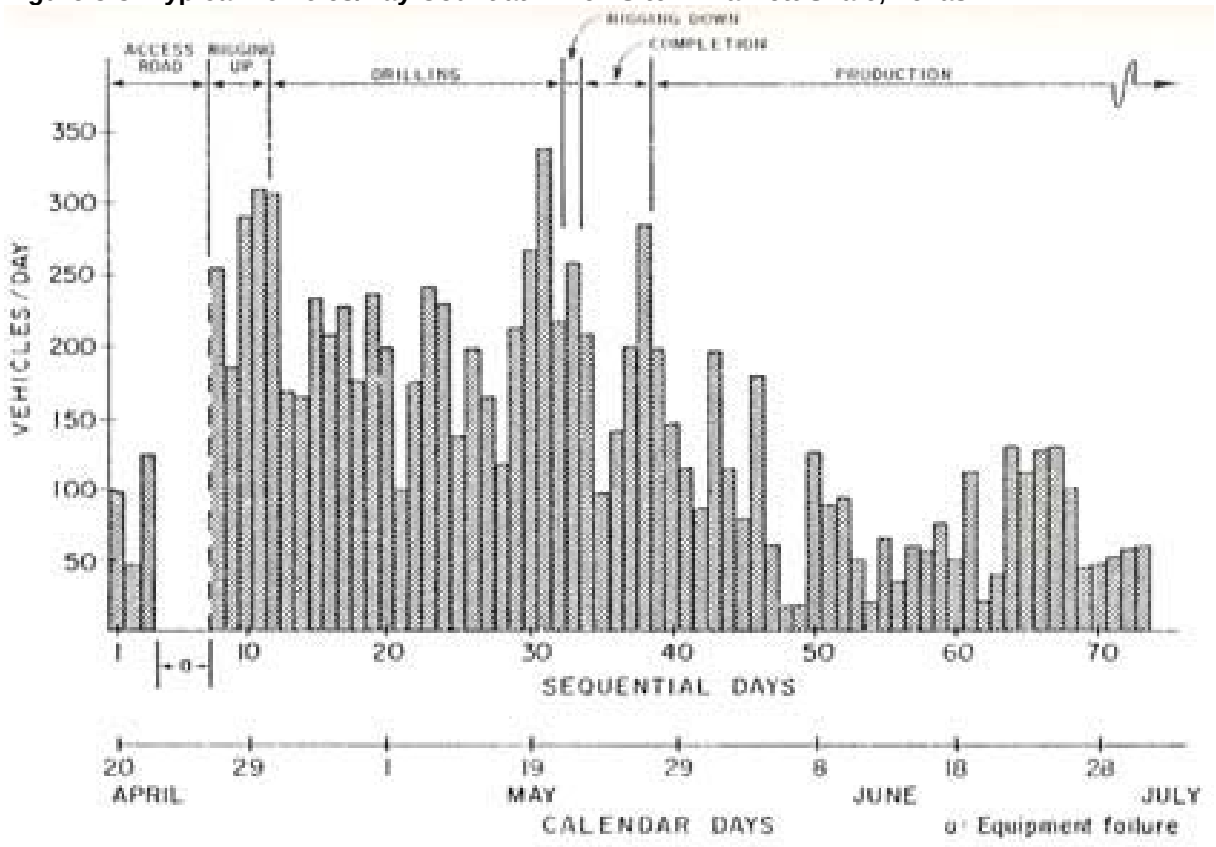
Category of road	Miles
Existing NFS Roads	1,261
Existing Municipal Roads	677
Existing Private/Other	2527
Subtotal Existing Roads	4,465
Projected New FS Roads	103
Projected New OGD Roads	2,800
Subtotal New Roads	2,903
GRAND TOTAL	7,368

Effects of road planning, design, maintenance, and cost for new pvt OGD road construction on private lands in all alternatives would likely be similar to the discussion included in Alternative 4. Alternative 4 includes guidelines included in Pennsylvania BMPs. Differences for each alternative related to new pvt OGD road construction on NFS land would be as described above.

Marcellus Shale

Additional road traffic is an effect of pvt Marcellus OGD. While traffic studies for pvt Marcellus OGD have not been completed, there have been limited traffic studies for development of the Barnett deposits in Texas. Barnett deposits are thicker than Marcellus Shale, but both are at approximately the same depth. These studies indicate that for one well, during development, approximately 250 vehicles per day were recorded. During early production an average of approximately 50 vehicles per day was recorded. See Figure 3-3 (Mason 1981). Dependent on location, time of year, weather conditions, other traffic, and conditions of the road system, this additional traffic may have significant effects on erosion and sedimentation, safety, wildlife interactions, and recreation. These issues will need to be addressed on a site-specific basis during project analysis.

Figure 3-3: Typical Vehicles/Day Count at 1 Well Site in Barnett Shale, Texas



Source: Mason 1981

3.3 Biological Environment: Direct, Indirect, and Cumulative Effects

3.3.1 Forest Vegetation

Affected Environment

The affected environment for forest vegetation on the ANF is described in the FEIS (USDA-FS 2007a, pp. 3-77–3-106) and is incorporated by reference. Existing forest vegetation is discussed in terms of forest composition, forest age and stocking, forest health, and forest vegetation management (silvicultural systems). In the FEIS a background and historical perspective is also provided for existing forest vegetation.

In summary, the ANF is largely dominated by even-aged, second hardwood forests that resulted from intensive harvesting that occurred between the 1890s and 1930s. Over 80 percent of the ANF is between 51 and 110 years old. The dominant forest types include upland, Allegheny, oak, and northern hardwood types. A number of natural and anthropogenic (human caused) disturbances influence forest vegetations and ecosystems on the ANF. Natural disturbances include wind and ice storms and native insects and diseases. Anthropogenic disturbances include fire, historical timber harvesting, introduced insects and diseases, excessively high deer browsing impacts, and climate change. Deer browsing in particular has influenced understory vegetation, including tree seedling abundance and diversity, for over 80 years. Though deer browsing impacts have declined in recent years, this legacy of over-browsing has resulted in forest understories dominated by fern, grass, beech, and striped maple that prevent other tree seedlings from becoming established. Introduced insects and diseases of particular concern include gypsy moth and beech bark disease complex. Looming forest health threats include introduced species such as emerald ash borer, hemlock woolly adelgid, Asian longhorned beetle, and sudden oak death. Wind events and insect population outbreaks, often in conjunction with drought, have affected forest health, composition, and stocking on the ANF.

Environmental Consequences

The environmental consequences of Alternative Cm on forest vegetation are described in the FEIS (USDA-FS 2007a, pp.3-107–3-179).

Scope of Analysis

The scope of this analysis focuses on the S&Gs related to pvt OGD on the ANF, and includes all federal land administered by the ANF. A general discussion on the effects of pvt OGD common to all alternatives is below. This is followed by a more detailed discussion on the effects of oil and gas S&Gs by alternative. Specifically on (1) forest composition, (2) forest age and stocking, (3) forest health, and (4) forest vegetation management, which are the four topics that were addressed during the forest planning process.

Effects Common Across Alternatives

Pvt OGD will occur in all alternatives, and affect forest vegetation on the ANF. Pvt OGD will change the amount and continuity of forested land on the ANF, as areas presently forested are converted to non-forested land and fragmented by clearing for roads, well pads, and associated facilities. This is most likely to occur in areas of intensive pvt OGD.

Pvt OGD is assumed to be constant across the alternatives evaluated, and is based on the analysis provided in Appendix C. Land clearing for pvt OGD converts forests and grasslands to non-forested land. Though some minor differences in the amount of land clearing might occur due to differences in S&Gs for pvt OGD included in each alternative, they are difficult to predict and quantify. Therefore, the amount of forest converted to non-forest is assumed to be essentially the same across all four alternatives.

Approximately 93 percent of the minerals underneath the ANF are privately owned. In 2005, it was estimated there were 8,000 existing wells (Appendix C, Table C-4). Assuming that each oil and gas well site, along with associated access roads, results in an average of 1.3 acres of disturbance, over 10,400 acres of have been disturbed or cleared for pvt OGD. Generally this disturbance has the effect of converting a forested area to non-forested or non-vegetated condition where access roads and well pads are located. It should be noted that some of this disturbance occurs on non-forested lands and areas already cleared for roads. It is estimated that the area cleared for pvt OGD (including associated roads) currently occupies 2 percent of the ANF land base.

Close well spacing of 500 feet is frequently used in areas of the ANF that contain oil and gas reserves. This equates to one well drilled per 5 acres of land. Oil and gas wells, associated access road construction, facilities, and powerlines have the indirect effect of increasing operational treatment costs, and reducing the efficiency of managing forested ecosystems, as blocks of contiguous, uniform forest vegetation are reduced in size where dense networks of roads exist. In some cases, dense networks of oil and gas wells, pipelines and powerlines can limit silvicultural tools available to foresters on the ANF. For instance, the use of prescribed fire to restore regimes to fire-dependent ecosystems may be limited by the presence of oil and gas pipelines, powerlines, oil wells, and flammable storage tanks. Since the amount and location of development is unpredictable, the potential impact to plant and animal communities is difficult to quantify. Not all of the ANF would be developed, and some areas may be restored. However, in general, as the density of wells and roads increase, ecosystem integrity decreases and forest management operational costs increase.

Estimates developed for the Forest Plan assumed an average future development rate of 512 wells per year (Appendix C, p. C-14), or an additional 666 acres annually converted to non-forested land on the ANF. This equates to 9,980 acres of clearing for pvt OGD over the 15 year planning period. Combined with disturbance that occurred for pvt OGD in the past, around 4 percent of the ANF could be disturbed and cleared to some degree by 2020.

Road construction associated with pvt OGD provides corridors for recreation users and hunters to more readily access areas on foot. By facilitating access by hunters, deer herds in previously remote areas can be more easily controlled by hunting. Reducing deer browsing impacts promotes greater understory vegetation abundance and diversity and helps sustain forest ecosystems.

All alternatives include S&Gs regarding the timely use of appropriate, native species for site restoration following pvt OGD activities. This will help ensure successful, rapid revegetation of impacted areas with species well suited to the site and environmental conditions found on the ANF.

Forest Carbon

The forests of the ANF store carbon from the atmosphere, as trees use atmospheric carbon to survive and grow, and store it within their wood. Atmospheric carbon is one of the greenhouse gasses that contribute towards climate change (Gucinkski and others 2004). Wood is about 50 percent carbon by weight. Smith and others (2006) provide methods for estimating the carbon stored in forests by forest type and age. Extrapolation between age classes gives an approximate rate of sequestration, or annual removal of carbon from the atmosphere. If 9,980 typical forested acres are cleared for pvt OGD during the 15-year planning period, approximately 630,000 metric tonnes of carbon will be harvested. By the end of the planning period, the forest capacity to remove carbon from the atmosphere through photosynthesis will be reduced by about 4,230 metric tonnes per year, equivalent to the emissions of driving a car 5000 miles at 24 miles per gallon (carboncaculator 2009) To reveal maximum possible effects, we assumed for this analysis that all clearing is from forested acres, even though we know that some proportion of the clearing is from non-forested acres. We also know that some acreage will likely be restored over the life of the Forest Plan, which is also not accounted for in this analysis. We then calculated the carbon stocks and sequestration rates of potentially cleared areas based on the distribution of forest types and age classes shown in Table 3-20 of the Forest Plan (USDA-FS 2007b, p. 3-89).

Most of the wood from trees removed for pvt OGD will be sold and used for furniture, construction, fiber, or paper products. Smith and others (2006) also provide tools for estimating what proportion of harvested carbon will remain sequestered in products over time. The proportion depends upon the type of product developed from the wood, which in turn depends upon the size of trees harvested. In older forests, a higher proportion of the trees are in large, or sawtimber, sizes, and most trees are large enough to become either pulpwood or sawtimber products. Since more than 60 percent of the Allegheny is greater than 80 years old, most of the acres likely to be cleared for pvt OGD will contain both pulpwood and sawtimber products.

Table 3-9 Estimated disposition proportions of Northeast Hardwood carbon after harvest.

Year after production	Saw log				Pulpwood			
	In use[1]	Landfill[2]	Energy[3]	Emitted without energy[4]	In use[1]	Landfill[2]	Energy[3]	Emitted without energy[4]
1	0.572	0.025	0.246	0.157	0.590	0.021	0.202	0.186
8	0.369	0.141	0.295	0.194	0.349	0.102	0.279	0.271
15	0.260	0.198	0.324	0.218	0.252	0.127	0.310	0.311

Source: Smith and others 2006 (Table 6)

[1]In use – End use products that have not been discarded or otherwise destroyed

[2] Landfills – Discarded wood and paper placed in landfills where most carbon is stored long-term

[3]Energy – Emitted with energy capture – Combustion of wood products with concomitant energy capture as carbon is emitted to the atmosphere

[4]Emitted without energy [capture] – Carbon in harvested wood emitted to the atmosphere through combustion or decay without concomitant energy recapture.

Direct and Indirect Effects

Effects from each Alternative – Differences in S&Gs by Alternative

Each of the four alternatives includes various S&Gs that apply to pvt OGD resources on the ANF. The following section focuses on the effects of the S&Gs included in each alternative on four forest vegetation areas.

1. Forest Composition

Alternatives 2 and 3 include language to maintain conifer species and rare species such as butternut. These alternatives also include S&Gs to plant species suited to existing site conditions, including light availability. Using planting stock best suited to site conditions will help ensure rapid restoration of areas disturbed by clearing for pvt OGD.

Alternatives 2 and 3 require that unnecessary roads be completely decommissioned and rendered inaccessible to all motorized traffic. This will help restore vegetation to these sites and eventual forested conditions in the very long term.

Alternatives 2 and 3 require the restoration and stabilization of all abandoned well sites and roads, while alternative 4 requires the restoration of well sites only. Active restoration of these abandoned well sites and roads will help ensure more rapid establishment of native vegetation and eventual forest cover on these areas.

As mentioned previously, land clearing for pvt OGD converts forests and grasslands to non-forested land. It is difficult to predict exactly how and where specific S&Gs will be applied for future pvt OGD. Therefore, it is difficult to predict any measurable differences in the amount of land clearing, or conversion to a non-forested condition, which might occur from one alternative to another. As stated previously, using estimates developed for the Forest Plan, combined with disturbance that occurred for pvt OGD in the past, around 4 percent of the ANF could be disturbed and cleared to some degree by 2020.

2. Pvt Forest Age and Stocking

Forest age and stocking is not as directly influenced as forest composition is by pvt OGD, as most areas cleared for OGD are converted to a non-forested or non-vegetated condition. Some natural seeding of trees on disturbed areas is anticipated. However, the location and amount of natural tree regeneration on previously disturbed areas is difficult to predict, as many variables such as seed source, interfering vegetation, and deer browsing impacts affect this process.

Alternatives 2 and 3 restrict the use of heavy equipment on soils that are commonly wet or on soils incapable of supporting equipment without incurring detrimental compaction. Avoiding the use of heavy equipment on these more sensitive soils will help maintain long term soil productivity on these sites and ensure their continued ability to support tree cover and a forested ecosystem in the long term. Otherwise, there are no real differences in the effects of each alternative on forest age and stocking.

3. Forest Health

Forest health is also not as directly influenced as forest composition is by pvt OGD. Alternatives 2, 3, and 4 specify that measures to reduce impacts of noxious or invasive plant species be included for activities that contribute toward the spread of these plants. This will help reduce the likelihood of noxious or invasive plant species introduction, better maintaining the long term sustainability of forested ecosystems on the ANF (see non-native invasive species section).

These measures will also help reduce the likelihood of forest pest introduction, which can impact forest health. Otherwise, there are generally no real differences in the effect of each alternative on forest health.

4. Forest Vegetation Management

Forest vegetation management is a tool used to achieve desired forest vegetation conditions on the landscape. Vegetation management includes various silvicultural systems and often associated reforestation treatments. Vegetation clearing associated with pvt OGD is not considered forest vegetation management. There are no differences related to forest vegetation management between the alternatives; therefore, there are no differences in the effects of each alternative on forest vegetation management.

Cumulative Effects

Private and state lands within and surrounding the ANF, also have OGD activities occurring on them. Development activities on adjacent private, state and federal lands within the proclamation boundary affect forest vegetation similarly to the effects on lands administered by the ANF.

Presently, an estimated 28,000 wells exist within the entire four-county cumulative effects analysis area (including ANF, state, and private lands) (see Appendix C, Table C-6). By applying the same anticipated future pvt OGD rates to the surrounding four county area, it is estimated a total of nearly 54,000 wells could exist in the entire cumulative effects analysis area (includes ANF, state and private lands in the four-county area, or 1.7 million acres) by the year 2020 (see Appendix C, Table C-6). This would result in nearly 4 percent of the total cumulative effects analysis area consisting of non-forested lands from pvt OGD, similar to the amount anticipated for the ANF. Areas developed for roads associated with pvt OGD on private and other publicly owned lands will not vary by alternative.

Marcellus Shale Development

The future of pvt Marcellus shale development on the ANF is difficult to predict. The overall effect would be similar to that associated with conventional shallow oil and gas well drilling. Pvt Marcellus shale development would reduce the amount of forested land on the ANF due to the clearing of vegetation, which would change forested areas to non-forested land. The scale of areas cleared of vegetation for Marcellus shale drilling is much larger than traditional shallow oil and gas well drilling, with areas as large as 5 acres cleared for the wellheads and associated facilities. It is possible that forest clearing would therefore be more concentrated with Marcellus drilling, as opposed to numerous, smaller oil and gas

wells. Wider roads would likely be required for Marcellus development, but the amount of vegetation cleared for roads would be dependent on the existing road system. All alternatives require reforestation of unoccupied areas once drilling operations are complete.

Separate estimates for land clearing and associated conversions to a non-forest condition for Marcellus shale development are not being made at this time. Given the limited amount of development to date in deep wells within the four-county area, and given the uncertainty for when deep well development might occur, no additional estimates for road miles or clearing will be made. If development does occur, and if road miles or acreage estimates are exceeded, additional analysis could occur.

Climate Change

In the past, climate change was driven solely by natural processes. Science now recognizes, however, that human interactions with the environment can have climatic consequences on a global scale. Foremost among these recognized interactions is the interaction of greenhouse gasses and solar radiation and the associated changes in global temperature and precipitation patterns.

In general, average global temperatures are increasing and are associated with changing precipitation patterns that threaten to alter local and regional ecosystems to varying degrees. These changes will alter plant and animal distributions, resulting in changed species interactions, population biology, and ecosystem functions. However, scientists cannot yet accurately forecast the degree and timeframes of shifts to forest communities and species habitat.

The Forest Plan provides for maintaining a diversity of plant and animal communities that will enhance the resiliency of the forest to respond to these changing conditions. The Forest Plan also provides for monitoring of forest vegetation for significant changes to forest health and of forest threats that are present (USDA-FS 2007b, p. 50). The FEIS further discusses climate change, and some of the uncertainties associated with predicting the effects on forest vegetation (USDA-FS 2007a, 3-83–3-84).

Responses to such uncertainty include flexible approaches and adaptive strategies (Millar and others 2007). Coupled with ecosystem resilience (the ability of ecosystems to return their original function and processes following disturbance), responses include managing for ecosystem resistance (the ability of ecosystems to resist changes in function and process caused by disturbances) and ecosystem adaptation (the ability of ecosystems to adapt to changing conditions).

By sustaining diverse forest structures and species, the ANF's ecosystem will be better prepared to recover from larger scale disturbances, such as that which may result from climate change.

3.3.2 Plant and Animal Habitats

Affected Environment

The affected environment for plant and animal habitat is described in the FEIS(USDA-FS 2007a, pages 3-184–3-211) and is incorporated here by reference. A description of the current habitat conditions is provided in terms of six habitat indicators.

1. Structural habitat diversity
2. Habitat composition
3. Habitat patterns on the landscape
4. Management indicator species
5. Habitat for game species
6. Habitat for species with viability concerns

Environmental Consequences

Direct and Indirect Effects

In addition to the effects discussion for aquatic species in the following sections, the reader should also reference Section 3.2.2 for a discussion on the effects to water quality which can affect suitable habitat.

Structural Habitat Diversity

Structural habitat diversity is not expected to change substantially from the description in the FEIS, under any alternative as a result of changes in S&Gs. As stated in the FEIS, both early and late structural habitats are expected to increase from the current condition over the long-term (USDA-FS 2007a, pp. 3-261–3-262). The acreage of non-forested habitat (openings) is expected to increase as the result of additional well pads and roads. By 2020 about 9,980 additional acres of non-forested habitat will result from clearing for well pads and roads (Appendix C, Table C-4).

Although the wording varies, all alternatives include S&Gs to minimize clearing widths and surface disturbance, use existing roads where possible, and reclaim and restore disturbed sites. These S&Gs will help reduce the acreage of non-forest openings created by roads and well pads. Alternatives 2 and 3 require that topsoil be salvaged and reused during reclamation and disturbed areas must be stabilized within 30 days and revegetated within 60 days. Alternatives 2, 3, and 4 include provisions for limiting the spread of non native invasive plants and for decommissioning roads both of which should help speed habitat recovery and restoration of impacted habitats. Alternative 3 has the most complete set of reclamation and restoration S&Gs and thus provides the highest likelihood of restoring structural habitat diversity where it has been impacted.

Alternatives 2 and 3 contain S&Gs for maintaining the “old field” habitat and minimizing disturbance to upland shrub and forb communities from pvt and fed OGD. Old field habitats are shrubby and brushy habitats created from the abandonment of agricultural fields. Prior to the establishment of the ANF in 1923, the landscape was scattered with homesteads with varying amounts of agriculture. Some habitat management for early successional species has been focused on these old homesteads. These S&Gs have minor effects to structural diversity across the landscape but are important to species in decline such as woodcock and golden-winged warblers that utilize these shrub and brush habitats for nesting and foraging. Alternatives 1 and 4 do not specifically address old field habitat.

Habitat Composition

In general the composition of forested habitats does not change substantially as the result of pvt OGD. However, the quality and quantity of wetland habitats including springs, seeps, and vernal pools could potentially be impacted by the S&Gs under each alternative. The importance of these unique habitats as breeding and foraging areas for salamanders, frogs, and invertebrates, as well as late winter foraging areas for turkeys, deer, and other wildlife are described in the FEIS (USDA-FS 2007a pp. 3-188–3-189).

Larger wetlands support a diverse assemblage of waterfowl, aquatic furbearers, and marsh birds. Many of the plant species of viability concern are associated with wetland habitats. Recommendations for buffers around wetlands to protect reptiles and amphibians range from >99 feet in Texas to >544 feet in the Eastern United States (Fischer and Fischenich 2000).

Riparian habitats are transition zones between terrestrial ecosystems and aquatic ecosystems and provide the most diverse flora of any habitat on the ANF (Williams and others 1999). Riparian zones support a diverse assemblage of songbirds, waterfowl, bats, turtles, and other animals and plants including many species with viability concerns.

Fischer and Fischenich (2000) summarized recommendations for riparian buffer widths for wildlife from research conducted throughout North America. For forest birds that utilize riparian areas

recommendations from 11 studies for riparian buffer widths ranged from 132 feet in Oregon to greater than 1,650 feet in South Carolina. Eight of the 11 studies recommended buffer widths greater than 330 feet. To protect diverse terrestrial riparian wildlife communities some buffers at least 300 feet wide are required (Wenger 1999).

Vernal pools are small (usually less than 1 acre) seasonal wetlands that lack perennial inlet and outlet streams and have no permanent fish populations. These highly productive habitats support a diversity of frogs, salamanders, and invertebrates (Calhoun and deMaynadier 2007). BMPs in the northeast include a 100 foot no disturbance zone and a less than 25 percent developed area between 100 and 750 feet (Calhoun and others 2005). Based on migration distances of reptiles and amphibians, Semlitsch and Bodie (2003) concluded that buffer distances of 49.5 to 99 feet used to protect wetland species in many states are inadequate for reptiles and amphibians.

S&Gs to protect wetlands, springs, and seeps are addressed in the water resources section. The analysis presented here focuses on the impacts to plants and animals that utilize this broad habitat type.

Alternative 1–As stated in the water resources section, Alternative 1 has a high potential for sedimentation due to limited buffers and no protection of vernal pools. No protection to vernal pools could adversely impact salamanders such as the Jefferson salamander. Jefferson salamanders spend most of the year in the adjacent uplands, and then migrate an average of 653 feet to vernal pools for breeding and egg laying (Calhoun and others 2005). This alternative has a high risk of water quality degradation, which can result in degradation of plant and animal habitat especially for amphibians and reptiles (Semlitsch and Bodie 2003; deMayndier and Hunter 1995; Calhoun and others 2005). Although maintenance and reclamation of new oil and gas facilities are addressed, no guidance is provided for long term maintenance of existing facilities and interim or final reclamation measures. This lack of guidance could result in a delay in habitat restoration.

Alternative 2–S&Gs for erosion control, side-slope equipment limitations, use of organic material to cover exposed soil, long-term maintenance, final reclamation measures, topsoil storage and reuse, would result in limited increases in sediment delivery to streams and wetlands. Use of a high quality durable surfacing material and strong guidance to reduce sediment at road crossings would result in a low risk of degradation of riparian and wetland habitats. Impacts to wetlands, springs, seeps and vernal pools are minimized through designation of buffers and restricting activity in these areas (Calhoun and others 2005).

Alternative 3–S&Gs would provide the highest level of protection for water quality and sedimentation resulting in a high level of protection for streams, wetlands, springs, seeps and vernal pools. In addition to the S&Gs in Alternative 2, guidance for shutting down during wet weather will reduce rutting, compaction, puddling and erosion thus reducing the potential for habitat damage. This alternative places greater emphasis on transportation planning and design of developments. ATV/OHV use is limited to approved corridors. Site reclamation and restoration of impacted habitats are emphasized.

Alternative 4–This alternative has a high potential for impacts to wetland and riparian habitats because there are less restrictive S&Gs for site development. Streams not shown on USGS maps would have minimal buffer widths. Wetlands that are smaller than one acre and vernal pools would receive no specific attention and could be degraded by site development. These smaller wetlands may be important to maintaining the current distribution of amphibians and may serve as sources for re-establishment of populations when nearby wetlands are impacted (deMaynadier and Hunter 1995). The lack of topsoil salvage and reuse could delay the restoration of impacted habitats. Lack of restrictions on use of ATVs/OHVs for pvt OGD not only increases the risk of soil erosion, compaction, and sedimentation but also increases the risk of direct mortality to small mammals, amphibians, reptiles and other less mobile species (Carr and Fahrig 2001; Reid and others 2002; Calhoun and others 2005).

Habitat Patterns on the Landscape

One of the main concerns raised during scoping was the potential for pvt OGD to fragment wildlife habitat. One method for analyzing fragmentation across the landscape is to determine which areas are heavily impacted by roads and well pads and where habitat remains intact and relatively free of new roads and other facilities.

In the FEIS, an analysis of remote habitats was used to determine what habitat was available for wildlife that was sensitive to disturbance (USDA-FS 2007a, pp. 3-227; 3-266). Eight areas (33,000 acres) were identified as high quality remote habitat and include Allegheny Front, Clarion River, Cornplanter, Hickory Creek Wilderness, Tracy Ridge, Morrison Run, Indian Run (Chestnut Ridge) and Steck Run (USDA-FS 2003, Map 6). Impacts to high quality remote habitat in the Morrison Run area were projected to occur (USDA-FS 2007a, p. 3-266).

Based on the number and location of new wells approved since the Forest Plan, and the projected new well development over the next 3 years, a portion of the high quality habitat in the central part of Tracy Ridge and the northern part of Chestnut Ridge could be impacted by pvt OGD. About two thirds of these areas would likely remain unroaded thus providing approximately 7,500 acres of quality remote habitat. Morrison Run would likely see additional pvt OGD as well with about 1,000 acres remaining unroaded.

Since the Federal Government owns the minerals under the Hickory Creek Wilderness, this area would continue to provide about 7,000 acres of high quality remote habitat. Allegheny Front, Clarion River Remote Recreation Area, Cornplanter, and Steck Run, currently do not have projections of pvt OGD and will likely remain relatively free of new roads during the planning period. These areas would continue to provide high quality remote habitat on about 12,100 acres (USDA-FS 2003b).

The amount of high quality remote habitat that would remain free of new roads was projected to be 88 percent of the projected level in the FEIS (USDA-FS 2007a, p. 3-260). Based on current information, and oil and gas projections, the amount of high quality remote habitat would drop to about 84 percent of the 2007 Forest Plan projected level under all alternatives. Over the long term, some habitat would be reclaimed and restored and some roads would be decommissioned. As addressed under the sections on habitat composition and structural habitat diversity, Alternative 3 provides the most comprehensive reclamation and restoration S&Gs that would be most effective in restoring remote habitat conditions.

Twenty-nine smaller areas were identified as quality remote habitat providing at least 500 acres of interior habitat without roads or motorized trails. Eleven of these areas have current or projected pvt OGD. Similar to the FEIS estimate, about 60 percent of the quality remote areas would likely remain free of new roads under all alternatives (USDA-FS 2007a, pg. 3-260). Alternative 3 provides the most comprehensive reclamation S&Gs to restore remote habitat conditions over the long term.

MAs established in the Forest Plan provide several large blocks of contiguous high canopy forest (core areas) that are linked by contiguous canopy corridors (MA 2.2). About 6 percent of core areas and 36 percent of landscape linkages occur within known oil and gas fields under Alternatives 2 through 4. In Alternative 1 there is 5 percent of the core areas within existing oil and gas fields, but connecting corridors are not provided. All alternatives include S&Gs to minimize clearing widths and surface disturbance, use existing roads where possible, and reclaim and restore disturbed sites with Alternative 3 being the most comprehensive. These S&Gs will help minimize habitat fragmentation at a landscape scale.

With the exception of the Hickory Creek Wilderness, all of the core areas contain private oil and gas reserves, thus the potential for pvt OGD remains. Unless further acquisition of mineral rights occurs, S&Gs do not preclude future impacts to high quality remote habitat. The degree of fragmentation and resulting impact to wildlife will depend on the density of new wells and associated new road construction. Long-term restoration of fragmented habitats will depend on the effectiveness of reclamation S&Gs and the extent of road decommissioning.

Management Indicator Species

Northern Goshawk

Northern goshawks are an indicator of diverse forested landscapes with predominantly mature forest conditions and minimal human disturbance (USDA-FS 2007a, p. 3-195). A detailed account of the life history of the northern goshawk is provided in the BE for the Forest Plan (USDA-FS 2007c p. 133–148). Since 2007, goshawk nesting success on the ANF has declined. Of the 43 known territories on the ANF only one nest successfully fledged one young in 2008. In 2009, no young were known to successfully fledge, and predation was documented as one of the causes of nest failure.

Habitat alteration is believed by some researchers to be the greatest threat to northern goshawks (Roberson and others 2003) while others believe that West Nile virus and predation may be impacting nest productivity (Brinker pers. comm.). Fragmentation of forested habitats can make the area more attractive to competing species such as great horned owls and red-tailed hawks (Roberson and others 2003). Where this occurs, these species can replace the goshawk or reduce nest productivity.

Goshawk management on the ANF emphasizes (1) protection of known nests, (2) maintenance of suitable structural conditions around known nests to provide for development of alternate nest sites, (3) maintenance of preferred structural conditions within the Post –Fledging Areas (PFA), and (4) Maintenance and enhancement of structural conditions that will provide abundant prey and improved goshawk foraging habitat.

Direct and indirect effects can be evaluated by examining pvt OGD activities that may cause direct mortality or harassment to individual birds as well as activities that may alter habitat conditions at either the nest site or landscape scale. Well density may influence northern goshawk habitat use. Fifty-five percent of known goshawk nests occur in areas with a density of wells between one and 33 per square mile. At 67 wells per square mile, no nests are known to occur (USDA-FS 2007c p. 146).

Alternative 1–Moderate level of nest protection with a 330 foot no disturbance zone and a 660 foot no road construction zone around active nests. During the nesting season when goshawks are laying eggs and rearing young, a 1,320 foot no pvt OGD zone is implemented. No landscape scale S&Gs are provided to maintain PFAs or foraging habitat and no measures to decommission roads to restore the site are offered.

Alternative 2 and 3– High level of nest protection with no activities that modify the landscape within 660 feet of an active nest. No road construction is allowed within 1,320 feet of an active nest. During the nesting season road construction activities are restricted within 2,640 feet of the nest. To provide PFAs and foraging habitat 70 percent of a goshawk territory is maintained in mid to late structural habitat, and new permanent openings greater than 4 acres are not permitted within the territory. Alternative 3 provides the most comprehensive reclamation S&Gs to restore goshawk habitat and decommission roads over the long term.

Alternative 4–Nest protection measures would be negotiated on a site specific basis with input from the PADEP and Pennsylvania Game Commission (PGC). Since goshawks are not a state listed species, compliance with PGC recommendations would be voluntary. Voluntary compliance increases the risk that measures would not be consistently implemented.

Since northern goshawks are a MIS for predominately mature forest conditions with minimal human disturbance, other species that would benefit from measures that conserve goshawk habitat include a suite of other forest raptors, great blue herons, forest interior song birds, fishers, bobcats, northern flying squirrels, and others.

In summary, northern goshawk nesting success continues to decline on the ANF. The suite of species hat uses similar habitat represented by the northern goshawk may also be declining. Increased disturbance from a variety of activities (not just pvt OGD) is suspected to be one of several possible causes.

Alternatives 2 and 3 provide the most effective protection of individual nests while providing some landscape level habitat guidelines (Roberson and others 2003; USDA-FS 2007c).

Cerulean Warbler

Cerulean warblers are an indicator of mid to late structural oak forest with some canopy gaps (USDA-FS 2007a, p. 3-195). Preliminary observations indicate that Ceruleans like to nest high in the canopy near the edge of the canopy where they can easily gain air lift when leaving the nest to search for insects (Stoleson pers. comm. 2009). Ceruleans have been found nesting in forests with a variety of road densities, indicating that it is not clear at what density of pvt OGD Ceruleans will be adversely affected (USDA-FS 2007a, pg. 3-238).

All alternatives are expected to continue to provide the landscape conditions preferred by this species, as well as landscape conditions consistent with documented cerulean warbler use on the Forest.

Since Cerulean warblers are a MIS for mid-late structural oak habitat with gaps in the canopy, other species that would benefit from measures to conserve Cerulean habitat include a suite of interior forest song birds including scarlet tanagers, black-throated blue warblers and black-throated green warblers.

Timber Rattlesnake

Timber rattlesnakes are an indicator of remote deciduous forests with minimal human disturbance (USDA-FS 2007a, p. 3-195). Construction of new roads and well pads can potentially disrupt den sites and open access into areas that were once remote. Although it is illegal to kill rattlesnakes, fear of snakes often results in injury or death to the snake during encounters with humans.

Alternative 1–Moderate level of protection. New roads and other facilities would be located to avoid rocky areas and southern and southeastern exposures suitable for snake dens (USDA-FS 1986, p. 4-38). No buffer zone would be placed around known den sites.

Alternatives 2 and 3–High level of protection. New roads are prohibited within 450 feet of known timber rattlesnake den sites. This guideline is consistent with the guideline used by the PA Department of Conservation and Natural Resources (DCNR). To protect the integrity of the den site, large rocks and boulders should not be moved, and soil compaction should be minimized.

Alternative 4–Moderate level of protection. Site specific mitigations would be developed for oil and gas development in the vicinity of known rattlesnake habitat in cooperation with PADEP and the PFBC.

All alternatives recognize the wildlife values associated with rock outcrops and boulder areas with guidelines to avoid disturbing these important wildlife features.

Alternatives 2 and 3 provide a specific buffer distance around known dens. Alternative 4 may provide a buffer zone, but the risk of applying ineffective measures or of non-compliance is higher because compliance is voluntary. Alternative 1 does not specify a buffer around dens but provides a general guideline to protect rock outcrops.

The PFBC surveyed known historic dens across the ANF and found many to no longer be occupied by timber rattlesnakes indicating a long term downward trend in populations. Since completion of the 2007 Forest Plan, an extensive timber rattlesnake monitoring effort in cooperation with the PFBC has been initiated to locate new den sites and gain a better understanding of rattlesnake movements. In 2008 radio transmitters were implanted in four snakes and two new dens were found and reproduction was documented at several dens. This study will be continuing in 2009, but initial results are encouraging.

Aquatic Invertebrates

This group of species is an indicator of stream habitat quality, including substrate and water quality. They are also an indicator that habitat is suitable for other aquatic and riparian species, such as

amphibians and reptiles. Some invertebrates are less tolerant to altered stream conditions while others are more tolerant of disturbance (USDA-FS 2007a, p. 3-204). They occur in just about any stream or impoundment where water quality and physical habitat conditions are suitable. Within the ANF, this includes several hundred miles of streams (USDA-FS 2007a, p. 3-203), which is the focus for the following discussion for direct and indirect effects.

Several S&Gs would remain similar enough across the four alternatives to provide the same level of protection as described in the FEIS (USDA-FS 2007a). Included are ones that address directing surface runoff from roads and well pads into effective filtering areas and not into streams, wetlands, and springs; keeping streams free of equipment, oil, logging debris, and other materials or obstructions; using energy dissipaters to prevent gully formation on discharge slopes; timing requirements for the removal of production equipment when production ceases; and decommissioning roads that are no longer needed, including temporary roads.

Numerous S&Gs however would be different enough across the alternatives that could potentially result in varying levels of effects to the diversity and abundance of aquatic invertebrates. The following discusses these for each alternative.

Alternative 1–his alternative poses a slightly higher risk to aquatic invertebrates than either Alternatives 2 or 3 because suitable habitat has a slightly higher chance to be impacted by sediment generated from earth-disturbing pvt OGD activities. There is no S&G prohibiting the use of heavy equipment on slopes greater than 40 percent. Working on slopes (to construct roads and well pads) greater than 40 percent increases the chance of runoff reaching a stream. Gully formations are more easily formed from road runoff, resulting in not only sediment carried from the road surface, but erosional sediment carried from the gully formation to a stream.

To minimize impacts from dirt and gravel roads, there are S&GS stating roads should be constructed outside the riparian area, be built where there is an effective filter strip between the road and stream, and surfacing roads with a type of stone to minimize sediment. To further minimize sediment input to streams, perennial and intermittent stream crossings would be surfaced with a high quality surfacing material. The construction of new roads would limit the grade of the road except for short pitches, thus minimizing potential runoff concerns that can occur from roads built with steeper grades. The ANF can suspend the use or construction of roads if unacceptable damage is or would occur, which would prevent rutting and runoff. ATV and OHV use is not permitted cross-country, thus avoiding potential runoff to streams and impact to suitable habitats. During road construction and reconstruction at perennial and intermittent stream crossings and areas that could affect water quality and aquatic species/habitat, interim and final erosion control measures would be implemented. This S&G doesn't specify the number of days in which to complete these measures as does Alternatives 2 and 3, although the interim measures as stated in the S&G should be done concurrently with the activity.

Alternatives 2 and 3–Aquatic invertebrates face a low risk of being impacted under these alternatives. S&Gs for operating restrictions on slopes greater than 40 percent, keeping the grade of new roads to less than 10 percent except for short pitches up to 15 percent, using a high quality surfacing on roads within 300 feet of a stream, protecting all springs (and not just those shown on a USGS quadrangle as in Alternative 4), limiting the use of ATVs/OHVs, requiring stabilization of disturbed sites within a specific timeframe, and preventing the use of dirt and gravel roads during spring thaw or excessively wet weather will all result in minimizing the potential for sediment delivery to streams and protect habitat for aquatic invertebrates.

Varying buffer widths for the various types and classifications of the streams found on the ANF are provided in Table 24 of the Forest Plan (USDA-FS 2007b, p. 75) . Within these areas, road construction and the surface occupancy of pvt and OGD should be avoided. These buffer widths should ensure high water quality and support good habitat for native aquatic organisms (Wenger 1999).

Within the 13 percent area (that area of the ANF that drains directly to the Allegheny River between Kinzua and Tionesta Dams), dirt and gravel roads within 300 feet of a stream are to be surfaced with a high quality material to minimize sediment runoff to the Allegheny River where endangered mussels occur (USDI-FWS 2007), and which will also benefit aquatic invertebrates in headwater streams.

Alternative 4–This alternative will address effects to aquatic invertebrates on two scales, the 13 percent area and the rest of the ANF outside of the 13 percent area.

13 Percent Area

S&Gs applicable to protecting the mussels in the Allegheny River remain in place and will provide protection to aquatic invertebrates in tributary streams as well as the river itself. This includes the following S&Gs: that roads within 300 feet of a stream be surfaced with a high quality material to minimize sedimentation; implementation of riparian corridor buffers the same as Alternatives 2 and 3, which includes avoidance of construction of pvt OGD; where natural revegetation is unlikely, or sedimentation and erosion are concerns, native or desired non-native species will immediately be planted after road construction or reconstruction; stream crossings will be sized to handle a 50-year stream flow; temporary stream crossings should be constructed to accommodate a minimum of bank full flow; and pvt OGD will implement and maintain their submitted Soil Erosion and Sedimentation Control Plan and Spill Prevention Plan.

ANF Outside the 13 Percent Area

This alternative is the least restrictive of the four. There is no S&G prohibiting the use of heavy equipment on slopes greater than 40 percent, nor is there a S&G restricting the use of ATVs/OHVs. There is a S&G for the use of durable surfacing on constructed pvt OGD roads, which may or may not be of a high-quality.

Alternative 4 provides a S&G that roads should be built with grades less than 10 percent, but short pitches of 15 to 20 percent could occur. These percentages are steeper than the S&Gs for Alternatives 1, 2, and 3. Small increases in the grade of the road greatly increase the runoff potential and the formation of rutting and washing of the road. It becomes difficult to retain adequate gravel surfacing at these grades. When rutting begins, water runs down the road carrying sediment with it. If a stream is located adjacent to or at the bottom of these steeper grades, sediment is more likely to reach the watercourse.

Riparian areas are not specifically addressed in a S&G, but Alternative 4 provides a S&G that no well site may be prepared or drilled within 100 feet of any stream shown on the most recent USGS quadrangles, but a waiver can be granted from the State with specific requirements. This leaves out a considerable number of streams that aren't shown on quadrangle maps. However, within this buffer, the buffer is narrowed for the construction of roads and surface occupancy of pvt OGD. Additionally, only springs identified from a USGS quadrangle would be protected. Springs are prevalent across the ANF and generally supply streams with clear cold water throughout the year. Not only do they provide habitat for aquatic invertebrates, they are a conduit to streams where habitat occurs in greater abundance. Preventing impacts to springs will also prevent or minimize impacts to receiving streams.

There is no S&G that prevents pvt OGD from continuing to use dirt and gravel roads during excessively wet periods or during spring thaw.

Alternative 4 requires an operator to conduct weekly inspections of their implemented BMPs and after each measurable rainfall to include the repair of any BMPs to ensure their continued effectiveness.

Specific timeframes are given for stabilizing disturbed areas from pvt OGD similar to Alternatives 2 and 3, but does not require it in watersheds with streams classified as CWF by the State and also allows the stabilization to occur in the next growing season, which can leave exposed soil to runoff during rain events. While the majority of streams on the ANF do not fall into the CWF category, they are still

prevalent, tend to be larger, and provide a substantial amount of suitable habitat for aquatic invertebrates, making up approximately 25 percent of the stream miles within the proclamation boundary. Without timely stabilization, the potential for greater amounts of sediment to move offsite are increased.

Mourning Warbler

Mourning warblers are an indicator of early structural habitat (USDA-FS 2007a, p. 3-195). Dense shrubs and saplings with at least a partially open overstory are preferred habitat. The degree to which mourning warblers may find oil and gas developments suitable is unknown. Roads and well pads that develop a shrubby forest edge may provide suitable nesting habitat especially where well spacing is dense. This benefit is partially offset by the conversion of forest to non-forest by the road surface and well pad that are not revegetated.

Although monitoring of mourning warblers in pvt OGD has not been completed, based on professional judgment, all alternatives are expected to have a slight short term beneficial impact associated with the shrubby forest edges along pvt OGD.

Alternatives 2 and 3 have S&Gs that specifically address the maintenance of "old field" habitat and upland shrub and forb communities. These guidelines would benefit mourning warblers by providing nesting and foraging habitat. Reclamation S&Gs are more comprehensive in Alternative 3 and may result in slight enhancements to some mourning warbler habitat.

Since mourning warblers are an indicator for early structural habitat, most game species such as white-tailed deer, ruffed grouse, and many shrub nesting song birds would be expected to react similarly.

Game Species

Although technically oil and gas roads are not open to the public, hunters often use these roads to drive to an area they plan to hunt. Some hunters welcome the additional access while others prefer the solitude and quiet associated with less roaded areas.

Although new roads will create additional non-forested area, the brushy edges along roadsides and along the edges of well pads may provide forage for deer and nesting and hiding cover for grouse and turkeys. The noise from pump jacks and additional traffic may disrupt game habitat use (Trombulak and Frissell 2000; Forman and Alexander 1998). Generally forest-wide, the increase in hunter access and the increase in edge habitat is not expected to substantially change game habitat or populations.

Alternatives 1, 2, and 3 have an S&G to avoid new road construction in deer and turkey winter ranges and brood rearing habitat. This guideline is designed to provide quality habitat with less risk of disruption in areas utilized by game species when they are most stressed by severe winter weather conditions or when they are raising their young. Alternative 4 does not have a winter range guideline. Some new pvt OGD roads are expected to be constructed in game winter ranges in order to provide access to pvt OGD reserves resulting is additional stress to deer and turkeys during severe winter conditions.

Activities that increase sedimentation and reduce water quality can impact game fish and their habitat (USDA-FS 2007a, p. 3-251). Of primary interest are trout that inhabit many of the coldwater streams that occur on the ANF. The direct and indirect affects described previously for MIS aquatic invertebrates on the two scales are the same or very similar for trout since they inhabit the same coldwater streams across the ANF.

Several S&Gs would remain similar enough to provide the same level of protection to trout and other coldwater species as described in the FEIS (USDA-FS 2007a, p. 3-251–3-253). These include the ones previously discussed for MIS aquatic invertebrates. In addition passage for fish, including trout, is provided for in a S&G in all alternatives to allow access to suitable spawning and rearing habitat on streams with reproducing trout, and stream crossing construction or replacement is restricted during

spawning season (State requirement when issuing a stream crossing permit) to avoid disturbance of streams and creating water quality conditions that could affect spawning success.

An additional S&G that varies slightly across alternatives involves the drafting of water from streams. While it is highly unlikely that drafting of water for use in fracing shallow wells would adversely impact trout, during low water periods some localized areas of a stream could experience short-term impacts. To avoid this, Alternative 4 provides a S&G that addresses this concern, and in addition requiring screens be placed over the intake end of the hose and that no interference with navigation on the stream, migration of fish, or the passage of flood flows occurs. Alternative 3 has a similar S&G, but does not contain wording related to navigation, migration and flood flows. Under Alternative 2, an S&G exists to maintain existing uses such as fish and aquatic life, including threatened and endangered species, but screening is not required. There is no such S&G under Alternative 1.

Species with Viability Concerns

A species viability outcome was determined for each of the 78 species identified during the species viability process completed for the FEIS (USDA-FS 2007a, p. 3-253–3-255). The outcomes for all species are provided in Appendix A, Table A-3. In Tables A-1 and A-2 of Appendix A, species have been grouped by primary habitat. A detailed description of the life history, distribution, habitat requirements, threats, direct, indirect and cumulative effects are contained in the Forest Plan BE (USDA-FS 2007c) and the species viability evaluation section of the 2007 Forest Plan record (USDA-FS 2007b, Appendix E).

The viability outcome should be thought of as an index of the capability of the environment to support population abundance and distribution, but not as an actual prediction of population occurrence, size, density, or other demographic characteristic. A viability outcome is a judgment based on scientific information found in the literature and from discussions with taxonomic experts. It does not make a yes-or-no determination on viability.

It is important to note that the concept of ecological conditions, distribution, and quality must be based on the knowledge of the species distributional range and life history. For example, some species may have received a viability outcome level of D or E. The reader must realize that many plants and animals occur in a localized or patchy distribution, and thus would rarely occur in the conditions described in viability outcome levels A, B, or C. The uncertainty associated with determining outcomes is acknowledged.

Many of the changes described in this section are the result of pvt OGD being considered as a direct and indirect effect, not just a cumulative effect. The following is a list of species and rationale for those with outcomes that changed from those presented in the FEIS.

The Pennsylvania Natural Heritage Program (PNHP) manages a database of rare plant and animal occurrences in Pennsylvania called the Pennsylvania Natural Diversity Inventory (PNDI). Agencies and private entities can access information on the general location of rare plants and animals during project planning. Oil and gas developers and the Pennsylvania Department of Environmental Protection often request information on rare plant and animal locations from the PNDI during the initial stages of pvt OGD planning. If a rare species has been reported near a proposed project, the State agency with jurisdiction for that species (e.g. PA Game Commission for birds and mammals, PA Fish and Boat Commission for fish, amphibians, and reptiles, and PA Department of Conservation and Natural Resources for plants) will make recommendations for mitigating potential impacts to the species. The ANF works closely with the PNHP to ensure that rare species occurrences are updated frequently for the National Forest.

Under Alternative 4, records from the PNDI would be utilized to determine which rare species occur in the vicinity of the proposed pvt OGD. Measures to protect rare species not listed as State threatened or endangered are not mandatory. Some species considered rare by the ANF are not listed in PNDI and would not receive consideration under Alternative 4.

Northern Flying Squirrel

Under all alternatives, the long-term (by 2060) outcome for the flying squirrel changes from C to D due to the loss of suitable conifer habitat from pvt OGD. There will likely be limited opportunity for population interactions among many of the suitable environmental patches.

Northern Goshawk

Under all alternatives, the short term outcome changes from B to C due to a 25 to 30 percent increase in unsuitable habitat due to pvt OGD (USDA-FS 2007a, Appendix E p. 29). In the long term, the outcome for the northern goshawk would change from B to C under Alternatives 1, 2 and 3 due to the loss of suitable habitat. Under Alternative 4 the long term outcome would drop to D because guidelines for nest protection are uncertain and compliance with the guideline is not required. Suitable ecological conditions would likely be isolated and exist at very low abundance.

Red-shouldered Hawk

The red-shouldered hawk is not included on the current Pennsylvania Natural Diversity Inventory (PNDI) tracked species list; therefore, would not receive protection under Alternative 4. With no guidelines to buffer active nests from disturbance, the long term outcome would drop from B to C under Alternative 4. The outcomes remain the same for the other alternatives.

Eastern Box Turtle

Under all alternatives the long-term outcome for the eastern box turtle would change from B to C as pvt OGD increases and potential for mortality due to roads increases (USDA-FS 2007a, Appendix E p. 32). Suitable ecological conditions would likely become isolated and exist at low abundance. While some of the subpopulations associated with these ecological conditions may be self sustaining, there would be limited opportunity for population interactions among many of the suitable habitat patches.

Timber Rattlesnake

Under Alternative 4 the long-term outcome for the timber rattlesnake would change from C to D, which is the same as the long-term outcome for the other three alternatives. Although some subpopulations may remain self sustaining, there would likely be limited opportunity for population interaction among many of the suitable habitat patches.

Wood turtle

Under all alternatives the long term outcome for the wood turtle would change from B to C. Because the wood turtle has such a small home range and populations and nesting success are not fully known, if one population is lost, interaction between subpopulations could be restricted (USDA-FS 2007a, Appendix E p. 34).

Four-toed Salamander

The four-toed salamander is not included on the PNDI tracked species list. Therefore under Alternative 4, guidelines would not be implemented to protect suitable occupied habitat. The result would be a change in the long term outcome from D to E for Alternative 4. Suitable habitat and populations would become highly isolated with little chance for interaction or colonization of suitable unoccupied habitat. Under

Alternative 1 vernal pools would not have any protective measures so the long term outcome would drop to E. Outcomes under Alternatives 2 and 3 would remain at D.

Jefferson Salamander

The Jefferson salamander is not included on the PNDI tracked species list. Under Alternative 4, guidelines would not be implemented to protect suitable habitat. The result would be a change in the long-term outcome from C to D under Alternative 4. Pvt OGD would likely isolate patches of suitable habitat with limited opportunity for population interactions. Under Alternative 1, vernal pools would not have any protective measures, so the long-term outcome would drop to D. Outcomes under Alternatives 2 through 3 would remain at C.

Aquatic Species (Fish, Mollusks, Aquatic Invertebrates)

The FEIS (USDA-FS 2007a, pp. 3-255; 3-282–3-285) discusses the potential effects to fish, mussels, and aquatic invertebrates. In this analysis, pvt OGD effects are considered direct and indirect and S&Gs differ among the four alternatives.

Similar to MIS and game species discussed previously, the S&Gs that are similar across the four alternatives would provide the same level of protection. One additional standard includes notification to either the USFWS or Forest Service when a federally threatened or endangered species, or a candidate species, is found within an active or proposed pvt OGD. This will allow the opportunity for Forest Plan S&Gs, or any site-specific mitigation to be developed and implemented to protect the species.

As summarized under MIS and game species, many S&Gs are different among the four alternatives, which can lead to changes in the outcomes. Two additional S&Gs would also vary by alternative, and include:

- Existing roads would be managed to avoid or lessen impacts to species with viability concerns under Alternatives 2 and 3 through the use of S&Gs and site-specific mitigation measures. These are species identified by the ANF and include Regional Forester Sensitive Species (RFSS). If impacts cannot be avoided, management changes will be evaluated. Alternative 1 does not contain language specifically addressing this. Under Alternative 4, the species of concern to be evaluated includes species on the PNDI list. Many of the RFSS are on the list, and the level of protection would be similar under Alternatives 2, 3, and 4. However, under Alternative 4, dirt and gravel roads would likely continue to contribute runoff to streams and potentially impact species with viability concern outside of the 13 percent area.
- Under Alternative 4 only, an oil and gas developer is required to request a list of species that may occur on their lease from the PNDI list. If a species is documented, the appropriate state agency in cooperation with the ANF will determine the appropriate mitigation to apply to protect the species. Under the other three alternatives, it is the RFSS that are evaluated by the ANF to determine if any exist within proposed pvt OGD and if present, to propose appropriate mitigation measures to be implemented by the operator.

Considering the above information, and pvt OGD assumptions, outcomes would decrease one level in Alternative 4 in either 2020 or 2060, or both, from the current condition for five fish, three mussels, and 11 aquatic invertebrates from direct and indirect effects (Appendix A, Table A-3). These outcomes are primarily for those species whose habitats include the streams in the interior of the ANF, that is, the area outside of the 13 percent area where less restrictive S&Gs apply. For species that primarily inhabit the Allegheny River and the 13 percent area, no decrease in outcomes would likely occur. This is because the 13 percent area of the ANF that drains directly into the Allegheny River is a relatively small land base (less than 5 percent) contributing to the watershed upstream of Tionesta, it is primarily forested with a large portion in the NRA, and S&Gs for the protection of threatened and endangered mussels will be implemented. Alternatives 1, 2, and 3 would remain the same as the present condition (Appendix A,

Table A-3). Although some S&Gs are less restrictive in Alternative 1, the impacts would likely not be enough to cause a decline in any of the outcomes.

Vascular Plant Species

The Forest Plan BE (USDA-FS 2007c) discusses the potential effects to vascular plants. In this analysis, pvt OGD effects are considered direct and indirect and S&Gs differ among the four alternatives. The following S&Gs are for plant species with viability concerns under Alternatives 2 and 3 and are deemed appropriate to conserve plant species with viability concerns and suitable habitat where implemented. As described in the Forest Plan BE, site specific conservation measures are determined in part by site conditions such as slope, aspect, soil drainage, topography, amount of sunlight available, and amount preferred by species.

Alternatives 1 and 4–S&Gs for plant species with viability concerns that would adequately protect plant species and suitable habitat from disturbance or habitat conversion are generally lacking. Species that are tracked through PNDI are afforded more protection under Alternative 4; however, not all plant species with viability concerns for the ANF are tracked species.

Alternative 2–Prior to ground disturbing activities or vegetation management activities, sites should be evaluated or surveyed for habitat for plants with viability concerns (see Appendix A for species list) to determine habitat suitability and occupancy. Management actions should avoid plant species with viability concerns and their associated habitat unless management is necessary to maintain, enhance, or restore that habitat. Conservation and management activities should be determined on a site specific basis.

Alternative 3–Prior to ground disturbing activities, sites should be evaluated or surveyed for habitat for plants with viability concerns (see Appendix A for species list) to determine habitat suitability and/or occupancy. Pvt OGD activities should avoid plant species with viability concerns and appropriate conservation measures should be determined on a site-specific basis.

American ginseng (*Panax quinquefolius*)

American ginseng is not included on the PNDI tracked species list. It is listed as a 'vulnerable' species in Chapter 45 Plant Code and has guidelines associated with its harvest and selling. However, it does not have specific S&Gs conserving this species during environmental review of ground disturbing projects. Under Alternative 1, S&Gs are lacking for plant species with viability concerns that would adequately protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. Under Alternative 4, guidelines would not be implemented to protect the species or suitable habitat from disturbance and/or habitat conversion. American ginseng is a species of stable habitats, such as the understory of mid- to late-successional deciduous forest. It is physiologically adapted to low light levels, reaching light saturation at levels as low as 10 percent of full sunlight; maximum growth occurs up to 30 percent of full sunlight. Pvt OGD may directly impact species and suitable habitat from ground disturbance (conversion from forest to non-forested conditions) as well as the fragmentation of habitat that could allow sunlight to penetrate forest remnants from the edges of disturbed habitat. Additionally, the more roads there are on the landscape, the more potential for increased access for illegal harvest and collection of American ginseng. The result would be a change for both short and long term outcomes from B to C under Alternative 1 and 4.

Bartram shadbush (*Amelanchier bartramiana*)

Bartram shadbush is included on the PNDI tracked species list as a Pennsylvania Endangered (PE) species. Alternative 4 has specific guidelines to conserve this species if found during environmental review for ground disturbing projects. Under Alternative 1, guidelines for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance and habitat conversion as exists under Alternatives 2 and 3. Suitable habitat for Bartram shadbush is considered to be swamps, sphagnum bogs, peaty thickets, moist woods, and stream banks. There are

broad considerations for wetlands and riparian areas, under Alternative 1; however, only National Wetland Inventory (NWI) identified wetlands, and suitable habitat for this species may exist in areas not specifically mentioned in Alternative 1 guidelines. Without specific guidelines under Alternative 1, the outcome for this species for both the short and long-term changed from D to E.

Bristly black currant (*Ribes lacustre*)

Bristly black currant is included on the PNDI tracked species list as a PE species and has specific guidelines to conserve this species if found during environmental review for ground disturbing projects. Under Alternative 1, guidelines for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. Suitable habitat for bristly black currant occurs in woods, forests, and shrublands. Without specific guidelines under Alternative 1, the outcome for this species for both the short and long term changes from C to D.

Butternut (*Juglans cinerea)*

Butternut is not included on the PNDI tracked species list and therefore does not have specific S&Gs conserving this species during environmental review of ground disturbing projects. Under Alternative 1, guidelines for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance and habitat conversion as exists under Alternatives 2 and 3. There are broad considerations for riparian areas, under Alternative 1; however, not all suitable habitat is included. Under Alternative 4, species specific S&GS would not be implemented as it is not a tracked species in PNDI. Butternut typically grows in rich mesophytic forests, lower slopes, ravines, and various types of bottomland, including banks and terraces of streams and floodplain forests. This species achieves its best growth in well-drained bottomland and floodplain soils. Without specific S&Gs under Alternatives 1 and 4 to protect the species and suitable habitat, the outcome for this species for both the short and long-term changes from D to E.

Canada yew (*Taxus canadensis*)

Canada yew is not included on the PNDI tracked species list and therefore it does not have specific guidelines conserving this species during environmental review of ground disturbing projects. Under Alternative 1, guidelines for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. Under Alternative 4, species specific guidelines would not be implemented as it is not a tracked species in PNDI. Canada yew is a slow growing, shade tolerant species that grows best in the stable environmental conditions of climax forests, and does not occur in early or mid-successional communities. On the ANF it is found on three sites. Without specific S&Gs under Alternatives 1 and 4 to protect the species and suitable habitat and the few occurrences within the ANF, the outcome for this species for both the short and long-term changes from D to E.

Checkered rattlesnake plantain (*Goodyera tesselata*)

Checkered rattlesnake plantain is not included on the PNDI tracked species list and therefore does not have specific S&Gs conserving it during environmental review of ground disturbing projects. Under Alternative 1, guidelines for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. Under Alternative 4, species specific S&GS would not be implemented as it is not a tracked species in PNDI. Checkered rattlesnake plantain is a woodland species typically found growing in upland coniferous or mixed deciduous and coniferous forest. Glacial/outwash influences habitat. On the ANF suitable habitat is limited to the northern sections. This genus has an unusual life history. It grows for many years as an underground, probably saprophytic, organism. The basal rosettes eventually are produced and also persist for another period of years. After the flowering stalk appears, this section of

the plant dies and the underground rhizome produces another basal rosette. The entire period from germination to anthesis may take a decade or more. During the underground phase of this plant, occupied sites may be disturbed and converted without even knowing of its presence. Without guidelines under Alternatives 1 and 4 to protect the species and suitable habitat, the outcome for this species for both the short and long-term changes from D to E.

Creeping Snowberry (*Gaultheria hispidula*)

Creeping Snowberry is included on the PNDI tracked species list; however, with a state status of Pennsylvania Rare (PR), it is not afforded the same conservation guidelines as a PE or Pennsylvania Threatened (PT) species. Under Alternative 1, S&Gs for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. There are broad considerations for wetlands under Alternative 1; however, only NWI identified wetlands, and suitable habitat for this species may exist in areas not specifically mentioned in Alternative 1 guidelines. Without specific guidelines under Alternative 1 and less protection then a PT or PE species under Alternative 4 to protect the species and suitable habitat, the outcome for this species for both the short and long-term changes from D to E.

Hooker's orchid (*Platanthera hookeri*)

Hooker's orchid is not included on the PNDI tracked species list and therefore does not have specific S&Gs conserving it during environmental review of ground disturbing projects. Under Alternative 1, guidelines for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. Under Alternative 4, species specific guidelines would not be implemented as it is not a tracked species in PNDI. Hooker's orchid is at the northern edge of its range in Pennsylvania. In Pennsylvania, it can be found in rich, well-drained mixed-deciduous forests in the northern region. This species has a low abundance due in part to edge of range effects. As a plant from a broad range of habitats, this plant has a wide but sparse distribution. This orchid, like a number of orchids, may require limited disturbance that creates light gaps, but not complete canopy removal and conversion to non-forest conditions. Without specific S&Gs under Alternatives 1 and 4 to protect the species and suitable habitat the outcome for this species for both the short and long term changes from C to D.

Kidney-leaved twayblade (*Listera smallii)*

Kidney-leaved twayblade is not included on the PNDI tracked species list and therefore does not have specific S&Gs conserving it during environmental review of ground disturbing projects. Under Alternative 1, guidelines for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. There are broad considerations for wetlands under Alternative 1; however, only NWI identified wetlands, and suitable habitat for this species may exist in areas not specifically mentioned in Alternative 1 S&Gs. Under Alternative 4, S&Gs would not be implemented to protect the species specifically as it is not a tracked species in PNDI. Suitable habitat may be conserved indirectly in terms of wetland mitigations for NWI wetlands; however, non-NWI wetlands and development during winter months with snow cover present may make suitable habitat not visible, especially if within dense rhododendron, so there is risk of habitat disturbance or habitat conversion. Kidney-leaved twayblade is at the northern edge of its range in PA, with one occurrence on the ANF. Without species specific S&Gs under Alternatives 1 and 4 to protect the species and suitable habitat, the outcome for this species for both short and long term changes from D to E.

Mountain starwort (*Stellaria borealis*)

Mountain starwort is included on the PNDI tracked species list; however, with a state status of Tentatively Undetermined (TU), it is not afforded the same conservation guidelines as a PE or PT species. Under Alternative 1, S&Gs are lacking for plant species with viability concerns that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. Suitable habitat is considered springy wooded slopes, sphagnous swamps, and stream banks. There are broad considerations for wetlands and riparian areas under Alternative 1; however, only NWI identified wetlands and suitable habitat for this species may exist in areas not specifically mentioned in Alternative 1 S&Gs. Without specific S&Gs under Alternative 1 and less protection than a PT or PE species under Alternative 4 to protect the species and suitable habitat, the outcome for this species for both the short and long-term changes from D to E.

Mountain wood fern (*Dryopteris campyloptera)*

Mountain wood fern is not included on the PNDI tracked species list and therefore does not have specific S&Gs conserving it during environmental review of ground disturbing projects. Under Alternative 1, guidelines for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. Under Alternative 4, species specific S&Gs would not be implemented as it is not a tracked species in PNDI. Mountain wood fern habitat is described as cool, moist woods, usually found on acidic soils. This species prefers to be moist during much of the growing season. It is tolerant to moderately tolerant of shade. Due in large part to its physiognomic type (forb), perennating bud location (geophyte), and leaf-stem architecture (erect) even minimal trampling can greatly reduce relative plant cover. Without specific S&Gs under Alternatives 1 and 4 to protect the species and suitable habitat, the outcome for this species for both the short and long-term changes from D to E.

Queen-of-the-prairie *(Filipendula rubra)*

Queen-of-the-prairie is included on the PNDI tracked species list; however, with a state status of TU, it is not afforded the same conservation S&Gs as a PE or PT species. Under Alternative 1, S&Gs for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. Suitable habitat for Queen-of-the-prairie is considered to be neutral and basic (alkaline), medium to wet soils, prefers light (sandy) or medium (loamy) soils, and can also grow in heavy clay soil. Requires full sun and can tolerate partial shade. While there may be an increase in open habitat conditions with pvt OGD, the disturbed, compacted soils that remain are not considered to provide suitable habitat based on current conditions along roads and development areas. There are broad considerations for wetlands and riparian areas, under Alternative 1, however, only NWI identified wetlands, and suitable habitat for this species may exist in areas not specifically mentioned in Alternative 1 guidelines. Without specific S&Gs under Alternative 1 and less protection than a PT or PE species under Alternative 4 to protect the species and suitable habitat, the outcome for this species for both the short and long-term changes from D to E.

Red currant (*Ribes triste)*

Red currant is included on the PNDI tracked species list as a PT species. Under Alternative 1, S&Gs for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. Suitable habitat is considered to be wet, rocky woods, swamps, and cliffs with a woodland, sunny edge or dappled shade canopy condition. There are broad considerations for wetlands and riparian areas, under Alternative 1; however, only NWI identified wetlands, and suitable habitat for this species may exist in areas not specifically mentioned in Alternative 1 S&Gs. Without specific S&Gs under Alternative 1, the outcome for this species for both the short and long-term changes from D to E.

Rough cotton-grass (*Eriophorum tenellum*)

Rough cotton-grass is included on the PNDI tracked species list as a PE species. Under Alternative 1, S&Gs for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. Suitable habitat for rough cotton-grass occurs in bogs and swamps. Such areas are generally hummocky with sphagnum moss. The hydric soils of the typical cotton-grass site are moist to occasionally dry upland peat and wet sphagnum with a pH of 4.0-6.5. Such soils are usually saturated with water and deprived of oxygen. There are broad considerations for wetlands and riparian areas under Alternative 1; however, only NWI identified wetlands and suitable habitat for this species may exist in areas not specifically mentioned in Alternative 1 S&Gs. Without specific S&Gs under Alternative 1, outcome for this species for both the short and long-term changes from D to E.

Stalked bulrush (*Scirpus pedicellatus*)

Stalked bulrush is included on the PNDI tracked species list as a PT species. Under Alternative 1, S&Gs for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance /or habitat conversion as exists under Alternatives 2 and 3. Suitable habitat for stalked bulrush occurs in lowland marshes in stream valleys, edges of bogs, boggy meadows, and wet sandy shorelines; lowland alluvial wetlands and ditches. There are broad considerations for wetlands and riparian areas under Alternative 1; however, only NWI identified wetlands and suitable habitat for this species may exist in areas not specifically mentioned in Alternative 1 S&Gs. Without specific S&Gs under Alternative 1, the outcome for this species for both the short and long-term changes from D to E.

Sweet-scented Indian plantain (*Hasteola suaveolens)*

Sweet-scented Indian plantain is not included on the PNDI tracked species list and therefore does not have specific S&Gs conserving it during environmental review of ground disturbing projects.. Under Alternative 1, guidelines for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. There are broad considerations for riparian areas under Alternative 1; however, not all suitable habitat is included. Under Alternative 4, species specific S&Gs would not be implemented as it is not a tracked species in PNDI. Suitable habitat for sweet-scented Indian plantain is described as dry to moist ground at the edge of rivers or streams. The three ANF documented occurrences occur on islands within the Allegheny River. Suitable habitat also occurs along the floodplain areas along the river. Without S&Gs under Alternatives 1 and 4 to protect the species and suitable habitat, the outcome for this species for both the short and long-term changes from D to E.

Threadrush (*Juncus filiformis*)

Threadrush is included on the PNDI tracked species list; however, with a state status of PR, it is not afforded the same conservation S&Gs as a PE or PT species. Under Alternative 1, S&Gs for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. There are broad considerations for wetlands and riparian areas under Alternative 1; however, only NWI identified wetlands and suitable habitat for this species may exist in areas not specifically mentioned in Alternative 1 S&Gs. Without specific S&Gs under Alternative 1 and less protection then a PT or PE species under Alternative 4 to protect the species and suitable habitat the outcome for this species for both the short and long-term changes from D to E.

White trout-lily (*Erythronium albidum)*

White trout-lily is included on the PNDI tracked species list; however, with a state status of TU, it is not afforded the same conservation S&Gs as a PE or PT species. Under Alternative 1, guidelines for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. There are broad considerations for wetlands and riparian areas under Alternative 1; however, only NWI identified wetlands and suitable habitat for this species may exist in areas not specifically mentioned in Alternative 1 S&Gs. Without specific S&Gs under Alternatives 1 and less protection then a PT or PE species under Alternative 4 to protect the species and suitable habitat, the outcome for this species for both the short and long-term changes from D to E.

Wiegand's sedge (*Carex wiegandii*)

Wiegand's sedge is included on the PNDI tracked species list as a PT species. Under Alternative 1, S&Gs for plant species with viability concerns are lacking that would specifically protect this species and suitable habitat from disturbance or habitat conversion as exists under Alternatives 2 and 3. In Pennsylvania, occupied habitat has been characterized as high-plateau white pine-hemlock-mixed hardwood swamps. Suitable habitat is patchy on the ANF. It is most prevalent where beaver activity has inundated the ground and where trees have died due to high water levels. There are broad considerations for wetlands and riparian areas under Alternative 1; however, only NWI identified wetlands and suitable habitat for this species may exist in areas not specifically mentioned in Alternative 1 S&Gs. Without specific S&Gs under Alternative 1, the outcome for this species for both the short and long-term changes from C to D.

Tables that summarize the outcomes by species and primary habitat are provided in Appendix A.

Federally Listed Threatened, Endangered, and Candidate Species

Except for the removal of the bald eagle from the federal threatened list, no changes in the status of federally listed species have occurred since completion of the FEIS (USDA-FS 2007a, pp. 3-209–3-211). Since conservation measures (referred to as S&Gs by the ANF) for federal species are determined through the consultation process with the USFWS under the Endangered Species Act, all S&Gs for federal species in the Forest Plan (USDA-FS 2007b, p. 81–84) apply to all four alternatives and effects remain the same as described in the FEIS (USDA-FS 2007a, p. 3-257–3-259; 3-288–3-289).

Cumulative Effects

The cumulative habitat effects include effects from past, present, and future foreseeable actions from activities on federal and non-federal lands (refer to FEIS for more information on cumulative effects analysis areas). The affected area for cumulative effects varies by section, and is consistent with the Forest Plan. In general the four-county area is used to assess cumulative effects for habitat structure and composition, while the proclamation boundary is used for other elements. Time frames used in the cumulative effects analysis are 2020 to address short-term effects and 2060 to address long-term effects (USDA-FS 2007a, p. 3-261).

The S&Gs for pvt OGD of shallow wells would also apply to deep well drilling into Marcellus shale. In general, impacts associated with deep well development have the potential to be more intense, longer in duration, and have broader landscape level effects. Effects to plants and animals are highly speculative and dependent on site specific conditions. The uncertainty associated with obtaining and possibly transporting millions of gallons of water for drilling operations plus the need for pipelines to transport the gas are examples of potential impacts that may need additional S&Gs, but are uncertain at this time. Once a specific project proposal is received, a site-specific analysis will be completed and may result in

site specific mitigation measures needed to mitigate potential effects to plants and animals to ensure Forest Plan goals and objectives are met.

Not only is there a high degree of uncertainty associated with the intensity, duration, and scale of development for deep well drilling, but there is some uncertainty as to how some animals may respond. Species like Cerulean warblers seem to prefer small opening in the forest canopy and it is uncertain how they would respond to large openings created by Marcellus shale developments. Early structural species like morning warblers may respond favorably to larger openings created by Marcellus developments if activity and noise levels are not too high. This uncertainty opens the door to implementing some adaptive management practices to better understand how some wildlife species respond and what additional mitigation may be needed.

Structural Habitat Diversity

Cumulative increases in both early and late structural habitat for all alternatives are anticipated. Pvt Marcellus shale development may remove forest structure on areas as large as 5 acres for each development site. All alternatives require reforestation of unoccupied areas once drilling operations are complete. No cumulative effect to animals and plants are expected to occur from these small shifts in habitat structure.

Habitat Composition

Cumulative effects to habitat composition include changes in the quality and quantity of oak, conifer, and beech habitat as described in the FEIS (USDA-FS 2007a, pp. 3-262–3-265). Alternatives 2 and 3 provide the most effective measures to ensure that habitat integrity and resilience are maintained in functioning wetland and riparian systems with the best chance to sustain plant and animal diversity over the long term. Both Alternatives 1 and 4 would increase risks to properly functioning riparian and wetland systems by reducing buffer widths and potentially impacting salamanders and other wetland and riparian species (Semlitsch and Bodie 2003; Calhoun and others 2005).

Habitat Patterns on the Landscape

Cumulative effect to habitat patterns across the landscape are the same as those addressed for Alternative Cm in the FEIS (USDA-FS 2007a, pp. 3-265–3-268). The amount of remote habitat, core areas, and habitat connectivity would be reduced in the long term under all alternatives.

Much uncertainty exists when attempting to predict cumulative effects of habitat fragmentation over the long term. In general, Alternatives 2 and 3 recognize the values of core areas, connected habitats, and remote habitats. Cumulative effects are dependent upon how much pvt OGD occurs outside of currently known oil and gas fields within these undeveloped habitats. The potential for pvt deep well OGD (including Marcellus) add to the uncertainty of cumulative impacts to plants and animals. A primary concern would be if repeated entries are made in areas where no previous development exists (new areas of habitat disturbance and fragmentation) and if all undeveloped areas were to be entered (loss of remote habitat and core areas).

Management Indicator Species

The drilling of Marcellus shale will require site-specific analysis at which time additional mitigations to protect MIS may be developed.

Northern Goshawk

Cumulative effects to northern goshawks were analyzed in the FEIS (USDA-FS 2007a, pp. 3-268–3-270). Under all alternatives, by 2060 it is estimated that between 40 and 50 percent of the nesting habitat on the ANF would be unsuitable while foraging habitat would be reduced by 33 percent due primarily to pvt

OGD. Cumulative effects from West Nile virus, increased predation, and disturbance from a variety of forest users would likely contribute to a further decline in the goshawk population.

It is uncertain whether the proposed nest buffers under Alternatives 2 and 3 would be sufficient to mitigate potential impacts of pvt deep well OGD into the Marcellus formation since no studies have been done. It is anticipated that goshawks could be adversely impacted by excessive noise, traffic, and drilling and fracing around the clock for extended periods of time.

Cerulean Warbler

The cumulative effect to cerulean warblers would be more than a 22 percent reduction in suitable habitat over the long term (USDA-FS 2007a, p. 3-272). Larger openings associated with Marcellus operations would likely be less preferred by Ceruleans than small openings associated with shallow wells. It is anticipated that a further reduction in suitable habitat over the long term could occur.

Mourning Warbler

Although some habitat will be reduced (loss due to roads and pads) and some may be enhanced (creation of brushy edges) for all alternatives over the long term, 80 percent of the area within the proclamation boundary will provide potentially suitable habitat (USDA-FS 2007a, p. 3-278). Proper reclamation and restoration of pvt Marcellus OGD sites could result in some enhancement of mourning warbler habitat by creating shrub and seedling habitat suitable for nesting and foraging. Alternative 3 provides the broadest measures for reclamation and is the most likely alternative to provide suitable mourning warbler habitat.

Timber Rattlesnake

Long term cumulative effects of pvt OGD may include habitat fragmentation and loss of habitat quality due to extensive road networks and well pads (USDA-FS 2007a, p. 3-275). Continual monitoring to identify important rattlesnake habitat is essential to reducing potential impacts. Alternatives 2 and 3 provide the most effective measures to protect timber rattlesnakes by establishing a 450 foot buffer zone around known den sites. Pvt Marcellus OGD that require extensive road construction, extensive land clearing, and high traffic levels near occupied rattlesnake habitat could have detrimental effects.

Aquatic Invertebrates

See write-up for aquatic species on page 3-52, as the discussion is similar.

Game Species

The long term cumulative effects to game species are expected to be an increase in habitat loss and disruption of deer and turkey winter ranges and turkey brood rearing habitat (USDA-FS 2007a, p. 3-279). This effect will likely be greatest under Alternative 4, where no protection of game winter ranges is afforded (Moen 1978; Trombulak and Frissell 2000). For trout, there is the potential for some streams on the ANF to be impacted by sedimentation from OGD on private property. Because of the patchwork ownership within the proclamation boundary, streams flow through public and private ownerships throughout much of the ANF. As long as Pennsylvania BMPs are implemented and maintained to an effective level, any potential effects should be minimized.

Species with Viability Concerns

Changes in cumulative outcomes found in Table E-3 of FEIS Appendix E (USDA-FS 2007a) include the northern goshawk, red-shouldered hawk, four-toed salamander, Jefferson salamander, three fish, two mollusks, nine aquatic invertebrates and 19 vascular plant species. Effects associated with future pvt Marcellus OGD are uncertain since scientific studies are lacking. It is anticipated that pvt Marcellus OGD may cause effects due to increased acres cleared, increased noise associated with drilling and

fracing, and increased traffic. The drafting of water for pvt Marcellus OGD would have to take into consideration aquatic species including amphibians and reptiles before being approved by the State.

Northern Goshawk

Based on current nesting data that indicates a substantial drop in nest productivity, the short term cumulative impact would drop from C to D under all alternatives. The long-term cumulative outcome would drop to E under Alternative 4 with no required nest site protection on private lands and with West Nile Virus, predation, and disturbance from forest users possibly contributing to the decline.

Red-Shouldered Hawk

Because red-shouldered hawks are not tracked in the PNDI and do not receive any protective measures under Alternative 4, the long term cumulative outcome would drop from B to C. Outcomes under Alternatives 1 through 3 would remain the same.

Four-toed Salamander

Because four-toed salamanders are not tracked in the PNDI, no mitigation measures would be recommended under Alternative 4. The long term cumulative outcome would drop from D to E under Alternative 4. Under Alternative 1, vernal pools are not protected resulting in a long-term cumulative outcome of E. In Alternatives 2 and 3 the cumulative outcomes remain at D.

Jefferson Salamander

Jefferson salamanders are not tracked in the PNDI. Under Alternative 4 no mitigation measures would be recommended resulting in a long-term cumulative outcome drop from C to D. The long term cumulative outcome under Alternatives 1 would drop to D because of a lack of protection for vernal pools. Cumulative outcomes for Alternatives 2 and 3 would remain at C.

Aquatic Species (Fish, Mollusks, Aquatic Invertebrates)

Pvt OGD and other earth-disturbing activities on non-ANF lands can contribute to cumulative effects. Known oil fields extend beyond ANF lands, and as a result are also developed. The process for drilling is similar in that pvt OGD needs a permit to drill a well and must submit an Erosion and Sediment (E&S) Control plan. The E&S plan includes BMPs to be implemented. It is expected that roads and other activities to develop and maintain well sites are done following Pennsylvania BMPs and their effectiveness maintained; therefore, cumulative effects are expected to be minimized.

As discussed in Appendix E of the FEIS (USDA-FS 2007a), the main reason for effects to occur and outcomes to drop for species that inhabit or have suitable habitat in the Allegheny River is the likely effects from zebra mussels. That threat still exists, and the outcomes for cumulative effects are carried into Table A-3 of Appendix A.

The outcomes for cumulative effects as displayed for the FEIS (USDA-FS 2007a) remain the same for Alternatives 1 through 3. Changes to the outcomes for some species in Alternative 4 could occur and are reflected in Table A-3 of Appendix A. For Alternative 4, the channel darter, gilt darter, creek heelsplitter, longsolid, and 9 aquatic invertebrates would drop to a lower outcome in 2020, with the mt. brook lamprey and creek heelsplitter also dropping to a lower outcome in 2060. These species are associated with smaller, interior streams of the ANF that would be more affected by the less restrictive S&Gs for minimizing sedimentation and stabilizing soils in a timely manner.

Vascular Plant Species

The activities that may impact plant species with viability concerns for non-Forest Service lands and activities within the ANF proclamation boundary are discussed in the Forest Plan BE and are incorporated

here by reference (USDA-FS 2007c). In summary, over-collection of plants or plant parts, changes in local hydrology, habitat alteration/loss from timber harvest, housing development, road construction, invasive plant species, and OGD on private lands, and whether a species was tracked via PNDI were the considerations used for determining cumulative effects outcomes for plant species with viability concerns. In conjunction with the effects described under the direct and indirect outcome sections, the cumulative outcomes for the 19 plant species changed and are displayed in Table A-2 in Appendix A.

3.3.3 Non-Native Invasive Plant Species

Affected Environment

The affected environment for non-native invasive plant (NNIP) species is described in the FEIS (USDA-FS 2007a, pp. 3-290–3-291) and is incorporated here by reference. In summary, NNIP of concern have become established within the ANF proclamation boundary and there are many factors that influence the ability of a particular plant species to become established into new areas and the extent to which a particular species becomes established (Parendes and Jones 2000).

Changes to the information in the affected environment of the FEIS, include an increase in the number of invasive plant species of concern. The ANF Invasive Plants of Concern list has 17 early detection species. These are defined as species 1) not yet found on Forest Service administered land within the ANF proclamation boundary, 2) may be on private land within the proclamation boundary, or 3) these are common landscape plants that are not yet known to be invading natural areas (forest, wetlands, etc.) but are of concern when found. There are currently 55 documented NNIP species of concern on Forest Service administered lands.

Direct and Indirect Effects

Effects by Alternative

The general effects of management activities to NNIP (listed as NNIS) are found within the FEIS (USDA- FS 2007a, pp. 3-291–3-295) and are incorporated here by reference. In summary, management activities that cause ground disturbance and/or create openings in the forest canopy have the greatest potential to facilitate the introduction and spread of NNIP on the ANF. Short-term effects are from changes in canopy cover, allowing more sunlight that enhances habitat for shade intolerant NNIP species. Long-term effects are considered to be forest conversion to openings (areas dominated by herbaceous plants) and non-forest conditions (roads). Roadways are considered the primary corridors for NNIP spread via human activities (Gucinski et al. 2000). In upper Michigan, haul roads have been shown to be the primary conduit for the dispersal of introduced species into the interior of managed stands; this study is considered to be applicable to the ANF (Buckley and others 2003).

In addition to the Forest Service activities discussed under the direct and indirect effects section of the 2007 FEIS, the effects from the application of oil and gas S&Gs on NNIP on Forest Service administered lands is being evaluated for its effects by alternative.

Alternative 1–Specific S&Gs under Alternative 1 to limit the introduction and spread of NNIP are lacking. Existing NNIP infestations are anticipated to persist and spread. Specific guidelines for revegetating disturbed sites in terms of species choice or mulch materials with the least likelihood of introducing unwanted vegetation, such as the use of straw instead of hay are also lacking. As a result it is anticipated that Alternative 1 has the risk for introduction and spread of NNIP.

Alternatives 2, 3 and 4– There are specific S&Gs to limit the introduction and spread of NNIP. These include revegetating disturbed sites in terms of species choice and using mulch materials with the least

likelihood of introducing unwanted vegetation. Factors that favor the establishment and spread of NNIP from pvt OGD are the conversion of forest to non-forested conditions, transport of seeds and plant propagules on equipment, transport of seeds and plant propagules in soil, road surfacing materials, and mulch. The conversion of forest to non-forest conditions creates and maintains a 'disturbance corridor' in which compacted and disturbed soils and increased sunlight are beneficial to NNIP. S&Gs that expedite the seeding and growth of desired species are deemed effective in lessening the amount of growing space available to NNIP species. It is well established that seed and plant propagules can be transported via motorvehicles and equipment that has mud and debris (Zwaenepoel et al. 2006; Carlton and Ruiz 2000). It is also reasonable to assume that the cleaner a piece of equipment, road surfacing, and mulch materials are, the less likely they will transport soil and plant debris capable of germinating and establishing itself in a new area if growing requirements are met.

Cumulative Effects

The cumulative effects boundary for NNIP is the same as was defined for the FEIS. As described in the FEIS, the primary non-federal activities that occur within the CE boundary that can facilitate NNIP invasion and spread include agriculture, timber harvest, residential development, road construction, and pvt OGD on private lands. Marcellus shale development on the ANF is also a reasonably foreseeable future action. Recognizing that the activities listed are variable depending on current markets, supply and demand and current and projected financial conditions, pvt OGD (including Marcellus shale) is predicted to have the greatest amount of growth in both the short and long term and as such the greatest amount of ground disturbance and habitat conversion that can lead to the spread and establishment of NNIP. Marcellus shale development is anticipated to require larger well pads (approximately 5 acres for current test wells), increased road clearing widths due to larger equipment used, and increased travel to the well. The S&Gs for NNIP prevention do not vary by alternative for Marcellus shale development and are as described under direct and indirect effects. The larger areas for pvt OGD that converts forest to non-forest conditions with Marcellus development has the potential for more suitable habitat for NNIP infestation and spread; however, there are no changes in S&Gs that would more effectively deal with NNIP prevention than those previously discussed.

3.4 Social Environment: Direct, Indirect, and Cumulative Effects

3.4.1 Recreation Opportunities, Forest Settings, and Congressionally and Administratively Designated Areas

This section of the document will discuss recreation opportunities, forest settings, and congressionally and administratively designated areas. This includes trails, dispersed and developed recreation sites, wilderness, recommended wilderness study areas, wild and scenic rivers, national recreation areas (NRAs), scenic and research natural areas, experimental forests, and historic areas on the ANF. Each of the following sections (affected environment, environmental consequences- effects common across alternatives, and effects from each alternative) follows the same general format found in the FEIS, organized by broad resource category related to recreation.

Affected Environment

The affected environment for recreation opportunities and forest settings on the ANF is described in the FEIS (USDA-FS 2007a, pp. 3-296–3-310). Current recreation opportunities and forest settings are described in terms of developed recreation, dispersed recreation, and trails. The affected environment for congressionally designated areas on the ANF is described in the FEIS in three sections: (1) wilderness and roadless areas, (2) wild and scenic rivers, and (3) NRAs (USDA-FS 2007a, pp. 3-329–3-334; 3-344–3-

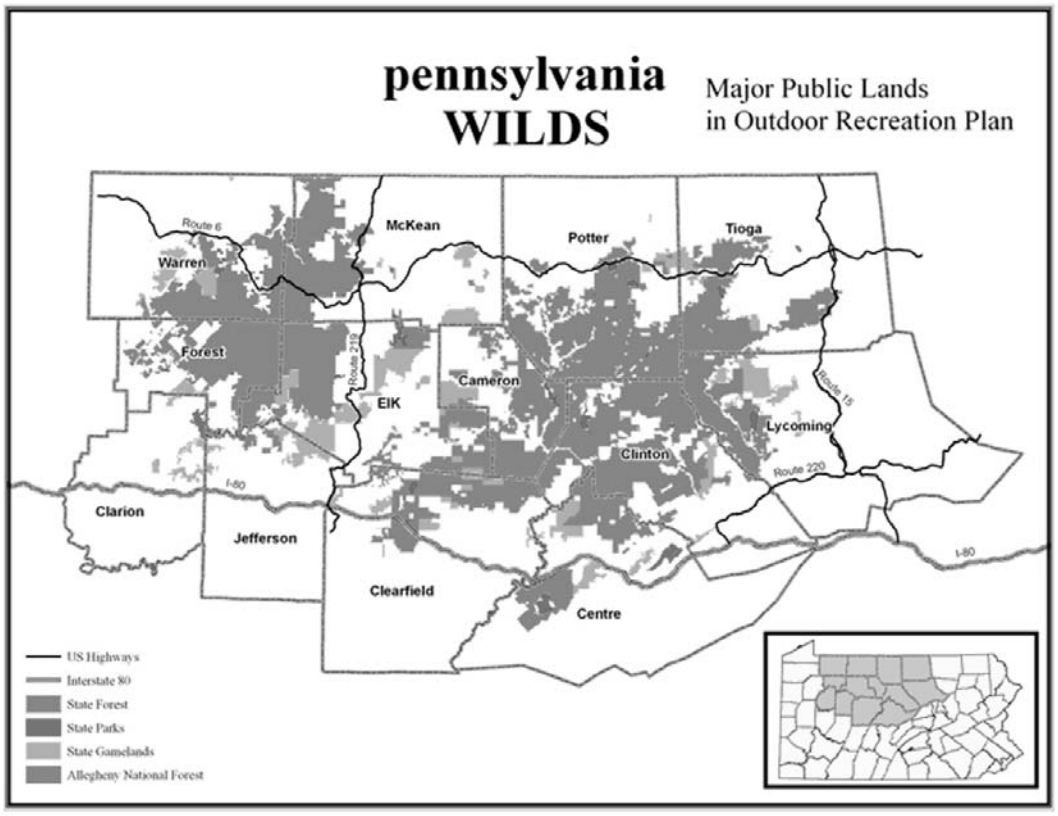
348; 3-352–3-356). The affected environment for administratively designated areas on the ANF is described in the FEIS (USDA-FS, 2007a, pp. 3-360–3-363). A brief summary of the affected environment for each follows, organized by topic.

The affected environment for recreation opportunities and forest settings, and congressionally and administratively designated areas from the FEIS for the 2007 Forest Plan is incorporated by reference.

1. Recreation Opportunities and Forest Settings

The recreational market area for the ANF can be defined on local and regional scales. Locally, the market area primarily consists of users from a four-county area: Elk, Forest, McKean, and Warren. Eighty percent of visitors to the ANF live within a 100-mile radius of the forest (i.e., the four-county area) (USDA-FS 2002). To a lesser degree, visitors come from Ohio, Maryland, New Jersey, New York and West Virginia (Shifflet and others 1997).

Figure 3-4. PA Wilds market area



The secondary market area consists of a regional marketing area referred to as PA Wilds (see figure 3-4). PA Wilds is a 12-county region highlighting and marketing outdoor recreation related experiences and activities in Pennsylvania. It encompasses more than 1.6 million acres of public lands, including the ANF.

Annual visits to the ANF are expected to increase from approximately 1.59 million in 2000 to 1.61 million visits in 2020. This represents a slight to moderate increase or 1.2 percent in the next 25 years (Bowker, personal communication). This prediction is based on the current user base. A change could occur in the future in which more users come from outside the four-county area to visit the ANF. Marketing strategies such as PA Wilds could attract more visitors from areas farther away.

Some people desire an emphasis on undeveloped, remote recreation settings while others desire more development and easier access. One goal for the ANF is to provide an appropriate mix of recreation settings for a variety of users. The present range of opportunities provided on the ANF is described based on the Recreation Opportunity Spectrum (ROS). The ROS is a nationally recognized classification system that describes different recreation settings, opportunities, and experiences available to visitors. ROS classes are defined by:

- Physical Setting
- Size
- Remoteness–distance from roads and settlements
- Naturalness–level of human modification to the landscape
- Social Setting–number of encounters with other people within a typical day
- Managerial setting–degree of visitor controls

The following table displays the current distribution of ROS classes provided on the ANF. A more complete description of ROS development levels and ROS classes can be found in Table 3-74 of the FEIS (USDA-FS 2007a, p. 3-300). An ROS inventory completed in 2004 indicated there are no primitive, semi-primitive motorized or urban ROS classes presently available on the ANF. Roaded natural is the most common ROS class, presently provided on 63 percent of the ANF, followed by the rural ROS class, which is presently provided on 21 percent of the ANF. ROS classes defined by a lack of roads and other developments, such as primitive and semi-primitive settings, are the rarest ROS class presently available on the ANF.

Table 3-10. ROS classifications and acreage on the Allegheny National Forest

Development Level	ROS Class (Existing)	2004 ROS Inventory (acres)
Development Level 1	**Primitive**	**0**
Development Level 2	**Semi-primitive, non-motorized**	**18,783**
	Semi-primitive motorized	**0**
Development Level 3	**Roaded natural**	**325,679**
	Roaded modified	**63,320**
Development Level 4	**Rural**	**106,388**
Development Level 5	**Urban**	**0**

2. Congressionally Designated Areas

The ANF contains three types of congressionally designated areas which include wilderness, national recreation areas and national wild and scenic rivers.

A. Wilderness

The Wilderness Act of 1964 defined a wilderness as an area of undeveloped federal land designated by Congress that is affected primarily by the forces of nature, where people are visitors who do not remain, and contains ecological, geological, or other features of scientific, educational, scenic, or historic value. Wilderness areas possess outstanding opportunities for solitude or a primitive and unconfined type of recreation, and are large enough so that continued use will not change their unspoiled natural condition

There are presently 9,031 acres of wilderness on the ANF contained within two congressionally designated areas, Hickory Creek Wilderness and the Allegheny Islands Wilderness. These wilderness areas comprise approximately 2 percent of the total ANF land base.

A detailed evaluation of roadless areas on the ANF was completed to consider areas for potential addition to the National Wilderness Preservation System during the 2007 forest planning process (USDA-FS 2007a, Appendix C). Three inventoried roadless areas were identified on the ANF during this process. These include Tracy Ridge, Chestnut Ridge, and Minister Valley. Wilderness study areas are those roadless areas that the ANF is recommending to Congress as potential wilderness. Chestnut Ridge and Minister Valley were included as proposed wilderness study areas in Alternative Cm, while Tracy Ridge will remain part of the existing Allegheny NRA. Only Congress has the authority to create wilderness areas. The Forest Plan provides direction that wilderness study areas be managed to protect wilderness characteristics until Congress decides on their designation.

B. Wild and Scenic Rivers

Wild and scenic rivers are designated by Congress for American rivers that possess "outstanding remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values" in order to preserve them in a free-flowing condition, so they and their immediate environments are protected for the benefit and enjoyment of present and future generations. In Pennsylvania and New Jersey, there are six nationally designated wild and scenic rivers, including the Allegheny and Clarion Rivers located on the ANF. Designated rivers or river segments may be classified as wild river, scenic river, or recreational river. The Allegheny and Clarion include river segments that contain both scenic and recreational river but no wild river classifications. The Forest Service lands along these two river corridors are included in MA 8.1, which contains S&Gs specific to the recreational and scenic classification of the river segments. The direction provided for MA 8.1 is designed to ensure protection of the rivers' free-flow, outstandingly remarkable values, and the protection and improvement of the aquatic resources and hydrologic function of the river.

C. National Recreation Areas

NRAs are congressionally designated areas that have outstanding combinations of outdoor recreation opportunities, aesthetic attractions, and proximity to potential users on a national scale. Areas should exhibit "exemplary" or "showcase" recreational values to merit consideration for National Recreation Area designation. They may also have cultural, historical, archaeological, pastoral, wilderness, scientific, wildlife and other values contributing to public enjoyment (FSH 2371.05(1), FSH 2371.03(3)).

The Pennsylvania Wilderness Act of 1984 established the Allegheny National Recreation Area for outdoor recreation, the conservation of fish and wildlife populations and habitat, the protection of watersheds, the maintenance of free flowing streams and the quality of ground and surface waters, and the conservation of scenic, cultural, and other natural values of the area. Legislation for the NRA allows for pvt OGD subject to reasonable conditions prescribed by the Secretary under subsection (c) for the protection of the area. To the extent practicable, environmental disturbances caused by resource development should be minimized, consistent with the exercise of private property rights

3. Administratively Designated Areas

Certain limited areas of NFS lands not designated as wilderness and containing outstanding examples of plant and animal communities, geological features, scenic grandeur, or other special attributes merit special management. These areas are designated by law, or may be designated administratively, as special areas. Areas so designated are managed to emphasize specific values. Other uses are permitted in the areas to the extent that these uses are in harmony with the purpose for which the area was designated. The ANF currently contains the following administratively designated special areas: Tionesta Research Natural Area, Tionesta and Hearts Content Scenic Areas, Kane Experimental Forest, and Buckaloons Historic Area.

A. Research Natural Areas
The Forest Service designates and manages research natural areas (RNAs) to permanently protect and maintain areas in natural conditions for the purposes of conserving biological diversity, conducting non-manipulative research and monitoring, and fostering education. Tionesta RNA has been managed to maintain the natural features for which it was established and to maintain natural processes.

B. Scenic Areas

A scenic area is a unit of land with outstanding natural beauty that requires special management to preserve this beauty. Tionesta and Hearts Content Scenic Areas are also included in the National Registry of Natural Landmarks. The National Registry, administrated by the U.S. Department of Interior, National Park Service, includes important examples of the Nation's natural history. Tionesta and Hearts Content both contain old growth forests where natural growth cycles have not been disturbed by logging. These areas contain outstanding aesthetic values related to old growth forests and associated large trees. They serve as a primary scenic attraction and recreation destination for visitors to the Forest. The landscape provides high scenic integrity; however there is evidence of human disturbance. Pvt OGD within the Tionesta Scenic Area has altered the natural condition and scenery. Wind damage and introduced insects and disease have also altered these landscapes.

C. Historic Areas
A historic area is a unit of land possessing a significant site or a concentration of sites, buildings, structures, or objects united historically or prehistorically by plan or physical development. Presently the ANF has one administratively designated historic site, Buckaloons. The Buckaloons Historic Area once contained a late woodland 300-acre Seneca-Iroquois settlement located along the Allegheny River.

Environmental Consequences

The environmental consequences of Alternative Cm on ANF recreation opportunities and congressionally and administratively designated areas are described in the FEIS (USDA-FS 2007a).

- Recreation opportunities and forest settings (pp. 3-311–3-328)
- Wilderness (pp. 3-334–3-344)
- Wild and scenic rivers (pp. 3-348–3-352)
- National recreation areas (pp. 3-354–3-359)
- Administratively designated areas (pp. 3-365–3-370)

Scope of Analysis

The scope of this analysis focuses on the S&Gs related to pvt OGD on the ANF, and includes all federal land managed by the ANF. A general discussion of the effects of pvt OGD common to all alternatives is below. This is followed by a more detailed discussion on the effects of pvt OGD S&Gs in each of the alternatives on recreation opportunities and settings and congressionally and administratively designated areas on the ANF.

Direct and Indirect Effects

Effects Common across Alternatives

Pvt OGD has the potential to impact a broad range of recreational opportunities (from semi-primitive to roaded modified or rural), forest settings, specially designated areas, and visitor experiences on the ANF in all of the alternatives being considered. Generally a shift towards a more modified, roaded setting will occur where road construction and pvt OGD occurs. The very presence of pvt OGD has the potential to impact recreation opportunities and experiences and forest settings. The degree of effects will depend on the location and intensity of development, as well as visitor expectations for their recreation experience.

For instance, development of a few oil wells on the edge of a presently unroaded, remote area would have much less of an impact than a large scale development (saturation) in the center of the same area.

Though these S&Gs may result in measurable differences in effects to some resources, such as water quality, given the subtleties and qualitative aspects of recreation resources, forest settings, and variable visitor expectations and experiences, the differences between alternatives are less obvious and are difficult to quantify. S&Gs designed to visually screen pvt OGD and better maintain Scenic Integrity Levels (SILS) may lessen effects, so the expectations of some visitor may still be met. However, the expectations of other visitors seeking more primitive environments may not be met. None of the S&Gs relative to pvt OGD will eliminate the effects to recreation resources and congressionally and administratively designated areas on the ANF.

Similarly, the presence of pvt OGD has the potential to affect congressionally designated areas and the integrity of scenic, research, experimental, and other specially designated areas on the ANF. Management of recommended wilderness study areas and NRAs for wilderness and recreational values could become more difficult where future pvt OGD occurs. Depending on the intensity and location of development, it is possible portions of wilderness study areas could become unsuited as potential wilderness areas in all of the alternatives considered here.

1. Recreation Resources and Forest Settings

Pvt OGD could change the balance of ROS classes, particularly opportunities for remote and non-motorized recreation on the ANF. If intensive pvt OGD occurs in areas that are currently in a semi-primitive, non-motorized ROS class, the ROS class would like shift towards roaded modified.

There is a general lack of "remoteness" on the ANF due to land ownership patterns and permanent roads that fragment the ANF into discontinuous blocks throughout the proclamation boundary. Effects to recreation settings from additional pvt OGD would potentially be greatest in areas where little to no evidence of such activities presently exists.

Environmental modification caused by pvt OGD influences all settings, especially semi-primitive recreation settings. Pvt OGD fragments previously unroaded areas, and decreases the distance of areas from roads or settlements, reducing the remoteness of areas. Pvt OGD reduces the size of non-motorized areas, therefore reducing the amount of semi-primitive non-motorized recreation opportunities available on the ANF. Pvt OGD increases the amount of human modification to the landscape through visible oil and gas facilities and equipment, and odors and noise associated with pumping and drilling equipment. This reduces the naturalness of recreational settings. The number of likely encounters with other people (including pvt OGD personnel) increases with pvt OGD intensity, changing the social setting to a more developed one. In areas with more intensive pvt OGD, additional visitor controls may be necessary for visitor safety around pvt OGD equipment and high pressure gas lines. Those opportunities defined by a greater degree of remoteness and naturalness will shift towards roaded, modified ROS classes where pvt OGD occurs.

The sights and sounds of human presence may diminish some users' experiences while others may not be affected at all. Effects to recreationists occur when the sights and sounds of development interferes with the achievement of a desired recreation experience. Those seeking nature based experiences free from the influence of human sights and sounds may be most affected.

Lands that have been heavily modified by pvt OGD have a somewhat "industrial" appearance, and have been inventoried as roaded modified (63,320 acres). From 1986 to 2005 there were 4,493 new wells drilled on the ANF. To maximize production, close well spacings of 500 feet were utilized in many areas. This equates to approximately one well drilled per every 5 acres. In addition to well pads, land is cleared for access roads to each well..

All of these factors affect the recreation opportunity classification, and therefore the range of opportunities available. As stated previously, generally a shift from remote, primitive settings towards roaded, modified settings will occur in all alternatives.

Due to a progressive rate of pvt OGD on the ANF, semi-primitive lands have become relatively scarce. Currently, MAs 5.1, 5.2, 7.2, 8.2, 8.3, and 8.5 have relatively limited pvt OGD when compared to the rest of the Forest and feature more remote and non-motorized recreation opportunities. Semi-primitive non-motorized areas are defined as typically being greater than 2,500 acres and located ½ to 3 miles from roads open to motorized use (see FEIS Table 3-74) (USDA-FS 2007a, p. 3-300). Semi-primitive non-motorized recreation opportunities presently comprise 4 percent of the ANF and are the rarest ROS class currently provided (primitive, semi-primitive motorized, and urban ROS classes are presently unavailable on the ANF)(see FEIS Table 3-74) (USDA-FS 2007a, p.3-300). Based on MA designations in the Forest Plan, the desired amount of semi-primitive non-motorized recreation class is 10 percent of the ANF. However, semi-primitive opportunities will likely be reduced through the combined effects of pvt OGD, presence of roads, and private land ownership patterns.

The distribution of ROS classes, particularly the amount of semi-primitive non-motorized and motorized opportunities on the ANF, could be used as one measure of the effects of pvt OGD on recreational opportunities and forest settings. However, due to the difficulty in predicting the amount, concentration, and location of future pvt OGD, and where specific S&Gs will be applied, it is not possible to quantify the exact effects on future ROS classification and semi-primitive recreation opportunities available on the ANF. It is likely, however, that semi-primitive recreation opportunities will be reduced in quantity where pvt OGD occurs in these areas. A shift from remote, primitive settings towards roaded, modified settings will occur in all of the alternatives where pvt OGD occurs in more primitive settings.

Opportunities for ATV/OHM trail riding or equestrian trail development and use will not be directly affected by pvt OGD, though the settings for these opportunities will be affected, depending where development occurs. The predominant effect is a reduction in remoteness and naturalness of recreation settings, and an increase in encounters with others. In areas of intensive pvt OGD, equestrians and ATV/OHM riders face a higher likelihood of encountering vehicles and ATVs operated by well tenders and noise and odors associated with drilling and pumping operations. In areas with more intensive pvt OGD, additional visitor controls may be necessary for visitor safety around pvt OGD equipment and high pressure gas lines. In some cases, intensive pvt OGD may affect outdoor recreational settings to the point that ATV user or equestrian expectations are not met.

Opportunities for snowmobile use can be directly affected by pvt OGD. Approximately 63 percent of the ANF snowmobile system is located on ANF system roads with concurrent use by vehicle traffic during the winter months. These roads are often plowed or sanded to improve driving conditions for vehicle passage.

The future forecast of development activity could range from the historic trend of 225 wells drilled per year (low scenario) to an average of 800 wells per year (high scenario). It is assumed an average of 512 wells will be drilled per year over this 15 year planning period. This scenario is a 50 percent increase from the current historic average. A transformation of settings and opportunities will likely occur roughly proportional to pvt OGD. Consequently, more roaded modified settings and less natural and semi-primitive settings could be expected in the future. High intensity pvt OGD in areas where little to no drilling has occurred will adversely affect recreation experiences, and in particular, remote, semi-primitive recreation experiences. As a result, those seeking a more remote and less developed recreation experience could be displaced to other state or national forests where remote, semi-primitive settings and experiences are more readily available.

2. Congressionally Designated Areas

This section provides a general discussion on the effects of pvt OGD common to all alternatives for the three areas listed below.

A. Wilderness and wilderness study areas
B. Wild and scenic rivers
C. National recreation areas

Due to the difficulty in predicting the amount, concentration, and location of future pvt OGD, and where specific S&Gs will be applied, it is not possible to quantify the exact effects on wilderness study areas, wild and scenic rivers, and NRAs on the ANF. For the most part, known shallow oil and gas fields on the ANF are generally located outside of wilderness study areas, wild and scenic river corridors, and NRAs. However, in all alternatives being considered, depending on the location and intensity of future pvt OGD, effects to these areas may occur.

A. Wilderness and Wilderness Study Areas

The subsurface rights for the Hickory Creek and Allegheny Islands Wilderness areas have been acquired, and are federally owned. Therefore, pvt OGD will not directly impact existing wilderness on the ANF. Indirect effects could occur if development were to occur adjacent to the wilderness. All of the subsurface mineral rights are privately owned in the recommended Chestnut Ridge and Minister Wilderness Study Areas. Some pvt OGD has occurred in the past in the Minister and Chestnut Ridge areas. However, drilling activity has been light relative to other parts of the ANF.

Pvt OGD and associated land use activities present one of the greatest potential changes to the character of these areas in the future. Depending on the degree of development, there could be moderate to heavy impacts to recommended wilderness study areas. The degree of impact would depend on the number of wells and the specific locations of developments. It is conceivable that the present remote character and wilderness potential of these areas could be lost. In addition, management of these areas as wilderness may be difficult or impossible to achieve due to pvt OGD activities. Pvt OGD could introduce roads, facilities, noise, activity, and disturbance to these areas. The sights and sounds of human activity, roads and other developments could diminish future wilderness values by reducing the untrammeled and unspoiled natural setting, and opportunities for primitive and unconfined recreation, and solitude.

B. Wild and Scenic Rivers

As subsurface mineral rights are nearly all privately owned in the wild and scenic river corridors on the ANF, these areas are also subject to pvt OGD. The effects of this development on wild and scenic rivers are similar to the effects described in the “Recreation Opportunities and Forest Settings” discussion. As the wild and scenic river corridors on the ANF includes an interspersion of Forest Service and private lands, human activity is readily observed on many parts of the corridor. Therefore, though pvt OGD will reduce the naturalness of most settings, it will not reduce the remoteness or naturalness as much as it would in less disturbed settings, such as the recommended wilderness study areas or the NRA. If intensive pvt OGD occurs in wild and scenic river corridors on the ANF and is visible from the rivers, outstanding remarkable scenic and recreational values could be compromised. S&Gs to maintain SILs and visually screen pvt OGD may reduce this effect to some degree.

C. National Recreation Areas

Subsurface mineral rights in the Allegheny NRA are privately held. A small amount of pvt OGD has occurred in the past. However, most pvt OGD activities in these areas have returned to a mostly natural appearance.

If pvt OGD were to occur in the NRA in the future, depending on the intensity of development, it could significantly reduce the naturalness and remoteness of these areas. Intensive pvt OGD, with new road construction, increased noise and activity levels, and addition of associated facilities could affect the outstanding combinations of outdoor recreation opportunities and aesthetic attractions for which the NRA was established. However, S&Gs to maintain SILs and visually screen pvt OGD may reduce some of these effects.

Recommended wilderness study areas and the Allegheny NRA feature more remote and non-motorized recreation opportunities. Generally a shift toward roaded, modified settings would occur in all of the alternatives if pvt OGD were to occur in these areas. This would adversely affect recreation experiences, as the remoteness and naturalness of these settings declines. As a result, those seeking a more remote and less developed recreation experience would be most affected by an increase in pvt OGD activities, and could be displaced to other state or national forests where remote, semi-primitive settings and experiences are more readily available.

3. Administratively Designated Areas

The following sections provide a general discussion on the effects of pvt OGD common to all alternatives, specifically the four areas listed below.

A. Research Natural Areas
B. Scenic Areas
C. Experimental Forests
D. Historic Areas

Due to the difficulty in predicting the amount, concentration, and location of future pvt OGD, and where specific S&Gs will be applied, it is not possible to quantify the exact effects on scenic areas, experimental forests, and historic areas on the ANF. In all of the alternatives being considered, depending on the location and intensity of pvt OGD, effects to scenic areas, experimental forests, and historic areas on the ANF could occur.

A. Research Natural Areas

All minerals in the Tionesta RNA are federally-owned and withdrawn from development. Thirteen wells that existed prior to the RNA designation are still permitted to operate, with no re-drilling. Therefore, future pvt OGD will not directly impact the Tionesta Research Natural Area.

B. Scenic Areas

The mineral rights in Tionesta and Hearts Content Scenic Areas are privately owned, and therefore subject to pvt OGD. These are both remnant old growth areas, representing old-growth ecosystems largely lost in the eastern United States. Scenic Areas are established for their outstanding scenic values, in order to protect their beauty for public enjoyment. Private mineral development and associated land use activities have the potential to impact scenic value in these areas.

The Tionesta Scenic Area has served largely as an underground gas storage area for at least a decade. It is not expected that there will be any substantial new pvt OGD in the area in the near future. However, if pvt OGD within this area increases in the future, the present remote character and ecological integrity of the area would decline. Similarly, pvt OGD in the Hearts Content Scenic Area would diminish its scenic qualities.

C. Experimental Forests

KEF has been dedicated to forest research since 1932. As subsurface mineral rights are nearly all privately owned in KEF, it is also subject to pvt OGD, which has the potential to impact long term forest ecosystem studies. Conversely, pvt OGD within the KEF could provide opportunities for research to explore ecosystem response to the development of mineral resources.

D. Historic Areas

Mineral rights in the Buckaloons Historic Area are 15/16 held by the Federal government. It is highly unlike that pvt OGD would occur in this area.

Effects from each Alternative – Differences in S&Gs by Alternative

Each of the four alternatives includes various S&Gs that apply to pvt OGD on the ANF. The following sections focus on the effects of the S&Gs included in each alternative on recreation opportunities, forest settings, and congressionally and administratively designated areas, in that order.

1. Recreation Opportunities and Forest Settings

The following discussion focuses on the effects of oil and gas S&Gs on the four primary areas of recreation concern identified during the forest planning process:

A. Range of opportunities based on ROS classes;
B. Range of opportunities for non-motorized recreation;
C. Range of opportunities for ATV/OHM trail riding; and
D. Range of opportunities for equestrian trail development and use.

A. **Range of Opportunities based on Recreation Opportunity Class**

Due to the range of S&Gs related to pvt OGD, Alternatives 2 and 3 would provide more opportunities to mitigate effects to existing recreation settings and opportunity classes provided on the ANF. These alternatives require pvt OGD to meet national SILs, which reduce the degree of human modification of the natural landscape visible to visitors. Long-term storage of pvt OGD equipment such as tanks and vehicles that reduce the naturalness of recreation settings would be limited. Abandoned pvt OGD equipment would be removed and old well sites and roads would be restored to a more natural recreation setting. New and reconstructed roads would visually blend into the landscape to the extent practical, and clearing widths would be minimized. These S&Gs would help maintain the natural appearance of outdoor recreation settings, an important determinant of ROS class.

Alternatives 2 and 3 include S&Gs that require unnecessary roads be completely decommissioned and rendered inaccessible to motorized traffic. This will help restore the remoteness and unroaded character of these areas, and potentially a less developed ROS class. This will also help restore native vegetation and eventual forest cover, more rapidly restoring the natural appearance of these areas.

Alternatives 2 and 3 include S&Gs limiting motorized use on roads that serve a seasonal public to times when visitors are less likely to be in an area. This would reduce the amount of noise and encounters with other visitors. Noise, resource damage, and the spread of noxious weeds would be reduced with S&Gs that control cross-country ATV use by pvt OGD operators. Alternative 4 does not address pvt OGD operators' use of ATVs.

Alternatives 2 and 3 also include S&Gs that require gates to restrict access within ¼ mile of wilderness and remote trout streams. This would control motorized access to these areas, limiting encounters between visitors and maintaining a more remote recreation setting. Alternatives 2 and 3 limit log skidding over designated trails, require the removal of slash near the North Country National Scenic Trail (NCNST), and the maintenance of a snow mat on snowmobile trails. Alternative 3 requires that a 4" mat of snow be maintained, as compared to a 3" mat in Alternative 2. They also require pvt OGD near trails be consistent with ROS development level. Pvt OGD should not compromise the national quality standards for the trails on the ANF, and the NCNST should be managed for its intended purpose.

Pvt OGD is required to be screened along Concern Level 1 and 2 (CL 1, CL 2) travel ways, use areas, and private property in Alternatives 2 and 3. These S&Gs will help reduce effects to the remoteness, naturalness, and social settings of trails and important travel corridors, which would better meet some visitor expectations.

Construction of roads can change the ROS classification of areas and the range of recreation opportunities available. However, due to the difficulty in predicting the amount, concentration, and location of future pvt OGD, and where specific S&Gs will be applied under the alternatives, it is not possible to quantify the exact effects of pvt OGD on the future range of recreation opportunities available on the ANF.

Generally a shift from remote, primitive settings toward roaded, modified settings would occur in all alternatives.

B. **Range of opportunities for non-motorized recreation**

Under all alternatives, it is anticipated that opportunities for non-motorized recreation will decline on the ANF as pvt OGD continues. However, similar to the discussion in the previous section, Alternatives 2 and 3 provide S&Gs to mitigate noise, activity, and degree of visible human caused modification to ANF landscapes associated with pvt OGD.

Non-motorized recreation would continue to be emphasized in MAs 5.1, 5.2, 7.2, 8.2, 8.3, and 8.5 in all alternatives. However, the sub-surface rights on most of the MAs, except for MA 5.1 (Hickory Creek and Allegheny Islands Wildernesses) and 8.5 (Tionesta Research Natural Area), are privately held and open to development. Though non-motorized recreation will continue to be emphasized on the surface of these MAs, pvt OGD may occur in the future. Non-motorized recreation opportunities would be reduced in all of the alternatives if pvt OGD occurs in these areas. Due to the difficulty predicting the location and intensity of future pvt OGD, the amount of reduction in future non-motorized recreation opportunities on the ANF is uncertain.

C. **Range of opportunities for ATV/OHM riding**

Opportunities for ATV/OHM trail riding on the ANF will not be directly affected by pvt OGD, though the settings for these opportunities will be affected depending where development occurs. Alternatives 2 and 3 provide S&Gs to moderate the degree of visible modification to ANF landscape. These alternatives would provide opportunities to mitigate effects to visitor experiences by maintaining settings that better meet their expectations.

D. **Range of opportunities for equestrian trail development and use**

Opportunities for equestrian trail development and use will not be directly affected by pvt OGD, though the settings for these opportunities will be affected, depending where development occurs. Alternatives 2 and 3 provide S&Gs to moderate the degree of visible modification to ANF landscape from pvt OGD. These alternatives would provide more opportunities to mitigate effects to visitor experiences by maintaining settings that better meet their expectations.

2. Congressionally Designated Areas

Due to the range of S&Gs related to pvt OGD, alternatives 2 and 3 would provide more opportunities to mitigate effects to the character of more remote areas on the ANF, including congressionally designated areas where subsurface mineral rights are still privately held. S&Gs to mitigate effects to scenic integrity, remoteness, and natural integrity may help maintain the naturalness of recommended wilderness study areas, wild and scenic rivers, and NRAs to some degree. However, without ownership of the subsurface rights, the potential for pvt OGD, and therefore effects to these areas exists in all alternatives.

In all four alternatives where pvt OGD occurs, the sights and sounds of human activity, roads and other developments could diminish future wilderness values by reducing the untrammeled and unspoiled natural setting, opportunities for primitive and unconfined recreation, and solitude. Similarly, in all four alternatives, intensive pvt OGD could reduce outstanding remarkable scenic and recreational values in wild and scenic river corridors, and affect the outdoor recreation opportunities and aesthetic attractions in the NRA. S&Gs included in Alternatives 2 and 3 to maintain SILs and screen pvt OGD from concern level 1 and 2 travel corridors may help reduce visual effects in these areas. Alternative 4 would still provide for some mitigation of pvt OGD effects on the wild and scenic river corridor, as national scenic rivers are specifically mentioned in the Pennsylvania Oil and Gas Act for additional protections. If pvt OGD were to occur within non-roaded portions of the NRA, areas presently classed as semi-primitive non-motorized could shift to a more developed setting such as semi-primitive motorized, roaded natural, or roaded modified ROS class.

3. Administratively Designated Areas

Due to the range of S&Gs related to pvt OGD, Alternatives 2 and 3 would provide the most opportunities to mitigate effects to the condition of administratively designated areas on the ANF, similar to the earlier discussion in the recreation opportunities and forest settings section. S&Gs related to mitigating effects to scenic and natural integrity and reducing the spread of noxious weeds may help maintain the integrity of administratively designated areas to some degree. The potential for pvt OGD, and therefore effects to these areas, exists in all alternatives.

In all alternatives being considered, depending on the location and intensity of pvt OGD, effects to scenic areas, experimental forests, and historic areas on the ANF could occur.

Cumulative Effects

Private and state lands within and surrounding the ANF, also have pvt OGD activities occurring. Development activities on adjacent private, state and federal lands within the proclamation boundary may also affect recreation experiences; however, the settings on the ANF are not anticipated to change as a result. Within a broader landscape context, the S&Gs included in Alternatives 2 and 3 would exceed standards required by the Commonwealth of Pennsylvania, and therefore possibly better maintain some recreational settings and special areas on the ANF.

Marcellus Shale Development

Marcellus shale, if developed, could result in greater effects to recreation settings and opportunities, and congressionally and administratively designated areas in several ways. The natural sounds and appearance of forest settings may be impacted more than with traditional shallow drilling, due to the scale and duration of Marcellus shale drilling activities. Areas as large as 5 acres could be cleared of vegetation for well pads and associated facilities. Possible security fencing and lighting will be necessary for this type of drilling. Well pads will require compressors, water storage, and water treatment facilities. S&Gs to better mitigate effects to scenic quality in Alternatives 2 and 3 may help maintain a more natural appearance around Marcellus shale developments, where adequate screening and visual design adjustments are feasible. However, the simple scale and duration of these activities has the potential to alter the naturalness of all forest settings, the integrity of special areas, and recreational experiences of visitors.

In areas with Marcellus shale drilling, additional visitor controls may be necessary for visitor safety around drilling equipment, high pressure gas lines, and compressors and haul routes. Effects from this degree of activity and alteration of natural forest settings will be greatest in areas that are presently unroaded. Similar to conventional shallow well drilling, Marcellus shale drilling could change the balance of ROS classes, particularly opportunities for remote and non-motorized recreation on the ANF. Those opportunities defined by a greater degree of remoteness and naturalness will shift towards roaded, modified ROS classes where this occurs. Where Marcellus shale development occurs in areas that are already categorized as roaded, modified or rural ROS classes, effects will result, but the areas will likely remain classed as providing a roaded, modified or rural ROS setting. It is possible that visitor expectations may not be met in areas of active development. If repeated entries are made for drilling of additional wells, effects could be long-term in nature.

Management of recommended wilderness study areas and NRAs for wilderness and recreational values could become more difficult where pvt Marcellus shale development occurs. Depending on the intensity and location of development, it is possible portions of wilderness study areas could become unsuited as potential wilderness areas. Similarly, the scenic and ecological integrity of special areas such as experimental forests and scenic natural areas on the ANF could be reduced where pvt Marcellus shale development occurs.

Drilling and fracturing operations can last as long as 1 year. Fracturing activities must be nearly continuous to be successful. Noise and associated activities of drilling therefore affect the surrounding forest for much longer than traditional drilling. Overall, well sites associated with pvt Marcellus shale development will have an industrial look and sound, with the potential for nearly constant human activity, noise, and lights that could last for months during drilling activities. Additionally, drilling and fracturing in Marcellus shale requires millions of gallons of water per well. This water will most likely be hauled in by trucks, increasing the amount of traffic on roads accessing well sites. This will increase the number of encounters that visitors have with others, as well as increase the potential for vehicle accidents on forest roads.

3.4.2 Scenic Integrity

Scenic integrity is defined as the "state of naturalness, or conversely, the state of disturbance created by human activities or alteration. Integrity is stated in degrees of deviation from the existing landscape character in a national forest" (USDA 1995b, p.Glossary-5). This section of the document addresses the existing scenic condition and environmental consequences of pvt OGD on scenic integrity. Alternatives will be discussed by considering several indicators of scenic value to evaluate the alternatives. One indicator is the ability to define and protect special features and corridors with a concern for scenery. These areas are described as CL1 & CL2 in the scenery management system (SMS). A second indicator uses forest SILs to determine if impacts occur in areas of high SIL. Cases where an unacceptably low SIL would result may be considered for a temporary SIL of rehabilitation.

Scenery is discussed on pages 3-370 through 3-380 of the FEIS and is incorporated by reference.

Affected Environment

Introduction

Visitors indicate that visual appeal of scenic driving is one of the greatest attractions to the ANF landscape. To maintain this visual appeal, the Forest Service established national guidelines for managing scenery with the SMS. These guidelines are used to inventory the landscape and classify the effects of management activities. SMS updates the Visual Management System following many of the same criteria to classify scenery and establish SILs.

Under the SMS, scenic classes are the unit of measure defining SILS. The forest acreage is represented by scenic classes from 1 to 8, and each scenic class was assigned a SIL based on forest priorities for scenery. Scenic classes are the product of landscape visibility and scenic attractiveness. On the ANF, all forest travelways (e.g. roads, trails, use areas, rivers, and streams) were evaluated and all major and secondary corridors and use areas were assigned one of three levels of concern as defined below. FEIS Appendix B (USDA-FS 2007a) contains a summary of the concern level inventory for the ANF.

CL1 travelways and use areas include nationally and regionally important locations including primary roads, scenic byways, trails, wild and scenic rivers and other special designation areas. These CL1 areas have the highest concern for scenery based on heavy recreation traffic and the perception that scenery is one of the primary objectives for traveling these corridors. CL2 travelways and use areas include locally important locations including secondary roads, hiking trails, streams, and all motorized trails. These CL2 areas may have high to low use, and may be traveled for dispersed recreation activities with a moderate interest in scenic viewing. CL3 travelways and use areas include all other forest roads, trails, and streams with a low or seasonal use. The interest in viewing scenery is considered low for these CL3 corridors.

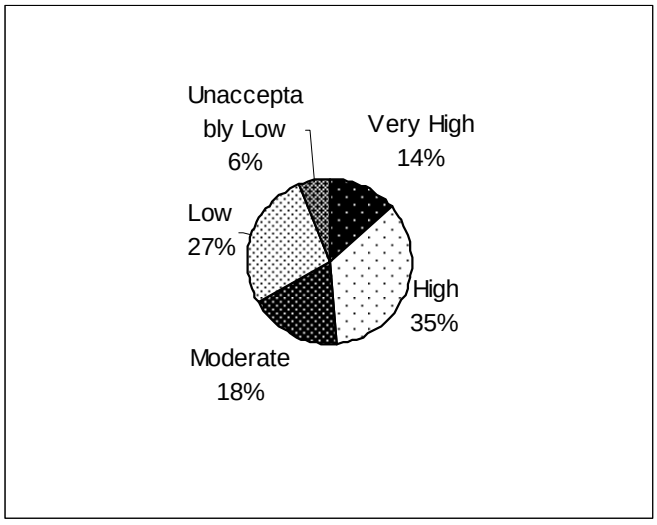
Concern Level 1- Special Features

Numerous special places including the natural and cultural features found on the ANF are associated with a high concern for scenery. High SILs assigned to the foreground of the travel corridors of most concern indicate those areas of scenic importance to a visitor. The NCNST and Longhouse Scenic Byway are examples of scenic corridors of most concern or CL1. Other examples include special features such as Rimrock and Jakes Rocks overlooks the Allegheny Reservoir, the Allegheny NRA, Hickory Creek and Allegheny Islands Wilderness, and Tionesta and Hearts Content Scenic Areas.

Scenic Integrity Levels

During plan revision, the ANF completed an inventory of the current scenic condition of all forest lands in order to provide a baseline to measure change and monitor results of management and activities that modify scenic integrity. Areas with the greatest disturbance have a "very low" SIL. Conversely, areas with little to no disturbance have a "very high" SIL. The range of existing forest SILs includes very high, high, moderate, low, and unacceptably low. Presently, 49 percent of the ANF is classed as "very high" or "high" SIL, while 33 percent is classed as "low" or "unacceptably low" SIL. The remaining 18 percent is considered "moderate" SIL (USDA-FS 2007a, p. 3-372).

Figure 3-5: Existing Scenic Integrity Levels on the ANF



Landscapes that have an existing SIL lower than the adopted SIL are areas of most concern for scenery. Landscapes that have an unacceptably low SIL may need rehabilitation to meet the minimum low SIL. Five landscapes of most concern include the following: Westline Area (14,500 Acres), Longhouse Scenic Byway (4,000 Acres), Salmon Creek (7,000 Acres), Sackett Oil Field (10,500 Acres), and Rocky Gap ATV Trail (6,000 Acres), (Scenery Impacts Worksheet in FP project file).These areas are associated with impacts from OGD including high road density, vegetative clearing, and construction of the facilities themselves. The SMS recommends using "rehabilitation" as a short-term objective to move highly impacted areas such as these to the desired condition over time. An interdisciplinary approach to this rehabilitation goal could be achieved during the planning cycle. Choosing one of these areas to plan project activities would provide the opportunity to achieve scenic integrity goals while meeting the goals of other resources as well.

For a complete description of the affected environment, refer to the FEIS (USDAFS 2007a, pp. 3-370 through 3-372).

Environmental Consequences

Scope of Analysis

The scope of this analysis is the S&Gs related to pvt OGD on the ANF, and includes all federal land managed by the ANF. Discussions address the effects common to all alternatives followed by the effects that differ between alternatives. Indicators used in the comparison of alternatives are special features and scenic integrity levels on the ANF.

Direct and Indirect Effects

Introduction

The historic use of pvt OGD on the forest can be seen as an existing land use with land patterns that result. The cyclic nature of the industry has allowed for over use and recovery over time. Remnant roads that access the high density sites on the forest such as Owls Nest create a historic use and land pattern within the forest landscape. However, as pvt OGD and road density increase over time, the natural appearing forest settings may be affected. What follows are some likely effects from pvt OGD based on industry standards of the past.

A. Effects Common across Alternatives

Pvt OGD activity is a land use that has defined this landscape for over 100 years. Historical use is not necessarily without its impacts, for this land use currently represents one of the greatest effects to ANF surface since 1985. Roads are concentrated in high density developments such as the Sackett Oil Field and are growing denser in others like Westline, and the Rocky Gap ATV area. Developments that access mineral rights are also found interspersed along the well traveled corridors of the Longhouse Scenic Byway, or the NCNST near Salmon Creek. Access roads to storage tank facilities are frequently seen in full view from scenic roads. As a result of this activity, ROS is moving from roaded natural to its sub class, roaded modified, indicating more impacts to the natural appearing forest landscape.

The projected estimate of new pvt OGD is at a rate of 512 new wells per year (Appendix C, Table C-2). If the trend continues as expected, maintaining SILs in certain areas of the forest is unlikely. Although a short-term objective of “rehabilitation” can be assigned to areas falling below SILs, some heavily impacted areas may never reach their desired SIL and may remain in “rehabilitation” throughout the life of the plan. All alternatives include a provision for temporarily lowering the SIL, or the Visual Quality Objective (VQO) in Alternative 1 to rehabilitate an area with an unacceptably low SIL.

Concern Level 1-Special Features

Alternatives 2 and 3 provide S&Gs addressing the mitigation of impacts to the ANF landscape. Special features as viewed from CL1 corridors or their use areas will be offered a better chance of being addressed and appropriate S&Gs applied. Alternatives 1 and 4 do not address the concern for special features on the ANF.

Scenic Integrity Levels

Pvt OGD has the potential to affect scenic quality in all of the alternatives being considered. Generally a shift towards lower SILs would occur where road construction and pvt OGD occurs. The degree of impacts will depend on the location and intensity of development, as well as concern levels of associated travel corridors, topography and existing vegetation cover. Pvt OGD modifies a natural appearing landscape setting through the clearing of vegetation, and the construction of roads and oil and gas facilities. The appearance of equipment and facilities, such as gas lines, compressors, buildings, and storage tanks also modify the integrity of a natural setting. Lands that have been heavily modified by pvt OGD have an industrial appearance.

Vegetation Clearing –Clearing vegetation for placement of tanks and pump jacks may create scenery impacts to the natural forest character and SILs as seen from CL1 or CL2 roads and trails. Pvt OGD industry design standards seek to create clearings that remove less vegetation, however, this is often still at the expense of impacting the foreground vegetation seen from CL 1 or CL2 travelways. Screening pvt OGD and maintaining SILs may partially reduce the effects of OGD, allowing the facilities to blend into the landscape. However, none of the S&Gs will completely eliminate the impacts of pvt OGD to scenic integrity on the ANF.

Associated Actions - Road Building–The industry design standard of clearing vegetation within high priority visual corridors often conflicts with the Forest Service goals for scenery**.** One example is the road building in the immediate foreground of a view corridor creating a smaller footprint and removing less vegetation; however this is often done at the expense of the foreground of a scenic corridor. Forest Service scenery standards seek to buffer pvt OGD activities by screening CL 1 or CL2 roads and designing them with reverse curves to minimize visual impacts along corridors with a high concern for scenery.

Construction - OGD Facilities–In the construction of pvt OGD facilities such as storage tanks and pump jacks, shiny metal structures or pump jacks with brightly colored orange paint may be selected with little concern about the effects to scenery in a natural setting. Incorporating earth toned colors and natural textures into the design of these facilities can reduce the contrast causing them to blend with the surrounding vegetation and landscape setting.

B. Effects from each Alternative – Differences in S&Gs by Alternative

Each of the four alternatives includes S&Gs that apply pvt OGD. The following section focuses on the effects of the S&Gs included in each of the alternatives for special features (CL1) and SILs on the ANF.

Concern Level 1- Special Features

Alternatives 2 and 3 provide design guidelines addressing the mitigation of impacts to the ANF landscape. Special features as viewed from CL1 corridors or their use areas will be offered a better chance of being addressed and appropriate design guidelines applied. Alternatives 1 and 4 do not address the concern for special features on the ANF.

Scenic Integrity Levels

Since alternatives 2 and 3 provide S&Gs addressing scenery, there are more opportunities to mitigate impacts to scenery on the ANF than the other alternatives. Alternatives 2 and 3 require pvt OGD to meet or exceed the SILs set forth in the forest plan and protect valued scenery as well as the special features on the landscape. The result is less modification of the natural appearing landscape character for visitors to the forest.

The distribution of SILs on the ANF, particularly the amount of high SILs, is a useful measure of the effects of pvt OGD on scenic integrity. Currently high SIL is found on 24 percent of the forest (approximately 124,000 acres). Provisions to maintain the high SILs occur in Alternatives 2 and 3 while Alternatives 1 and 4 would have no requirements. There is a possibility that meeting SILs may not be feasible in some areas of intensive pvt OGD. Factors such as topography, vegetation cover, location of travel corridors, and design and layout of pvt OGD will predict these outcomes. Although meeting SILs is not a guarantee, alternatives 2 and 3 will provide a greater opportunity to mitigate pvt OGD to scenery as viewed along CL1and CL2 travel corridors and use areas. However, impacts to scenery will occur, and some of these areas with not meet SILs.

The impacts to high SILs and the future scenic integrity on the ANF are as difficult to predict as are the amounts, concentrations, and locations of future pvt OGD and application of specific S&Gs. However,

impacts to scenic quality would be greatest in areas where new pvt OGD are found in previously undeveloped areas and are located within view of CL1 and CL2 travel corridors and use areas.

Vegetation Clearing–Vegetative management includes the management of foreground vegetation within high priority corridors for viewing scenery. Mitigation measures along CL1 or CL2 include the disposing of slash, screening impacts from road development and well structures, and treating openings to naturalize them and to reduce visual impacts. Alternatives 2 and 3 require pvt OGD activities to meet or exceed the mapped SILs for scenery and offer the best alternatives to mitigating effects to scenery with vegetative management. Alternative 4 would still provide for some mitigation of pvt OGD effects on the scenic integrity of the Wild and Scenic River corridor, as National Scenic Rivers are specifically mentioned in the Pennsylvania Oil and Gas Act for additional protections (PA DCNR 1985). Alternatives 3 and 4 include a general provision for Forest Service approved slash treatment. Alternative 1 does not require slash treatment or any other mitigation to meet or exceed forest objectives for scenery and may result in greater effects to scenery.

Associated Actions - Road Building–Appropriate road layout enhances the ability of the road to blend with the surrounding landscape. Techniques such as designing roads with reverse curves and minimizing clearing widths, and the number of roads entering a CL1 & CL2 travelway are included in the S&G's for Alternatives 2 & 3. Since guidelines on road design do not exist in Alternatives 1 and 4, this could result in more road construction and less blending of roads with the surrounding landscape.

Construction OGD Facilities–Use of earth toned colors for facilities such as storage tanks and pump jacks to blend with the surrounding landscape is addressed in Alternatives 2 and 3. Alternatives 2 and 3 also offer the best direction on treating long term storage of pvt OGD tanks, abandoned equipment and vehicles that impact scenery. Requiring these items to be removed from ANF lands, the well sites and roads can be restored to a natural appearing forest setting in less time and maintained in the future. Since Alternatives 1 and 4 are both silent on reducing contrast of structures in a natural setting, there is a possibility of greater visual contrast and impacts of pvt OGD facilities in a natural forest setting.

Cumulative Effects

The construction of the Kinzua Dam, early timber harvest, and pvt OGD practices represent some of the cumulative effects that impacted the landscape of the ANF in the past. These changes frame the story of the landscape and help predict future trends. The landscape character we expect to see in the next planning cycle would be the result of the collection of actions that occurred in the past, today and into the future.

Impacts from pvt OGD activity could double across the forest landscape resulting in a roaded forest setting that is more modified than in the past. The historic high levels of activity on the landscape are likely to continue, however, Marcellus shale developments could significantly change the landscape character.

Marcellus Shale development

Marcellus shale developments could result in greater effects to scenic integrity than more traditional shallow pvt OGD. The larger footprint, scale, and duration of Marcellus shale drilling activities potentially result in a number of effects to scenic integrity. A footprint as large as 5 acres may be cleared of vegetation for well pads and associated facilities. Security fencing and lighting needs for this type of drilling effect the natural setting as do the compressors, water storage and treatment facilities required for the well pads. Settings where well sites associated with Marcellus shale occur will have an industrial appearance, a modified natural landscape, and light pollution that could last for months during drilling activities.

Alternatives 2 and 3 provide the best opportunity to apply mitigation measures to meet or exceed SILs as seen from CL1 & CL2 corridors when screening and other mitigations are possible. However, the scale and duration of these activities has the potential to alter the natural appearing character of forest settings, the integrity of special places, and scenic viewing experiences of forest visitors. Although Alternatives 2 and 3 strive to meet or exceed existing SILs on the ANF, this may not be feasible where Marcellus shale developments occur. Factors such as the topography, existing vegetation, concern levels, and scale of the development need to be evaluated for the ability to meet SILs. Consequently, future Marcellus shale development could result in not meeting SIL's on the ANF.

For the complete discussion on scenery cumulative effects see the FEIS (USDA-FS 2007a, pp. 3-378–3-380).

3.4.3 Heritage Resources

Affected Environment

Discussion on the affected environment for heritage resources can be found in the FEIS (USDA-FS 2007a, pp. 3-380–3-381) and is incorporated by reference. There are over 2,000 known heritage sites that represent a wide variety of heritage resources, both prehistoric and historic, representing over 12,000 years of human use of this area. Only a small percentage of the inventoried sites have been evaluated for National Register significance. Over two dozen sites have been determined eligible for inclusion.

Direct and Indirect Effects

Introduction to Effects

Potential effects to heritage resources could occur during pvt OGD site development (including construction of access roads, well pads, tank batteries, and other infrastructure). Travel way management has the potential to affect heritage resource sites to the extent that these activities disturb heritage resource areas in proximity to the travel way, or make site locations more accessible to a greater number of people. This is particularly true for historic period sites that have a direct association with the historical transportation network and of "high visibility" heritage resource sites such as rock shelters. On the ANF these sites not only attracted prehistoric and historic human uses, but also modern dispersed recreational activities that sometimes lead to vandalism or looting. Widening travel ways or shoulders or replacing bridges can have a direct adverse effect. Altering or replacing drainage structures, such as culverts or ditches, or tread and surface material can have the potential for other direct effects and indirect effects including erosion, undercutting sites, or sedimentation.

Since 1986, there has only been one incident where damage to a heritage resource from pvt OGD resulted in a need to contact the Pennsylvania State Historic Preservation Office (SHPO). Adverse impacts were successfully mitigated.

Effects from Each Alternative

Although all of these ground disturbing activities have the potential to adversely affect heritage resources, proper project planning and implementation, compliance with federal and state laws and regulations and Forest Plan S&Gs should avoid most effects. Under all alternatives, the heritage program will provide support to resource projects, as required by Sections 106 and 110 of the National Historic Preservation Act of 1966, as amended (NHPA). This includes the identification and evaluation of heritage resources for the National Register of Historic Places (NRHP) and compliance with the ANF's Programmatic Agreement with the SHPO and the Advisory Council on Historic Preservation (ACHP) to identify, evaluate, treat, enhance, protect, preserve, conserve, and consult about historic properties.

Non-project related site inventory and site evaluations will occur under all alternatives, providing the data base needed for land managers to develop management approaches that adequately address heritage values. In addition, project-supportive site inventory, evaluations, and monitoring will occur under all alternatives. This information will be used to design each proposed project to avoid adversely affecting significant heritage resource sites. Site monitoring will occur for potential project impacts, and for the degree of damage caused by vandalism, visitor use, and natural deterioration, also involving identifying protective measures to employ. Opportunities for interpretation of heritage resources will be explored in all alternatives for both on-site and off-site interpretation, taking into account significance, accessibility, and protection needs.

Cumulative Effects

Heritage resources are a population of sites that cut across ownerships and jurisdictions. The archeological resource base found on private lands has a lower level of site protection than that found on state lands, or portions of the private sector that are subject to the Pennsylvania History Code. Pvt OGD is expected to continue on these lands in both the short-term and long-term, at levels that are comparable to those anticipated on the ANF. Effects to heritage resources are likely to occur on private lands, also. The importance of heritage resource sites on the ANF and State-owned lands will increase in importance if sites are lost in areas where less protection occurs. Effects similar to that described for shallow well development are anticipated to occur if Marcellus shale development were to occur on the ANF.

3.4.4 Forest Products

Affected Environment

The affected environment for forest products on the ANF is described in the FEIS (USDA-FS 2007a, p. 3-385–3-393) and is incorporated by reference. Forest products are discussed in terms of demand, species values, growing stock, harvest volumes, and lands tentatively suited for commercial timber harvest. Lands tentatively suited for commercial timber harvest are those lands capable of providing a sustained yield of timber products, and are considered appropriate for scheduled timber harvest based on their MA designations. Timber harvested from lands suited for scheduled timber production contributes toward the allowable sale quantity (ASQ). Lands considered unsuitable may have unscheduled timber harvest that does not contribute toward the ASQ (USDA-FS 2007b, p. 33-34).

Environmental Consequences

The environmental consequences of the Forest Plan's selected alternative (Alternative Cm) on forest products are described in the FEIS (USDA-FS 2007a, p. 3-393–3-399). Forest products are discussed in terms of lands suited for commercial timber harvest, annual allowable sale quantity (ASQ), and changes in other harvest opportunities. Total suitable forest land in Alternative Cm is 379,055 acres, with a calculated ASQ of 8.9 million cubic feet per year or 54.1 million board feet per year. The following effects discussion describes the effects common to all alternatives evaluated, followed by a discussion on the effects of each alternative on forest products.

Scope of Analysis

The scope of this analysis focuses on the S&Gs related to pvt OGD on the ANF and includes all federal land administered by the ANF. A general discussion on the effects of pvt OGD common to all alternatives is below, followed by a more detailed discussion on the effects of pvt OGD S&Gs by alternative on three forest product topics addressed during the forest planning process: (1) acres of land suited for timber management; (2) annual ASQ; and (3) changes in other harvest opportunities.

Effects Common Across Alternatives

In all alternatives, pvt OGD will occur and affect forest vegetation. Pvt OGD will change the amount of forested land, and therefore growing stock of timber on the ANF, as areas are cleared for pvt OGD and converted to non-forested land. This occurs in areas considered suited for scheduled timber production and in areas considered unsuited for scheduled timber production.

Pvt OGD is assumed to be constant across the alternatives, based on the analysis provided in Forest Plan FEIS Appendix F. Minor differences in the amount of land clearing might occur due to differences in S&Gs for pvt OGD in each alternative. These differences are difficult to predict and quantify. Therefore, the amount of forest converted to non-forest and the effect on forest products is assumed to be essentially the same across all four alternatives.

For the purpose of this analysis, an average future development rate of 512 wells per year (Appendix C, Table C-4), or an additional 666 acres annually converted to non-forested land on the ANF is assumed for the 15 year planning period. This equates to 9,980 acres of clearing for pvt OGD over 15 years, on both lands suited for scheduled timber production and those not suited for scheduled timber production.

When lands are cleared and converted to a non-forested condition by pvt OGD, they are no longer considered tentatively suited for commercial timber harvest, as they are no longer capable of producing industrial wood. Simulation modeling software, SPECTRUM, was used to determine ASQ values for the ANF, given the existing forest inventories and land allocation scenarios in each of the alternatives considered during the 2007 forest planning process. In order to account for the loss of timber growing stock and reduction of lands considered suited for scheduled timber production due to pvt OGD, harvest allocation constraints were incorporated into SPECTRUM modeling. These constraints removed forested land from the suitable lands available for harvest in the model, proportional to anticipated pvt OGD rates (USDA-FS 2007b, p. B-35).

Effects to other harvest opportunities, such as salvage, are similarly affected by pvt OGD.

ANF timber harvested during pvt OGD activities is purchased by the oil and gas company, and is used for various finished and pulp forest products. Since 2001, timber products harvested for pvt OGD activities on the ANF have ranged from 2.7 million cubic feet (mmcf) (1.6 million board feet (mmbf)) in 2003 to 9.5 mmcf (5.7 mmbf) in 2006.

Direct and Indirect Effects

Effects from each Alternative – Differences in S&Gs by Alternative

Each of the four alternatives includes various S&Gs that apply to pvt OGD on the ANF. As mentioned previously, land clearing for pvt OGD converts forests and grasslands to non-forested land. Where pvt OGD occurs on lands considered suitable for scheduled timber production, lands converted to a non-forested condition become unsuited for timber production as they no longer can produce forest products. The effect on ASQ was accounted for during SPECTRUM modeling, as previously mentioned.

It is difficult to predict exactly how and where specific S&Gs will be applied for future pvt OGD. Therefore, it is difficult to predict any measurable differences in the amount of land clearing, or conversion to a non-forested condition, which might occur from one alternative to another. The effects on lands suited for timber production, ASQ, and other harvest opportunities are assumed to be the same across all four alternatives evaluated here.

Cumulative Effects

Private and state lands within and surrounding the ANF also have OGD activities occurring on them. OGD on adjacent private, state and federal lands within the proclamation boundary affect land productivity and available timber growing stock similar to lands administered by the ANF.

It is anticipated that nearly 4 percent of the total cumulative effects analysis area (ANF four-county area totaling over 1.7 million acres) will consist of non-forested lands due to pvt OGD, similar to the amount anticipated for the ANF. These figures are not anticipated to vary among the four alternatives evaluated in this document.

Marcellus Shale Development

The overall effect of Marcellus shale development would be similar to that associated with conventional shallow oil and gas well drilling. Similar to conventional shallow oil and gas drilling, Marcellus shale drilling would change the amount of forested land, and therefore growing stock of timber on the ANF. Areas converted to a non-forested condition are no longer considered tentatively suited for commercial timber harvest, as they are no longer capable of producing industrial wood. Marcellus shale development would occur at a larger scale, with areas up to 5 acres cleared of timber and forest vegetation. Wider roads would likely be required for Marcellus shale development, but the amount of vegetation clearing for roads would be dependent on the existing road system.

Separate estimates for land clearing and associated conversion to non-forest condition for Marcellus shale development are not being made at this time. Given the limited Marcellus shale development to date within the four-county area, and given the uncertainty for when deep well development might occur, no additional estimates for road miles or clearing will be made.

3.4.5 Economics

Affected Environment

The affected environment for economics is found on pp. 3-399 through 3-419 of the FEIS. The ANF economic region (ANF region) comprises the four counties where the ANF is located (Elk, Forest, McKean and Warren Counties). Historically, economic development within the found county area has relied upon development and use of natural resources. Timber harvest, oil and gas exploration, and recreation opportunities have been the basis for economic growth and development.

Oil and Gas Economies in Elk, Forest, McKean, and Warren Counties

Some definitions and nomenclature essential to understanding the following information: regional economists define economic impacts as changes to the local economy resulting from some action. The action could be a decision by the government, a change in global economics, a natural disaster, or any of many things. Regional economists define contributions to economies as the functional business interactions taking place at any one point in time. In these terms, the jobs and income associated with the present level of economic activity associated with oil and gas industry in the four-county area are contributions. Any major change in the present level of economic activity would be an impact. Authors of some of the following references refer to “impacts” where in the context of this document, they will be referred to as “contributions.” Choice of terms does not lessen the importance.

It is clear from all points of view that oil and gas drilling, support, and production are overwhelmingly important sectors of the Elk, Forest, McKean, and Warren Counties (four-county area). Economic activity in these counties is the sum of drilling and production on both private and public surface ownerships. Data on economic activity in the oil and gas industry in the four-county area is not readily available. Oil production from pvt OGD on NFS land is not reported to the Federal Government. Production reported to the Commonwealth of Pennsylvania is held confidential for 5 years. Economic

activity reported to the Federal Government Economic Census can be withheld at the county level on the request of businesses. Oil and gas businesses in Elk and Forest Counties have so elected.

There is information on economic importance in various reports and accounts, although not published in peer-reviewed literature,. Baker and Passmore (2008) estimate that for every 100 jobs, the four-county oil and gas operations industry generates $5.9 million in compensation and an additional $1 million in indirect compensation for employees of industries providing goods and services. The Pennsylvania Economy League of Southwestern Pennsylvania (2008) found that McKean, Warren, and Forest Counties had 26 percent of the drilling activity in the Commonwealth between 2000 and 2007. Decker and Pierce (2008) quoted Baker and Passmore in the multiplier importance of oil and gas jobs on the entire economy. The American Refining Group (ARG) refinery in Bradford utilizes 10,000 barrels of crude oil per day, much of which is purchased from producers in the four-county area. This provides manufacturing jobs in the community and indirectly pays the salaries of workers drilling, supporting, and producing crude oil. In summary, the continued drilling activity, support, and production are important contributors to the four-county economy.

Contributions to the local economy are primarily derived from wages and purchases in the four-county area. Higher oil and gas prices result in more drilling activity in the area, but extremely high prices, as experienced in recent years may not have as much local economic effect as might be thought. Higher prices may mean higher profits for investors and stock holders, but the impact on the local economy is driven by the number or wells being drilled, the number of pump jacks being serviced, barrels of crude oil hauled by truck, and other associated labor and purchases required to support drilling and production. If higher prices result in additional rigs moving in to the area and more pump jacks being held in service, then there will be a positive economic impact. Predicting the level of activity, in a world of widely fluctuating oil and gas prices, and in the absence of local production information, is difficult.

Using the IMPLAN model (Minnesota IMPLAN Group 1999) with 2006 data, the importance of oil and gas activities in the four-county area can be explored and quantified. For reasons previously described, oil and gas production information is not available by county in Pennsylvania. A rough estimate of production follows: Drilling activity reported by the Pennsylvania Economy League (2008) estimates an average of 813 oil wells and 256 gas wells are drilled per year in the four-county area. From 2000 to 2007, the four-county area accounts for approximately 29 percent of state oil drilling and 6 percent of state gas well drilling. Using drilling activity as a proxy for production, apply the two percentages to state-wide production figures provided by Pennsylvania Geologic Survey Oil and Gas Production Summary for 2006 (most recent), yielding 1,974,201 bbl and 181,429,238 mcf (PADCNR 2008). A four-county production scenario of 577,347 bbl and 10,112,320 mcf per year will be considered. Estimates of the cost for equipping and drilling a well range from $228,913 per oil well, $361,568 per gas well reported for Pennsylvania by the Independent Petroleum Association of America 2007 report, to Decker and Pierce estimates of $39,120 per oil well (plus $44,700 per oil well per year maintenance, operations, and transportation to the refinery). Pennsylvania Oil and Gas Association (POGAM) estimates cost of a natural gas well to be $150,000 per well in NW Pennsylvania.

Table 3-11 Assumptions used to Predict Costs of OGD for Four-county Area

Assumptions					
		Low		High	
Production					
	oil	577,347	bbl	577,347	bbl
	gas	10,112,320	Mcf	10,112,320	Mcf
Price					
	oil	$66.05	/bbl	$66.05	/bbl
	gas	$8.09	/Mcf	$8.09	/Mcf
Drilling					
	oil	813	wells	813	wells
	gas	256	wells	256	wells
	oil	$39,120	/well	$228,913	/well
	gas	$150,000	/well	$361,568	/well

Table 3-12 Employment Assumptions for Four-county Area

Results - employment (full & part time)		
	Low	**High**
Production		
Direct	44	44
Indirect	6	6
Induced	21	21
Total	70	70
Drilling		
Direct	128	509
Indirect	140	554
Induced	69	275
Total	337	1,337
Combined	407	1,408

In Table 3-11, costs and income are in 2008 dollars and production levels are held constant in order to illustrate relative importance of drilling cost per well dollars in the local economy. Similar scenarios could be constructed to illustrate effects of oil and gas prices on number of wells drilled and the length of time wells are kept working as daily production declines over time.

Note the high indirect employment in drilling as compared to production (Table 3-12). It appears that management of oil and gas, and other companies in the area employ 554 people for the 509 direct drilling employees, in the high scenario. This indicates a relatively high proportion of drilling investment dollars, paid as income, is going to management and to employees of support companies.

The Pennsylvania Center for Workforce Information and Analysis estimated the working population to be 57,200 out of a total population of 123,358 in the four-county area. In the low scenario 407 out of 57,200

workers and in the high scenario 1,408 out of 57,200 workers are directly or indirectly supported by the oil and gas industry. While there is no information on how many workers may drive in from other counties in the region, one can see that between one in 141 (low scenario) and one in 41 (high scenario) or about one worker out of every hundred may be directly or indirectly supported by the oil and gas industry in the four-county area.

IMPLAN estimates of income include both wages and benefits, excluding social security payments. This makes large scale comparisons to direct wage payments difficult without benefit compensation values. Estimates of total wage compensation in the four-county area ranges from the Bureau of Economic Analysis 2006 of $1,687 million dollars (without benefits) to IMPLAN's $2,132 million dollars (with benefits.) This, places the 2006 value around $2 billion. Oil and gas exploration and production accounts for between 1 and 4 percent of wage income in the four-county area. This does not include the oil refineries such as the American Refining Group in Bradford. Considering the findings of Baker and Passmore (2008), indirect and induced jobs and income add up to a much higher proportion of jobs and income in the four-county area.

Relatively high indirect drilling income is associated with the several oil drilling management and support firms based in the four-county area.

Direct and Indirect Effects

Introduction

Assumptions in the SEIS are that the level of oil and gas drilling, support, and production will be the same, regardless of alternative selected. Costs associated with applying the S&Gs will vary by alternative; however, determining a dollar value for some costs would be highly speculative. Alternatives vary greatly in terms of environmental protection that is required. Generally, cost of planning will increase if S&G's define more environmental components to be protected. For example, there is a cost associated with locating vernal pools and a cost associated with transportation planning that would be needed to protect vernal pools. S&Gs for minimizing impacts to vernal pools are only included in two alternatives.

For purposes of this analysis, differences in costs for road construction reflecting differences in alternatives will be included. Economic impacts of alternatives, using IMPLAN are presented with the number of wells and production levels held constant at the high levels presented in the affected environment section. Actual production numbers are confidential, so setting baseline and predicting change cannot be done with any confidence. To meet the needs of readers of this document, high and low scenarios are explored, given the difference in estimated cost of drilling and maintaining wells in Western Pennsylvania.

Layout and Design

Differences in cost of layout and design between the alternatives are directly related to kinds of resource protection that is required. S&Gs included in Alternatives 2 and 3 require that more resource information is known in order to minimize impacts from development to other resources, therefore, generally layout and design costs will be higher for these alternatives than Alternatives 1 and 4. Several examples of differences in S&Gs between alternatives are provided here. Alternatives 2 and 3 require that riparian buffers be applied to perennial and intermittent streams, wetlands, springs, seeps, and vernal pools, whereas, Alternatives 1 and 4 have no requirement for protection of vernal pools.

S&Gs designed to reduce impacts to nesting birds are included in Alternatives 1, 2, and 3, however the particular species of bird differs slightly in Alternative 1, than Alternatives 2 and 3. Seasonal restrictions to reduce noise and disturbance in close proximity to the nest have the potential to impact continuity of operations, causing delays in development. At the project level, consideration of alternative access routes could be made to avoid seasonal restriction.

Transportation system costs are closely linked to selection of road corridor locations. Roads that are constructed on plateau or gentle side slope will have a lower cost for construction and maintenance than roads constructed in riparian zones. Therefore, costs associated with layout and design may be beneficial in the long run if ultimately, the costs for the transportation system are reduced by avoiding riparian zones.

Exploration (drilling and road building)

Application of standards and guidelines associated with alternatives may have effects on costs of pvt OGD road building. Using estimates of an average of 512 wells per year and 0.25 miles of pvt OGD road per well, an average of 128 miles per year will be constructed. Currently, and to a greater degree in Alternative 4, a relatively larger percentage of roads are allowed within 300 feet of streams, requiring a greater investment in road surfacing materials, resulting in a higher average cost per mile. In Alternatives 2 and 3, emphasis is made on transportation planning that should result in fewer miles of roads being built within 300 feet of streams, resulting in lower cost per mile. Alternatives considering different levels of more expensive road standards and the association jobs impact are summarized in the following table.

Table 3-13 Summary of Costs and Associated Jobs per Alternative

Alternative	Cost/year	Direct jobs	Total jobs	Direct income	Total income
1	$ 6,836,000	68	90	$ 1,600,617	$ 2,225,613
2	$ 6,528,000	65	86	$ 1,528,500	$ 2,125,336
3	$ 6,528,000	65	86	$ 1,528,500	$ 2,125,336
4	$ 7,144,000	71	94	$ 1,672,733	$ 2,325,889

In Table 3-13 jobs include full and part time jobs as estimated using IMPLAN. Total jobs include direct, indirect, and induced jobs. Income includes employee compensation, but does not include not include proprietor's income. Income is expressed in 2008 dollars.

Higher costs per mile are born by the investors in the oil development enterprise. These dollars pay for additional labor, equipment, and materials purchased locally to meet higher road standards. If this higher cost, when added to all other costs associated with well drilling, exceeds the potential income from oil production, then fewer than 512 wells will be drilled, less than 128 miles of road constructed, and negative economic impacts could result. This contingency is tied to the highly volatile price of oil and the availability of investment capital.

Unlike roads, S&Gs associated with well pad development are expected to increase costs in Alternatives 2 and 3. Alternative 4 is likely to result in less cost than 3. Given the current nature of successful negotiations with oil and gas developers, estimates of cost differences are not available. In other words, if a new Standard requires some well pad mitigation measure that has been done voluntarily in the past, there is no additional economic impact.

Production

If higher development costs associated with Alternative 3 result in fewer wells being drilled, then in the long run, there will be a loss of production in the area. The primary local economic contribution is in the wages and equipment required to maintain pump jacks, tank batteries, and transport crude oil to the American Refining Group refinery in Bradford. If local crude oil production is negatively impacted, the refinery may have to purchase a greater amount of supply from distant sources, such as Ohio. This higher

cost could result in lower profits going to refining owners and investors. If refinery production is reduced, then jobs and income losses would occur in the local economy.

Marcellus Shale development

Marcellus Shale development would provide additional jobs and income in the four-county area. Drilling requires more resources than shallow oil well drilling, and for a longer time period. Other areas experiencing increased deep gas well development have experienced a reduction in unemployment and overall improvement in local economies. Possible impacts to recreation visitation discussed elsewhere are impossible to quantify at this time.

Updating information found in 2007 FEIS*:*

The following tables (Table 3-14, 3-15, 3-16, and 3-17) provide updates to tables included in the FEIS to reflect costs and production associated with pvt OGD. Tables are based on timber and recreation estimates used in the FEIS, plus the addition of:

- 512 Wells per year at $260,881 per well. Cost per well for this stage of analysis is an average of both oil and gas well costs/well.
- Oil production: 577,347 bbl at $68.05 per bbl
- Gas production: 10,112,230 thousand cubic feet at $8.03 per thousand cubic feet

Production figures are four-county-wide because information to separate production on private lands from production on private resources with Federal surface ownership is not known. As stated above, actual exploration and production of oil and gas is dependent on a number of external factors, such as world prices for these commodities, just as timber production figures are dependent on demand for wood products nationally and internationally.

Table 3-14. Current Role of Forest Service-Related Contributions to the Area Economy*

	Employment (jobs)		Labor Income (Thousands of 2008 dollars)	
Industry	**Area Totals**	**FS-Related**	**Area Totals**	**FS-Related**
Agriculture	1,402	113	$23,829.7	$3,623
Mining	1,219	264	$84,115.9	$13,413
Utilities	257	4	$18,841.1	$307
Construction	2,379	35	$99,080.1	$1,487
Manufacturing	13,172	121	$735,886.8	$5,192
Wholesale Trade	1,251	50	$72,977.4	$2,926
Transportation & Warehousing	3,014	77	$139,838.4	$3,717
Retail Trade	5,821	164	$129,813.9	$3,458
Information	567	22	$19,568.8	$640
Finance & Insurance	1,363	17	$63,343.5	$854
Real Estate & Rental & Leasing	398	10	$10,566.8	$293
Prof, Scientific, & Tech Services	1,321	39	$68,290.5	$2,058
Mngt of Companies	894	80	$77,316.6	$6,907
Admin, Waste Mngt & Rem Serv	1,342	25	$28,347.4	$487
Educational Services	970	8	$25,168.2	$224
Health Care & Social Assistance	8,608	51	$301,669.4	$1,983
Arts, Entertainment, and Rec	529	128	$6,642.4	$1,689
Accommodation & Food Services	3,038	531	$37,272.1	$6,989
Other Services	4,836	45	$71,080.7	$684
Government	7,495	319	$395,680.4	$7,043
Total	59,876	2,105	2,409,330	63,973
FS as Percent of Total	---	3.52%	---	2.66%

*Replaces FEIS Table 3-109 (USDA-FS, 2007a, p. 3-412))

Table 3-15 Employment by Program by Alternative (Average Annual, First 2 decades)*

Resource	Current	A 86 Plan	B 07 Plan	C	D
Recreation: non-local only	921	956	956	956	956
Timber	239	716	716	716	716
Minerals	667	667	667	667	667
Payments to States/Counties	109	259	259	259	259
Forest Service Expenditures	169	246	246	246	246
Total Forest Management	**2,105**	**2,843**	**2,843**	**2,843**	**2,843**
Percent Change from Current	**---**	**35.1%**	**35.1%**	**35.1%**	**35.1%**

*****Replaces FEIS Table 3-111(USDA-FS 2007a, p. 3-414)

Table 3-16 Employment by Major Industry by Alternative (Average Annual, First 2 decades)*

Industry	Current	A 86 Plan	B 07 Plan	C	D
Agriculture	113	300	300	300	300
Mining	264	264	264	264	264
Utilities	4	6	6	6	6
Construction	35	74	74	74	74
Manufacturing	121	288	288	288	288
Wholesale Trade	50	61	61	61	61
Transportation & Warehousing	77	94	94	94	94
Retail Trade	164	192	192	192	192
Information	22	25	25	25	25
Finance & Insurance	17	23	23	23	23
Real Estate & Rental & Leasing	10	12	12	12	12
Prof, Scientific, & Tech Services	39	46	46	46	46
Mngt of Companies	80	84	84	84	84
Admin, Waste Mngt & Rem Serv	25	30	30	30	30
Educational Services	8	12	12	12	12
Health Care & Social Assistance	51	73	73	73	73
Arts, Entertainment, and Rec	128	135	135	135	135
Accommodation & Food Services	531	562	562	562	562
Other Services	45	63	63	63	63
Government	319	502	502	502	502
Total Forest Management	**2,105**	**2,843**	**2,843**	**2,843**	**2,843**
Percent Change from Current	**---**	**35.1%**	**35.1%**	**35.1%**	**35.1%**

*****Replaces FEIS Table 3-112 (USDA-FS 2007a, p. 3-415)

Table 3-17. Labor Income by Program by Alternative (Average Annual, First 2 decades; $1,000)*

Resource	Current	A 86 Plan	B 07 Plan	C	D
Recreation: non-local only	$12,523.7	$13,285.8	$13,285.8	$13,285.8	$13,285.8
Wildlife and Fish: non-local only	$6,617.8	$6,606.9	$6,606.9	$6,606.9	$6,606.9
Grazing	$0.0	$0.0	$0.0	$0.0	$0.0
Timber	$9,099.1	$27,273.5	$27,273.5	$27,273.5	$27,273.5
Minerals	$31,166.3	$31,166.3	$31,166.3	$31,166.3	$31,166.3
Ecosystem Restoration	$0.0	$0.0	$0.0	$0.0	$0.0
Payments to States/Counties	$4,566.3	$10,851.3	$10,851.3	$10,851.3	$10,851.3
Forest Service Expenditures	$0.0	$0.0	$0.0	$0.0	$0.0
Total Forest Management	**$63,973.2**	**$89,183.7**	**$89,183.7**	**$89,183.7**	**$89,183.7**
Percent Change from Current	**---**	**39.4%**	**39.4%**	**39.4%**	**39.4%**

*****Replaces FEIS Table 3-113 (USDA-FS 2007a, p. 3-416)

Table 3-18. Labor Income by Major Industry by Alternative (Average Annual, First 2 decades; $1,000)*

Industry	Current	A 86 Plan	B 07 Plan	C	D
Agriculture	$3,623.1	$10,531.2	$10,531.2	$10,531.2	$10,531.2
Mining	$13,413.2	$13,448.1	$13,448.1	$13,448.1	$13,448.1
Utilities	$307.3	$411.6	$411.6	$411.6	$411.6
Construction	$1,486.8	$3,128.4	$3,128.4	$3,128.4	$3,128.4
Manufacturing	$5,191.5	$11,913.0	$11,913.0	$11,913.0	$11,913.0
Wholesale Trade	$2,925.6	$3,582.1	$3,582.1	$3,582.1	$3,582.1
Transportation & Warehousing	$3,716.9	$4,511.8	$4,511.8	$4,511.8	$4,511.8
Retail Trade	$3,458.3	$4,058.3	$4,058.3	$4,058.3	$4,058.3
Information	$639.8	$732.2	$732.2	$732.2	$732.2
Finance & Insurance	$854.3	$1,114.9	$1,114.9	$1,114.9	$1,114.9
Real Estate & Rental & Leasing	$292.6	$344.6	$344.6	$344.6	$344.6
Prof, Scientific, & Tech Services	$2,057.8	$2,408.7	$2,408.7	$2,408.7	$2,408.7
Mngt of Companies	$6,906.6	$7,244.0	$7,244.0	$7,244.0	$7,244.0
Admin, Waste Mngt & Rem Serv	$486.7	$591.3	$591.3	$591.3	$591.3
Educational Services	$224.1	$315.1	$315.1	$315.1	$315.1
Health Care & Social Assistance	$1,982.8	$2,821.7	$2,821.7	$2,821.7	$2,821.7
Arts, Entertainment, and Rec	$1,689.5	$1,781.6	$1,781.6	$1,781.6	$1,781.6
Accommodation & Food Services	$6,988.8	$7,387.2	$7,387.2	$7,387.2	$7,387.2
Other Services	$684.0	$982.5	$982.5	$982.5	$982.5
Government	$7,043.4	$11,875.3	$11,875.3	$11,875.3	$11,875.3
Total Forest Management	**$63,973.2**	**$89,183.7**	**$89,183.7**	**$89,183.7**	**$89,183.7**
Percent Change from Current	**---**	**39.4%**	**39.4%**	**39.4%**	**39.4%**

* Replaces FEIS Table 3-114 (USDA-FS 2007a, p. 3-416)

Changes between the 2007 FEIS and these tables are primarily due to structural changes in the economy between the 2002 IMPLAN data used in the FEIS and the 2006 data used here. Compilation of IMPLAN data takes from one to two years. 2007 data has become available, but changes in grouping and structures require upgrades to software which are incomplete at this time. Percent change from current rows indicate potential economic benefits from full implementation of the timber program described in the 2007 FEIS.

3.5 Resource Commitments

This section contains effects disclosures that are required by federal law, regulations, or policy, and that generally apply to all the preceding resource area effects sections in this chapter associated with the 4 alternatives analyzed in this document. Forest plans do not directly implement any management activities; however, S&Gs establish how pvt OGD may take place.

3.5.1 Unavoidable Adverse Effects and Mitigation

The application of forest-wide S&Gs and resource protection measures are designed to limit the extent and duration of adverse environmental effects. Nevertheless, some adverse effects are unavoidable. For a detailed disclosure of effects, including unavoidable adverse effects, see the preceding environmental consequences discussions for each resource area in the physical, biological, and social sections of Chapter 3. It is important to note actual effects do not occur until project-level decisions are implemented.

This section describes those adverse effects that may not be avoided when pvt OGD project decisions are made. Implementing any of the alternatives would generally provide for public safety and resource protections to various degrees; however, adverse environmental effects may occur even when S&Gs to minimize the effects are implemented. The most notable unavoidable effects that could potentially occur when project-level decisions are made are summarized below.

Physical

From 2005 to 2020, the average annual amount of land that potentially would be cleared for pvt OGD is 666 acres of land (9,995 acres total, see Appendix C, Table C-4). There will be a long-term commitment of soil resources (e.g. under roads, well pads, tank batteries and other infrastructure) in a condition where soils have dense compaction and nutrients are lacking or buried.

There is the potential for increased erosion and sedimentation from soil disturbances associated with road and well pad construction, and associated facilities. These effects can be long-term as they involve land use conversion from forest to non-forest with a loss of soil productivity and natural landform.

There is the potential for increased runoff on compacted soils which could cause changes to streamflow volumes and timing of flows. Some level of sediment from roads will reach streams and wetlands and could impact the physical characteristics of water resources to some degree. These effects should be short-term until sites are reclaimed.

Biological

Vegetation removal, fragmentation of forest canopies, opportunities for invasive species to expand, disturbance of sensitive species, and encroachment on streams and riparian areas can all potentially occur as a result of pvt OGD. This could adversely affect the distribution and abundance of some animals and plants.

Pvt OGD can result in alteration of natural landforms and may result in loss of forest vegetation (including vascular plants, shrubs, and tree species) and wildlife habitat. Pvt OGD can convert areas that presently support forest cover and are capable of producing wood products to non-forested areas that do not sustain forest or produce wood products in the long-term.

Social

Pvt OGD activities may disrupt recreational uses. Road construction and road closures may permanently reduce or change the opportunities available, particularly those for more remote or primitive types of

recreation. Pvt OGD may displace other recreation uses that are incompatible and create user conflicts. Change in Scenic Integrity Levels may impact visitor enjoyment of forest landscapes. Some recreationists may consider increased access provided through pvt OGD roads to be beneficial.

Relationship between Short-term Uses and Long-term Productivity

For purposes of this discussion, a short term use refers to activity that will occur between 2005 and 2020. In the short-term, it is anticipated that an average of 512 wells per year will be developed, with a total of 15,680 wells potentially developed by the year 2020 (Appendix C, Table 4). In the long-term (2060), there is the potential for additional pvt OGD to occur. The number of wells would be dependent on the spacing utilized and the area being developed. Table C-5 (Appendix C) displays the range in numbers of wells that occur from 9,000 wells (at 1,000 foot spacing in a 191,000 acre field) to as high as 48,200 wells (at a 500 foot spacing in a 241,000 acre field).

All alternatives contain minimum management requirements prescribed by the forest-wide S&Gs and some S&Gs that are specific to particular MAs. Though they vary by content and resource, they are directed at reducing environmental harm to surface use values. Minimum restoration requirements address the long-term productivity of the land that may be impacted by short-term uses.

Monitoring and evaluation, as described in the Forest Plan (Chapter 4), apply to all alternatives. A primary purpose of monitoring is to ensure that long-term productivity of the land is maintained or improved. If monitoring and evaluation show that Forest Plan S&Gs are inadequate to protect long-term productivity of the land, the plan will be adjusted (through amendment or revision) to provide more protection or fewer impacts during project implementation.

Although all alternatives are designed to provide for public safety and to protect resource values, there are differences among the alternatives in the long-term condition of resources. There may also be differences among alternatives in long-term expenditures necessary to maintain or achieve desired conditions. The differences are discussed throughout the various sections of Chapter 3.

Irreversible and Irretrievable Commitments of Resources

Irreversible and irretrievable commitments of resources are defined in Forest Service Handbook 1909.15, Environmental Policy and Procedures (7/06/2004).

Irreversible is a term that describes the loss of future options. It applies primarily to the effects of use of non-renewable resources, such as material minerals (stone pits) or cultural resources, or to those factors, such as soil productivity that are renewable only over long periods of time.

Irretrievable is a term that applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area has private minerals extracted. The production lost is irretrievable, but the action is not irreversible. When extraction is complete and the site fully restored, it is possible to reestablish vegetation cover types, but it could be a very long time before commercial timber production would occur. When one alternative's set of S&Gs will result in less protection of a natural resource (such as wildlife habitat for sensitive species or visual resources) or offers fewer opportunities for mitigation of effects on other uses (such as motorized or non-motorized recreation) than another alternative, the difference represents an irretrievable commitment of resources.

Decisions made in a forest plan do not represent actual irreversible or irretrievable commitments of resources. This forest plan supplement will determine what kind of S&Gs apply to pvt OGD, it does not make site-specific decisions. The decision to irreversibly or irretrievably commit resources occurs when

(1) the Forest Service makes a project or site-specific decision and (2) at the time Congress acts on a recommendation to establish a new wilderness or to include a river in the wild and scenic river system,

Examples of irretrievable resource commitments associated with project-level pvt OGD decisions are:

- Opportunities for non-motorized recreation, solitude, and primitive or wilderness experiences could be foregone when pvt OGD projects are implemented.
- Opportunities to maintain or produce a specific vegetation condition or wildlife habitat could be foregone for some period of time so that another condition may be produced in its place, such as conversion from forest to non-forest for the period the pvt OGD occurs.
- Opportunities to maintain or improve SILs could be limited when pvt OGD projects are implemented near CL1 and CL2 travel corridors and use areas.
- Cumulatively, in the long-term, some plants and animals sensitive to disruption may drop to the lowest viability outcome "Level E", resulting in strong potential for extirpations within many of the patches, and little likelihood or re-colonization of such patches.
- Commodity outputs could be reduced or foregone on areas where specific uses are implemented, such as pvt OGD.
- Non-commodity values and uses including scenic resources, hunting, and fishing may be reduced or foregone in areas where pvt OGD activities are implemented.

Energy Requirements and Conservation Potential

Energy is consumed during the development of pvt OGD (which occurs in the short-term) and in the long-term maintenance of development of pvt OGD and with administrative functions conducted by ANF personnel during both short-term and long-term activities. Energy is consumed by vehicles and equipment used during site development, movement of products and associated by-products, site maintenance, and administrative activities of the Forest Service and other regulatory agencies. Energy consumption is not expected to vary by alternative as each set of standards and guidelines will be applied to the same level of development. Alternatives with higher resource protections are expected to arrange the same level of development around localized habitats. Several opportunities exist under all alternatives to provide for energy conservation or conversion to renewable energy sources from less plentiful fuels to more plentiful fuels.

Conflicts with Other Agency or Government Goals or Objectives

This supplement is not changing the goals and objectives in the Forest Plan, which complement and support those of surrounding government entities and the County Comprehensive Plans referenced below. Most of the contents within the Forest Plan are refinements of the 1986 Forest Plan, which has been under implementation for over 20 years. The various S&Gs addressed in the four alternatives analyzed in this supplement address real effects to resources and attempt to promote conservation of natural resources. Similar goals for wise use and promotion of eco-friendly tourist development are contained in each County Comprehensive Plan.

Economic development is a high priority in each county. Job creation related to pvt OGD, extraction of forest products, tourism, and recreation are expectations of science based, multiple-use management on the ANF. The economic development zones identified are all in areas with existing or mixed private ownerships along major road corridors (with exception of the Kinzua Resort, identified by Warren County). There is no identified conflict over any specific economic development proposal set forth by the

County Plans related to pvt OGD; however, this could arise as project level pvt OGD is proposed in ecologically important areas or high recreation areas featured for eco-tourism.

Potentially Conflicting Goals, Objectives, or Concerns in County Comprehensive Plans

1. Elk County 1999 Update of the 1968 Comprehensive Plan (Elk County Commissioners, 1999). The Rigdway Borough Water Works and Johnsonburg Municipal Authority list concerns for quality and quantity of future water supplies to service their needs from two watersheds located largely on the ANF. Nothing specific about ANF management is mentioned in these general statements. Pvt OGD is listed in mineral resources on page 14, but no conflicting concerns are raised or addressed.
2. Forest County Comprehensive Plan 1998 (Forest County Conservation District and Planning Commission, 1998). Pvt OGD is listed in economic sector on page 24 under "sale of raw resources, such as sand/gravel/timber/and natural gas." No conflicting concerns are raised or addressed with respect to pvt OGD.
3. Multi-Municipal Comprehensive Plan for McKean County 1977 (McKean County Planning Commission, 1977) and the Tuna Valley Council of Governments Multi-Municipal Comprehensive Plan 2001 (City of Bradford, and Bradford, Foster, Lafayette, and Lewis Run Townships, 6/2001). Pvt OGD is listed on pages III H-1 to H-5 as an existing land use. No conflicting concerns with pvt OGD are raised or addressed.
4. Warren County Comprehensive Plan Update 2005 (Warren County Planning and Zoning Commission, 6/2005). A concern listed on pg. 14 states, "there was a feeling that the management of public lands, especially the ANF, prevented reasonable use of wood, gas and oil resources". As mentioned in the FEIS, Warren County stated that "one prime deficiency is the lack of a lodge in the Kinzua Dam area" for development of eco-tourism.

Currently, the Warren County Commissioners have entered into a lawsuit against the Forest Service concerning how pvt OGD planning will be undertaken on the ANF based on a settlement agreement (need full citation 2/09) to resolve another complaint filed in federal court. A stated objective in the county plan on page 27 is to "Develop strategies to allow the wise use of the Allegheny National Forest for timbering, natural gas production, and recreation." However, no conflicting concerns specific to pvt OGD are raised or addressed in the County Plan.

These conflicts are not considered to be barriers to further productive relationships with County planners or commissioners. No other major conflicts between this Forest Plan supplement effort and the stated goals and objectives of other governmental entities are known. Project level proposals during implementation will allow additional public involvement opportunities for decision makers to consider any specific associated controversy in these areas.

Chapter 4

List of Preparers

CHAPTER 4. LIST OF PREPARERS

A team of Forest Service associates representing a broad spectrum of disciplines wrote and compiled the draft SEIS. Input from the public, other FS associates, and specialists from other agencies was instrumental in the completion of this document.

4.1 Interdisciplinary Core Team

Name	**Lois DeMarco**
Position	Ecosystem Management Staff Officer
Education	B.S. in Forest Management, Rutgers University
Experience	District Silviculturist, District Recreation Planner, Forester - Oil and Gas, Assistant Forest Silviculturist, Forest Environmental Coordinator, Ecosystem Management Staff Officer
Contribution	ID Team Leader
Name	**Jim Apgar**
Position	Forest Environmental Coordinator
Education	B.S. in Forest Management, University of Massachusetts
Experience	Silviculturist, Timber Management Assistant, Off Highway Vehicle Trail Planner, Planning and Design Leader
Contribution	NEPA Coordinator
Name	**Lori Elmquist**
Position	Office Automation Clerk
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Experience	3 years with USFS
Contribution	Planning record/administrative support
Name	**Glenn Howard**
Position	Program Specialist
Education	J.D., SUNY at Buffalo
Experience	Program coordination
Contribution	Supporting team member
Name	**Andrea Hille**
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Education	B.S. Natural Resources Management; Continuing Education in Hardwood Silviculture, Forest Health Topics, and Ecosystem Management; Recreation Planning Short Course, Clemson University; Completed USDA Forest Service Eastern Region Program for Advanced Studies in Silviculture
Experience	21 years USDA Forest Service: silviculture, reforestation, recreation and wilderness planning, special uses; Certified Silviculturist in USDA Forest Service Eastern Region for 10 years;
Contribution	Certified Pesticide Applicator: USDA and PA Dept of Agriculture Completed portions of DEIS related to forest vegetation and products, recreation resources, and congressionally and administratively designated

areas.

Name	**Rickard H. Hokans**
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Contribution	Economic impact analysis
Name	**Charles M Keeports**
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Name	**April Moore**
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Contribution	Botany/Habitat Diversity/Species Viability Evaluation
Name	**Russell LaFayette**
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Contribution	Water Resource Management/Effects
Name	**Brad Nelson**
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Contribution	Interdisciplinary Team Member – Habitat Diversity, Species Viability Analysis, Threatened and Endangered Species Consultation

Name	**Brent Pence**
Position	Fisheries Biologist
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Contribution	Team member working on Species Viability Evaluation, with Aquatic Species; Assisted with development of Standards and Guidelines for fisheries, riparian, and other aquatic resources; Contributed to the affected environment and effects analysis write-ups for aquatic resources

Name	**Ralph Perron**
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Name	**Dan Salm**
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Experience	30 years - FS Transportation Planning
Contribution	Long term Transportation System Planning and Analysis

Name	**James Seyler**
Position	Operations Staff Officer (Supervisors Office)
Education	BS Environmental Forest Biology and Natural Resource Management, SUNY ESF 1995
Experience	13 years as a Biologist/Environmental Planner
Contribution	Minerals, Roads, and Recreation

Name	**Janet Stubbe**
Position	Forest Landscape Architect
Education	B.S. Natural Resources, Department of Landscape Architecture, University of Wisconsin
Experience	18 years Landscape Architect, USDA Forest Service, Warren, PA; 12 years Landscape Architect/Environmental Planner for Landscape Architecture and Consulting Engineering firms, Wheaton, IL
Contribution	Scenery including inventory and evaluation of visual resources using the Scenery Management System (SMS)

Name	**Paul Weese**
Position	Oil and Gas Administration Team Leader
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Experience	Civil Engineer, Business Consultant, Transportation Planner, Oil and Gas Administration Team Leader
Contribution	Supporting Team Member

Chapter 5

Glossary

CHAPTER 5. GLOSSARY

5.1 Abbreviations and Acronyms

ANF	Allegheny National Forest
ASQ	Allowable Sustainable Quantity
ATV	All-Terrain Vehicle
BA	Biological Assessment
BBL	Barrel
BE	Biological Evaluation
BLM	Bureau of Land Management
BMP	Best Management Practices
CE	Cumulative Effects
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CL	Concern Level
CWF	Cold-water Fishery
DC	Desired Condition
DCNR	Department of Conservation and Natural Resources
DEP	Department of Environmental Protection
DSA	Driving Surface Aggregate
DSEIS	Draft Supplemental Environmental Impact Statement
EA	Environmental Assessment
EIS	Environmental Impact Statement
ELT	Ecological Land Type
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FR	Forest Road
FS	Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
FY	Fiscal Year
GIS	Geographic Information System
IDT	Interdisciplinary Team
KEF	Kane Experimental Forest
LRMP	Land and Resource Management Plan ("Forest Plan")
LTA	Land Type Association
MA	Management Area
MBF	One Thousand Board Feet
MCF	One Thousand Cubic Feet
M&E	Monitoring and Evaluation
MMBF	One Million Board Feet
MMCF	One Million Cubic Feet
MIS	Management Indicator Species
MUSY	Multiple-Use and Sustained-Yield Act
NCNST	North Country National Scenic Trail
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NETL	National Energy Technical Lab
NF	National Forest
NFMA	National Forest Management Act
NFS	National Forest System
NNIP	Non-native Invasive Plants
NNIS	Non-native Invasive Species
NOI	Notice of Intent
NRA	National Recreation Area
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OGM	Oil, Gas and Minerals
OHM	Off-Highway Motorcycle
OHV	Off-Highway Vehicle
PFA	Post-Fledging Areas
PFBC	Pennsylvania Fish and Boat Commission
PGC	Pennsylvania Game Commission
PVT OGD	Private Reserved and Outstanding Oil and Gas Development
RAP	Roads Analysis Process
RARE	Roadless Area Review and Evaluation
RD	Ranger District
RFSS	Regional Forester Sensitive Species
PE	Pennsylvania Endangered
PNDI	Pennsylvania Natural Diversity Inventory
PPB	Parts per Billion
PPM	Parts Per Million
PT	Pennsylvania Threatened
RM	Roaded Modified
RN	Roaded Natural
RNA	Research Natural Area
ROS	Recreation Opportunity Spectrum
ROD	Record of Decision
S&Gs	Standards and Guidelines
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office
SIL	Scenic Integrity Level
SMS	Scenery Management System
SPM	Semi-primitive Motorized
SPNM	Semi-primitive Non-motorized
SUP	Special Use Permit
SVE	Species Viability Evaluation
TES	Threatened, Endangered, and Sensitive
TEPS	Threatened, Endangered, Proposed, and Sensitive
TDD	Telecommunication Device for the Deaf
TTY	Teletype
TU	Tentatively Undetermined
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USDOE	United States Department of Energy
USFS	United States Forest Service
USFWS	USDI Fish and Wildlife Service
USGS	United States Geologic Survey
USNPS	USDI National Park Service
VIS	Visitor Information Services

VMS	Visual Management System	WSR	Wild and Scenic River
VQO	Visual Quality Objective		

5.2 Terms

The following definitions and/or descriptions clarify terminology used in the Land and Resource Management Plan and Final Environmental Impact Statement.

[A]

ABIOTIC – Non-living. Climate is an abiotic component of ecosystems.

ACQUISITION – Obtaining land or land interest through purchase, exchange, and donation.

ADAPTIVE MANAGEMENT – A type of natural resource management that implies decisions are made as part of an on-going process. Monitoring the results of actions will provide a flow of information that may indicate the need to change a course of action. Scientific findings and the needs of society may also indicate the need to adapt resource management to new information.

ADMINISTRATIVE USE – Use of National Forest land, interests in land, or other resources, by the Forest Service, or an individual or entity authorized by the Forest Service, for the protection, administration, or management of the National Forest.

AFFECTED ENVIRONMENT – The current state of the environment that may be affected by the plan or project.

AIRSHED – A geographic area that shares the same air.

ALLEGHENY HARDWOODS – Forest type containing Black Cherry, Yellow Poplar, White Ash, red maple and other species.

ALL-TERRAIN VEHICLE (ATV) – Any motorized, off-highway vehicle 50 inches or less in width, having a dry weight of 600 pounds or less that travels on three or more low-pressure tires with a seat designed to be straddled by the operator. Low-pressure tires are 6 inches or more in width and designed for use on wheel rim diameters of 12 inches or less, utilizing an operating pressure of 10 pounds per square inch (psi) or less as recommended by the vehicle manufacturer.

ALLOWABLE SALE QUANTITY (ASQ) – The amount of timber that may be sold within a certain time period from an area of suitable land. See discussion in LRMP for more detail.

ALTERNATIVE – Alternatives provide options for meeting the purpose and need of a Plan revision process by emphasizing reasonable ways to resolve management issues as though each alternative were a separate Forest Plan. While all alternatives provide a wide range of multiple uses, goods and services, they respond to the issues needing change in different ways and describe a different desired future condition.

ANNUAL MAINTENANCE – Work performed to maintain serviceability or repair failures during the year in which they occur. Includes preventive and/or cyclic maintenance performed in the year in which it is scheduled to occur. Unscheduled or catastrophic failures of components or assets may also need to be repaired as a part of annual maintenance.

AQUATIC – Pertaining to standing and running water in streams, rivers, lakes and reservoirs.

ARTIFACT – An object made or modified by humans having cultural or historic value.

ASPECT – The direction a slope faces. A hillside facing east has an eastern aspect.

ASSESSMENT (Resource Assessment) – A compilation of background material on the status of a particular resource area, on a local, regional, or national scale. A Resource Assessment describes the present condition of a particular resource and speculates on the future condition of the resource based on current and expected trends. Assessments address management problems, new policy and direction, monitoring results, and the existing condition of the resource on the forest.

[B]

BACKGROUND – A term used in the management of visual resources or scenery. It refers to the visible terrain located 3 miles to infinity from the viewer (4 miles to the viewer in flat landscapes).

BASKING AREAS – Exposed areas, i.e. sunny areas where cold-blooded amphibians can warm themselves.

BENEFIT – Inclusive term used to quantify the results of a proposed activity, project, or program; expressed in monetary or non-monetary terms.

BEST MANAGEMENT PRACTICES (BMPs) – A practice or combination of practices that is determined by a State (or designated areawide planning agency) to be the most effective, practicable (including technological, economical and institutional considerations) means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

BIOLOGICAL DIVERSITY (biodiversity) – The variety of life forms and processes within an area. Included in the

consideration of diversity are genetic variation, number and distribution of species, and the ways in which the variety of biologic communities interact and function.

BIOLOGICAL EVALUATION/ASSESSMENT - (Threatened, Endangered, Proposed, and Sensitive Species) – A technical report prepared by the Forest Service that uses a variety of tools, including review of existing literature and data, field survey, and data gathering and analysis, to determine the presence of, and effects of activities on, threatened, endangered, proposed, and sensitive species (FSM 2670).

BIOLOGICAL POTENTIAL – The maximum production of a selected organism that can be obtained under optimum management.

BIOMASS – The total weight of all living organisms in a biological community.

BIOME – The complex of living communities maintained by the climate of a region and characterized by a distinctive type of vegetation. Examples of biomes in North America include the tundra, desert, prairie, and the eastern hardwood forest.

BIOTIC – Living; for example, green plants and soil microorganisms are biotic components of ecosystems.

BOARD FOOT – A measurement term for lumber or timber. It is the amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide. Often used variations are MBF (thousand board feet) and MMBF (million board feet).

BROWSE – Twigs, leaves, and young shoots of trees and shrubs that animals eat.

BUFFER – A land area that is designated to block or absorb unwanted impacts to the area beyond the buffer. For example buffers may be set aside next to wildlife habitat to reduce abrupt change to the habitat and along aquatic areas to minimize impacts.

BUILT ENVIRONMENT IMAGE GUIDE (BEIG)– The *built environment*, as used in this guide, refers to the administrative and recreation buildings, landscape structures, site furnishings, structures on roads and trails, and signs installed or operated by the U.S. Department of Agriculture (USDA) Forest Service, its cooperators, and permittees. The guide incorporates design standards focusing on sustainability within the natural and cultural landscape while providing optimal service to customers and cooperators.

[C]

CAPABILITY – The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity.

CARRYING CAPACITY – the maximum number of animals or people that a habitat can sustain while maintaining the ecosystem in a healthy, vigorous condition.

CAVITY – A hole in a tree often used by wildlife species, usually birds, for nesting, roosting, and reproduction.

COARSE FILTER MANAGEMENT – Land management that attempts to address the needs of a majority of native species through management of natural landscapes and ecological communities (see fine filter management).

COHORT – A population of plants or animals having approximately the same age.

COLLECTOR ROADS – These roads serve small land areas and are usually connected to a Forest System Road, a county road, or a state highway.

COMMERCIAL FOREST LAND – Forest land that has not been withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service, and is producing, or is capable of producing, crops of industrial wood without irreversible damage to soils, productivity, or watershed conditions, and with reasonable assurance that adequate restocking can be attained within five years after final harvesting. These lands are also appropriate for timber production.

COMMERCIAL USE (SPECIAL USES) – Any use or activity on National Forest System land where (a) an entry or participation fee is charged, or (b) the primary purpose is the sale of a good or service, and in either case, regardless of whether the use or activity is intended to produce a profit (36 CFR 251.51).

COMMON VARIETY MINERALS – See Mineral Material, Common Variety.

COMMUNITY (Natural Community) – An interacting assemblage of organisms, their physical environment, and the natural processes that affect them.

COMPOSITION – The types of organisms and environmental features present in a particular area.

CONCERN LEVEL – A measure of the degree of public

importance placed on landscapes viewed from travelways and use areas. Concern levels are divided into three categories: 1, 2, and 3.

CONCESSION PERMIT – A permit which authorizes private individuals or corporations to operate FS-owned facilities as a commercial business.

CONCOMITANT – Events that are coincident in time and so clearly related that one probably is a direct result of the other.

CONGRESSIONALLY DESIGNATED WILDERNESS – *see* Wilderness

CONIFER – A tree that produces cones, such as a pine, spruce, or fir tree.

CONNECTIVITY (of habitats) – A condition in which the spatial arrangement of land cover types allows organisms and ecological processes (such as disturbance) to move across the landscape. Connectivity is the opposite of fragmentation.

CONNECTOR TRAILS – Trails that provide linkages between other trails designated for the same use or to communities that may provide services.

CONSTRAINT – A limit placed on levels of management activities that could be produced or incurred in a given time period.

CONSUMPTIVE USE – Resource use that reduces the supply, such as logging and mining.

CONTOUR – A line drawn on a map connecting points of the same elevation.

CORD – A unit of gross volume measurement for stacking round or split wood. A standard cord is 4’ by 4’ by 8’ or 128 cubic feet. A standard cord may contain 60-100 cubic feet of solid wood depending on the size of the pieces and the compactness of the stacks.

CORRIDOR (Ecological Landscape) – A landscape feature that allows animal movement between two patches of habitat or between habitat and geographically discrete resources.

COST EFFICIENCY – The usefulness of specified inputs (cost) to produce specified outputs (benefits). In measuring cost efficiency, some outputs (such as environmental, economic or social impacts) are not assigned monetary values but are achieved at specified levels in a least cost manner.

COVER – Any feature that conceals wildlife or fish. Cover may be dead or live vegetation, boulders, or undercut streambanks. Animals use cover to escape from predators, rest, and/or feed.

CREATED OPENING – An opening in the forest cover created by the application of even-aged silvicultural practices.

CRITICAL HABITAT – Areas designated for the survival and recovery of species listed as threatened or endangered under the federal Endangered Species Act.

CULTURAL RESOURCE – *see* Heritage Resource

CUMULATIVE EFFECTS – Effects on the environment that result from separate, individual actions and that, collectively, become significant over time.

[D]

DECISION CRITERIA – The information used to evaluate alternatives to a proposed action on National Forest land. Decision criteria are designed to help a decision maker identify a preferred choice from the array of alternatives.

DECOMMISSION – Demolition, dismantling, removal, obliteration and/or disposal of a deteriorated or otherwise unneeded asset or component, including necessary cleanup work. This action eliminates the deferred maintenance needs for the fixed asset. Portions of an asset or component may remain if they do not cause problems or require maintenance.

DEER WINTERING AREAS (deer yards) – Land parcels that include two basic habitat components required by white–tailed deer during winter: shelter and browse.

DEFERRED MAINTENANCE – Maintenance that was not performed when it should have been or when it was scheduled and which, therefore, was put off or delayed for a future period. When allowed to accumulate without limits or consideration of useful life, deferred maintenance leads to deterioration of performance, increased costs to repair, and decrease in asset value.

DEN TREE – A live or dead tree, at least 10” dbh, containing a natural cavity in the main stem or with exfoliating bark used by wildlife for nesting, brood rearing, hibernating, roosting, daily or seasonal shelter and escape.

DESIGN CRITERIA – The standards and guidelines of the Land and Resource Management Plan.

DESIGNATED ROAD, TRAIL OR AREA – A National Forest System road, a National Forest System trail, or an area on national forest system that is designated for motor

vehicle use .. on a motor vehicle use map.

DESIRED CONDITION – This describes a future condition that is the long term goal of the Plan. It is not identified for any specific time period, but for some future period. The description identifies desired ANF uses, ecological conditions and ANF infrastructure. Activities conducted during plan implementation contribute to the achievement of this desired condition.

DESIRED LANDSCAPE CHARACTER - Appearance of the landscape to be retained or created over time. This desired character recognizes that the landscape is a dynamic, constantly changing community of plants and animals.

DEVELOPED RECREATION – Recreation activities that are dependent on the presence of constructed features or facilities. Examples include camping in a campground or using a picnic area.

DEVELOPED RECREATION SITE - An area with a concentration of constructed features or facilities managed primarily for the enhancement of recreation activities. Examples include campgrounds, picnic areas, interpretive sites, and trailheads.

DISPERSED RECREATION – Recreation that does not occur in a developed recreation site, such as hunting, backpacking, and scenic driving.

DISTANCE ZONES - Areas of landscapes denoted by specified distances from the observer. Used as a frame of reference in which to describe landscape characteristics or human activities and described as foreground (fg), middleground (mg) or background (bg).

DISTINCTIVE – Refers to extraordinary and special landscapes. These unusual landscapes stand out from landscapes that are typical or common.

DISTURBANCE – A discrete event, either natural or human induced, that causes a change in the existing condition of an ecological system.

DIVERSITY – The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

DOWN WOODY DEBRIS – Trees or portions of trees that have died and fallen to the forest floor that will be at various stages of decomposition.

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) – The draft version of the Environmental Impact Statement that is released to the public and other agencies for review and comment.

[E]

EARLY STRUCTURAL HABITAT – See Structural stages.

EARLY SUCCESSIONAL SPECIES – The biotic (living) community that develops immediately following the removal or destruction of forest vegetation in an area. For instance, grasses may be the first plants to grow in an area that was burned.

EASEMENT – The right of use over the property of another owner.

ECOLOGICAL LAND TYPE (ELT) **–** An area of land hundreds to thousands of acres in size, with a well-known succession of forest species on unique soil materials. Ecological Land Type classification is based on geomorphic history, nature of soil substrata, and potential natural vegetation.

ECOLOGY – The interrelationships of living things to one another and to their environment, or the study of these interrelationships.

ECOSYSTEM – A dynamic arrangement of living organisms interacting with each other and their non-living environment. Living organisms include plants and animals. The non-living environment includes soils, landforms, weather, and disturbances.

ECOSYSTEM MANAGEMENT – An approach to the management of natural resources that strives to maintain or restore the sustainability of ecosystems and to provide present and future generations a continuous flow of multiple benefits in a manner that is harmonious with ecosystem sustainability.

ECOSYSTEM RESTORATION – The process of reestablishing, to the extent possible, the structure, function, and composition of ecosystems.

EDGE – The margin where two or more vegetation patches meet, such as a grassy opening next to a mature forest stand, or a young stand next to a mature stand.

ENDANGERED SPECIES – A plant or animal that is in danger of extinction throughout all, or a significant portion, of its range. Endangered species are identified by the Secretary of the Interior in accordance with the Endangered Species Act of 1973.

ENDEMIC PLANT/ORGANISM – A plant or animal that occurs naturally in a certain region and whose

distribution is relatively limited geographically.

ENVIRONMENTAL ANALYSIS – An analysis of alternative actions and their predictable long and short-term environmental effects. Environmental analyses include physical, biological, social, and economic factors.

ENVIRONMENTAL ASSESSMENT – A concise public document that briefly provides sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement or to return a finding of no significant impact, aids an agency's compliance with NEPA when no Environmental Impact Statement is necessary, or facilitates preparation of a statement when one is necessary. An EA normally includes an analysis of alternative actions and their predictable long and short-term environmental effects.

ENVIRONMENTAL IMPACT STATEMENT (EIS) – A formal document required by the National Environmental Protection Act, as detailed in section 102(2)c (40 CFR 1508.11), and filed with the Environmental Protection Agency that considers significant environmental impacts expected from implementation of a proposed major Federal action and alternatives to it. The EIS is released as a draft to other agencies and the public for comment and review.

EQUESTRIAN USE – Pertaining to horseback riding for recreational purposes.

EROSION – The wearing away of the land surface by wind, water, ice, or other geological agents.

EXCEPTIONAL VALUE WATERS – Surface waters of high quality which satisfy biological and chemical criteria as set forth by Pennsylvania Department of Environmental Protection.

EXISTING SCENIC INTEGRITY – Current state of the landscape, considering previous human alterations. State of the landscape includes naturalness or disturbance created by human activities or alteration. Integrity is stated in degrees of deviation from the existing landscape character.

EXPLORATION (MINERALS) – Establishing the location, size, grade, or reserves of a mineral or energy resource by gathering direct evidence of the resource. Direct data gathering techniques may include drilling holes or digging pits to sample or test a known suspected zone of interest.

EXTANT – Still in existence; not extinct, destroyed, or lost.

EXTIRPATE – Eradicate, or cause the extinction of, a plant or animal species on a local or regional scale.

EXTIRPATION – Eradication or extinction of a plant or animal species on a local or regional scale.

EXTRACTION – The process of mining or removing mineral deposits, oil, or gas from the earth.

[F]

FAUNA –The animal life of an area.

FEATHERING – Partial cutting of trees along an edge to create a transition in heights between areas and/or a transition in stand density between stands of different densities (FSH 559).

FELLING – Cutting down trees.

FILTER STRIP – A portion of land that provides largely undisturbed soil to separate soil-disturbing activities from streams, ponds, wetlands, and seasonal pools. The purpose of the protective strip is to protect the soil's infiltration capacity and to filter out sediment.

FINE FILTER MANAGEMENT – Management that focuses on the welfare of a single species, or only a few species, rather than the broader habitat or ecosystem (*see* Coarse Filter Management).

FISHERIES HABITAT – Streams, lakes, impoundments, and reservoirs that support, or have the potential to support, fish.

FLOOD PLAIN – A flat lowland area adjoining a watercourse that is made up of unconsolidated river borne sediments and is periodically flooded.

FLORA – The plant life of an area.

FORAGE – All browse and non-woody plants that are eaten by wildlife.

FORB – A broadleaf plant that has little or no woody material in it.

FOREGROUND – A term used in the management of visual resources or scenery. The part of a scene or landscape that is nearest to the viewer, generally found from the observer up to one-half mile away or one-quarter mile away in flat landscapes..

FOREST HEALTH – A condition wherein a forest has the capacity across the landscape for renewal, for recovery from a wide range of disturbances, and for retention of its ecological resiliency while meeting current and future needs of people for desired levels of values,

uses, products, and services.

FOREST LAND – Land at least ten percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for nonforest use.

FOREST PLAN – see Land and Resource Management Plan

FOREST PLAN REVISION – A formal modification of an existing Forest Plan.

FOREST ROADS AND TRAILS – Roads and trails under the jurisdiction of the Forest Service.

FOREST SUPERVISOR – The official responsible for administering National Forest lands on an administrative unit, usually one or more National Forests. The Forest Supervisor reports to the Regional Forester.

FOREST TYPE – A descriptive term used to group stands of similar character, species composition and other ecological factors.

FOREST-WIDE STANDARDS AND GUIDELINES – Standards and guidelines that may apply (based on the nature of the direction) to the entire forest. For example, forestwide riparian standards apply to all riparian areas in the ANF.

FRAGMENTATION – The physical division of contiguous areas into progressively smaller patches of increasing degrees of isolation from each other.

FROST HEAVE – A land surface that is pushed up by the accumulation of ice in the underlying soil.

FUELS – Plants and woody vegetation, both living and dead, that are capable of burning.

FUNCTION – All the processes within an ecosystem through which the elements interact, such as succession, the food chain, fire, weather, and the hydrologic cycle.

[G]

GAME SPECIES – Any species of wildlife or fish that is harvested according to prescribed limits and seasons.

GEOMORPHIC PROCESSES – Processes that change the form of the earth, such as volcanic activity, running water, and glacial action.

GEOMORPHOLOGY – The science that deals with the relief features of the earth's surface.

GEOGRAPHIC INFORMATION SYSTEMS (GIS) – GIS is both a database designed to handle geographic data as well as a set of computer operations that can be used to analyze data.

GLOBAL POSITIONING SYSTEM (GPS) – a navigational system using satellite signals to fix the location of a receiver on or above the earth's surface.

GOAL – A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad terms and is timeless in that it has no specific date by which it is to be completed.

GOODS AND SERVICES – The various outputs, including on-site uses, produced by forest and rangeland resources (36 CFR 219.3).

GROUND WATER – The supply of fresh water under the earth's surface in aquifers and soils.

GUIDELINE – A guideline is an expected course of action that promotes the achievement of Forest Plan desired condition, goals and objectives. A project-level analysis and a signed decision (by the responsible official) are required in order to deviate from an established guideline.

[H]

HABITAT – The natural environment of a plant or animal. An animal's habitat includes the total environmental conditions for food, cover and water within its home range.

HABITAT CAPABILITY – The ability of a land area or plant community to support a given plant or animal species.

HABITAT DIVERSITY – The number of different types of plant or animal species habitat within a given area.

HARD SNAG – Snags composed essentially of sound wood on the outside.

HARDWOOD – A broad-leaved flowering tree, as distinguished from a conifer. Trees belonging to the botanical group of angiospermae.

HAZARDOUS FUELS – Naturally occurring vegetation, both live and dead, that given a wildfire occurrence would present a higher than normal resistance to control. Hazardous fuels may be measured by tons per acre, fuel arrangement, and/or continuity or burning characteristics.

HEALTHY FOREST- A condition wherein a forest has the capacity, across the landscape, for renewal, for

recovery from a wide range of disturbances, and for retention of ecological resiliency, while meeting current and future needs of people for desired levels of values, uses, products and services.

HERITAGE RESOURCE – Historic landscapes, archaeological sites, buildings, structures, features, artifacts, Native American Traditional Cultural properties, and/or related clusters of these (referred to as "districts").

HIBERNACULA – Plural form of hibernaculum.

HIBERNACULUM – A shelter, such as a cave or abandoned mine, occupied during the winter by a hibernating animal, such as an Indiana bat.

HORIZONTAL DIVERSITY – The distribution and abundance of different plant and animal communities, or plant conditions, across an area of land; the greater the numbers of communities or condition stages in a given area, the higher the degree of horizontal diversity.

HYDROLOGY – The study of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere.

[I]

IGNEOUS ROCK – Rocks formed when high temperature, molten mineral matter cools and solidifies.

IMMEDIATE FOREGROUND – The detailed feature landscape found within the first 300 hundred feet of the observer. This distance zone is normally more useful to project level planning than to broad scale planning.

IMPLAN® – An economic impact assessment modeling system. IMPLAN allows the user to easily build economic models to estimate the impacts of economic changes in their states, counties, or communities.

IMPLEMENTING REGULATIONS – Regulations generated by an agency to implement an Act of Congress; i.e., 36 CFR 219 contains implementing regulations for RPA and NFMA.

IMPOUNDMENTS – Structures used to collect and confine water, as in a reservoir.

IMPROVED ROAD – An improved road is any constructed or existing feature or facility created on the land for the purpose of travel by passenger vehicles (four wheeled, two wheel drive) which are legally owned and operated on Forest roads and highways, and vehicles that are greater than 50 inches in width. Said facility will have an area for vehicles to travel on and will incorporate some manner for disposal of surface runoff.

INDICATOR SPECIES – A plant or animal species related to a particular kind of environment. Its presence indicates that specific habitat conditions are also present.

INDIGENOUS (species) – Any plant or animal species native to a given land or water area by natural occurrence.

INFRA – An integrated data management tool where Forest managers enter, manage and report information and associated financial data in an inventory of constructed features on the land (such as buildings, dams, bridges, water systems, roads, trails, developed recreation sites, range improvements, administrative sites, heritage sites, general forest areas and wilderness). The database also includes information on permits and contracts that alter Forest land.

INSECTICIDE – An agent used to control insect populations.

INTANGIBLE VALUES (INTANGIBLE OUTPUTS) – Goods, services, uses and conditions which are believed to have values to the society but which have neither market values nor assigned values.

INTERDISCIPLINARY TEAM – A team of individuals with skills from different disciplines that focuses on the same task or project.

INTERIOR FOREST – An area of late structural or old forest that is large enough, and of an appropriate shape, to provide conditions that minimize predation, parasitism, and microclimate fluctuations associated with forest edges. These interior forest conditions provide habitat for a diversity of wildlife and plant species.

INTERMITTENT STREAM – A stream which flows during wet portions of the year and has a defined channel and banks that transport water, sediment and organics. They dry up when the water tables drops below the stream bed.

INTERPRETATION – Communication and education that forges emotional and intellectual connections between the interests of the audience and the inherent resource meanings.

INVASIVE SPECIES – A species that is 1) nonnative (or alien) to the ecosystem under consideration, and 2) whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.

INVASIVE SPECIES, APPROACHES:

Contain – Prevent the spread of the invasive species beyond the perimeter of patches or infested areas. Tolerate invasive species within established infestation areas, but suppress or eradicate outside those areas.

Eradicate – Totally eliminate an invasive species from the Forest or location. Eradication methods may include the following, either individually or in combination:

Suppress – Prevent reproduction throughout the target area and reduce the area coverage of the invasive species. Prevent the invasive species from dominating the area, but accept low levels.

Tolerate – Accept the continued presence of established infestations and the probable spread to ecological limits for certain invasive species. Use preventive practices to preclude new infestations.

INVASIVE SPECIES, METHODS OF CONTROL:

Biological – The deliberate introduction and establishment of natural enemies to reduce the target species' competitive or reproductive capacities. Includes, but is not limited to, insects and pathogens such as fungi. The purpose is not eradication, but to reduce densities and rate of spread to an acceptable level.

Chemical – Direct and broadcast application of approved herbicides, following EPA label requirements, USDA policy, and Forest Service policy and direction (FSM 2150, FSH 2109.11, FSH 2109.12, and FSH 2109.13).

Cultural/Land Use – Practices that discourage initial infestation of invasive species. Includes, but is not limited to, seeding, planting and retaining brush and tree canopy cover, and minimizing the extent and duration of exposed soil during management actions.

Physical/Mechanical – Hand or mechanical labor to physically remove all or any part of the plant. Includes, but is not limited to, hand digging, mowing, tilling, and burning.

INVENTORIED ROADLESS AREA – (1) Areas identified in a set of inventoried roadless area maps, contained in the Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000 or (2) roadless areas to be evaluated and considered for wilderness in the forest planning process.

IRRETRIEVABLE – One of the categories of impacts mentioned in the National Environmental Policy Act to be included in Environmental Impact Statements. An irretrievable effect applies to losses of production or commitment of renewable natural resources. For example, while an area is used as a ski area, some or all of the timber production there is irretrievably lost. The loss of timber production during that time, however, is not irreversible, because it is possible for timber production to resume if the area is no longer used as a ski area.

IRREVERSIBLE – A category of impacts mentioned in statements of environmental impacts that applies to non-renewable resources, such as minerals and archaeological sites. Irreversible effects can also refer to effects of actions that can be renewed only after a very long period of time, such as the loss of soil productivity.

ISSUE – A subject or question of wide-spread public discussion or interest regarding management of National Forest System land.

[L]

LAND ADJUSTMENT – Changing National Forest System land ownership through acquisition, exchange, or disposal of land or interest in land.

LAND ALLOCATION – The commitment of a given area and its resources to a particular management area.

LANDFORM – A natural feature of the surface of the land; includes such features as slopes, valleys, plateaus, and ridges.

LANDING – Any place where cut timber is assembled for further transport from the timber sale area.

LANDLINE – National Forest System boundary lines.

LANDSCAPE – An area composed of interacting ecosystems that are repeated due to factors such as geology, soils, climate, and human influences. Landscapes are variable in size, shape, and pattern and are often used for coarse filter analysis.

LANDSCAPE CHARACTER – Particular attributes, qualities, and traits of a landscape that give it an image and make it identifiable or unique. This includes the visual image created by the physical, biological and cultural factors of the past, present and future.

LANDSCAPE SETTING – The context and environment in which a landscape is set; a landscape backdrop.

LANDSCAPE VISIBILITY – Accessibility of the landscape to viewers, referring to one’s ability to see and perceive landscapes.

LAND AND RESOURCE MANAGEMENT PLAN (LRMP) – Formal name for the Forest Plan, the LRMP is a document that guides all long-range natural resource management activities for a National Forest. For more discussion on LRMP, see introduction to the LRMP.

LAND TYPE ASSOCIATION (LTA) – Areas of common ecosystem characteristics that generally number in the thousands of acres. LTAs are defined by similarities in general topography, geomorphic processes, geology, soil and potential plant community patterns.

LATE STRUCTURAL HABITAT – See Structural Stages.

LEASABLE MINERALS – These include coal, oil, gas, phosphate, sodium, potassium, oil shale, and geothermal steam that are leased for development (FSM 2811.2).

LIFE HISTORY – The sequence of changes making up the span of an organism's life.

LITTER (forest litter) – The freshly fallen, or only slightly decomposed, plant material on the forest floor. This layer includes foliage, bark fragments, twigs, flowers, and fruit.

LOCAL ROAD – Serves smaller land areas than collector roads. Connects to other roads or terminal facilities.

LOGGING RESIDUE (slash) – The residue left on the ground after timber cutting. It includes unutilized logs, uprooted stumps, broken branches, bark, and leaves. Certain amounts of slash provide important ecosystem roles, such as soil protection, nutrient cycling, and wildlife habitat.

LONG-TERM SUSTAINED YIELD – The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity consistent with multiple-use objectives.

[M]

M – Thousand. Five thousand board feet of timber can be expressed as 5M board feet.

MACRO-CLIMATE – The general, large scale climate of a large area, as distinguished from the smaller scale micro climates within it.

MAINTENANCE – The act of keeping fixed assets in acceptable condition. It includes preventive maintenance, normal repairs, replacement of parts and structural components, and other activities needed to preserve a fixed asset, so that it continues to provide acceptable service and achieves its expected life. Maintenance excludes activities aimed at expanding the capacity of an asset or otherwise upgrading it to serve needs different from, or significantly greater than, those originally intended.

MAINTENANCE LEVEL - Defines the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria. For more information, see discussion in Chapter 3 of the FEIS.

MANAGEMENT AREAS (MAs) – Areas of the National Forest designated in the Forest Plan as having similar desired conditions, standards and guidelines. Similar to city planning zones.

MANAGEMENT INDICATOR SPECIES (MIS) – A wildlife species whose population will indicate the health of the ecosystem in which it lives and, consequently, the effects of forest management activities to that ecosystem.

MANAGEMENT PRACTICE – A specific activity, measure, course of action, or treatment.

MANAGEMENT PRESCRIPTION – See Prescription.

MARKET VALUE (MARKET OUTPUT) – Goods, services and uses which are commonly bought and sold and which are priced or valued directly from existing markets.

MASS MOVEMENT/WASTING – The down-slope movement of large masses of earth material by the force of gravity. Also called a landslide.

MAST TREES – Species that provide nuts and fruits. These include the oak group, American beech, hop hornbeam and black cherry.

MEAN ANNUAL INCREMENT OF GROWTH – The increase in size and volume of a stand of trees at a particular age divided by that age in years.

MECHANIZED VEHICLES – Any contrivance which travels over ground, snow, or water on wheels, tracks, skids or by floatation, and is propelled by a living power source contained, or carried on or within, the device.

METAPOPULATION – A group of locally interbreeding populations, or demes, each isolated in a patch of habitat. The persistence of the metapopulation is dependent on the persistence of the demes and movement of animals among demes to exchange genes.

MICRO-CLIMATE – The climate of a small site. It may differ from the macro-climate of the area due to aspect, tree cover (or the absence of tree cover), or exposure to winds.

MID STRUCTURAL HABITAT – See Structural stages.

MIDDLEGROUND – The zone between the foreground and background in a landscape. The area is located from 1/2 to 4 miles from the observer. (1/4 mile to 3 miles, in flat landscapes)

MINERAL – Inorganic material that includes sand, gravel, and stone.

MINERAL MATERIALS, COMMON VARIETY – Also referred to as Salable Minerals or Mineral Materials, include construction and landscaping materials (cinders, sand, gravel, boulders, loose rock and common clay) and minerals of similar occurrence commonly used as aggregate, rip-rap, ballast, borrow or fill.

MINERAL RIGHTS – Owning minerals beneath the surface of the ground; often it is someone other than the owner of the surface.

MINERAL SOIL – Soil that consists mainly of inorganic material, such as weathered rock, rather than organic matter.

MITIGATION – Actions taken to avoid, minimize, rectify, maintain or monitor the impact of a land management practice.

MONITORING AND EVALUATION – The periodic evaluation of forest management activities to determine how well objectives are met and how management practices should be adjusted. (*see* Adaptive Management)

MOSAIC – Areas with a variety of plant communities over a landscape, such as areas with trees and areas without trees occurring over a landscape.

MOTORIZED VEHICLES – Any contrivance which travels over ground, snow, or water on wheels, tracks, skids, or by floatation and is propelled by a non-living power source contained or carried on or within the device.

MULTIPLE USE – Managing National Forest resources in a manner to best meet the needs of the American people, recognizing that not all uses can occur on all acres and that changing needs and conditions over time will change the combination and intensity of use. Productivity of the land and sustainability of ecosystems is maintained, and the interrelationships among resources and the effects of use are monitored and evaluated. Multiple-use management does not necessarily prescribe the combination of uses that will give the greatest dollar return or the greatest unit output.

[N]

NATIONAL REGISTER OF HISTORIC PLACES (NR) – Listings of historic properties (or heritage resources) that meet the criteria of significance established by the National Historic Preservation Act.

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (NEPA) – NEPA establishes a national policy to encourage productive and enjoyable harmony between humankind and the environment, to promote efforts that will prevent or eliminate damage to the environment and stimulate the health and welfare of humans, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council on Environmental Quality. One of the major tenets of NEPA is its emphasis on public disclosure of possible environmental effects of any major action on public lands.

NATIONAL FOREST MANAGEMENT ACT OF 1976 (NFMA) – NFMA requires the Secretary of Agriculture to assess forest lands, develop management programs based on multiple-use and sustained yield principles, and implement a Land and Resource Management Plan for each National Forest.

NATIONAL FOREST SYSTEM ROADS – Those roads wholly or partly within, or adjacent to and serving, the National Forests, and other areas administered by the Forest Service that have been included in the Forest Transportation Atlas (36 CFR 212.1 and 261.2).

NATIONAL FOREST SYSTEM TRAILS – Those trails wholly or partly within, or adjacent to and serving, the National Forests, and other areas administered by the Forest Service that have been included in the Forest Transportation Atlas (36 CFR 212.1 and 261.2).

NATIONAL PARK SERVICE (NPS) – The agency of the US Department of the Interior responsible for the administration of National Parks, Monuments, and Historic Sites. The NPS is distinct from the USDA Forest Service both administratively and by mission.

NATIONAL RECREATION AREA –Congressionally-designated areas that have outstanding combinations of outdoor recreation, aesthetic attractions, and proximity to potential users. They may also have cultural, historical, archaeological, pastoral, wilderness, scientific, wildlife, and other values contributing to public enjoyment.

NATURAL-APPEARING LANDSCAPE CHARACTER – Landscape character that has resulted from human activities, yet appears natural. Examples include the historic converting of native forests into farmlands and pastures and reverting back to forests through reforestation activities or natural regeneration.

NATURAL BARRIER – A natural feature, such as a dense stand of trees or downfall, that will restrict animal travel.

NATURAL DISTURBANCE – *see* Disturbance

NATURAL INTEGRITY (a.k.a. ecosystem integrity) – The capability of an ecosystem to support and maintain the structure and function characteristic of its particular location.

NEST TREE – Tree containing large nests, built by crows, herons, or hawks, that from the ground resemble a platform of sticks and are two to three feet in diameter. These may be used by owls, which do not build nests, or they may be re-used by crows, herons, and hawks, among other species.

NET PUBLIC BENEFITS – An expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of the National Forest units is consistent with the principles of multiple-use and sustained-yield management.

NO-ACTION ALTERNATIVE – The most likely condition expected to exist in the future if management practices continue unchanged.

NON-FOREST LAND – Lands never having or incapable of having 10 percent or more of the area occupied by forest trees or lands previously having such cover and currently developed for non-forest use.

NON-GAME – Wildlife species that are not hunted for sport.

NON-MARKET VALUE (NON-MARKET OUTPUT) – Goods, services and uses which are not commonly bought or sold in existing markets. For use in comparing alternatives they are assigned dollar values derived from willingness-to-pay analysis. See also “Intangible Values.”

NON-MOTORIZED USE – Land uses requiring or largely dependent on isolation from motor vehicles and/or roads.

NON-NATIVE INVASIVE SPECIES (NNIS) – An organism that has been purposefully or accidentally introduced outside its original geographic range, and that is able to proliferate and aggressively alter its new environment, causing harm to the economy, environment, or human health (Executive Order 13112)

NON-POINT SOURCE POLLUTION – Pollution whose source is not specific in location. The sources of the discharge are dispersed, not well defined, or constant. Rain storms and snowmelt often make this type of pollution worse. Examples include sediments from earth disturbing activities and runoff from agricultural chemicals.

NON-RECREATION SPECIAL USE PERMITS – A general definition of permitted uses of ANF land. These include agriculture, community and public information, energy generation and transmission, communications, feasibility, research, training, cultural resources, and historical classes, among other uses. By definition, recreation is excluded.

NON-RENEWABLE RESOURCE – A resource whose total quantity does not increase measurably over time, so that each use of the resource diminishes the supply.

NORTHERN HARDWOODS – Primarily sugar maple, yellow birch, and beech. May include red maple, white ash, black cherry, red spruce, and hemlock.

NOTICE OF INTENT (NOI) – A notice in the federal register of intent to prepare an environmental impact statement on a proposed action.

NOXIOUS WEED – Those plant species designated as noxious weeds by the Secretary of Agriculture or by a responsible State official. Noxious weeds generally possess one or more of the following characteristics: Aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and being native or new to or not common to the United States or parts thereof. (FSM 2080)

NUTRIENT CYCLE – The circulation of chemical elements and compounds, such as carbon and nitrogen, in specific pathways from the non-living parts of ecosystems into the organic substances of the living parts of ecosystems, and then back again to the non-living parts of the ecosystem. For instance, nitrogen in wood is returned to the soil as the dead tree decays. The nitrogen again becomes available to living organisms

in the soil and, upon their death, the nitrogen is available to plants growing in that soil.

[O]

OBJECTIVE – A concise, time-specific statement of measurable and planned results that respond to pre-established goals.

OFF-ROAD VEHICLE (ORV) – Any motorized vehicle designed for or capable of cross-country travel on, or immediately over, land, water, sand, snow, ice, marsh, swampland, or other natural terrain; except that such term excludes (A) any registered motorboat, (B) any fire, military, emergency, or law enforcement vehicle when used for emergency purposes, and any combat or combat support vehicle when used for national defense purposes, and (C) any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or contract.

OFF SITE VIEWS – A term used in management of visual resources. The view beyond foreground, includes middleground and background views.

ON-SITE VIEW – A term used in management of visual resources. *see* Foreground

OPERATIONS – Activities related to the normal performance of the functions for which a fixed asset or component is intended to be used. Includes tasks such as janitorial services, vault toilet pumping, grounds upkeep, and law enforcement patrols.

ORGANIC SOIL – Soil at least partly derived from living matter, such as decayed plant material.

OUTFITTING – Providing, through rental or livery, any saddle or pack animal, vehicle or boat, tents or camp gear, or similar supplies or equipment, for pecuniary remuneration or other gain. The term "outfitter" includes the holder's employees, agents, and instructors.

OUTSTANDING MINERAL RIGHTS – Rights owned by a party other than the surface owner at the time the surface was conveyed to the United States.

OUTSTANDINGLY REMARKABLE VALUE – A river-related value that is a unique, rare or exemplary feature that is significant at a comparative regional or national scale. This is associated with evaluation of wild and scenic rivers.

[P]

PARENT MATERIAL – The mineral or organic matter from which the upper layers of soil are formed.

PASSERINE – A bird of the very large and diverse taxonomic order Passeriformes, sometimes referred to as perching birds or, less accurately, as songbirds. More than half of all living species of birds are passerines, including species as varied as chickadees, crows, jays, wrens, thrushes, swallows, warblers, and sparrows.

PERCOLATION – Downward flow or infiltration of water through the pores or spaces of rock or soil.

PERENNIAL STREAM – A stream which flows year round except during drought years and is typically maintained by groundwater flow during the dry season.

PERMANENT OPENING – An opening dominated by perennial grasses, forbs, sedges and shrubs, that has less than 16 percent stocking of trees and less that 10 percent tree cover. Vegetation in permanent openings may be periodically cut or burned to prevent vegetative succession and tree growth. Optimal size of permanent openings is one-half to ten acres.

PERSONAL USE OF MINERALS – Recreational mineral activities which contribute to the personal enjoyment of mineral collecting as a leisure activity and not for the purpose of realizing personal financial gain either through the sale of the material or through an exchange for other goods or services. The exchange of mineral specimens, and/or the fabrication by the collector of functional or decorative items from the collected material, and the disposal of same, are not considered to constitute a commercial activity as long as the motive for doing so is the further enjoyment of a leisure activity and not for profit.

PEST – A plant, animal, or environmental stress which the land manager determines to be detrimental to achieving resource management objectives.

PESTICIDE – A chemical used to control pests such as insects, fungi or rodents.

PIT – An open surface excavation for extracting stone.

PLAN AMENDMENT – Changes to the text of the Forest Plan decisions contained in the forest plan.

PLAN CORRECTION – Minor changes to the plan that do not substantively affect the management direction or create additional environmental consequences. These include elements of the plan that are not identified as plan decisions, corrections and updates to data or maps, changes in projections of activities, and minor text changes.

PLANNING AREA – The area of National Forest land covered by a Regional Guide or Forest Plan.

PLANNING PERIOD – The time frame for which goods, services, and effects were projected in the development of the Forest Plan.

POINT SOURCE POLLUTION – Pollution traceable to a discharge of pollutants from a discernable, confined, and discrete conveyance, such as a discharge from a sewage treatment plant.

PREDATOR – An animal that lives by preying on other animals. Predators are at or near the tops of food chains.

PRE-EXISTING USE – Land use that may not conform to current direction but existed prior to the establishment of that direction.

PREFERRED ALTERNATIVE – Chosen from among the alternatives developed in the DEIS to address the range of solutions to the Forest's management problems.

PRESCRIPTION – Management practices selected to accomplish specific land and resource management objectives.

PRESENT NET VALUE (PNV) [a.k.a Net Present Value (NPV) or present net worth] – The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area.

PROCLAMATION BOUNDARY – National Forest boundary as proclaimed by the President of the United States.

PROTECTED WATER USE – Pennsylvania Department of Environmental Protection (DEP) defines which water uses shall be protected and the level of water quality criteria for the identified body of water based on their potential and existing use. Protected water uses on the ANF include cold water fisheries (CWF), high quality-cold water fisheries (HQ-CWF), exceptional value waters (EV) and warm water fisheries (WWF).

PUBLIC LAND – Land for which title and control rests with a federal, state, regional, county, or municipal government.

PUBLIC INVOLVEMENT – The use of appropriate procedures to inform the public, obtain early and continuing public participation, and consider the views of interested parties in planning and decision making.

[R]

RANGER DISTRICT – The administrative subunit of a National Forest that is supervised by a District Ranger who reports directly to the Forest Supervisor.

RAPTOR – A bird of prey, such as an eagle or hawk.

RECHARGE – The addition of water to ground water by natural or artificial processes.

RECORD OF DECISION (ROD) – An official document in which a deciding official states the alternative that will be implemented from a prepared Environmental Impact Statement.

RECREATION OPPORTUNITY SPECTRUM (ROS) – A formal Forest Service classification system designed to delineate, define, and integrate outdoor recreation opportunities in land and resource management planning. ROS classes are used to describe all recreation opportunity settings, from natural, undisturbed, and undeveloped to heavily used, modified and developed. ROS designations attempt to describe the kind of recreation experience one may expect to have in a given part of the National Forest. The ROS classes are discussed in detail in Chapter 3 of the FEIS.

RECREATION RIVER – Wild and Scenic Rivers Act Usage: Classification applied to rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

REGIONAL FORESTER – The official of the USDA Forest Service responsible for administering an entire region of the Forest Service.

REGIONAL FORESTER'S SENSITIVE SPECIES – Those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: (1) Significant current or predicted downward trends in population numbers or density Or (2) Significant current or predicted downward trends in habitat capability that would reduce a species existing distribution (FSM 2670.5).

REHABILITATION – A short-term management goal used to return a landscape with existing visual impacts and deviations to a desired level of scenic quality formerly found in the landscape.

REHABILITATION (OF ASSETS) – Renovation or restoration of an existing fixed asset or any of its components in order to restore the functionality or life of the asset. Because there is no significant expansion or change of purpose for the fixed asset, the work primarily

addresses deferred maintenance.

REPAIR (OF ASSETS) – Work to restore a damaged, broken, or worn-out fixed asset, component, or item of equipment to normal operating condition. Repairs may be done as annual maintenance or deferred maintenance activities.

REPLACEMENT (OF ASSETS) – Substitution or exchange of an existing fixed asset or component with one having essentially the same capacity and purpose.

RESEARCH NATURAL AREA (RNA) – A physical or biological unit in which current natural conditions are maintained insofar as possible. These conditions are ordinarily achieved by allowing natural physical and biological processes to prevail without human intervention.

RESERVED MINERAL RIGHTS (mineral reservations) – Mineral rights retained by a grantor in a deed conveying land to the United States.

RESILIENCE – The degree, manner, and pace of restoration of the structure and function of the original ecosystem after disturbance.

RESPONSIBLE OFFICIAL – The Forest Service employee who has been delegated the authority to carry out a specific planning action.

RESTORATION (of ecosystems) – see ecosystem restoration.

REVEGETATION – The re-establishment and development of a plant cover by either natural or artificial means, such as re-seeding.

RIPARIAN AREAS – Geographically delineable area with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems.

RIPARIAN CORRIDOR – This area encompasses the aquatic and riparian ecosystems. Prescriptions and treatments which occur in the riparian corridor would protect, manage and improve riparian resources.

RIPARIAN ECOSYSTEMS – A transition area between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

ROAD DECOMMISSIONING – Activities that result in the stabilization and restoration of unneeded roads to a more natural state.

ROAD DENSITY - Quantity of road mileage per unit area, commonly measured as miles of road per square mile of land area.

ROAD IMPROVEMENT – Activity that results in an increase of an existing road's traffic service level, expansion of its capacity, or change in its original design function.

ROAD MAINTENANCE – The ongoing upkeep of a road necessary to regain or restore the road to the approved road management objective (FSM 7712.3).

ROAD OBLITERATION - Process of removing a road from the landscape. Obliterations are used on system and temporary roads, which are to be removed from service (decommissioned). Obliteration can include removing evidence of any access points; removing any structures from the roadbed (such as culverts, bridges, signs, guide rails, etc.); and restoring wetlands and riparian areas.

ROAD, PRIVATE – A road under private ownership authorized by a Special-Use Authorization, or a road that provides access pursuant to a reserved or private right.

ROAD, PUBLIC – Any road or street under the jurisdiction of and maintained by a public authority and open to public travel (23 U.S.C. 101(a)).

ROAD, TEMPORARY – Road authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be part of the forest transportation system and not necessary for long-term resource management.

ROAD UNCLASSIFIED – Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail. Includes those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1). This term has been replaced with unauthorized road.

ROADLESS AREA - A National Forest-system area that has been inventoried by the Forest Service for possible inclusion in the wilderness preservation system.

ROADLESS AREA REVIEW AND EVALUATION II (RARE II) - A national inventory of roadless and undeveloped areas within the National Forests and Grasslands that was completed in 1979.

RUN-OFF – That part of precipitation, as well as any other flow contributions, that appears in surface water, either perennially or intermittently.

[S]

SCALE – In ecosystem management, it refers to the degree of resolution at which ecosystems are observed and measured.

SCENERY MANAGEMENT SYSTEM (SMS) – SMS is a tool for integrating the benefits, values, desires, and preferences regarding aesthetics and scenery for all levels of management planning.

SCENIC ATTRACTIVENESS – The scenic importance of a landscape based on perceptions of the intrinsic beauty of landform, rockform, and vegetative pattern. This inventory is based on the premise that landscapes with the greatest variety or diversity have the greatest potential for scenic value. Scenery is classified as the following:

A - Distinctive
B - Typical or Common
C - Undistinguished

SCENIC CLASS – A measurement of the relative importance or value of areas having similar inventoried characteristics of scenic attractiveness and landscape visibility. Scenic classes are mapped by combining the three classes of scenic attractiveness with the distance zones, and concern levels of landscape visibility.

SCENIC INTEGRITY LEVEL (SIL) – The state of naturalness or disturbance created by human activities or alteration. SIL is used to inventory the existing condition and to describe objectives during alternative development. See Chapter 3 in the FEIS for details.

SCENIC RIVER – Wild and Scenic Rivers Act Usage: Classification applied to rivers, or sections of rivers, that are free of impoundments; where shorelines or watersheds are still largely primitive and shorelines are largely undeveloped, but accessible at places by a road.

SCOPING – The ongoing process to determine public opinion, receive comments and suggestions, and determine issues during the environmental analysis process. It may involve public meetings, telephone conversations, or letters.

SEEDLING – As used in vegetation surveys, a size class definition: trees less than one inch at DBH.

SEEP – broad, shallow, slow-moving flow that occurs where groundwater emerges on strongly sloping to steep side slopes and low slope colluvial landforms. Seeps provide year round habitat for a variety of wildlife species, including amphibians and invertebrates.

SENSITIVE SPECIES – See Regional Forester Sensitive Species

SERAL – Any stage of the sequence of changes in plant and animal communities on a site over time (*see* Succession).

SETTING – (See Landscape Setting)

SHRUB OPENING – An area managed for wildlife that is dominated by short, woody vegetation and may include small patches of grassy openings and clumps of trees.

SILVICULTURE – The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.

SITE SPECIFIC PLAN AMENDMENT – Plan amendments that allow a specific project or activity to deviate from plan direction. These amendments do not change plan language or plan decisions, except in the application to the specific project or activity.

SKID ROADS (a.k.a. tractor roads) – Skid trails constructed for the purpose of transporting cut trees to a landing. They are ordinarily constructed by ground clearing and/or excavation (FSH 2409.15).

SKID TRAILS – Trails used for the purpose of transporting cut trees to a road or landing. Skid trail use normally does not include ground excavation or clearing (FSH 2409).

SKIDDING – Hauling logs by sliding with a cable, not on wheels, from stump to a collection point.

SLASH – The residue left on the ground after timber cutting or left after a storm, fire, or other event. Slash includes unused logs, uprooted stumps, broken or uprooted stems, branches, bark, among others.

SLUMP – A landslide where the underlying rock masses tilt back as they slide from a cliff or escarpment.

SMALL GAME – Birds and small animals normally hunted or trapped.

SNAG – Includes standing dead or partially dead trees that are at least six inches in diameter at breast height (dbh) and 20 feet tall. (*see* Hard Snag and Soft Snag)

SNOWMOBILE –A motor vehicle that is designed exclusively for use over snow and that runs on a track or tracks and/or a ski or skis.

SOFTWOOD – A coniferous tree. Trees belonging to the botanical group gymnosperme.

SOIL COMPACTION – The reduction of soil volume. For instance, the weight of heavy equipment on soils can compact the soil and thereby change it in some ways, such as in its ability to absorb water.

SOIL PRODUCTIVITY – The capacity of a soil to produce vegetation. Productivity depends on adequate moisture and soil nutrients, as well as favorable climate.

SOIL QUALITY – The capacity of the soil to function within ecosystem boundaries to sustain biological productivity, maintain or enhance water and air quality, and support human health and habitation.

SPECIAL AREA (SA) – National Forest System lands that contain outstanding examples of plant and animal communities, geological features, scenic grandeur, or other special attributes. SAs are nationally designated by the Forest Service or by legislation. SAs are managed to emphasize recreational and other specific related values.

SPECIAL PLACES – Those specific locations in outdoor settings that have attractions and features that are identified as unique, different, distinctive, and extraordinary to people.

SPECIAL USE AUTHORIZATION– An authorization issued to an individual or group by the USDA Forest Service for use of National Forest land for a special purpose. Examples might be a Boy Scout Jamboree, a water system serving private land, or a mountain bike race. Authorizations can be in the form of permits, easements, or leases.

SPECIES VIABILITY EVALUATION (SVE) – A qualitative process for gathering information on species for which viability may be a concern now or during the planning period. The process includes identifying at-risk species, compiling literature and unpublished information on those species, and using that information to develop and analyze Forest Plan revision alternatives.

SPECTRUM – A specific linear program model designed for Forest Service planning.

SPRING – Small to large defined flow from a clearly defined opening in the ground where the water table intercepts the ground surface.

STAND – A contiguous group of trees sufficiently uniform in age class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit, such as mixed, pure, even-aged, and uneven-aged stands. A stand is the fundamental unit of silviculture reporting and record-keeping.

STANDARD – A required course of action, or level of attainment, that promotes the achievement of forest plan desired condition, goals or objectives. Standards found in a forest plan impose limits on natural resource management activities, generally for environmental protection. Deviation from a standard requires a plan amendment.

STATE HISTORIC PRESERVATION OFFICE(R) (SHPO) – The National Historic Preservation Act establishes an oversight role for this office/position vis a vis federal agencies operating within the states. Thus, the SHPO must concur with federal agency decisions which have the potential to affect NR-eligible properties (a.k.a. “significant Heritage Resources”).

STEWARDSHIP – Caring for the land and its resources to pass healthy ecosystems to future generations.

STREAM - A body of water that flows within a defined channel and transports water, sediment and organics. Includes intermittent and perennial streams.

STRUCTURAL STAGES – Describe the forest vegetation conditions, primarily diameter and canopy closure of forest, of importance to wildlife. The term “structural” rather than “successional” is used to describe the vegetation conditions rather than the species composition. These stages include:

EARLY STRUCTURAL HABITAT – Seedling and sapling communities or forested stands normally less than 20 years old where the dominant canopy layer is less than 5 inches in diameter(dbh). Savannahs or open areas with encroaching woody vegetation where tree cover or canopy closure is less than 40% are also considered to be early structural habitat.

MID STRUCTURAL HABITAT – Pole stands of trees where the dominant canopy layer is greater than 5 inches in diameter (dbh) and less than 20 inches in diameter (dbh) and tree cover or canopy closure is greater than 40%.

LATE STRUCTURAL HABITAT – Old forest stands where the dominant canopy layer is greater than 20 inches in diameter (dbh) and tree cover or canopy closure is greater than 40%. These also include standing dead and down tree and canopy gaps with understory and midstory

development.

SUBSURFACE RIGHTS (MINERAL RIGHTS) – Ownership of or right to develop or recover the oil, gas or mineral resources under the land surface.

SUCCESSION – The sequence of changes in plant and animal communities on a site over time.

SUCCESSIONAL STAGE – *see* Seral

SUMMER OFF-ROAD VEHICLE – All off-road vehicles except snowmobiles. (*see* Off-Road Vehicle)

SURFACE RESOURCES – Renewable resources that are on the surface of the earth, such as timber and forage, in contrast to ground water and minerals which are located beneath the surface.

SURFACE RIGHTS – Ownership of the surface of the land only; right to use the surface of the land.

SUSTAINABILITY (general) – The ability of an ecological, economic, and/or social system to maintain structure and function, and to remain resilient, in order to continue to support biological diversity (including humans and their social and economic organization) and system productivity over time.

SUSTAINABLE – The yield of a natural resource that can be produced continually at a given intensity of management is said to be sustainable.

SUSTAINED YIELD – The yield that a renewable resource can produce continuously at a given intensity of management.

[T]

TAXON (TAXA) – A group of organisms at any level of the taxonomic hierarchy. The major taxa are the species and genus and the higher taxa, including the family, order, class, phylum, and kingdom. Minor taxa include subspecies and varieties.

TEMPORARY ROAD – See Road, Temporary.

THERMAL COVER – Cover used by animals against weather.

THIRTEEN PERCENT AREA – A term used to describe Forest Service land that drains directly into the unimpounded section of the Allegheny River between Kinzua Dam and Tionesta Dam. The area makes up 13% of the total land base managed by the ANF, and is important to aquatic species in the Allegheny River.

THREATENED SPECIES – Those plant or animal species likely to become endangered throughout all or a specific portion of their range within the foreseeable future as designated by the U.S. Fish and Wildlife Service under the Endangered Species Act of 1973.

TRAFFIC SERVICE LEVEL (TSL) - Describes the significant characteristics and operating conditions of a road *(FSH 7709.56, Ch 4 - Road Preconstruction Handbook, FSM 7705 - Transportation System).*

TSL A: Free flowing, mixed traffic; stable, smooth surface; provides safe service to all traffic.
TSL B: Congested during heavy traffic, slower speeds and periodic dust; accommodates any legal-size load or vehicle.
TSL C: Interrupted traffic flow, limited passing facilities, may not accommodate some vehicles. Low design speeds. Unstable surface under certain traffic or weather.
TSL D: Traffic flow is slow and may be blocked by management activities. Two-way traffic is difficult, backing may be required. Rough and irregular surface. Accommodates high clearance vehicles. Single purpose facility.

TRAIL – A designated path or travelway of varying width which is maintained for varied recreational uses.

TROUT STREAMS

Class A Trout Stream – A Pennsylvania Fish and Boat Commission designation based on biomass criteria. Class A is the highest level given for a trout stream.

Remote Trout Stream – An Allegheny National Forest designation of a stream that provides an experience in a remote, natural and unspoiled environment with minimal human activities.

Wilderness Trout Stream - A Pennsylvania Fish and Boat Commission designation of a stream that provides an experience in a remote, natural and unspoiled environment with minimal human activities.

[U]

UNAUTHORIZED ROAD OR TRAIL – A road or trail that is not a forest road or trail or temporary road or trail and that is not included in the forest transportation atlas.

UTILITY CORRIDOR – A linear tract of land of varying width forming a passageway through which various commodities such as oil, gas and electricity may be transported.

[V]

VARIETY CLASS – (See new term, “Scenic

Attractiveness")

VEGETATION MANAGEMENT – Activities affecting vegetation designed primarily to promote the health of forest vegetation for multiple-use purposes.

VEGETATION TYPE – A plant community with distinguishable characteristics.

VERNAL POOL – Naturally occurring or constructed small pools or depressions that are inundated for a period of time each year, primarily late fall through spring, as a result of a combination of snowmelt, precipitation and high water tables. These pools dry up for a period of time, generally during the summer and early fall. Vernal pools are free of fish and the pool basin is utilized as breeding habitat for pool-dependent amphibians and invertebrates. Vernal pools are not puddles or pools formed from ruts in roads or skid trails. Indicators during the summer or fall when they are dry include blackened on compressed leaf litter, buttressed tree trunks, and water marked tree trunks.

VIABLE POPULATION – A population that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range within the planning area (FSM 2670.5).

VIEW – A broad landscape or panorama that is kept in sight. The act of looking toward an object or a scene.

VISTA – A confined view that often focuses on a specific feature in the landscape. Unlike a view, a vista is often created and is subject to design.

VISUAL MANAGEMENT SYSTEM (VMS) – System for managing the scenic resources for forest landscapes developed in 1974 and updated to the Scenery Management System in 1995.

VISUAL QUALITY OBJECTIVE (VQO) – (See new term, "Scenic Integrity Level" and Chapter 3 of the FEIS for crosswalk of terms). A management goal for the visual resource that is based on physical and sociological characteristics of an area and on the degree of acceptable alteration of the natural appearing landscape.

[W]

WATERSHED – A geographic area in which water, sediments and dissolved materials drain to a common outlet such as a point on a larger stream or river.

WATER TABLE – The upper surface of groundwater. Below it, the soil is saturated with water.

WATER YIELD – The runoff from a watershed, including groundwater outflow.

WETLAND – Those areas that under normal circumstances are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetation or aquatic life that requires saturated or seasonally- saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar area such as sloughs, potholes, wet meadows, river overflows, mud flats, natural ponds, springs, seeps and vernal ponds (FSM 2527.05).

WILD RIVER – Wild and Scenic Rivers Act Usage: Congressionally-designated rivers, or sections of rivers, that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted.

WILDERNESS - The Wilderness Act of 1964 defined a wilderness as an area of undeveloped federal land designated by Congress that has the following characteristics: (1) It generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) It has outstanding opportunities for solitude or a primitive and unconfirmed type of recreation; (3) It has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) It may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value (Wilderness Act, Sec. 2(c)).

WILDERNESS STUDY AREA – An area designated for study to determine suitability or non-suitability for preservation as wilderness.

WILDLIFE HABITAT DIVERSITY – The distribution and abundance of different plant and animal communities and species within a specific area.

WILDLIFE OPENING – Terrestrial opening dominated by native grasses, forbs (e.g. goldenrod, ferns, meadowsweet), and/or shrubs (e.g. blackberries, raspberries, blueberries, alder) that is maintained in a non-forested condition. Only areas that are maintained primarily for wildlife benefits are considered wildlife openings.

WINDTHROW – Trees uprooted by wind.

Chapter 6

Reference List

CHAPTER 6. REFERENCE LIST

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