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**Southwestern
Region**

Santa Fe NF

Draft Specialist Report: Roads

A report for the environmental impact statement on the Travel Management Rule

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Introduction

This report is a specialist's report about roads for the Santa Fe National Forest's environmental impact statement on the Travel Management Rule. This report explains the current condition of the road system on the forest and how the road system may change when the Travel Management Rule comes into effect. Other reports provide information about trails and areas.

The Travel Management Rule requires that the Santa Fe National Forest designate National Forest System roads, trails, and areas for motor vehicle use by class of vehicle and, if appropriate, by time of year.

In June 2008, the Santa Fe National Forest published the *Travel Analysis Process Report*; the report contains information on the Forest Service road system, how it developed, and how we keep track of it. That report can be found on the Santa Fe National Forest website in the Travel Management Rule section.

This report discusses 5 alternatives. Alternative 1 is the *no action* alternative and we cannot adopt this alternative. Alternatives 2 through 5 are the *action* alternatives. We may adopt one of the action alternatives.

Here are some questions and answers that summarize this report.

What is the Santa Fe National Forest doing? The effect of all action alternatives being proposed will be to close roads to motorized use, allowing certain exemptions listed in the regulation. The Travel Management Rule requires that we designate motor vehicle use on our roads. Because motor vehicle use is allowed on almost every road on the forest now, and because we will allow motor vehicle use on fewer roads in every alternative, the forest is closing roads to motorized use.

This project does not propose *any* construction of any kind in any alternative.

What could cause environmental impacts for this project? A change in traffic could cause a change in environmental impacts. All the roads that currently exist on the forest will continue in their current form and location after the Travel Management Rule goes into effect until we do something to obliterate the road or the road becomes overgrown. *Obliterate* means returning a road to a more natural state. All the impacts from the *existence* of the roads, from the fact that the roads are in the landscape, will continue. Impacts on soils, water, wildlife, and anything else from the existence of the roads will continue.

If traffic changes, however, there could be a change in environmental impacts. It is important to remember, however, that some of the impacts associated with the road will still be there, even if traffic is eliminated. All

The cost of road maintenance does not vary among the action alternatives. Each alternative has the same number of miles of passenger car roads, and these roads carry the lion's share of maintenance needs. Even though each alternative has four or five times as many high-clearance vehicle miles, these roads have lower maintenance needs. Here, a Forest Service employee directs trucks during a gravel replacement operation on Road 263, a passenger car road, on the Pecos-Las Vegas Ranger District.

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of the roads will still be there until they revegetate naturally or are obliterated. Some roads will not disappear unless the Forest Service obliterates them.

How will traffic on the forest change after the Travel Management Rule goes into effect? It is not possible to predict how traffic will change or *if* traffic will change. We have only limited data on traffic now, so we have only limited information to base our estimates on.

We have traffic counts for some roads on the Santa Fe National Forest and this report will discuss them. While these counts provide general comparative information, they are based on a very small sample. We use the counts to rank the roads from busiest to not-so-busy, not for an absolute count of the number of vehicles that travel the road each day. Any reasonable change in traffic could be within the accuracy and precision of the counts. In other words, if we had this type of traffic count data before and after the Travel Management Rule, we might not be able to tell if there was a change, even if there was a change.

How much will each alternative cost? Regardless of the alternative that we choose, the total expenditure for maintaining the road system on the Santa Fe National Forest will not change. The budget we have received and expect to receive in the future has not been sufficient to maintain the total road system each year to the objective maintenance level. The objective maintenance level is the ideal standard for the type of vehicle use for which the road is intended. Because of our budget, we maintain the roads that have the most traffic each year, but roads with less traffic only get maintained periodically. Even though all alternatives we're considering reduce the total mileage of system roads, the current practice of maintaining some roads less frequently will continue. We will not be able to maintain all the roads that don't get much traffic each year, but with a smaller road system, we will be able to maintain those with priority for maintenance more frequently. Thus, the *difference* in total expenditure between what we are doing now and the cost of any alternative that we propose is zero.

Some people are interested in knowing how the cost of each alternative compares; they are interested in a *cost per mile* amount so that they can compare the different alternatives. The costs of maintaining roads can be tremendously variable. The Forest Service collects data on maintenance *needs* for roads. The data show that there is no difference among the alternatives. We propose to designate the same number of miles of passenger car road in each alternative and the passenger car roads carry the vast majority of the maintenance needs.

But won't there be less traffic on the roads that are not designated for motorized use? Maybe. We're not

This road looks to be in terrible shape, but it is not as bad as many. The maintenance *needs* for a high-clearance vehicle road like this are low, much lower than for a passenger car road. The road is on the Cuba Ranger District near the Jicarilla Apache Indian Reservation.

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at all sure whether minor roads have traffic. We have traffic data on only a few major roads on the forest. Except for the roads with traffic count data, we don't know how many vehicles use the roads, or even *if* vehicles use the roads. Some of the roads that are not proposed for designation under any alternative have not had traffic for years. We know this because of the size of the trees growing up in some roads. Traffic will not change on these roads. Unfortunately, while we do know what roads we propose to designate in each alternative, we don't have traffic data for all of the roads that we are propose for designation.

Wouldn't it be possible to save money and reduce costs by allowing passenger car roads to become high-clearance vehicle roads? It is at least theoretically possible to change the amount of maintenance that we do on a road and change the road from a passenger car road to a high-clearance vehicle road and save a little money. On the Santa Fe National Forest, most passenger car roads are either paved or gravel-surfaced. We improved these roads to a higher standard because they are roads with more traffic. If we stopped maintenance or gravel replacement, the road would return to dirt, and, after a time, become a high-clearance vehicle road. Conversely, increasing maintenance, repairing the road and adding gravel could turn the road from a high-clearance vehicle road to a passenger car road.

We believe that it would be a waste of resources to allow necessary roads to return to dirt. We have worked hard over the years to find the money to keep our roads in the best condition we can with limited resources that we have. The public has paid for these necessary roads and we believe that it would be a disservice to the public to allow the roads to fall apart. While it may be possible to change a road from a passenger car road to a high-clearance vehicle road, we believe it would be bad practice.

Why do some of the tables show different road lengths in different reports? The Santa Fe National Forest has many roads, and it's difficult to know how long each road is. For passenger car roads, we generally used an accurate electronic measuring device to get the road length. We prefer this method. For high-clearance vehicle roads, we used a less accurate method, we took measurements from maps in our geographic information system. Both methods have errors that can accumulate as you add the lengths of each road or each road segment. Our roads database stores information for more than 10,000 road segments. For a large number of road segments, the errors can accumulate and lead to apparent discrepancies in tables that list road lengths.

Databases store information to a large number of decimal places, for example, a length may show as 10.2345 miles. It is unlikely that we know the length of any road to that precision. When the database adds all these lengths, the numbers after the decimal point can

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add up and make it appear that we have more miles of road than we really do. If the database rounds the numbers, the totals in tables may show different numbers.

We have spent a tremendous amount of time and effort to arrive at numbers for this difficult situation. You can be assured that the numbers for the road lengths are the best information we have.

Affected Environment

The extensive road system on the Santa Fe National Forest developed over many years. Some of the roads existed before Congress created the Santa Fe National Forest, while some of the roads may be only a few years old. Road 263, for example, leads up Gallinas Canyon near Las Vegas. The road's origins can be traced back to at least the 1880s; the Federal Emergency Relief Administration and the Civilian Conservation Corps built bridges and culverts along the road in the 1930s. We built some of the bridges during the 1970s. A few years ago we replaced gravel along a portion of the road.

Many of the roads on the forest were built for timber sales. Timber sale roads would be classified as *low standard* roads, roads that would be suitable for logging equipment and for short term use, but might not be suitable for normal vehicles. In some cases, the roads were obliterated or have overgrown, but some of the roads still exist and we may have incorporated some of them into our road system. Chapter 2 of the *Travel Analysis Process Report* explains how we incorporated roads into our system. The National Forest Management Act requires that certain timber sale roads be designed to revegetate themselves or be manually revegetated within 10 years after the sale. Some of the roads that we have incorporated into our system may have been built before the effective date of the act.

We have many unauthorized roads on the Santa Fe National Forest. Unauthorized roads developed for a variety of reasons. People may want to drive their car or truck to their favorite camping spot or to a good area for collecting piñon nuts.

The Forest Service did not build all the roads on the Santa Fe National Forest. Many unauthorized roads developed as just short cuts, an easy way to avoid an intersection, to get around mud bog or a rock, or to get to a favorite campsite. Over the years we have incorporated some of these unauthorized roads into our road system. They have road numbers and are listed in our database.

Roads Managed for Public Motor Vehicle Use

Type of Road	Miles
High-clearance Vehicle Roads	4,481
Passenger Car Roads	443
Total	**4,924**

From *Travel Analysis Process Report*, page 9.

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Types of Roads

The Forest Service has two types of roads:

1. Roads that are suitable for passenger cars, and

2. Roads that are suitable only for high-clearance vehicles.

Roads that are suitable for passenger cars are usually paved or have a gravel surface. On the Santa Fe National Forest, most of our passenger car roads have a gravel surface. Except for the south end of Road 376 and part of Road 263, most of our paved roads are in campgrounds or are paved roads to campgrounds. Passenger car roads are maintained more frequently because they receive the most use.

High-clearance vehicle roads are usually dirt roads. High-clearance vehicle roads receive little or no maintenance and you would need a pickup truck or a four-wheel drive high-clearance vehicle to drive on many of these roads. The lack of maintenance on high-clearance vehicle roads shows. Many roads have ruts that you need to straddle with your vehicle as you drive along. Many have eroded channels that cross the road. Driving on some of these roads can be a challenge, even for an experienced driver.

At the same time, many sections of the high-clearance vehicle roads are smooth and level and would be suitable for passenger cars. Because of poor conditions along other parts of the these good roads, use of passenger cars on these roads is not recommended, even though sections of the road may be adequate for passenger cars.

The Forest Service has a complex system for describing maintenance conditions on its roads, a system that we use for planning road maintenance and other activities on the forest, for information on this system see the Forest Service's *Road System Operation and Maintenance Handbook*, Chapter 60 Road Maintenance, Paragraph 62.32.

Size and Extent

As you will read in the environmental impact statement, the Santa Fe National Forest is 1½ million acres—that's over 2,300 square miles. The total area of New York City, with a population of 8.2 million people, is only 301 square miles. Manhattan is less than 24 square miles. Tokyo, one of the largest cities in the world, has an area of less than 900 square miles. Even the urban area of Los Angeles is less than 1,700 square miles. Several Manhattans could comfortably fit in the Pecos Wilderness.

The Santa Fe National Forest is divided into two approximately equal sections, with the city of Santa Fe in the middle. Coyote, Cuba, and Jemez Ranger

Just how big is 1½ million acres? An outline of the Pecos Wilderness and an aerial photo of Manhattan at approximately the same scale give you some idea of the size of the Santa Fe National Forest. Several Manhattans could comfortably fit in this one wilderness area.

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Districts make up the west side and Española and Pecos/Las Vegas Ranger Districts comprise the east side. The forest has four wilderness areas. The Pecos Wilderness is on the east side and the San Pedro Parks Wilderness, Dome Wilderness, and Chama River Wilderness are on the west side.

As you drive around the Santa Fe National Forest, you see a tremendous variation in the landscape. Scraggly juniper trees dot the dry Caja del Rio area near Santa Fe. You can stop on Road 70 south of the San Pedro Parks Wilderness and watch the trees fade into the haze in the distance with Sandia Crest in the background. In the Pecos River canyon along the road to Jack's Creek Campground, you can see fireweed, usually associated with wetter climates, along the sides of the roads.

Much of this landscape is accessed by thousands of miles of roads on the forest. The wilderness areas, of course, have no roads, so the total mileage of roads is confined to much less than the total 1½ million acres.

The *Travel Analysis Process Report* has information on the number of roads and how many miles of roads the forest has.

Issues and Measures

Because all the roads on the forest will continue to exist regardless of the alternative that we choose, the only issue is whether traffic will change after the Travel Management Rule goes into effect. The only measure that we have is the change in traffic from before to after. Of all the things that we propose to do as part of this project, traffic is the only thing that will change.

In recent years, the Santa Fe National Forest has not had traffic count data to use while making decisions. To help us get better information, we bought some magnetic traffic counters. The counters are small, battery-powered electronic devices that measure the upset in the earth's magnetic field as a vehicle drives past the counter. The counter electronically stores the number of vehicles counted in each hour and then we can download the data from the counter to a computer. The computer program displays text and graphic information to help us analyze the traffic.

Traffic engineers use a term called *annual average daily traffic*. To calculate the annual average daily traffic, you would place a traffic counter in the same place for one year. The total number of vehicles that go past the counter divided by 365 gives you the annual average daily traffic. It is impractical to do this on the Santa Fe National Forest because it would require a counter in the same place for a year; many national forest roads are not drivable or are closed during the winter. To help us solve this problem, we assume that the thirtieth highest hour of traffic in a short count period is approximately 14 percent of the annual average daily traffic.

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To get a traffic count on a road on the Santa Fe National Forest, we put a traffic counter in a waterproof case and bury it or hide it along the edge of a road. To count off-highway vehicle traffic on trails, we bury the counter in the middle of the trail. After two weeks, we take the information from the counter and rank each hour of data from the highest hour to the lowest hour. We find the thirtieth highest hour and divide that number by 0.14. This gives us a good estimate of the annual average daily traffic. The annual average daily traffic is *not* an exact count of the number of vehicles that will travel along a road on a day. We do not use the traffic counts to know how many vehicles drive down the road. Rather, we use the traffic counts to rank the roads on the forest from the busiest to the not-so-busy.

Road 376, for example, on the Jemez Ranger District, is the most heavily traveled road on the forest, as far as we know. The road parallels some fine fishing and camping areas, and when you drive along the road you almost always see cars parked along the side. Our traffic counts at the south end of the road near the tunnels show an annual average daily traffic of around 185. For a comparison, the New Mexico Department of Transportation, using a much better counting system, shows that the annual average daily traffic through Jemez Springs is around 2,600. Farther north on Road 376, the traffic drops to around 150. This is the number of vehicles that go past the counter, regardless of direction. Many of these vehicles will be counted twice because people drive in and out, and don't necessarily drive all the way through. But for engineering purposes, we want to know the total number of vehicles so that we can adequately plan for road maintenance—more vehicles means more maintenance, regardless of the direction the vehicles travel.

On the other side of the forest on the Pecos/Las Vegas Ranger District, Road 79 doesn't get anywhere near as much traffic as Road 376. Road 79 is a dead-end road that serves a trailhead and some private property in the Cañada de Los Alamos area. At the south end of the road near the forest boundary, the traffic count is 30, but at the trailhead the count is only 15. In the Glorieta Mesa area, the Road 326 traffic count shows 23, not an exact number.

While the traffic counts that we have are the best information available, they are by no means perfect. With a count of only two weeks, the accuracy is not as good as if we counted for, say, two months. As an exercise in just how much of a problem this can be, we deleted half of a count period and based the annual average daily traffic count on only one week. For one counter that we placed on Road 151 on the Coyote Ranger District, a two week count showed an annual average daily traffic of 35. Selecting either of the two weeks and processing just that one week produced a count of 28, a decrease of 20 percent. This points out the difficulty of using such a short period for our counts. We believe, however, that if we do all the counts the same way, and don't include holiday

Traffic on Forest Roads

Road	Mile Post	AADT
376	Before Tunnels	185
	After Tunnels	150
	13	128
103	0.73	121
	5.54	92
	19.75	85
151	0.54	85
156	After Rd18	85
	0.2	85
263	0.5	71
534	0.3	64
	12.8	62
	11.6	57
412		57
24	1.03	50
102	Upper End	50
	9.75	42
79	0.78	37
	10.65	35
70	0.1	28
98	0.3	28
	Before the Bridge	28
20	1.85	21
	3.18	21
24J	0.29	14
326	9.99	14
	10.42	14
533		14
	13.3	7

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weekends, the traffic counts are similar enough to give us a relative ranking from busiest road to the not-so-busiest road.

The question, though, is how will traffic change after the Travel Management Rule goes into effect? Is it possible that, because we have fewer open roads on the forest, the traffic that currently exists on almost all the roads will be concentrated on the fewer remaining roads?

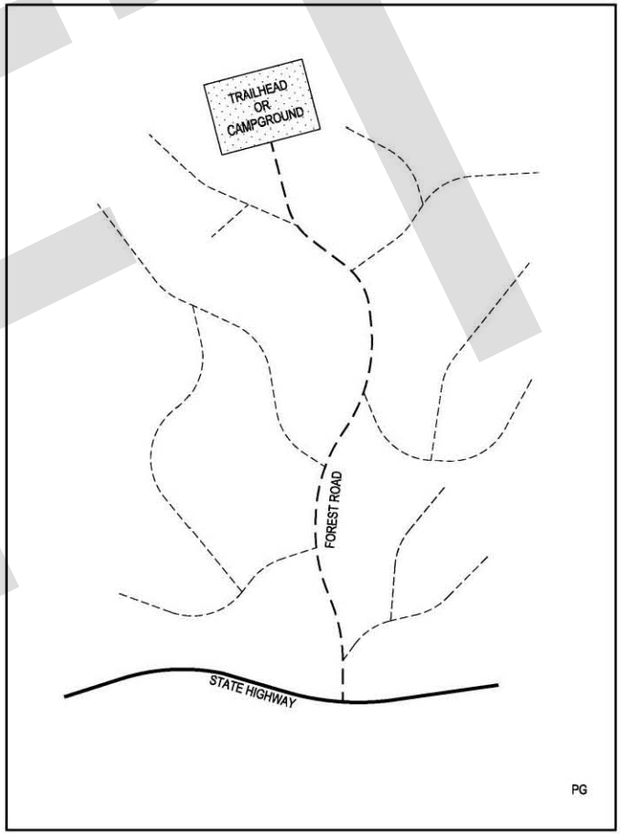
As the introduction to this report points out, we really don't know what will happen to traffic; no one knows. But we can look at some simple examples to illustrate how traffic might or might not change. The figure at the right is an imagined area of the forest that shows roads in a specific area. It may look like a typical drainage pattern that you might see in a drainage basin, and many road systems seem to imitate drainage patterns. In this case, the main road, State Highway, is at the entrance to the area. If we assume that all the roads are now open, what will happen if we close most of the side roads that connect to Forest Road? If we closed all but Forest Road, it would be difficult to imagine that people would drive along the central road simply because the side roads are closed. It would be easy to imagine that overall traffic would decrease once people realized that most of the roads were closed—it might cease to be a forest destination.

If we added a trailhead or campground at the end of Forest Road, but still closed most of the side roads, it would be easy to imagine that traffic would not change at all on Forest Road. Some of the side roads would certainly attract some traffic, but the lion's share of the traffic would be to the trailhead or the campground. At this point, we must remember that we have no traffic data on any minor side roads and only limited data on major forest roads.

A good example of this might be the area on Road 70 on the Cuba Ranger District. Road 70 provides major access to the San Pedro Parks Wilderness Area at two trailheads and to dispersed camping areas. It also provides access to the Eureka Mesa electronic site. We propose to designate Road 70 in all the alternatives and there would be no reason to expect that traffic to the wilderness areas or to the electronic site would change because side roads are closed.

Some roads provide access between communities around the forest. Road 103 provides access between Cuba and Coyote and to inholdings in the area. Regardless of the number of side roads that we close in the area, the traffic between Cuba and Coyote and the inholdings will continue as before. We wouldn't expect to see a change in traffic on Road 103.

It is certainly possible that traffic could decline on some forest roads. For resource protection, some system and unauthorized roads would not be designated, and traffic



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will decrease on these roads. But we have no traffic data on these roads, so it is impossible to tell how much traffic will go down; we don't know what the traffic is now.

It is important to remember that traffic on *all* forest roads is low, compared with city roads. Road 376 has a calculated annual average daily traffic of 185, and that's high by forest standards. At one location on Road 534 between Jemez and Cuba, the annual average daily traffic is only 7. While these are not absolute numbers, you can see the variation from high to low. On Road 534 a 10 percent increase or decrease in traffic would mean a difference of less than one vehicle per day.

So, how will traffic change? We do not have data with which to make a reliable prediction, but it is most likely that traffic as a whole will *not* change appreciably on the Santa Fe National Forest because of the Travel Management Rule, except for roads that we don't designate that people may travel on now.

Most of the traffic on the Santa Fe National Forest is on the 400 miles of passenger car roads. These roads serve campgrounds, trailheads, picnic areas, and provide access between forest communities. Because these uses are fixed, the Travel Management Rule will not change these uses.

Most of the roads on the forest are high-clearance vehicle roads. Many of these roads see little traffic; some haven't see traffic in years. We propose to close some of the high-clearance vehicle roads that people use and this may cause a slight increase in traffic on designated high-clearance vehicle roads. Because the traffic on high-clearance vehicle roads is so low to begin with, any increase on designated roads would be small, indeed, it may be so small that we couldn't measure the change.

Consider as an example a high-clearance vehicle road that has one vehicle drive on it every other day. Based on observations, there are plenty of roads on the forest with much less traffic than that. If you assumed that the Travel Management Rule changed the traffic by 10 percent, that would be a little more than 1 vehicle in 28 days. Because we have counted traffic over a two-week period, it would be impossible to count that one vehicle. Even if we extended the count to four weeks, a difference of one vehicle might depend on what four weeks we chose to make the count. The 10 percent change in traffic would be within the accuracy and precision of our counts.

How much traffic could these roads generate? On the Santa Fe National Forest, almost 1,500 of the roads in our database are less than two-tenths of a mile long—1,056 feet. Almost 1,000 roads on the forest are less than one-tenth of a mile long—528 feet. Over 300 roads are shorter than a football field.

We occasionally use large rocks, called *riprap*, to help control erosion along roads. The riprap slows water flow and holds soil to allow plants to grow and to stabilize the slope. Here, a Forest Service employee walks past riprap while he inspects a project on Road 151 on the Coyote Ranger District.

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Not only is traffic on these roads low and uncountable, the roads don't go anywhere. Many of these roads ended up in our database because they appeared on aerial photos. Many are dead end roads and if you drive down one of them you quickly discover your mistake. It is difficult to see how traffic—if there is any—on these short roads could concentrate on main roads to the point where we could count it.

For these reasons, I believe that traffic will not change on the Santa Fe National Forest after the Travel Management Rule goes into effect except on roads that we don't designate that people drive on now.

Costs

In 2009, the road maintenance budget for the Santa Fe National Forest is around $1,500,000. With this money, we pay the salaries of our road maintenance crew, the operation and maintenance of our heavy equipment, and buy supplies, such as signs and fence posts. This amount of money has been stable over the past ten years.

We maintain between 400 and 550 miles of road on the forest each year. We spend our money where we have the most traffic—passenger car roads. We maintain some high-clearance vehicle roads; in 2007 we maintained 88 miles and in 2006 we maintained 49 miles. District rangers on field units and the engineering group decide priorities for maintenance of these high-clearance roads each year based on specific needs for resource protection, specific access and condition of the roads.

The Santa Fe National Forest is not funded to maintain all the roads on the forest every year. With thousands of miles of roads on the forest and the possibility of maintaining only 400 to 550 miles—and the same roads are maintained every year—the maintenance backlog is obvious.

Road maintenance costs cannot be simplified into a "cost per mile" unit and applied to all roads on the forest. We can, however, determine average needs for certain types of roads on the forest based on our surveys of maintenance needs.

From information we gathered in 2006, the annual maintenance needs for passenger car roads on the Santa Fe National Forest was approximately $11,000 per mile. This is an *average* amount based on a standard method that the Forest Service uses to determine maintenance *needs*. It is by no means perfect, but it is the best information we have.

From information we gathered in 2005, the annual maintenance needs for high-clearance vehicle roads on the forest was approximately $500 per mile. The table on this page summarizes the maintenance needs for all the alternatives. Alternative 1 is the no-action alternative and we cannot adopt this alternative.

"…the cost of each alternative is the same."

Maintenance Needs Alternative Millions of Dollars

	1	2	3	4	5
Passenger Car Roads	4.7	4.5	4.5	4.5	4.4
High-clearance Vehicle Roads	2.3	0.9	0.7	1.0	0.9
Total	7.0	5.4	5.2	5.5	5.3

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As you can see from the table, the maintenance needs do not significantly vary among the action alternatives. The reason for the lack of variation is obvious. Each alternative has approximately the same number of passenger car miles, and these roads carry the vast majority of the costs. The difference between $5,200,000 for alternative 3 and $5,500,000 for alternative 4 is around 5 percent of the total maintenance needs. This amount could easily be accounted for in the averaging process. If you consider the maintenance needs to be the cost of maintaining each alternative, then the cost of each alternative is the same.

Converting Roads

It is at least theoretically possible to change the amount of maintenance that we do on a road and change the road from a passenger car road to a high-clearance vehicle road. On the Santa Fe National Forest, passenger car roads are either paved or gravel-surfaced; a few passenger car roads are dirt. If we stopped any maintenance or replacement of gravel, eventually the road would return to dirt, and, after a time, become a high-clearance vehicle road. Conversely, increasing maintenance, repairing the road and adding gravel could turn the road from a high-clearance vehicle road to a passenger car road.

The Santa Fe National Forest has few paved roads. Except for part of Road 376 south of the tunnels and part of Road 263, paved roads are in campgrounds and parking areas. We are not proposing to reduce maintenance on these roads because it would waste the investment that has been made to bring them to a paved status.

We have many miles of gravel roads on the forest. Like the paving that we have done in the campgrounds and parking areas, we have worked hard to find the money to place and replace the gravel on these roads. Gravel roads tend to be heavily traveled. Road 151 on the Coyote Ranger District, for example, provides camping and rafting access along the Chama River, a wild and scenic river. The road also provides the only access to Christ in the Desert Monastery, a popular tourist destination. Road 376 on the Jemez Ranger District is a gravel road that provides camping and fishing access along the Rio Guadalupe. Road 263 provides camping and fishing access along Gallinas Creek on the Pecos/Las Vegas Ranger District. The road also provides access to inholdings up the Gallinas Canyon.

We have 500 miles of gravel roads on the forest. Pecos/Las Vegas Ranger district has 51 miles of gravel roads and Coyote Ranger District has 152 miles; the other districts are in between. We are not proposing to reduce maintenance on these roads and waste the investment that has been made to bring them to their current standard.

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What Happens to Roads

If you live in the same area for any length of time, you begin to notice that the paved roads gradually become cracked and potholed and rough, and eventually the state or local government has to repair the road. Traffic and weather account for a huge portion of the decline. Forest roads also deteriorate over time, and our roads deteriorate from traffic and weather. On the forest, though, weather can play a bigger role than it does on city streets.

What would happen if we stopped maintenance on all the roads and at the same time stopped all the traffic? We'll look at the three types of roads that we have: paved, gravel, and dirt.

You can tell what might happen to a paved road if you stopped maintenance and traffic by looking at an old fenced-off parking lot. Over the years the parking lot begins to crack, and in the winter—around Santa Fe—water gets into the cracks, freezes, and makes the cracks bigger. Freezing water can exert a tremendous force and can even pop sections of the asphalt out of the parking lot. Seeds fall into the cracks and plants take root. The growing plants also increase the size of the cracks and allow more plants to grow, and so on. Eventually, the parking lot is not useable and would require a lot of work to fix.

The same thing would happen to paved roads. Most of our 37 miles of paved roads on the forest are in campgrounds. The campgrounds would deteriorate and become unusable.

Gravel roads would deteriorate, too. Without regular maintenance, the wind and rain gradually erode the gravel from the road; it would eventually return to dirt.

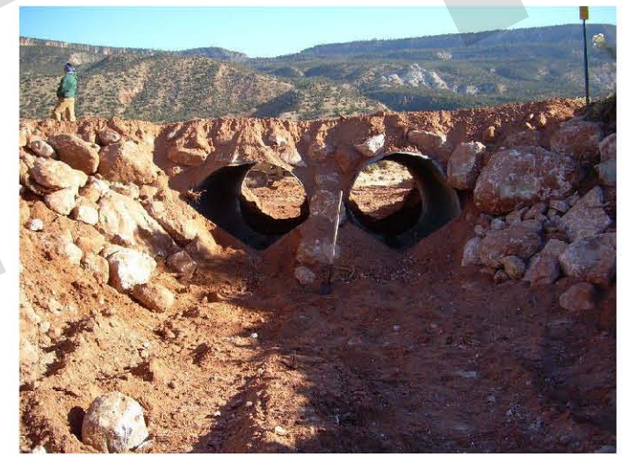
Dirt roads deteriorate, too, and the most obvious example is that the roads gradually return to forest or grassland. When you drive around the forest it is not difficult to find "roads" with trees growing up in them. It is not difficult to find roads that are overgrown and impassable.

Dirt roads can become impassable from erosion, too. Water runs down the slope or across the road and forms little rills. As more of the road erodes, the rills can become gullies and the road becomes impassable.

This is not the only problem, though. Without maintenance, the gullies and other erosion can only get worse. On roads without slopes the forest or grassland can gradually come back, even though it may take years.

Methodology

The information for this report comes from data gathered on the forest, and the experience of other engineers and staff on the Santa Fe National Forest.



Road maintenance involves much more than just grading the road surface. Here, culverts are being installed along a section of Road 151 on the Coyote Ranger District.

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The information gathered specifically for this report is primarily the traffic counts. Other sections of this report explain how the traffic is counted and how the information from the counts is used.

Legal Consistency

Before the Santa Fe National Forest can designate motor vehicle use on roads, we have several things that we must consider. The Travel Management Rule lists these requirements, and this section describes those requirements. This report does not make determinations about these requirements; the report describes them. Before the forest supervisor signs the decision document and we publish the motor vehicle use map, we will evaluate each of these requirements for each road that we will designate. If we evaluate all of the requirements for each road now for each alternative, we may evaluate roads that we don't designate. In the interests of efficiency, we will evaluate these requirements at the appropriate time.

Public Safety

Without any doubt, the most important thing that we must consider when we designate motor vehicle use on a road is public safety. Public safety is a broad issue and involves many things. It involves the type of traffic on the road, the amount of traffic, and the speed of the traffic. This is true for any road that most people regularly drive on.

But roads on the Santa Fe National Forest aren't roads that people typically drive on. Most neighborhoods have paved streets and most people commute to work on paved roads. Dirt roads and gravel roads, however, have problems that don't happen on paved roads. The most common problem is *washboarding*. The vehicles driving on the road cause small ridges that extend across the road. These ridges make it feel like your car is driving on an old-fashioned clothes washing board. The ridges don't just make driving difficult or uncomfortable, they can make driving dangerous. As the wheels bounce on the road, the car's suspension system causes the wheels to be off the ground for an instant. If you apply the brakes you may be surprised when nothing happens. If you try to turn when your car is riding on washboards, you may skid off the road.

The engineering staff drive the roads on the Santa Fe National Forest on a regular basis, and this knowledge is the basis for our evaluation of public safety. We also use information from accident fatalities. The engineering staff don't often find out about accidents unless the accident involves a fatality. We do, however, investigate fatal accidents to see if the road may have contributed to the accident.

In the past 5 years, the forest has suffered 5 fatal accidents. In three, the drivers were either drunk or under the influence of controlled substances and there is little that we can do to change roads to deal with that problem. One of the three accidents involved an off-

We don't always use gravel for road maintenance. This photo shows a replacement operation on Road 85 on the Pecos-Las Vegas Ranger District. This is a recycling operation—we're using ground up asphalt instead of gravel.

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highway vehicle and both people on the vehicle died. The Sandoval County sheriff's office decided that the fifth fatality was a suicide—the accident wasn't discovered until months after it happened.

The engineering staff has been driving Forest Service roads for decades, on this forest and on others around the country. While we don't necessarily drive the roads specifically for public safety evaluations, we drive the roads regularly. We are familiar with the alignment of the roads, where the curves and the hills are. We know about the surface of the road, and because we drive them regularly, we know the safe speeds are for the different roads.

In a general way, we're familiar with the *volume* of traffic on the roads. While we do not have traffic counts on all the roads, generally, roads that need more maintenance have more traffic.

Resources for Maintenance and Administration

We must consider the resources that we have for the maintenance and administration of the roads based on the uses that we are considering. These resources are people, equipment, and money. As we show in other parts of this report, regardless of what alternative we choose we will not have enough money to maintain the system of roads in the alternative to the objective maintenance level each year. While we will consider the amount of money that we have available for maintenance, it is not the only factor that we must consider. The Travel Management Rule does not limit us to designating motor vehicle use on roads that we have enough money to maintain; it requires that we consider the money available.

The forest has a road crew that maintains roads. We have heavy equipment that we use on the forest—two motorgraders, one dozer, a backhoe, dumptrucks, and equipment to transport the heavy equipment. With this equipment we maintain the roads on the forest. By carefully planning and scheduling the maintenance work, we are able to keep the roads on the forest in a respectable, if not perfect, condition.

All action alternatives being considered are a significant improvement from a maintenance cost standpoint over the current situation. All action alternatives will be acceptable choices from a maintenance cost standpoint, given our ability to set priorities for periodic maintenance based on resource protection and traffic. Thus all alternatives we are considering take into account the resources for maintenance and administration as required by the Travel Management Rule.

Traffic: Speed, Volume, Composition, and Distribution of Traffic on the Roads

Most of the roads on the Santa Fe National Forest are low-speed roads. We don't set speed limits on the

We use our traffic counts to rank the roads from busy to not-so-busy, not to give us a precise number of cars on the road each day. This magnetic counter is 3 inches across and we can easily hide it on the edge of a road or bury it in a trail.

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roads, but you can't drive very fast on most roads. On a road with heavy washboarding it is impossible to go much over 10 or 15 miles per hour. The well-maintained gravel road allows higher speeds on straight sections, but the curves and hills in the road, the *geometry*, keep speeds lower. On many dirt roads you must crawl along at less than 5 miles per hour—sometimes even slower—to keep the wheels out of the erosion channels.

In general, on Forest Service roads, the roads themselves limit the speed. We must consider the speed of traffic on the roads, but it is generally low enough to not be a concern.

Volume refers to the number of vehicles on the road. As this report says, we have traffic counts for a few roads on the forest, but these counts are most useful for ranking roads from busiest to not-so-busy. Excepting the main roads on the forest, traffic volumes are low. Even on the busiest roads it is possible to drive the entire length of the road and not see another vehicle driving on the road. The table on page 4 shows the average daily traffic on roads that we have counted.

Based on the information in this section, the volume on the roads on the Santa Fe National Forest that we are considering would not disqualify the road from designation for motor vehicle use.

Composition refers to the different type of vehicles in the traffic stream. We have no data on traffic composition.

When we travel around the forest we see different types of vehicles. Mostly we see pickup trucks, but we also see passenger cars, off-highway vehicles, recreational vehicles and motorcycles. To get specific data on composition, someone would have to sit at the same location and keep track of all the vehicles that drove past.

Distribution of traffic generally means directional distribution—how many vehicles go in each direction. We have no data on distribution.

It is, however, safe to assume that people drive onto the forest and then leave. This would tend to indicate that distribution is a fifty-fifty split; half the traffic goes in each direction.

The Travel Management Rule requires that we consider compatibility of vehicle class with road geometry and road surfacing. Over 90 percent of the road miles on the forest are dirt. The second most common surface is gravel, at less than 10 percent. Finally, most campground roads and part of Road 376 are paved.

The geometry of roads on the forest is fixed. In some cases, we designed the roads and considered things like sight distance and ease of driving. In some cases the

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roads came about gradually over many years as people drove on the forest. Sometimes cow trails gradually changed from one track to two tracks and became roads.

Given the low speeds and traffic volumes on the forest roads, geometry and road surfacing are not concerns. Except for the few fatalities listed in this report, we have no data on traffic accidents on the forest. When we travel the forest, we see damaged signs and damaged trees, and we assume that they have been hit by vehicles, but we have no information other than this assumption.

Rights of Access

The Travel Management Rule requires that we consider valid rights of access for people with inholdings in the forest. The Lands Specialist report discusses this issue in detail.

Comparing Alternatives

The number of miles of *open road* varies among the alternatives, but because we are not doing any construction or obliteration, the number of miles of road in the landscape does not vary among the alternatives. We have only limited traffic data on major forest roads and no traffic data on minor forest roads. It is difficult to know with any certainty how traffic might change among the alternatives. Is there another feature that we could look at to distinguish the alternative from one to the other?

The number of miles of open roads tells us how many roads will have traffic and how this will vary among the alternatives. The number of miles of open road can also help us see how we might be able to better maintain the road system on the Santa Fe National Forest.

The table on this page lists the number of miles of open road in each alternative. It lists both passenger car miles and high-clearance vehicle miles.

Alternative 1 is the no action alternative and we cannot adopt this alternative. Under the no action alternative, cross-country motor vehicle travel is allowed, and the Travel Management Rule does not allow cross-country motor vehicle travel except in designated areas.

In the other alternatives the number of miles of passenger car roads does not vary significantly.

The number of miles of high-clearance vehicle roads varies from a high of 2,100 miles in Alternative 4 to a low of 1,400 miles in Alternative 3. Fewer miles of road to maintain should result in lower maintenance costs. In a general sense, this is true: Fewer miles of roads cost less money.

The Highway Safety Act requires that we maintain our passenger car roads to certain standards; the Highway Safety Act does not apply to high-clearance vehicle

	Alternative				
	1	**2**	**3**	**4**	**5**
Passenger Car Miles	428	408	405	408	403
High-clearance Vehicle Miles	4,691	1,882	1,424	2,140	1,827

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roads. Because of this requirement, our first maintenance priority is our passenger car roads. The maintenance involves more than just blading the road to ensure a smooth surface. We also have to maintain safety standards like signs, side slopes, sight distance, and guardrails.

After we have maintained the passenger car roads we can work on the high-clearance vehicle roads. We don't always maintain high-clearance vehicle roads and we will not maintain *all* the high-clearance vehicle roads under any alternative. As the table on the previous page shows, in any alternative that we could adopt will have fewer miles of roads to maintain. Even the alternative with the most high-clearance vehicle roads will still be less than half of the current mileage.

We can draw some broad conclusions from this information. First, passenger car road miles do not vary significantly among alternatives. Second, alternatives with fewer miles of high-clearance vehicle roads will probably, although not certainly, cost less than alternatives with more miles of these roads. Third, in alternatives with fewer miles of high clearance vehicle roads we are more likely to maintain some of these roads each year; the maintenance *return frequency* will be more frequent. Fourth, for *any* alternative that we adopt the maintenance return frequency will be more frequent than what we are doing now.

References

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