

3.0 Environmental Consequences

3.1 Introduction

Chapter 3 presents the predicted environmental effects of implementing the proposed action and each of the alternatives. It is organized by resource topics, with the impacts of all alternatives combined under resource headings. The affected environment and environmental consequences of the Proposed Action and alternatives are described, forming the **scientific and analytic basis** for the summary comparisons presented in Section 2.5. This chapter focuses on the project objectives listed in Section 1.3 and the issue listed in Section 1.8.

This chapter describes the existing condition of the relevant environmental resources within the South Branch area that **would be affected** by, or that **would affect** the proposed action or Alternative 2, if implemented. This description, combined with the description of the activities in Alternative 1: Do Not Permit (No Action) in Chapter 2 and the predicted effects of Alternative 1 in this chapter, establishes the **baseline conditions** against which the decisionmaker and the public can compare the potential effects of the Proposed Action and Alternative 2.

Existing and Reasonable Foreseeable oil and gas Development Scenario

If the SB1-8 well proves to be economic to produce, the operator would likely drill additional wells to further develop the target formation (Prairie du Chien or PdC). Recognizing that Savoy completed 3-D seismic studies over approximately 6,400 acres in the vicinity of the proposed well, an assumption of additional development is reasonable. One phase of the noise assessment requested additional information from Savoy regarding future plans. Savoy responded:

“At this point in time, the 3D seismic data has been acquired and is being processed. No decisions can be made about where or if additional well locations would be proposed until the final data interpretation is complete. If the 3D seismic indicates potential well locations, Savoy expects them to be located east and southeast of Hickey Creek Road (*i.e., River Lake Road*).” (italics added) (Note: The area to the east and southeast of Hickey Creek Road is outside of the SPM area.)

“Additional flowlines would be dependent on additional wells. Existing roads, pipelines and utilities would be followed if possible.”

“An additional well or wells would be flowed to the proposed facility. Alterations to the proposed facility would be minimal.”

In completing the noise assessment, the contractor assumed that the proposed facility could serve up to three (3) additional gas wells. Based on other PdC fields, four wells is a reasonable estimate of expected development.

An existing 8-inch Michigan Consolidated Gas Company transmission line runs north-south along River Lake Road. Any gas produced from future foreseeable development would be processed at the proposed production facility and would be put into this existing transmission line.

Table 3, Estimate of Additional Disturbance Associated with Foreseeable Development

Disturbance	Per Well	Cumulative	Cumulative Acres
Three Well pads	3.5 acres	10.5 acres	10.5 acres
Three Access Roads	.25 miles	.75 miles	2.0 acres
Upgrading of existing roads	1 mile	3 miles	1.5 acres
New pipeline ROW (not in existing road ROW)	.33 miles	1 miles	2.0 acres
Production Facility*	N/A	N/A	N/A
Total			16.0 acres

*assumes use of proposed production facility – no new construction

Hickey Creek Field – Oil and Gas Development

The Hickey Creek oil and gas field exists approximately two miles to the southwest of the proposed SB1-8. This field produces both oil from the Richfield formation and natural gas from the PdC formation. Currently, there are two producing oil wells in this field and one producing natural gas well. The State South Branch 1-19 natural gas well, which is located in SWSENW, Section 19, T25N, R1W, is within the SPNM area on NFS lands. The two Richfield oil wells are located on private land in Section 25, T25N, R2W.

Both T25N, R1W and R2W have seen moderate exploration over the years. The earliest well drilled on record was drilled in 1936 to a depth of 3,200 feet. It was a dry hole. Five wells were drilled during the period 1936-1950. Most recent drilling occurred during the 1980's and early 1990's. Cumulatively, 13 dry holes have been drilled in these two townships. Of the 13 dry holes, two were PdC wells, seven were Richfield wells, one was an Antrim well, and three were to unknown formations. There have been nine wells producing at one time or another in the two townships for varying lengths of time. As stated above, there are three that remain in production. Of the remaining six wells, there is one PdC shut-in well, one PdC plugged well, one Richfield plugged well, and three plugged Antrim test wells.

Based on the information provided by the operator and the data represented above, development of the Richfield formation for oil is speculative at this time. Our foreseeable development scenario, assuming the SB 1-8 well is productive, is limited to discussion of future PdC development.

3.2 Predicted Attainment of Project Objectives by All Alternatives

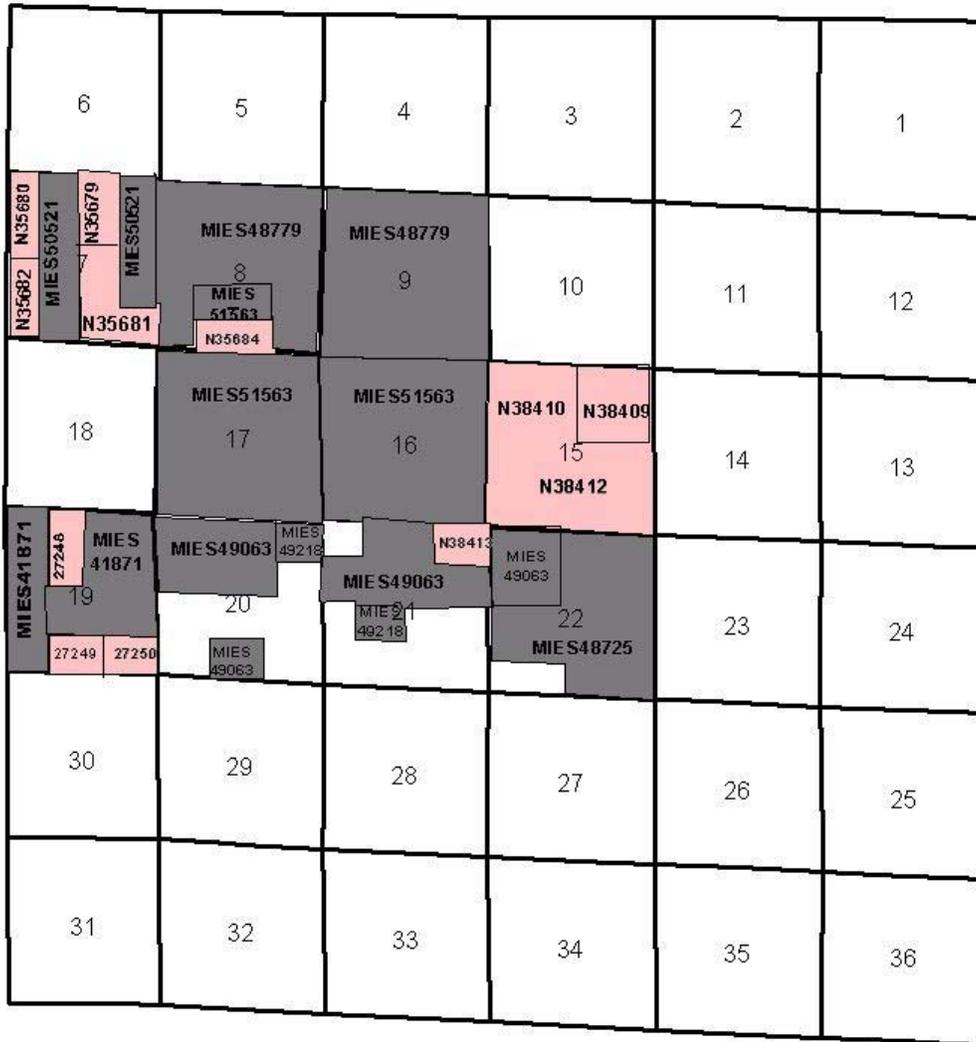
Predicted Effects on meeting legal obligations to lessee

Description of Relevant Affected Resources

Existing leases for surrounding areas are shown on Map 4, Mineral Leases Map.

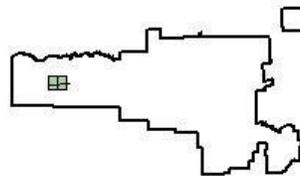
Map 4. Existing Leases Map

EXISTING LEASES



Crawford County
T25N, R1W

- Federal Leases
- State Leases



Description of Area Related to Cumulative Effects

For the purposes of analyzing cumulative effects, the analysis area would be the area of the existing mineral leases are shown Map 4. This includes the area which could be affected by foreseeable future development of wells should the exploratory well prove to be productive.

Effects of Alternative 1: (No Action)

Direct and Indirect Effects

Under this alternative the Forest Service would not approve the Surface Use Plan of Operation (SUPO) and the BLM could not issue the permit to drill. The lessee would be prevented from exercising their right to develop the minerals in the 6 leases this well would access.

Cumulative Effects

When combined with the no surface occupancy stipulation on the Mason Tract, this could increase the number of lease tracts that are inaccessible. Less oil and gas would be produced from the Huron-Manistee National Forests. Further exploration outside the SPM southeast of the drilling unit could be considered as Savoy stated (Section 3.1).

Effects of the Proposed Action and Alternative 2

Direct and Indirect Effects

Under the Proposed Action and Alternative 2, the SUPO and the APD would be approved with additional conditions of approval. This would meet the federal government's obligation to grant access to the lessee.

Cumulative Effects

The Proposed Action and Alternative 2 would have a beneficial cumulative effect on the federal mineral program, following direction in the laws, agencies' policies, and Forest Plan.

3.3 Predicted Effects of All Alternatives on Significant Issues

Predicted Effects on Recreational Experience on the South Branch of the Au Sable River, the Mason Tract and the South Branch Semiprimitive Nonmotorized area

There are three factors (visuals, noise, and odor) that would impact the recreational experience. Burning of hydrogen sulfide encountered while drilling could produce an odor. Petroleum odors are associated with the storage of petroleum products. Activities associated with the drilling and producing of a gas well will serve as a source of both intermittent and constant noises. Removing vegetation (trees, brush, and ground cover) and exposing soil will reduce the visual quality of the area. All three of these factors along with improved roads and additional vehicle traffic could contribute to the reduction in the recreational experience.

Description of Relevant Affected Resources

The proposed production facilities and a portion of the pipeline are in MPA 4.5 and the balance of the flowline/pipeline and wellhead are in MPA 6.1. The Recreation Opportunity Spectrum (ROS) is a system of classifying the range of recreational experiences, opportunities, and settings available on a given area of land. The ROS for MPA 6.1 is Semiprimitive Nonmotorized (SPNM) which is characterized by few and/or subtle human modifications and with a large probability of isolation from the sights and sounds of others. The ROS for MPA 4.5 is Roaded Natural which is characterized by a predominately natural environment with evidence of moderately permanent alternate resources and resource utilization. Evidence of the sights and sounds of humans is moderate but in harmony with the natural environment. Opportunities exist for both social interaction and moderate isolation from the sights and sounds of humans.

The proposed location for the exploratory well is within the South Branch SPNM Area. The area is on the east side of the State of Michigan's Mason Tract. Recreational activities in these two areas currently includes, but is not limited to: driving to the Mason Chapel and dock on the South Branch of the Au Sable River, canoeing and fishing, biking, cross country skiing, snow shoeing, dispersed camping, hunting, and mushroom and berry picking. This area is characterized by a forested setting.

The South Branch SPNM is mostly forested. All of the SPNM (MPA 6.1) was designated old growth, in the Forest Plan Amendment #24, March, 2003. An old growth designation does not preclude activities as directed in the Forest Plan from occurring.

Within the four compartments of National Forest System lands that make up the SPNM area only 4.6 percent is nonforested. Approximately seventy one percent of the stands are dominated by red and jack pine. Aspen/birch makes up approximately 17 percent of the area. Low wet forest ecosystems make up approximately 7.5 percent of the SPNM area. Approximately 1.5 percent of the area is in stands that are less than 10 years old.

FSR 4209, Mason Chapel road, cuts through the SPNM area. Driving along this road to the Chapel visitors pass through forest settings, a small opening, and pass a couple of low wet areas. The road to the Mason Chapel will remain open. Existing roads are used to access the forest and are maintained only in emergency situations when major damage occurred or potential damage to other resources is expected.

Immediately west of the South Branch SPNM area is the Mason Tract, a 4,699 acre area of State of Michigan land. The South Branch of the Au Sable River flows through the middle of the tract. The area is predominately in a forested condition. The Michigan Department of Natural Resources (MDNR) manages this area. Forest management is evident. Clearcuts and harvest activities have occurred intermittently over the past 10 years on approximately 400 acres. Logging equipment is used during the harvesting timeframe, November 1 – April 1 and includes: vehicles – cars, pick-up and semi-trucks, chainsaws, and logging equipment, i.e. feller-bunchers, skidders, and forwarders, and dozers. Most harvested areas are naturally regenerated, but some harvested areas are mechanically planted. There is a ski trail along the river, parking lots, some open roads providing access to the river, and a campground within the Mason Tract that MDNR manages and maintains. They are maintained using small power tools, lawnmowers, weed whips, snowplows, and a snowmobile pulling a trail groomer.

The South Branch of the Au Sable River is moderately to heavily used by anglers and is a popular stretch for canoeing. There are four liveries in Roscommon that utilize the stretch from Chase Bridge to Smith Bridge for commercial outfitting.

Currently a natural gas well and production facility is operating within the SPNM, SWSENW, Section 19, T25N, R1W, under an existing lease and a pipeline along River Lake Road to serve this facility is under permit. Seismic testing for mineral development on 6,400 acres near the proposed well site was conducted in 2004.

The rest of the area is within the Eldorado Kirtland's Warbler (KW) Management Area (MPA 4.5).

Foreseeable future activities in the Mason Tract, SPNM and KW Management Area include:

- Continued forest management activities within the Mason Tract. MDNR is planning harvesting silvicultural treatments and reforestation activities on approximately 1,200 acres over the next 10 years. (MDNR, 2004). Continued maintenance of the Mason Chapel, dock, and parking areas, trails, campgrounds and roads are expected.
- Continued recreational activities, canoeing, fishing, biking, cross-country skiing, hiking, camping, unauthorized snowmobile use (SPNM), and driving to the river and the Mason Chapel are expected. Maintenance of the roads would continue as needed to protect the resources i.e. soils, wetlands, water quality. Continued suppression of wildfires would occur.
- Continued mineral exploration activities, operation and maintenance as needed of the natural gas well, production facilities, and pipeline.
- Continued management of the Kirtland's warbler through timber harvesting including 18 acres of red pine thinning south of the proposed production facility location, and cowbird trapping.

VISUAL QUALITY

Because the terrain is generally flat in the project area and views are limited, the visual distance zone that will be analyzed is the foreground. Foreground is defined in the Forest Plan as; "That part of the scene or landscape nearest the viewer and in which detail is evident, usually ½ to ¼ mile from the viewer."

The Forest Plan, Visual Quality Objective Chart, IV-87, describes the visual aspects for planning and design based on the following definitions:

- **Sensitivity Level** - a particular degree or measure of viewer interest in the scenic qualities of the landscape. The degrees are: **1**-most sensitive, **2**- sensitive, and **3**-less sensitive.
- **Variety Class** – A particular level of visual variety or diversity of landscape character, described as:

1. **Distinctive (Variety Class A)** – Refers to unusual and /or outstanding landscape varieties that stand out from the common features in the character type.
 2. **Common (Variety class B)** – Refers to prevalent, usual, or widespread landscape variety with in the character type. It also refers to ordinary or undistinguished visual variety.
 3. **Minimal (Variety Class C)** – Refers to little or no visual variety in the landscape. A monotonous or below-average landscape when compared with the common features in the character type.
- **Visual Quality Objective (VQO)** – A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristic landscape. The five levels are:
 1. **Maximum Modification (MM)** – A visual quality objective that means management activities may dominate the characteristic landscape but should appear as natural occurrences when viewed as background area.
 2. **Modification (M)** – A visual quality objective that means management activities may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. They should appear as natural occurrences when viewed in foreground and middleground.
 3. **Partial Retention (PR)** – A visual quality objective that in general means management activities may be evident but remain subordinate to the characteristic landscape.
 4. **Retention (R)** - A visual quality objective that in general means management activities are not evident to the casual forest visitor.
 5. **Preservation (P)** – A visual quality objective that provides for ecological changes only.

Traffic counts were gathered on two roads 4209 (Road to Mason Chapel) and 4208 (well pad is located along this road). The table below displays the average number of vehicles traveling both ways on the two roads. Since these are both dead end roads, vehicles must return on the same road. Data was recorded during the following periods: July 2 to July 27, 2003; June 18 to June 30, 2004; and July 1 to July 29, 2004.

Table 4. Average Daily Number of Vehicles Traveling FR 4209 and FR 4208

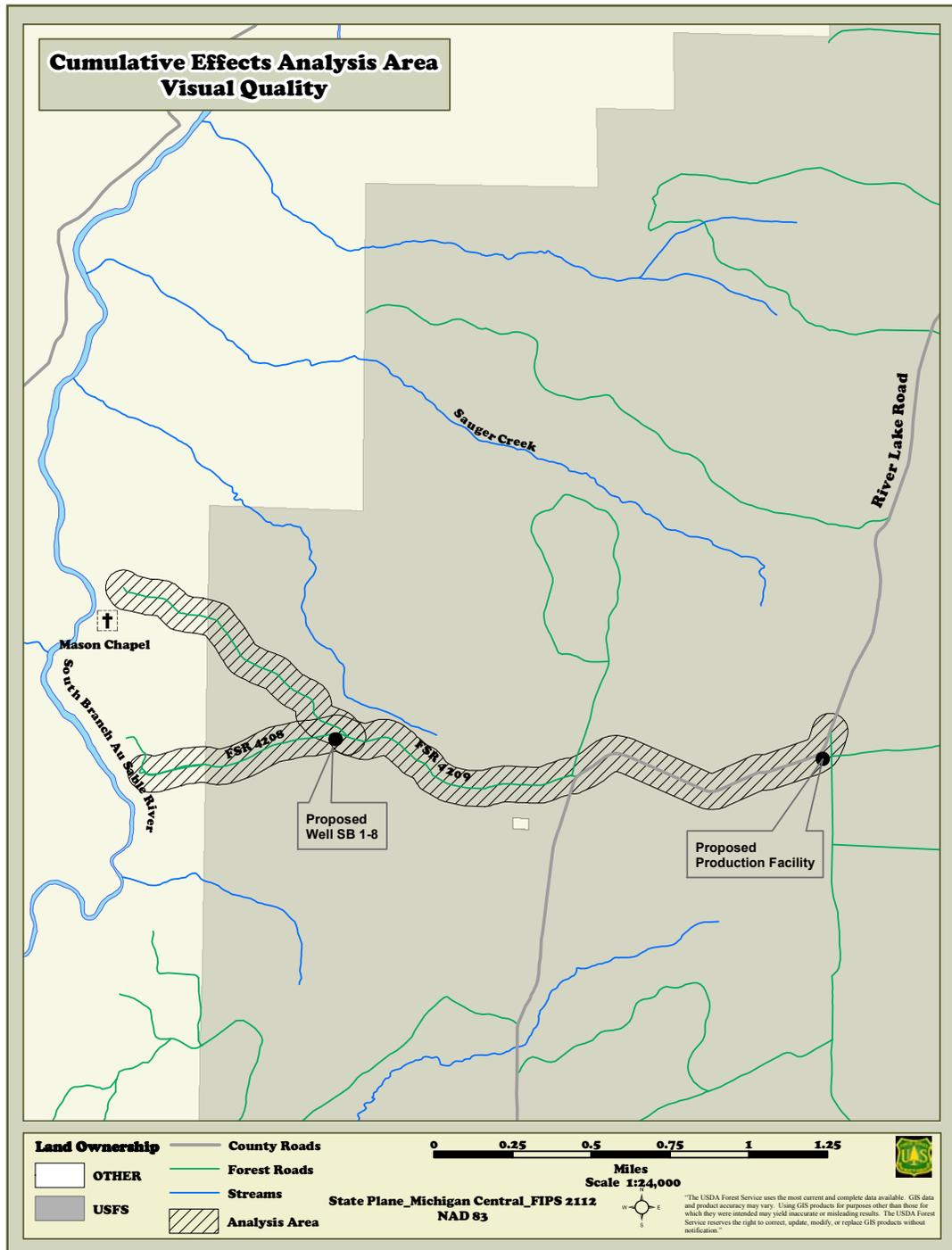
Forest Road	July 2003	June 2004	July 2004
4209 (Road to Mason Chapel)	7.0	4.5	4.0
4208 (Spur Road to Well Pad)	No data	2.9	1.1

One effect of improving FR 4209 and FR 4208 would be minor long term increases in vehicle traffic. People with sedans are more likely to drive down an improved road. Because FR 4209 would not be improved its entire length, traffic numbers to the Mason Chapel parking lot (west end of FR 4209) would likely not increase.

Description of Area Related to Cumulative Effects

Visual quality is evaluated from FR 4209 (road to the Mason Chapel), FSR 4208 (spur road to well pad), and River Lake Road (aka Hickey Creek Rd.) as shown on Map 5.

Map 5. Cumulative Effects Analysis Area – Visual Quality Map



FSR 4209

Current Condition

The road to the Mason Chapel, FR 4209, is a sensitivity level 1 with 1 being the most sensitive and 3 being the least. Because most recreationists that visit the Mason Chapel, fish the South Branch of the Au Sable River, or visit the SPNM area, have an expectation of viewing a large undisturbed natural landscape, it is a sensitivity level 1. The variety class for FR 4209 is common (Variety Class B). The landscape is largely flat and forested with a few openings (wetlands and uplands). Average traffic during the summer season is 4 to 7 vehicles per day with over 20 vehicles per day on some weekends. With 2 people per vehicle and a 7 month recreation season (May thru November), there could be a few thousand visitors traveling this road annually. This road also receives some unauthorized snowmobile use in the winter. The impact to the visual resource along FR 4209 may be noted by 2 to 3 thousand visitors in a year.

From the chart on page IV-87 of the Forest Plan, a sensitivity level 1 and variety class B in the foreground has a VQO of retention. A VQO of retention means that management activities are not evident to the casual forest visitor.

Effects of Alternative 1 - Do Not Permit (No Action)

Direct and Indirect Effects

Alternative 1 would have no effect on the visual quality along FSR 4209. No man-made activities are planned along the road. Visitors would notice changes due to natural processes. The VQO of retention would continue to be met. The condition of the road would not be improved encouraging sedans and low-clearance vehicles to travel the road. Alternative 1 would have no effect on visitors' recreational experience in the SPNM or the Mason Tract.

Cumulative Effects

When considered with all past, present, and foreseeable future activities, Alternative 1, would have no effect to the visual quality along FSR 4209. There could be temporary visual changes from natural processes but there are no planned activities along FR 4209 on NFS land. The State of Michigan is planning to harvest a red pine area just north of the Chapel in 2009. It appears that the harvest area would not be visible from the Chapel or FR 4209. The only effect on visuals could be the soil disturbance associated with the road work to get heavy logging equipment to the harvest area. This disturbance could be very minor because harvesting activities are only allowed in the winter (November 1 – April 1). The effect of the soil disturbance would be temporary. One growing season after the road work is complete there would likely be no visual evidence of the activity. The foreground would meet the VQO of retention after one growing season. No change is expected to the recreational experience of forest visitors to the SPNM area or the Mason Tract.

Effects on the Proposed Action

Direct and Indirect Effects

Approximately 20 larger (5 inches and greater diameter at breast height) trees would be removed, so that large drilling equipment could travel this road. Tree removal would generate slash and stumps. Also, a strip of ground vegetation approximately two feet wide adjacent and north of the road would be removed to place the flowline/pipeline. These activities would not meet the VQO of retention. Eventually (5-10 years) after the slash decomposed and the stumps

weathered the VQO of retention would be met. Five to ten years after the trees and vegetation are removed, some forest visitors would notice this activity as they drive down the road to the river or the Mason Chapel.

In the short term, during activities associated with drilling this well, numerous trucks will utilize FSR 4209. Because most of this traffic is expected to occur during winter months, this would impact a limited number of visitors. In the long term, if the well is productive, it is expected that the operator would make one trip to the wellhead daily. Improvement of FSR 4209 would create a minor long term increase in vehicle traffic. People with sedans are more likely to drive down an improved road. Because FR 4209 would not be improved its entire length, traffic numbers to the Mason Chapel parking lot (west end of FR 4209) would likely not increase. They would likely increase in the SPNM area along the improved FSR 4209.

Cumulative Effects

When considered with all past, present, and foreseeable future activities, the Proposed Action along FSR 4209 would be visible and decrease the visual quality over a 5 – 10 year period. It would not meet the VQO of retention during that time. In 5 -10 years with natural decomposition, this alternative would meet the VQO of retention, and visitors would not notice the past vegetation removal. There could be an increase in traffic from the additional low clearance vehicles traveling the improved portion of FSR 4209. Some visitors might notice the increase in traffic which could impact their recreational experience in the SPNM. In 2009, a timber harvest on the Mason Tract will improve the road to the Mason Tract parking lot which will allow low clearance vehicles access. This is expected to increase traffic encounters along FSR 4209 to the Chapel.

Effects on Alternative 2 - (Modified Proposed Action with Conditions of Approval)

Direct and Indirect Effects

In Alternative 2, the number of trees removed and the amount of ground disturbed along FSR 4209 is the same as the Proposed Action. Traffic effects would be the same as the Proposed Action. Visual effects on FSR 4208 would be the same as for the Proposed Action. In the short term (up to one growing season after activities are completed) the foreground would not meet the VQO of retention. Additional mitigation measures would be required to place stumps out of view and to chip or lop slash and scatter it to lie within 12 inches of the ground. After one complete growing season, it is expected the VQO of retention would be met. After one growing season these activities would not be evident to the casual forest visitor.

Cumulative Effects

When considered with all past, present, and foreseeable future activities, the cumulative effects for Alternative 2 along FSR 4209 would meet the VQO of retention within one growing season. It would not be evident to visitor in the area, and therefore, have no effect to their recreational experience after one growing season. The effects on traffic from improving the road would be the same as the Proposed Action.

FSR 4208

Current Condition

Forest Service Road 4208 is a narrow, low standard road that dead ends after approximately ½ mile. FSR 4208 is a spur road off of FSR 4209. Because most recreationists that visit the Mason Tract or the SPNM area have an expectation of viewing a large undisturbed natural landscape, it is a sensitivity level 1. The variety class for FR 4208 is common (Variety Class B). The landscape is largely flat and forested. Average traffic during the summer season is 1 to 3 vehicles per day with as many as 6 vehicles per day on some weekends. With 2 people per vehicle and a 7 month recreation season (May thru November), there are approximately one thousand visitors traveling this road annually. This road also receives some unauthorized snowmobile use in the winter. The impact to the visual resource along FR 4209 may be noted by one thousand visitors in a year.

From the chart on page IV-87 of the Forest Plan, a sensitivity level 1 and variety class B in the foreground has a VQO of retention. A VQO of retention means that management activities are not evident to the casual forest visitor.

Effects of Alternative 1 - Do Not Permit (No Action)

Direct and Indirect Effects

Alternative 1 would have no effect on the visual quality along FSR 4208. No man-made activities are planned along the road. Visitors would notice changes due to natural processes. The VQO of retention would continue to be met. The condition of the road would not be improved so no additional traffic is expected. Alternative 1 would have no effect on visitor's recreational experience in the SPNM or Mason Tract.

Cumulative Effects

When considered with all past, present, and foreseeable future activities, Alternative 1, would have no effect to the visual quality along FSR 4208. There could be temporary visual changes from natural processes but there are no planned activities along FR 4208 on NFS land. The State of Michigan is planning to harvest a red pine (thinning) and oak (shelterwood) stand along both sides of FSR 4208. This harvesting would require the reconstruction of FSR 4208 and take place in the next couple of years. These harvest activities would not meet retention for 5 -10 years, which means that these harvests are visually evident to the casual forest visitor for that period. With the reconstruction of FSR 4208 to access the Mason Tract timber harvest, a slight increase in traffic is expected.

Effects on the Proposed Action

Direct and Indirect Effects

Approximately 10 larger (5 inches and greater diameter at breast height) trees along FSR 4208 would be removed, so that large drilling equipment could travel this road. Tree removal would generate slash and stumps. Also, a strip of ground vegetation approximately two feet wide adjacent and south of the road would be removed to place the pipeline. Also, a well pad approximately 3.5 acres would be cleared and leveled. These activities would not meet the VQO of retention. Eventually (20-30 years) after the productive life of the well and the rehabilitation work is completed, the VQO of retention would be met. If the well is not productive rehabilitation work would start after drilling activities are complete, it could meet retention in 5-10

years. Five to thirty years after the activities are initiated; some forest visitors would notice this activity as they drive down the road.

In the short term, during activities associated with drilling this well, numerous trucks will utilize FSR 4208. Because most of this traffic is expected to occur during winter months, this would impact a limited number of visitors. In the long term, if the well is productive, it is expected that the operator would make one trip to the wellhead daily. Visitors driving along FSR 4208 would encounter a new spur road with a gate at the well site. Improvement of FSR 4208 would create a minor long term increase in vehicle traffic. People with sedans are more likely to drive down an improved road.

Cumulative Effects

When considered with all past, present, and foreseeable future activities, the Proposed Action along FSR 4208 would be visible and decrease the visual quality over a 5 – 30 year period. It would not meet the VQO of retention during that time. In 5 -30 years with well pad rehabilitation, this alternative would meet the VQO of retention, and visitors would not notice the past activities. There could be an increase in traffic from the additional low clearance vehicles traveling the improved portion of FSR 4208. Some visitors might notice the increase in traffic which could impact their recreational experience in the SPNM. In the next couple of years, a timber harvest on the Mason Tract will improve the road to the Mason Tract which will allow low clearance vehicles access. This is expected to increase traffic along FSR 4208.

Effects on Alternative 2 - (Modified Proposed Action with Conditions of Approval)

Direct and Indirect Effects

In Alternative 2, the number of trees removed and the amount of ground disturbed along FSR 4208 is the same as the Proposed Action. Traffic effects would be the same as the Proposed Action. Visual effects on FSR 4208 would be the same as for the Proposed Action. In the long term (5 – 30 years) the foreground would not meet the VQO of retention, which means these activities could be evident to the casual forest visitor for that period.

Cumulative Effects

When considered with all past, present, and foreseeable future activities, the cumulative effects for Alternative 2 along FSR 4208 would not meet the VQO of retention for 5 – 30 years. It would be evident to visitor in the area, and therefore, have an effect on their recreational experience. The effects on traffic from improving the road would be the same as the Proposed Action.

River Lake Road

Current Condition

River Lake Road (aka Hickey Creek Road) is maintained by Crawford County. Private landowners use it to access their property north of the proposed production facility. Visitors use the road for recreational activities, driving for pleasure, hunting, berry picking, etc. It is the boundary of the SPNM area (west of road). It has a sensitivity level of 2 which represents the “typical” viewer interest. The visual sensitivity level of the road varies. The variety class in the immediate vicinity of the production facility is minimal (Variety Class C). The variety class for the pipeline route along River Lake Road is Common (Variety Class B). Variety class B (more diverse area) will be used to determine the VQO for River Lake Road.

From the chart on page IV-87 of the Forest Plan, a sensitivity level 2 and variety class B in the foreground has a VQO of partial retention. A VQO of partial retention means management activities may be evident but must remain subordinate to the characteristic landscape.

Effects of Alternative 1 - Do Not Permit (No Action)

Direct and Indirect Effects

Because no activities are proposed, Alternative 1 would have no effect on the VQO along River Lake Road. People would continue to use the road to access the SPNM area for recreation, fishing, hunting, dispersed camping, etc. There would be no change to the visual quality, except from natural occurrences. The VQO of partial retention would continue to be met.

Cumulative Effects

When considered with all past, present, and foreseeable future activities, Alternative 1, would have no effect to the existing visual quality along River Lake Road. There is one proposed timber harvest along River Lake Road in 2008 on NFS lands. The proposed timber harvest is approximately 18 acres of red pine thinning 200-300 feet south of the production facility. It would be evident in the foreground, but would still meet the VQO of partial retention.

Effects of the Proposed Action and Alternative 2 - (Modified Proposed Action with Conditions of Approval)

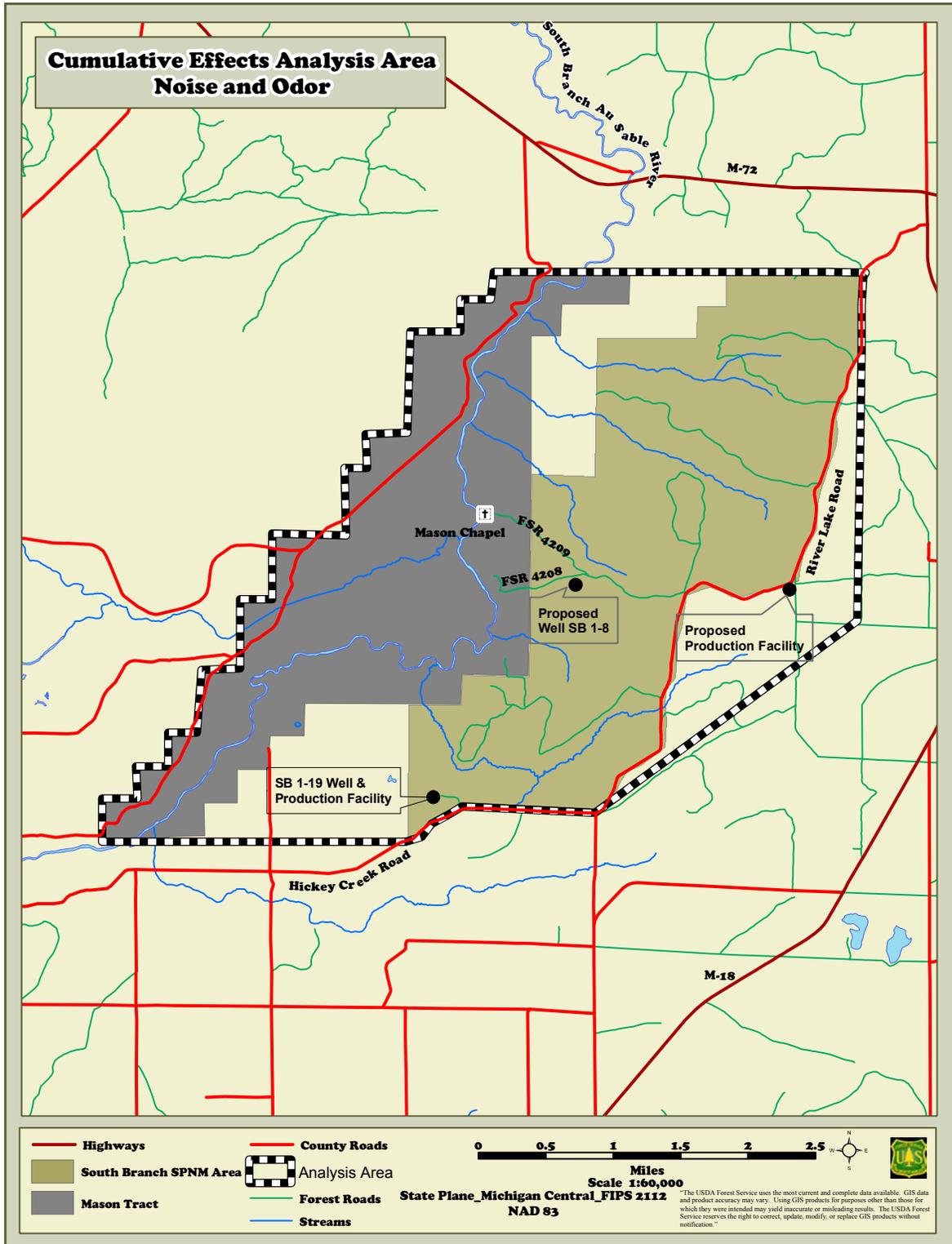
Direct and Indirect Effects

Approximately 30 larger (diameter at breast height of 5 inches and greater) trees and brush would be removed, so that a flowline/pipeline could be placed adjacent to the road. This tree and brush removal would generate slash. A strip of vegetation next to the road and approximately two feet wide would be removed to place the flowline/pipeline. Also, an access road and a 2 acre clearing would be constructed for the production facilities. These activities would meet the VQO of partial retention (general management activities are evident but must remain subordinate to the characteristic landscape). A 100 foot strip of vegetation would be retained between River Lake Road and the opening for the production facility. The access road into the production facility would be curved preventing people driving down River Lake Road from seeing directly into the clearing. There would be no effect to the visual quality as the objective of partial retention would be met.

Cumulative Effects

When considered with all past, present, and foreseeable future activities, cumulative effects for the Proposed Action and Alternative 2 would be the same as Alternative 1. The design location of the production facility and access road would meet the VQO of partial retention for River Lake Road. Visitors turning onto FSR 4209 near the production facility would not notice the clearing.

Map 6. Cumulative Effects Analysis Area – Noise and Odor Map



ODOR

Current Condition

There are three potential sources of odor from this proposed project. Burning of vented hydrogen sulfide gas if encountered during drilling may produce an odor. Equipment associated with drilling and producing a well would produce an exhaust odor and when petroleum products are stored they may produce an odor. The Mio Ranger District has 12 gas wells that are drilled into the Prairie du Chien (PdC) formation. None of these wells currently produce a detectable odor. The production facilities associated with these wells have a very minor petroleum odor near the storage tanks and the exhaust from the compressor is detectable in the immediate vicinity. Also, there is a production facility and petroleum storage tank on NFS land in the southwest corner of the SPNM area which is producing from the PdC formation. To date the Forest Service has received no complaints regarding this production facility and storage tank.

Description of Area Related to Cumulative Effects

For the purposes of analyzing cumulative effects, the analysis area will be the Mason Tract, the South Branch Semiprimitive Nonmotorized Area with the addition of the lands between the SPNM area and Highway M-18 to the east and south of the SPNM area. (See Map 6) This includes the area which could be affected by foreseeable future development of wells should the exploratory well prove to be productive.

Effects of Alternative 1 - Do Not Permit (No Action)

Direct and Indirect Effects

Because no management activities are proposed in this alternative, there would be no additional odors. It would have no effect to forest visitors and the SPNM recreational experience.

Cumulative Effects

When considered with all past, present, and foreseeable future activities, Alternative 1 would have no effects to existing odor in the area. These existing odors come from heavy equipment exhaust used to log and maintain roads and snowmobile exhaust used to pull trail grooming equipment. There is also unauthorized use of the area by snowmobiles that would produce an odor. These odors are short term (minutes) and would be rapidly dispersed by wind. Crawford County Road Commission, MDNR, and the Forest Service are involved in the management activities with vehicles and machines that produce odors. Odors from the existing petroleum storage tanks are detectable for a few hundred feet. Future oil and gas development could contribute odors. Short term (exhaust from heavy equipment and snowmobiles) and long term in the immediate vicinity of petroleum storage tanks and compressor odors could be experienced by visitors to the SPNM area.

Effects of the Proposed Action and Alternative 2: Modified Proposed Action

Direct and Indirect Effects

The Proposed Action and Alternative 2 have three potential sources of odor. Burning of hydrogen sulfide encountered while drilling would produce an odor. Secondly, there are odors that could be emitted from tanks used to store petroleum products and the exhaust from the compressor. Thirdly engine exhaust from construction equipment, vehicles, the drilling rig and associated equipment would cause odors.

There are several formations that would be drilled through that contain hydrogen sulfide. An intermittent odor from burning while drilling could be present up to hundreds of feet in the down wind area of the drilling pad. This intermittent odor would be short term (1-2 weeks). The well would be drilled from December 1 to April 15.

If the well is productive a production facility would be required, and includes a heater-treater, tank battery, separator, and compressor. It is common not to need a compressor in the early years of a PdC well, but when well pressure drops a compressor is needed to get the gas into the sales pipeline. The two sources of odor at the production facility would be the compressor exhaust and the petroleum storage tanks. Onshore Order #4 (pressure-vacuum thief hatch and/or vent-line valve) would reduce the odor from the storage tanks. The only long term odor associated with the production facility would be the exhaust from the compressor and fumes from the petroleum storage tank. This odor would not be detectable in the SPNM area or the Mason Tract, but would be present in the immediate vicinity of the compressor. There would be short term odors present from the exhaust of heavy equipment during the construction of the production facility. This construction would take up to a couple of months and odors would only be detectable in the immediate vicinity of the heavy equipment. Past experience on the Mio Ranger District indicates that once a PdC well becomes productive there would be no odors from the well.

During the drilling phase (December 1 to April 15), the construction of roads and a well pad, heavy equipment, generators, and drilling equipment would produce exhaust that has an odor. The road and pad construction phase would be complete in a week and the drilling would take up to six weeks. This odor would not be detectable for more than a few hundred feet. The drilling phase takes place when visitation in the area is at its lowest. This could have a short term effect to visitors passing by the area.

If productive, wells and production facilities would also require heavy equipment for maintenance. This could happen a few times per year and last less than a week. This action could continue for the life of the well. The heavy equipment would have an exhaust odor in the immediate vicinity (100 -200 feet) of the well and the production facility. This could also have an effect to forest visitors in the immediate vicinity.

Cumulative Effects

When considered with all past, present, and foreseeable future activities, the Proposed Action and Alternative 2 could have a short term effect on visitors in the immediate vicinity of activities during the construction and drilling phases. Odors are expected to dissipate quickly and not be noticeable unless downwind or within 200 feet of the activity. Long term odors from the storage tanks would be evident again in the immediate vicinity of the tanks; however the storage tanks would be located at least 200 feet from River Lake Road. The odor from the storage tanks would not likely be detectable to people driving by the production facility most of the time.

NOISE

The primary noise concern is its impact on the recreational experience in the Mason Tract and the South Branch SPNM area. One purpose of a SPNM area is to provide for a recreational experience that is somewhat primitive (away from the sight and sounds of others). After leaving

their vehicle, visitors to the Mason Tract are also looking to escape the sight and sounds of modern civilization. Once a visitor is out of sight of an open road, noise would have the largest effect on the semiprimitive recreational experience. Noise (an unwanted sound) may be generated by the voices of other visitors, a paddle hitting the side of an aluminum canoe, a vehicle using roads in the area, a car door slamming, an aircraft flying overhead, a barking dog, or a gas well compressor. All of these sounds can be noise and diminish the semiprimitive recreational experience.

The BLM and Forest Service contracted with a sound consultant to better assess the potential effects of long term noise. This noise analysis is based on the contractor's noise impact assessment.

Perception of sound is determined by the listener's distance from the sound source, intensity and pitch of the sound, air temperature and density, humidity, air turbulence, wind direction, screening or focusing effects of topography and vegetation, a listener's ability to hear sounds and what they consider acceptable types and levels of sound. Evenings with still, humid air provide near optimal conditions for sound to carry, while turbulent, dry air conditions dampen sound transmittance.

Environmental and industrial noise is commonly measured in decibels using the A-Weighted Sound Level (dBA), a logarithmic measurement, which correlates to the human perception of the loudness of sound. The following table depicts sound levels for typical activities.

Table 5. Sound Levels for Typical Activities.

SOUND LEVELS FOR TYPICAL ACTIVITIES			REFERENCE AND COMMUN	
Subjective Human Response and Conversation	Home and Industrial (Indoor Noise)	dBA Scale (Level)	Community and Traffic (Outdoor Noise)	Reference Loudness
Threshold of Pain		-- 140 --	Aircraft Carrier	
			Military Jet Aircraft	
Threshold of Discomfort	Rock Band (Max.)	-- 130 --	Large Siren at 100 Ft.	16 Times as Loud
			Jet Takeoff at 200 Ft.	
Maximum Vocal Effort	Discotheque (Max.)	-- 120 --	Thunderstorm Activity	8 Times as Loud
			Elevated Train	
Very Loud	Symphonic Music (Max.)	-- 110 --	Auto Horn at 5 Ft.	4 Times as Loud
			Compacting Trash Truck	
Shouting in Ear	Industrial Plant	-- 100 --	Heavy Truck at 25 Ft.	2 Times as Loud
			Newspaper Printing Rm.	
Shouting	Food Blender	-- 90 --	Motorcycle at 25 Ft.	Reference Loudness
			Symphonic Music (Typ.)	
Very Annoying	Garbage Disposal	-- 80 --	Small Truck at 25 Ft.	1/2 as Loud
			Alarm Clock	
Moderately Loud	Vacuum Cleaner	-- 70 --	Avg. Traffic at 100 Ft.	1/4 as Loud
			Electric Typewriter	
Normal Conversation	Air Conditioner at 20 Ft.	-- 60 --	Light Traffic at 100 Ft.	1/8 as Loud
			Typical Office	
Quiet	Living Room	-- 50 --	Typical Suburban Area	
			Bedroom	
Very Quiet	Library	-- 40 --	Birdsong	
Soft Whisper	Broadcasting Studio	-- 30 --	Rural Area	Just Audible
		-- 20 --		
		-- 10 --		Threshold of Hearing
Hoover & Keith Inc. (Consultants in Acoustics)				
11391 Meadowglen, Suite D				
Houston, Texas 77082		-- 0 --		

Description of Area Related to Cumulative Effects

Same as Odor.

Effects of Alternative 1 – Do Not Permit (No Action)

Direct and Indirect Effects

Because no activities are proposed in this alternative, visitors would not notice any additional noise other than what is currently heard from activities occurring in the area, and would not affect their SPNM recreational experience.

Cumulative Effects

There are planned and on-going activities that would produce noise. (See Table 6) The analysis area included activities that could be heard in the Mason Tract and SPNM area. These noise producing activities come from private, State of Michigan, and Forest Service lands. Aircraft flying in the vicinity of this area create noise. Vehicles using the roads create noise. Crawford County Road Commission maintains some roads in the area creating noise. There are many sources of noise that could be detected by visitors to the Mason Tract and the SPNM area. The visitors themselves may create noise with their voices, vehicles, and recreation equipment.

The following table displays sources of sound that could affect the users of the Mason Tract and the SPNM area. The level of sound received by the visitor depends upon, loudness of sound, distance from source, weather conditions, and effects of vegetation and topography. Most visitors to the Mason Tract or the SPNM area would hear a man-made sound, other than the sound made by their vehicle, during their visit. Common man-made sounds include vehicles, voices, and aircraft.

Table 6. Sources of Sound That May Impact Visitors to the Mason Tract and SPNM Area

Landowner	Activity	Sound Level at Source (max dBA)	Approximate Duration	Time of Day	Time of Year
State	Mowing	90	6 Hours	Day	Summer
State	Weed whipping	90	45 Minutes	Day	Summer
State	Snow plowing	80	45 Minutes	Day	Winter
State	Trail grooming	90	6 Hours	Day	Winter
State	Timber Harvest 683 acres (2005-2007)	95	1-3 Weeks	Day	November 1 –April 1
State	Tree Planting (Mechanical)	95	5 Days	Day	Spring
State	Timber Harvest 531 acres (2008-2014)	95	1-3 Weeks	Day	November 1- April 1
State/ Federal	Camping, Canoeing, Driving	80	Variable – Less than a minute to 16 Hours	Day/ Night	Year round
Federal	Timber Harvest 421 acres (2008)	95	1-2 Weeks	Day	Anytime of year
Federal	Existing Gas Production Facility	100	20-30 Years	24 Hours	Year round
Federal	Future oil and gas development	115	3 Months	Day/Night	Year round
Private	Maintaining Home and Lawn	90	Occasional Activity	Day	Year round

There are many sources of sound that affect the recreational experience of visitors to the Mason Tract and the SPNM area. These noises (unwanted sound) could have an effect on their experience and cause some visitors to go elsewhere in the Mason Tract and SPNM area or select an entirely different area to visit. The gas production facility in NW, Section 19, T25N, R1W has been active since 1991, and is within the SPNM area on NFS lands. To date, the Forest Service has received no complaints from visitors to the SPNM regarding the sound of the compressor and other production operations. The existing facility is not built to current State of Michigan standards. Expected levels of sound at the proposed production facility would be less than those at the existing facility in the SPNM area.

Effects of the Proposed Action

Direct and Indirect Effects – Short-Term

This alternative has both short (days and weeks) and long-term (20-30 years) noise sources. The short term noise sources are associated with road widening and construction, drilling, casing installation, production testing, well stimulation, and flowline/pipeline construction. Flowline/pipeline construction would only be necessary if the well is productive. The table below displays the activity, loudness, and duration of the short-term sounds.

Table 7. Expected Short-Term Sounds

Activity	Max.* Sound Level at Source (dBA)	Approximate Duration	Time of Day
Construction of Road/Pad	115	4 Days	Day
Well Drilling	115	1.5 Months	Day and Night
Casing Installation	105	2-3 Days	Day
Production Testing	105	Variable	Day
Well Stimulation	105	1-2 Days	Day
Pipeline/Facility Installation	115	2 Weeks	Day

*Michigan DEQ's permit requires hospital-type mufflers to be used on drilling, completion, and work over rigs, mud pumps, and compressors. These predicted sound levels do not factor in the hospital-type mufflers.

Michigan DEQ's permit only allows drilling and completion activities (casing installation, production testing, and well stimulation) from December 1 to April 15 which would limit the impact of noise to a low visitation period. The largest impact would be to cross country skiers and snowmobile operators. Snowmobile use in the SPNM area is unauthorized. The impact to snowmobile operators would be minimal. Because operators wear a helmet they would not be able to hear sounds other than that of their own vehicle. Depending on weather conditions and distance from the source, cross country skiers and people on snowshoes would be able to hear the drilling and completion operation. They may choose to go to another location.

Road and well pad construction would most likely occur in the late fall prior to the drilling. Flowline/pipeline installation could happen at anytime of the year. These two activities may be heard by visitors to the Mason Tract and the SPNM area. The flowline/pipeline installation would take about two weeks and construction of the well pad and road would take approximately 4 days.

Another source of short-term noise would be a well work over rig. Every few years a large truck (work over rig) may be needed to work on the well. The noise would last less than a week and would be heard by visitors in the area. Also, a portable pump (truck mounted) may be needed to inject water down the well periodically. The road to the well would be snow plowed when necessary. All of these activities could have a short-term effect on the recreational experience.

Direct and Indirect Effects – Long-Term

If the well is productive a long-term (20-30 years) noise would be associated with the production facility. Because the gas comes out of the ground at a high pressure, a compressor may not be needed the first few years of production. Since most of the noise associated with the production facility comes from the operation of the compressor, this analysis assumes a compressor at the production facilities. The analysis looks at the estimated sound contribution of the production facility at four locations:

1. Adjacent to the Mason Chapel (11,800 feet away).
2. The boundary of the Mason Tract (9,800 feet away).
3. The SPNM area (5,500 feet away).
4. Approximately 100 feet from the production facility. (MPA 4.5, IV-172. Sound level limit for KW habitat)

The table below displays the ambient sound level, the sound contribution from the production facility, and the total sound levels expected at the four locations. The lowest measured L₉₀ (90% of the time this sound level is exceeded) during the sound survey was 24 dBA and was used to represent ambient sound levels. In order for a sound not to be additive it would need to be 10 dBA below 24 dBA or 14 dBA. Therefore, contributions of 14 dBA and less would not add to a sound level (logarithmic addition).

Table 8. Sound Contribution of the Production Facility

Position	Distance from Production Facility (feet)	Ambient Sound (dBA) - Existing	Sound Contribution from Production Facility (dBA)	Total (dBA)
Mason Chapel	11,800	24	13	24
Mason Tract Boundary	9,800	24	15	25
SPNM Area	5,500	24	22	26
Adjacent to Facility	100	24	60	60

The additive effect of the sound contributions from the production facility results in an increase in total dBA at three of the sites. The Mason Chapel is the site where the production facility would not exceed the ambient sound level. Even though the data indicates that the ambient sound level is maintained, under rare conditions it may be heard at the Mason Chapel. The sound contribution at the Mason Tract Boundary and SPNM area could be characterized as background sounds, and sound contribution of 60 dBA at 100 feet could be characterized as dominant. Visitors that are in the immediate vicinity of the production facility would be affected by noise. Visitors at the Mason Tract boundary and the SPNM area could hear a background noise (natural sounds would dominate). This could affect their recreational experience.

The information in the above table ignored the effects of vegetation, land contours and other shielding, to be conservative. Also, there are atmospheric factors that could positively or negatively influence outdoor sound. Prevailing winds are generally from the south or southwest. Wind blowing from the production facility in the direction of the receiver could increase the received sound level contributed by the production facility by 3 to 5 decibels at distances over 1,500 feet. Atmospheric nighttime temperature inversions (colder air near ground) could increase the received sound level by 2 to 5 decibels at distances over 1,500 feet. Consequently, the sound heard from the production facility could increase by 5 to 10 decibels due to favorable atmospheric conditions. The sound of wind blowing in the forest can mask the additional contribution of the production facility. In addition, wind blowing towards the production facility and/or normal temperature gradients could decrease the sound heard from the production facility.

Cumulative Effects

Same as Alternative 1 with the addition of the following:

If this exploratory gas well is productive it could generate additional drilling in the area. Initial indications are that these wells would be drilled east and south of River Lake Road outside the SPNM area. The existing production facility would need a larger compressor if additional wells are drilled in the area.

The table below displays the ambient sound level, the sound contribution from the production facility with a more powerful compressor, and the total sound levels expected at the four locations.

Table 9. Sound Contribution of More Powerful Compressor at Production Facility

Position	Distance from Production Facility (feet)	Ambient Sound (dBA)- Existing	Sound Contribution (dBA) from the Production Facility	Total (dBA)
Mason Chapel	11,800	24	17	25
Mason Tract Boundary	9,800	24	20	25
SPNM Area	5,500	24	27	29
Adjacent to Facility	100	24	65	65

The additive effect of the sound contributions from the production facility results in an increase in total dBA at all of the sites. The sound contribution at the Mason Chapel, and Mason Tract Boundary could be characterized as background sounds, and sound contribution of 65 dBA at 100 feet could be characterized as dominant. The sound contribution at the SPNM could be characterized as either background or dominant depending on atmospheric conditions. Visitors that are in the immediate vicinity of the production facility would be affected by noise. Visitors at the Mason Chapel and the Mason Tract boundary could hear a background noise (natural sounds would dominate). Visitors in the SPNM area could hear a background or a dominant sound. This could affect their recreational experience.

Effects of Alternative 2 - (Modified Proposed Action with Conditions of Approval)

Direct and Indirect – Short-Term Effects

Same as the Proposed Action.

Direct and Indirect Effects – Long-Term

This alternative would add mitigation measures (conditions of approval) to the production facilities that would reduce the sound contribution to the four sites. The table below displays these reduced sound contributions.

Table 10. Sound Contribution of the Production Facility with Conditions of Approval

Position	Distance from Production Facility (feet)	Ambient Sound (dBA) - Existing	Sound Contribution (dBA) from the Production Facility	Total (dBA)
Mason Chapel	11,800	24	7	24
Mason Tract Boundary	9,800	24	10	24
SPNM Area	5,500	24	18	25
Adjacent to Facility	100	24	56	56

The additive effect of the sound contributions from the production facility results in an increase in total dBA at two of the sites the SPNM area and adjacent to the production facility. Even though the data indicates that the ambient sound level is maintained, under rare conditions it may be heard at the Mason Chapel and the Mason Tract Boundary. The sound contribution at SPNM area could be characterized as background sounds, and the sound contribution of 56 dBA at 100 feet could be characterized as dominant. Visitors that are in the immediate vicinity of the production facility would be affected by noise. Visitors at the SPNM area could hear a background noise (natural sounds would dominate). This could affect their recreational experience.

Cumulative Effects

Same as the Proposed Action except for the conditions of approval would reduce the sound contribution of the more powerful compressor as displayed in the table below.

Table 11. Sound Contribution of More Powerful Compressor with Conditions of Approval

Position	Distance from Production Facility (feet)	Ambient Sound (dBA)	Sound Contribution from Production Facility (dBA)	Total (dBA)
Mason Chapel	11,800	24	11	24
Mason Tract Boundary	9,800	24	14	24
SPNM Area	5,500	24	21	26
Adjacent to Facility	100	24	59	59

The additive effect of the sound contributions from the production facility results in an increase in total dBA at two of the sites. The sound contribution at the SPNM area could be characterized as background sounds, and a sound contribution of 59 dBA at 100 feet could be characterized as dominant. Visitors that are in the immediate vicinity of the production facility could be affected by noise. Visitors at the SPNM area could hear a background noise (natural sounds would dominate). This could affect their recreational experience. Even though the data indicates that the ambient sound level is maintained, under rare conditions it may be heard at the Mason Chapel and the Mason Tract boundary.

3.4 Predicted Effects of all Alternatives on Relevant Affected Resources

Predicted Effects on Wildlife, Threatened, Sensitive and Endangered Species, and Management Indicator Species (MIS)

Description of Relevant Affected Resources

Wildlife species diversity is directly related to diversity of vegetative communities: the more forest and understory types and ages present, the greater the species diversity in a given area. Measuring, comparing and projecting diversity within and between vegetative communities is complex. For this analysis, forest type diversity and age-class of stands in the analysis area (Maps 7 & 8) will be used to establish a baseline of landscape diversity.

Currently, the diversity of forest communities is low, with 78% of the total area in the short and long rotation conifer types (see Figure 1). This is primarily due to the jack and red pine present on the sandy soils found in the area. The remaining area of the analysis area is dominated by aspen/birch and lowland conifer in the Douglas and Sauger Creeks and two unnamed creek drainages. The dominant vegetation in the analysis area currently provides habitat for wildlife species that prefer dry coniferous forests.

Biological diversity is often measured by species richness (number of species present) and species evenness (distribution of abundance among different species) (Hunter 1990). Species richness in dry forests tends to be lower than forests on moister sites. Species evenness in these dry forests tends to be low as well. The short rotation conifer stands tend to be dominated by jack pine, with a small percentage of northern pin oak and red pine. The long

rotation conifer stands tend to be dominated by red pine (usually as plantations), with a small percentage of northern pin oak and jack pine.

In general, age-class diversity in the project area is high, with habitat well distributed across age classes (See Map 8 & Figure 2). Age-class diversity within the analysis area currently provides diverse habitats for a variety of wildlife species. [Historically, many of the jack pine stands within the analysis area were managed for Kirtland's warbler breeding habitat, creating large tracts of jack pine of the same or similar age (Figure 3).] Overall, the stands currently provide habitat for species that need large areas of unbroken forest, and those that require forest edge.

Approximately 42% of the analysis area has been designated as old growth which comprises the bulk of the long rotation conifer, aspen/birch, lowland conifer and lowland hardwood community types. Over time, areas managed as old growth provide habitat for species such as pileated woodpeckers that require mature to overmature with a component of dead and dying trees. Natural disturbances such as fire and windthrow will also create or maintain openings for openland-dependant species such as bluebirds.

Past, present, and future activities occurring in the analysis area are the same as those in the Description of Relevant Affected Resources for the Recreational Experience issue. (Section 3.3)

Map 7. Current Community Types in the Analysis Area.

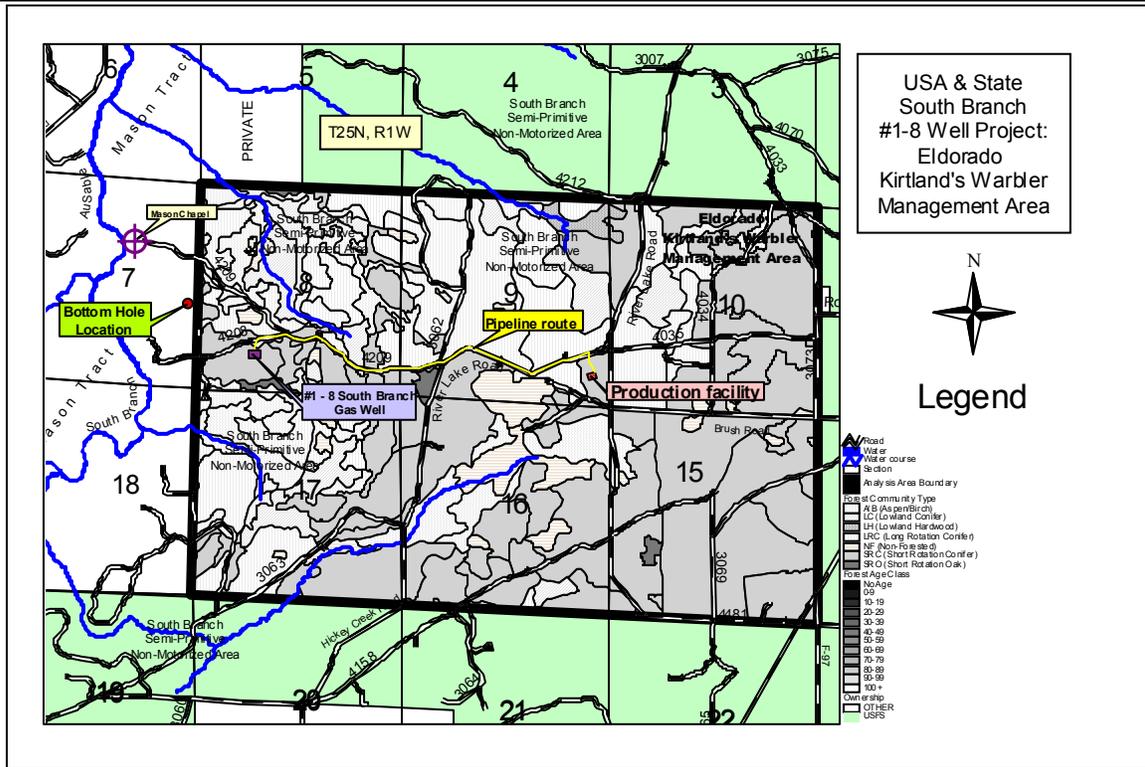
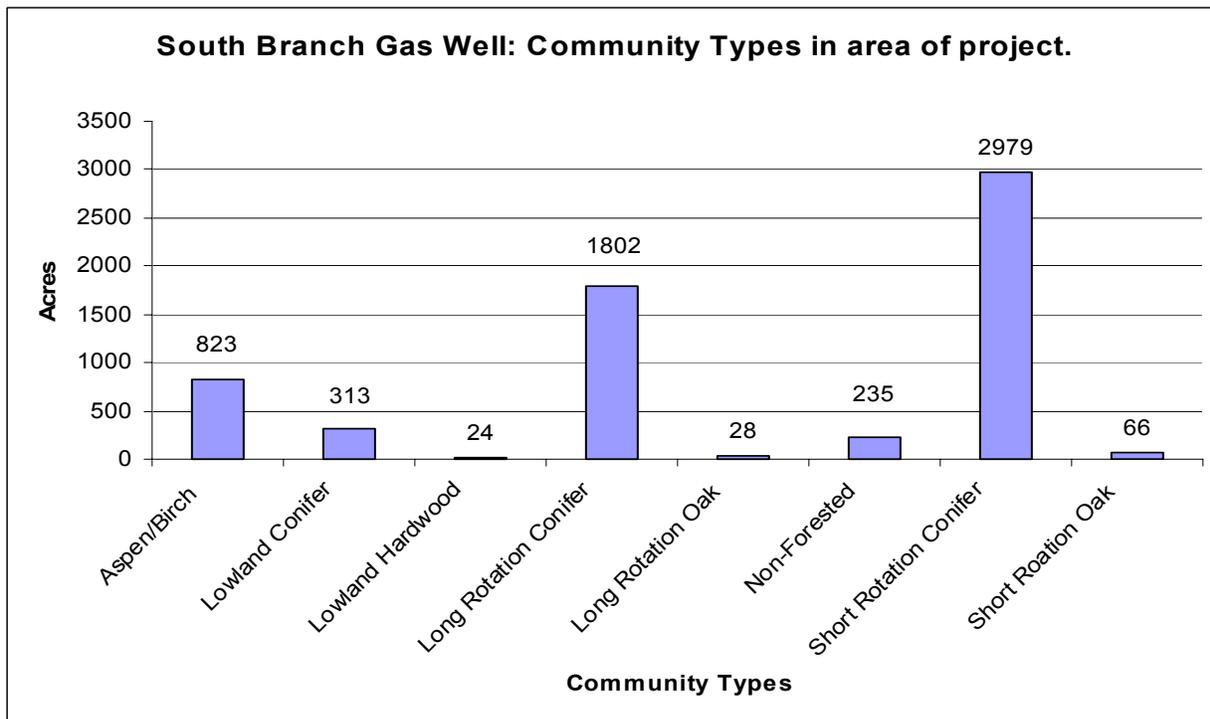


Figure 1. Current Community Type Distribution in the Analysis Area.



Map 8. Current Age Class Distribution of All Community Types in the Analysis Area.

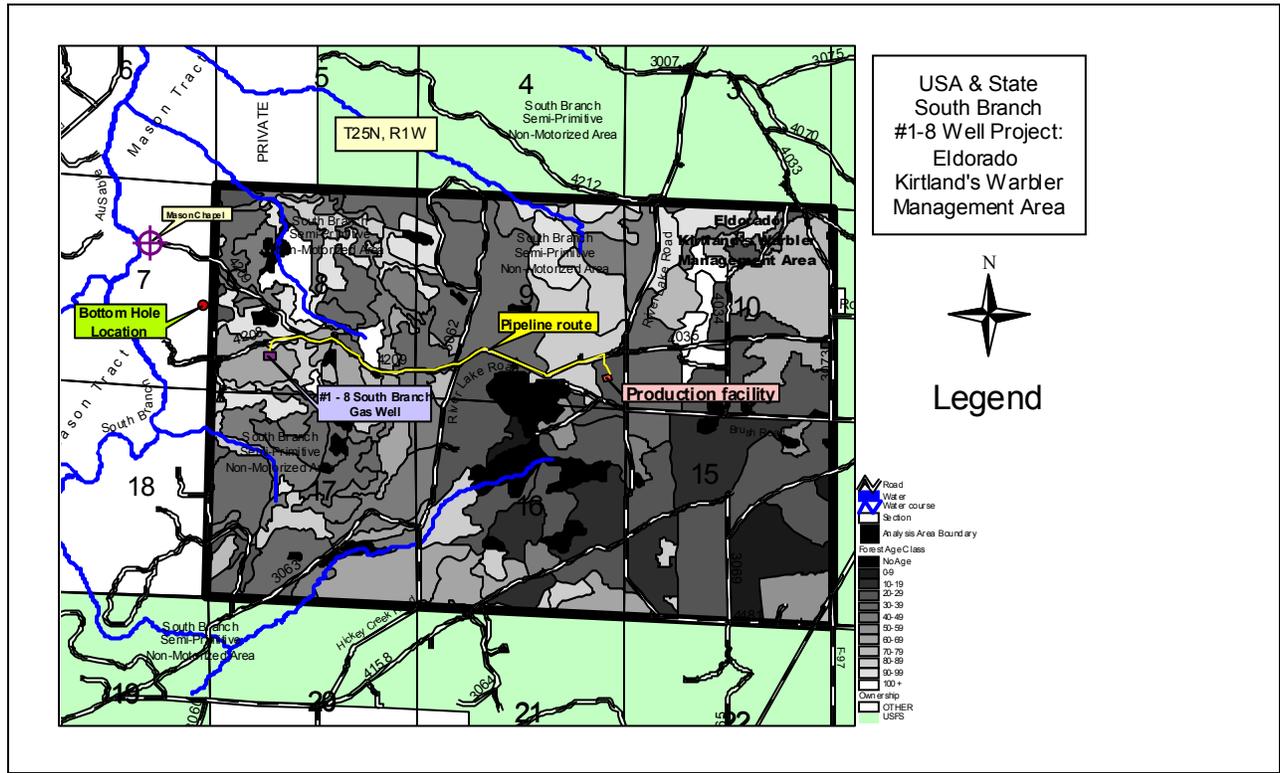
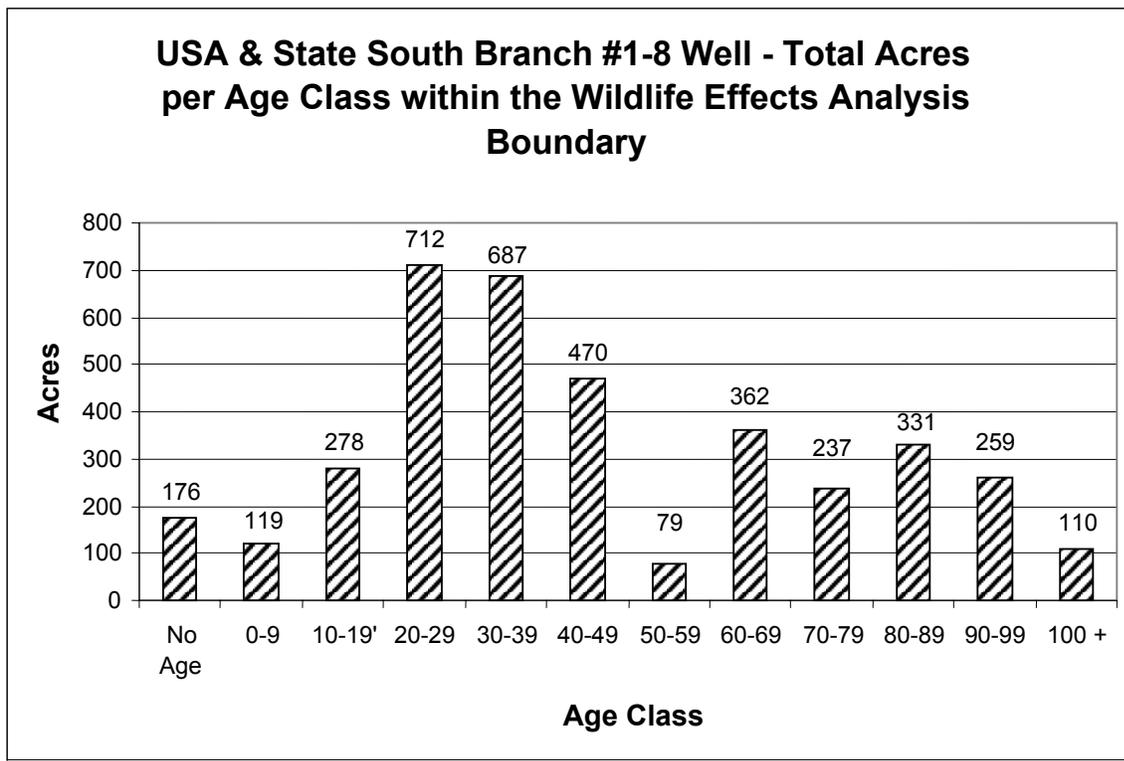


Figure 2. Current Age Class Distribution in the Analysis Area.



Wildlife species diversity within the project area is directly related to the forest landscape diversity discussed above. An estimation of present habitat quality for wildlife species of public interest is shown in Table 12.

Table 12. Wildlife Species and Present Habitat Quality [*Italics* indicate Forest Plan management indicator species (MIS), *italics* and * indicate proposed MIS]

Species	Habitat	Present Habitat Quality
Mammals		
<i>Black Bear*</i>	Grasses, forbs and down wood (ant pupae) for forage, best in wetlands. Down wood for denning habitat.	Good cover, forage, and potential denning habitat.
<i>White-tailed deer</i>	Trees/shrubs for cover. Grasses, forbs and regenerating oak, aspen, maple for forage.	Good cover and forage.
<i>Fox and gray squirrels</i>	Mature oak trees for habitat and forage.	Poor habitat as Short rotation Oak is only 0.7% of the analysis area
<i>Beaver</i>	Creeks with adjacent aspen or other hardwood forests.	Available habitat along Douglas and Sauger Creeks and two un-named creeks.
Coyote & Red Fox	General forest with prey. Prey requires grasses and forbs for forage and down wood for cover.	Good habitat and prey base.
Bobcat	Lowland conifer stands.	Poor habitat as Lowland Conifer ~ 6%; moderate to good prey base.
Bats	General forest with openings. Open water and upland openings for foraging. Exposed trees with cavities or sloughing bark for roosting.	Poor to moderate foraging habitat (little open water, some openings); poor to moderate roosting habitat (exposed dead trees).
Birds		
<i>Ruffed grouse</i>	Aspen in all age classes for cover and forage.	Poor forage and cover as aspen/birch (A/B) ~ 10%.
<i>Black-throated green warbler</i>	Mature and overmature conifer and hardwood forests.	Moderate breeding and foraging habitat (~ 36% of all communities over 50 years old).
<i>Chestnut-sided warbler</i>	Regenerating aspen and hardwood stands.	Poor breeding and foraging habitat (~ 3% of A/B in 0-9 age class).
<i>Eastern bluebird</i>	Openings generally more than five acres, with cavities in trees for nesting.	Poor to moderate forage and breeding habitat (~ 6% of the analysis area is in the 0 - 9 age class or are non-forested openings ≥ 5 acres with snags).
<i>Lincoln's sparrow</i>	Regenerating stands of jack and red pine.	Poor breeding and foraging habitat (~3 % of analysis area in jack pine of 0-9 age class).
<i>Pileated woodpecker</i>	Mature and overmature forest with a component of dead and dying trees.	Moderate breeding habitat (~ 36% of all communities more than 50 years old).

Species	Habitat	Present Habitat Quality
<i>Ducks</i>	Open water with submerged vegetation or small fish.	Some habitat associated with available open water.
Forest interior neotropical migratory bird species -Mature forest	Large contiguous stands of mature to overmature forest.	Moderate breeding and foraging habitat (~ 36% of all communities more than 50 years old).
Forest interior neotropical migratory bird species - Immature forest	Large contiguous stands of open or immature forest.	Good breeding and foraging habitat (~ 59% of all communities less than 50 years old).
Woodpeckers	Mature and overmature forest with a component of dead and dying trees.	Moderate breeding and foraging habitat.
Cavity dwellers	Forested to open stands with a component of den trees or snags.	Poor to moderate cavity habitat (few large decadent trees).
Brown-headed cowbird	Open areas with seeds or insects foraging. Forested to open stands with other species of breeding birds for breeding habitat.	Poor foraging/moderate breeding habitat, active cowbird trapping by US Fish and Wildlife Service in occupied Kirtland's warbler habitat.
Wild Turkey	Oak stands and openings for foraging. Matures stands of red pine or white pine for roosting.	Poor foraging but moderate breeding habitat.
<i>Common Loon*</i>	Lakes with fish, generally larger than 10 acres.	No habitat.
Reptiles and Amphibians		
Snakes	Forested to open stands with prey, openings for basking, down wood for cover.	Moderate habitat and prey base.
Salamanders	Mature to overmature stands on moist sites with down wood.	Some habitat in lowland stands with enough moisture to support salamanders.
Fish		
<i>Brook trout</i>	Cold water streams.	Moderate habitat locally in Douglas Creek.
<i>Brown trout</i>	Cold and cool water streams.	Moderate habitat locally in Douglas Creek.

Note: The *Huron-Manistee National Forests Monitoring and Evaluation Report for Fiscal Year 2000* has forest-wide trend information for many of the species mentioned in Table 12.

Alternative 1: Do Not Permit (No Action)

Direct and Indirect Effects

Effects to wildlife individuals or the viability of species are unlikely to occur because no actions would occur. However, effects to local populations through habitat changes are more likely. Alternative 1 therefore might affect local populations. Potential effects to habitat quality are as follows:

Over the long-term (20 to 30 years, which is the expected productive life of the well), Alternative 1 would result in a no change in wildlife habitat diversity, and consequently maintain or decrease the diversity of wildlife species in the areas of the proposed actions.

No major changes are anticipated in forest type diversity. Species evenness and richness would remain unchanged in the analysis area.

Age-class diversity of the community types in the analysis area would decrease over the long-term. As the community types mature in the absence of natural or human-caused disturbance, there would be a void in the younger age classes. The trees would die over the long-term, thereby providing an increase in snags and dead woody debris.

Under Alternative 1, structural diversity within forested stands would remain in their current condition, generally at a low level.

Table 13. Effects on Wildlife Species and Habitat Quality as a Result of Alternative 1. [*Italics* indicate Forest Plan management indicator species (MIS), *italics* and * indicate proposed MIS].

Species	Habitat	Short-term Effects on Habitat Quality as a Result of Alternative 1	Long-term Effects on Habitat Quality as a Result of Alternative 1
Mammals			
<i>Black Bear*</i>	Grasses, forbs and down wood (ant pupae) for forage, best in wetlands. Down wood for denning habitat.	No change in habitat.	No change in cover, increase in forage, increase in potential denning habitat.
<i>White-tailed deer</i>	Trees/shrubs for cover. Grasses, forbs and regenerating oak, aspen, maple for forage.	No change in habitat.	No change in cover and decrease in forage due to succession.
<i>Fox and gray squirrels</i>	Mature oak trees for habitat and forage.	No change in habitat.	No change in habitat and forage.
<i>Beaver</i>	Creeks with adjacent aspen or other hardwood forests.	No change in habitat.	No change in habitat.
Coyote & Red Fox	General forest with prey. Prey requires grasses and forbs for forage and down wood for cover.	No change in habitat and prey base.	No change in habitat or prey base.
Bobcat	Lowland conifer stands.	No change in habitat.	No change in habitat.
Bats	General forest with openings. Open water and upland openings for foraging. Exposed trees with cavities or sloughing bark for roosting.	No change in habitat.	No change in foraging habitat, and increase in roosting habitat.
Birds			
<i>Ruffed grouse</i>	Aspen in all age classes for cover and forage.	No change in habitat.	No change in habitat.

Species	Habitat	Short-term Effects on Habitat Quality as a Result of Alternative 1	Long-term Effects on Habitat Quality as a Result of Alternative 1
<i>Black-throated green warbler</i>	Mature and overmature conifer and hardwood forests.	No change in habitat.	Increase in breeding and foraging habitat.
<i>Chestnut-sided warbler</i>	Regenerating aspen and hardwood stands.	No change in habitat.	No change in habitat.
<i>Eastern bluebird</i>	Openings generally more than 5 acres, with cavities in trees for nesting.	No change in habitat.	Decrease in foraging and breeding habitat.
<i>Lincoln's sparrow</i>	Regenerating stands of jack and red pine.	No change in habitat.	Decrease in breeding and foraging habitat.
<i>Pileated woodpecker</i>	Mature and overmature forest with a component of dead and dying trees.	No change in habitat.	Increase in breeding and foraging habitat.
<i>Ducks</i>	Open water with submerged vegetation or small fish.	No change in habitat.	No change in habitat.
Forest interior neotropical migratory bird species - Mature forest	Large contiguous stands of mature or overmature forest.	No change in habitat.	Increase in breeding and foraging habitat due to maturing forest.
Forest interior neotropical migratory bird species - Immature forest	Large contiguous stands of open or immature forest.	No change in habitat.	Decrease in breeding and foraging habitat due to maturing forest.
Woodpeckers	Mature and overmature forest with a component of dead and dying trees.	No change in habitat.	Increase in breeding and foraging habitat.
Cavity dwellers	Forested to open stands with a component of den trees or snags.	No change in habitat.	Increase in potential cavities.
Brown-headed cowbird	Forage in open areas for seeds or insects. Breed in forested to open stands with other bird species.	No change in habitat.	Decrease in breeding habitat, but active trapping would continue.
Wild Turkey	Oak stands and openings for foraging. Matures stands of red pine or white pine for roosting.	No change in habitat.	Decrease in breeding and foraging habitat due to loss of openings.
<i>Common Loon*</i>	Lakes with fish, generally larger than 10 acres.	No habitat.	No habitat.
Reptiles and Amphibians			
Snakes	Forested to open stands with prey, openings for basking, down wood for cover.	No change in habitat.	Decrease in habitat and prey base due to succession.

Species	Habitat	Short-term Effects on Habitat Quality as a Result of Alternative 1	Long-term Effects on Habitat Quality as a Result of Alternative 1
Salamanders	Mature to overmature stands on moist sites with down wood.	No change in habitat.	No change in habitat.
Fish			
<i>Brook trout</i>	Cold water streams.	No change in habitat.	No change in habitat.
<i>Brown trout</i>	Cold and cool water streams.	No change in habitat.	No change in habitat.

Description of Area Related to Cumulative Effects

For analyzing cumulative effects on wildlife, the analysis area will be the area designated in Maps 7 & 8. Past, present, and future activities occurring in the analysis area are the same as those in the Description of Relevant Affected Resources for the Recreational Experience issue. (Section 3.3)

Cumulative Effects

Alternative 1 is not anticipated to have significant adverse cumulative effects on wildlife or the viability of species. An estimation of change in habitat quality for wildlife species of public interest under Alternative 1 can be found in Table 13.

Past timber harvest within the forested landscape has created a mosaic of thinned and cleared areas in various stages of growth (see Map 8). Alternative 1 would not change this diverse landscape.

Alternative 1, when considered with past, present and reasonably foreseeable future actions, would not contribute to a loss of biomass in the analysis area. This alternative would maintain the quality of habitat for species requiring mature/overmature forests such as woodpeckers and other cavity dwelling species such as bats, and black bear.

Proposed Action and Alternative 2 (Proposed Action with additional mitigation)

Direct and Indirect Effects

Effects to wildlife individuals from implementing the Proposed Action and Alternative 2 may occur, but the effects would not affect the viability of the species within the analysis area. The most common effect would be the temporary or permanent displacement and/or avoidance of individuals from the proposed project area. Most individuals would avoid the project area during construction activities such as well pad clearing, road building and widening, and flowline/pipeline construction. The effects would be reduced by implementing the Proposed Action or Alternative 2 during winter when most wildlife species listed in table 13 would not be breeding. Species that have limited dispersal capabilities, such as snakes, may be killed from the activities listed above, if they are hibernating in the project areas. However, this would not have a long-term effect on populations of these limited-dispersal species.

Because less than two per-cent of the analysis area would be directly impacted by the activities proposed in the Proposed Action and Alternative 2, the effects to habitat quality would be similar to those in Alternative 1 (see Table 13).

Only the habitat for the brown-headed cowbird would likely change from the construction of the well pad and production facility which would provide suitable foraging habitat for the species.

Cumulative Effects

The past, present, and future federal and non-federal actions in the analysis area are the same as in Alternative 1. The cumulative effects to the species and their habitats for the Proposed Action and Alternative 2 would be similar to those listed in Alternative 1.

Flora

Description of Area Related to Biological Determination

The analysis area is generally within 1-3 km (0.6 -1.9 miles) of the Proposed Action locations for the well pad, access road, flowlines, and production facilities. Past, present, and future activities occurring in the analysis area are the same as those in the Description of Relevant Affected Resources for the Recreational Experience issue. (Section 3.3)

Biological Determination of Impacts

Alternative 1 would have no impact on *Agoseris glauca*, *Arabis missouriensis*, *Asclepias purpurascens*, *Astragalus canadensis*, *Astragalus neglectus*, *Botrychium hesperium*, *Botrychium rugulosum*, *Cirsium hillii*, *Cynoglossum boreale*, *Cypripedium arietinum*, *Festuca scabrella*, *Prunus alleghaniensis* var. *davisii*, *Pterospora andromedea*, *Ranunculus rhomboideus*, and *Trichostema brachiatum*.

Alternative 1: Do Not Permit (No Action)

Direct and Indirect Effects

Alternative 1 would have no direct impact on individuals of these species because none were found within the project area. There would be no indirect impacts to these species; because actions would be deferred indefinitely and small scale natural disturbance and vegetative succession would continue to provide a varying amount of favorable habitat.

Cumulative Effects

There would be no impacts from Alternative 1 to be cumulative with other activities in the analysis area. Therefore, there would be no cumulative impacts from Alternative 1 when added together past, present, and reasonably foreseeable future actions. There would also be no change in the viability of these species in the planning area, because impacts would be negligible.

Proposed Action and Alternative 2

Biological Determination of Impacts

The Proposed Action and Alternative 2: Modified Proposed Action with Conditions of Approval with mitigation may impact *Agoseris glauca*, *Arabis missouriensis*, *Asclepias*

purpurascens, *Astragalus canadensis*, *Astragalus neglectus*, *Botrychium hesperium*, *Botrychium rugulosum*, *Cirsium hillii*, *Cynoglossum boreale*, *Cypripedium arietinum*, *Festuca scabrella*, *Prunus alleghaniensis* var. *davisii*, *Pterospora andromedea*, *Ranunculus rhomboideus*, and *Trichostema brachiatum*, but is not likely to cause a trend toward federal listing or loss of viability within the planning area.

Direct and Indirect Effects

The Proposed Action would have no direct impact on existing individuals of these species, because they were not found within the project area. Possible introduction of non-native invasive species would be controlled with mitigation measures. Highly disturbed industrial sites are not favorable habitats for any of these species. Therefore there would be indirect impacts to these species at the proposed well site and production site, because the habitat would be changed irretrievably for a long period of time. However, the impacts would be shorter term beyond the immediate area of occupancy and along the flowline/pipeline, especially if mitigation measures to limit non-native invasive plants are implemented successfully.

Cumulative Effects

The impacts from the Proposed Action would be cumulative with probable future oil and gas exploration activities within the analysis area. Therefore, there would be cumulative impacts from the Proposed Action when added to other past, present, and reasonably foreseeable future actions. Future activities could result in losses of up to several hectares (acres) of habitat over an area of a few square kilometers (miles) or on the order of 1%. However there would be no change in the viability of any of these species in the planning area, because the analysis area does not host an important population center for any of these species relative to the rest of the planning area.

A complete discussion of the effects can be found in the Biological Evaluation found in the project administrative file.

Heritage Resources

Description of Area Related to Heritage Resources

The analysis area is proposed for ground disturbance area of Proposed Action locations for the well pad, access road, flowlines, and production facilities. Past, present, and future activities occurring in the analysis area are the same as those in the Description of Relevant Affected Resources for the Recreational Experience issue. (Section 3.3)

Direct, Indirect and Cumulative Effects for All Alternatives

Field surveys of the area discovered no historic or prehistoric cultural resources. With mitigation, there would be no effect to Heritage Resources.

3.5 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are decisions to use, modify or otherwise affect nonrenewable resources such as minerals and cultural resources. Irreversible commitments could also apply to resources that are renewable only over a long period, such as soil productivity or old-growth forests. Such commitment of resources are considered irreversible

because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or the resource has been destroyed or removed.

Irretrievable commitments represent opportunities forgone for the period of the proposed actions, during which other resource utilization cannot be realized. These decisions are reversible, but the utilization opportunities are irretrievable. Under multiple-use management, some irretrievable commitments of resources are unavoidable, due to the mutually exclusive relationship between some resources.

Implementation of the Proposed Action or Alternative 2: Modified Proposed Action with Conditions of Approval would result in irreversible commitments of mineral resources if the exploratory well proves to be productive. When the mineral rights were leased, the lessee was granted the right to extract the specific mineral resources. Implementation of either the Proposed Action or Alternative 2 would comply with the existing laws, policies and Forest Plan direction to make mineral resources available to the people of the United States to fulfill their energy needs.

Construction of the well pad, production facility and installation of the flowlines in the Proposed Action and Alternative 2 would cause an irretrievable commitment of resources related to production of timber resources. Trees removed to clear the sites and improve the access roads would be cut. This would be an irretrievable commitment of trees lost for timber resources over the operational span of the well and production facilities.

3.6 Environmental Justice

None of the alternatives is expected to affect the civil rights of any landowners near the project area or other individuals. There would be no discrimination based on race, religion, sex, age, disabilities or family status. Access for persons with disabilities would not change. Crawford County consists of 12.7% low-income and 3.6% minorities. The 2000 U.S. Census showed the population for the State of Michigan consists of 10.5% low income and 19.8% minority (US Census Bureau website). The percentages of the local population in low income or minority status are less than twice that of the state averages. This demographic information indicates that Crawford County is not qualified as an environmental justice community. Alternatives 1, 2 and 3 would not affect environmental justice.