United States Department of the Interior

Bureau of Land Management
Eastern States
Southeastern States District Office
411 Briarwood Drive, Suite 404
Jackson, Mississippi 39206
http://www.es.blm.gov

IN REPLY REFER TO:
3100 (020) AM

May 28, 2015

Memorandum

To: State Director, Eastern States (ES-930)

From: District Manager, Southeastern States District Office

Subject: National Environmental Policy Act (NEPA) Review for Kisatchie National Forest Environmental Assessment for Lease Parcels Sold at the September 2012 Lease Sale

We have completed our NEPA review for lease parcels on Kisatchie National Forest that were sold at the September 2012 Lease Sale. The Environmental Assessment (EA) is attached. Please return a signed copy of the EA to me for our records. If you have any questions please contact Alison McCartney at (601) 977-5407.

Attachment (1)
EA Document

Preparers and Reviewers

Prepared by: _____ Date: 5/26/15
Alison McCartney
Planning and Environmental Coordinator

Prepared by: _____ Date: 5/27/15
John Sullivan
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Faye Winters
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Reviewed by: _____ Date: 5/27/2015
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Natural Resource Supervisor

Reviewed by: _____ Date: 5/27/15
Elizabeth Ivy
Minerals Supervisor

Reviewed by: _____ Date: 5/27/15
District Manager
Bruce Dawson

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Southeastern States District Office
411 Briarwood Drive, Suite 404
Jackson, Mississippi 39206

Environmental Assessment
ES-020-2015-01

Environmental Assessment for the
Kisatchie National Forest Lease Parcels
Sold but not Issued at the
September 2012 Competitive Lease Sale

Prepared by: Alison McCartney
Date: May 12, 2015

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LIST OF ACRONYMS AND ABBREVIATIONS

APD – Application for Permit to Drill
AQI – Air Quality Index
BCC – Birds of Conservation Concern
BLM – Bureau of Land Management
BMP – Best Management Practices
C - Celcius
CAIR – Clean Air Interstate Rule
CAA – Clean Air Act
CERCLA – Comprehensive Environmental Response Compensation and Liability Act
CFR – Code of Federal Regulations
CH_4 - Methane
CO – Carbon Monoxide
CO_2 - Carbon Dioxide
CO_2e - CO_2 Equivalent
COAs – Conditions of Approval
CSU – Controlled Surface Use
DBH – Diameter at Breast Height
DNA – Determination of NEPA Adequacy
GHG – Greenhouse Gas
EA – Environmental Assessment
EF – Eagle Ford
EO – Executive Order
EPA – Environmental Protection Agency
ESA - Endangered Species Act
ESO – Eastern State Office
F - Fahrenheit
FEIS – Final Environmental Impact Statement
FLPMA – Federal Land Policy and Management Act
FOOGLA – Federal Onshore Oil and Gas Leasing Reform Act
FS – Forest Service
ft - Foot
FWS - U.S. Fish and Wildlife Service
GPD – Gallons per Day
GPM – Gallons per Minute
GWP – Global Warming Potential
Ha - Hectare
HFC - Hydrofluorocarbons
HNO_3 - Nitric Acid
H_2SO_4 - Sulfuric Acid
ID – Interdisciplinary
IMPROVE - Interagency Monitoring of Protected Visual Environments
In - inches
IPCC - Intergovernmental Panel on Climate Change
JFC – J-fluorocarbon

Kg - Kilograms
KNF – Kisatchie National Forest
LA – Louisiana
LADNROC - Louisiana Department of Natural Resources Office of Conservation
LAED – Louisiana Environment Department
LDEQ - Louisiana Department of Environmental Quality
LOC – Levels of Concern
LNHP - Louisiana Natural Heritage Program
LPS – Louisiana Pine Snake
LRMP – Land and Resource Management Plan
LTA – Land Type Association
MBTA – Migratory Bird Treaty Act
MLA – Mineral Leasing Act
mm – millimeters
MOU – Memorandum of Understanding
NAAQS – National Ambient Air Quality Standards
NEPA – National Environmental Policy Act
NH_{4+} - Ammonium
NHPA – National Historic Preservation Act
N_2O - Nitrous Oxide
NO_2 - Nitrogen Dioxide
NO_3 - Nitrates
NRDC - Natural Resources Defense Council
NRHP – National Register of Historic Places
NSO – No Surface Occupancy
No. – Number
NWR – National Wildlife Refuge
O_3 - Ozone
ODS – Ozone Depleting Substances
Pb - Lead
PFC - Perfluorocarbons
PM – Particulate Matter
PSD – Prevention of Significant Deterioration
RAPZ – Riparian Area Protection Zone
RCRA – Resource Conservation and Recover Act
RCW – Red-cockaded Woodpecker
RFD - Reasonable Foreseeable Development
S3 – Vulnerable
S5 - Secure
SF – Sulfur Hexafluoride
SHPO – State Historic Preservation Officer
SHPZ - Streamside Habitat Protection Zone
SO_2 - Sulfur Dioxide
SO_4 - Sulfates
SPCC – Spill Prevention, Control, and Countermeasure

sq - Square
SSFO – Southeastern States Field Office
SUP – Surface Use Plan
SVR – Standard Visual Range
TCP – Traditional Cultural Property
Tg – Million Metric Tons
TMS – Tuscaloosa Marine Shale
VOC – Volatile Organic Compounds
U.S. – United States
USCB – U.S. Census Bureau
USDA – U.S. Department of Agriculture
USDI – U.S. Department of Interior
USDW – Underground Sources of Drinking Water
USGS – U.S. Geological Survey
WNS – White-nose Syndrome
WQCC – Water Quality Control Commission

CH 1 – PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.0 Introduction

A Bureau of Land Management (BLM) Competitive Lease Sale was conducted on September 13, 2012, which offered for lease federal minerals located under 53 parcels on estate managed by the Kisatchie National Forest (KNF) in Louisiana. All 53 leases were sold, however due to a protest on the sale, the leases were not issued. This Environmental Assessment (EA) documents the BLM Southeastern States District Office (SSDO) review of the 53 sold but not issued lease parcels. Where the surface is administered by the Forest Service (FS) and the mineral estate is also federally owned, the FS and BLM share the responsibility for implementing mineral leasing policies and regulations (United States [U.S.] Department of Interior [USDI] and U.S. Department of Agriculture [USDA] 1996). The parcels are located within the Winn, Catahoula, Kisatchie and Calcasieu Districts of KNF in Louisiana (Figure 1 and Appendix A).

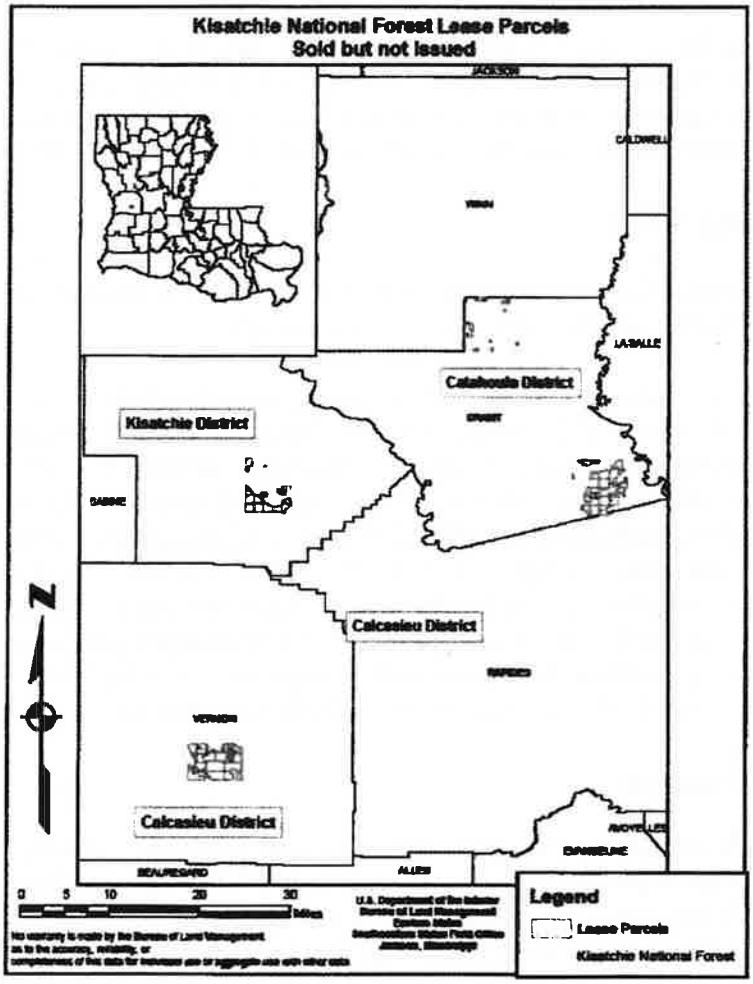

Figure 1. Location of federal mineral leases located under 53 parcels in KNF in Louisiana which were sold but not issued at the September 2012 Lease Sale.

On July 19, 2012, the BLM Eastern State Office (ESO) received a protest letter from the Natural Resources Defense Council and 9 other environmental-advocacy groups (NRDC et al.) objecting to the offering of the 53 leases located in the KNF. BLM issued its protest decision on August 1, 2013 (Appendix C). All of the arguments put forth by NRDC et al., except one, were either dismissed or denied; the remaining argument was granted a deferral. The decision of the BLM Authorized Officer, in answering the protest found that: although a Determination of National Environmental Policy Act (NEPA) Adequacy (DNA) document was prepared for the leases, it was never signed and therefore never completed. In addition, the DNA tiered to two documents that covered the proposed action: the 2008 KNF Monitoring and Evaluation Action Plan and Report and the 2007 5-Year Review and Recommendations for KNF's Revised Land and Resource Management Plan (LRMP) (USDA 1999a)", but the BLM decision found that, "in regard to the 53 leases nominated in the KNF, BLM has not yet provided documentation of compliance with NEPA, either through adopting the FS NEPA documents or through preparation of its own. Until then, the ESO will not issue the 53 protested leases located in the KNF, and this portion of the protest is deferred."

This EA is being prepared by the BLM to fulfill NEPA compliance. It is prepared in accordance with the 2006 BLM MOU WO300-2006-07 between the FS and the BLM. The BLM is the lead agency for this assessment, and the FS is a cooperating agency. This EA incorporates by reference the KNF 1999 Final Environmental Impact Statement (FEIS) for the LRMP.

1.1 Need for the Proposed Action

The purpose of the proposed action is to issue leases for federal minerals located under 53 parcels that were sold at the September 2012 competitive lease sale.

The development of oil and natural gas is essential to meeting the nation's future needs for energy. Continued sale and issuance of lease parcels is necessary to maintain options for production as oil and gas companies seek new areas for production or attempt to develop previously inaccessible or uneconomical reserves. Private exploration and development of federal oil and gas reserves are integral to the FS and BLM oil and gas leasing programs under the authority of the Mineral Leasing Act (MLA) 1920, as amended, the MLA for Acquired Lands of 1947, as amended, the Federal Land Policy and Management Act (FLPMA) of 1976 and the Energy Policy Act of 2005. The oil and gas leasing program managed by the FS and BLM encourages the development of domestic oil and gas reserves and reduction of U.S. dependence on foreign sources of energy as part of its multiple-use mandate.

1.2 Land Use Plan Conformance

The KNF LRMP, as amended (USDA 1999a) identifies approximately 591,000 acres available for oil and gas leasing. Of the available acreage, approximately 25,000 acres are subject to a No Surface Occupancy (NSO) stipulation and approximately 202,000 acres are subject to a Controlled Surface Use (CSU) stipulation (CSU1 or CSU2) (Appendix B). All of the lands within the 53 parcels that were sold are identified as available for lease in the 1999 KNF Revised LRMP and as such, are in conformance with the KNF LRMP.

There is not a BLM Resource Management Plan for the area that includes the proposed parcels. The BLM did not formally participate in the development of the KNF LRMP as a cooperator and has not formally adopted the 1999 KNF Revised LRMP. According to the regulations at 43 Code of Federal Regulations (CFR) 1610.8 (b) (1), however, this EA will be used as a basis for making a decision on the proposal. This EA incorporates the analysis and information provided in the LRMP, in its entirety. The proposed action does not conflict with any known state or local planning, ordinance or zoning.

1.3 Applicable Regulatory Requirements and Required Coordination

The proposed action is consistent with federal environmental laws and regulations, Executive Orders (EOs) and USDI and BLM policies and is in compliance, to the maximum extent possible, with state laws and local and county ordinances and plans, including the following:

- FLPMA (1976) as amended and the associated regulations at 43 CFR Part 1600
- MLA (1920) as amended and the associated regulations at 43 CFR Part 3100
- NEPA (1969) and the associated CEQ regulations at 40 CFR Parts 1500 through 1508
- National Historic Preservation Act (NHPA) (1966) as amended and the associated regulations at 36 CFR Part 800
- American Indian Religious Freedom Act
- Endangered Species Act (ESA) (1973) as amended
- BLM Manual 6840-Special Status Species Management
- Migratory Bird Treaty Act (1918)
- Birds of Conservation Concern (BCC) 2002 (U.S. Fish and Wildlife Service [FWS] 2008)
- EO 13186: Responsibilities of Federal Agencies to Protect Migratory Birds
- MOU between the USDI BLM and FWS to Promote the Conservation and Management of Migratory Birds (4/2010)
- Oil and Gas Leasing Reform – Land Use Planning and Lease Parcel Reviews (BLM WO IM 2010-117)
- Oil and Gas Leasing Program NEPA Procedures Pursuant to Leasing Reform (BLM USO IM 2014-006)

Consultation with the Louisiana State Historic Preservation Officer (SHPO), coordination with Native American Tribes, and informal consultation with FWS, Louisiana Ecological Services was conducted and their responses are located in Appendix C.

1.4 Issue Identification and Public Involvement

1.4.1 Internal Scoping

In March, 2014 a BLM interdisciplinary (ID) team was formed which included a Natural Resource Specialist, Geologist, GIS Specialist, Wildlife Biologist, and Archeologist. The ID team began analyzing all relevant data and writing portions of the EA. A preliminary EA was created by the ID team and submitted to the FS ID team for review. The FS ID team consisted of a Lands and Minerals Program Manager, Wildlife Biologist, Archeologist, Natural Resource

Specialist, Air Resource Specialist, Environmental Coordinator, Ecosystem/Planning Staff Officer and Botanist. The BLM and FS ID teams met on March 13, 2014 to discuss the preliminary EA and additional issues regarding analysis.

1.4.2 External Scoping

Informal consultation with FWS was initiated on July 25, 2014 in compliance with the ESA, Section 7 Consultation requirements. A concurrence letter was received on September 17, 2014 and is located in Appendix C. A request was submitted to the Louisiana Natural Heritage Program (LNHP) on August 21, 2014 to review their files for records indicating the occurrence of rare plants and animals, outstanding natural communities, natural or scenic rivers, or other elements of special concern within or near the proposed parcels. A response was received on November 10, 2014 and is located in Appendix C. Consultation with SHPO occurred on June 17, 2014. A concurrence letter was received on July 30 and can be found in Appendix C. Letters were sent to those Native American Tribes who have ancestral interest in the region on June 17, 2014 notifying them of the proposed action and requesting comments or concerns. Responses were received from three Tribes on June 24, June 25, and July 11, 2014 with no concerns expressed.

The following Tribes were contacted to notify them of the proposed action and to request comments or concerns (Appendix C):

- Tunica-Biloxi Tribe of Louisiana
- Coushatta Indian Tribe
- Chitimacha Tribe of Louisiana
- Caddo Nation of Oklahoma
- Seminole Nation of Oklahoma
- Alabama-Quassarte Tribal Town
- Alabama Coushatta Tribe of Texas
- Choctaw Nation of Oklahoma
- Jena Band of Choctaw
- Mississippi Band of Choctaw Indians

The following state and/or federal agencies were contacted by the BLM ID team:

- FWS, Louisiana Ecological Services
- LA SHPO
- LNHP

1.4.3 Public Involvement

On June 15, 2012, the BLM posted the Sept. 2012 Sale Notice for public review. On July 19, 2012, BLM ESO received a letter from the NRDC et al. protesting the 53 oil and gas lease sale parcels. BLM sent a response letter to NRDC on August 1, 2013 (Appendix C).

1.5 Decision To Be Made

The decision under consideration from the BLM for the proposed action is whether to issue the sold leases or not. Based on analysis of scoping, no issues were identified that would require the development of additional action alternatives. The No Action alternative is considered and analyzed to provide a baseline for comparison of the impacts of the proposed action.
The proposed action for consideration is to issue the leases for 53 parcels administered by the KNF. BLM's policy is to promote oil and gas development as long as it meets the guidelines and regulations set forth by NEPA and other subsequent laws and policies passed by the U.S. Congress.

1.6 Leasing

Analysis as required by NEPA was conducted by SSDO specialists who relied on personal knowledge of the areas involved and FS expertise and databases and reviewed existing databases and file information to determine if appropriate stipulations had been attached to specific parcels prior to being made available for lease. It is unknown when, where or if future well sites or roads might be proposed. Detailed site-specific analysis of individual wells or roads would occur when a lease holder submits an Application for Permit to Drill (APD). Issuances of leases would not be in conflict with any local, parish, or state plans.

CH 2 – PROPOSED ACTION

2.0 Proposed Action

The proposed action is to issue leases for 53 parcels that were previously sold. The 53 parcels contain approximately 28,581.86 acres of federal minerals, as shown in Figure 1 and identified in Appendix A.

Leasing is an administrative action that does not directly cause environmental consequences. However, leasing is considered to be an irretrievable commitment of resources because the BLM generally cannot deny all surface use of a lease unless the lease is issued with a NSO stipulation. Potential oil and gas exploration and production activities, committed to in a lease sale, could impact other resources and uses in the planning area. Direct, indirect, or cumulative effects to resources and uses could result from as yet undetermined and uncertain future levels of lease exploration or development.

The FS consented to leasing with the requirement of the inclusion of appropriate stipulations (30 U.S. C. 226(h)). The BLM retains separate, independent authority to decide whether to include FS lands in a lease sale and, if so, to include additional stipulations, as described at Title 43 Code of Federal Regulation (CFR) 3101.7-2. Both FS and BLM stipulations and notices, identified in Appendix B, are made part of the proposed action.

Once sold and a lease issued, the lease purchaser has the right to use so much of the leased lands as is reasonably necessary to explore and drill for all of the oil and gas within the lease boundaries, subject to the stipulations attached to the lease (Title 43 CFR 3101.1-4). Oil and gas leases are issued for a 10-year period and continue for as long thereafter as oil or gas is produced in paying quantities. If a lessee fails to produce oil and gas within the 10-year term, does not make annual rental payments, does not comply with the terms and conditions of the lease, or relinquishes the lease, ownership of the minerals leased revert back to the federal government and may be leased again.

Although at this time it is unknown when, where, or if future well sites or roads might be proposed on any leased parcel, should a lease be issued, site specific analysis of individual wells or roads would occur when a lease holder submits an APD. For the purposes of this analysis, the BLM assumed that activities would be implemented at the rate estimated in the Reasonably Foreseeable Development Scenario (RFD).

The RFD for the proposed action estimates that spacing units would vary between 640 – 1920 acres (Appendix D). It is projected that a typical spacing unit would be 1920 acres for the deep horizontal drilling/production purposes and 640 to 1280 acres for wells usually less than 10,000 measured depth. The well pad size is assumed for purposes of analysis to be 8.25 acres (600 X 600 feet). This analysis also assumes that multiple wells would eventually be installed on each well pad and that 8 oil wells would be installed on each pad. Co-located access roads and pipeline right-of-ways are estimated at 5,000 feet per well pad and would have a disturbance width of approximately 50 feet. Once drilling and completion activities have been completed on

each of the wells, the half of the well pad disturbance not needed for production purposes would be reclaimed. Production facilities would be installed on the well pad.

Two trends have potential for oil and gas production on the offered tracts; the Austin Chalk and the Eagle Ford/Tuscaloosa Marine Shale (EF/TMS). The formations in Natchitoches and Vernon Parishes are generally found at depths between 10,000 and 15,000 feet. Water use for wells drilled/completed in the Austin Chalk is estimated at 420,000 gallons per well. For the EF/TMS wells, water use is estimated to average 8,000,000 gallons per well for drilling and completion purposes. Based on local drilling/completion activities, it is assumed that stimulation of the EF/TMS formation would be conducted in an average of 20 stages, each utilizing 500,000 pounds of sand as a proppant. True Vertical Depth for the wells will likely vary between 8,000 feet to 15,000 feet below ground surface. The base of the Underground Sources of Drinking Water (USDW) varies between depths of 1,500 to minus 3,000 feet. Hydraulic stimulation may occur at an interval between 6,500 to 12,000 feet below the base of the USDW.

The RFD projects that a maximum of 20 well pads could be constructed for a total of 165 acres disturbed, if all 53 leases are developed. An additional 68.87 acres (20 X 5000 X 30 feet) could be disturbed for access roads and pipeline infrastructure and an additional 30 acres could be disturbed for other production and storage facilities. Total estimated disturbance is 263.87 acres. This RFD and EA also assumes that approximately 60 acres (20 X 3 acres/pad) would be reclaimed after wells are put in production for a net disturbance of 203.87 acres for all 53 parcels. The RFD predicts that approximately 0.71% of the total lease area or 0.03% of the total acreage on KNF would be disturbed as a result of the proposed action.

Specific guidelines for well pad and access road construction are listed in Appendix D of the 1999 KNF Revised LRMP as Minerals Operations Clauses and Attachments (Appendix E). These guidelines include some of the following requirements: during well pad construction, the topsoil would be stockpiled to be used during restoration activities. Topsoil would be stockpiled at a 3:1 slope for use in reclamation operations. At least 50% of the reserve pit would be constructed in an excavation of the pad site, with side walls not to exceed 3:1. The pit would be protected from surface waters by levees or walls. No siphons or openings would be placed in or over levees that would permit escaping of contents that could cause pollution contamination. Reserve pits would be temporarily fenced to prevent entry by casual foot travel and wildlife. Upon cessation of operations and filling the pit, the fence and posts may be removed. All pits would be operated and closed in accordance with Louisiana Department of Natural Resources Office of Conservation (LADNROC) Statewide Order No. 29-B. Upon closure of pits or pipelines, copies of test results as required by LADNROC Order No. 29-B would be sent to the appropriate KNF Ranger District. An alternative, would be to use a closed loop system which would eliminate the need for an open pit. The FS recommends a fully containerized (closed) drilling system as outlined in the KNF FEIS on page D3. If the well is successful, the drill pad would be reduced to about 100 x 100 feet with the remaining surface area, but will vary based on operations, including the reserve pit, re-graded and restored per FS requirements. Partial or full reclamation, as required by Onshore Order #1 is required to commence within six months of the last well on the pad going into production (partial reclamation required), or plugging in the case of a dry hole (full reclamation). Final seed mixtures and plantings are determined by the FS (Appendix F). Reclamation may be approved not earlier than one year following the successful

establishment of vegetative cover. Vegetative cover over at least 80% of the entire disturbed area would be considered successful establishment, if no gullies or other erosion related problems exist. The life of a productive well may be 25 years. Following well abandonment, the remainder of the well pad and access road disturbance is reclaimed. Pipelines above the surface would be removed. Buried pipelines could remain in place or be removed. The well bore would be cemented.

Standard lease terms would be attached to all issued leases. These terms provide for reasonable measures to minimize adverse impacts to specific resource values, land uses, or users (the standard lease terms are contained in Form 3100-11, Offer to Lease and Lease for Oil and Gas, USDI, BLM, October 2008). Once the lease has been issued, the lessee has the right to use as much of the leased land as necessary to explore for, drill for, extract, remove, and dispose of oil and gas deposits located under the leased lands subject to the standard lease terms and the lease stipulations attached to the lease; however, operations, must be conducted in a manner that avoids unnecessary or undue degradation of the environment and minimizes adverse impacts to the land, air, water, cultural, biological and visual elements of the environment, as well as other land uses or users. Compliance with valid, nondiscretionary statutes (laws) is included in the standard lease terms and would apply to all lands and operations that are part of all of the alternatives. Nondiscretionary actions include the BLM's requirements under federal environmental protection laws, such as the Clean Water Act, Clean Air Act (CAA), ESA, and NHPA.

FLPMA is applicable to all actions on federal lands even though they are not reflected in the oil and gas stipulations in the 1999 KNF FEIS and would be applied to all potential leases regardless of their category. Also included in all leases are the two mandatory stipulations for the statutory protection of cultural resources (BLM WO IM-2005-03, Cultural Resources and Tribal Consultation for Fluid Minerals Leasing) and threatened and endangered species (BLM WO IM-2002-174, Endangered Species Action Section 7 Consultation).

The following information on the federal mineral tracts is based on information collected during site visits conducted in 2014 by BLM, aerial photographs, topographic maps, and shapefiles provided by KNF. Mitigation methods for potential negative impacts are listed in Appendix B as lease stipulations and lease notices. These lease stipulations and notices have been developed to provide general habitat protection and setbacks to protect sensitive habitats from oil and gas development and are in conformance with the KNF LRMP and listed in Appendix D of the document. For the protection of jurisdictional wetlands, streamside habitat protection zones (SHPZs), riparian zones (RAPZs), amenity values of Longleaf Trail, flood plains and Hickman Trail Head, and due to military activities, two FS CSU stipulations (CSU1 or CSU2) apply to these leases (Appendix B). SHPZs and RAPZs are strips of land adjacent to a stream or river that are managed to maintain riparian functions to meet water quality, fish habitat, wildlife, productivity, and other goals. For the protection of jurisdictional wetlands, a developed recreation site (Blue Hole Complex), Longleaf Vista, Bayou Pierre Overlook, and Bayou Cypress Overlook, a FS NSO stipulation also applies to this lease (Appendix B). For the protection of listed or sensitive animal or plant species and wetlands located outside of SHPZs or RAPZs, two FS lease notices are attached to this lease (Appendix B). BLM recommended mitigation for the proposed action is suggested as stipulations for freshwater aquatic habitat,

cultural resources and tribal consultations, endangered species, and special plant species (Appendix B). Additional surveys may be required for special status species after APDs have been received.

2.1 No Action Alternative

Under the No Action Alternative, leases would not be issued for the 53 parcels. BLM is currently holding $433,091.50 which was received from the sale; this total amount would be refunded.

Under the No Action alternative, surface management would remain the same. Ongoing oil and gas development, however, would continue on surrounding federal, private, and state leases, with the possibility of drainage from these adjacent wells.

It is not expected that demand for energy oil and gas will go down, and a decision to not issue the leases would not prevent future leasing in these areas provided it is consistent with land use planning decisions, and subject to appropriate stipulations identified in the KNF LRMP. Therefore, it is anticipated that these parcels may be nominated and leased at a future date. While future leases may contain more restrictive lease terms, it is reasonable to consider that a substantial portion of the development possible under current planning decisions will be possible under future leases.

CH. 3 – DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.0 Introduction

This section describes the environment that would be affected by implementation of the proposed action described in Chapter 2. Aspects of the affected environment described in this section focus on the relevant resources and issues. Only those elements of the affected environment that have the potential to be impacted are described in detail.

The KNF LRMP and FEIS analyzed the environmental effects associated with leasing all FS parcels identified in this document. The following resource analysis incorporates by reference the information and analysis contained in the KNF LRMP and FEIS. Based on review of environmental elements and consideration of the Purpose and Need statement prepared for this EA, the following elements will be addressed in this EA:

- Environmental Justice
- Social and Economic Environment
- Cultural Resources and Native American Concerns
- Recreation/Scenery/Noise Resources
- Minerals and Mineral Development
- Wastes
- Soils
- Air Resources
- Water Resources - Surface/Ground
- Floodplains/Riparian Areas/Wetlands
- Invasive/Exotic Species
- Special Status Species
- Wildlife and Vegetation
- Migratory Birds of Concern

In addition to the air quality information in the LRMP, new information about Greenhouse Gases (GHGs) and their effects on national and global climate conditions has emerged since the LRMP was prepared. On-going scientific research has identified the potential impacts of GHG emissions such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO_2), water vapor, and several trace gases on global climate. Through complex interactions on a global scale, GHG emissions cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), industrialization and burning of fossil carbon sources have caused GHG concentrations to increase measurably, and may contribute to overall climatic changes. This EA incorporates an analysis of the contributions of the proposed action to GHG emissions and a general discussion of potential impacts to climate.

3.1 Description of Project Area

The proposed project area consists of 53 parcels totaling 28,581.86 acres in KNF in Grant, Natchitoches, and Vernon Parishes, Louisiana. Maps of the 53 parcels can be found in Figure 1 and Appendix A. Legal descriptions and associated stipulations for the 53 parcels can also be found in Appendix A and B. Twenty-three parcels are located in Grant Parish on the Catahoula and Winn Districts totaling 10,501.29 acres. Seventeen parcels are located in Natchitoches Parish on the Kisatchie District totaling 6,002.30 acres. Thirteen parcels are located in Vernon Parish on the Calcasieu District totaling 12,078.27 acres. Alexandria is the closest large town (population > 150,000) to all of the parcels. The 11 parcels located in northern Grant Parish are within the boundaries of the FS National Catahoula Wildlife Management Preserve. The parcels located on the Calcasieu District are within the boundaries of the FS Fort Polk Intensive Use Area. Several of these parcels intersect Fort Polk Wildlife Management Area.

All of the parcels are located in the South Central Plains Ecoregion. The South Central Plains Ecoregion is composed of rolling plains that are broken by nearly flat fluvial terraces, bottomlands, sandy low hills, and low cuestas. Its terrain is unlike the flatter, less dissected Mississippi Alluvial Plain or the Western Gulf Coastal Plain. Natural vegetation of uplands was historically dominated by longleaf pine woodlands and savannas in the south and shortleaf pine/hardwood forests in the north.

3.2 Environmental Justice and Social and Economic Environment

A description of environmental justice is referenced in the 1999 KNF FEIS on pages 3-92 to 3-93. Title IV of the Civil Rights Act of 1964 and related statutes ensure that individuals are not excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity receiving federal assistance on the basis of race, color, national origin, age, sex, or disability. EO 12898 on Environmental Justice directs that programs, policies, and activities not have a disproportionately high and adverse human health and environmental effect on minority and low-income populations.

Table 1 presents the 2013 census data including population numbers and demographics for the three parishes in the project area: Grant, Natchitoches, and Vernon. According to the U.S. Census Bureau (USCB), Vernon Parish has the highest population (52,606), median household income ($46,572) and lowest percentage of persons living below the poverty level (13.50%) of the three parishes in the project area. The 1999 KNF FEIS provides additional information regarding the social and economic environment on pages 3-88 to 3-91 and environmental justice on pages 3-92 and 3-93. FS programs stimulate employment and income-related effects through direct expenditures on salaries and commodities and through the economic effects stemming from the production of resource outputs (USDA 1999b). Through its programs and activities, the KNF would have the greatest effect within the rural 11-parish region that comprises its impact area.

Table 1. Census data in 2013 including population numbers and demographics for the project area.

Parish	Population	Female	White	Black	Hispanic or Latino	Median Household Income	Persons Below Poverty Level
Grant	22,030	43.80%	81.10%	15.70%	4.50%	$39,654	17.30%
Natchitoches	39,566	52.30%	54.90%	41.40%	2.10%	$33,953	26%
Vernon	52,606	47.40%	77.80%	14.70%	9.20%	$46,572	13.50%

3.3 Cultural Resources and Native American Concerns

3.3.1 Cultural Resources

A description of cultural resources is referenced in the 1999 KNF FEIS on pages 3-85 to 3-87. A cultural resource is a broad term that refers to areas of traditional significance, use and the remains of past and current human activity. A Traditional Cultural Property (TCP) refers to the connection between places on the landscape and a group's traditional beliefs, religion, or cultural practice. Because cultural resources are nonrenewable and easily damaged, laws and regulations exist to help protect them.

The NHPA, as amended, and its implementing regulations require that federal agencies consider the effects of their undertakings on "historic properties." The term "historic properties" refers to cultural properties, both prehistoric and historic, that are eligible for listing in the National Register of Historic Places (NRHP). Consultations about these uses and places are governed and/or mandated by the NHPA, as amended in 1992 (U.S.C. 470 et seq.), the American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996), the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 et seq.) and EOs 13007, 13175, 13084, and 13647. Federal agencies consider the effects of their management activities on historic properties by first determining the area of potential effect, then conducting literature searches and field surveys to locate cultural properties. Additionally, they consult with American Indian Tribes and other interested parties to determine whether Traditional Cultural Properties (TCPs) are within the area of potential effect. The locations and descriptions of cultural sites are stored in secure state and FS databases and geographic information systems for analysis and protection.

To date, approximately 46% of KNF has been inventoried or surveyed for the presence of cultural resources. Slightly more than 3,800 sites have been recorded, 3,140 of which belong to the prehistoric period, 500 of which are of the historic period, and 200 have both components. Almost 500 sites are in protective status and pending evaluation for NRHP eligibility. Most of the inventory has been conducted in support of various timber activities, land exchanges, road construction, and recreation development (USDA 1999b, pg. 3-86). While there are areas of the KNF that have not been surveyed, there are recorded sites within the leasing area. The lease area may have sites that would qualify as historic properties (36 CFR 61). Professionally conducted surveys for historic properties and cultural resources would be required before any ground disturbing activities take place.

GIS coverage of the KNF's site predictive model reveals differential percentages and acres of high, moderate (or indeterminate), and low probabilities for containing significant archeological or historical sites within each Land Type Association (LTA) (USDA 1999b). Overall, 52.5% of the KNF conforms to criteria for having a high and medium probability of containing significant or potentially significant sites and 47.5% contains low probability. Forest-wide 94.5% of all significant or potentially significant sites would be expected to occur in areas of high and medium predicted probability (USDA 1999b, pg. 3-86). Virtually all of the lease parcels contain some acreage of high and/or moderate probability areas. Due to the sensitivity of these sites and need for protection, maps showing specific locations of the probability areas located on the lease parcels will not be included in this EA.

3.3.2 Native American Concerns

Federally recognized Native Americans Tribes were contacted about this proposed undertaking. No known sites for religious purposes, Sacred Sites or TCPs were identified by Native Americans on the lease tracts.

3.4 Recreation/Scenery/Noise Resources

3.4.1 Recreation Resources

A description of recreation resources is referenced in the 1999 KNF FEIS on pages 3-54 to 3-67. There are 46 Recreation Areas located on the 5 KNF Districts; 4 are located on the Caney District, 5 are located on the Catahoula District, 17 on the Kisatchie District, and 12 on the Calcasieu District. Four of the lease parcels contain managed Recreation Areas. The Longleaf Vista Complex, Bayou Pierre Overlook Complex, and Bayou Cypress Overlook Complex are located on the Kisatchie District on three separate lease parcels (Figure 2). The Blue Hole Complex is located on one of the lease parcels on the Calcasieu District (Figure 3).

3.4.2 Scenery Resources

A description of scenic resources is referenced in the 1999 KNF FEIS on pages 3-52 to 3-53. The scenic resources of KNF are managed in accordance with the LRMP (USDA 1999a) which is in compliance with the FS Visual Management System. More than 80% of KNF meets the requirements for visual quality objectives indicating that the overall scenic resources of KNF are in excellent condition (USDA 1999b, pg. 3-52).

Most of the land that is now KNF had been cleared by timber harvest or for agriculture prior to acquisition by the federal government in the 1930s. Over much of the landscape, mid- and understory vegetation is sparse. This allows viewing depths up to 0.25 mile, but the relatively flat terrain makes distant landscape views or panoramas rare. An exception to this is the Kisatchie District; its hilly topography contains numerous vistas (USDA 1999b, pg. 3-52). The Kisatchie District includes the Kisatchie Hills Wilderness and designated wilderness or roadless areas. These are areas that are considered sensitive to visual change due to lower road densities, high values for wildlife habitat, and cultural resources.

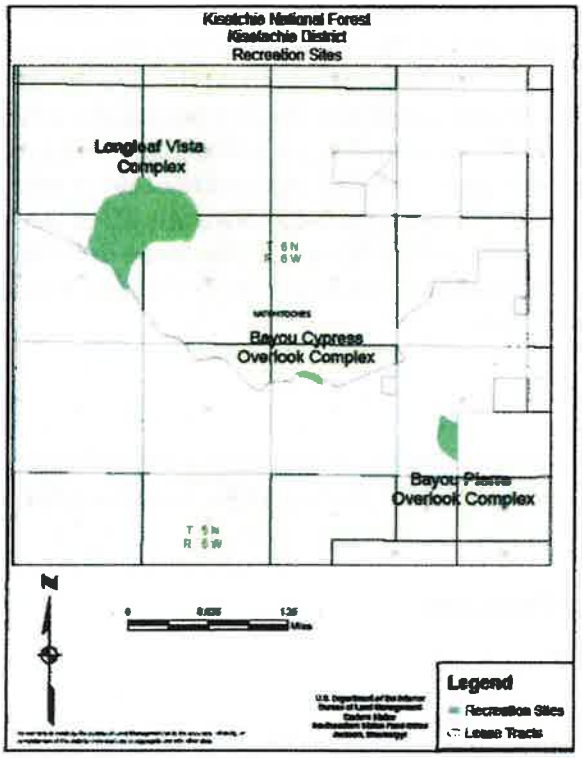

Figure 2. Recreation sites located on three lease parcels on the Kisatchie District of KNF.

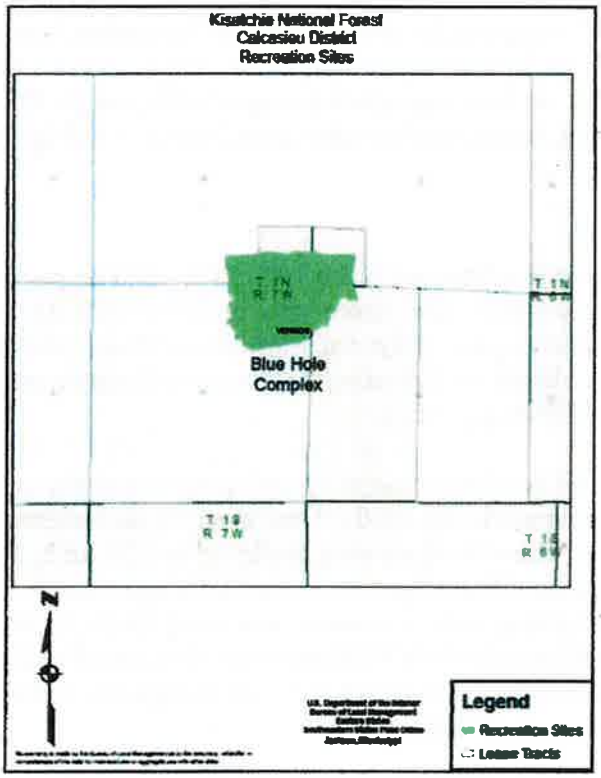

Figure 3. Recreation site located on one lease parcel on the Calcasieu District of KNF.

3.4.3 Noise

Noise levels for the majority of KNF are relatively low due to minimal traffic and development. Noise levels increase slightly during hunting seasons due to an increase in truck and ATV use.

3.5 Minerals and Mineral Development

Minerals and mineral development are referenced in the 1999 KNF FEIS on pages 2-42 and 3-105 to 3-112.

3.5.1 Minerals

Two formations have potential for oil and gas production on the offered tracts; the Austin Chalk and the EF/TMS. Both formations produce from natural fractures, but the EF/TMS requires high volume hydraulic stimulation in order to establish commercial production. Previous Austin Chalk wells were not normally stimulated, but future ones may be treated in some form. The Austin Chalk is considered a conventional resource play whereas the EF/TMS is classified as an unconventional resource play. Both horizons for the most part dip gently to the south-southeast until a point over the Lower Cretaceous Shelf Edge where the dip steepens. As a result of this point of flexure, the formations above are highly fractured. The majority of the chalk production is along this trend.

The oil and gas occurrence potential is high for these parcels as there is established EF/TMS production east of the lands in Natchitoches Parish on the Kisatchie Ranger District. There is also Austin Chalk production adjacent to the parcels in the Calcasieu Ranger District in Vernon Parish. With the exception of the lands in 9N-2W, all of the other nominated parcels are within the projected EF/TMS fairway. For the proposed parcels, the Austin Chalk is potentially productive on those lands in the Calcasieu Ranger District. The EF/TMS is potentially productive from all other lands with the exception of those in 9N-2W. The oil and gas development potential is high in all of the tracts except for the lands in 9N-2W as long as oil prices exceed $100/barrel. At prices less than $100/barrel, the development potential is reduced significantly. At very low prices, there would be no development at all.

There is some occurrence and development potential for shallow Wilcox Sand for the lands in 9N-2W. However, both the oil and gas occurrence and oil and gas development potential is rated low.

3.5.2 Mineral Development

For both the Austin Chalk and EF/TMS, wells are drilled vertically to a certain depth referred to as the kick-off point, generally between 10,000 – 15,000 feet. From there the wells are steered from the vertical to the horizontal using a short, medium, or long radius curve. A horizontal lateral is then drilled in the objective horizon for a distance of between 4,000 and 9,000 feet. For the previous development for the Chalk, a large vertical pilot hole was drilled and two laterals were drilled; one north and one south. This may or may not be the case in future development. Shale wells are generally drilled having only one long lateral. A slotted liner may or may not be

run in the Chalk wells. Production casing is run in the EF/TMS wells. The Chalk wells tend to flow naturally but require a pump or other lifting mechanism at a later point.

The EF/TMS requires high volume hydraulic stimulation/fracturing in order to establish commercial production. Hydraulic stimulation occurs after a well has been drilled to a particular depth vertically and possibly drilled a certain distance horizontally through the targeted geologic zone (Figure 4). Steel pipe (casing) will be inserted in the well bore and will be perforated within the target zone(s) that contain oil or gas, enabling production out of the targeted zone(s) when the fracturing fluid is injected at high pressure into the well flowing through the perforations. Eventually, the targeted formation will not be able to absorb the fluid as quickly as it is being injected and at this point, the pressure created causes the formation to crack or fracture. Once the fractures have been created, injection ceases and some quantity of the fracturing fluids will begin to flow back to the surface. Materials called proppants (e.g., usually sand or ceramic beads), which were injected as part of the fracturing fluid mixture, remain in the target formation to hold open the fractures.

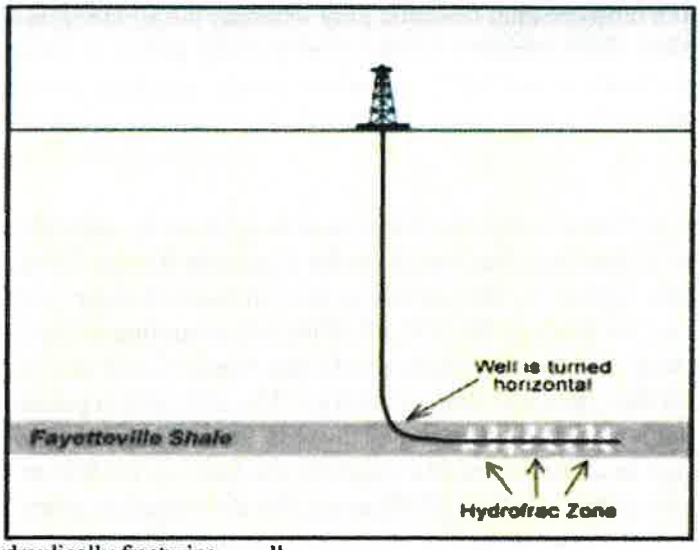

Figure 4. Diagram of hydraulically fracturing a well.

The EF/TMS requires stimulation which is done in 15 to 25 stages depending on the length of the lateral. Water is used for drilling in both kinds of wells, but the stimulation required in the EF/TMS uses an additional 6–10 million gallons per well. Each stage of hydraulic stimulation will utilize 500,000 pounds of sand as a proppant. Hydraulic stimulation will occur at an interval between 6,500 to 12,000 feet below the base of the USDW. Some studies have shown that anywhere from 20-85% of fracturing fluids may remain underground. Used fracturing fluids that return to the surface are often referred to as flowback, and these wastes are typically stored in open pits or tanks at the well site prior to proper disposal or can be reused in developing other wells.

Table 2 lists the features related to energy development, production, supply or distribution including plugged or unplugged oil and gas wells located on the project area.

Table 2. Well and pipeline locations within the project area.

Structure	Township/Range	Section	Year Plugged
Well	T6N, R1E	21	1958
Two Wells	T9N, R2W	19	1989 & 1995
Pipeline	T1N, R7W	14, 24, 25	
Pipeline	T6N, R1E	2,4,5,11,14,20, 23,26	
Pipeline	T9N, R2W	19	

3.6 Wastes

The Resource Conservation and Recovery Act (RCRA) of 1976 established a comprehensive program for managing hazardous wastes from the time they are produced until their disposal. The EPA regulations define solid wastes as any "discarded materials" subject to a number of exclusions. On January 6, 1988, EPA determined that oil and gas exploration, development and production wastes would not be regulated as hazardous wastes under the RCRA. The Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980, deals with the release (spillage, leaking dumping, accumulation, etc.), or threat of release of hazardous substances into the environment. Despite many oil and gas constituent wastes being exempt from hazardous waste regulations, certain RCRA exempt contaminants could be subject to regulations as a hazardous substance under CERCLA.

No hazardous or solid waste disposal sites are known to exist on the lease tracts. Should a parcel be developed, generation and temporary storage of waste materials (solid and liquid) would likely occur. Waste materials would be managed in accordance with Onshore Orders 1 & 7, RCRA, applicable Louisiana Department of Environmental Quality (LDEQ) regulations, and Louisiana Department of Natural Resources rules. Fluid handling would be evaluated at the development stage and fluids associated with any subsequent drilling, completions and/or production would either be treated, evaporated, or transferred to an approved LDEQ treatment facility. Solids would be treated on site or transferred to a LDEQ approved facility.

3.7 Soils

Soil resources are described by LTA in the 1999 KNF FEIS on pages 3-120 to 3-160. Most soils in KNF are highly weathered, acidic, and have low nutrient status. Soil productivity, however, is generally high because soils are generally deep with abundant plant-available moisture (USDA 1999b, pg. 3-7). The soil characteristics, potential for erosion, and likelihood for success in revegetation efforts are important to consider when planning for stabilization of disturbed areas. Management actions may affect soil chemical and physical properties causing increases in compaction, displacement, erosion, and sedimentation. Existing problems with sedimentation or turbidity in streams downstream from KNF would be exacerbated by accelerated soil erosion, which can be defined as erosion rates greater than the natural erosion rate.

There are 27 soil series that can be found on the subject parcels. The most common soil series on the northern lease parcels in Grant Parish on the Catahoula and Winn Districts are Guyton, Caddo, and Frizzell-Guyton (Figure 5). The most common soil series on the southern lease parcels on the Catahoula District are Smithdale and Ruston (Figure 6). The most common soil

series on the lease parcels on the Kisatchie District in Natchitoches Parish are Kisatchie and Anacocco (Figure 7). The most common soil series on the lease parcels on the Calcasieu District are Briley, Eastwood and Ruston (Figure 8). Soil series descriptions are listed in Appendix G.

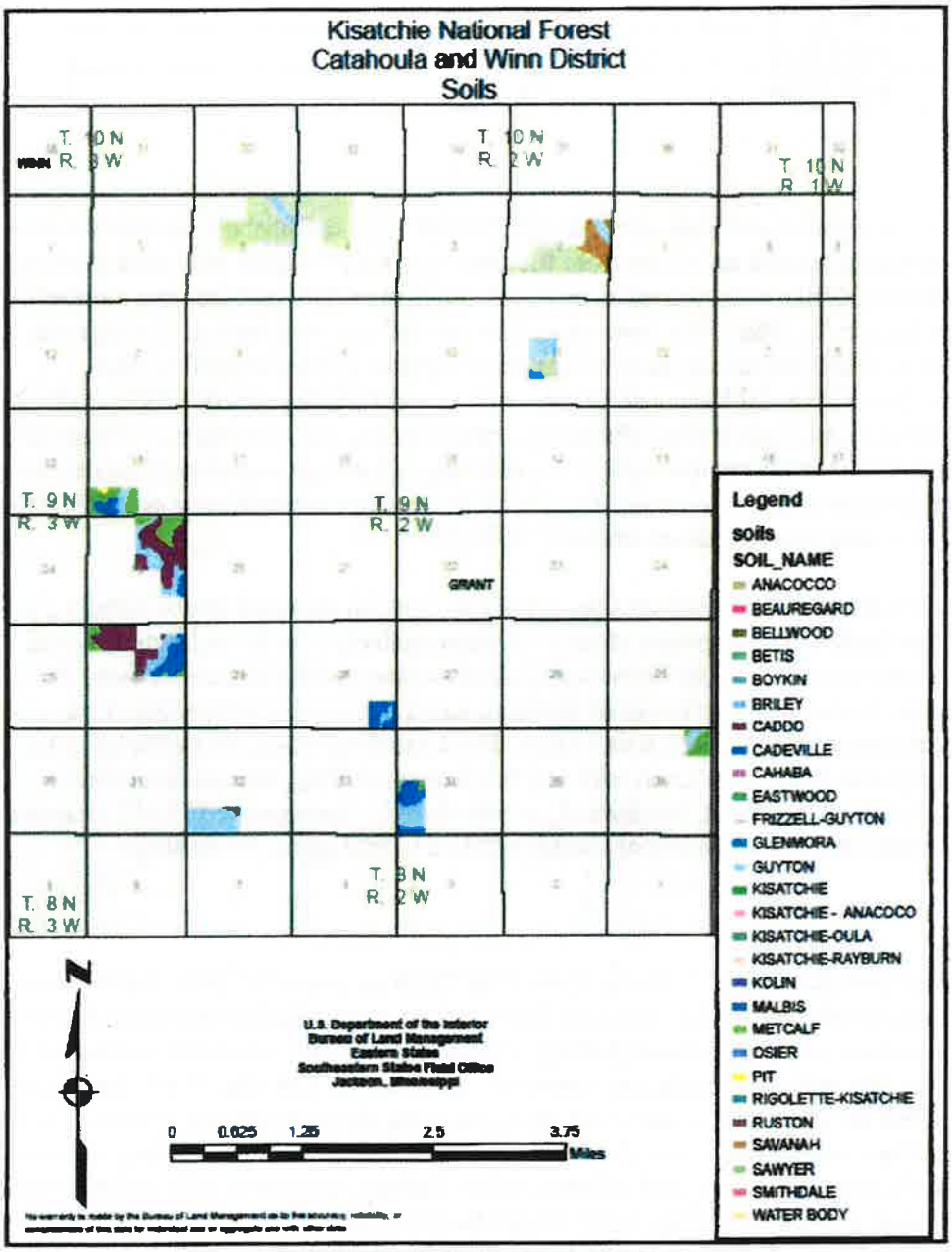

Figure 5. Soil series on the lease parcels located on the Winn and northern Catahoula Districts of KNF.

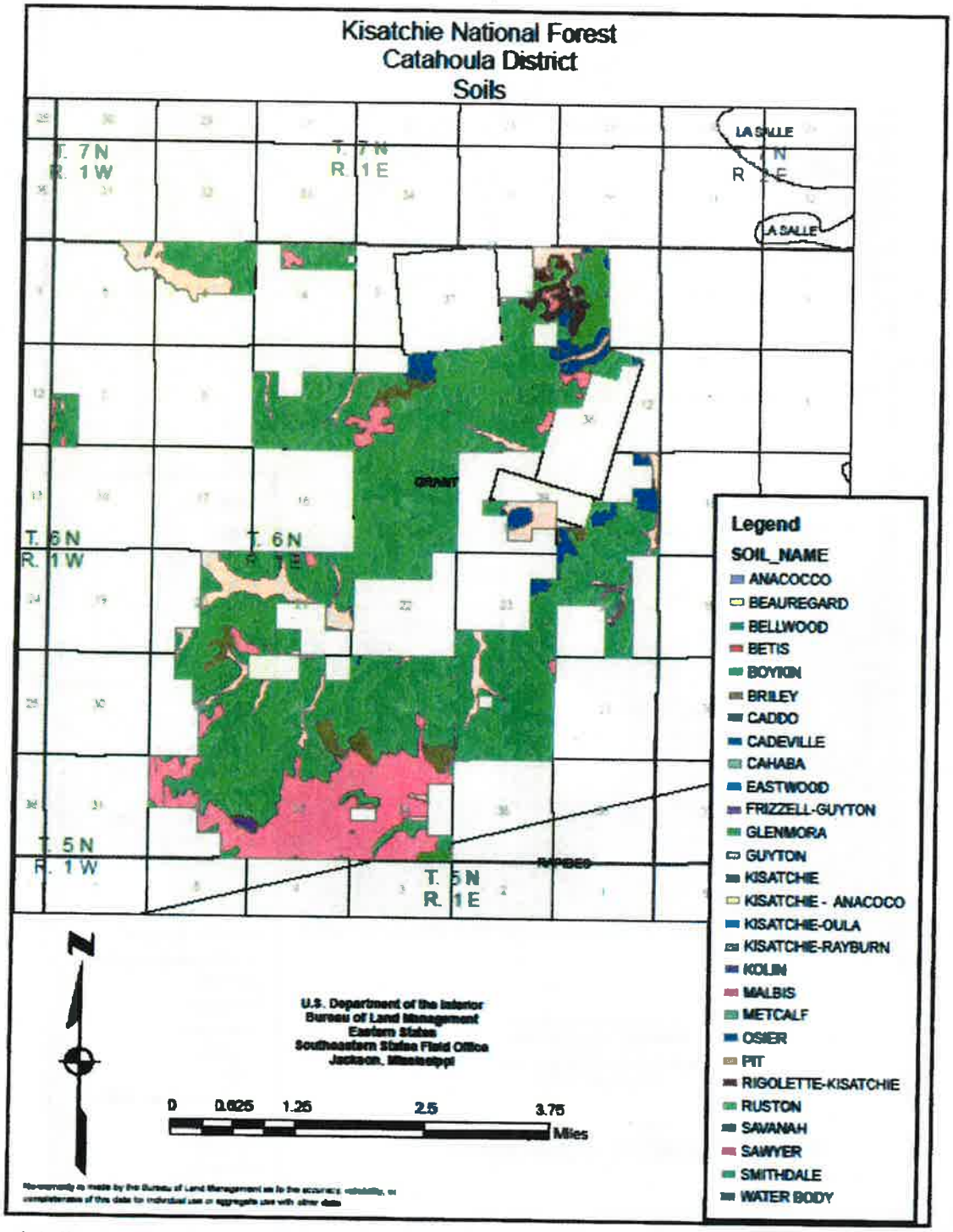

Figure 6. Soil series on the lease parcels located on the southern portion of the Catahoula District of KNF.

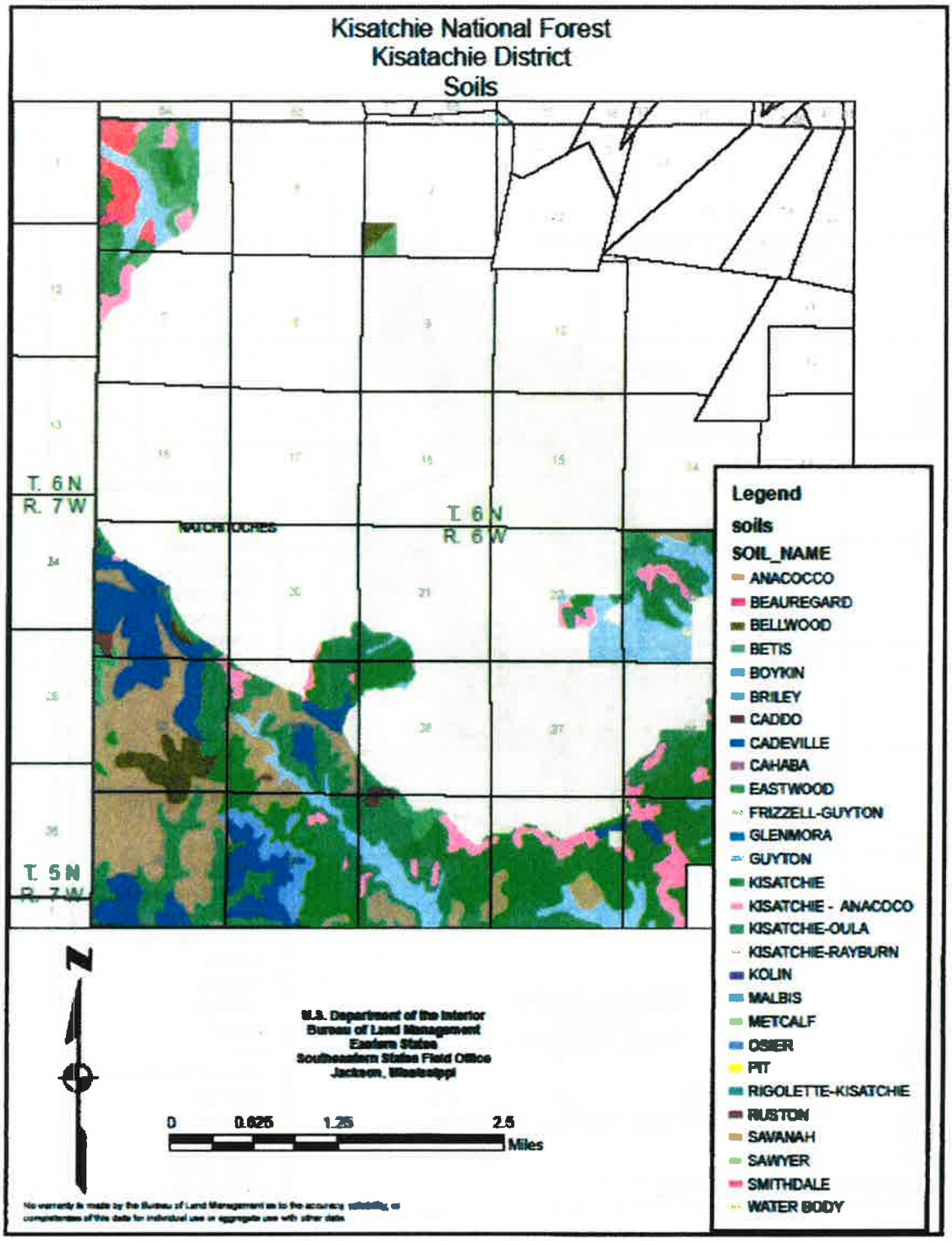

Figure 7. Soil series on the lease parcels located on the Kisatchie District of KNF.

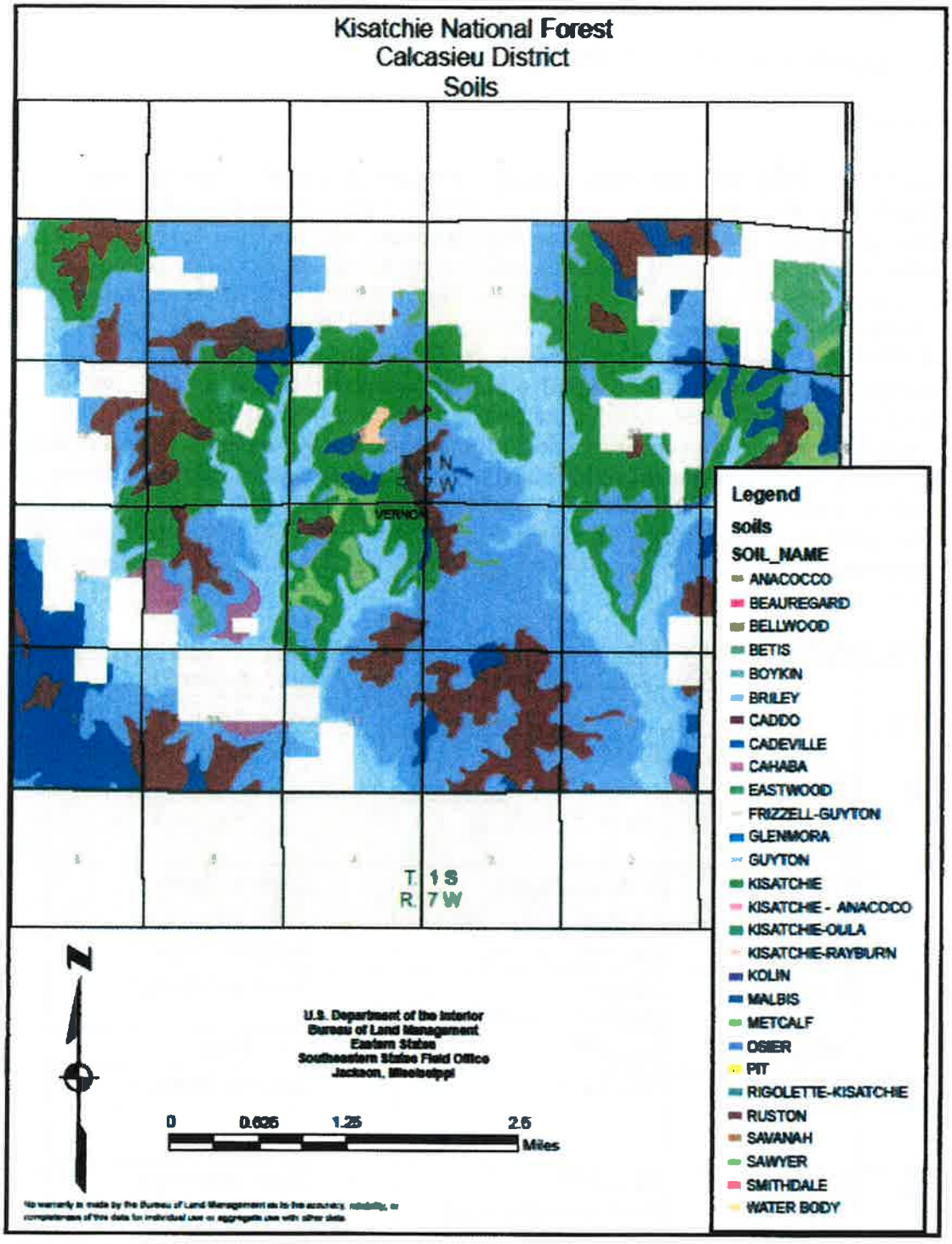

Figure 8. Soil series on the lease parcels located on the Calcasieu District of KNF.

3.8 Air Resources

Air resources are referenced in the 1999 KNF FEIS on page 3-6.

3.8.1 Air Quality

In the general area of the parcels, the primary sources of air pollution are dust from blowing wind on disturbed or exposed soil, exhaust emissions from motorized equipment, oil and gas development, agriculture, and industrial sources. The Environmental Protection Agency (EPA) was given the authority for air quality protection with the provision to delegate this authority to the state as appropriate under U.S. law. The LDEQ has been delegated most of the authority for air quality protection in Louisiana. The CAA of 1970, as amended, requires the establishment of National Ambient Air Quality Standards (NAAQS). NAAQS pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} & $PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). The NAAQS pollutants are monitored in Louisiana by the LDEQ. The CAA identifies two types of national ambient air quality standards. Primary standards define levels of air quality that the Administrator of the EPA judges to be necessary, with an adequate margin of safety, to protect the public health. Secondary standards define levels of air quality that the Administrator of the EPA judges to be necessary to protect the public from any known or anticipated adverse effects of a pollutant. Both primary and secondary standards are currently in effect (Table 3).

Table 3. National ambient air quality standards.

	Primary Standards		Secondary Standards	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [1]	None	
	35 ppm (40 mg/m^3)	1-hour [1]		
Lead	0.15 $\mu g/m^3$ [2]	Rolling 3-Month Average	Same as Primary	
	1.5 $\mu g/m^3$	Quarterly Average	Same as Primary	
Nitrogen Dioxide	53 ppb [3]	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour [4]	None	
Particulate Matter (PM_{10})	150 $\mu g/m^3$	24-hour [5]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 $\mu g/m^3$	Annual [6] (Arithmetic Average)	Same as Primary	
	35 $\mu g/m^3$	24-hour [7]	Same as Primary	

	Primary Standards		Secondary Standards	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
Ozone	0.075 ppm (2008 std)	8-hour [8]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [9]	Same as Primary	
	0.12 ppm	1-hour [10]	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Average)	0.5 ppm	3-hour [1]
	0.14 ppm	24-hour [1]		

Note:

(1) Not to be exceeded more than once per year.

(2) Final rule signed October 15, 2008.

(3) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

(5) Not to be exceeded more than once per year on average over 3 years.

(6) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.

(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).

(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008).

(9) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes
rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c) EPA is in the process of reconsidering these standards (set in March 2008).

(10) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.

Ambient air quality measurements taken by LDEQ indicate that ambient air quality for Louisiana is within standards. In 2011, the EPA granted attainment status for 1-hour ozone for the following Parishes: Beauregard, Grant, Lafayette, Lafourche, St. James, St. Mary, Jefferson, Orleans, St. Charles, St. Bernard, Point Coupee, and Calcasieu. The EPA also granted attainment status for 8-hour ozone in the Baton Rouge area. All areas of the KNF are in attainment of the NAAQS including NAAQS for ozone. Monitoring data for ozone was continuously collected at the LDEQ air monitoring station located on the Catahoula Ranger District at the Bentley site in Grant Parish until the station was destroyed by fire in August 2005.

Air quality in a given region can be measured by its Air Quality Index (AQI) value. The AQI is reported according to a 500-point scale for each of the major criteria air pollutants, with the worst denominator determining the ranking. For example, if an area has a CO value of 132 on a given day and all other pollutants are below 50, the AQI for that day would be 132. The AQI scale breaks down into four categories: good (AQI<50), moderate (50-100), unhealthy for sensitive groups (100-150), and unhealthy (>150). The AQI is a national index and the air quality

rating is an important indicator for populations sensitive to air quality changes. There are no air quality monitoring stations near the lease parcels, however, there are 3 air quality monitoring sites in northern Louisiana (located ~ 60 miles northwest of the northern-most parcel). The AQI for all 3 sites for ozone was good (<50) with the highest AQI being 17 on October 10, 2014. Only 1 site monitored PM_{25} and SO_2, both of which were listed as good (AQI = 32 and 0 respectively). There are 10 air quality monitoring sites in the Baton Rouge area (located ~ 75 miles southeast of the southern-most parcel). The AQI for all sites for ozone was good (<50), with 18 as the highest AQI on October 9, 2014. Two of the stations monitor $PM_{2.5}$; both of which had a good AQI with the highest being 44. Two stations monitor SO_2, both of which had a good AQI, with the highest being 0.

3.8.1.1 Visibility

Visibility, also referred to as visual range, is a subjective measure of the distance that light or an object can clearly be seen by an observer. Light extinction is used as a measure of visibility and is calculated from the monitored components of fine particle mass (aerosols) and relative humidity. It is expressed in terms of deciviews, a measure for describing perceived changes in visibility. One deciview is defined as a change in visibility that is just perceptible to an average person, which is approximately a 10% change in light extinction. Visibility can also be defined by Standard Visual Range (SVR) measured in miles, which is the farthest distance at which an observer can see a black object viewed against the sky above the horizon. Cleaner air will have a larger SVR. To estimate potential visibility impairment, monitored aerosol concentrations are used to reconstruct visibility conditions for each day monitored. The aerosol species include ammonium sulfate, ammonium nitrate, organic mass, elemental carbon, soil elements, and coarse mass. The daily values are then ranked from clearest to haziest and divided into three categories; the mean visibility for all days (average), the 20% of days with the clearest visibility (20% clearest), and the 20% of days with the worst visibility (20% haziest).

A wide variety of pollutants can impact visibility, including particulate matter, NO_2, nitrates (compounds containing NO_3), and sulfates (compounds containing SO_4). Fine particles suspended in the atmosphere decrease visibility by blocking, reflecting, or absorbing light. Two types of visible impairment can be caused by emission sources: plume impairment and regional haze. Plume impairment occurs when a section of the atmosphere becomes visible due to the contrast or color difference between a discrete pollutant plume and a viewed background, such as a landscape feature. Regional haze occurs when pollutants from widespread emission sources become mixed in the atmosphere and travel long distances.

It is estimated that the average natural background visibility range for the eastern U.S. varies from 65 to 121 miles. The average annual SVR for the KNF is estimated to be 18 miles. Visibility is poorest in the summer (15 miles SVR) and greatest in the spring (20 miles SVR). The bulk of this visibility reduction is due to man-made sulfur emissions (USDA 1999b, pg. 3 – 6).

There are three classifications of areas that attain NAAQS: Class I, Class II, and Class III. Congress established certain national parks and wilderness areas as mandatory Class I areas where only a small amount of air quality degradation is allowed. Since 1980, the Interagency

Monitoring of Protected Visual Environments (IMPROVE) network has measured visibility in Class I areas. These are managed as high visual quality under the federal visual resource management (VRM) program. The CAA 1997 amendment declared "as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I federal areas...from manmade air pollution." 42 U.S.C. § 7491(a) (1).25. All other areas of the U.S. are designated as Class II, which allow a moderate amount of air quality degradation. No areas of the U.S. have been designated Class III, which would allow more air quality degradation. The CAA gives federal managers the affirmative responsibility, but no regulatory authority, to protect air quality-related values, including visibility, from degradation.

Breton Wilderness Area is the only Class I area in LA. This 5,000 acre National Wildlife Refuge (NWR) is an island located in the Gulf of Mexico near Venice, LA. The NWR is located over 400 miles south of the proposed project site. The only National Wilderness Area on the KNF is Kisatchie Hills, which was established in 1980. This area does not meet the Class I CAA requirement of being more than 5,000 acres and therefore is classified as a Class II area. All lands on KNF are categorized as Class II areas.

3.8.1.2 Atmospheric Deposition

Atmospheric deposition refers to processes in which air pollutants are removed from the atmosphere and deposited into terrestrial and aquatic ecosystems. Air pollutants can be deposited by precipitation (rain and snow) or the gravitational settling of gaseous pollutants on soil, water, and vegetation. Much of the concern about deposition is due to secondary formation of acids and other compounds from emitted nitrogen and sulfur species, such as oxides of nitrogen (NOx) and SO_2, which can contribute to acidification of lakes, streams, and soils and affect other ecosystem characteristics, including nutrient cycling and biological diversity.

Substances deposited include:

- Acids, such as sulfuric (H_2SO_4) and nitric (HNO_3), sometimes referred to as acid rain
- Air toxins, such as pesticides, herbicides, and volatile organic compounds (VOC)
- Heavy metals, such as mercury
- Nutrients, such as NO_3- and ammonium (NH_{4+})

The accurate measurement of atmospheric deposition is complicated by contributions to deposition by several components including but not limited to rain, snow, cloud water, particle settling, and gaseous pollutants. Deposition varies with precipitation and other meteorological variables (e.g., temperature, humidity, winds, and atmospheric stability), which in turn, vary with elevation and time.

The FS has established guidelines or Levels of Concern (LOC) for total deposition of nitrogen and sulfur compounds in Class I Wilderness Areas. Total nitrogen deposition of 1.5 kilograms

(kg) per hectare (ha) per year or less is considered to be unlikely to harm terrestrial or aquatic ecosystems. For total sulfur deposition, the LOC is 5 kg per ha per year. The FS is considering a sulfur LOC of 1.5 kg per ha per year. Note that these are the same LOCs the National Park Service uses. Breton Wilderness Area is the only Class I area in Louisiana and LOC data is not available.

3.8.2 Climate and Climate Change

3.8.2.1 Climate

A description of the areas' climate is referenced in the 1999 KNF FEIS on page 3-5. The climate of KNF is considered subtropical. Weather is highly variable. Summer temperatures range from 85°F to 95°F during the afternoon and 65°F to 75°F in the early morning. Average winter temperatures range from 55°F to 65°F in the afternoon and from 40°F to 50°F in the early morning hours. The annual temperature on KNF averages about 68°F and the mean relative humidity is about 74% (USDA 1999b, pg. 3-5).

Rainfall, mainly in the form of showers, occurs on about 2 of every 7 days throughout the year. The annual rainfall averages about 59 in. During the rainy season from December to March, the average rainfall is 28 in. The measured pH of rainfall in central and northern Louisana averages 4.8. Hurricane season is from June through November. Tornadoes can develop any time of the year, but the primary season is from March to May. March to May is the season when extensive thunderstorms are often seen with rainfall amounts exceeding 10 in per storm (USDA 1999b, pg. 3-5).

3.8.2.2 Climate Change

Climate change refers to any significant change in measures of climate (e.g., temperature or precipitation) lasting for an extended period (decades or longer). Climate change may result from natural processes, such as changes in the sun's intensity, natural processes within the climate system (such as changes in ocean circulation), and human activities that change the atmosphere's composition (such as burning fossil fuels) and the land surface (such as urbanization) (Intergovernmental Panel on Climate Change [IPCC] 2013).

GHGs are gases in the atmosphere composed of molecules that absorb and reradiate infrared electromagnetic radiation. When present in the atmosphere the gas contributes to the greenhouse effect. The greenhouse effect is a process by which thermal radiation from a planetary surface is absorbed by atmospheric GHGs and is re-radiated in all directions. Since part of this re-radiation is back towards the surface and the lower atmosphere, it results in an elevation of the average surface temperature above what it would be in the absence of the gases. Some GHGs such as CO_2 occur naturally and are emitted to the atmosphere through natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. The primary GHGs that enter the atmosphere as a result of anthropogenic activities include CO_2, CH_4, N_2O, and fluorinated gases such as hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF). Fluorinated gases are powerful GHGs that are emitted from a variety of industrial processes including production of

refrigeration/cooling systems, foams and aerosols. Fluorinated gases are not primary to the activities authorized by the FS or BLM and will not be discussed further in this document.

Ongoing scientific research has identified the potential impacts of anthropogenic GHG emissions and changes in biological sequestration due to land management activities on global climate. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused CO_2 equivalent (CO_2e) concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. CO_2e is the metric measurement used to compare the emissions for various GHGs based upon their global warming potential (GWP). The CO_2e for a gas is derived by multiplying the tons of the gas by the GWP. The IPCC recently concluded that "warming of the climate system is unequivocal" and "most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations" (IPCC 2013).

It is important to note that GHGs may have a sustained climatic impact over different temporal scales. For example, recent emissions of CO_2 can potentially influence climate for 100 years. In contrast, black carbon is a relatively short-lived pollutant, as it remains in the atmosphere for only about a week. It is estimated that black carbon is the second greatest contributor to global climate change behind CO_2 (Ramanathan and Carmichael 2008). Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change.

Global mean surface temperatures have increased nearly 1.0°C (1.8°F) from 1890 to 2006 (Goddard Institute for Space Studies 2007). In 2001, the IPCC indicated that by the year 2100, global average surface temperatures would increase 1.4 to 5.8°C (2.5 to 10.4°F) above 1990 levels. The National Academy of Sciences (2006) has confirmed these findings, but also indicated that there are uncertainties regarding how climate change may affect different regions. Observations and predictive models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Data indicates that northern latitudes (above 24° N) have exhibited temperature increases of nearly 1.2°C (2.1°F) since 1900, with nearly a 1.0°C (1.8°F) increase since 1970 alone. It also shows temperature and precipitation trends for the conterminous U.S. For both parameters we see varying rates of change, but overall increases in both temperature and precipitation.

The lack of scientific tools designed to predict climate change at regional or local scales limits the ability to quantify potential future impacts. However, potential impacts to air quality due to climate change are likely to be varied. Several activities occur within KNF that may generate GHG emissions. Oil and gas development activities can generate CO_2 and CH_4. CO_2 emissions result from the use of combustion engines, while CH_4 can be released during processing and development/production of oil and gas resources. Wild land fires also are a source of other GHG emissions, while livestock grazing is a source of CH_4. Currently, the LDEQ does not have

regulations regarding GHG emissions, although these emissions are regulated indirectly by various other regulations.

Because GHGs circulate freely throughout Earth's atmosphere, the planning area for this resource is the entire globe. The largest component of global anthropogenic GHG emissions is CO_2. Global anthropogenic carbon emissions reached about 7,000,000,000 metric tons per year in 2000 and about 9,000,000,000 metric tons per year in 2008 (Boden et al 2010). Oil and gas production is a major contributor of GHGs. In 2006, natural gas production accounted for 8% of global CH_4 emissions, and oil production accounted for 0.5% of global CH_4 emissions (URS Corporation 2010).

3.9 Water Resources - Surface/Ground

A description of water resources is referenced in the 1999 KNF FEIS on pages 3-9 to 3-12.

3.9.1 Surface Water Resources

Surface water hydrology within the area is typically influenced by geology, soil characteristics, precipitation and vegetation. KNF lies within 2 water resource regions: the lower Mississippi and the Arkansas-Red-White. The Forest Contains 35 watersheds within these drainage basins (USDA 1999b, pg. 3-9). The following perennial and/or ephemeral creeks are located on the lease parcels on the Winn and northern Catahoula Districts in Grant Parish: Bear Creek, Four Mile Branch, Prairie Creek, and Log Bayou (Appendix A). Big Creek is located on one of the parcels in the southern portion of the Catahoula District in Grant Parish and Bayou Cypress is located on one of the parcels on the Kisatchie District in Natchitoches Parish. The following perennial and/or ephemeral creeks are located on the nominated parcels on the Calcasieu District in Vernon Parish: Six Mile Creek, Dooley Branch, Bee Branch, Bit Branch, Whisky Chitto Creek, and Bird Creek. There are also numerous ponds, lakes, tributaries and additional small creeks located on the lease parcels (Appendix A).

Many of Louisiana's water bodies remain impaired for the designated use of fish and wildlife propagation. This is largely because there are many possible causes and sources of impairment impacting this use, and any one of these causes can result in a water body being considered impaired for fish and wildlife propagation. There are more than 30 different suspected causes of impairment reported as impacting fish and wildlife propagation. The most frequently cited suspected causes of impairment for all water bodies combined in Louisiana are fecal coliforms, primarily from septic tanks and municipal sewage treatment systems, low dissolved oxygen from sewage, agriculture, or natural causes, sediment-related problems such as turbidity, suspended solids, and siltation caused by agriculture, forestry, sewage systems, construction, hydro-modification, resource extraction, or natural processes, and mercury related to fish consumption advisories, due primarily to atmospheric deposition of mercury on the watershed. Many of the suspected sources of water quality impairment are known collectively as nonpoint source pollution because it typically does not come from a single point of discharge but runs across the land when it rains and is carried through small canals and streams to major water bodies (LDEQ 2008). With the exception of mercury, all of the top eight suspected causes of impairment generally can be related to nonpoint sources of pollution. The remaining causes of impairment

generally are related to various forms of industry, small business, or municipal sources (LDEQ 2008).

The essential water quality parameters for streams within the Forest are measured chlorides, sulfates, total dissolved solids, dissolved oxygen, the pH factor, temperature, and fecal coliform (USDA 1999b, pg. 3-9). Data collected by the U.S. Geological Survey (USGS) and FS show almost all the Forest's surface water meeting or exceeding standards set for recommended stream uses. The numerical criteria for water quality parameters depend on stream classification. Water originating on or passing through the Forest generally has met the numerical criteria for these parameters. Fecal coliform is the parameter most commonly exceeded. This generally occurs after periods of long intense rains which flush watersheds. Values return to normal within a few days after rain. The source of fecal coliform is unknown. Total dissolved solids and chlorides have run high in watersheds with energy mineral extraction activities, as compared to those where there is no mineral activity, but have not exceeded stream standards (USDA 1999b, pg. 3-10).

The LADNROC regulates oil and gas operations in Louisiana. The LADNROC has the responsibility to gather oil and gas production data, permit new wells, establish pool rules and oil and gas allowables, issue discharge permits, enforce rules and regulations of the division, monitor underground injection wells, and ensure that abandoned wells are properly plugged and the land is responsibly restored. The Louisiana Environment Department (LAED) administers the major environmental protection laws. The Water Quality Control Commission (WQCC), which is administratively attached to the LAED, assigns responsibility for administering its regulations to constituent agencies, including the LADNROC. The LADNROC administers, through delegation by the WQCC, all Water Quality Act regulations pertaining to surface and groundwater (except sewage not present in a combined waste stream). According to the LADNROC, produced water if predictable in salt concentration, can be used for drilling and completion and possibly cementing.

3.9.2 Ground Water Resources

The results of the LDEQ Baseline Monitoring Program indicate that water quality is good in Louisiana aquifers. Although the overall quality of the state's ground water is good, there are more than 200 sites where active investigation or remediation of contaminated ground water is taking place, not including underground storage tank or Superfund sites. There also were 14 public water supply systems impacted by VOC contamination of ground water between 1989 and 2002 (GWPC 2009).

The lease parcels are located within the Mississippi embayment aquifer system which consists of 6 individual aquifers that crop out as an arcuate band of poorly consolidated to unconsolidated, bedded sand, silt and clay. Geologic units of the aquifer system range from Late Cretaceous to middle Eocene in age. Aquifers of the Mississippi embayment aquifer system consist of an interbedded sequence of poorly consolidated fluvial, deltaic, and marine deposits in which diagenesis or postdepositional geochemical processes have not greatly altered the original pattern of permeability. The hydraulic conductivity of the unconsolidated to poorly consolidated sediments that compose the aquifers of the Mississippi embayment aquifer system does not appear to have been greatly reduced by cementation or compactions. Consequently, the

distribution of hydraulic conductivity and transmissivity of the Mississippi embayment aquifer system can be inferred from maps of sediment lithofacies, if a direct correlation between sediment type and aquifer permeability is assumed.

In central Louisiana, freshwater is contained in Eocene, Miocene, Pliocene, and Pleistocene sands. Sources of recharge are rain falling on outcrop areas and downward seepage of rainfall through permeable over-lying Pleistocene and recent deposits. Most of the upland areas on the Forest which contain deep well-drained soils have a high aquifer recharge potential (USDA 1999b, pg. 3–12).

The capacities of well fields depend upon aquifer characteristics and the efficiency of well construction and development. Specific well capacities range from a low of 0.7 gallon per minute per foot (GPM/ft) to a high of 18.0 GPM/ft. Coefficients of transmissibility range from 1,400 to 60,000 gallons per day per square foot (GPD/sq ft), with an average of 16,000 in Miocene aquifers to 1,000 – 2,000 GPD/sq ft in Pleistocene aquifers (USDA 1999b, pg. 3-12).

Most onshore produced water is injected deep underground for either enhanced recovery or disposal. With the passage of the Safe Drinking Water Act in 1974, the subsurface injection of fluids came under federal regulation. In 1980, the EPA promulgated the Underground Injection Control regulations. The program is designed to protect underground sources of drinking water.

In the area of the 53 parcels, USDWs are known to occur at depths generally above 1500 feet below ground surface.

3.9.3 Water Quantity

The average surface yield from the 35 sub-watersheds on KNF is approximately 896,287 acre-feet annually, which is approximately 1.5 acre-feet for each national forest acre. This total volume varies annually, depending on climatic conditions and management practices within the sub-watershed (USDA 1999b, pg. 3-12). Little surface water in this area is used for domestic and industrial purposes. Ground water is used for municipal water supplies. The primary consumptive use of surface water is for livestock and wildlife. The primary in-stream, non-consumptive users are fisheries and recreation. The total consumptive and non-consumptive use of surface and ground water on or associated with KNF is roughly 313,295 acre-feet. KNF administers 7 special-use permits for municipal water systems, which utilize nearly 6.8 billion gallons of water per year (USDA 1999b, pg. 3-13).

3.9.4 Hydraulic Fracturing

Two formations have potential for oil and gas production on the offered tracts; the Austin Chalk and the EF/TMS. Both formations produce from natural fractures, but the EF/TMS requires high volume hydraulic stimulation in order to establish commercial production. Previous Austin Chalk wells were not normally stimulated, but future ones may be treated in some form. Water is used for drilling in both kinds of wells, but the stimulation required in the EF/TMS uses an additional 6 – 10 million gallons per well. Water use for wells drilled/completed in the Austin Chalk is estimated at 420,000 gallons per well. The RFD predicts that 80 Austin Chalk wells

could be drilled on the 53 parcels totaling 33,600,000 gallons of water used. For the EF/TMS wells, water use is estimated to average 8,000,000 gallons per well. The RFD predicts that 80 EF/TMS wells could be drilled totaling 640,000,000 gallons of water used. The total estimated amount of water used for all wells could be 976,000,000 gallons. True Vertical Depth for the wells will vary between 8,000 feet to 15,000 feet. The base of the USDW varies between minus 1,500 to minus 3,000 feet. Hydraulic stimulation may occur at an interval between 6,500 to 12,000 feet below the base of the USDW.

Some studies have shown that anywhere from 20-85% of fracturing fluids may remain underground. Used fracturing fluids that return to the surface are often referred to as flowback. The resulting flowback and produced water will be contained until it is promptly removed and disposed of to an injection well, recycling facility, or disposal facility. Appendix D of the KNF LRMP lists requirements and guidelines that will be enforced at the APD stage which, among other things, will require the operator and contractors to ensure that all use, production, storage, transportation and disposal of produced water associated with the drilling, completion and production of a well be in accordance with all applicable existing or hereafter promulgated federal, state and local government rules, regulations and guidelines (Appendix E).

3.10 Floodplains/Riparian Areas/Wetlands

A description of floodplains/riparian areas and wetlands is referenced in the KNF FEIS on page 3-13.

3.10.1 Floodplains

There are roughly 67,000 acres of mapped alluvial floodplains on KNF. Additional acres of relatively narrow floodplains occur along many smaller streams. These floodplains are the flat or level landform on either side of a stream channel. They consist of alluvial soils which are hydric, seasonally wet, or at least occasionally flooded. These landforms and their associated aquatic and vegetation communities comprise the majority of KNF's riparian areas. Figure 9 – 11 illustrates the occurrence of floodplains within the project area. Approximately 497 acres of floodplains occur in sections 35 and 36, T1N R7W; T6N R6W. However, 9N 2W does not contain any floodplains within the project area. Table 4 shows the specific Ranger District and the approximate acres of floodplains within the project area.

Table 4. Approximate acres of floodplains within the project area in each Ranger District.

District	Proposed Action
Calcasieu Ranger District	91 Acres
Catahoula Ranger District	0 Acres
Kisatchie Ranger District	406 Acres
Total Floodplains	497Acres

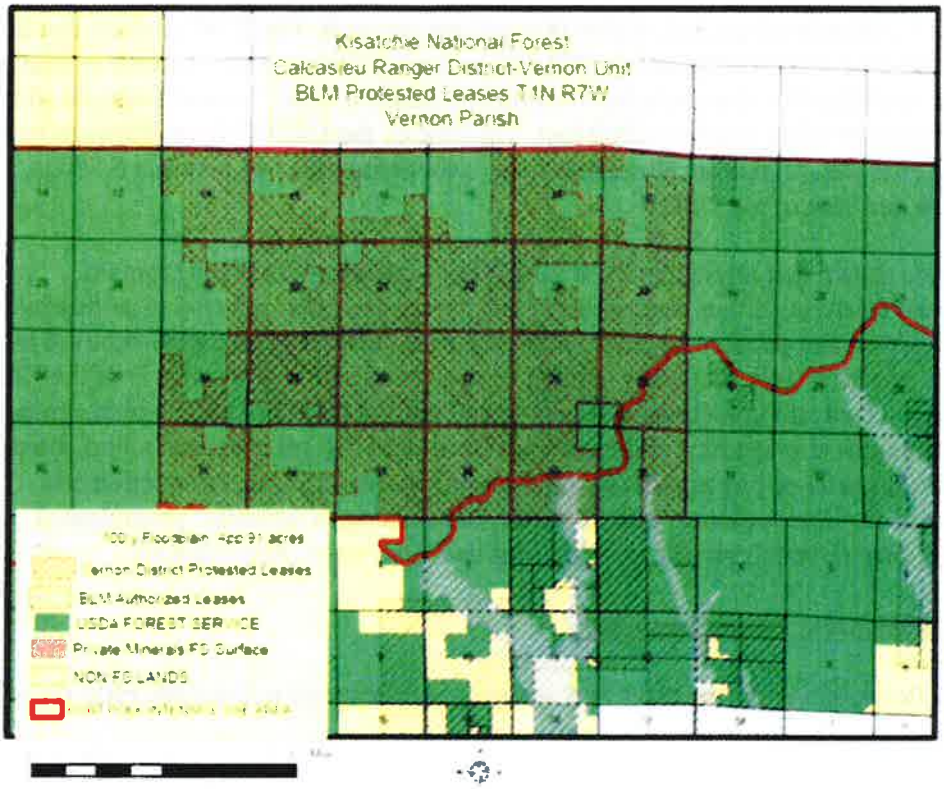

Figure 9. Calcasieu Ranger District floodplains.

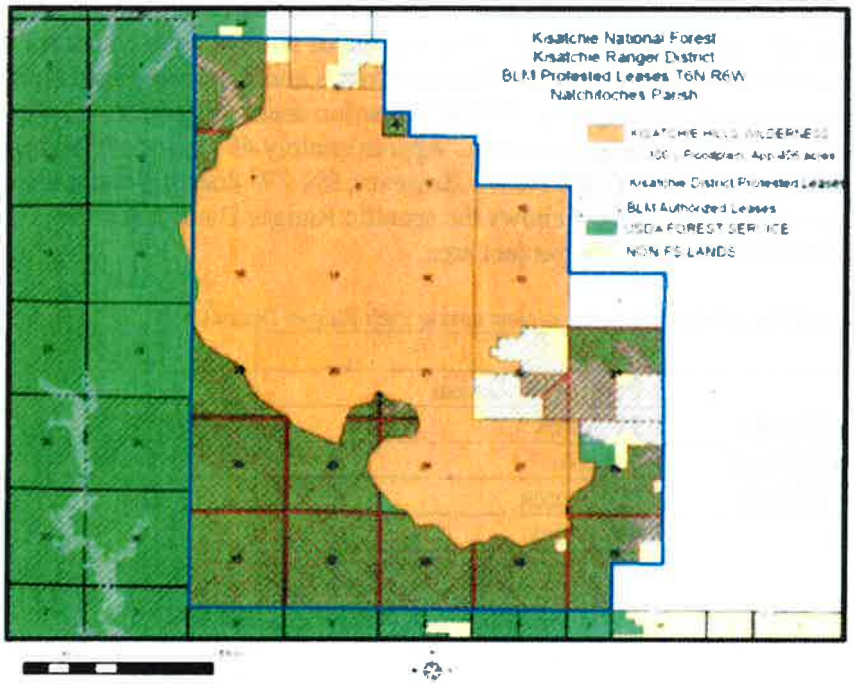

Figure 10. Kisatchie Ranger District floodplains.

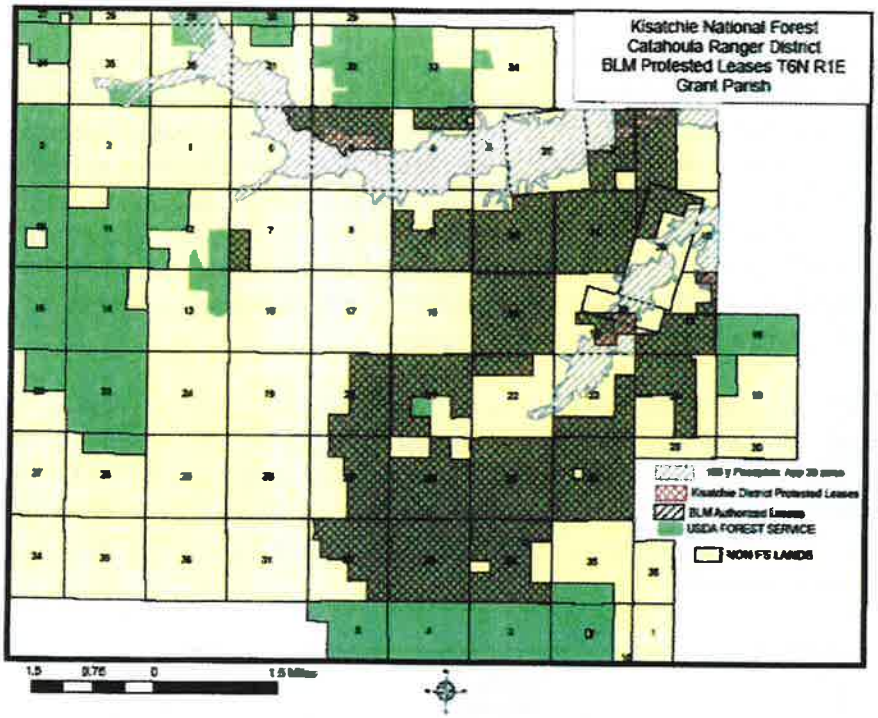

Figure 11. Catahoula Ranger District floodplains.

3.10.2 Riparian Areas

The National Wild and Scenic Rivers Act (P.L. 90-542; U.S.C. §1271) was established by Congress in 1968 to preserve free-flowing rivers that possess certain "outstandingly remarkable" values. Pursuant to Section 5(d) (1) of the act, the Secretary of Agriculture requires the FS to evaluate rivers within its jurisdiction for their potential for inclusion in the National Wild and Scenic Rivers System. In October 1986 approximately 19 miles of Saline Bayou was designated as a National Scenic River. It is located on the Winn District over 20 miles west of the closest parcel. The FS has recommended Congressional designation and inclusion into the National Wild and Scenic River System four additional river segments; Kisatchie Bayou, two segments of Six Mile Creek, and Whisky Chitto Creek. The Louisiana Natural and Scenic Rivers System emerged in the 1970's when the Louisiana Natural and Scenic Rivers Act was passed. Today, there are approximately 3,000 miles of Louisiana designated Natural and Scenic Rivers. Big Creek is a designated Scenic River and intersects several of the lease parcels in Vernon parish.

Management emphasis for the rivers above and their corridors are focused on protection and enhancement of the values for which they were found eligible for the National Wild and Scenic Rivers System, without limiting other uses that do not substantially interfere with public use and enjoyment of those values. The establishment values include scenery, recreation use, and free-flowing water.

3.10.3 Wetlands

Wetland habitats provide important wintering and migration habitat for several species of migratory birds. Wetlands also provide a link between land and water and are some of the most productive ecosystems in the world. EO 11990 on the Protection of Wetlands provides an opportunity for early review of federal agency plans regarding new construction in wetland areas. Under EO 11990, each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands while carrying out the agency's responsibilities for conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating and licensing activities.

Of the wetland communities on KNF, 9,300 acres have been identified and mapped as jurisdictional wetlands. Wetland areas are located on 5 of the lease parcels; 1 on the Winn District, 2 on the Catahoula District, and 2 on the Calcasieu District (Figures 12 – 14). These parcels have the following legal descriptions: T9N, R2W, Sec. 18, Grant Parish, Winn District, T6N, R1E, Sec. 5 and Sec. 34, Grant Parish, Catahoula District, and T1N, R7W, Sec. 25 and 36, Vernon Parish, Calcasieu District.

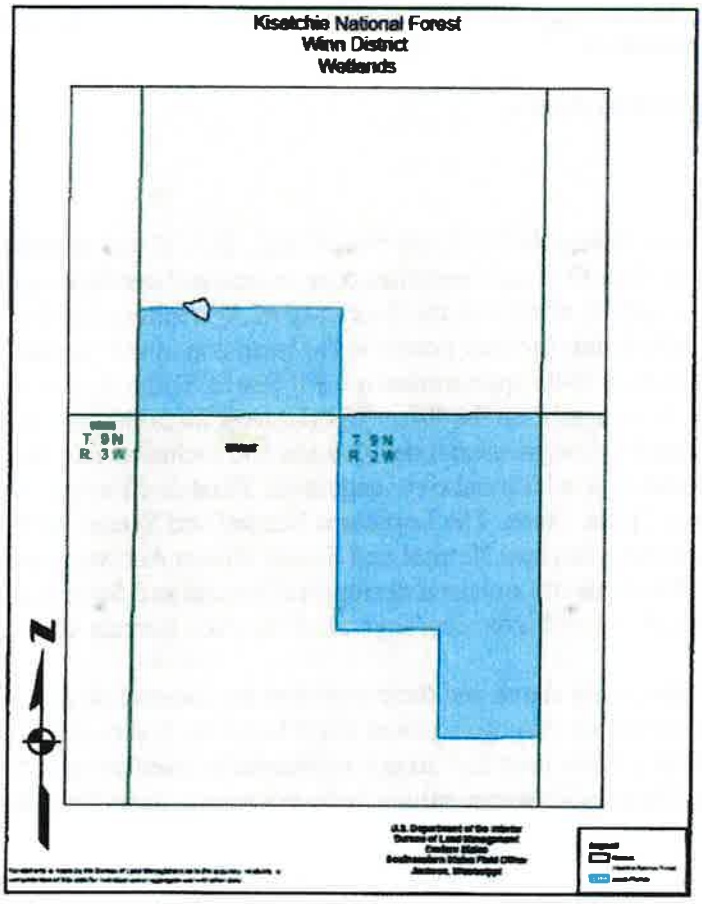

Figure 12. Wetland located on a lease parcel on the Winn District of KNF.

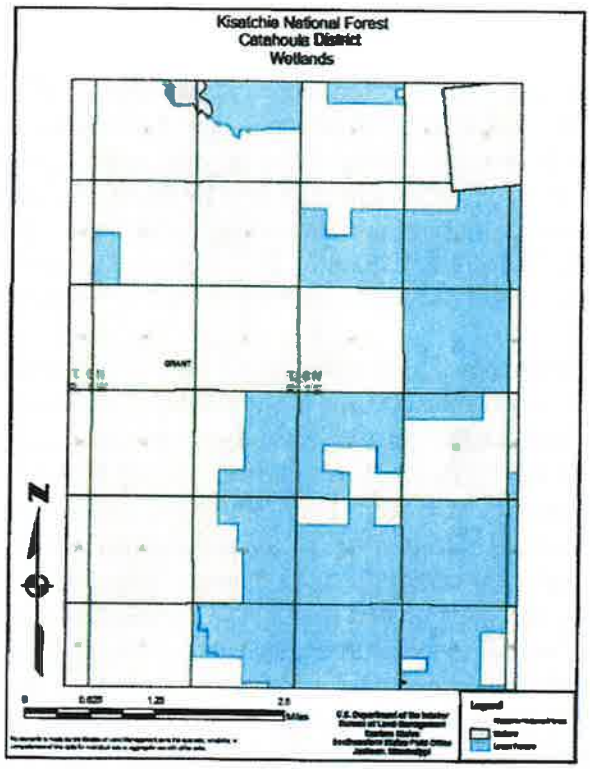

Figure 13. Two wetland areas located on two lease parcels on the Catahoula District of KNF.

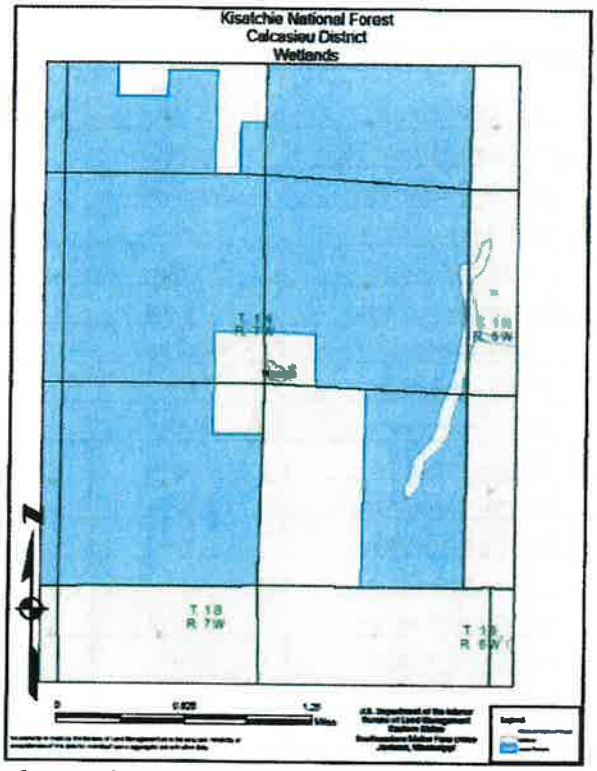

Figure 14. Wetland area located on two lease parcels on the Calcasieu District of KNF.

3.11 Invasive/Exotic Species

A description of invasive/exotic plant species is referenced in the 1999 KNF FEIS on page 3-22. Noxious weeds can have a disastrous impact on biodiversity and natural ecosystems. Noxious weeds affect native plant species by out-competing native vegetation for light, water and soil nutrients. Noxious weeds cause $2 to $3 million in estimated losses to producers annually. These losses are attributed to: 1) decreased quality of agricultural products due to high levels of competition from noxious weeds, 2) decreased quantity of agricultural products due to noxious weed infestations, and 3) costs to control and/or prevent the spread of noxious weeds.

Thirty-seven non-native plant species have been found on KNF (Table 5). Seventeen of these have been documented on the subject parcels located in the southern portion of the Catahoula District (Figure 15). These species include: Johnson grass, Japanese clover, Japanese climbing fern, Chinese privet, mimosa silktree, kudzu, yellow bluestem, callery pear, Chinese tallow, Chinaberry tree, Japanese honeysuckle, Macartney rose, Brazilian vervain, and Vasey's grass. These parcels have the highest number of man-made residences and surface disturbance out of all the lease parcels. Surface disturbance is thought to be a major factor for the introduction and establishment of invasive species (Radosevich and Holt 1984). People are known to plant invasive species as ornamentals. In addition, disturbance creates openings in which invasive species can get established, spread, and compete with native species. There are 4 non-native species documented on the parcels located on the Kisatchie District: Johnson grass, sericia lespedeza, Japanese climbing fern, and Vasey's grass (Figure 16). There are 3 documented non-native plant species on the parcels located on the Calcasieu District: Japanese climbing fern, Vasey's grass, and Chinese privet (Figure 17).

Table 5. Thirty-seven non-native plant species found on KNF.

Common Name	Scientific Name	Control Priority	Found in Project Area
Alligator Weed	*Alternanthera philoxeroides*	Medium	
Autumn Olive	*Elaeagnus umbellata*	Medium	
Brazilian Vervain	*Verben brasiliensis*	Low	X
Callery Pear	*Pyrus calleryana*	Low	X
Chamber Bitter	*Phyllanthus urinaria*	Medium	
Cherokee Rose	*Rosa laevigata*	Medium	
Chinaberry	*Melia azedarach*	Low	X
Chinese Privet	*Ligustrum sinense*	High	X
Chines Tallow	*Triadica sebifera*	High	X
Cogon Grass	*Imperata cylindrica*	High	
Dallis Grass	*Paspalum dilatatum*	Low	
English Ivy	*Hedera helix*	Low	
Golden Bamboo	*Phyllostachys aurea*	Medium	
Hardy Orange	*Poncirus trifoliata*	Low	
Hydrilla	*Hydrilla verticillata*	High	
Japanese Climbing Fern	*Lygodium japonicum*	High	X
Japanese Clover	*Kummerowia striata*	Low	X

Common Name	Scientific Name	Control Priority	Found in Project Area
Japanese Honeysuckle	*Lonicera japonica*	High	X
Johson Grass	*Sorghum halepense*	High	X
Kudzu	*Pueraria montana var. lobata*	High	X
Macartney Rose	*Rosa bracteata*	High	X
Mimosa Silktree	*Albizia julibrissin*	Medium	X
Parrot Feather Watermilfoil	*Myriophyllum aquaticum*	High	
Sacred Bamboo	*Nandina domestica*	Low	
Salvinia (Common)	*Salvinia minima*	Medium	
Salvinia (Giant)	*Salvinia molesta*	High	
Santa Maria Feverfew	*Parthenium hysterophorus*	Medium	
Sawtooth Oak	*Quercus acutissima*	Low	
Sericea Lespedeza	*Lespedeza cuneata*	High	X
Shrub Lespedeza	*Lespedeza bicolor*	Medium	
Thorny Olive	*Elaeagnus pungens*	Low	
Tree of Heaven	*Ailanthus altissima*	Low	
Tungoil Tree	*Vernicia fordii*	Low	
Vasey's Grass	*Paspalum urvillei*	Medium	X
Water Hyacinth	*Eichhornia crassipes*	High	
Weeping Lovegrass	*Eragrostic curvula*	Low	
Wisteria	*Wisteria sinensis*	Low	
Yellow Bluestem	*Bothriochloa ischaemum*	Low	X

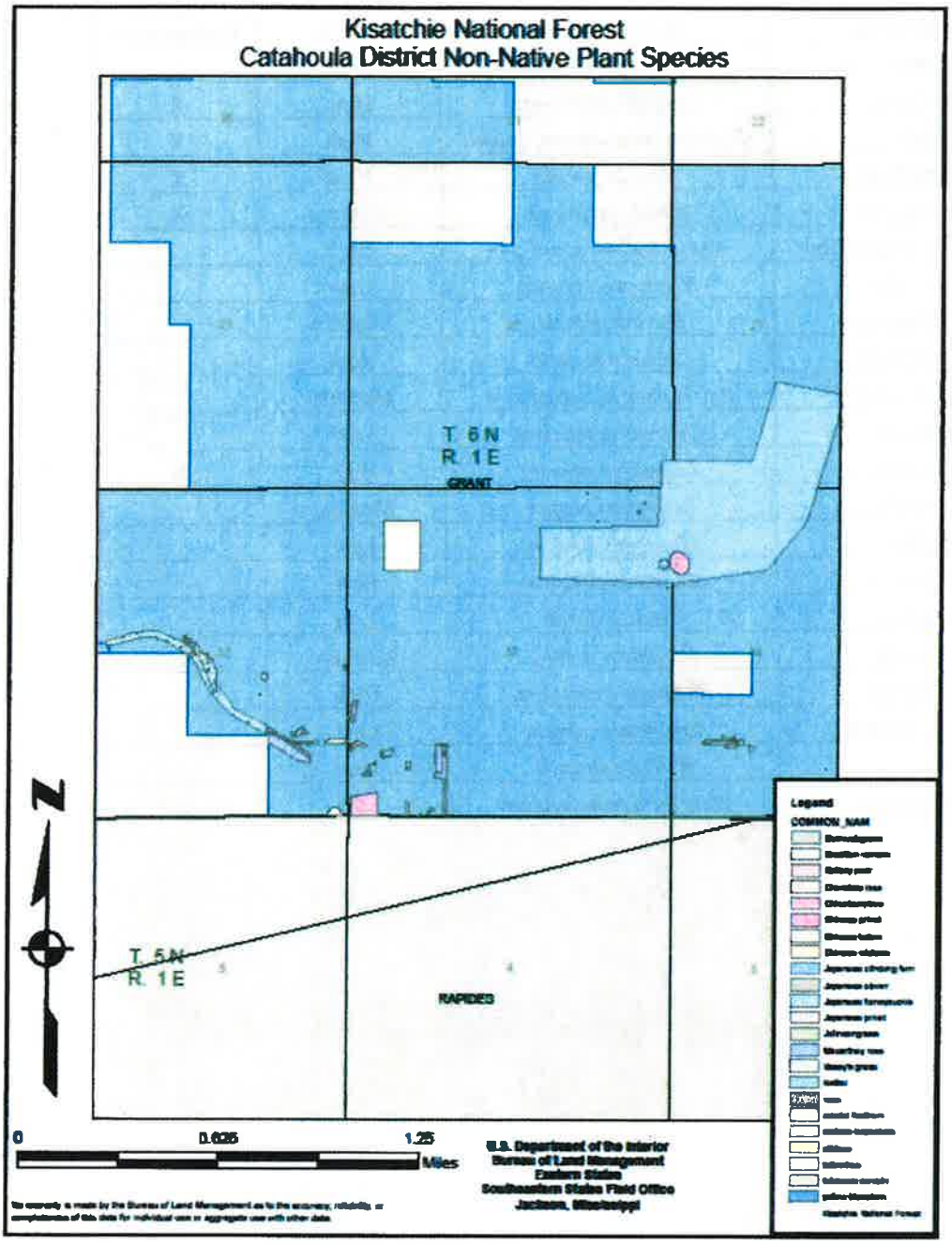

Figure 15. Non-native plant species found on the lease parcels on the Catahoula District of KNF.

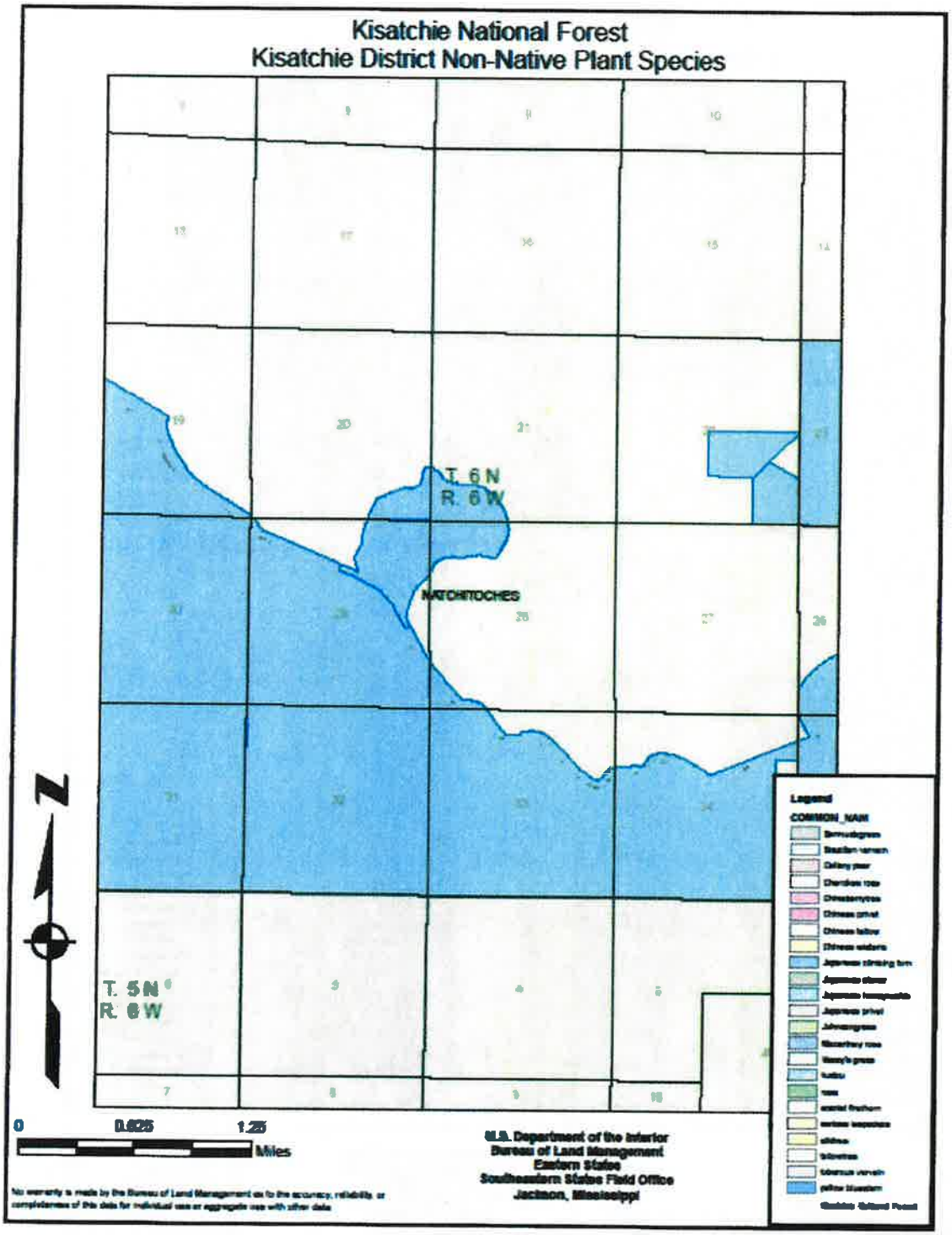

Figure 16. Non-native plant species found on the lease parcels on the Kisatchie District of KNF.

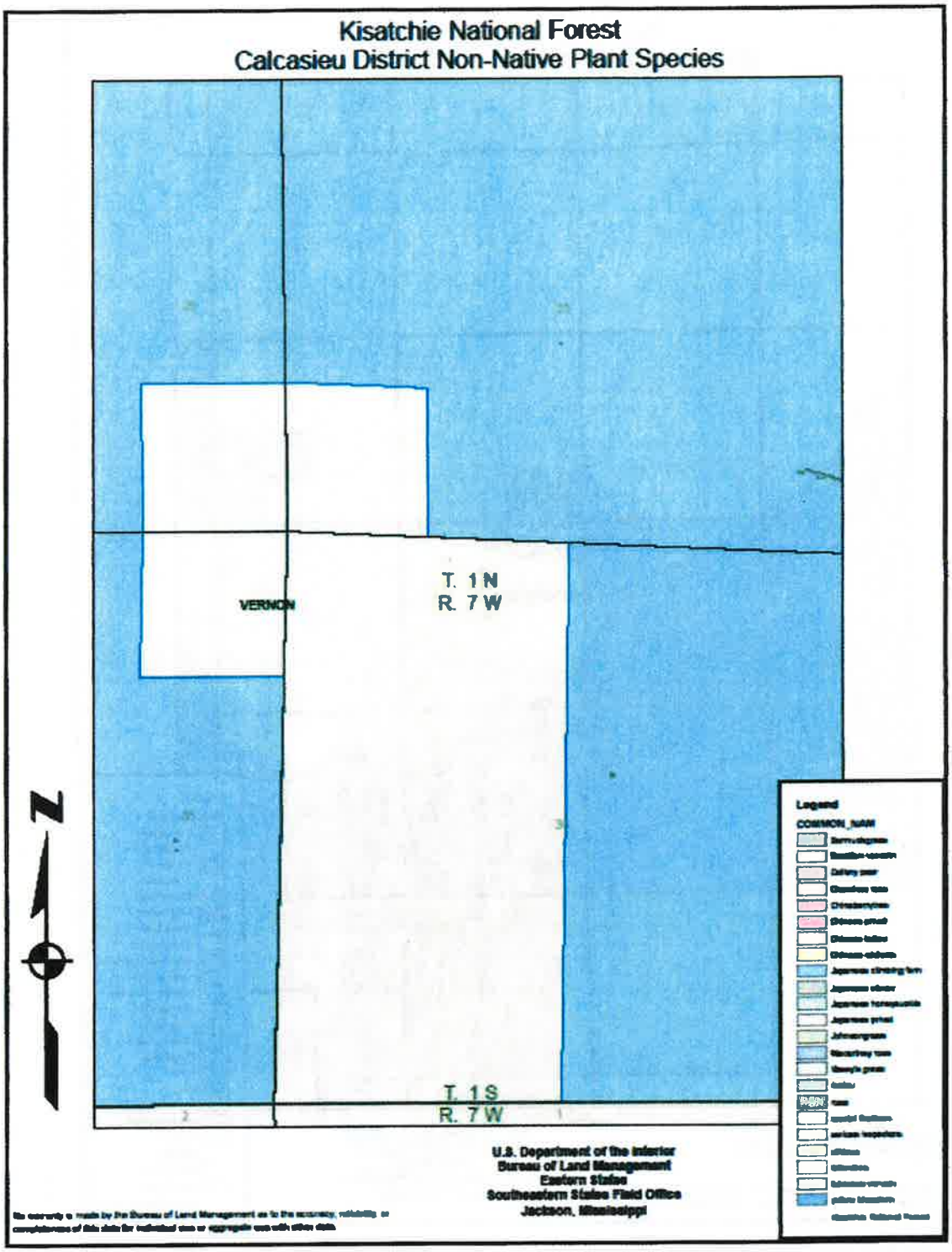

Figure 17. Non-native plant species found on the lease parcels on the Calcasieu District of KNF.

3.12 Special Status Species

3.12.1 Federally Listed Species

A description of federally listed wildlife species is referenced in the 1999 KNF FEIS on pages 3-36 to 3-41. Section 7 of the ESA requires that federal agencies prevent or modify any projects authorized, funded, or carried out by the agencies that are "likely to jeopardize the continued existence of any endangered species or threatened species, or result in the destruction or adverse modification of critical habitat of such species." Table 6 – 8 presents the species listed by FWS as endangered, threatened, proposed, or candidate that are documented to occur in Grant, Natchitoches, and Vernon Parish, Louisiana. The tables also present a summary of BLMs determination regarding anticipated effects on those species from development that might occur from issuance of the sold leases. Specific information regarding habitat requirements and rationale for those determinations are provided below under each species section. Details regarding species occurrence records on KNF, habitat, habits, threats and other information has been obtained from the Nature Serve website (www.natureserve.org), the KNF LRMP (USDA 1999b), documented literature, and shapefiles provided by KNF.

Table 6. Federally listed species documented to occur in Grant Parish, Louisiana by FWS.

Species	Federal Status	Determination	Rationale
Northern Long-eared Bat (*Myotis septentrionalis)*	Proposed Endangered	May affect, not likely to adversely affect	Suitable foraging and/or roosting habitat present on many parcels. Documented records on 1 parcel and near several others. Stipulations should protect species.
Louisiana Pearlshell (*Margaritifera hembeli*)	Threatened	May affect, not likely to adversely affect	Potential suitable habitat present on several parcels. Stipulations should protect species.
Pallid Sturgeon (*Scaphirhuncus albus*)	Endangered	May affect, not likely to adversely affect	Potential erosion could affect water quality and quantity downstream from parcels. Stipulations should protect species.
Interior Least Tern (*Sterna antillarum athalassos)*	Endangered	No effect	No suitable habitat present.
Red-cockaded Woodpecker (*Picoides borealis*)	Endangered	May affect, not likely to adversely affect	Suitable habitat present on many parcels. Documented records on many parcels. Stipulations should protect species.

Table 7. Federally listed species documented to occur in Natchitoches Parish, Louisiana by FWS.

Species	Federal Status	Determination	Rationale
Sprague's Pipit *(Anthus spragueii)*	Candidate	No effect	No suitable habitat present.
Louisiana Pine Snake (*Pituophis ruthyeni*)	Candidate	May affect, not likely to adversely affect	Known suitable habitat present on Kisatchie and Calcasieu District parcels. Stipulations should protect species.
Pallid Sturgeon (*Scaphirhuncus albus*)	Endangered	May affect, not likely to adversely affect	Potential erosion could affect water quality and quantity downstream from parcels.

Species	Federal Status	Determination	Rationale
Interior Least Tern (*Sterna antillarum athalassos*)	Endangered	No effect	No suitable habitat present.
Red-cockaded Woodpecker (*Picoides borealis*)	Endangered	May affect, not likely to adversely affect	Suitable habitat present on many parcels. Documented records on many parcels. Stipulations should protect species.

Table 8. Federally listed species documented to occur in Vernon Parish, Louisiana by FWS.

Species	Federal Status	Determination	Rationale
Louisiana Pine Snake (*Pituophis ruthveni*)	Candidate	May affect, not likely to adversely affect	Known suitable habitat present on Kisatchie and Calcasieu District parcels. Stipulations should protect species.
Red-cockaded Woodpecker (*Picoides borealis*)	Endangered	May affect, not likely to adversely affect	Suitable habitat present on many parcels. Documented records on many parcels. Stipulations should protect species.

3.12.1.1 Northern Long-eared Bat (Myotis septentrionalis) (Proposed)

On April 2, 2015, FWS designated the northern long-eared bat (*Myotis septentrionalis)* as a threatened species under the ESA. It is estimated that populations of the northern long-eared bat have declined by 99% since 2006 due to a disease called White-nose Syndrome (WNS). WNS was first documented at 4 sites in New York in 2006. Since that time, FWS has estimated that over 6 million bats have died from WNS which has spread to 25 U.S. States and 5 Canadian Provinces and is expected to continue to spread throughout the U.S. (FWS 2014). WNS is caused by a fungus known as *Pseudogymnoascus desructans* which thrives in cold temperatures and affects hibernating bats. Louisiana is not in the anticipated range for WNS, due primarily to the lack of caves available for bats to hibernate in and mild winters (Shelton 2013).

Suitable habitat for *M. septentrionalis* consists of a variety of forested/wooded habitats. Research has shown that presence and activity of *M. septentrionalis* is highest in older forests with late successional characteristics (Center for Biological Diversity 2013). Late-successional forest characteristics that seem to be important to this species include a high percentage of old trees (>100 years), uneven forest structure, single and multiple tree fall gaps, standing snags, and woody debris (Krusic et al 1996, Leverette 2001). These characteristics provide a high number of dead or decaying trees that can be used for breeding, day roosting, and foraging. Studies conducted by Foster and Kurta (1999) have documented that maternal tree roosts for this species in the eastern U.S. include; beech (*Fagus grandifolia*), silver maple (*Acer saccharinum*), red maple (*A. rubrum*), black cherry (*Prunus serotina*), green ash (*Fraxinus pennsylvanica*), and black locust (*Robinia pseudoacacia*). Studies conducted by Perry and Thill (2007) in the Ouachita Mountains of central Arkansas, found that shortleaf pine (*Pinus echinata*) was the most utilized tree species. Pine snags were more commonly used by this species than hardwood snags during this study.

The northern long-eared bat was first documented in Louisiana in 2000 when 3 individuals were captured on the Winn District of KNF in Winn Parish during mist net surveys conducted by

Crnkovic (2003). Fourteen additional individuals were captured during mist net and bridge surveys on the Winn and Catahoula Districts of KNF in Winn and Grant Parishes from 2002 – 2004 (Leberg 2004, Ferrara and Leberg 2005) and 2008 - 2009 (Nixon and Leberg 2009). All occurrence records for this species (individuals observed and/or captured) in Louisiana have been documented during mist net and bridge surveys conducted on KNF in 2 parishes. These records have extensively extended the previously known range for this species in the U.S by >250 miles.

Eleven of the nominated parcels are located on the Catahoula and Winn Districts of KNF in northern Grant Parish. A documented occurrence record for the northern long-eared bat is located on 1 of the parcels (Figure 18). Two occurrence records are located within 1 mile of 2 different lease parcels and two records are located within 3 miles of lease parcels. The majority of the parcels contain suitable foraging and roosting habitat for this species.

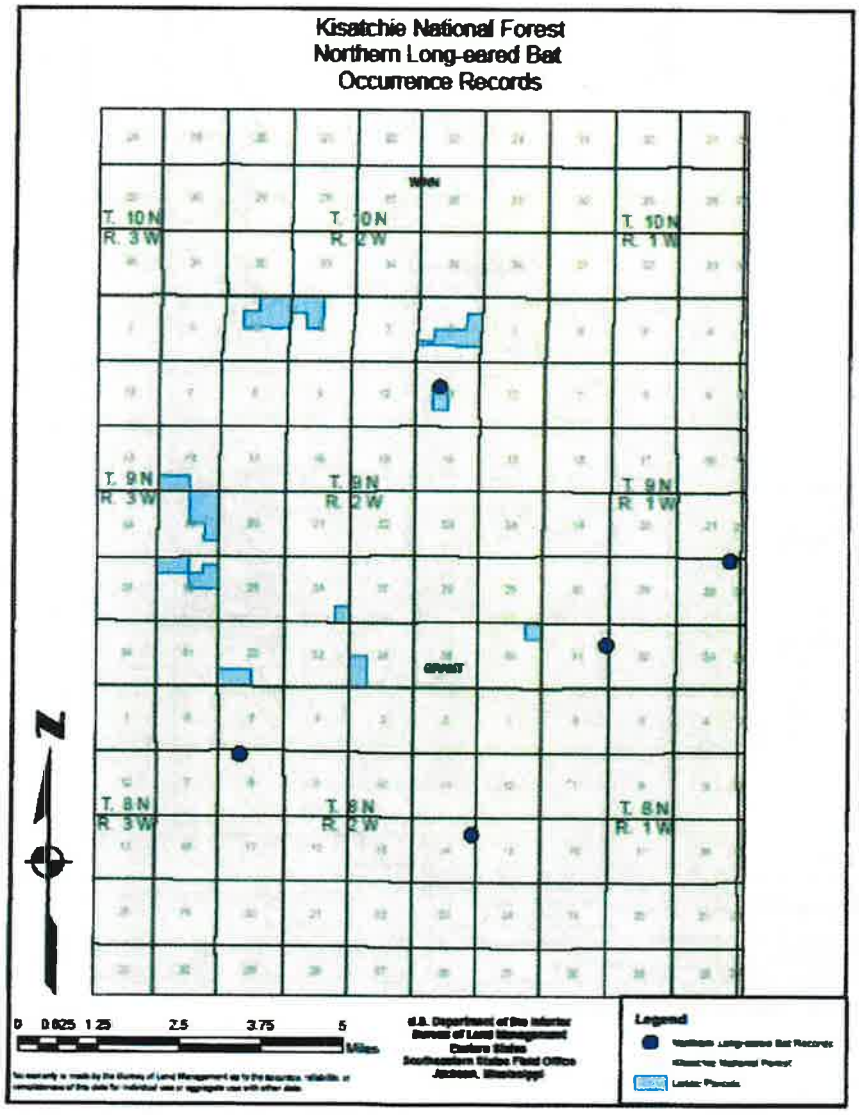

Figure 18. Northern long-eared bat records on KNF.

3.12.1.2 Louisiana Pearlshell (Margaritifera hembeli) (Threatened)

The Louisiana pearlshell (*Margaritifera hembeli*) is federally and state listed as threatened. This is a severely declining species that can be found in small streams in central Louisiana. Some researchers report that the species is limited to 22 headwater streams in the Red River Basin. There are no known occurrence records for this species on the lease parcels. However there are documented occurrence records within 6 miles of the parcels located in northern Grant Parish and within 8 miles of the parcels located in southern Grant Parish (Figure 19). Several of the nominated parcels contain small streams that provide suitable habitat for this species.

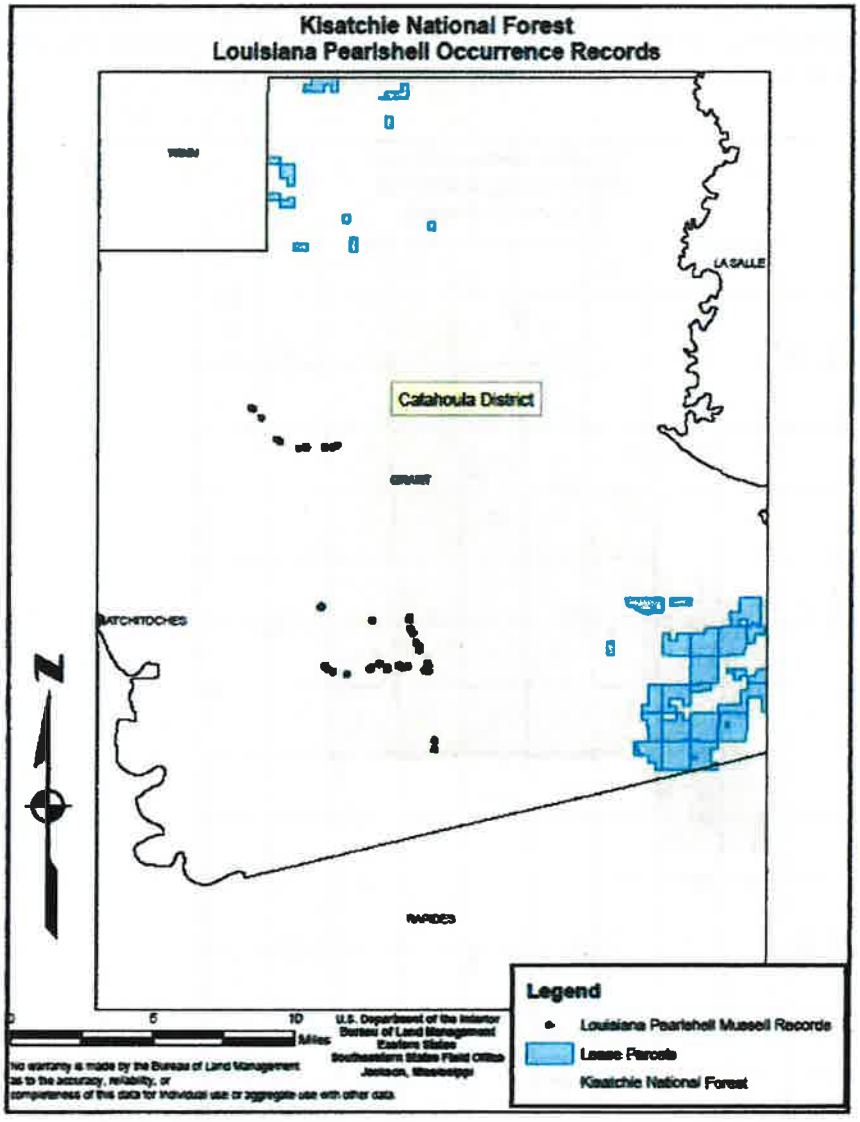

Figure 19. Louisiana pearlshell occurrence records on KNF.

3.12.1.3 Pallid Sturgeon (Scaphirhyncus albus) (Endangered)

The pallid sturgeon (*Scaphirrhyncus albus*) is known to occur in the Atchafalaya River in central Louisiana. The Atchafalaya River contains approximately 224 free-flowing river-kilometers. The population in this river may be a few thousand. Construction and operation of large dams and river channelization has eliminated and degraded preferred sturgeon habitat. Habitat changes have severely reduced or eliminated successful reproduction. This species occupies large, turbid, free-flowing riverine habitat. It occurs in strong current over firm gravel or sandy substrate. The Atchafalaya River is located ~ 35 miles southeast of the southeastern-most parcels. There are no rivers located on the lease parcels, however there are numerous creeks which drain into the Red River, Little River, and Black River. All of these Rivers ultimately drain into the Atchafalaya River.

3.12.1.4 Interior Least Tern (Sterna antillarum athalassos) (Endangered)

The interior least tern (*Sterna antillarum athalassos)* is federally and state listed as endangered. It breeds on sand bars of rivers and lakes. In Louisiana, the interior least tern nests on sand bars associated with the Mississippi River and the upper portion of the Red River. There are no documented winter records for this species in Louisiana. There are no suitable rivers or lakes on the project parcels for this species. As a result, BLM has determined that issuing the sold leases and/or the potential of subsequent development will have no effect on the interior least tern due to a lack of suitable habitat. Due to the no effect determination for this species, it will not be further analyzed in the effects section for Special Status Species in Chapter 4 of this EA.

3.12.1.5 Red-cockaded Woodpecker (Picoides borealis) (Endangered)

The Red-cockaded woodpecker (RCW) (*Picoides borealis*) is both federally and state listed as endangered and is the only known endangered species documented to occur in the project area. The RCW is a territorial; cooperative breeding, cavity-nesting, tree-trunk-probing insectivorous bird that is mainly associated with mature pinewoods with little or no midstory. Family groups form the base of the RCW social system, with groups typically consisting of one pair of breeding birds, the current year's offspring (if any), and 0-4 helpers. Helpers, usually adult male offspring, assist the breeding pair with excavating cavities, defending the group's territory, incubating eggs and feeding young. RCW groups occupy discrete territories consisting of cavity trees, called a cluster, and adjacent foraging habitat.

In general, RCW's require open pine woodlands or savannas with mature pine stems for roosting and nesting habitat. Longleaf pine ecosystems are preferred RCW nesting and roosting habitat and historically were the most extensive habitat type used throughout the species range (Conner et al. 2001 as cited in FWS 2003). The FWS has defined good roosting and nesting habitat in the *Recovery Plan for the Red-cockaded Woodpecker, Second Revision* (RCW Recovery Plan; FWS 2003) as mature pine forest with a rich fire-tolerant/dependent native herbaceous ground cover, clear of mid-story.

There are 316 documented RCW cavity trees located on the lease parcels (Figure 20). Nine of which are on the Catahoula District in Grant Parish, 68 are on the Kisatchie District in

Natchitoches Parish, and 239 on the Vernon District in Vernon Parish. Suitable habitat for RCWs is available on many of the remaining parcels. The KNF provides one primary core population (Vernon Unit), one secondary core (Catahoula District) and three significance support populations (Evangeline, Kisatchie and Winn). These five separate RCW populations are recognized and habitat management areas (HMAs) are delineated around each. Figures 21 -24 illustrate the occurrence of RCW HMAs within the project area. Table 9 shows the specific Ranger District and the approximate acres of RCW HMAs within the project area.

Table 9. RCW HMAs acreage within each Ranger District.

District	Proposed Action
Calcasieu Ranger District	12,461 Acres
Catahoula Ranger District	4,431 Acres
Kisatchie Ranger District	6,002 Acres
Winn Ranger District	160 Acres
Total HMAs	23,054Acres

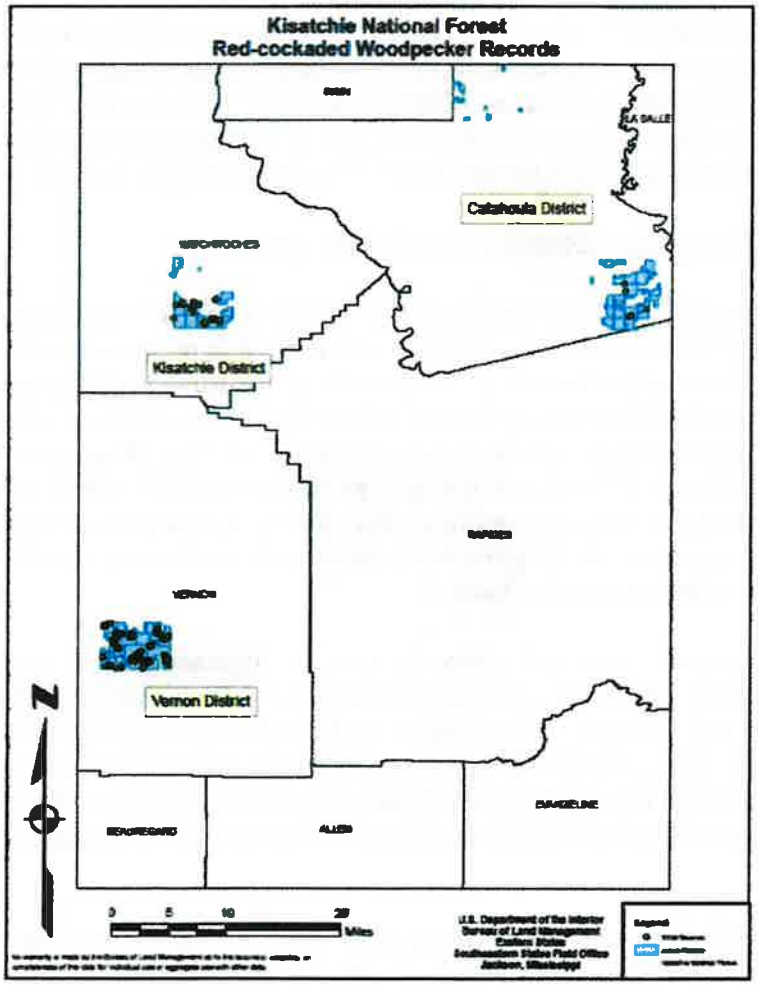

Figure 20. RCW records located on the subject lease parcels on KNF.

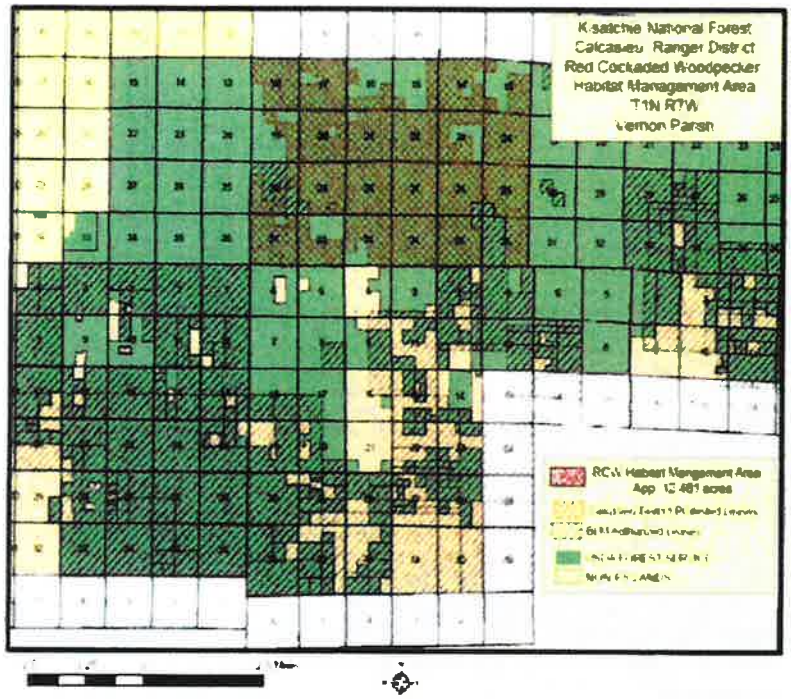

Figure 21. RCW HMAs within the lease parcels on the Calcasieu Ranger District.

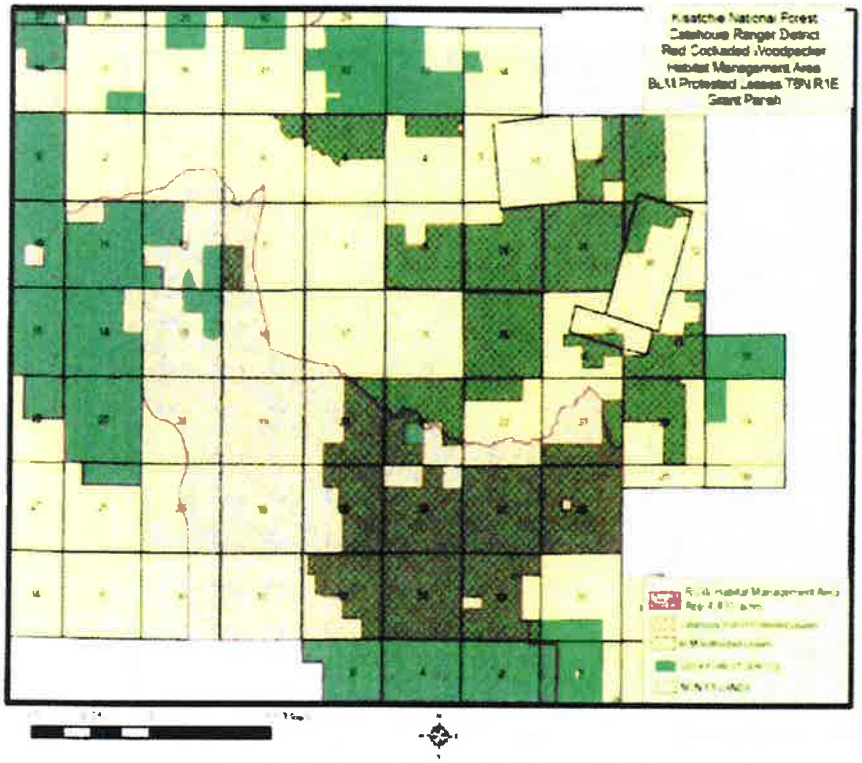

Figure 22. RCW HMAs within the lease parcels on the Catahoula Ranger District.

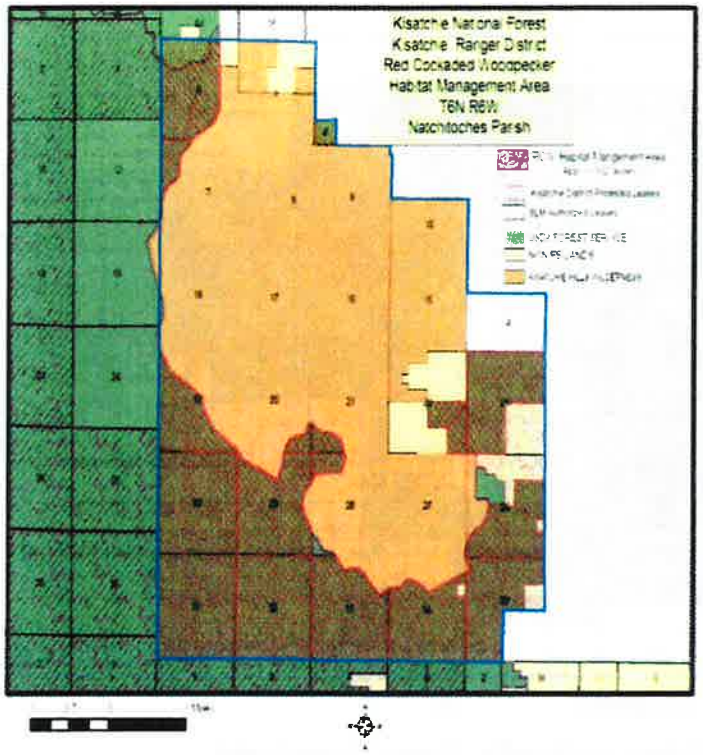

Figure 23. RCW HMAs within the lease parcels located on the Kisatchie Ranger District.

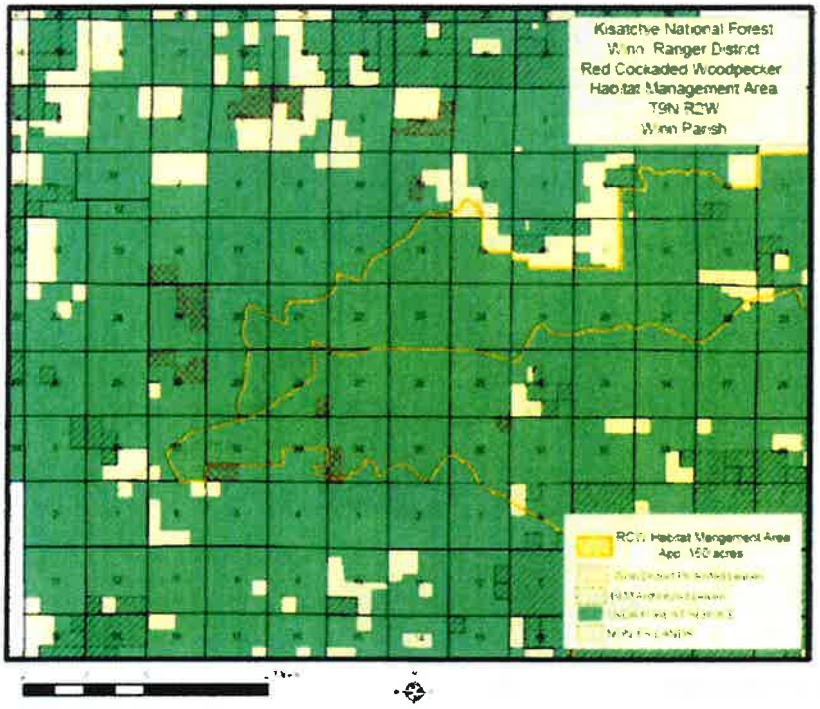

Figure 24. RCW HMAs within the lease parcels located on the Winn Ranger District.

3.12.1.6 Sprague's Pipit (Anthus spragueii) (Candidate)

Sprague's pipit (*Anthus spragueii*) is a small, short-distance migrant bird species strictly associated with well-drained, open grasslands and fields, with a preference for native grasses of intermediate height and thickness and moderate litter depths for foraging and nesting. Breeding occurs throughout the summer (April – November) on the native prairies of the Great Plains (southern regions of Alberta, Saskatchewan, and Manitoba provinces to Montana, North and South Dakota, and Minnesota). Pipits migrate southward from September into November, to wintering grounds on the grasslands of Arizona, New Mexico, Texas, Oklahoma, Arkansas, Mississippi, Louisiana, and into Mexico. Threats to this species include destruction and decline of breeding and wintering habitat suitability due to agriculture, overgrazing, and introduction of non-native grasses. Sprague's pipits are likely to be observed in open fields with few to no shrubs or woody vegetation. Suitable habitat for this species is not present within the vicinity of the project area. As a result, BLM has determined that the proposed project will have no effect on the Sprague's pipit due to a lack of suitable habitat. Due to the no effect determination for this species, it will not be further analyzed in the effect section for Special Status Species in Chapter 4 of this EA.

3.12.1.7 Louisiana Pine Snake (Pituophis ruthveni) (Candidate)

The Louisiana pine snake (LPA) (*Pituophis ruthveni*), is a federal and state listed candidate species and identified by the FS as a sensitive species in the KNF LRMP. Additionally it is considered a species of special concern by the FWS. The KNF entered into a revised Candidate Conservation Agreement (CCA) (Appendix H) with the FWS, FS, Texas Parks and Wildlife Department, and Louisiana Department of Wildlife and Fisheries in 2013. The CCA contains adaptive management principles to protect known populations and habitat, reduce threats to pine snake survival, maintain the ecosystem, and restore degraded habitat. RCW management, including the maintenance of old growth pine stands through prescribed fire and hardwood midstory removal and reestablishment of longleaf pine where appropriate, generally also benefits the LPS. As a candidate species, the LPS is being considered for listing under the ESA, but currently receives no federal protection. The LPS has experienced population declines due to the loss and fragmentation of native longleaf and shortleaf pine forests in recent decades. The LPS's remarkably low fecundity magnifies threats from urban development, conversion to agriculture, road construction, and mining, making it particularly vulnerable to local extirpations. Presently found in four of the nine Louisiana Parishes in which it originally existed, one of three populations in the State of Louisiana exists in Vernon Parish on Fort Polk and KNF lands used by the Army (FWS, 2009).

The LPS is a large (4-5 feet), non-venomous constrictor of the Colubridae family, the LPS is one of the rarest snakes in North America and one of the rarest vertebrate species in the U.S. The LPS is generally associated with sandy, well-drained soils, open pine forests, especially longleaf pine savannah, with moderate to sparse midstory, and a well-developed herbaceous understory dominated by grasses. Its activity appears to be heavily concentrated on low, broad ridges overlain with sandy soils and is closely associated with Baird's pocket gophers (*Geomys breviceps*) which serve as a major source of food and create the burrow systems in which the pine snakes spend much of their time. Pocket gopher occurrence is dependent on an abundance

of herbaceous groundcover and loose, sandy soils. Herbaceous groundcover is directly correlated with an open canopy.

On the KNF, the CCA identified HMAs based upon areas having significant amounts of preferable soils (Appendix D in the CCA). The LNHP has two documented occurrence records for this species on the lease parcels on the Vernon District with the following legal description: T1N, R7W, Sec. 17 and 18. Table 10 shows the specific Ranger District and the approximate acres of LPS HMAs within the project area. There are no LPS HMAs within the project area for the Winn and Catahoula Districts. Figures 25 and 26 illustrate the occurrence of LPS HMAs within the project area.

Table 10. LPS HMAs acreages for the Calcasieu and Kisatchie Ranger Districts.

District	Proposed Action
Calcasieu Ranger District	12,461 Acres
Kisatchie Ranger District	2,286 Acres
Total HMU	14,747 Acres

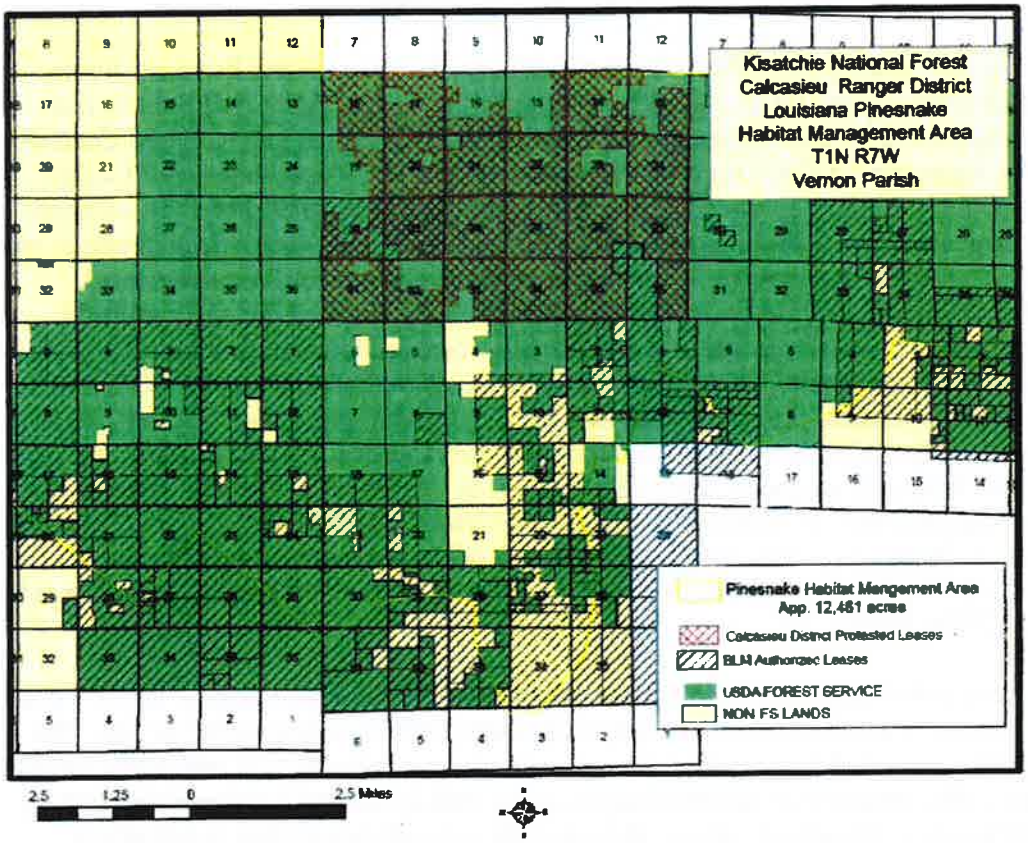

Figure 25. LPS HMAs and proximity to the lease parcels located on the Calcasieu Ranger District.

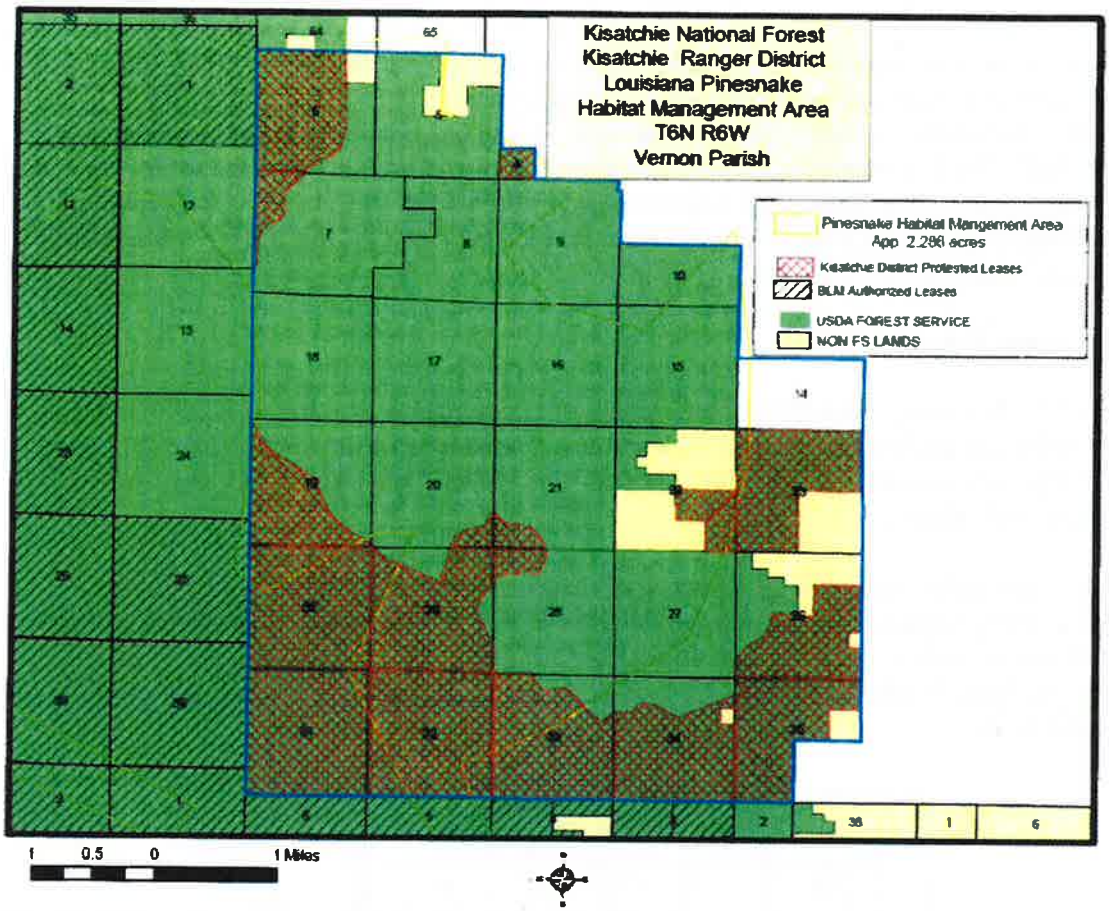

Figure 26. LPS HMAs and proximity to the lease parcels located on the Kisatchie Ranger District.

3.13 Vegetation and Wildlife

3.13.1 Vegetation

A description of vegetation on the forest is referenced in the 1999 KNF FEIS on pages 3-19 to 3-22. Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. All of the lease parcels are located in the South Central Plains Ecoregion. The South Central Plains Ecoregion is composed of rolling plains that are broken by nearly flat fluvial terraces, bottomlands, sandy low hills, and low cuestas. Natural vegetation of uplands was historically dominated by longleaf pine woodlands and savannas in the south and shortleaf pine/hardwood forests in the north. Southern floodplain forest of hardwoods and bald cypress typified bottomlands. This ecoregion is mostly in forests or woodland, with less than 20% in cropland. Commercial pine plantations are extensive. Timber production, livestock grazing, and oil and gas production are major land uses.

The subtropical climate and the geology of the South Central Plains Ecoregion combine to produce the environment for the flora of KNF. Vegetation can generally be divided into 4 broad historical community types; longleaf pine, shortleaf pine/oak-hickory, mixed hardwood-loblolly pine, and riparian (USDA1999b, pg. 3-19). A majority of KNF consists of mature stands occupied by larger, older trees. Old-growth forest representing each of the four major landscape

communities occur as medium-sized patches scattered throughout the forest. Within each of KNF's four major landscape communities, old-growth community types have been tentatively identified based on their existing forest cover type. Eleven old-growth communities potentially exist on KNF. The four communities are situated within nine LTAs: high terrace rolling uplands, Kisatchie sandstone hills, undulating clayey uplands, alluvial floodplains and stream terraces, Winn rolling uplands, Fort Polk rolling uplands, Red River alluvial plains, Caney Lakes loamy uplands, and north LA clayey hills.

3.13.1.1 Forest Types

There are 21 forest types defined by the Silvicultural Examination and Prescription Field Book (USDA 1989) that can be found on the lease parcels. Forest types with the most acreage on the nominated parcels include; loblolly pine, longleaf pine, loblolly pine-hardwood, and white oak-northern red oak-hickory.

Below are maps representing the 21 forest types that can be found on the 53 parcels on the Catahoula, Winn, Kisatchie, and Calcasieu Districts of KNF (Figure 27 – 30). Appendix I lists the dominant tree species found in each forest type. This data was obtained from site visits conducted by BLM in 2014 and forest types listed in the FS Geographical Information System (GIS) stand layer.

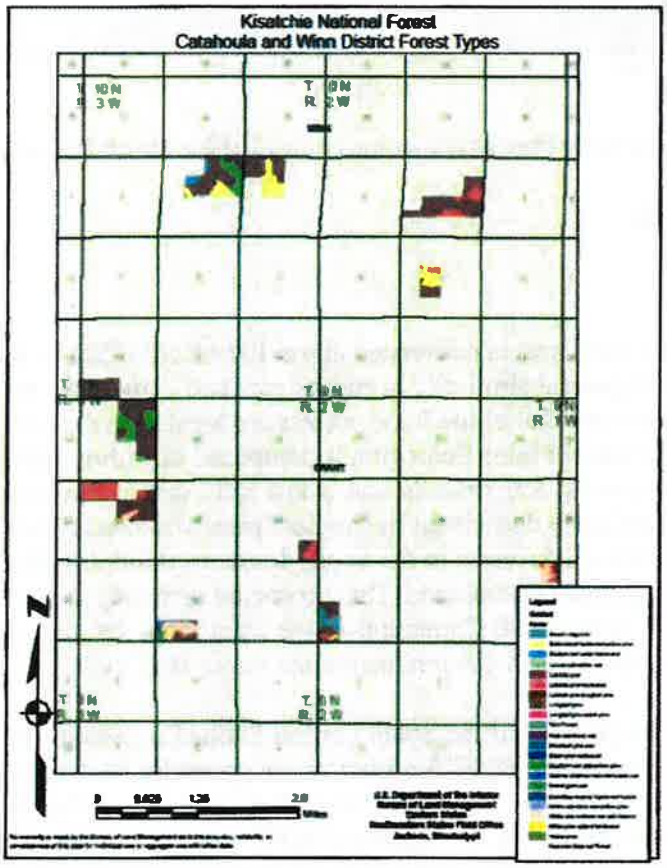

Figure 27. Forest types found on the lease parcels located on the Catahoula and Winn Districts of KNF.

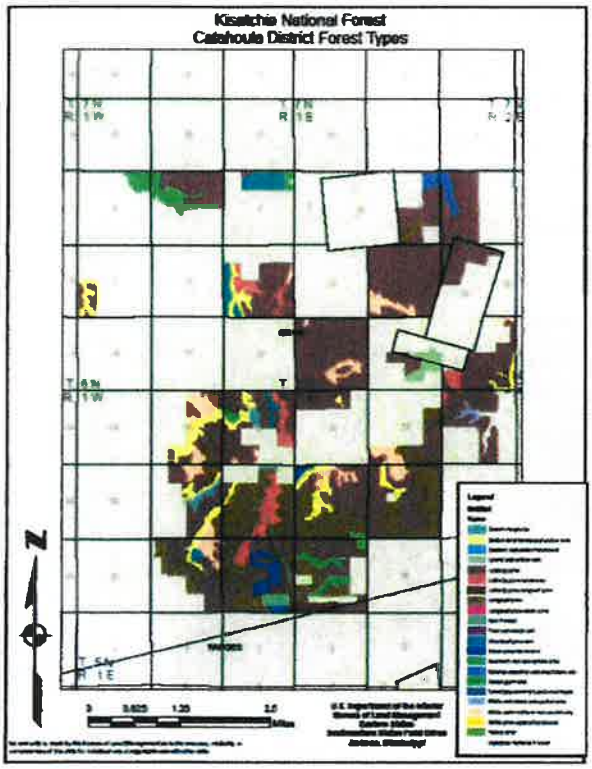

Figure 28. Forest types found on the lease parcels located on the Catahoula District of KNF.

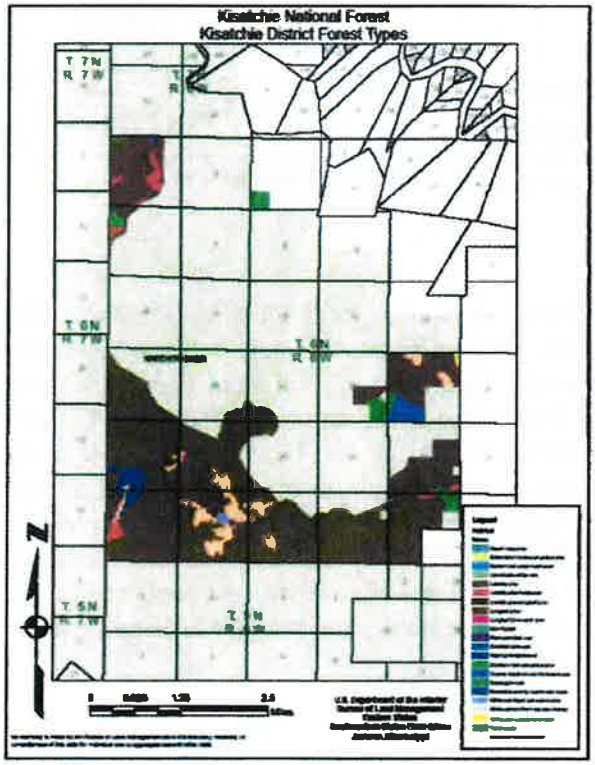

Figure 29. Forest types found on the lease parcels on the Kisatchie District of KNF.

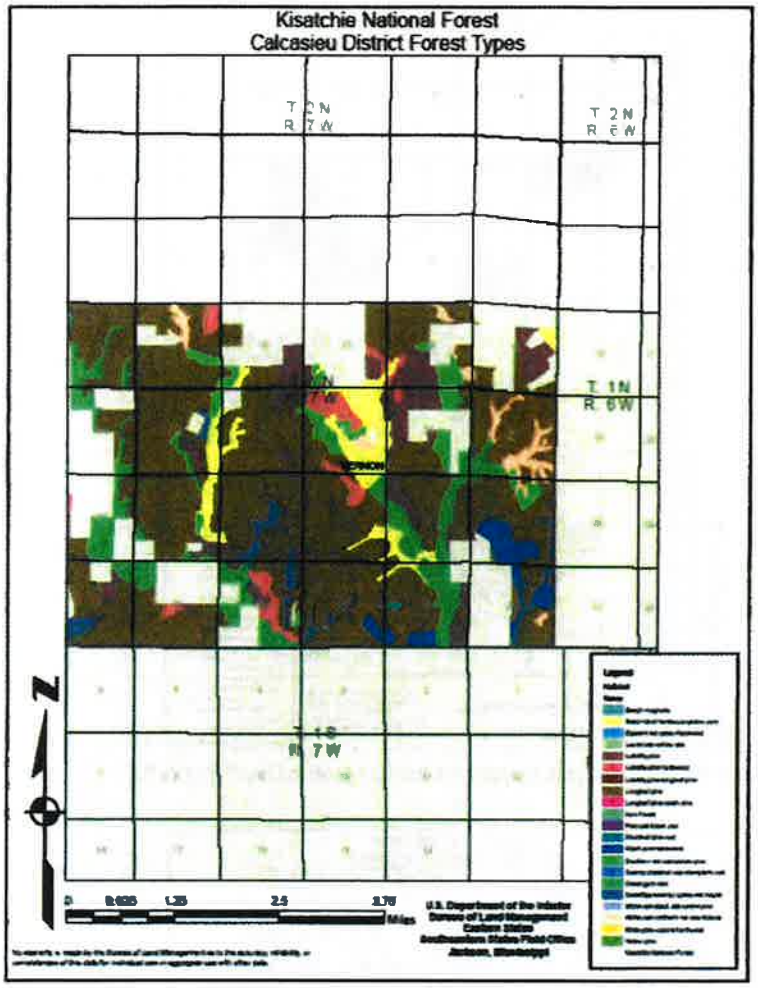

Figure 30. Forest types found on lease parcels on the Calcasieu District of KNF.

3.13.1.2 Rare Communities

Natural communities consist of groups of plant and animal species that can often be found in association in certain environments. Natural factors that help define a community include associated soil, vegetation, topography, hydrology and climate. The LNHP inventories and classifies natural communities in Louisiana. This data is included in the LNHP database. A request was submitted to the LNHP on August 21, 2014 to review their database for records indicating the occurrence of rare plants and animals, outstanding natural communities, natural or scenic rivers, or other elements of special concern within or near the project site. A response was received on November 10, 2014. The LNHP has stated that there are four communities within the project are that are considered communities of conservation concern in Louisiana: western upland longleaf pine forest, cave, sandstone glade, and western hillside seepage bog.

3.13.1.2.1 Western Upland Longleaf Pine

Western upland longleaf pine forest is considered rare to imperiled both globally and in the state of Louisiana with a G2G3/S2S3 rank. This natural community harbors the highest numbers of rare plant and wildlife species for any of the natural communities recognized in Louisiana, and therefore is critical to conservation of associated species. Efforts should be made to minimize any impacts to these longleaf sites. The LNHP has documented this community on the lease parcel on the Vernon District with the following legal description: T1N, R7W, Sec. 31.

3.13.1.2.2 Cave

Caves are defined as large air-filled cavities with openings to the surface. They are considered very rare in central Louisiana with only 5 documented caves in the state and a rank of S1 (critically imperiled). They are associated with sandstone strata such as the Catahoula formation. The LNHP has documented a cave on the Kisatchie District. Due to sensitivity issues for this rare community, disclosure of specific locality information is not allowed under the Cave Protection Act.

3.13.1.2.3 Sandstone Glade

Sandstone glade is a rare community in Louisiana and has a G1G2/S1S2 rank (critically imperiled to imperiled). A glade is an open area in an otherwise wooded landscape due to the presence of rock at or near the surface. It is primarily associated with the Catahoula Formation and typically occurs on upper landscape positions such as mid to upper slopes and ridge-tops. In Louisiana, this community type is found in the Lower West Gulf Coastal Plain Ecoregion, primarily in central and west-central Louisiana. Two sandstone glade areas have been documented by the LNHP on the lease parcels on the Kisatchie District with the following legal description: T6N, R6W, Sec. 7 and Sec. 33.

3.13.1.2.4 Western Hillside Seepage Bog

Western hillside seepage bog is an open, continually moist, floristically diverse habitat occurring along slopes of ravines and hills in upland pine forests primarily in central and western Louisiana, but present sporadically in the eastern Florida Counties. This community has been given a S2 rank by the LNHP. The LNHP has 20 documented occurrence records for this community on the lease parcels on the Kisatchie and Vernon Districts.

3.13.1.3 Sensitive Plant Species

A description of sensitive plant species is referenced in the 1999 KNF FEIS on pages 3-23 to 3-30. There are 83 sensitive and conservation plant species that have been defined by LNHP and the FS that are documented on KNF (Table 11), 17 of which are known to occur on the subject parcels (Figure 31). A BLM sensitive plant species stipulation would be attached to all leases issued and requires the identification of all suitable special status plant species habitat prior to the authorization of any surface disturbing activities. If field examination indicates that habitat of one or more of these species is present, the BLM will require a survey by a qualified botanist for

special status plants during periods appropriate to each species. Operations will not be allowed in areas where sensitive plants would be affected.

Table 11. Eighty-three sensitive and conservation plant species found on KNF and within the project area.

	Scientific Name	Common Name	Designation/Viability	Occurrence in Project Area
1	*Amsonia ludoviciana*	Louisiana bluestar	S/High	
2	*Andropogon liebmanii var. pungensis*	Mohr's bluestem	C/Low	
3	*Asclepias stenophylla*	Narrow-leaved milkweed	C/Low	
4	*Asplenium resiliens*	Black-stemmedspleenwort*	C/Low	
5	*Asplenium trichomanes*	Maidenhair spleenwort*	C/Low	
6	*Astragalus crassicarpus var. trichocalyx*	Ground-plum	C/Moderate	
7	*Astragalus soxmanorium*	Soxman's milkvetch	C/Low	
8	*Burmannia biflora*	Northern burmannia	C/Moderate	
9	*Calopogon barbatus*	Bearded grass-pink	C/Low	X
10	*Calopogon oklahomensis*	Oklahoma grasspink	C/Moderate	X
11	*Camassia scilloides*	Wild hyacinth	C/Low	
12	*Carex decomposita*	Cypress-knee sedge	S/Low	
13	*Carex meadii*	Mead's sedge	C/Moderate	
14	*Carex microdonta*	Small-toothed sedge	C/High	
15	*Carex stricta*	Tussock sedge*	C/Low	
16	*Ceanothus herbaceus*	Prairie redroot	C/Low	
17	*Cheilanthes alabamensis*	Alabama lip-fern*	C/Low	
18	*Cheilanthes lanosa*	Hairy lip-fern	C/Low	
19	*Cyperus grayioides*	Mohlenbrock's umbrella sedge	S/Moderate	X
20	*Cypripedium kentuckiense*	Northern lady's slipper	S/Low	
21	*Dodecatheon meadia*	Shooting star	C/Low	
22	*Draba cuneifloia*	Wedge-leaved Whitlow grass	C/Low	
23	*Echinacea purpurea*	Purple coneflower	C/Low	
24	*Eriogonum longifolium*	Long-leaved wild buckwheat	C/Low	
25	*Euphorbia discoidalis*	Summer spurge	S/Low	
26	*Geranium maculatum*	Wild geranium	C/Low	
27	*Hedyotis purpurea var. calycosa*	Purple bluet	C/Moderate	
28	*Heliotropium tenellum*	Slender heliotrope	C/Moderate	
29	*Hexalectris spicata*	Crested coral-root	C/Low	
30	*Koeleria macrantha*	June grass	C/Low	
31	*Lachnocaulon digynum*	Pineland bogbutton	S/High	X
32	*Liatris tenuis*	Slender gay-feather	S/Low	
33	*Lyonia mariana*	Staggerbush	C/Low	
34	*Marshallia trinervia*	Broad-leaved Barbara's buttons	S/Low	X

	Scientific Name	Common Name	Designation/Viability	Occurrence in Project Area
35	*Mayaca aubletii*	Bog moss	C/Moderate	
36	*Monotropa hypopithys*	American pinesap	C/Moderate	
37	*Orobanche uniflora*	Broomrape	C/Low	
38	*Palhinhaea cernua*	Nodding clubmoss	C/Low	
39	*Panicum flexile*	Wiry witch grass	C/Moderate	
40	*Panicum rigidulum var. combsii*	Comb's redtop panic grass	C/Low	
41	*Panicum strigosum var. leucoblepharis*	Roughhair panic grass*	C/Low	
42	*Parnassia grandifolia*	Grass-of-parnassus	C/Low	
43	*Paronychia drummondii*	Drummond's nailwort	C/Moderate	
44	*Pellaea atropurpurea*	Purple cliff-brake fern*	C/Low	
45	*Penstemon murrayanus*	Cupleaf beardtongue	C/Low	
46	*Phacelia strictiflora*	Robbin's phacelia	C/Low	
47	*Platanthera blephartiglottis*	White-fringed orchid	C/Low	
48	*Platanthera integra*	Yellow fringeless orchid	S/High	X
49	*Polanisia erosa*	Clammy weed	C/Moderate	
50	*Polygonella americana*	Southern jointweed	C/Low	
51	*Polygonella polygama*	October jointweed	C/Low	
52	*Prenanthes barbata*	Barbed rattlesnake root	S/Moderate	
53	*Psilocarya scirpoides*	Shortbeak baldsedge	C/Low	
54	*Psoralea subulata*	Awl-shaped scurf-pea	C/Low	
55	*Pteroglossaspis ecristata*	Giant orchid	S/Low	
56	*Rhynchospora macra*	Large beakrush	S/High	X
57	*Rhynchospora miliacea*	Millet beakrush	C/Low	
58	*Rudbeckia scabrifolia*	Sabine coneflower	S/High	X
59	*Schichandra glabra*	Bay starvine	S/Moderate	
60	*Schoenolirion wrightii*	Texas sunnybell	S/Moderate	
61	*Selaginella arenicola ssp. riddelli*	Riddell's spikemoss	C/High	X
62	*Silene subciliata*	Louisiana catchfly	S/Unknown	X
63	*Smilacina racemosa*	False Solomon's seal*	C/Low	
64	*Spartina pectinata*	Prairie cordgrass	C/Low	
65	*Spiranthes longilabris*	Giant spiral orchid	S/Low	
66	*Spiranthes magnicamporum*	Great Plains ladies'-tresses	C/Moderate	
67	*Sporobolus ozarkanus*	Ozark dropseed	C/Low	
68	*Taenidia integerrima*	Yellow pimpernel	C/Moderate	
69	*Talinum calycinum*	Calyciphilic flame flower	C/Low	
70	*Talinum parviflorum*	Small-flowered flame flower	C/Low	X
71	*Tetragonotheca ludoviciana*	Louisiana squarehead	C/Moderate	
72	*Tridens carolinianus*	Carolina purpletop	S/Low	
73	*Triosteum perfoliatum*	Feverwort	C/Low	

	Scientific Name	Common Name	Designation/Viability	Occurrence in Project Area
74	*Triphora trianthophora*	Nodding pogonia	C/Low	
75	*Uvularia sessilifolia*	Sessile-leaved bellwort	C/Low	X
76	*Verbesina walteri*	Carolina crownbeard	S/Moderate	X
77	*Xanthorhiza simplicissima*	Yellowroot	C/Low	X
78	*Xyris drummondii*	Drummond's yellow-eyed grass	S/High	X
79	*Xyris louisianica*	Louisiana yellow-eyed grass	S/Unknown	
80	*Xyris scabriflora*	Harper's yellow-eyed grass	S/Moderate	X
81	*Xyris stricta*	Pineland Yellow-eyed Grass	C/Low	
82	*Zigadenus densus*	Black snakeroot	C/Moderate	X
83	*Zornia bracteata*	Viperina	C/Low	

Note: S – Sensitive, C – Conservation

3.13.1.3.1 Oklahoma Grasspink (*Calapolgon oklahomensis*) (Vulnerable)

Oklahoma grasspink (*Calapolgon oklahomensis*) prefers mesic, acidic, sandy to loamy soils. It avoids the wetter habitats preferred by most of the other species in the genus. It can be found in tallgrass and coastal prairies (including prairie remnants such as those beside railroads as well as prairie-hay meadows and other mowed meadows), savannas (such as longleaf pine savannas) and wetland savanna borders, moderately open woodlands (such as post oak-blackjack oak woodlands), hillside seepage bogs and edges of bogs. It can occasionally be found in pine plantations, acidic wet barrens, or claypan savannas. It appears to thrive under relatively frequent fires (every 1-3 years, particularly dormant-season burns), late-season hay meadow mowing (where most or all of the above-ground vegetation is effectively removed once every 1-2 years, with thatch not left behind), and perhaps light grazing. This species is ranked as vulnerable (S3) in Louisiana by the LNHP. The FS designates this as a conservation species on KNF with moderate viability. On KNF, it can be found on sandy loamy uplands. There are 2 documented occurrence records for this species on the lease parcels on KNF and they are located on the Vernon District.

3.13.1.3.2 Mohlenbrock's Umbrella Sedge (*Cyperus grayoides*) (Vulnerable)

Mohnlenbrock's umbrella sedge (*Cyperus grayioides*) occurs primarily in deep, periodically disturbed sandy soils in open areas maintained by factors such as wind, erosion, or fire. This species does not occur in shaded areas or in areas of high competition with other herbaceous species. Habitats include remnant sand prairies, sandy fields, sand "blow outs", sandhill-specialized seepy calcereous habitats (which is a habitat generally unsuited for other uses), woodlands, pine barrens, and open barrens in which the slope is sufficient to produce sand erosion. This species may also occur in areas where the soils have been disturbed by logging or road construction. This species is ranked as vulnerable in LA by the LNHP. The FS designates this as a sensitive species on KNF with moderate viability. It can be found on KNF on sandy woodlands. There are 2 occurrence records for this species on the lease parcels on KNF; 1 on the Kisatchie District and 1 on the Vernon District.

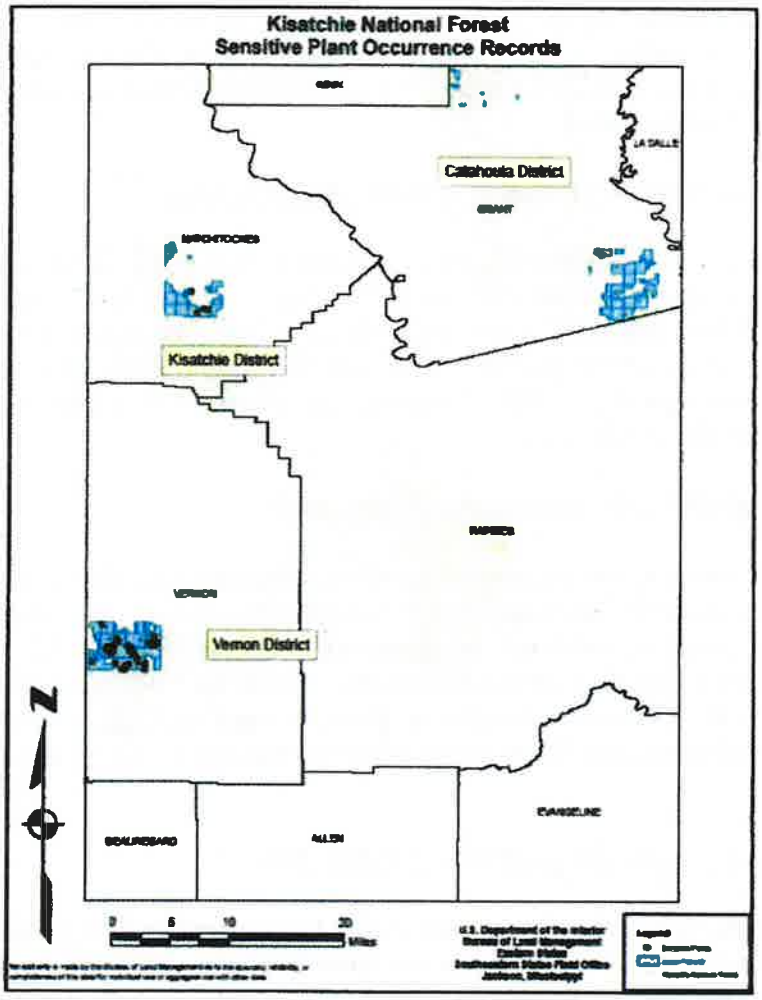

Figure 31. Sensitive plants found on the lease parcels on KNF.

3.13.1.3.3 Pineland Bogbutton (*Lachnocaulon digynum*) (Vulnerable)

Pineland bogbutton (*Lachnocaulon digynum*) is restricted to seasonally or semipermanently saturated substrates, usually with little or no shrub or tree cover, near the southern edge of the East Gulf Coastal Plain Ecoregion. General habitat requirements seem to include partial or full sun, an almost permanently or at least seasonally wet substrate, little shrub or tall herb competition, and a substrate of sand, mucky sand, muck, sandy peat, or Sphagnum species. This species is ranked as vulnerable in Louisiana by the LNHP. The FS designates this as a sensitive species on KNF with high viability. On KNF, it can be found on hillside bogs and longleaf pine flatwood savannahs. There are 7 records for this species on the lease parcels on KNF all of which are on the Vernon District.

3.13.1.3.4 Broad-leaved Barbara's Buttons (*Marshallia trinervia*) (Vulnerable)

Endemic to the southeastern U.S., broad-leaved Barbara's buttons (*Marshallia trinervia*) is known from several states, but is nowhere common. The plant is restricted to specialized seepy

calcereous habitats, which is a habitat generally unsuited for other uses. The LNHP has ranked this species as vulnerable in Louisiana. FS designates this species as sensitive on KNF with high viability. It can be found on sandy banks of large streams. There are 4 records documented on the lease parcels on the Vernon District.

3.13.1.3.5 Yellow Fringeless Orchid (*Platanthera integra*) (Vulnerable)

The yellow fringeless orchid (*Platanthera integra*) is rare throughout a moderately wide range and is threatened by elimination of habitat. The number of element occurrences is low despite recent surveys in the plant's habitat. LNHP has ranked this species as vulnerable in Louisiana. The FS has designated it as a sensitive species in KNF with high viability. On KNF, it can be found on hillside bogs and longleaf pine flatwood savannahs. There is 1 record for this species on one lease parcel on the Vernon District.

3.13.1.3.6 Large Beakrush (*Rhynchospora macra*) (Vulnerable)

The large beakrush (*Rhynchospora macra*) can be found in sphagnum bogs, frequently burned streamhead pocosins, and in sandhill seepage bogs. It is highly threatened by land-use conversion, habitat fragmentation, and forest management practices and is especially vulnerable to succession. This species is ranked as vulnerable in Louisiana by the LNHP. The FS has designated it as sensitive on KNF with high viability. It can be found on KNF on hillside bogs and longleaf pine flatwood savannahs. There are 2 records for this species on the lease parcels on the Kisatchie District.

3.13.1.3.7 Bog Coneflower (*Rudbeckia scabrifolia*) (Vulnerable)

The bog coneflower (*Rudbeckia scabrifolia*) is restricted to bogs in eastern Texas and adjacent Louisiana. There are over 80 populations documented. It can be found on hillside seepage bogs and associated broadleaf, semi-evergreen acid seep forests. The habitat is threatened by fire suppression, which causes the bogs to become shrub-invaded and by alteration of the local hydrology by roads and fire lanes, which can cause the bogs to dry out. However many populations are well-managed and in well-maintained fire situations. This species is ranked as vulnerable in Louisiana by the LNHP. The FS designates it as a sensitive species in KNF with high viability. On the KNF, it can be found on hillside bogs and bayhead swamps. There are 16 records for this species on the lease parcels on the Vernon District.

3.13.1.3.8 Riddell's Spikemoss (*Selaginella arenicola var. riddellii*) (Apparently Secure)

Riddell's spikemoss (*Selaginella arenicola var. riddellii)* is ranked as apparently secure (S4) in Louisiana by the LNHP and is designated as a conservation species on KNF by the FS with high viability. There is 1 record on one lease parcel on the Kisatchie District.

3.13.1.3.9 Louisiana Catchfly (*Silene subciliata*) (Vulnerable)

The Louisiana catchfly (*Silene subciliata*) occurs in dry to mesic mixed pine-hardwood forests, on well-drained, but not xeric, sandy soils. It is often found on slopes at the fire-maintained

ecotone between upland longleaf pine woodlands and mesic ravine forests. The LNHP has ranked this species as vulnerable in Louisiana and the FS has designated it as a sensitive species on KNF with unknown viability. It can be found on the KNF in sandy woodlands. There is 1 record on one lease parcel on the Vernon District.

3.13.1.3.10 Small-flower Flameflower (*Talinum parviflorum*) (Secure)

Small-flower flameflower (*Talinum parviflorum*) is ranked as secure (S5) in Louisiana by the LNHP and is designated as a conservation species on KNF by the FS with low viability. It can be found on KNF in sandstone glades and barrens. There is 1 record for this species on the Kisatchie District.

3.13.1.3.11 Sessile-leaf Bellwort (*Uvularia sessilifolia*) (Secure)

Sessile-leaf bellwort (*Uvularia sessilifolia*) is ranked as secure in Louisiana by the LNHP and is designated as a conservation species on KNF by the FS with low viability. On the KNF, it can be found on mesic slopes and bottomland forests. There are 2 records for this species on the lease parcels on the Vernon District.

3.13.1.3.12 Carolina Crownbeard (*Verbesina walteri*) (Apparently Secure)

Carolina crownbeard (*Verbesina walteri*) has a moderate size range with disjunct populations. It occurs from North Carolina (historical) south to Georgia, west to Louisiana and Oklahoma, with disjunct populations in the Piedmont of North Carolina, and the Ouachita Mountains of Arkansas and Oklahoma. It is apparently rare across most of its range, but appears to be secure in Louisiana. In Louisiana, there are a number of huge populations in the central and southeast portions of the state, including several along drainages in Baton Rouge. The FS has designated this species as sensitive on KNF with moderate viability. On the KNF, it can be found on mesic slopes and terraces and minor stream bottoms. There are 2 records on the lease parcels on the Catahoula District.

3.13.1.3.13 Shrubby Yellow-root (*Xanthorhiza simplissima*) (Secure)

Shrubby yellow-root (*Xanthorhiza simplissima*) is ranked as secure in Louisiana by the LNHP and designated by the FS as a conservation species on KNF with low viability. It can be found on KNF in mesic slopes and bottomland forests. There are 3 records on the lease parcels on the Vernon District.

3.13.1.3.14 Drummond's Yellow-eyed-grass (*Xyris drummondii*) (Vulnerable)

Drummond's yellow-eyed-grass (*Xyris drummondii*) is threatened by drainage in areas which have been clear-cut or subject to other logging or site preparations. It requires full sun so that while it may occur in pine plantations where the young trees are on elevated "strips", it will not persist after the crowns have closed. It can be found in moist to wet acid sands or sandy peats of bogs and seeps or sphagnous peats of roadside ditches, pine flatwoods or disturbed lowlands. This species is ranked as vulnerable in Louisiana by the LNHP and designated as sensitive on

KNF by the FS with high viability. On the KNF, it can be found on hillside bogs and longleaf pine flatwood savannahs. There are 18 records on the lease parcels on the Vernon District.

3.13.1.3.15 Harper's Yelloweyed Grass (*Xyris scabrifolia*) (Vulnerable)

Harper's yelloweyed grass (*Xyris scabrifolia*) can be found on hillside seepage bogs throughout the southeastern coastal plain and is relatively uncommon. Of the approximately 100 examples of hillside bogs identified in the west gulf coastal plain, probably less than 30 bogs remain relatively undisturbed. The greatest threats to these communities and the Harper's yelloweyed grass subpopulations they contain include (1) habitat destruction by conversion to urban, suburban, agricultural, silvicultural, or military use, (2) alteration of hydrology as a result of habitat fragmentation, and (3) loss of herb diversity due to fire suppression. This species is ranked as vulnerable in Louisiana by the LNHP and is designated by the FS as sensitive on KNF with moderate viability. It can be found on hillside bogs and longleaf pine flatwood savannahs. There is 1 record for this species on one lease parcel on the Vernon District.

3.13.1.3.16 Black Snakeroot (*Zigadenus densus*) (Secure)

Black Snakeroot (*Zigadenus densus*) is ranked as secure in Louisiana by the LNHP and is designated by the FS as a conservation species on KNF with moderate viability. It can be found on hillside bogs and bayhead swamps on KNF. There are 4 records for the species on the lease parcels on the Vernon District.

3.13.1.3.17 Bearded Grasspink (*Calopogon barbatus*) (Critically Imperiled)
Bearded grasspink (*Calopogon barbatus*) is ranked as critically imperiled by the LNHP and is designated by the FS as a conservation species on KNF with low viability. The LNHP documents two records of this species on the lease parcels on the Vernon District.

3.13.2 Wildlife

A description of wildlife on the forest is referenced in the 1999 KNF FEIS on pages 3-33 to 3-49. The KNF offers a variety of wildlife habitats. These habitats support more than 280 species of wildlife, including 155 breeding or wintering birds, 48 mammals, 56 reptiles, 30 amphibians and countless invertebrates (USDA 1999b). Most species may occur commonly in one particular habitat but are also likely to frequent adjacent habitats.

3.14 Migratory Bird Species of Concern

A description of migratory bird species and their habitats is referenced in the 1999 KNF FEIS by LTA in Chapter 3. For the purpose of this analysis, the term "migratory birds" applies generally to native bird species protected by the Migratory Bird Treaty Act (MBTA). This includes native passerines (flycatchers and songbirds) as well as birds of prey, migratory waterbirds (waterfowl, wading birds, and shorebirds), and other species such as doves, hummingbirds, swifts, and woodpeckers. The term "migratory" is a misnomer and should be interpreted broadly to include native species that remain in the same area throughout the year as well as species that exhibit patterns of latitudinal or elevational migration to avoid winter conditions of cold or shortage of

food. For most migrant and native resident species, nesting habitat is of special importance because it is critical for supporting reproduction in terms of both nesting sites and food. Also, because birds are generally territorial during the nesting season, their ability to access and utilize sufficient food is limited by the quality of the territory occupied. During non-breeding seasons, birds are generally non-territorial and able to feed across a larger area and wider range of habitats.

Under the MBTA (MBTA; 16 U.S.C. 703), unless permitted by regulation (i.e., waterfowl hunting), it is illegal to "take" migratory birds, their eggs, feathers or nests. "Take" includes by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof. Under the MBTA, only the direct "take" of migratory birds requires authorization by FWS. Actions that may adversely impact or indirectly "take" birds such as habitat destruction or manipulation are not a violation of the MBTA unless migratory birds are killed or wounded during the activity. However, a Memorandum of Understanding (MOU) between the FS and the FWS to promote the conservation of migratory birds was developed pursuant to Executive Order (EO) 13186. (Appendix J). Responsibilities of EO 13186, Federal Agencies to Protect Migratory Birds, address both direct and indirect take of migratory birds. The MOU between the FS and FWS to promote the conservation of migratory birds identifies specific activities where cooperation between FWS and FS will contribute substantially to the conservation of migratory birds and their habitats. This MOU does not authorize the take of migratory birds.

Because of the many species that fall within one or more of these groups, BLM focuses on species identified by FWS as BCC (USDI 2002). Table 12 lists the BCC found in the Southeastern Coastal Plain Bird Conservation Region, where all of the lease parcels are located.

Table 12. List of BCC found in the Southeastern Coastal Plain Bird Conservation Region.

Common Name	Scientific Name
Kentucky Warbler	*Oporonis formosus*
American Bittern (nb)	*Botaurus lentifinosus*
American Kestrel (*paulus* ssp.)	*Falco sparverius paulus*
American Oystercatcher	*Haematoput palliatus palliatus*
Audubon's Shearwater (nb)	*Puffinus nativitatis*
Bachman's Sparrow	*Aimophila aestvalis*
Bald Eagle (b)	*Haliaeetus leucocephalus*
Bewick's Wren (*bewickii* ssp.)	*Thryomanes bewickii bewickkii*
Black Rail	*Laterallus jamaicensis*
Black Skimmer	*Rynchops niger*
Black-capped Petrel (nb)	*Pterodorma hasitata*
Black-throated Green Warbler	*Dendroica virens*
Blue-winged Warbler	*Vermivora pinus*
Brown-headed Nuthatch	*Sitta pusilla*
Buff-breasted Sandpiper (nb)	*Tryngites subruficollis*
Cerulean Warbler	*Dendroica cerulea*

Common Name	Scientific Name
Chuck-will's-widow	*Caprimulgus carolinensis*
Common Ground-Dove	*Colmbina passerina*
Gull-billed Tern	*Gelochelidon nilotica*
Henslow's Sparrow	*Ammodramus henslowii*
Least Bittern	*Ixobrychus exilis*
Least Tern (c)	*Sternula antillarum*
LeConte's Sparrow (nb)	*Ammodramus leconteii*
Limpkin	*Aramus guarauna*
Loggerhead Shrike	*Lanius ludovicianus*
Long-billed Curlew (nb)	*Numenius americanus*
Marbled Godwit (nb)	*Limosa fedoa*
Nelson's Sharp-tailed Sparrow (nb)	*Ammodramus nelsoni*
Painted Bunting	*Passerina ciris*
Peregrine Falcon (b)	*Falco peregrinus*
Prairie Warbler	*Dendroica discolor*
Prothonotary Warbler	*Protonotaria citrea*
Red Knot (*rufa* ssp.) (a) (nb)	*Caladris canutus rufa*
red-headed Woodpecker	*Melanerpes eryhrocephalus*
Red-throated Loon	*Gavia stellata*
Roseate Spoonbill (nb)	*Platalea ajaja*
Rusty Blackbird (nb)	*Euphagus carolinus*
Saltmarsh Sharp-tailed Sparrow (nb)	*Ammodramuscaudacutus*
Sandwich Tern	*Thalasseus sandvicensis*
Seaside Sparrow (c)	*Ammodramus maritimus*
Sedge Wren (nb)	*Cistothorus platensis*
Semipalmated Sandpiper (Eastern) (nb)	*Calidris pusilla*
Short-billed Dowitcher (nb)	*Limnodromus griseus*
Snowy Plover (c)	*Charadrius alexandrinus nivosus/tenuirostis*
Solitary Sandpiper (nb)	*Tringa solitaria*
Swainson's Warbler	*Limnothlypis swainsonii*
Swallow-tailed Kite	*Elanoides forficatus*
Upland Sandpiper (nb)	*Bartramia longicauda*
Whimbrel (nb)	*Numenius phaeopus*
Whip-poor-will	*Caprimulgus vociferus*
Wilson's Plover	*Charadrius wilsoniha wilsonia*
Wood Thrush	*Hylocichla mustelina*
Yellow Rail (nb)	*Coturnicops noveboracensis*

Note: (a) - ESA candidate, (b) - ESA delisted, (c) - non-listed subspecies or population of threatened or endangered species, (nb) - non-breeding in this Bird Conservation Region

The following BCC found in the Southeastern Coastal Plain Bird Conservation Region have been documented on KNF: American kestrel, Bachman's sparrow, bald eagle, Henslow's sparrow, prairie warbler, red-headed woodpecker, brown-headed nuthatch, and wood thrush. There is suitable habitat on many of the lease parcels for additional BCC on this list.

KNF management strategies are aimed at the landscape level and designed to restore or maintain the natural diversity of forest composition, structure and function to provide habitat conditions necessary to maintain viable populations of all native and desirable populations of all native and desirable nonnative wildlife. Forest conditions provide effective breeding habitats for neotropical migratory birds that nest on the Forest or important stopover habitat for those migrating through. Wetland ecosystems provide improved habitat for a variety of waterfowl and other wetland wildlife. The KNF LRMP provides a list of avian species referred to as management indicator species and their preferred habitat.

Ch. 4 - ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

4.0 Introduction

This chapter evaluates the potential environmental consequences associated with direct, indirect, and cumulative effects of the proposed action. The act of leasing parcels would, by itself, have no impact on any resources in the lease area. All impacts would be linked to as yet undetermined future levels of lease development that will be analyzed separately during the APD process. However, leasing is considered to be an irretrievable commitment of resources because the BLM generally cannot deny all surface use of a lease unless the lease is issued with a NSO stipulation. Potential oil and gas exploration and production activities, committed to in a lease sale, could impact other resources and uses in the planning area. If these parcels are developed, short-term impacts are considered those that would be stabilized or mitigated within five years and long-term impacts are those that would substantially remain for more than five years.

Cumulative impacts include the combined effect of past projects, specific planned projects and other reasonably foreseeable future actions such as other infield wells being located within these leases. The cumulative impacts fluctuate with the gradual reclamation of well abandonments and the creation of new additional surface disturbances from the construction of new access roads and well pads. The on-going process of restoration of abandonments and creating new disturbances for drilling new wells gradually accumulates as the minerals are extracted from the land. Preserving as much land as possible and applying appropriate mitigation measures will alleviate the cumulative impacts. Cumulative impacts are addressed for each resource within each resource section.

In addition to the 53 parcels discussed in this EA, 55 parcels totaling 21,232.03 acres located on KNF were sold at the December 2012 Lease Sale and 25 parcels totaling 24,470.45 acres on KNF were sold at the March 2013 Lease Sale. Monies were received although the leases have not yet been issued. NEPA will be completed for these parcels and leases will likely be issued within the next 6 months. RFDs are currently being created for these parcels. The cumulative effects discussion included in each resource section includes potential impacts from these planned leases.

The following resource analysis incorporates by reference the information and analysis contained in the 1999 KNF FEIS. Based on review of elements of the environment and consideration of the Purpose and Need statement prepared for this EA, the following elements will be addressed:

- Environmental Justice
- Social and Economic Environment
- Cultural Resources and Native American Concerns
- Recreation/Scenery/Noise Resources
- Minerals and Mineral Development
- Wastes
- Soils
- Air Resources
- Water Resources - Surface/Ground

- Floodplains/Riparian Areas/Wetlands
- Invasive/Exotic Species
- Special Status Species
- Wildlife and Vegetation
- Migratory Birds of Concern.

4.1 Environmental Justice and Social and Economic Environment

A description of potential effects of oil and gas development on environmental justice and social and economic environment is referenced in the 1999 KNF FEIS on page 4-111 and 4-110 respectively. Issuance of the sold leases would have little effect on environmental justice or the social and economic environment. No minority or low income populations would be directly or disproportionately affected in the vicinity of the lease parcels from issuing the sold leases or possible subsequent development. Issuing the leases for the subject parcels will not create an unsafe or unhealthy environment for any population, including minority and low-income populations and therefore will not be out of conformance with EO 12898. Indirect impacts from possible future development could include an increase in overall employment opportunities related to the oil and gas and service support industry in the region, as well as the economic benefits to state and parish governments related to royalty payments and severance taxes. Other potential impacts include a short-term increase in traffic volume and dust and noise which could negatively impact nearby residents or businesses. These nuisance impacts are usually limited to the construction, drilling, and/or completion phases and would be significantly reduced during production, when the site would be visited periodically for maintenance, inspection and/or to haul produced fluids. These impacts would apply to all land users in the area. There are no cumulative impacts anticipated for environmental justice or the social and economic environment from issuing the leases.

4.2 Cultural Resources and Native American Concerns

A description of minerals management on cultural resources is referenced in the 1999 KNF FEIS on page 4-106. Site specific surveys for cultural resources would be required at the APD stage before surface disturbance is authorized. This discussion of direct and indirect effects is based on the assumption that although required inventories including field surveys are conducted before development, a previously unknown site or property could be revealed or destroyed during or subsequent to project implementation. It is anticipated that a maximum of 20 well pads could be developed under this alternative, potentially disturbing 203.87 acres of land. Direct effects could result from both natural and human-caused events, such as: soil disturbance to varying depths, compaction or rutting, alteration of a site's immediate or proximal setting (for example — intrusive visual or auditory components), and diminished jurisdiction, as in the case of land exchange. Indirect effects may include vandalism due to increased access, or erosion or siltation from an off-site project.

Under the proposed action there would be a greater potential for oil and gas development to cause direct impacts on cultural resources, owing to the increased likelihood of unmitigated effects on previously undocumented and unrecognized NRHP-eligible archeological sites.

Cumulative effects from repetitious illegal activity, primarily archeological vandalism, may occur on certain sites or site types unless perpetrators are apprehended and prosecuted, but this effect cannot be predicted or analyzed. The degree of cumulative effects to known properties from all management activities should be slight as inventory, assessment, protection, and mitigation measures would be implemented prior to initiation of a management action (USDA 1999b). Because surveys are required before any surface disturbance can occur, effects of oil and gas development on cultural resources should be minimal.

Consultation with the SHPO occurred on June 17, 2014. A concurrence letter was received on July 30 and can be found in Appendix C. SHPO concurred with BLM's determination that cultural surveys should take place prior to any ground disturbing activities. Letters were sent to various Native American Tribes on June 17, 2014 notifying them of the proposed action and requesting comments or concerns. Responses were received from three Tribes on June 24, June 25, and July 11, 2014. One Tribe responded that the project is out of their area of interest and deferred to other tribal groups that may be more closely affiliated to the project area. The other two Tribes requested that site-specific surveys be conducted at the APD stage with results sent to them.

4.2.1 Mitigation

All historic and archeological sites that are eligible or potentially eligible for listing in the NRHP would be either avoided by the proposed undertaking or have the information in the sites extracted through data recovery prior to subsurface disturbance. Decisions about planned management undertakings on KNF lands are preceded by cultural resource inventories of the proposed area of potential effect and consultation with the Louisiana SHPO and federally recognized Tribes. If consultation indicates that protective or mitigative measures are necessary to conserve cultural resource values or properties, the FS includes these measures in a project plan. Even after a conscientious, intensive field survey of a proposed project area, some sites may not be recorded, especially small or sparse properties (USDA 1999b, pg. 3-86).

BLM and FS stipulations regarding cultural resources and sites significant to Native Americans are applied to these lease parcels (Appendix B). The stipulations state that the BLM and FS would not approve any ground disturbing activities that may affect historic properties and/or resources until it completes its obligations under applicable requirements of the NHPA and other authorities. If currently unknown burials are discovered during development activities associated with these leases, these activities must cease immediately, applicable law on unknown burials will be followed and, if necessary, consultation with the appropriate tribe/group of federally recognized Native Americans will take place.

4.3 Recreation/Scenery/Noise Resources

4.3.1 Recreation

A description of potential effects from mineral management on recreation activities is referenced in the 1999 KNF FEIS on page 4-70. Exploration or development of the proposed leases could impact recreation quality and opportunities through: increased vehicle traffic and human

presence, loss of areas to recreate, blocked access, and increased noise and visual disturbance which could cause a loss of solitude.

Diminished or relocated wildlife populations attributed to a loss of functional habitat or to other oil and gas related factors could impact wildlife dependent recreational activities. Where quality recreational opportunities are diminished or foregone, there would be a loss of personal, social, and economic benefits. However, potential onsite and offsite mitigation for wildlife habitat, if implemented, would reduce these impacts or enhance recreational values and associated benefits. Areas of intense oil and gas development pose public health and safety risks, especially when industrial traffic and hazardous materials are present. Likewise, some recreational activities such as game hunting within close proximity of oil and gas facilities and activities may create hazards to industry employees and property. This potential risk-related impact may currently be low, but as development expands in the presence of continued public access, this impact may become a moderate risk. In addition, continued fluid mineral development would reduce the satisfaction associated with the hunting experience, as areas of high development are generally not satisfactory places to hunt.

Additional intense oil and gas development would reduce the availability of open space and associated recreational resources. Indirect impacts would occur where fluid mineral activities create undesirable conditions. Displaced recreationists may move to adjacent undeveloped areas for their recreation. These new use areas could become more crowded, and social conditions may deteriorate.

Hunting in this area is regulated by the State of Louisiana which only allows hunting for each game species during specified times of the year by state law. Hunting prohibitions for the well sites would be a short-term direct impact while drilling, but long-term impacts are not expected. If oil and gas development increases on KNF additional forested acreage could be cleared for well pads and access roads. Cumulative impacts from an increase in oil and gas activity could include a loss of available habitat for game species. Game species would likely move away from areas of active and ongoing development into potentially less-suitable habitat. Additional suitable habitat may become available for game species when restoration activities begin. Use of disturbed areas by game species would be dependent on restoration methods and success.

4.3.1.1 Mitigation

A FS NSO stipulation applies to the four lease parcels located within the recreation areas listed in the Recreation Resources Section (3.4.1, pg. 13). Three of the lease parcels are located on the Kisatchie District with the following legal descriptions: T6N, R6W, Sec. 20, 21, 29, and 28 (first parcel), Sec. 34 (second parcel), and Sec. 35 (third parcel). The fourth parcel is located on the Calcasieu District at the following location: T1N, R7W, Sec. 25, 26, 35, and 36. The NSO would not allow any surface disturbance on the recreation sites on these parcels.

4.3.2 Scenery Resources

Impacts of minerals management on scenery resources is referenced in the 1999 KNF FEIS on page 4-65. Exploration/development of the proposed leases could impact visual quality through:

increased visibility of constructed features such as roads, well pads, pipelines, and tank batteries; road degeneration from heavy trucks and vehicles following rain; dust and exhaust from construction, drilling, and production vehicles and equipment; vegetation removal and construction of steep slopes; unreclaimed sites; and discarded equipment. Well pads, power lines, access roads, and associated production facilities and storage tanks have the greatest potential to alter visual conditions for the life of the well. Vegetation removal would present an obvious contrast in color with the surrounding vegetation and affect foreground and middleground distance zones. These impacts would be most obvious immediately after construction. Impacts would decrease as the disturbed surface began to blend in color, form, and texture, when interim or final reclamation occurs. Long-term visual impacts could persist as long as the well is producing, which could be a couple of years to more than 50 years. Long-term impacts may include vegetation removal, alteration of the landscape, and installation of equipment and facilities. The extent of cumulative effects on visual resources will depend on the future amount of oil and gas development in northwest Louisiana. Oil and gas productivity has been high in this area and it is likely that continued development will also be high. Additional roads, wells pads and other constructed features due to oil and gas development may have a negative cumulative effect on visual resources but with mitigation is not considered significant. As well pads are reclaimed residual impacts associated with construction scars should diminish.

4.3.3 Noise

Noise generation from well operations would be associated with vehicle movements and the operation of drilling and completion equipment which can be loud and continuous but short-lived. Increased traffic to well sites may have a short-term impact on noise levels. After drilling/completion operations are completed, minimal traffic for production purposes and maintenance would be associated with the proposed wells. As a result, long-term and/or cumulative impacts from noise on people and wildlife species inhabiting the areas are expected to be minimal.

4.4 Minerals and Mineral Development

Impacts of minerals management on mineral develoment is referenced in the 1999 KNF FEIS on page 4-121. Exploration/development of the proposed leases could impact the production horizons and reservoir pressures. If production wells are established, the resources allotted to the wells would eventually be depleted. The amount and location of direct and indirect effects cannot be predicted until site-specific development information is available, typically during the APD stage.

4.5 Wastes

Exploration/development of the proposed leases could result in the introduction of hazardous and non-hazardous substances to the site. Hazardous substances may be produced, used, stored, transported or disposed of as a result of development on the leases. Projects would typically generate the following wastes: (1) discharge of drilling fluids and cuttings into the reserve pits, (2) wastes generated from used lubrication oils, hydraulic fluids, and other fluids used during production of oil and gas, some of which may be characteristic or listed hazardous waste, and (3)

service company wastes from exploration and production activities as well as containment of some general trash. Certain wastes unique to the exploration, development, and production of crude oil and natural gas have been exempted from Federal Regulations as hazardous waste under Subtitle C of the RCRA of 1976. The exempt waste must be intrinsic to exploration, development or production activities and cannot be generated as part of a transportation or manufacturing operation. The drilling fluids, drill cuttings, and produced waters are classified as a RCRA exempt waste, and potential drilling that could occur would not introduce hazardous substances into the environment if they are managed and disposed of properly under federal, state, and local waste management regulations and guidelines. Properly used, stored, and disposed of hazardous and non-hazardous substances greatly decreases the potential for any impact on any environmental resources. One way operators, FS and the BLM ensure hazardous and non-hazardous substances are properly managed is through the preparation of a Spill Prevention, Control, and Countermeasure (SPCC) plan.

In hydraulic fracturing, chemical substances other than water make up a small percentage of the fluid composition; however, the very large volumes used require correspondingly large volumes of a variety of compounds. These substances range from the relatively benign to the highly toxic at certain concentrations. In addition to these added chemicals, naturally occurring toxicants such as heavy metals, VOCs, and radioactive compounds are mobilized during extraction and return to the surface with the produced water. Of the millions of gallons of water used to hydraulically fracture a well one time, less than 30% to more than 70% may remain underground (Bamberger and Oswald 2012). Although the risk is low, the potential exists for unplanned releases that could have negative effects on human health and environment. A number of chemical additives are used that could be hazardous, but are safe when properly handled according to requirements and long-standing industry practices. In addition, many of these additives are common chemicals which people regularly encounter in everyday life (GWPC 2009).

Surface spills of drilling mud and additives, hydraulic fracturing fluids and additives, flowback water, and other formation fluids can happen at a variety of points in the development and production phases. Spills that occur can span a range of different spill sizes and causes of failure at any point in the process. For example, small spills often happen as the result of poor pipe connections or leaks; large spills sometimes occur as the result of a major well blowout, but such blowouts rarely occur. Additionally, spills from some parts of the phases may be the result of human error (i.e. vehicle collisions, improper handling, improper equipment operation or installation, etc.), while others stem from equipment failure (i.e. broken pipes, torn pit liners, leading tanks, etc.) or acts of nature (Fletcher 2012). The most common cause of spills comes from equipment failure and corrosion (Wenzel 2012).

The cause of the spill, the spill size, the hazard rating of the spilled material, response time to clean up the spill and the effectiveness of the cleanup, all play a critical role in determining the overall impact on the environment. The volume of a spill can significantly vary with spill types. Pipe spills are not expected to release more than 1,000 gallons into the environment, retaining pit spills and truck spills are not expected to release more than 10,000 gallons of fluid, and blowouts are expected to cause the largest spills, with the potential to release tens of thousands of gallons into the environment. Small spills occur with greater frequency than large spills. Secondary containment or recovery for small spills would likely minimize, if not eliminate, any potential

release into the environment. However, for spills on the order of several thousands of gallons of fluid, it is expected that less than half the fluid may be captured by secondary containment or recovery. The vast majority of operations do not incur reportable spills (5 gallons or more), indicating that the fluid management process can be, and usually is, managed safely and effectively (Fletcher 2012). Significant cumulative effects from wastes are not anticipated. Appendix D in the 1999 KNF Revised LRMP describes the guidance and direction for federal mineral operations on KNF. All leases are subject to the clauses, attachments and stipulations listed on page D1 – D17. Several of the clauses and attachments listed in Appendix D refer specifically to waste management and would reduce or eliminate any affects from wastes.

4.5.1 Mitigation

Specific mitigation is deferred to the APD process. Mitigation requirements are listed as Minerals Operations Clauses and Attachments in Appendix D of the 1999 KNF Revised LRMP. An example of mitigation requirements is listed in Attachment #5 and states that fluid impermeable containment systems (i.e. liners, dikes, berms) would be placed in, under and/or around any tank, pit, drilling cellar, ditches associated with the drilling process, or other equipment that use or has the potential to leak/spill hazardous and non-hazardous fluids, to completely prevent solid contamination (e.g. liners) at the site or prevent the spill from going beyond the immediate site (e.g. dikes, berms). This attachment also states that any liquids collected within dikes will not be drained off the site. Liquids will be removed by vacuum truck to an approved disposal or injection facility.

Future development activities on these lease parcels would be regulated under the RCRA, Subtitle C regulations. Additionally, waste management requirements are included in the 12 point surface use plan and the 9 point drilling plan required for all APDs. Leaseholders proposing development would be required to have approved SPCCPs, if the applicable requirements of 40 CFR 112 are met, and comply with all requirements for reporting of undesirable events. Lease bonds would not be released until all facilities have been removed, wells are plugged, and satisfactory reclamation has occurred.

4.6 Soils

A description of effects on soils from minerals management is referenced in the 1999 KNF FEIS on pages 4-8 to 4-11. Exploration/development of the subject leases may produce impacts by physically disturbing the topsoil and exposing the substratum soil on subsequent project areas. Direct impacts resulting from oil and gas construction of well pads, access roads, and reserve pits include: removal of vegetation, exposure of the soil, mixing of horizons, compaction, loss of topsoil productivity and susceptibility to wind and water erosion. Wind erosion would be expected to be a minor contributor to soil erosion with the possible exception of dust from vehicle traffic during all phases of development. Vehicle traffic related wind erosion would be limited to approved travel routes in which the surface has not been paved or dressed in a material to prevent soil movement. The extent of wind erosion related to vehicle traffic will be dependent on a number of factors including: length of well bore, whether hydraulic fracturing is used during completion, whether telemetry is used during production, and whether the well is gas, oil, condensate, or a combination thereof. These impacts could result in increased indirect impacts

such as runoff, erosion and off-site sedimentation. Activities that could cause these types of indirect impacts include construction and operation on well sites, access roads, gas pipelines and facilities.

Additional soil impacts associated with lease development would occur when heavy precipitation causes water erosion damage. When water saturated segment(s) on the access road become impassable, vehicles may still be driven over the road. Consequently, deep tire ruts would develop. Where impassable segments are created from deep rutting, unauthorized driving may occur outside the designated route of access roads.

Contamination of soil from drilling, completion fluids, and/or production wastes mixed into soil or spilled on the soil surface could cause a long-term reduction in site productivity. Contaminants spilled on soil would have the potential to pollute and/or change the soil chemistry. See the Waste Section (4.5) for a more in-depth analysis of spill contamination.

Cumulative impacts could include additional loss of soil productivity, erosion and sedimentation issues, and road damage due to the direct and indirect impacts discussed above in combination with other activities occurring on the forest, including but not limited to prescribed fire and silvacultural activities. These direct, indirect, and cumulative impacts can be reduced or avoided through proper design, construction, maintenance and implementation of the Minerals Operations Clauses and Attachments listed in Appendix D of the 1999 KNF Revised LRMP.

4.6.1 Mitigation

Specific mitigation for effects on soils would be deferred to the APD stage. The Minerals Operations Clauses and Attachments listed in the Appendix D of the 1999 KNF Revised LRMP lists many requirements implemented at the APD stage that would reduce effects on soil. Some examples include:

- Erosion control blankets must be used on all cut or fill slopes that cannot be shaped to a 3:1 gradient or less.
- The topsoil from the surface of well pads must be stockpiled in approved locations and should be leveled or rounded on top and smoothed on the sides to a 3:1 slope and vegetated as specified.

The impact to the soil would be remedied upon reclamation of well pads when the stockpiled soil that was specifically conserved to establish a seed bed is spread over well pads and vegetation re-establishes. A permanent vegetation cover per FS recommendations would be established on all disturbed areas. Final seed mixtures and plantings are determined with recommendations from FS (Appendix F).

4.7 Air Resources

A description of effects on air resources is referenced in the 1999 KNF FEIS on pages 4-2 to 4-6.

4.7.1 Air Quality

Any potential effects to air quality would occur if and when the leases were developed. Any proposed development project would be subject to additional analysis of possible air effects before approval. The analysis may include air quality modeling for the activity.

An MOU between the Departments of the Interior and Agriculture and EPA directs that air quality modeling be conducted for actions that meet certain emissions or geographic criteria:

- Creation of a substantial increase in emissions
- Material contribution to potential adverse cumulative air quality impacts
- Class I or sensitive Class II Areas
- Non-attainment or maintenance area
- Area expected to exceed NAAQS or PSD increment

The project area includes no Class I, sensitive Class II, or non-attainment areas. Due to the small number of wells projected to follow a lease on the lease tracts in relation to the current volume of hydrocarbon, development of the lease is not likely to exceed the emissions criteria, NAAQS or PSD increment.

The following source of emissions are anticipated during any oil and gas exploration or development: combustion engines (i.e. fossil fuel fired internal combustion engines used to supply electrical or hydraulic power for hydraulic fracturing to drive the pumps and rigs used to drill the well, drill out the hydraulic stage plugs and run the production tubing in the well; generators to power drill rigs, pumps, and other equipment; compressors used to increase the pressure of the oil or gas for transport and use; and tailpipe emissions from vehicles transporting equipment to the site), venting (i.e. fuel storage tanks vents and pressure control equipment), mobile emissions (i.e. vehicles bringing equipment, personnel, or supplies to the location) and fugitive sources (i.e. pneumatic valves, tank leaks, and dust). A number of pollutants associated with combustion of fossil fuels are anticipated to be released during drilling including: CO, NOx, SO_2, Pb, PM, CO_2, CH_4, and N_2O. Venting may release VOC/HAP, H_2S, and CH_4. Mobile source emissions are likely to include fugitive particulate matter from dust or inordinate idling.

The actual emissions of each pollutant will be entirely dependent on the factors described in the previous paragraph. During the completion phase, the most significant emissions of criteria pollutants emitted by oil and gas operations in general are VOCs, particulate matter and NO_2. VOCs and NOx contribute to the formation of O_3. The EPA's Natural Gas STAR Program is a voluntary program that identifies sources of fugitive CH_4 and seeks to minimize fugitive CH_4 through careful tuning of existing equipment and technology upgrades. Data provided by STAR show that some of the largest air emissions in the natural gas industry occur as natural gas wells that have been fractured and are being prepared for production. During well completion, flowback, fracturing fluids, water, and reservoir gas come to the surface at high velocity and

volume. This mixture includes a high volume of VOCs and CH_4, along with air toxins such as benzene, ethylbenzene, and n-hexane. The typical flowback process lasts from 3 to 10 days. Pollution also is emitted from other processes and equipment during production and transportation of the oil and gas from the well to a processing facility.

To reasonably quantify emissions associated with well exploration and production activities, certain types of information are needed. Such information includes a combination of activity data such as:

- The number, type, and duration of equipment needed to construct/reclaim, drill and complete (e.g. belly scrapers, rig, completions, supply trucks, compressor, and production facilities)

- The technologies which may be employed by a given company for drilling any new wells to reduce emissions (e.g. urea towers on diesel powered drill rigs, green completions, and multi-stage flares)

- Area of disturbance for each type of activity (e.g. roads, pads, pipelines, electrical lines, and compressor station)

- Compression per well (sales and field booster), or average horsepower for each type of compressor

- The number and type of facilities utilized for production

The degree of impact will also vary according to the characteristics of the geological formations from which production occurs. Currently, it is not feasible to directly quantify emissions. What can be said is that emissions associated with oil and gas exploration and production would incrementally contribute to increases in air quality emissions into the atmosphere.

Air pollution can affect public health in many ways. Numerous scientific studies have linked air pollution to a variety of health problems including: (1) aggravation of respiratory and cardiovascular disease, (2) decreased lung function, (3) increased frequency and severity of respiratory symptoms such as difficulty breathing and coughing, (4) increased susceptibility to respiratory infections, (5) effects on the nervous system, including the brain, such as IQ loss and impacts on learning, memory, and behavior, (6) cancer, and (7) premature death. Some sensitive individuals appear to be at greater risk for air pollution-related health effects, for example, those with pre-existing heart and lung diseases (e.g., heart failure/ischemic heart disease, asthma, emphysema, and chronic bronchitis), diabetics, older adults, and children.

Significant degradation of air quality may also damage ecosystem resources. For example, ozone can damage vegetation, adversely impacting the growth of plants and trees. These impacts can reduce the ability of plants to uptake CO_2 from the atmosphere and can then indirectly affect the larger ecosystems.

Cumulative effects from potential oil and gas development from the issuing of these leases, the leases from the December 2012 and March 2013 Lease Sales and possible future development could be an overall increase in CO, NOx, SO_2, Pb, PM, CO_2, CH_4, and N_2O. However, according to EPA's Air Trends report for 2011 (EPA 2011), since 1990, nationwide air quality has improved significantly for the six common air pollutants (Figure 32). These six pollutants are ground-level O_3, $PM_{2.5}$, PM_{10}, Pb, NO_2, CO, and SO_2. Nationally, air pollution was lower in 2010 than in 1990 for:

- 8-hour O_3, by 17%
- 24-hour PM_{10} , by 38%
- 3-month average Pb, by 83%
- annual NO_2 , by 45%
- 8-hour CO, by 73%
- annual SO_2 , by 75%

Nationally, annual $PM_{2.5}$ concentrations were 24% lower in 2010 compared to 2001 and 24-hour $PM_{2.5}$ concentrations were 28% lower in 2010 compared to 2001. O_3 levels did not improve in much of the East until 2002, after which there was a significant decline. Eight-hour O_3 concentrations were 13% lower in 2010 than in 2001. This decline is largely due to reductions in NOx required by EPA rules including the NOx State Implementation Plan (SIP) Call, preliminary implementation of the Clean Air Interstate Rule (CAIR), and Tier 2 Light Duty Vehicle Emissions Standards.

EPA concludes that total emissions of toxic air pollutants have decreased by approximately 42% between 1990 and 2005. Control programs for mobile sources and facilities such as chemical plants, dry cleaners, coke ovens, and incinerators are primarily responsible for these reductions. They also found that monitored concentrations of toxic pollutants such as benzene, 1,3-butadiene, ethylbenzene, and toluene decreased by 5% or more per year between 2003 and 2010 at more than half of ambient monitoring sites. Other toxic air pollutants of concern to public health such as carbon tetrachloride, formaldehyde, and several metals, declined at most sites.

4.7.1.1 Mitigation

The BLM encourages industry to incorporate and implement BMPs, which are designed to reduce impacts to air quality by reducing emissions, surface disturbances, and dust from field production and operations. Typical measures include:

- Flared hydrocarbon gases at high temperatures in order to reduce emissions of incomplete combustion

- Watering dirt roads during periods of high use to reduce fugitive dust emissions

- Co-location wells and production facilities to reduce new surface disturbance
- Implementation of directional drilling and horizontal completion technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores
- Requiring that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored
- Performing interim reclamation to reclaim areas of the pad not required for production facilities and to reduce the amount of dust from the pads

Additionally, the BLM encourages oil and natural gas companies to adopt proven, cost-effective technologies and practices that improve operational efficiency and reduce natural gas emissions.

In October 2012, EPA promulgated air quality regulations for completion of hydraulically fractured gas wells. These rules require air pollution mitigation measures that reduce the emissions of VOCs during gas well completions. Mitigation includes a process known as "Green Completion" in which natural gas brought up during flowback must be recaptured and rerouted into the gathering line. In addition, at the APD stage, the FS would encourage operators to participate in the voluntary STAR program.

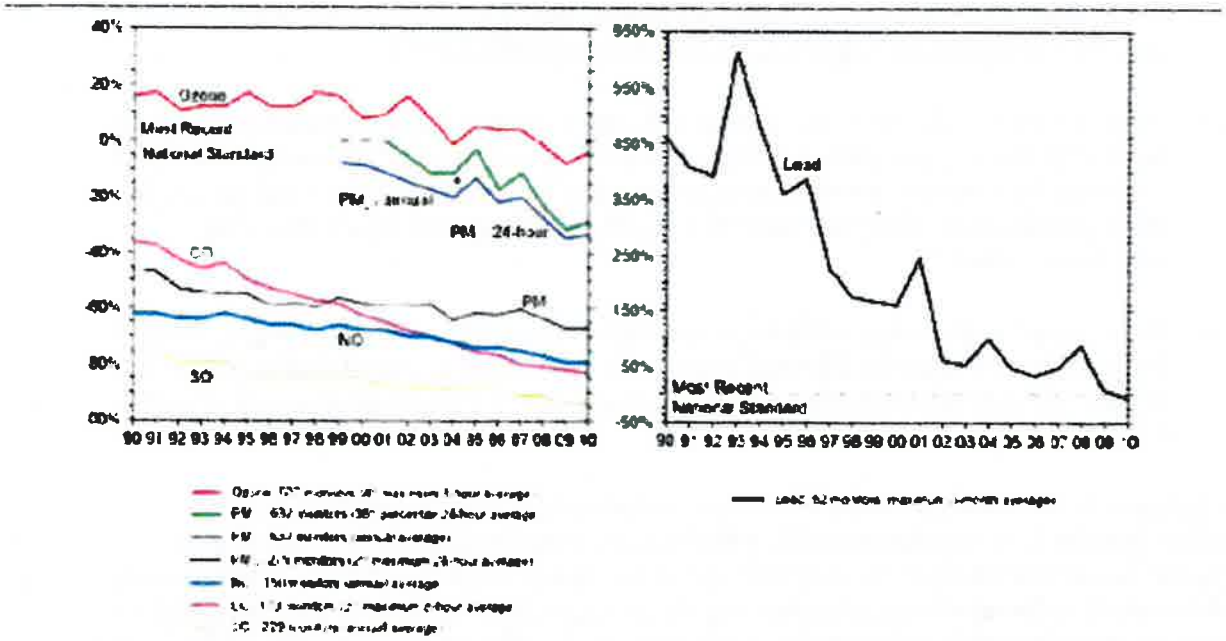

Figure 32. Comparison of national levels of the six common pollutants to the most recent NAAQS, 1990-2010. National levels are averages across all monitor stations with complete data for the time period. Note: Air quality data for $PM_{2.5}$ starts in 1999 (EPA, 2011).

4.7.2 Climate and Climate Change

The assessment of GHG emissions and climate change is in its formative phase. While it is not possible to accurately quantify potential GHG emissions in the affected area as a result of issuing the sold leases, some general assumptions can be made: issuing the sold leases may contribute to the installation and production of new wells, which may consequently lead to an increase in GHG emissions.

Emissions from fossil fuel production grew 101% from 1990 to 2005 and are projected to increase by a further 10% between 2005 and 2020. The natural gas industry is the major contributor to both GHG emissions and emissions growth, with CH_4 emissions from coal mining second. That said, it is worth noting that a significant portion of the emissions attributed to the natural gas industry are due to vented gas from processing plants, many of which are used for injection in enhanced oil recovery operations. Additionally, many technological advances in emission control technology have been implemented by the oil and gas industry to reduce emission levels.

Many aspects of oil and gas production emit GHGs. The primary aspects include the following:

- Fossil fuel combustion for construction and operation of oil and gas facilities which include vehicles driving to and from production sites, engines that drive drill rigs, etc. These produce CO_2 in quantities that vary depending on the age, types, and conditions of the equipment as well as the targeted formation, locations of wells with respect to processing facilities and pipelines, and other site-specific factors.

- Fugitive CH_4 is CH_4 that escapes from wells (both gas and oil), oil storage, and various types of processing equipment. This is a major source of global CH_4 emissions. These emissions have been estimated for various aspects of the energy sector, and starting in 2011, producers are required under 40 CFR 98, to estimate and report their CH_4 emissions to the EPA.

- It is expected that drilling will produce marketable quantities of oil and/or gas. Most of these products will be used for energy, and the combustion of the oil and/or gas would release CO_2 into the atmosphere. Fossil fuel combustion is the largest source of global CO_2.

The assessment of GHG emissions, their relationship to global climatic patterns, and the resulting impacts is an ongoing scientific process. It is currently not feasible to know with certainty the net impacts from the proposed action on climate – that is, while BLM actions may contribute to the climate change phenomenon, the specific effects of those actions on global climate are speculative given the current state of the science. The BLM does not have the ability to associate a BLM action's contribution to climate change with impacts in any particular area. The science to be able to do so is not yet available. The inconsistency in results of scientific models designed to predict climate change on regional or local scales, limits the ability to quantify potential future impacts of decisions made at this level and determining the significance of any discrete amount of GHG emissions is beyond the limits of existing science. When further

information on the impact to climate change is known, such information would be incorporated in the BLM's planning and NEPA documents as appropriate.

In recent years, many states and other organizations have initiated GHG inventories, tallying GHG emissions by economic sector. The EPA provides links to statewide GHG emissions inventories (EPA 2014). Emissions inventories can be developed using the Climate Analysis Indicators Tool (CAIT) (World Resources Institute 2014). For the state of Louisiana, the total emissions by sector are summarized in Table 13. Currently, the LDEQ does not have established thresholds for GHG emissions. Guidelines for estimating project-specific GHG emissions are available (URS Corporation 2010), but some necessary data, including the volume of oil produced and the number of wells, are not available for the proposed action. The uncertainties regarding numbers of wells and other factors make it very impractical to attempt to project amounts of GHG that the proposed action would emit. At the APD stage, more site-specific information on GHG impacts and mitigation measures would be described in detail.

Table 13. GHG emissions by sector for the state of Louisiana compared to the U.S. total (1990 – 2011).

Emissions Totals Sources	**Louisiana Latest Value** $MtCO_2$ and Percent of US Total	**Louisiana Absolute Change from Earliest to Latest Value**	**United States Latest Value** $MtCO_2$	**United States Absolute Change from Earliest to Latest Value**
Total GHG Emissions Excluding Land-Use Change and Forestry	237.88/ 3.6%	4.37%	6,554.95	9.67%
Total GHG Emissions Including Land-Use Change and Forestry	213.54 3.8%	-4.56%	5,523.48	8.74%
Emissions by Gas Sources				
Total CO_2 (excluding Land-Use Change and Forestry)	220.84 3.9%	5.57%	5,647.00	9.79%
Total CH_4	11.68 2.2%	-14.12%	519.60	3.66%
Total N_2O	3.39 1.3%	-24.74%	254.43	-14.11%
Total F-Gas	1.95 1.5%	207.38%	133.49	268.47%
Emissions by Sector Sources				
Energy	223.47 3.8%	5.59%	5,734.89	7.48%
Industrial Processes	6.91 2.6%	0.72%	258.06	168.35%
Agriculture	5.47 1.3%	-15.86%	419.08	9.38%
Waste	2.00, 1.4%	-31.07%	142.50	-12.10%

Emissions Totals Sources	**Louisiana Latest Value** $MtCO_2$ and Percent of US Total	**Louisiana Absolute Change from Earliest to Latest Value**	**United States Latest Value** $MtCO_2$	**United States Absolute Change from Earliest to Latest Value**
Land-Use Change and Forestry	-24.34 2.3%	483.44%	-1,031.47	14.90%
Bunker Fuels	0.03 7%	Infinity%	0.42	Infinity%
Energy Emissions by Sub-Sector Sources				
Electric Power	46.44 2.1%	33.71%	2,119.28	16.91%
Commercial	1.91 0.08%	-0.16%	225.14	-1.24%
Residential	2.32 0.07%	-26.56%	331.06	-4.51%
Industrial	115.05 1.1%	1.10%	972.91	-12.75%
Transportation	50.73 2.6%	0.83%	1,890.45	13.85%
Fugitive Emissions	7.02 3.5%	-9.18%	196.06	13.57%

Recent IPCC publications (2013) indicate that due to increasing temperatures, faster evaporation rates, and more sustained droughts brought on by climate change, increasing levels of GHGs contributing to climate change may bring about the following impacts in the southeastern U.S., including Louisiana:

- A shift towards a warmer climate with an increase in extreme high temperatures and a reduction in extreme low temperatures. These changes have been especially apparent in the western half of North America
- Abnormally hot days and nights and heat waves are very likely to become more frequent. Cold days and cold nights are very likely to become much less frequent
- Increasing stress due to heat waves. This may lead to more illness and death, particularly among the young, elderly and frail
- Respiratory disorder may be exacerbated by warming-induced deterioration in air quality

- The growing season length is expected to increase. However, as temperature rises, crops grown in the southwestern U.S. will increasingly experience temperatures above their optimum, and animal production of meat or dairy products will be impacted by temperature extremes

- Weeds and other invasive plants will continue to migrate northward

- Arid areas are very likely to experience increases in erosion and fire risk

- An increase in the length of the forest fire season and the area subject to forest fires

- Additional stress to ground water and surface water sources that are already overtaxed in many areas

- Changes in the abundance and spatial distribution of species and expanded ranges of tree killing insects, vector-borne and tick-borne diseases

- Precipitation is likely to be less frequent but more intense and precipitation extremes are very likely to increase

- Increased weather related losses of property

- Rising sea level in and around the Gulf Coast area

- It is likely that hurricane intensity will increase in response to human-caused warming, but this requires further study

4.7.3 Cumulative Impacts on Air Quality and Climate Change

The primary activities that contribute to levels of air pollutants on the KNF are predominately combustible engines of road and non-road diesel and gasoline vehicles and equipment. In February 2014, the BLM completed a documented titled, "The Air Resources Technical Report." The purpose of the document is to summarize the technical information on air quality and climate change relative to all EAs for APDs and lease sales. It includes a description of the varied sources of national and regional emissions that are incorporated here to represent the past, present, and reasonably foreseeable impacts to air resources (USDI 2014). It includes a summary of emissions on the national and regional scale by an industry source. Sources that are considered to have notable contributions to air quality impacts and GHG emissions include electrical generating units, fossil fuel production (nationally and regionally) and transportation.

The very small increase in emissions that could result from approval of the proposed action would not result in the area violating the NAAQS for any criteria pollutant. In October 2012, EPA regulations that require control of VOC emissions from oil and gas development became effective. These regulations will reduce VOC emissions from oil and gas exploration and production emissions that contribute to the formation of O_3. Emissions from any lease

development are not expected to impact the 8-hour average O_3 concentrations, or any other criteria pollutants in the area of the proposed lease.

Visitors to national parks and wilderness areas list the ability to view unobscured scenic vistas as a significant part of a satisfying experience. Unfortunately, visibility impairment has been documented in all Class I areas with visibility monitoring. Most visibility impairment is in the form of regional haze. The greatest visibility impairment due to regional haze occurs in the eastern U.S. and in southern California, while the least impairment occurs in the Colorado Plateau, Nevada Great Basin areas, and in Alaska. Ammonium sulfate contributes at least 50% to visibility impairment at most Class I areas in the eastern U.S. The contribution to visibility impairment from ammonium nitrate is highest in central and southern California and in the Midwest. The largest region of high rural organic carbon visibility impairment is in the southeastern U.S. Impairment in this range is also present in the Sierra Nevada region of California and in the northern Rockies of Montana. The highest contribution to visibility impairment from fine soil is found in the arid Southwest. The highest coarse particle contribution to impairment is also in the arid Southwest and southern California (IPCC 2013). Visibility impairment on federal lands can also result from plume intrusion and has been documented in Mount Zirkel Wilderness, Moosehorn National Wildlife Refuge, and Grand Canyon National Park.

The EPA develops an annual report called the Inventory of U.S. Greenhouse Gas Emissions and Sink (Inventory). According to the Inventory report, in 2012, total GHG emissions in the U.S. were 6,525.6 million metric tons (Tg) CO_{2e}. Total U.S. emissions have increased by 4.7% from 1990 to 2012, and emissions decreased from 2011 to 2012 by 3.4% (227.4 Tg CO_{2e}). The decrease from 2011 to 2012 was due to a decrease in the carbon intensity of fuels consumed by power producers to generate electricity due to a decrease in the price of natural gas, a decrease in transportation sector emissions attributed to a small increase in fuel efficiency across different transportation modes and limited new demand for passenger transportation, and much warmer winter conditions resulting in a decreased demand for heating fuel in the residential and commercial sectors. Since 1990, U.S. emissions have increased at an average annual rate of 0.2%.

The primary GHG emitted by human activities in the U.S. was CO_2 representing approximately 82.5% of total GHG emissions. The largest source of CO_2 and of overall GHG emissions was fossil fuel combustion. CH_4 emissions, which have decreased by 10.8% since 1990, resulted primarily from enteric fermentation associated with domestic livestock, natural gas systems, and decomposition of wastes in landfills. Agricultural soil management, manure management, mobile source fuel combustion and stationary fuel combustion were the major sources of NO_2 emissions.

HFCs and PFCs are families of synthetic chemicals that are used as alternatives to O_3 Depleting Substances (ODS), which are being phased out under the Montreal Protocol and CAA Amendments of 1990. HFCs and PFCs do not deplete the stratospheric O_3 layer, and are therefore acceptable alternatives under the Montreal Protocol. These compounds, however, along with SF_6, are potent GHGs. In addition to having high global warming potentials, SF_6 and PFCs have extremely long atmospheric lifetimes, resulting in their essentially irreversible

accumulation in the atmosphere once emitted. SF_6 is the most potent GHG the IPCC has evaluated (IPCC 2013). Other emissive sources of these gases include HCFC-22 production, electrical transmission and distribution systems, semiconductor manufacturing, aluminum production, and magnesium production and processing.

ODS substitute emissions and emissions of J-fluorocarbon (JFC)-23 during the production of JCFS-22 were the primary contributors to aggregate HFC emissions. PFC emissions resulted as a by-product of primary aluminum production and from semiconductor manufacturing, while electrical transmission and distribution systems accounted for most SF_5 emissions.

Overall, from 1990 to 2012, total emissions of CO_2 increased by 274.5 Tg CO_{2e} (5.4%), while total emissions of CH_4 decreased by 68.4 Tg CO_{2e} (10.8%), and N_2O increased by 11.5 Tg CO_{2e} (2.9%). During the same period, aggregate weighted emissions of HFCs PFCs, and SF_6 rose by 74.8 Tg CO_{2e} (83%). From 1990 to 2012, HFCs increased by 114.3 Tg CO_{2e} (309.6%), PFCs decreased by 15.2 Tg CO_{2e} (732.8%), and SF_6 decreased by 24.2 Tg CO_{2e} (74.3%). Despite being emitted in smaller quantities relative to the other principal GHGs, emissions of JFCs, PFCs, and SF_6 are significant because many of these gases have extremely high global warming potentials and, in the cases of PFCs and SF_6, long atmospheric lifetimes. Conversely, U.S. GHG emissions were partly offset by carbon sequestration in forests, trees in urban areas, agricultural soils, and landfilled yard trimmings and food scraps, which, in aggregate, offset 15% of total emissions in 2012.

Within the U.S., fossil fuel combustion accounted for 94.2% of CO_2 emissions in 2012. Globally, approximately 32,579 Tg of CO_2 were added to the atmosphere through the combustion of fossil fuels in 2011, of which the U.S. accounted for about 17%. Changes in land use and forestry practices can also emit CO_2 (e.g. through conversion of forest land to agricultural or urban use) or can act as a sink for CO_2 (e.g. through net additions to forest biomass). In addition to fossil fuel combustion, several other sources emit significant quantities of CO_2. These sources include, but are not limited to non-energy use of fuels, iron and steel production and cement production.

The five major fuel consuming sectors contributing to CO_2 emissions from fossil fuel combustion are electricity generation, transportation, industrial, residential, and commercial. CO_2 emissions are produced by the electricity generation sector as they consume fossil fuel to provide electricity to one of the other four sectors, or "end-use" sectors. For the discussion below, electricity generation emissions have been distributed to each end-use sector on the basis of each sector's share of aggregate electricity consumption. This method of distributing emissions assumes that each end-use sector consumes electricity that is generated from the national average mix of fuels according to their carbon intensity.

Transportation End-Use Sector. When electricity-related emissions are distributed to economic end-use sectors, transportation activities accounted for 34.4% of U.S. CO_2 emissions from fossil fuel combustion in 2012. The largest sources of transportation GHGs in 2012 were passenger cars (43.1%), light duty trucks, which include sport utility vehicles, pickup trucks, and minivans (18.4%), freight trucks (21.9%), commercial aircraft (6.2%), rail (2.5%), and ships and boats (2.2%). These figures include direct emissions from fossil fuel combustion used in transportation and emissions from non-energy use (i.e. lubricants) used in transportation, as well as HFC

emissions from mobile air conditioners and refrigerated transport allocated to these vehicle types.

In terms of the overall trend, from 1990 to 2012, total transportation emissions rose by 18% due, in large part, to increased demand for travel with limited gains in fuel efficiency over the same time period. The number of vehicle miles traveled by light-duty motor vehicles (passenger cars and light-duty trucks) increased 35% from 1990 to 2012, as a result of a confluence of factors including population growth, economic growth, urban sprawl, and low fuel prices during the beginning of this period. Almost all of the energy consumed for transportation was supplied by petroleum-based products, with more than half being related to gasoline consumption in automobiles and other highway vehicles. Other fuel uses, especially diesel fuel for freight trucks and jet fuel for aircraft, accounted for the remainder. The primary driver of transportation-related emissions was CO_2 from fossil fuel combustion, which increased by 16% from 1990 to 2012. This rise in CO_2 emissions, combined with an increase in HFCs from close to zero emissions in 1990 to 72.9 Tg CO_{2e} in 2012, led to an increase in overall emissions from transportation activities of 18%.

Industrial End-Use Sector. Industrial CO_2 emissions, resulting both directly from the combustion of fossil fuels and indirectly from the generation of electricity that is consumed by industry, accounted for 27% of CO_2 from fossil fuel combustion in 2012. Approximately 57% of these emissions resulted from direct fossil fuel combustion to produce steam and/or heat for industrial processes. The remaining emissions resulted from consuming electricity for motors, electric furnaces, ovens, lighting, and other applications. In contrast to the other end-use sectors, emissions from industry have steadily declined since 1990. This decline is due to structural changes in the U.S. economy (i.e., shifts from a manufacturing-based to a service-based economy), fuel switching, and efficiency improvements.

In 2012, CH_4 emissions from coal mining were 55.8 Tg CO_{2e}, which is a 4.0 Tg CO_{2e} (6.7%) decrease below 2011 emission levels. The overall decline of 25.2 Tg CO_{2e} (31.1%) from 1990 results from the mining of less gassy coal from underground mines and the increased use of CH_4 collected from degasification systems.

N_2O is produced by biological processes that occur in soil and water and by a variety of anthropogenic activities in the agricultural, energy-related, industrial, and waste management fields. While total N_2O emissions are much lower than CO_2 emissions, N_2O is approximately 300 times more powerful than CO_2 at trapping heat in the atmosphere (IPCC 2013). Since 1750, the global atmospheric concentration of N_2O has risen by approximately 20% (IPCC 2013). The main anthropogenic activities producing N_2O in the U.S. are agricultural soil management, stationary fuel combustion, fuel combustion in motor vehicles, manure management and nitric acid production.

Emissions resulting from the substitution of ODS (e.g., CFCs) have been consistently increasing, from small amounts in 1990 to 146.8 Tg CO_{2e} in 2012. Emissions from ODS substitutes are both the largest and the fastest growing source of HFC, PFC, and SF_6 emissions. These emissions have been increasing as phase-out of ODS required under the Montreal Protocol came into

effect, especially after 1994, when full market penetration was made for the first generation of new technologies featuring ODS substitutes.

GWP-weighted PFC, HFC, and SF_6 emissions from semiconductor manufacture have increased by 28% from 1990 to 2012 due to the rapid growth of this industry and the increasing complexity of semiconductor products (more complex devices have a larger number of layers that require additional F-GHG using process steps). Within that time span, emissions peaked in 1999, the initial year of the EPA's PFC Reduction/Climate Partnership for the Semiconductor Industry, but have since declined to 3.7 Tg CO_{2e} in 2012 (a 48% decrease relative to 1999).

The National Climate Assessment is a document that summarizes the impacts of climate on the U.S. now and in the future. Over 300 experts working with a 60 member Federal Advisory Committee created the report. Major consequences of a warming climate, as discussed in the National Climate Assessment include significant increases in the number of hot days (95°F or above) and decreases in freezing events. Higher temperatures contribute to the formation of harmful air pollutants and allergens. Higher temperatures are also projected to reduce livestock and crop productivity. Climate change is expected to increase harmful blooms of algae and several disease-causing agents in inland and coastal waters. The number of Category 4 and 5 hurricanes in the North Atlantic and the amount of rain falling in very heavy precipitation events have increased over recent decades, and further increases are projected.
Global sea level rose about eight inches in the last century and is projected to rise another 1 to 4 feet in this century. Large numbers of southeastern cities, roads, railways, ports, airports, oil and gas facilities, and water supplies are vulnerable to the impacts of sea level rise. Major cities like New Orleans, with roughly half of its population below sea level, Miami, Tampa, Charleston, and Virginia Beach are among those most at risk. As a result of current sea level rise, the coastline of Puerto Rico around Rincòn is being eroded at a rate of 3.3 feet per year. Puerto Rico has one of the highest population densities in the world, with 56% of the population living in coastal municipalities.

Sea level rise and storm surge can have impacts far beyond the area directly affected. Sea level rise combines with other climate-related impacts and existing pressures such as land subsidence, causing significant economic and ecological implications. According to a recent study co-sponsored by a regional utility, coastal areas in Alabama, Mississippi, Louisiana, and Texas already face losses that annually average $14 billion from hurricane winds, land subsidence, and sea level rise. Losses for the 2030 timeframe could reach $23 billion assuming a nearly 3% increase in hurricane wind speed and just under 6 in of sea level rise. About 50% of the increase in losses is related to climate change. LA State Highway 1, heavily used for delivering critical oil and gas resources from Port Fourchon, is sinking, at the same time sea level is rising, resulting in more frequent and more severe flooding during high tides and storms. A 90-day shutdown of this road would cost the nation an estimated $7.8 billion.

Freshwater supplies from rivers, streams, and groundwater sources near the coast are at risk from accelerated saltwater intrusion due to higher sea levels. Porous aquifers in some areas make them particularly vulnerable to saltwater intrusion. For example, officials in the city of Hallandale Beach, Florida, have already abandoned six of their eight drinking water wells. Continued urban development and increases in irrigated agriculture will increase water demand while higher

temperatures will increase evaporative losses. All of these factors will combine to reduce the availability of water in the Southeast. Severe water stress is projected for many small Caribbean islands.

While recognizing that many factors besides climate change affect energy demand (including population changes, economic conditions, energy prices, consumer behavior, conservation programs, and changes in energy-using equipment), increases in temperature will result in increased energy use for cooling and decreased energy use for heating. These impacts differ among regions of the country and indicate a shift from predominantly heating to predominantly cooling in some regions with moderate climates. For example, in the Northwest, energy demand for cooling is projected to increase over the next century due to population growth, increased cooling degree days, and increased use of air conditioners as people adapt to higher temperatures. Population growth is also expected to increase energy demand for heating. However, the projected increase in energy demand for heating is about half as much when the effects of a warming climate are considered along with population growth.

In sum, the cumulative impacts may result in a very small increase in GHG emissions but are not expected to create climate change impacts that differ from the No Action Alternative because climate change is a global process that is impacted by the sum total of GHGs in the Earth's atmosphere. The incremental contribution to global GHGs from the proposed action cannot be translated into effects on climate change globally or in the area of this site-specific action. It is currently not feasible to predict with certainty the net impacts from particular emissions associated with a federal action; however, EPA's recently finalized oil and gas air quality regulations have a co-benefit of CH_4 reduction that will reduce GHG emissions from any oil and gas development that would occur on these leases.

4.8 Water Resources

Effects from mineral management on water resources are referenced in the 1999 KNF FEIS on pages 4-8 to 4-11. The physical effects of mineral extraction include erosion, compaction, sedimentation, and potential surface and/or groundwater contamination. Sedimentation and pollution of streams or wetlands can occur down-gradient from such activity sites (USDA 1999b, pg. 4-8). Surface disturbance from the construction of well pads, access roads, pipelines, and utility corridors can result in degradation of surface water and groundwater quality from non-point source pollution, increased soil losses, and increased erosion.

4.8.1 Surface Water Resources

Potential impacts to surface water that may occur due to construction of well pads, access roads, fracturing ponds, pipelines, utility lines and production include:

- Increased surface runoff and off-site sedimentation brought about by soil disturbance
- Increased salt loading and water quality impairment of surface waters

- Channel morphology changes due to road and pipeline crossings and possible contamination of surface waters by spills

The magnitude of these impacts to water resources would depend on the proximity of the disturbance to the drainage channel, slope aspect and gradient, degree and area of soil disturbance, amount of local precipitation, soil character, and duration and time before implementation mitigation or clean up measures can be put into place. Direct impacts would likely be greatest shortly after the start of construction activities and would decrease in time due to decreased activity during production, natural stabilization and reclamation efforts. Construction activities would occur over a relatively short period therefore, the majority of the disturbance would be temporary and localized. Flows of perennial, ephemeral, or intermittent rivers and streams could be directly affected in the short term by an increase in impervious surfaces resulting from the construction of the well pad and road. Hydrologic processes may be altered where the perennial, ephemeral, and intermittent river and stream system responds by changing physical parameters, such as channel configuration. These changes may in turn impact water quality and ultimately the aquatic ecosystem through eutrophication, changes in water temperature, and/or a change in the food structure.

Minor long-term direct and indirect impacts to the watershed and hydrology could continue for the life of surface disturbance from water discharge from roads, road ditches, and well pads, but would decrease once all well pads and road surfacing material has been removed and reclamation of well pads, access roads, pipelines, and powerlines have taken place. Interim reclamation of the portion of the well pad not needed for production operation, re-vegetating the portion of the pad that is needed for production operations, and re-vegetating road ditches would reduce this long-term impact. Short-term direct and indirect impacts to the watershed and hydrology from access roads that are not surfaced with impervious materials would occur and would likely decrease in time due to reclamation efforts. Cumulative effects to surface water could include alterations to channel configuration and water quality, which could affect aquatic vegetation and wildlife.

4.8.2 Ground Water Resources

Groundwater could be affected by multiple factors, including industrial, domestic, or agricultural activities through withdrawal, injection (including chemical injection), or mixing of materials from different geologic layers or the surface. Withdrawal of groundwater could affect local groundwater flow patterns and create changes in the quality or quantity of the remaining groundwater. Based on an evaluation of statewide groundwater availability, and the total projected number of wells to be drilled/completed on lands with federal mineral ownership, adequate water supplies are available and would not result in significant impacts on a regional basis. Loss of a permitted source of groundwater supply due to drawdown would be considered a significant impact if it were to occur. This potential would be assessed at the development stage should development be proposed. The drilling of horizontal wells, versus directional and vertical wells may initially appear to require a greater volume of water for drilling/completion purposes. However, a horizontal well develops a much larger area of the reservoir than a directional and/or vertical well and actually results in a lesser volume of fluids being required. Vertical and directional wells can easily require one well per 10 acres resulting in 64 wells per

section. This is in contrast to one horizontal well per 640 acres or one per 320 acres which results in a net decrease in total fluid volumes needed and in surface disturbance acreages. Impacts to the quality of groundwater, should they occur, would likely be limited to near a well bore location due to inferred groundwater flow conditions in the area of the parcels.

Oil and gas contained in geologic formations is often not under sufficient hydraulic pressure to flow freely to a production well. The formation may have low permeability or the area immediately surrounding the well may become packed with cuttings. A number of techniques are used to increase or enhance the flow. They include hydraulic fracturing and acid introduction to dissolve the formation matrix and create larger void space(s). The use of these flow enhancement techniques and secondary recovery methods result in physical changes to the geologic formation that will affect the hydraulic properties of the formation. Typically, the effects of these techniques and methods are localized to the area immediately surrounding the individual well, are limited to the specific oil and gas reservoir, and do not impact adjacent aquifers.

However, in recent years there has been an elevated public concern about the possibility of subsurface hydraulic fracturing operations creating fractures that extend well beyond the target formation to water aquifers, allowing CH_4, contaminants naturally occurring in formation water, and fracturing fluids to migrate from the target formation into drinking water supplies (Zoback et al 2010). Typically, thousands of feet of rock, including some impermeable, separate most major formations in the U.S. from the base of aquifers that contain drinkable water (U.S. Department of Energy, 2009). The direct contamination of underground sources of drinking water from fractures created by hydraulic fracturing would require hydrofractures to propagate several thousand feet beyond the upward boundary of the target formations through many layers of rock. It is extremely unlikely that the fractures would ever reach fresh water zones and contaminate freshwater aquifers (Zoback et al 2010). During the APD review, the exact difference between the base of usable water and the top of the target formation for the specific site would be reviewed to determine the potential for direct contamination of underground sources. According to the RFD, True Vertical Depth for the wells will vary between 8,000 feet to 15,000 feet. The base of the USDWs varies between minus 1,500 to minus 3,000 feet. Well completion operations may occur at an interval between 6,500 to 12,000 feet below the base of the USDW.

Contamination of groundwater could occur without adequate cementing and casing of the proposed well bore. For completion or formation fluids to escape the wellbore and affect the usable quality water or contaminate or cross contaminate aquifers, the fluid would have to breech several layers of steel casing and cement. Failure of the cement or casing surrounding the wellbore is a possible risk to water supplies. If the annulus is improperly sealed, natural gas, fracturing fluids, and formation water containing high concentrations of dissolved solids may be transferred directly along the outside of the wellbore among the target formation, drinking water aquifers, and layers of rock in between. Complying with BLM and state regulations regarding casing and cementing, implementing BMPs, testing casings and cement prior to continuing to drill or introducing additional fluids and continual monitoring during drilling and hydraulic fracturing, allow producers and regulators to check the integrity of casing and cement jobs and greatly reduce the chance of aquifer contamination.

Casing specifications are designed and submitted to the BLM. The BLM independently verifies the casing program, and the installation of the casing and cementing operations are witnessed by a Petroleum Engineer. Petroleum products and other chemicals used in the drilling and/or completion process could result in groundwater contamination through a variety of operational sources including but not limited to pipeline and well casing failure, well (gas and water) construction, and spills. Similarly, improper construction and management of reserve and evaporation pits could degrade ground water quality through leakage and leaching.

Any proposed drilling/completion activities would have to be in compliance with Onshore Order #2, 43 CFR 3160 regulations, and not result in a violation of a federal and/or state law. If these conditions were not met, the proposal would be denied. As such, no significant impacts to groundwater from the proposed action are expected. Cumulative effects to ground water are not anticipated.

4.8.3 Mitigation

For the protection of jurisdictional wetlands, SHPZs, and RAPZs, FS CSU1, CSU2, and NSO stipulations apply to these leases which would limit or not allow for surface disturbance near water bodies. CSU1 states that placement of mineral extraction equipment, buildings, roads, ponds, and well pads and the clearing of pipeline right-of-way vegetation are prohibited. CSU2 states that roads and clearing of right-of-way vegetation may occur if a site-specific environmental analysis determines that the mitigated environment effects would not be significant.

In addition, a BLM freshwater aquatic habitat stipulation also applies to this lease which states that no surface occupancy or disturbance, including discharges, are permitted within 250 feet of a river, stream, wetland spring, headwater, wet meadow, wet pine savanna, pond, tributary, lake, coastal slough, sand bar, vernal pools, calcareous seepage marsh, or small, marshy calcareous stream. This stipulation was created during the collaborative Arkansas Best Management Practices document (2009) which was developed in coordination with FWS, FS, BLM, state agencies and industry representatives. A stipulation exception may be granted if the operator agrees to 1) span creeks, rivers, wetlands, and floodplains by attaching pipelines to bridges; 2) directionally drill wells and pipelines from upland sites under creeks, rivers, other waters, and wetlands or 3) implement other measures developed in consultation with FWS and in coordination with state agencies. A modification may be granted which will reduce the buffer if the adjacent waterway has been surveyed for 100 yards upstream and 300 yards downstream of the site, and the results document the lack of suitable/occupied/critical habitat for listed species which may be affected by the project, as determined by the FS, BLM and FWS.

The FS will closely analyze areas proposed for drilling in APDs during the onsite inspection, since regional wetland inventories often do not capture small wetlands. EPA requires that Storm Water Pollution Prevention Plans and SPCCP be in place to prevent any spill from reaching surface water due to rain events or accidental release of fluids related to production operations. Specific mitigation for effects on water resources would be deferred to the APD stage. The Minerals Operations Clauses and Attachments listed in the Appendix D of the 1999 KNF Revised LRMP lists many requirements implemented at the APD stage that would reduce effects on surface and ground water. Some examples include: At the APD stage, a standard FS COA

will apply that the requirement to use silt fencing along the stream-side prior to removal of trees and vegetation. The silt fencing would be a self-supported system and should prevent channel bank erosion from occurring on the well location. Likewise, an adequate amount of sediment control measures should be in place throughout the well location and access right-of-way so that all sediment and debris is removed prior to discharging any water runoff on or from the project area.

In addition, the FS requires fluid impermeable containment systems (i.e. liners, dikes, berms) be placed in, under and/or around any tank, pit, drilling cellar, or ditches associated with the drilling process, or other equipment that use or has the potential to leak/spill hazardous and non-hazardous fluids, to prevent chemicals from penetrating the soil and impacting the aquifer or from moving off-site to a surface water source.

4.9 Floodplains/Riparian Areas/Wetlands

Information regarding the effects of oil and gas development on floodplains, riparian areas, and wetlands are referenced in the 1999 KNF FEIS on page 4-133. No significant adverse impacts on wetlands or floodplains are anticipated. Floodplains and wetlands would be protected under all alternatives. Under the requirements of Executive Order 11990, wetland protection would be provided by ensuring that new construction of roads and other facilities would not have an adverse effect on sensitive aquatic habitat. In addition, wetland evaluation would be required before issuing special-use permits in areas where conflicts with wetland ecosystems may occur. Mitigation measures have been designed to conserve riparian areas and protect floodplains, as required by Executive Order 11988. Protective measures for riparian areas include the delineation of riparian area protection zones which are designated as unsuitable for timber production. Any vegetation manipulation in these areas would be for the enhancement of riparian-dependent resources. Floodplains would be managed by locating critical facilities away from floodplains or by using structural mitigation measures.

4.9.1 Mitigation

For the protection of jurisdictional wetlands, SHPZs, and RAPZs, FS CSU1, CSU2, and NSO stipulations apply to this lease. A FS NSO stipulation applies to the lease parcels containing wetlands located on the Winn and Calcasieu Districts which would not allow surface disturbance on these tracts. A CSU1 stipulation is attached to those parcels on the Catahoula District and states that roads and clearing of right-of-way vegetation may occur if a site-specific environmental analysis determines that the mitigated environmental effects would not be significant. FS lease notice #4 also applies to the lease parcels and states that all activities within lands classified as wetlands may require special measures to mitigate adverse impacts to the resource values. They must comply with EOs, regulations and laws and be in accordance with the LRMP guidelines. To protect the water quality of watersheds and natural stream substrate and morphology and to avoid potential impacts to aquatic species and their habitat, a BLM stipulation regarding freshwater aquatic habitat applies to this lease. The stipulation states that no surface occupancy or disturbance, including discharges, are permitted within 250 feet of a river, stream, wetland spring, headwater, wet meadow, wet pine savanna, pond, tributary, lake, coastal slough, sand bar, vernal pools, calcareous seepage marsh, or small, marshy calcareous stream.

4.10 Invasive/Exotic Species

Exploration/development of the proposed leases may contribute to the spread or control of invasive or non-native species. Any surface disturbance could establish new populations of invasive non-native species, although the probability of this happening cannot be predicted using existing information. Noxious weed seeds can be carried to and from the project areas by construction equipment, the drilling rig and transport vehicles. Particular care should be exercised for the parcels listed in Section 3.11 that are known to contain invasive species. At the APD stage, FS requirements for use of weed control strategies would minimize the potential for the spread of these species.

4.10.1 Mitigation

Mitigation is deferred to site-specific development outlined by the SUP at the APD stage. BMPs require that all federal actions involving surface disturbance or reclamation take reasonable steps to prevent the introduction or spread of noxious weeds, including requirements to use weed-free hay, mulch and straw. Final seed mixtures will be according to FS seeding specifications (Appendix F). Post-construction monitoring for cogon grass and other invasive plant species should be conducted to ensure early detection and control. If invasive species are found, the proper control techniques should be used to either eradicate the species from the area or minimize its spread to other areas. If cogon grass is found on site, equipment should be washed before exiting the site to prevent the spread of this highly invasive species to other locations.

4.11 Special Status Species

Issuing leases for the subject parcels would have no effects on special status species, however subsequent development on the lease could. Threatened and endangered species may be disturbed during construction, drilling, or hydraulic fracturing operations, as these activities involve many vehicles, mobile and non-mobile heavy equipment, and numerous noise-producing equipment (i.e. generators, compressors). The most significant impacts would be limited to the construction, drilling, and completion/stimulation phases, which can span from several weeks to several months and is entirely dependent on the size and extent of new surface disturbance, length of the well bore, formations encountered during drilling, and specific completion methodologies used, just to name a few factors. During production, impacts from noise and human disturbance would be less than that associated with construction, drilling, and/or completion operations. In general, most wildlife species would become habituated to the anthropogenic disturbances. For other wildlife species with a low tolerance to activities, the operations on the well pad would continue to displace wildlife from the area due to ongoing disturbances such as vehicle traffic from inspectors and semi-trucks hauling produced fluids, noise from compressors and/or a pump-jack if needed, and equipment maintenance. These impacts would last for the life of the well. Information contained in the LRMP, pages 4-41 to 4-44 (Minerals management, range management, recreation, structures, and transportation) is incorporated by reference. This information is summarized in the preceding paragraphs.

Activities associated with oil and gas production that could occur from issuing leases for the subject parcels from the September 2012, December 2012, and March 2013 lease sales, in

addition to future development could result in decreased use of KNF by threatened and endangered species. Human noise and activity associated with production could cause wildlife to move elsewhere. In addition, a decrease in available habitat due to construction of well pads and access roads could also cause wildlife to move to surrounding areas. Reclamation of well pads could allow for species to use the sites again as long as reclamation creates similar habitats to what was originally there. In short, cumulative impacts associated with continued oil and gas development on KNF could include displacement of threatened and endangered species to surrounding areas or a decrease in population viability if suitable habitat is not available in surrounding areas.

4.11.1 Northern Long-eared Bat

Direct impacts associated from clearing forested areas for the construction of well pads and access roads would include: a loss of roost tree availability, a loss of foraging areas, and disturbance created from human noise and activity. Human noise and activity would primarily be limited to the construction, drilling, and completion phases and would diminish during the production phase of the well and therefore would be of short duration. Roosting and foraging habitat is available on KNF in areas surrounding the lease sites. Future use of the lease sites would be dependent on reclamation success and methods. Cumulative effects of oil and gas production on KNF would include a short-term reduction of suitable foraging and roosting habitat for this species in addition to other ongoing activities on the forest.

4.11.1.1 Mitigation

FS Lease Notice #3 applies to these leases and states that exploration and development proposals may be limited or modifications required if activity is planned within the boundaries of a threatened, endangered or sensitive plant or animal species location as it then exists. A FS CSU stipulation (CSU1) also applies to this lease to protect SHPZs and will be implemented in areas within the vicinity of northern long-eared bat occurrence records. CSU1 states that placement of mineral extraction equipment, buildings, roads, ponds, and wellpads and the clearing of pipeline right-of-way vegetation are prohibited (Figure 33). A second CSU (CSU2) stipulation applies to this lease and will be implemented in areas in the vicinity of these records to protect RAPZs. CSU2 states that roads and clearing of right-of-way vegetation may occur if a site-specific environmental analysis determines that the mitigated environment effects would not be significant.

However, there could be unknown occurrences of this species on any of the forested parcels and there are no CSU stipulations that would protect this species and/or habitat outside of SHPZs or RAPZs. On September 3, 2014, the FS and FWS discussed the potential for affects to this species from oil and gas development projects on KNF. The FS stated that a site-specific analysis and ESA consultation with FWS would occur at the APD stage for all projects on KNF that occurred on areas that provided suitable habitat for this species. FWS recommends that the guidance in the following document be strictly followed before any ground disturbance occurs, "Interim Presence/Absence Survey Guidance from the 2014 Northern Long-Eared Bat Interim Conference and Planning Guidance." This document requires presence/absence surveys following FWS protocols for projects at locations that provide suitable habitat for this species.

As a result, BLM has determined that the proposed project may affect, but is not likely to adversely affect the northern long-eared bat.

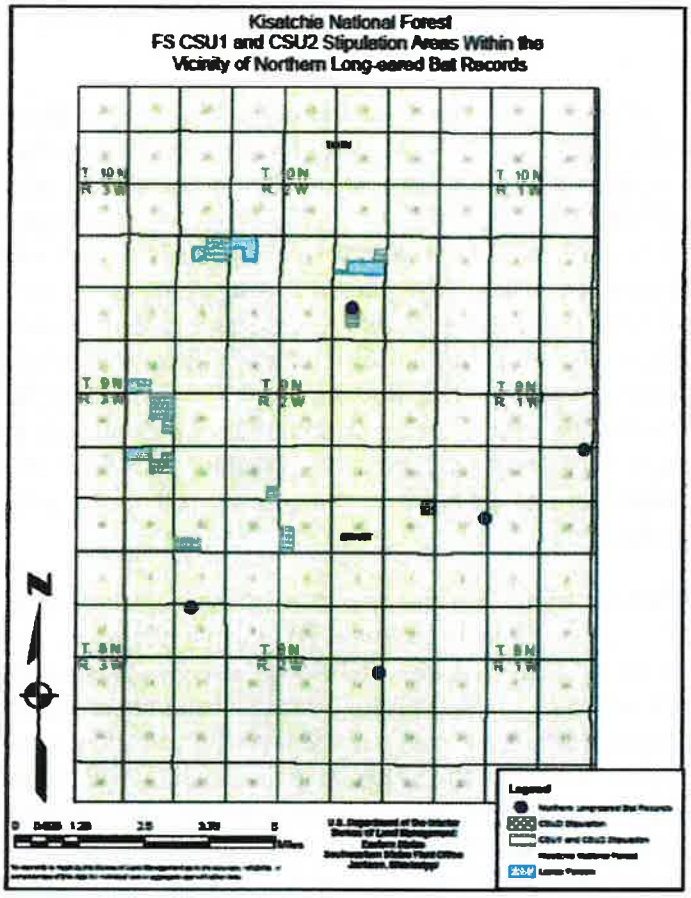

Figure 33. FS CSU1 and CSU2 stipulation areas on the lease parcels within the vicinity of northern long-eared bat records on KNF.

4.11.2 Louisiana Pearlshell

While there would likely be no direct effects from oil and gas development on the Louisiana pearshell, indirect and cumulative effects could occur from erosion and sedimentation issues in water bodies utilized by this species due to well pad and access road construction. Erosion and sedimentation could create changes in water quality and quantity.

4.11.2.1 Mitigation

FS CSU1, CSU2, and NSO stipulations to protect jurisdiction wetlands, SHPZs, and RAPZs apply to these leases. These stipulations would not allow for or would limit surface disturbance near water bodies which would help to prevent water quality degradation. In addition, FS Lease Notice #3 also applies to the leases and states that exploration and development proposals may be limited or modifications required if activity is planned within the boundaries of a threatened, endangered or sensitive plant or animal species location as it then exists. FS Lease Notice #4 also

applies to this lease and states that all activities within areas classified as wetlands may require special measures to mitigate adverse impacts to the resource values. These stipulations and lease notices along with proper erosion control measures at the development stage should protect this species from potential affects from development occurring as a result of issuing the subject lease parcels.

In addition to stipulations and lease notices, the LRMP outlines two forest-wide guidelines for this species on page 2-74. The first guideline is to manage habitat for the Louisiana pearlshell mussel by complying with conservation measures addressed in the Louisiana pearlshell Recovery Plan including maintaining high water quality in streams where the species is known to occur. The second guideline is to protect Louisiana pearlshell mussel habitat by reducing the delivery of sediment into the stream channel using the following guidance: issue oil and gas leases with a highly restrictive CSU stipulation within all SHPZs and RAPZs inside Louisiana pearlshell sub-watersheds, ensure that roads be constructed as far from streambeds as practical (preferably along ridges), provide improved roadway ditch relief by increasing the number of lead-off ditches, construct lead-off ditches so that they do not discharge directly into streams, and provide for temporary erosion control reconstruction which includes hay-bale ditch checks, inclusion of annual grass deed (rye) into the permanent seed mix, and placing silt fences along the road right-of-way where needed.

A BLM freshwater aquatic habitat stipulation also applies to these leases and states that there will be NSO within 250 feet of a water body (Appendix B). An exception may be granted if the operator agrees to 1) span creeks, rivers, wetlands, and floodplains by attaching pipelines to bridges; 2) directionally drill wells and pipelines from upland sites under creeks, rivers, other waters, and wetlands or 3) implement other measures developed in consultation with FWS and in coordination with state agencies. A modification may be granted which will reduce the buffer if the adjacent waterway has been surveyed for 100 yards upstream and 300 yards downstream of the site, and the results document the lack of suitable/occupied/critical habitat for listed species which may be affected by the project, as determined by the FS, BLM and FWS. A BLM stipulation regarding endangered species also applies to this lease. The stipulation states that BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat.

The FS is responsible for conducting a site-specific analysis and consulting with FWS at the APD stage. As a result, and due to the stipulations, lease notices, and FS guidelines, BLM has determined that issuing the sold leases may affect, but is not likely to adversely affect the Louisiana pearlshell.

4.11.3 Pallid Sturgeon

Numerous creeks are located on the lease parcels which drain into the Red River, Little River, and Black River and ultimately into the Atchafalaya River. There would likely be no direct effects from oil and gas development on the pallid sturgeon, however indirect and cumulative effects could occur from erosion and sedimentation issues due to well pad and access road construction, which could create changes in water quality and quantity in creeks and rivers which could ultimately affect the Atchafalaya River.

4.11.3.1 Mitigation

The BLM freshwater aquatic habitat stipulation, FS CSU1, CSU2, and NSO stipulations (described above) to protect SHPZs, RAPZs, and jurisdictional wetlands, FS Lease Notice #3 regarding wetlands outside of SHPZs and RAPZs, and use of proper erosion control measures during the development phase outlined in Appendix C of the KNF LRMP, applies to these leases and should protect this species from potential affects. As a result, BLM has determined that the proposed project may affect, but is not likely to adversely affect the pallid sturgeon.

4.11.4 Interior Least Tern

There is no suitable habitat for this species on the lease parcels and therefore, BLM has determined that there will be no effect on the interior least tern from issuing the sold leases.

4.11.5 Red-cockaded Woodpecker

Direct effects on the RCW from oil and gas development could include the removal of roosting and foraging habitat due to well pad and access road construction. Indirect effects could include disturbance to individuals due to human noise and activity. This would be limited to the construction, drilling, and completion phases however and would be localized and of short duration. Cumulative effects could include long term (>100 years) loss of RCW suitable roost trees and habitat.

4.11.5.1 Mitigation

The FS CSU1 stipulation designed to protect SHPZs, will cover all of the areas on the subject parcels that contain RCW records excluding: T6N, R6W, Sec. 20, 28, 34, and 35 (Figure 34). CSU1 would not allow for any surface disturbance. Some of the areas with a CSU1 stipulation also have a CSU2 stipulation to protect RAPZs, a CSU2a stipulation due to military activities, and a NSO stipulation to protect jurisdictional wetlands and 4 recreation sites. In addition, a CSU2 stipulation applies to T6N, R6W, Sec. 28, 34, and 35 (Figure 35) and a NSO stipulation applies to T6N, R6W, Sec. 20 (Figure 36). As a result, all of the parcels containing RCW records contain a CSU1, CSU2, CSU2a, or NSO stipulation. In addition, the FS will conduct a site-specific analysis and consult with FWS at the APD stage. The FS CSU1, CSU2, CSU2a, and NSO stipulations, standard BLM endangered species stipulation and FS listed and special species Lease Notice #3 should protect this species from affects from the proposed project.

In addition to BLM and FS stipulations and lease notices, the LRMP lists forest-wide standards and guidelines for the RCW which would be adhered to at the APD stage. The standards and guidelines for this species as discussed in the LRMP on pages 2-61 to 2-73 are too numerous to outline in this EA, however some of the guidelines that are the most relevant to oil and gas leases include:

- Timber harvest, other cutting, or killing of trees is prohibited within clusters or replacement or recruitment stands

- Cutting of living or dead cavity trees in active or inactive clusters, including inactive clusters identified as replacement or recruitment stands, is prohibited
- FWS must be contacted and issue concurrence before any cavity tree is cut
- The development of new concentrated equipment use or concentrated human use areas is prohibited within clusters, replacement and recruitment stands
- All potentially disturbing activities within clusters shall be scheduled before or after the nesting season
- Construction of linear rights-of-way such as roads, powerlines, or pipelines is prohibited within clusters, replacement or recruitment stands

As a result of stipulations, lease notices, and forest-wide standards and guidelines, BLM has determined that the proposed project may affect, is not likely to adversely affect the RCW.

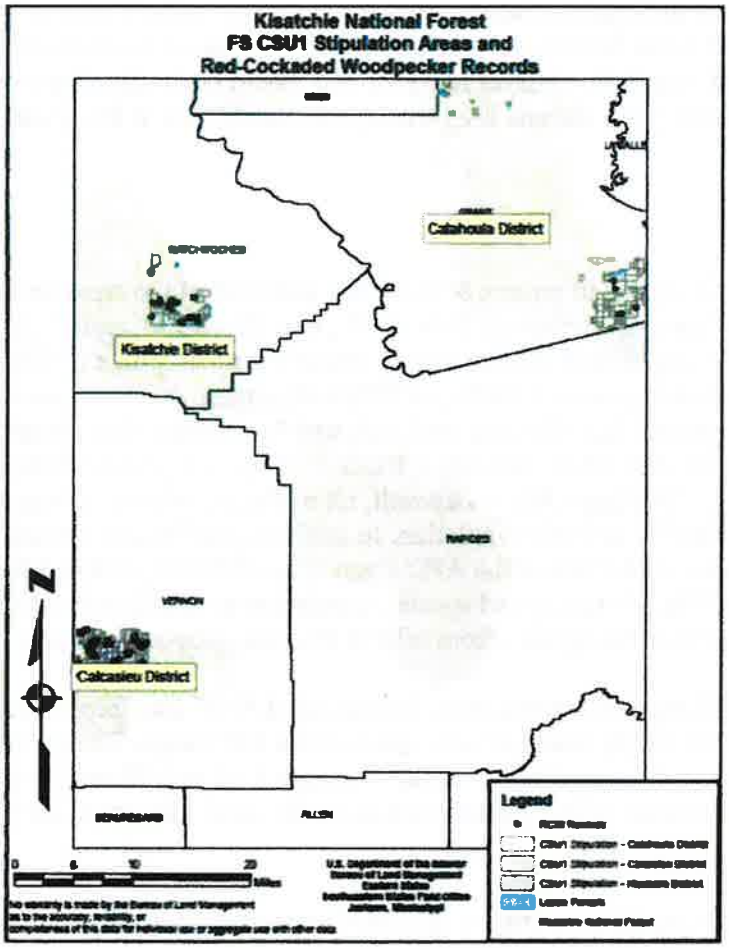

Figure 34. FS CSU1 stipulation areas and RCW records on lease parcels.

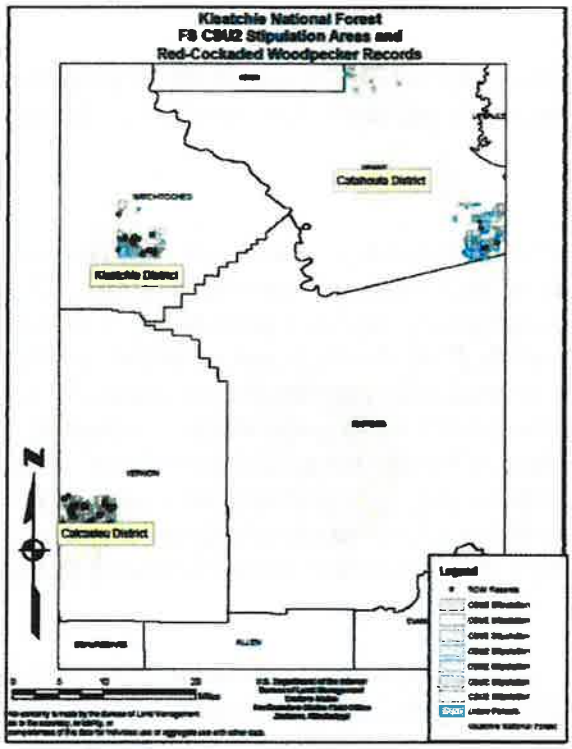

Figure 35. FS CSU2 stipulation areas and RCW records on the lease parcels.

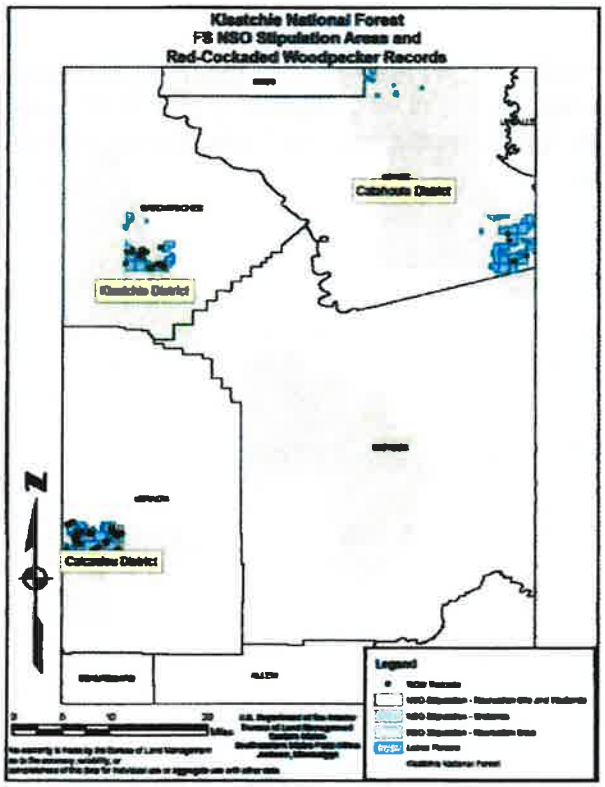

Figure 36. FS NSO stipulation areas and RCW records on the lease parcels.

4.11.6 Sprague's Pipit

No suitable habitat for this species occurs within the vicinity of the project area. As a result, BLM has determined that the proposed project will have no effect on the Sprague's pipit.

4.11.7 Louisiana Pine Snake

Surface and ground disturbance from the development of well pads, access roads, pipelines, and utility lines could have an impact to the LPS and the associated HMAs. These ground disturbing activities associated with drilling operations would be disclosed within the site specific APD. With continued implementation of the KNF standards and guidelines, participation in the LPS CCA and the BLM stipulations, impacts to this species are expected to be negligible, direct, short-term, and adverse during site specific drilling operations. Negligible, direct, long-term, adverse conditions upon completion of the drilling activities would be anticipated to occur. BLM has determined that the proposed project may affect, but is not likely to adversely affect the LPS. Negligible impacts, by definition, are unmeasurable and therefore cannot be added to other past, present and reasonably foreseeable future actions to produce a measurable cumulative impact.

Additionally the FWS recommends that potential impacts to the LPS and its habitat be re-evaluated in cooperation with their office, during the APD stage prior to any drilling, surface disturbance, or clearing of forested land parcels on the Kisatchie and Vernon Districts.

4.11.7.1 Mitigation

A FS CSU1 stipulation will be implemented in all areas of the lease parcels containing LPS habitat excluding: T6N, R6W, Sec. 20, 21, and 28 (Figure 37). A FS CSU2 stipulation will be implemented in Sec. 28. Sec. 20 and 21 are the only nominated parcel areas of LPS habitat that are not covered by a stipulation.

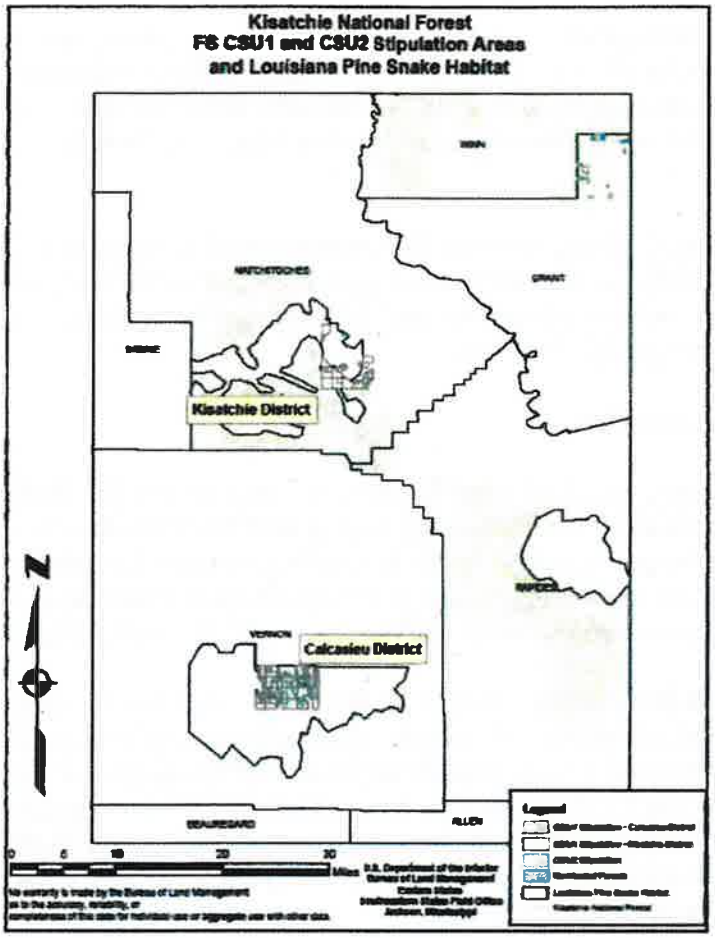

Figure 37. Map of FS CSU1 and CSU2 stipulation areas and LPS habitat located on the lease parcels.

4.11.8 Mitigation Relevant to All Special Status Species

If the leases result in oil or gas exploration and development, site-specific surveys for threatened or endangered species may be required. Additional consultation with FWS would occur at that time, if necessary.

FS and BLM stipulations and lease notices regarding rare species apply to this proposal. FS Lease Notice #3 states that exploration and development proposals may be limited or modifications required if activity is planned within the boundaries of a threatened, endangered or sensitive plant or animal species location as it then exists. All activities within these areas must be conducted in accordance with existing laws, regulations, and the LRMP guidelines. The BLM stipulation states that the BLM may recommend modifications to exploration and development proposals to further the conservation and management objectives for threatened, endangered, or other special status plant or animal species or their habitat to avoid BLM-approved activity that would contribute to a need to list such a species or their habitat. To protect threatened, endangered, candidate, proposed, and BLM sensitive plant species, a second stipulation applies to this lease and applies for all 53 parcels. The stipulation states that all suitable special status plant species habitat will be identified during environmental review of any proposed surface use

activity. All operations outlined in the SUP will be analyzed and surveyed by the FS to determine if threatened, endangered, or sensitive plant species are present and will confer with FWS. Operations will not be allowed in areas where sensitive plants would be affected. BLM sensitive plant species are those species that are not federally listed but which are designated by the BLM State Director for special management consideration. This includes federal candidate species.

FS COAs will be developed during site-specific environmental analysis and will supplement conditions included in the SUP. Requirements and guidelines that would apply at the APD stage to protect threatened and endangered species and habitats can be found in the KNF Revised LRMP in Appendix D on pages D-14 to D-18.

4.11.9 Consultation/Coordination

Consultation with FWS, Louisiana Ecological Services occurred on July 25, 2014. FWS responded on September 17, 2014 stating that they concur with BLM's determination that there will be no effect from the proposed project for the interior least tern or Sprague's pipit due to unsuitable habitat and that the project may affect, but is not likely to adversely affect the northern long-eared bat, Louisiana pearlshell, pallid sturgeon, RCW, and LPS (Appendix C).

A request was submitted to the LNHP on August 21, 2014 to review their files for records indicating the occurrence of rare plants and animals, outstanding natural communities, natural or scenic rivers, or other elements of special concern within or near the project site. A response was received on November 10, 2014 and is located in Appendix C. LNHP data regarding rare plants and animals, natural communities and scenic rivers have been incorporated into the Sensitive Plant Species, Special Status Species, Rare Communities, and Riparian Area Sections (3.13.1.3, 3.12, 3.13.1.2 and 3.10.2 respectively).

4.12 Vegetation and Wildlife

Information regarding the effects of oil and gas development on vegetation and wildlife are referenced in the 1999 KNF FEIS on page 4-19 to 4-60. Impacts on vegetation and wildlife from oil and gas development could result from increased habitat fragmentation, noise, or other disturbance during development. Although reclamation and restoration efforts for surface disturbance could provide for the integrity of other resources, these efforts may not always provide the same habitat values (e.g. structure, composition, cover, etc.) in the short or in some instance, the long-term, in complex vegetative community types (e.g., shrub oak communities). Short-term negative impacts to wildlife would occur during the construction and production phase of the operation (drilling, fracturing, production, etc.) due to noise and habitat destruction. In general, most wildlife species would become habituated to the new facilities. For other wildlife species with a low tolerance to activities, the operations on the well pad would continue to displace wildlife from the area due to ongoing disturbances such as vehicle traffic, noise and equipment maintenance. The magnitude of the above effects would be dependent on the rate and location of the oil and gas development, but populations could likely not recover to pre-disturbance levels until the activity was completed and vegetative community restored.

Cumulative effects on wildlife and vegetation from oil and gas production on KNF could include an overall loss of suitable habitat.

The RFD projects that a maximum of 20 well pads could be constructed for a total of 165 acres disturbed, if all 53 leases are developed. An additional 68.87 acres (20 X 5000 X 30 feet) could be disturbed for access roads and pipeline infrastructure and an additional 30 acres could be disturbed for other production and storage facilities. Total estimated disturbance is 263.87 acres. This EA also assumes that approximately 60 acres (20 X 3 acres/pad) would be reclaimed after wells are put in production for a net disturbance of 203.87 acres for all 53 parcels.

Many of the common species expected to occur on the lease parcels have broad habitat requirements and would continue to be found in a variety of habitats in the surrounding areas. Wildlife use of the site after the well is put into production would vary depending on vegetation and succession stage. Once put into production, the well pad would be reduced in size and the reserve pit would be graded and seeded. The producing well site would be subject to regular maintenance and inspection. Wildlife use of the site is dependent on the adequacy of restoration. However, over the life of the well, some of the acreage would be excluded from utilization by most wildlife species.

4.12.1 Mitigation Common to All Species

Measures would be taken to prevent, minimize, or mitigate impacts to fish and wildlife animal species from exploration and development activities. Prior to authorization, activities would be evaluated on a case-by-case basis, and the project would be subject to mitigation measures. Mitigation could potentially include rapid re-vegetation, noise restrictions, project relocation, or pre-disturbance wildlife species surveying.

FS COAs will be developed during site-specific environmental analysis and will supplement conditions included in the SUP. Examples of FS COAs that would apply at the APD stage to protect vegetation and wildlife can be found in the LRMP in Appendix D on pages D-14 to D-18.

4.13 Migratory Bird Species of Concern

Surface disturbance from the development of well pads, access roads, pipelines, and utility lines can result in an impact to migratory birds and their habitat. Cumulative effects on migratory birds could increase as oil and gas development increases in the area. The extent of the effect will be dependent on the amount of increase in development.

FWS estimates that 500,000 to one million migratory birds are killed annually throughout the U.S. in oil field production skim pits, reserve pits, and centralized oilfield wastewater disposal facilities (FWS 2011). Numerous grasshoppers, moths, June bugs, and the like become trapped on the surface in tanks and on pits, and become bait for many species of migratory birds. Open tanks and pits then become traps to many species of birds protected under the MBTA. Properly covered tanks and pits (and regularly inspected covered tanks and pits) is imperative to the continued protection of migratory birds in the well pad area.

4.13.1 Mitigation

Per the MOU between FS and FWS that was signed in 2008, entitled, "To Promote the Conservation of Migratory Birds," the FS has agreed to "within the NEPA process, evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors. This would include:

1. Evaluating and balancing long-term benefits of projects against any sort-or long-term adverse effects when analyzing, disclosing, and mitigating the effects of actions.

2. Coordinating with the appropriate FWS Ecological Services office when planning projects that are likely to have a negative effect on migratory bird populations. Cooperate in developing approaches to minimize negative impacts and maximize benefits to migratory birds.

3. Consider approaches, to the extent practicable, for identifying and minimizing take that is incidental to otherwise lawful activities including such approaches as:

    - Altering the season of activities to minimize disturbances during the breeding season
    - Retain the integrity of breeding sites
    - Give consideration to key wintering areas, migration routes, and stopovers "

4.14 No Action Alternative

Under the No Action Alternative, leases would not be issued for the 53 parcels and all monies would be returned. There would be no subsequent impacts from oil and/or gas construction, drilling, and production activities. The No Action Alternative would result in the continuation of the current land and resource uses in the proposed lease areas.

4.14.1 Environmental Justice and Social and Economic Environment

By not issuing the leases for the 53 parcels under the No Action Alternative, there may be negative effects on the overall employment opportunities related to the oil and gas and service support industry, as well as a loss of the economic benefits to state and parish governments related to royalty payments and severance taxes. However, there would be no increase in activity and noise associated with these leases unless the land is used for other purposes.

4.14.2 Cultural Resources and Native American Concerns

If the leases are not issued and cultural resource surveys are not conducted, direct and indirect impacts may continue but would not be associated with the development of oil and gas resources. Direct impacts are those such as completely destroying a site by "relic hunters" or by people picking up artifacts. Other direct impacts may be the mixing of layers in a site by plowing or the

destruction of a site by land leveling. Indirect impacts are those such as after timber thinning or clear-cutting resulting in erosion of a site.

4.14.3 Mineral Resources

Under the No Action Alternative there would be no new impacts from oil and gas production on the lease parcels. Oil and gas development of federal, state, and private minerals would continue on the land surrounding the lease parcels. No additional natural gas or crude oil from the parcels would enter the public markets and no royalties would accrue to the federal or state treasuries. An assumption is that the No Action Alternative would not affect current domestic production of oil and gas. However, this may result in reduced federal and state royalty income, and the potential for federal land to be drained by wells on adjacent private or state land. Oil and gas consumption is driven by a variety of complex interacting factors including energy costs, energy efficiency, availability of other energy sources, economics, demography, and weather or climate. If the BLM were to forego issuing the leases and potential development of the subject parcels, the assumption is that the public's demand for the resource would not be expected to change. Instead, the mineral resource foregone would be replaced in the short- and long-term by other sources that may include a combination of imports, using alternative energy sources (e.g. wind, solar), and other domestic production. This offset in supply would result in a no net gain for oil and gas domestic production.

4.14.4 All Other Resources

No other resources would be affected under the No Action Alternative, as there would be no surface disturbance that could detrimentally affect these resources. The No Action Alternative would result in the continuation of the current land and resource uses on the parcels.

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