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Agriculture

Forest  
Service

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# Transportation Specialist's Report

## Four-Forest Restoration Initiative

**Coconino and Kaibab National Forest**

**Coconino County, Arizona**



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## Background

The Coconino and Kaibab National forests have identified the needed road system for public and administrative motorized use through the Travel Management Rule (TMR) process., the Coconino NF conducted seven formal Roads Analysis Processes (RAPs) including the forest-wide RAP for Passenger Car Roads (MLs 3, 4 and 5), the East Clear Creek RAP, the Anderson Mesa RAP, and the Mountaineer RAP, Southeast RAP, Fossil Creek RAP and NW Rap. With the exception of the forest-wide RAP for passenger car roads, the RAPs identified resource risks and access benefits associated with all roads and were used for NEPA project specific road decisions and included all maintenance level of roads (1-5). The forest-wide RAP for Passenger Car Roads (MLs 3, 4 and 5) was used for the Forest-wide TMR process . Resource risks included impacts to soil and water resources and watershed function from roads that are eroding and contributing sediment, as well as wildlife, threatened and endangered species habitat, and impacts to cultural resources. As part of the risk/benefit evaluation process, the RAPs identified roads that should be closed to public travel, decommissioned, or considered for other uses because they were no longer needed to meet resource management objectives (USDA 2010). These data informed a Forest-wide TAP that was completed in January of 2010 (USDA, 2010).

The Kaibab NF completed a Travel Analysis Process (TAP) report on the Tusayan district in 2008 (USDA 2008) and on the Williams district in 2010 (USDA 2010a). Similar to the Coconino process, the TAPs identified resource risks and access benefits associated with roads. National Environmental Policy (NEPA) decisions were completed for each of these units, with the dates of decisions outlined in the table below.

**Table 1. Travel Management Decision Documents for the 4FRI Planning Area**

NEPA Document	Type of Decision Document	Date of Decision
Coconino National Forest Travel Management Environmental Impact Statement	Record of Decision (USDA 2011a)	9/28/2011
Environmental Assessment (EA) for the Williams Ranger District of the Kaibab National Forest Travel Management Project	Decision Notice/FONSI (USDA 2010b)	7/9/2010
Environmental Assessment (EA) for the Tusayan Ranger District of the Kaibab National Forest Travel Management Project	Decision Notice/FONSI (USDA 2011)	1/31/2011

## Regulatory Authority

### Laws

1. National Forest Roads and Trails Act of October 13, 1964, as amended (16 U.S.C. 532-538). Authorizes road and trail systems for the national forests. Authorizes granting of easements across NFS lands, construction and financing of maximum economy roads (FSM 7705), and imposition of requirements on road users for maintaining and reconstructing roads, including cooperative deposits for that work.

2. Highway Safety Act of 1966 (23 U.S.C. 402). Authorizes state and local governments and participating federal agencies to identify and survey accident locations; to design, construct, and maintain roads in accordance with safety standards; to apply sound traffic control principles and standards; and to promote pedestrian safety.
3. Surface Transportation Assistance Act of 1978, as amended (23 U.S.C. 101a, 201-205). Supersedes the Forest Highway Act of 1958. Authorizes appropriations for forest highways and public lands highways. Establishes criteria for forest highways; defines forest roads, forest development roads and forest development trails (referred to as “NFS roads” and “NFS trails” in Forest Service regulations and directives); and limits the size of projects performed by Forest Service employees on forest roads. Establishes the Federal Lands Highway Program.
4. Organic Administration Act of 1897 (16 U.S.C. 551). This act authorizes the regulation of national forests.

## **Regulations**

1. Travel Management (36 CFR Part 212, Subparts A). Subpart A of these regulations establishes requirements for administration of the forest transportation system, including roads, trails, and airfields, and contains provisions for acquisition of rights-of-way. Subpart A also requires identification of the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of NFS lands and use of a science-based roads analysis at the appropriate scale in determining the minimum road system.
2. Prohibitions (36 CFR Part 261, Subpart A). These regulations establish prohibitions on use of NFS lands, including prohibitions on possession and operation of motor vehicles on NFS roads, on NFS trails, and in areas on NFS lands.
3. Sale and Disposal of National Forest System Timber (36 CFR Part 223). These regulations govern road construction related to Forest Service timber sale appraisals and contracts.

## **Other Authorities**

1. Forest Service Directives. Direction on travel analysis, resides in chapters in FSM 7710, and FSH 7709.55. Direction on management and maintenance of NFS trails resides in FSM 2350 and FSH 2309.18, and direction on management and maintenance of roads resides in FSM 7730 and FSH 7709.59. Direction on law enforcement activities resides in FSM 5300 and FSH 5309.11. This project will not be making any travel management decisions that were decided in the tow Forest’s respective TMR decisions.
3. Memorandum of Understanding Between the Forest Service and the Bureau of Land Management on Rights-of-Way and Road Use. Includes provisions for granting temporary and long-term rights-of-way between the agencies. Provides for a license agreement to be issued to timber and mineral purchasers of one agency using roads under the jurisdiction of another agency (FSM 1531.12f and 5465.1).

## **Desired Condition**

The desired condition for roads within the analysis area is to have a system of roads that will provide access to the project area, while minimizing impacts to natural and cultural resources. The desired condition for system and unauthorized roads that have been determined to be not needed and are not

identified on the needed road system in the Travel Management Planning NEPA analysis is to convert these roads in a naturalized condition within 10 years (ie decommissioned).

## **Purpose and Need**

There is a need to have adequate access to the project area for implementation. A portion of the open, existing road system that would be used to access the project has resource and human safety concerns. In some parts of the project area, there are no existing roads that could provide access to treatment areas, or the existing roads are currently managed as closed. There is a need to improve road conditions (improve drainage, maintain road surface, improve sight distance, etc) where there are resource or human safety concerns, construct temporary roads, and temporarily open existing closed roads. Once the project is completed, there is a need to decommission the temporary roads and re-close roads that should be placed in long term storage.

In addition to the need for providing access, there is a need to decommission unneeded roads and implement management strategies and road maintenance techniques (including restoration of drainage features) that moves towards restoring road prisms (as soon possible and practical) to their natural condition and providing a road system that is outlined in each Forests respective TMR decisions.

There is a need to decommission approximately 722 miles<sup>1</sup> of existing system and unauthorized roads on the Coconino National Forest. A review of Kaibab NF data indicates approximately 134 miles of unauthorized roads (often referred to as user-created routes) are recommended for decommissioning. These roads are not proposed for designation for public motorized use or currently needed for administrative use on the Coconino NF or Kaibab NF. Road decommissioning is defined as “activities that result in the stabilization and restoration of unneeded road to a more natural state” (36 CFR 212.1). Appendix A outlines the possible management activities that can occur under road decommissioning activities.

## **Alternative Descriptions**

The following are descriptions of the alternatives in relation to the transportation system

### **Alternative A**

Alternative A is the no action Alternative.

### **Alternative B-D**

Alternative B, C and D have the same needed road system, even though there are differences in the acres of mechanical treatment between the Alternatives. Alternatives B and D have the same acres of mechanical treatment. Alternative C has an increased acreage in grassland restoration and a decrease in mechanical acres in research watersheds. The existing road systems and proposed temporary roads are adequate for the increased acreage.

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<sup>1</sup> The original Proposed Action that was scoped in March of 2011 had a total of 941 miles of road needed for decommissioning on the Coconino and 170 miles of decommissioning on the Kaibab. These mileages were changed to 722 miles needed on the Coconino and 134 miles on the Kaibab. The discussion below defines the rationale for the change.

The Proposed Action as scoped in August of 2011 is listed below. Under this Alternative, the following road related activities are proposed:

- Decommission approximately 1,111 miles of roads, including:
  - Decommission 941 miles of existing system and unauthorized roads on the Coconino NF
  - Decommission 170 miles of unauthorized roads on the Kaibab NF
- Construct 46 miles of temporary roads for haul access and decommission when treatments are finished
- Reconstruct 27 miles of existing open system roads for to mitigate negative impacts to natural resources and user safety concerns.
- Open 183 miles of existing closed roads in order to conduct treatments and decommission when treatments are finished.

The road miles that are carried forward into Alternatives B-D were refined through additional analysis.

- Decommission 904 miles of roads and include the following:
  - Decommission 770 miles of existing system and unauthorized roads on the Coconino NF
  - Decommission 134 miles of unauthorized roads on the Kaibab NF
- Construct about 517 miles of temporary roads for haul access.
- Reconstruct up to 40 miles of existing, open roads for resource and safety concerns (no new permanent roads would be constructed). Of these miles, approximately 30 miles will be to improve roads<sup>2</sup> to allow for haul (primarily widening corners to improve turn radiuses) and about 10 miles will relocate roads<sup>3</sup> out of stream bottoms. Relocated roads will include rehabilitation of the moved road segment.

The rationales for refining the mileage from the original Proposed Action for Alts B-D are below.

### ***DECOMMISSION CLOSED ROADS***

The 941 miles of roads to be decommissioned in the Proposed Action is determined from the TMR analysis as non-open roads with identified resource risks on the Coconino National Forest within the project area and are recommended to be decommissioned in Coconino TAP. The 770 miles in Alternatives B&D is 1) a subtraction of miles that are being analyzed within the Wing Mountain 10K project that has its' own road analysis necessary to implement projects proposed within the Wing Mountain 10K and 2) the Cinder Hills OHV area where no harvest treatments are being proposed.

### ***DECOMMISSION UNAUTHORIZED ROADS***

The 170 miles of unauthorized roads to be decommission in the Proposed action is determined from the TMR analysis as unauthorized roads on the Kaibab National Forest within the project area and are not needed. The 134 miles in Alts B&D is a subtraction of miles that were roads that cannot be

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<sup>2</sup> Road reconstruction-improvement are any activity that results in an increase of an existing road's traffic service level, expansion of its capacity, or a change in its original design function. Activities include, but are not limited to, reconstruction of bridges and major culverts, placing bar ditches, subgrade repairs, shoulder widening, lane widening, ditch widening, roadway prism widening, horizontal and vertical alignment changes, curve widening, and improving site distance at road intersections. Vegetation will likely be removed with these activities.

<sup>3</sup>

decommissioned because they were later determined to be on private land. This data error has been corrected in the Kaibab NF's transportation database.

### **TEMPORARY ROADS**

Between the March PA and the August PA, two major activities were undertaken that changed the total miles of temporary roads needed for the project. First, a Geographic Information System (gis) exercise was undertaken identify haul routes from the existing road system. From this analysis, the haul routes were buffered by ¼ mile<sup>4</sup> on each side of the haul route to determine where temporary roads were needed. Approximate temporary road locations were created in gis to arrive at an approximate mileage of temporary roads needed for the analysis area—this increased the total miles to nearly 500 miles of temporary roads needed. The exact location of the temporary roads determined in this exercise will be determined at the time of implementation, but are expected to be similar as the gis exercise.

Second, a field review of 4FRI temporary roads and road systems-4FRI First EIS Area (USDA 2012) was undertaken to validate the temporary road mileage needs as well as the on-the-ground conditions with what is displayed in the database. From this analysis, it was noted that there is a need for more temporary roads than was originally scoped and that the conditions on the ground were accurately displayed by the database. Temporary road segments that were identified in the field review were added to the gis analysis for the final temporary road mileage that is displayed above.

### **RECONSTRUCTION<sup>5</sup> OF EXISTING ROADS**

There are two categories of reconstruction, road improvement and road relocation. Activities in road improvement include, but are not limited to, reconstruction of bridges and major culverts, placing bar ditches, subgrade repairs, shoulder widening, lane widening, ditch widening, roadway prism widening, horizontal and vertical alignment changes, curve widening, and improving site distance at road intersections improve site distance and haul safety. These activities may result in limited removal of vegetation. Alternatives B –D identify the need to implement road improvement on approximately 30 miles of road.

Within Alternatives B and D, road relocation is expected to occur on about 10 miles of road and is expected to occur on roads that are located directly adjacent to drainages. This activity includes creating a new road alignment in an upland position, installing the proper drainage features, signage, and surfacing on the new road alignment and the decommissioning of the old road alignment. The new road alignment will require the removal of vegetation at the new alignment site. The objective for these

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<sup>4</sup> ¼ mile is the maximum skid distance to roads that is economical.

<sup>5</sup> Reconstruction is defined as follows: Activity that results in improvement or realignment of an existing classified road as defined below:

*a. Road Improvement.* Activity that results in an increase of an existing road's traffic service level, expansion of its capacity, or a change in its original design function.

*b. Road Realignment.* Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway.

roads is to relocate or realign some segments outside of the filter strips for drainages. The original mileage was derived from a geographic information system (gis) exercise that intersected road segments within streams for the entire project area. The revised mileage reduced this by 1) taking out segments that were perpendicular stream crossings and less than 50 feet of road within the drainage and, 2) taking out segments that were located in other project areas.

In addition to the actions stated above, there are about 2,297 miles of system roads that will be used for haul routes. Haul routes are identified as primary (arterial) roads and secondary roads (collector roads). As a general rule, primary haul routes are roads that have an Operational Road Maintenance Level of 3 or greater, however approximately 10% of the primary haul routes are level 2 roads. Secondary haul routes generally have a maintenance level of 1 or 2, as well as are temporary roads. Approximately 42 miles of existing system road haul routes will be decommissioned after use. The table below displays the route numbers and approximate miles of system roads that will be decommissioned after use as a haul route (these miles are a subset of the 770 miles of road to be decommissioned on the Coconino NF that is listed above and are not a “new” or “different” category of decommissioned road).

**Table 2. System Haul Roads that are decommissioned after Use**

Road Number	Miles	Road Number	Miles	Road Number	Miles
522	2.3	6391	1.7	06077D	0.4
655	0.6	9021	0.3	09001G	1.5
703	1.4	9411	1.3	09002G	1.1
6015	1.9	9474	0.5	09003F	0.2
6028	0.7	9480	0.3	09003S	2.4
6224	0.7	00003P	1.2	09004F	2.0
6227	0.8	00078C	0.7	09004H	1.7
6275	3.2	00132B	1.6	09006E	1.2
6353	2.1	00235J	1.2	09007G	0.6
6354	1.4	06028B	1.1	09009K	2.2
6357	1.9	06077C	0.8	09021A	0.6
SUM	17.1		10.7		13.8
<b>TOTAL</b>					<b>41.6</b>

## Affected Environment

Currently, there are approximately 4,278 miles of NF system roads within the project area. Of these, approximately 3,334 are open roads and 944 miles are closed roads. In addition to the roads that are currently managed as National Forest System Roads, there is an additional approximately 374 miles of unauthorized roads that have been identified within the analysis area, for a total of approximately 4,652



miles of roads on Forest Service lands within that analysis area. The maps and the table below display the miles of road by operational maintenance Level<sup>6</sup>.

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<sup>6</sup> Operational maintenance level is defined as the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria. (FSH 7709.58, 12.3)

**LEVEL 1.** These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate" all traffic. These roads are not shown on motor vehicle use maps. Roads receiving Level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are closed to vehicular traffic but may be available and suitable for nonmotorized uses.

**LEVEL 2.** Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not provided with the exception that some signing, such as W-18-1 "No Traffic Signs," may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to:

- a. Discourage or prohibit passenger cars, or
- b. Accept or discourage high clearance vehicles.

**LEVEL 3.** Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. The Manual on Uniform Traffic Control Devices (MUTCD) is applicable. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations.

Roads in this maintenance level are typically low speed with single lanes and turnouts. Appropriate traffic management strategies are either "encourage" or "accept." "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

**LEVEL 4.** Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. Manual on Uniform Traffic Control Devices is applicable. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.

**LEVEL 5.** Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. Manual on Uniform Traffic Control Devices is applicable. The appropriate traffic management strategy is "encourage."

**Table 3. Operational Maintenance Level Road System for the 4FRI Planning Area**

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<b>Type of Road</b>	<b>Miles</b>
1 - BASIC CUSTODIAL CARE (CLOSED)	943.9
2 - HIGH CLEARANCE VEHICLES	2,677.0
3 - SUITABLE FOR PASSENGER CARS	479.6
4 - MODERATE DEGREE OF USER COMFORT	90.6
5 - HIGH DEGREE OF USER COMFORT	86.4
Unauthorized Roads	374.0
<b>Grand Total</b>	<b>4,651.5</b>

Figure 1. Existing Road System for the 4FRI Planning Area-South Half

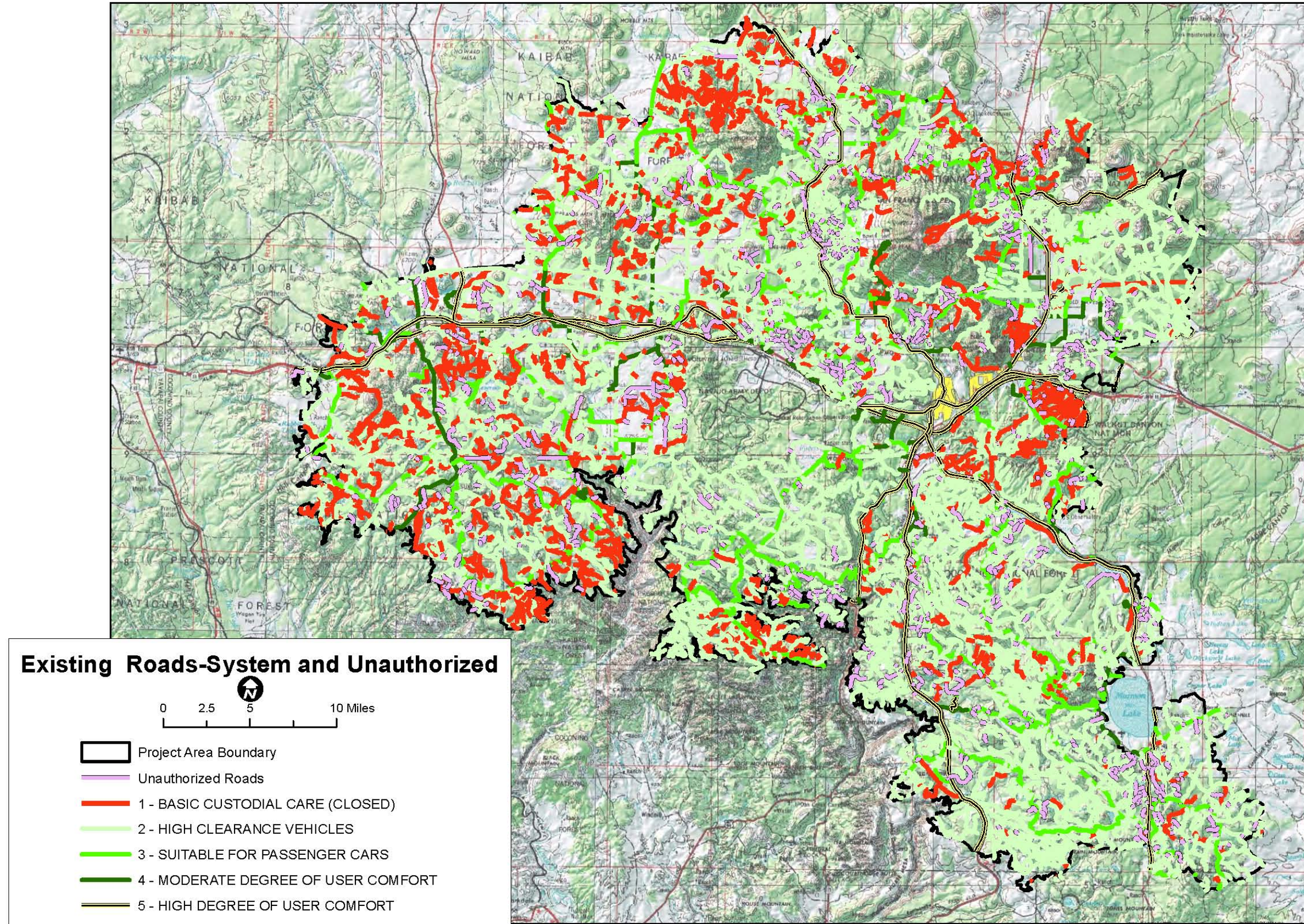
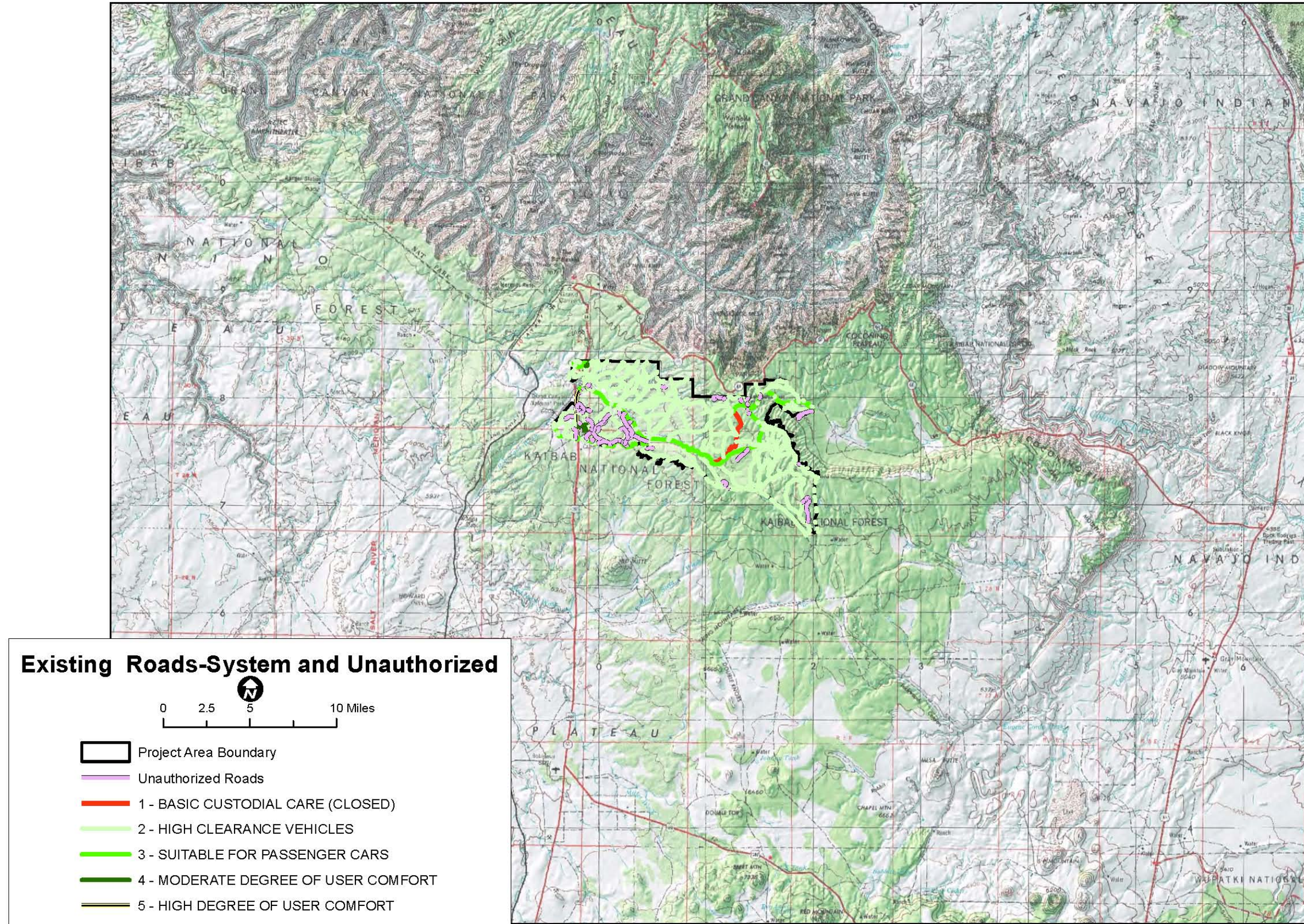


Figure 2. Existing Road System for the 4FRI Planning Area-North Half



Not all of the 4,278 miles of open road within the 990,000 acre analysis area will be needed for removal of forest products. A haul route analysis identified approximately 2,297 miles of existing open road necessary for removal of forest products after harvest, as well as the need for approximately 517 miles of temporary roads.

## **Environmental Consequences**

The analysis will focus on two items related to the purpose and need of the project. First, the analysis will disclose how the needed access to the analysis area by alternative in order to implement the proposed action. The unit of measure will be miles of system road and miles of temporary road. Second, the analysis will disclose how each alternative moves towards a safe and more affordable transportation system that is identified within each Forests respective TAP documents. The unit of measure will be miles of decommissioned roads and miles of open road for a more affordable road system, and the miles of road maintenance for road safety. The timeframe for the analysis will be the life of the project (about 10-15 years).

## **Alternative A**

### **Direct and Indirect Effects**

Under Alternative A, current road management would continue on the two Forests, including implementing the TMR open road system. There is not a need to implement a transportation system in order to implement the No Action alternative. The transportation system will be adequate to access the analysis area for the general public as defined in each Forests respective TMR decisions for both the short-term (current to 10 years) and long-term (greater than 10 years from current). No harvest activities will occur, so no new temporary roads will need to be constructed.

Additional NEPA analyses is necessary to carry out on-the-ground closure activities, therefore this Alternative does not move towards a safe and more affordable road system. Road maintenance will continue, primarily on Maintenance Level 3-5 roads, as well as a limited basis on Level 2 roads.

### **Cumulative Effects**

There are no actions proposed from this Alternative, hence there are no cumulative effects.

## **Alternatives B-D**

### **Direct and Indirect Effects**

The following describes the effects of road treatments that occur on roads within the analysis area.

#### **Road Activities**

- Maintenance of open existing roads may include road maintenance activities described in the Forest Service Operations and Maintenance Handbook (FSH 7709.59) such as, but not limited to, road blading, draining maintenance, culvert installation, culvert replacement, spot surfacing and resurfacing, removal

of slides and slumps, removal of danger trees, removal of road side vegetation for improved site distance on the roads, dust abatement, removal of overhanging vegetation to allow for access and installation of signs. This activity is expected to occur on approximately 2,297 miles of road. Dust abatement is expected to occur on about 7 miles of road.

The 2,297 miles of haul route maintenance activity does not provide for full access to the area to be able to implement the proposed action during the life of the project and will require additional temporary roads. There is a short-term benefit for a safer transportation system through improved surfacing, and signage during the life of the project. If the roads are not on a long-term maintenance schedule, the effect to the safety of the transportation system will decrease as drainages and road surfaces continue to degrade. A long-term maintenance schedule after the life of this project for roads is outside the scope of this analysis.

An indirect effect of the proposed thinning activities is the removal of vegetation to improve site distance. This effect will decrease over time as vegetation re-establishes itself. However, , the desired condition is for an open stand condition and these effects will be effective for both the short and a portion of the long-term. Routine maintenance activities that occur during the life of this project will also provide for adequate site distances. The negative effects of roads on soil and water resources are decreased during this action and are discussed within the respective soil and water specialist reports. The spot surfacing and gravelling component of this activity will require the use of a rock source (either commercial or rock sources on Forest Service land), but will not deplete all available rock sources in or adjacent to the project area. The total amount of material necessary is not quantifiable at this time but will be identified with specific road packages as implementation of projects proceed. There will be energy use necessary for this activity for equipment to be able to maintain roads and haul trucks to transport material. The amount of energy use will be minimized for haul needs of material by utilizing the closest pit available for the material type needed for the project.

- Road reconstruction includes road improvement activities on about 30 miles of roads and road relocation on about 10 miles of roads in the vicinity of ephemeral, intermittent, and perennial streams would be completed to lessen the impact on these waters.

Road improvement activities are defined as activities that result in an increase of an existing road's traffic service level, expansion of its capacity, or a change in its original design function (36 CFR 212.1). Activities included in road improvement include, but are not limited to, widening corners to improve turn radiuses, straightening of road segments to improve haul safety, installing turnouts to improve haul safety, and changing alignments at road intersections to improve site distance and haul safety. These activities may result in limited removal of vegetation. These activities will occur on approximately 30 miles of roads within the project area.

These activities have limited effect to the transportation system because the existing transportation system will be utilized, but does provide related short-term and long-term benefit to improved safety of the road system. Reconstruction/improvement will require the use of a local rock source (either

commercial or rock sources on Forest Service land), but will not deplete all available rock sources in or adjacent to the project area.

Approximately 10 miles of road within the project area will have the relocation treatment. The desired condition for stream road segments is to have ephemeral, intermittent, and perennial water courses slow the speed of water flow, have access to the flood plain, transport sediment, and maintain longer sustained base flows on the landscape, rather than a flush of peak flows. Floodplains are functioning and lessen the impacts of floods on human safety and health. Road reconstruction may include the road relocation out of drainages, construction of rock rip-rap, the installation of new culverts, and the construction of low water crossings, as well as decommissioning the old road segment.

These activities have limited effect to the transportation system because the existing transportation system will be utilized, but does provide related short-term and long-term benefit to soil and water that are discussed in the respective soil and water specialist reports. Reconstruction away from streams will result in major improvement in the ability to maintain roads, and such, will result in short-term and long-term benefits to a more affordable and safe road system on approximately 10 miles of road within the analysis area. Reconstruction/relocation will require the use of a local rock source (either commercial or rock sources on Forest Service land), but will not deplete all available rock sources in or adjacent to the project area.

Temporary and closed system roads that are opened for treatment purposes would be used during project implementation to provide for access to the area to implement the proposed action. 245 miles of temporary roads will be constructed and decommissioned when treatments are finished and 272 miles of existing system roads that have been previously closed/decommissioned will be reconstructed or opened and decommissioned after use for a total of 517 miles. This is primarily a short-term effect that occurs during the first 10-years of the project. A small, unquantifiable portion of this effect is expected to occur after a 10-year timeframe due to implementation timeframes associated with contracts. Effects to soil and water resources, as well as recreation resources are expected to occur during this timeframe and are discussed within the respective specialist reports. Temporary road construction will be defined in detail by contract specifications with the objective of minimizing impacts to soil and water, wildlife and recreation resources and will utilize design features within these specialists' reports to minimize impacts to the respective resources.

Once harvest treatments have been completed, temporary roads would be decommissioned. Unneeded (ML 1) roads would be decommissioned. Decommissioning of unneeded (ML1) and unauthorized routes will use an adaptive management framework that is outlined in the table in Appendix A below, and will also utilize design features outlined in the respective soil and water specialist reports. This occurs on approximately 517 miles of temporary roads within the analysis area, and approximately 42 miles of system roads within the analysis area. The decommissioning of 42 miles of current system roads on the Coconino National Forest begins to move the road system towards a more affordable transportation system. Again, the bulk of this work is expected to occur in the short-term of the first 10 years of the project. The 42 miles of decommissioned system road is a long-term beneficial effect and is moving towards a more affordable transportation system.

- Decommissioning does occur on approximately 904 miles of road in these alternatives. This activity occurs after the removal of forest products and does not have an effect on the transportation system to provide access for project implementation. There may be a negative effect on access needed for implementation of prescribed burning in Alternatives B and C on approximately 904 miles of roads for both the short term and the long term and an indirect effect to implementation if roads identified for decommissioning are needed as firelines/containment lines for prescribed burns (primarily long-term effect on maintenance due to the timeframe for naturalization of decommissioned roads is 10 years). In Alternative D, the acres of prescribed burning is decreased, and the corresponding road mileage that would be used to access prescribe burn sites is decreased to about 225 miles of road that can affect access for implementation. Alternative D also has an indirect effect to implementation if roads identified for decommissioning are to be used as firelines/containment lines for prescribed burns on about 225 miles. The decommissioning of about 904 miles of road do have a short-term and long-term positive effect on creating a more affordable transportation system.

In summary, the effects of increased amount of road maintenance on 2,297 miles of open roads are a short term improvement in access to implement the project, as well as providing for a safe transportation system in the short term. Safety is improved through improved surfacing, improved site distance and improved signage that maintenance provides. The improvement of approximately 30 miles of roads will improve safety through creating turnouts, straightening of roads, and changing alignments at road intersections to improve site distance. The reconstruction of 9 miles of roads out of stream channels will have a short-term and long-term improvement in a safe and more affordable transportation system on about 3 miles. The construction, use and decommissioning of about 517 miles of temporary road will be necessary to effectively implement the proposed action and is primarily a short-term benefit. The decommissioning of 904 miles of road does move toward a more economic and efficient road system in both the short and long-term through the reduction of miles of system roads.

### **Forest Plan Amendments – Alternatives B-D**

On both forests, the proposed forest plan amendments address management in Mexican spotted owl habitat, management of canopy cover, managing select acres for an open reference conditions, and propose using vegetation and prescribed fire treatments in the proposed Garland Prairie RNA on the Kaibab NF (alternative C only). No road activities would be affected by implementing (or not implementing) the proposed amendments.

### **Cumulative Effects**

The cumulative effects boundary will be the approximately 990,000 acre analysis area. The timeframe of the cumulative effects analysis for past projects will be 10 years. The table below displays the projects within the analysis area and the corresponding roads related decisions within the projects.

The table displays that there are about 251 miles of road decommissioning within previous projects and that 4FRI will add an additional 904 miles of decommissioned roads. The total of about 1,155 miles of decommissioned roads will move the cumulative effects analysis area closer to a safer and more affordable road system.



In addition, the table displays that there are .8 miles of road relocation in other projects and that there will be 9.4 miles of additional road relocation from the 4FRI project for a total of 10.2 miles of road relocation. This will have a limited effect on creating a safer and more affordable road system. As stated above, the 30 miles of road improvement will improve safety. Thus, there are a total of about 1,198 miles (1,155 miles decommissioned roads, 30 miles of road improvement and 10.2 miles of relocated roads) of action proposed between past, present, and future foreseeable roads projects and the 4FRI project that will contribute towards a safer and more affordable road system.

**Table 4. Past, Present and Future and Foreseeable Roads Projects and 4FRI Proposed Roads Management**

PROJECT	YEAR of DECISION	FOREST	ROAD MAINT	ROAD DECOM	MILES TEMP RD	NEW SYSTEM ROADS	ROAD IMPROVEMENT	ROAD RELOCATE	ESTABLISH BORROW PIT
Elk Park	2007	Coconino			4			0.8	
Hart Prairie	2010	Coconino							1
Jack Smith Schultz	2008	Coconino		66	5				
Mountaineer	2006	Coconino		0	1.3				
Munds Park	2009	Coconino		0	2				
Railroad	2008	Coconino		0	1				
Mormon Lake Basin	2005	Coconino		0	2				
Ft Valley Experimental Forest	2000	Coconino		19					
Kachina Village	2003	Coconino		7.7	5.8				
Woody	2004	Coconino		5					
Mint	1998	Coconino		32.1					
Arboretum	2000	Coconino		1					
Marshall	2011	Coconino		3.4	6				
Wing Mountain	future	Coconino		8	4				
Dogtown	2004	Kaibab		18					
Community Tank	2009	Kaibab		2.2					
Spring Valley	2002	Kaibab		30.5					
Frenchy	2003	Kaibab		30.2					
Road Pit NEPA	future	both		0					39
Bill Williams	future	Kaibab		28	16	23			
Annual Maintenance	Forest Plan	both	500 <sup>7</sup>						
<b>TOTAL</b>				<b>251.1</b>	<b>47.1</b>	<b>23</b>		<b>0.8</b>	<b>40</b>
4FRI EIS		both	2,297 <sup>8</sup>	904	517	0	30	9.4	0
<b>CUMULATIVE EFFECTS</b>			<b>2,297<sup>9</sup></b>	<b>1,155.1</b>	<b>564.1</b>	<b>23.0</b>	<b>30</b>	<b>10.2</b>	<b>40</b>

<sup>7</sup> The mileage of annual maintenance came from personal communication with Forest Engineer John O’Brien for the Coconino and Kaibab National Forests on April 6, 2012. The mileage varies by year based on funding and is primarily level 3 and greater roads..

<sup>8</sup> The 2,297 miles of road maintenance is road maintenance that will be completed as part of harvest implementation and is not the normal Forest program of work.

<sup>9</sup> The 2,297 mile of road maintenance from 4FRI harvest projects includes the same roads that are normally done during the annual maintenance, thus, only the 4FRI road maintenance mileage is reported for the total miles.

Cumulatively, there will be a total of approximately 564 miles of temporary roads that will be constructed and decommissioned when all of the project are complete. These actions are related to access to 4FRI and adjacent project areas, and as such, meet the need for access. The 2,297 miles of road maintenance from project implementation will have a short term improvement for access to the project area, as well as meet the needs of annual road maintenance for the 2 Forests within the cumulative effects project area. The road maintenance also provides a short term improvement in safe and more affordable access during the effective life of the maintenance; hence 4FRI will add an additional approximately 1,797 miles of road maintenance over the current approximately 500 miles of level 3-5 roads that currently occur on the 2 Forests within the 4FRI area.

## Summary of Alternatives by Units of Measure

The table below displays a summary of the Alternatives by the units of measure. The first portion of the table displays the miles of system road and miles of temporary road for each alternative that are needed to access the analysis area by alternative in order to implement the proposed action. In Alternative A, there is not a need for existing or temporary roads because no treatments are being proposed. It is understood that the existing road system will still be in place and will be utilized by the public for National Forest access, but there is nothing to implement in the No Action alternative. The miles of road that currently exist within the analysis area is displayed in the affected environment section above. In Alternatives B-D, the miles of existing road system is the defined haul routes that are system roads, as well as the approximately 517 miles of temporary roads needed.

The second portion of the table displays the summary of units of measure that are related to a more affordable road system. Alternative A does not decommission any miles of road and the open road system remains the same as the current condition. Alternatives B-D do decommission about 904 miles of road, of these approximately 538 miles are system roads ( a mixture of ML1 and ML 2 roads), thus reducing the miles of open system road to about 2,796 in the project area. Relocating roads does provide for easier maintenance and reduces the fiscal and environmental costs of roads that are located within drainage systems.

The third portion of the table displays road maintenance and road improvement as a surrogate for safety (improved surface ways, improved site distances, improved signage). For safety, Alternative A maintains primarily only level 3 and greater roads at about 500 miles per year. Alternatives B-D maintains all haul route roads while product removal is occurring, providing for a safe road system through improved drainage and surfacing on these roads.

**Table 5. Summary of 4FRI units of measure by alternative**

<b>ACCESS</b>	<b>Alternative A</b>	<b>Alternative B-D</b>
System Road	0	2,297
Temporary Road	0	517
<b>MORE AFFORDABLE ROAD SYSTEM</b>	<b>Alternative A</b>	<b>Alternative B-D</b>
Miles of Decommissioned Road	0	906
System Road	0	538
Unauthorized Road	0	368

Miles of Open System Road	3,334	2,796
Miles of Road Realignment	0	9.4
<b>SAFETY</b>	<b>Alternative A</b>	<b>Alternative B-D</b>
Miles of Road Maintenance	500	2,297
Miles of Road Improvement	0	30

## Resource Protection Measures

Resource protection measures are outlined below for transportation management. There is a need to coordinate any roads related activities with other resources to minimize impacts on other resources from roads activities.

**Table 6. Mitigation Measures for 4FRI Proposed Roads Management**

Mitigation	Why
Utilize accepted engineering practices and manual direction for maintenance and reconstruction practices.	To maintain a safe and economic road system.
Coordinate any road use in associated with the El Paso and Transwestern High Pressure Natural gas pipelines. Haul can occur at designated crossings with sufficient pad material. No haul is proposed down these gas pipelines on Forest Roads 160, 796, 6796, 09007P, 09008P, 09228D, 09229Y, 09231Q.	To prevent damage to high-pressure gas pipelines.
On areas to be prescribed burned, if decommissioned roads are to be used as fire lines, return decommissioned roads back to the condition prior to burning. Rehabilitation of the surface should refer to the soil and water Best Management Practices for rehabilitation of fire lines and ground disturbed areas.	To discourage use on previously decommissioned road and to maintain a safe and economic road system.
Utilize road safety signage with any project road activities that are related to project implementation.	To provide for user safety.
Do not blade roads when the road surface is too dry. If the road surface is too dry, a water truck can apply water, or the project can be scheduled for when adequate moisture occurs to complete the project.	To protect the road investment by not detaching sediments.

Mitigation	Why
Utilize the closest material source that has the specified material type for all road maintenance/reconstruction /relocation to projects.	To minimize energy use for road maintenance/reconstruction/relocation activities.
Road maintenance through the <b>Timber Sale Contract or Stewardship Contract</b> should require pre-haul and post haul maintenance on all roads to be used for haul.	To provide for a safe travel surface and to provide for access to the project area.
Utilize mitigation measures for soil and water, recreation, cultural resources, timber/silviculture, wildlife and botany/noxious weeds in project design. to minimize resource impacts from the transportation system	To minimize resource impacts from the transportation system

## Data

The roads data used for this analysis is from Forest GIS data layers for the Coconino and Kaibab National Forests, as well as tabular data from the INFRA database. Four sample areas were utilized to ground truth roads data by Bob Rich, Regional Logging Engineer and Kit MacDonald, soil scientist on the Kaibab National Forest in the fall of 2011 (USDA, 2012). The four sampled areas had a total acreage of 58,201 acres, or about 15% of the mechanical harvest acres proposed. The sampled area did not sample other ownership, PACs and areas that were covered under other NEPA. The sample displayed that a portion of the system roads that are in the database were actually closed and/or decommissioned roads.

My experience includes a Bachelor’s degree in Forest Management, and Master’s degree in Public Administration and 33 years of experience in the US Forest Service. From 2010 to the present, I have been the Assistant team Leader for the Four Forest Restoration Initiative. From 1994-2010, I was the soil and water resource specialist on the Mogollon Rim Ranger District (and Blue Ridge and Long Valley Ranger Districts’ prior to the districts being combined) and was the Interdisciplinary Team Leader for the ECC RAP, the Anderson Mesa RAP and the SE Rap. I was also the soil and water specialist for the Flagstaff Ranger District (formerly Peaks and Mormon Lake Ranger Districts) of the Coconino National Forest from 2007 to 2010. Prior to that, I was a Timber Sale Administrator/presale forester from 1985-1994 and a Forester on the Coconino National Forest land management planning team responsible for timber simulation from 1980 to 1985.

Prepared by: /s/ *Dick Fleishman* Date: 4/12//12

Assistant Team Leader—Four Forest Restoration Initiative

Coconino National Forest

Reviewed by Marjorie Apodaca and edits made by Dick Fleishman 6/29/12

Second Review by Marjorie Apodaca (10/24/12) and edits made by Dick Fleishman 11/21/12, 1/8/12

## Transportation Terminology

- **Administrative NFS Road.** Any NFS road that is not a public road. (FSM 7730.5)
- ***Administrative NFS Road (Further defined by IDT).*** *Administrative National Forest System Roads are maintenance level (ML) 2 roads with motorized access restricted to administrative use only. Traffic may be managed with gates. . Also referred to as system road.*
- **Bridge (1).** A structure, including supports, erected over a depression or an obstruction, such as water, a highway, or a railway, having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of the openings for multiple boxes; it may include multiple pipes where the clear distance between openings is less than half of the smaller contiguous opening. (23 CFR 650.403)
- **Bridge (2).** A road or trail structure, including supports, erected over a depression or an obstruction, such as water, a road, a trail, or railway, and having a deck for carrying traffic or other loads. (FSM 7705)
- ***Closing a Road (Defined by IDT).*** *The act of not allowing motorized use on an existing Maintenance Level 2-5 National Forest System Road (NFSR) and moving it to a Maintenance Level 1 status. Activities to eliminate motorized use may include cross ripping the entrance to the roadway and placing natural physical barriers such as boulders, berms, vegetation, etc. to block vehicles from entering the roadway.*
- **Commercial Use or Activity.** Any use or activity on National Forest System lands (a) where an entry or participation fee is charged, or (b) where the primary purpose is the sale of a good or service, and in either case, regardless of whether the use or activity is intended to produce a profit. (36 CFR 251.51, FSM 7730.5)
- **Construction.** The supervising, inspecting, actual building, and incurrence of all costs incidental to the construction or reconstruction of a highway, including bond costs and other costs relating to the issuance in accordance with section 122 of bonds or other debt financing instruments and costs incurred by the State in performing Federal-aid project related audits that directly benefit the Federal-aid highway program. Such term includes--
  - (A) locating, surveying, and mapping (including the establishment of temporary and permanent geodetic markers in accordance with specifications of the National Oceanic and Atmospheric Administration of the Department of Commerce);
  - (B) resurfacing, restoration, and rehabilitation;

(C) acquisition of rights-of-way;

(D) relocation assistance, acquisition of replacement housing sites, and acquisition and rehabilitation, relocation, and construction of replacement housing;

(E) elimination of hazards of railway grade crossings;

(F) elimination of roadside obstacles;

(G) improvements that directly facilitate and control traffic flow, such as grade separation of intersections, widening of lanes, channelization of traffic, traffic control systems, and passenger loading and unloading areas; and

(H) capital improvements that directly facilitate an effective vehicle weight enforcement program, such as scales (fixed and portable), scale pits, scale installation, and scale houses. (23 USC 101)

- **Forest Road or Trail.** A road or trail wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration and utilization of the National Forest System and the use and development of its resources. (23 U.S.C. 101, 36 CFR 212.1, 36 CFR 251.51, 36 CFR 261.2, FSM 7705)
- ***Haul Route Road Maintenance (Defined by IDT).*** Ongoing road maintenance accomplished on National Forest System Roads that will be used to haul material off of NF system lands. Activities may include blading surfacing material, spot surfacing, pulling bar ditches, cleaning culverts, replacing failed culverts, bridge repair, etc.
- **Heavy Maintenance.** Work usually done by highway agencies in repairing damage normally expected from seasonal and occasionally unusual natural conditions or occurrences. It includes work at a site required as a direct result of a disaster which can reasonably be accommodated by a State or local road authority's maintenance, emergency or contingency program. (23 CFR 668.103)
- **Maintenance (1).** The preservation of the entire highway, including surface, shoulders, roadsides, structures and such traffic-control devices as are necessary for safe and efficient utilization of the highway. (23 USC 101, 23 CFR 460.2)
- **Maintenance (2).** The upkeep of the entire forest transportation facility including surface and shoulders, parking and side areas, structures, and such traffic-control devices as are necessary for its safe and efficient utilization. (36 CFR 212.1)



- **Maintenance Levels.** Defines the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria. (FSH 7709.59, 62.32)

**LEVEL 1.** These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate" all traffic. These roads are not shown on motor vehicle use maps.

Roads receiving Level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are closed to vehicular traffic but may be available and suitable for nonmotorized uses.

**LEVEL 2.** Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not provided with the exception that some signing, such as W-18-1 "No Traffic Signs," may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to:

- a. Discourage or prohibit passenger cars, or
- b. Accept or discourage high clearance vehicles.

**LEVEL 3.** Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. The Manual on Uniform Traffic Control Devices (MUTCD) is applicable. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations.

Roads in this maintenance level are typically low speed with single lanes and turnouts. Appropriate traffic management strategies are either "encourage" or "accept." "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

**LEVEL 4.** Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. Manual on Uniform Traffic Control Devices is applicable. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.

**LEVEL 5.** Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. Manual on Uniform Traffic Control Devices is applicable. The appropriate traffic management strategy is "encourage."

- **National Forest System Road.** A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county or other local public road authority. (36 CFR 212.1, 36 CFR 251.51, 36 CFR 261.2, FSM 7705). *Also referred to as system road.*
- **Objective Maintenance Level.** The maintenance level to be assigned at a future date considering future road management objectives, traffic needs, budget constraints, and environmental concerns. The objective maintenance level may be the same as, or higher or lower than, the operational maintenance level. The transition from operational maintenance level to objective maintenance level may depend on reconstruction or disinvestment. (FSH 7709.59, 62.3)
- **Opening a Road (Defined by IDT).** *The act of allowing motorized use on an existing Maintenance Level 1 National Forest System Road (NFSR). Activities to accommodate motorized use include removing physical barricades such as berm, boulders, vegetation, gates, etc. and re-establishing and maintaining drainages and runoff patterns along the roadway that had not been maintained while the road was in Maintenance Level 1 status.*
- **Road Construction or Reconstruction.** Supervising, inspecting, actual building, and incurrence of all costs incidental to the construction or reconstruction of a road. (36 CFR 212.1, FSM 7705)
- **Road Construction/Reconstruction (Further defined by IDT).** *This work will generally include work that is beyond the scope of road maintenance and may expand the capacity or change the original design function of the road. This work includes:*

*Construction of Bridges and Major Culverts*

*Placing Bar Ditches*

*Subgrade Repairs*

*Shoulder widening*

*Lane widening*

*Ditch widening*

*Roadway prism widening*

*Horizontal and Vertical Alignment Changes*

*Curve Widening*

- **Road Decommissioning (1).** Activities that result in the stabilization and restoration of unneeded roads to a more natural state. (36 CFR 212.1)
- **Road Decommissioning (2).** Activities that result in restoration of unneeded roads to a more natural state. (FSM 7705, FSM 7734)
- **Road Decommissioning Treatments.** Decommissioning includes applying various treatments, including one or more of the following: 1. Reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation; 2. Blocking the entrance to a road or installing water bars; 3. Removing culverts, reestablished drainages, removing unstable fills, pulling back road shoulders, and scattering slash on the roadbed; 4. Completely eliminating the roadbed by restoring natural contours and slopes; and 5. Other method designed to meet the specific condition associated with the unneeded roads. (FSM 7734)
- **Road Improvement (Further defined by IDT).** Activity that results in an increase of an existing road's traffic service level, expansion of its capacity, or a change in its original design function.
- **Road Maintenance.** Ongoing upkeep of a road necessary to maintain or restore the road in accordance with its road management objectives. (FSM 7705, FSM 7714)
- **Road Maintenance (Further defined by IDT).** Road maintenance that occurs within the existing roadway prism (See Figure 1-1). Activities may include

*Surfacing and blading*

*Spot surfacing*

*Pulling bar ditch*

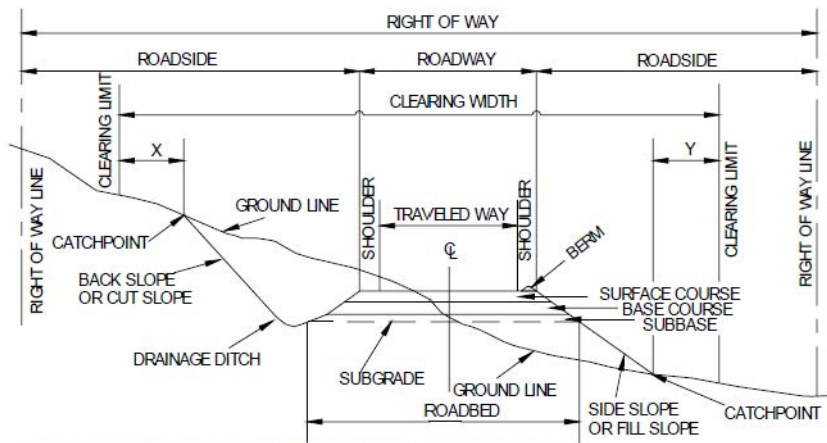
*Cleaning Culverts*

*Replacing signs, gate, and cattle guards*

*Bridge repair*

*Culvert replacements*

- **Road Realignment (Defined by IDT).** *Activity that moves all or parts of the horizontal and vertical alignment of a road, i.e. the roadway prism to a new location and decommissioning the old alignment. Generally realignments are for the purpose of moving the road location to more suitable areas to mitigate impacts to streams, critical habitat, and other natural or cultural resources. Often, used interchangeable with Road Re-location.*
- **Roadway.** The portion of a highway, including shoulders and auxiliary lanes, for vehicular use. (AASHTO, 2001, A Policy on Geometric Design of Highways and Streets)
- **Previously Decommissioned Roads (Defined by IDT).** *Existing roads that are not National Forest System Roads that have previously determined to be not needed and may have been decommissioned using one or more the decommissioning treatments.*
- **Temporary Road.** A road or trail necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or trail and that is not included in a forest transportation atlas. (36 CFR 212.1, FSM 7705)
- **Unauthorized Road or Trail.** A road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas. (36 CFR 212.1, FSM 2353.05, FSM 7705).



NOTE: SHAPES AND DIMENSIONS WILL VARY TO FIT LOCAL CONDITIONS  
 SEE DRAWINGS FOR TYPICAL SECTIONS  
 X & Y DENOTE CLEARING OUTSIDE OF FINAL DESIGN CROSS SECTION

Figure 1-1. Illustration of road structure terms

## APPENDIX A. Road Decommission and Unauthorized Route Adaptive Management Plan

Evaluation Criteria	Desired Condition (forest plan, policy, etc.)	Existing Condition (what, where, how much?)	Possible Management Actions	Monitoring Measure	Trigger Indicating Additional Action is Needed (What – When)	Adaptive Options	Effects	Design Features/ Mitigations
Roads and unauthorized routes located in upland (non-meadow) and in meadows	Soils are in satisfactory condition so that the soil can resist erosion, recycle nutrients, and absorb water. Understory species (e.g., grasses, forbs, and shrubs) diversity is consistent with site potential and provides for infiltration of water and reduction of accelerated erosion. The understory has a variety of heights of cool and warm season vegetation.	X miles of road/route. All roads are in unsatisfactory soil condition due to accelerated erosion, lack of effective ground cover, and compaction.	1. Reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation; 2. Blocking the entrance to a road or installing water bars; 3. Removing culverts, reestablishing drainages, removing unstable fills, pulling back road shoulders, and scattering slash on the roadbed; 4. Completely eliminating the roadbed by restoring natural contours and slopes; and 5. Other methods designed to meet the specific conditions associated with the unneeded road.	Miles of road treated; Soil condition assessment.	Soil condition is impaired or unsatisfactory as defined in soil condition assessment. Time is 5 years after treatment.	Additional drainage, additional revegetation efforts (including mulching), possibly short-term fencing to protect revegetation, possibly complete removal of roadbed.	Short-term ground disturbance and possible sediment detachment and movement off-site, short-term noise disturbance to wildlife species. Long-term establishment of vegetation, improved soil productivity, soil erosion minimized to natural levels (soil in satisfactory condition), decreased animal disturbance from vehicles. Short and long-term reduction of vehicular access	To be added as BMP's

Evaluation Criteria	Desired Condition (forest plan, policy, etc.)	Existing Condition (what, where, how much?)	Possible Management Actions	Monitoring Measure	Trigger Indicating Additional Action is Needed (What – When)	Adaptive Options	Effects	Design Features/ Mitigations
Roads and unauthorized routes located in filter strips of identified riparian and non-riparian streamcourses.	Soils are in satisfactory condition so that the soil can resist erosion, recycle nutrients, and absorb water. Understory species (e.g., grasses, forbs, and shrubs) diversity is consistent with site potential and provides for infiltration of water and reduction of accelerated erosion. The understory has a variety of heights of cool and warm season vegetation.	X miles of road/route. All roads are in unsatisfactory soil condition due to accelerated erosion, lack of effective ground cover, and compaction.	1.Reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation; 2. Blocking the entrance to a road or installing water bars; 3. Removing culverts, reestablishing drainages, removing unstable fills, pulling back road shoulders, and scattering slash on the roadbed;4. Completely eliminating the roadbed by restoring natural contours and slopes; and 5. Other methods designed to meet the specific conditions associated with the unneeded road.	Miles of road treated; Soil condition assessment.	Soil condition is impaired or unsatisfactory as defined in soil condition assessment. Time is 5 years after treatment.	Additional drainage, additional revegetation efforts (including mulching), possibly short-term fencing to protect revegetation.	Short-term ground disturbance and possible sediment detachment and movement off-site into streamcourses, short-term noise disturbance to wildlife species. Long-term establishment of vegetation, improved soil productivity, soil erosion minimized to natural levels (soil in satisfactory condition), decreased animal disturbance from vehicles. Short and long-term reduction of vehicular access	To be added as BMP's.

## APPENDIX B- Roads to be Decommissioned

The table displays the road numbers of roads that are analyzed for decommissioning within the analysis. There are roads within the table that are only a portion of the road will be decommissioned. The spatial data for this is stored within the Forest Service GIS network in a geodatabase with at the following address:

T:\FS\NFS\R03\Collaboration\4FRI\GIS\Data\FS\_Files\4-FRI\Roads\4FRI\_Roads.gdb

The shapefile within the geodatabases is titled "allroads\_4fri\_20120320. The attribute is titled "decommission".

Road Number	Road Number	Road Number	Road Number	Road Number	Road Number
522	9021	00151B	00762E	09006P	09018K
627	9110	00231G	00773B	09006S	09018N
649	9112	00235J	00861A	09007D	09019C
655	9137	00237E	06028B	09007E	09019E
700	9143	00244C	06077C	09007F	09021A
703	9146	00253C	06077D	09007G	09021B
860	9147	00253G	09001F	09007J	09021F
862	9149	00296B	09001G	09007L	09021J
865	9157	00390B	09001M	09007M	09021K
2121	9159	00418X	09001S	09007S	09021L
3155	9160	00420A	09001T	09007T	09021M
3237	9216	00420B	09001U	09007U	09021N
3244	9217	00420C	09001W	09007X	09021P
6006	9219	00420L	09002D	09008D	09021Q
6007	9232	00420M	09002G	09008E	09021R
6009	9234	00514A	09002K	09008J	09021S
6014	9237	00526C	09002M	09008K	09021T
6015	9239	00527F	09002N	09008M	09021U
6016	9247	00530E	09002R	09008U	09022W
6018	9411	00536B	09002S	09009G	09023A
6019	9415	00536D	09002X	09009K	09023B
6028	9420	00538F	09003E	09009L	09023C
6065	9458	00545B	09003F	09009M	09024A
6113	9470	00545E	09003M	09009R	09024D
6215	9474	00553A	09003N	09009T	09025V
6224	9477	00553B	09003P	09011L	09111A
6227	9480	00557B	09003S	09012F	09111L
6275	9482	00631B	09004D	09012G	09111P
6276	9491	00631C	09004F	09012H	09111R
6353	9499	00631D	09004G	09013G	09111S
6354	00003H	00631E	09004H	09014G	09111T
6355	00003J	00700A	09004N	09014J	09111V
6356	00003K	00700B	09004P	09014R	09111W
6357	00003L	00700C	09004R	09015J	09111X
6360	00003P	00700G	09004S	09015Y	09111Y
6361	00003R	00700J	09005D	09016D	09112B
6391	00068B	00700K	09005E	09016P	09112C
6434	00075A	00700L	09005M	09017F	09112J
6435	00078B	00700M	09005N	09017G	09112K



Road Number	Road Number	Road Number	Road Number	Road Number	Road Number
6436	00078C	00707A	09005R	09017K	09113E
6437	00080B	00707B	09005Y	09017P	09113J
6439	00124B	00707C	09006E	09017X	09113Y
6441	00132B	00707D	09006F	09018B	09114G
6442	00132H	00714A	09006G	09018C	09114H
9018	00132J	00714E	09006L	09018D	09114L
09114M	09128C	09142P	09149A	09159L	09217A
09114R	09128E	09142Q	09149B	09159N	09217B
09114S	09128H	09142R	09149C	09159P	09217D
09114V	09128N	09142S	09149R	09159Q	09217E
09114W	09129C	09142T	09151F	09159R	09217F
09114X	09129D	09142U	09151G	09159S	09217G
09114Y	09129E	09143A	09151P	09159T	09217H
09117M	09129Y	09143D	09151R	09159U	09217J
09121B	09131T	09143F	09151S	09159V	09217L
09121C	09131W	09143H	09151T	09159W	09217M
09121D	09131Y	09143J	09151V	09159X	09217P
09121E	09132A	09143K	09151W	09159Y	09217Q
09122B	09132D	09143M	09152Q	09160B	09217S
09122C	09132E	09144T	09152R	09166J	09217T
09122D	09132M	09144X	09153F	09166K	09217Y
09122E	09132R	09145A	09153G	09166L	09218C
09122F	09132V	09145B	09153H	09166N	09218D
09122G	09133C	09145H	09153J	09171F	09218E
09122J	09133D	09145Q	09153K	09171G	09218F
09122K	09133E	09145S	09153L	09171H	09218G
09122R	09134B	09145T	09153M	09171L	09218J
09123B	09134C	09145U	09153N	09173B	09218K
09123C	09137A	09145W	09153P	09173D	09218P
09123D	09137B	09145Y	09153Q	09173E	09218Q
09123G	09137D	09146B	09153R	09180J	09218R
09123L	09140F	09146C	09153S	09180L	09218S
09123M	09140J	09146Y	09153T	09180M	09218T
09123R	09140N	09147A	09156V	09180N	09218U
09124D	09140Q	09147B	09156W	09180P	09218V
09124E	09140S	09147C	09158K	09180Q	09218X
09124G	09141Q	09147D	09158M	09180R	09218Y
09124H	09141R	09147E	09158N	09180T	09219A
09124J	09141S	09147F	09158P	09180W	09219B
09124K	09141T	09147G	09158Q	09181E	09219C
09124L	09141V	09147H	09158R	09215E	09219D
09125C	09141W	09147J	09158S	09216A	09219E
09125E	09141Y	09147K	09158T	09216B	09219F
09125G	09142C	09147L	09158U	09216C	09219J
09126E	09142D	09147N	09158V	09216D	09219K
09126G	09142E	09147P	09158X	09216E	09219L
09126H	09142F	09148G	09159A	09216F	09219P
09126J	09142H	09148Q	09159B	09216G	09219R
09126K	09142J	09148R	09159F	09216H	09219S
09126N	09142K	09148V	09159G	09216K	09219T
09127C	09142L	09148W	09159H	09216L	09219U
09127D	09142M	09148X	09159J	09216Q	09219X
09127F	09142N	09148Y	09159K	09216Y	09219Y

Road Number	Road Number	Road Number	Road Number	Road Number	Road Number
09220K	09229J	09234B	09410S	09455C	09462K
09220N	09229K	09234C	09410Y	09456F	09462M
09220P	09229M	09234D	09411A	09456N	09462P
09220Q	09229N	09234E	09411C	09457A	09462Q
09220R	09229P	09234F	09411K	09457D	09462R
09220T	09229Q	09234G	09411L	09457E	09462S
09220U	09229R	09234H	09411P	09457F	09462U
09220V	09229S	09234J	09411S	09457G	09462V
09220W	09229T	09234K	09411U	09457V	09462X
09220X	09229X	09234L	09411V	09457Y	09463N
09221P	09231L	09234N	09412B	09458D	09463V
09222B	09231M	09234P	09412H	09458H	09463X
09222D	09231N	09234Q	09413X	09458K	09465A
09222F	09231P	09234T	09414N	09458U	09465D
09222Q	09231R	09234U	09415J	09458V	09465L
09222R	09231S	09234V	09415K	09458W	09465Q
09222S	09231X	09234W	09415W	09458X	09465V
09222T	09231Y	09234X	09419G	09458Y	09466M
09222U	09232B	09234Y	09419M	09459H	09466W
09222V	09232C	09236B	09419N	09459J	09467L
09222X	09232D	09237A	09419P	09459M	09467M
09224A	09232E	09237B	09419Q	09459S	09467U
09224F	09232F	09237C	09419W	09459T	09467Y
09224G	09232G	09237D	09419Y	09459U	09468R
09226W	09232H	09237E	09420A	09460B	09468Y
09226X	09232J	09237M	09420D	09460C	09469Q
09227B	09232K	09237N	09420J	09460D	09469W
09227C	09232L	09237P	09420L	09460F	09470R
09227D	09232M	09237Q	09420M	09460G	09471E
09227E	09233F	09237S	09420P	09460H	09471N
09227F	09233G	09237T	09420X	09460K	09471Q
09227G	09233H	09237U	09420Y	09460V	09472L
09227H	09233J	09237V	09421C	09461E	09472N
09227J	09233K	09237W	09421D	09461F	09473B
09227U	09233L	09237X	09421E	09461G	09473N
09228E	09233M	09237Y	09421K	09461Q	09473P
09228F	09233N	09238A	09421P	09461R	09473T
09228G	09233P	09238R	09421W	09461S	09473U
09228H	09233Q	09238W	09421X	09461T	09474D
09228J	09233R	09253N	09421Y	09461U	09474G
09228L	09233S	09253Q	09423C	09462A	09474S
09228X	09233T	09257D	09423E	09462B	09475U
09229C	09233U	09257P	09423F	09462D	09475W
09229D	09233V	09257U	09423U	09462E	09475Y
09229F	09233X	09257Y	09453A	09462F	09477A
09229G	09233Y	09258B	09453G	09462G	09477B
09229H	09234A	09258D	09455A	09462H	09478C
09478D	700A	U337	U459	U539	U686
09478E	701GA	U338	U460	U540	U688
09478S	785BA	U339	U461	U546	U69
09478T	9439E	U342	U464	U547	U690
09479M	U104	U345	U465	U548	U691
09480A	U105	U346	U466	U550	U692

Road Number	Road Number	Road Number	Road Number	Road Number	Road Number
09480B	U106	U347	U467	U551	U693
09481K	U107	U348	U469	U554	U694
09482K	U108	U349	U471	U557	U695
09482U	U109	U35	U472	U561	U697
09482W	U110	U351	U473	U563	U698
09484P	U119	U356	U475	U564	U70
09484W	U12	U357	U477	U565	U704
09485K	U16	U358	U478	U568	U707
09485W	U167	U368	U479	U572	U71
09486R	U168	U371	U480	U574	U72
09486W	U169	U374	U481	U575	U73
09486X	U170	U377	U485	U582	U736
09487M	U171	U381	U486	U586	U74
09487R	U173	U384	U488	U588	U75
09488J	U174	U385	U490	U589	U754
09488M	U177	U386	U491	U594	U76
09489C	U178	U387	U492	U598	U760
09489D	U20	U388	U494	U600	U77
09491A	U21	U389	U500	U603	U78
09491B	U236	U392	U501	U617	U90
09491L	U239	U394	U502	U624	U91
09492D	U248	U397	U504	U63	U92
09493M	U250	U398	U505	U635	U93
09493N	U251	U408	U506	U64	X-00637
09494G	U252	U411	U507	U642	X-00639
09495B	U274	U412	U508	U643	X-00706
09495C	U277	U418	U510	U644	X-00845
09495G	U278	U425	U511	U645	X-00913
09496B	U281	U428	U514	U646	X-00919
09496G	U282	U430	U516	U650	X-00929
09497A	U283	U440	U517	U651	X-00956
09498B	U284	U442	U518	U66	X-00957
09498C	U301	U446	U522	U67	X-00975
09499B	U312	U448	U523	U677	X-00977
09499F	U316	U449	U524	U678	X-01008
09499G	U317	U450	U526	U68	X-01054
12T	U322	U451	U527	U680	X-01061
141GG	U323	U453	U528	U681	X-01075
166A	U333	U455	U533	U682	X-01089
305AA	U334	U456	U534	U684	X-01111
3244A	U336	U457	U535	U685	X-01150
X-01161	X-01844	X-02081	X-02452	X-02893	X-03277
X-01206	X-01856	X-02084	X-02465	X-02914	X-03278
X-01248	X-01863	X-02090	X-02469	X-02922	X-03283
X-01253	X-01865	X-02108	X-02491	X-02948	X-03295
X-01262	X-01869	X-02115	X-02504	X-02961	X-03298
X-01266	X-01872	X-02116	X-02506	X-02965	X-03299
X-01276	X-01876	X-02120	X-02509	X-02971	X-03301
X-01287	X-01878	X-02125	X-02510	X-02972	X-03306
X-01306	X-01889	X-02126	X-02515	X-02975	X-03316
X-01309	X-01892	X-02128	X-02519	X-02981	X-03319
X-01311	X-01893	X-02129	X-02521	X-02991	X-03324
X-01316	X-01906	X-02137	X-02528	X-02992	X-03331

Road Number	Road Number	Road Number	Road Number	Road Number	Road Number
X-01356	X-01918	X-02139	X-02532	X-02994	X-03337
X-01388	X-01920	X-02142	X-02537	X-03005	X-03338
X-01399	X-01922	X-02143	X-02557	X-03013	X-03339
X-01437	X-01925	X-02144	X-02561	X-03037	X-03342
X-01480	X-01926	X-02145	X-02562	X-03048	X-03371
X-01553	X-01929	X-02147	X-02574	X-03050	X-03378
X-01570	X-01931	X-02148	X-02591	X-03066	X-03397
X-01572	X-01935	X-02149	X-02602	X-03067	X-03402
X-01600	X-01939	X-02153	X-02615	X-03071	X-03412
X-01608	X-01940	X-02154	X-02646	X-03083	X-03422
X-01616	X-01941	X-02155	X-02650	X-03099	X-03429
X-01626	X-01942	X-02157	X-02661	X-03105	X-03430
X-01634	X-01946	X-02160	X-02670	X-03106	X-03443
X-01637	X-01957	X-02163	X-02685	X-03107	X-03444
X-01654	X-01958	X-02164	X-02692	X-03128	X-03446
X-01677	X-01972	X-02173	X-02717	X-03147	X-03467
X-01678	X-01974	X-02179	X-02725	X-03171	X-03475
X-01686	X-01977	X-02185	X-02734	X-03173	X-03491
X-01688	X-01978	X-02186	X-02745	X-03181	X-03505
X-01692	X-01980	X-02211	X-02751	X-03185	X-03506
X-01699	X-01985	X-02216	X-02754	X-03186	X-03507
X-01705	X-01991	X-02238	X-02762	X-03193	X-03538
X-01716	X-01998	X-02249	X-02775	X-03200	X-03564
X-01719	X-02000	X-02269	X-02796	X-03209	X-03588
X-01723	X-02004	X-02292	X-02822	X-03226	X-03624
X-01727	X-02007	X-02319	X-02823	X-03227	X-03638
X-01765	X-02011	X-02330	X-02836	X-03235	X-03642
X-01779	X-02013	X-02364	X-02838	X-03241	X-03671
X-01784	X-02023	X-02382	X-02845	X-03246	X-03702
X-01785	X-02039	X-02390	X-02846	X-03247	X-03708
X-01797	X-02042	X-02391	X-02847	X-03251	X-03749
X-01810	X-02043	X-02401	X-02850	X-03259	X-03761
X-01817	X-02063	X-02412	X-02866	X-03265	X-03798
X-01829	X-02072	X-02427	X-02878	X-03266	X-03810
X-01842	X-02078	X-02448	X-02887	X-03272	X-03925
X-03954	X-04597	X-05099	X-05363	X-05587	X-06114
X-03982	X-04621	X-05100	X-05364	X-05589	X-06178
X-03992	X-04624	X-05108	X-05365	X-05600	X-06212
X-03994	X-04625	X-05109	X-05366	X-05604	X-06225
X-04003	X-04644	X-05111	X-05370	X-05605	X-06234
X-04008	X-04659	X-05118	X-05371	X-05609	X-06258
X-04011	X-04694	X-05132	X-05377	X-05620	X-06279
X-04012	X-04712	X-05155	X-05380	X-05622	X-06295
X-04086	X-04730	X-05165	X-05382	X-05623	X-06298
X-04102	X-04735	X-05176	X-05385	X-05624	X-06317
X-04107	X-04736	X-05184	X-05388	X-05633	X-06321
X-04133	X-04750	X-05193	X-05390	X-05638	X-06331
X-04140	X-04761	X-05201	X-05391	X-05639	X-06342
X-04147	X-04762	X-05214	X-05399	X-05644	X-06351
X-04153	X-04775	X-05219	X-05400	X-05647	X-06354
X-04176	X-04776	X-05220	X-05402	X-05648	X-06356
X-04189	X-04781	X-05222	X-05403	X-05650	X-06357
X-04209	X-04809	X-05224	X-05404	X-05651	X-06359

Road Number	Road Number	Road Number	Road Number	Road Number	Road Number
X-04213	X-04821	X-05225	X-05405	X-05663	X-06367
X-04216	X-04841	X-05229	X-05406	X-05672	X-06378
X-04222	X-04884	X-05230	X-05408	X-05689	X-06394
X-04231	X-04895	X-05231	X-05414	X-05690	X-06399
X-04248	X-04900	X-05234	X-05415	X-05699	X-06409
X-04249	X-04910	X-05240	X-05416	X-05701	X-06410
X-04298	X-04912	X-05246	X-05417	X-05703	X-06433
X-04304	X-04922	X-05257	X-05419	X-05710	X-06487
X-04307	X-04936	X-05258	X-05420	X-05714	X-06532
X-04318	X-04952	X-05261	X-05421	X-05718	X-06533
X-04333	X-04954	X-05265	X-05434	X-05727	X-06549
X-04352	X-04974	X-05271	X-05439	X-05736	X-06555
X-04357	X-04981	X-05273	X-05446	X-05756	X-06592
X-04373	X-04985	X-05280	X-05466	X-05757	X-06635
X-04375	X-04994	X-05284	X-05469	X-05803	X-06693
X-04389	X-04998	X-05287	X-05474	X-05804	X-06706
X-04397	X-05008	X-05293	X-05491	X-05873	X-06729
X-04398	X-05009	X-05296	X-05499	X-05889	X-06750
X-04405	X-05017	X-05298	X-05500	X-05911	X-06769
X-04420	X-05018	X-05299	X-05501	X-05969	X-06779
X-04432	X-05024	X-05314	X-05508	X-05970	X-06795
X-04450	X-05026	X-05320	X-05509	X-05983	X-06810
X-04455	X-05041	X-05321	X-05524	X-05984	X-06811
X-04458	X-05054	X-05324	X-05528	X-06004	X-06829
X-04577	X-05078	X-05343	X-05529	X-06009	X-06878
X-04579	X-05085	X-05348	X-05549	X-06029	X-06881
X-04586	X-05086	X-05354	X-05552	X-06055	X-06882
X-04587	X-05095	X-05357	X-05561	X-06089	X-06904
X-04590	X-05096	X-05362	X-05581	X-06090	X-06912
X-06913	X-11804	X-12517	X-13183	X-13465	X-13699
X-06955	X-11809	X-12518	X-13185	X-13481	X-13704
X-07007	X-11827	X-12521	X-13192	X-13482	X-13711
X-07031	X-11837	X-12532	X-13196	X-13488	X-13712
X-07039	X-11862	X-12535	X-13197	X-13492	X-13758
X-07195	X-11871	X-12536	X-13203	X-13493	X-13763
X-07514	X-11875	X-12558	X-13220	X-13499	X-13774
X-07523	X-11876	X-12588	X-13222	X-13505	X-13777
X-07534	X-11882	X-12598	X-13229	X-13507	X-13806
X-07621	X-11936	X-12600	X-13237	X-13514	X-13823
X-07730	X-11957	X-12621	X-13244	X-13515	X-13827
X-07809	X-11992	X-12653	X-13245	X-13516	X-13853
X-07848	X-12015	X-12654	X-13279	X-13523	X-13855
X-07883	X-12047	X-12677	X-13282	X-13526	X-13865
X-07888	X-12063	X-12700	X-13290	X-13535	X-13866
X-08004	X-12076	X-12786	X-13308	X-13538	X-13872
X-08119	X-12087	X-12834	X-13317	X-13551	X-13922
X-08153	X-12097	X-12839	X-13321	X-13552	X-13931
X-08253	X-12100	X-12846	X-13349	X-13566	X-13943
X-08518	X-12126	X-12849	X-13351	X-13567	X-13984
X-08679	X-12149	X-12878	X-13358	X-13568	X-14047
X-08687	X-12160	X-12883	X-13364	X-13569	X-14068
X-08760	X-12179	X-12898	X-13367	X-13570	X-14070
X-09080	X-12188	X-12933	X-13368	X-13574	X-14107

Road Number	Road Number	Road Number	Road Number	Road Number	Road Number
X-09128	X-12194	X-12937	X-13372	X-13581	X-14131
X-09208	X-12205	X-12949	X-13379	X-13583	X-14206
X-09220	X-12206	X-12959	X-13394	X-13589	X-14224
X-09379	X-12215	X-12964	X-13396	X-13594	X-14225
X-09444	X-12258	X-12965	X-13397	X-13598	X-14226
X-09613	X-12305	X-12972	X-13399	X-13599	X-14274
X-09724	X-12311	X-12975	X-13402	X-13603	X-14284
X-10196	X-12317	X-12992	X-13410	X-13606	X-14289
X-10549	X-12325	X-13045	X-13412	X-13610	X-14312
X-10727	X-12360	X-13049	X-13414	X-13613	X-14323
X-10892	X-12390	X-13053	X-13416	X-13618	X-14371
X-10914	X-12394	X-13079	X-13417	X-13648	X-14378
X-11028	X-12403	X-13090	X-13418	X-13654	X-14385
X-11100	X-12410	X-13101	X-13421	X-13655	X-14388
X-11133	X-12415	X-13104	X-13422	X-13656	X-14389
X-11150	X-12421	X-13105	X-13423	X-13661	X-14399
X-11221	X-12437	X-13112	X-13441	X-13671	X-14403
X-11348	X-12449	X-13117	X-13443	X-13679	X-14407
X-11524	X-12465	X-13145	X-13444	X-13684	X-14409
X-11643	X-12486	X-13149	X-13451	X-13685	X-14415
X-11674	X-12509	X-13157	X-13457	X-13691	X-14438
X-11677	X-12512	X-13175	X-13463	X-13694	X-14450
X-11790	X-12516	X-13179	X-13464	X-13697	X-14453
X-14473	X-15036	X-15598	X-15971	X-16765	X-17582
X-14475	X-15048	X-15601	X-16078	X-16766	X-17584
X-14506	X-15088	X-15606	X-16118	X-16800	X-17656
X-14509	X-15140	X-15613	X-16197	X-16811	X-17658
X-14520	X-15189	X-15616	X-16215	X-16815	X-17668
X-14522	X-15233	X-15633	X-16254	X-16846	X-17718
X-14530	X-15238	X-15638	X-16326	X-16955	X-17722
X-14544	X-15269	X-15644	X-16327	X-16978	X-17785
X-14551	X-15289	X-15645	X-16338	X-17039	X-17818
X-14555	X-15378	X-15650	X-16341	X-17122	X-17915
X-14566	X-15393	X-15652	X-16362	X-17145	X-17917
X-14610	X-15410	X-15669	X-16385	X-17187	X-17926
X-14881	X-15411	X-15676	X-16406	X-17202	X-17961
X-14912	X-15419	X-15681	X-16426	X-17274	X-18033
X-14940	X-15424	X-15697	X-16430	X-17288	X-18117
X-14963	X-15431	X-15734	X-16459	X-17299	X-18137
X-14964	X-15446	X-15755	X-16495	X-17408	X-18237
X-14966	X-15453	X-15758	X-16536	X-17415	X-18252
X-14973	X-15454	X-15770	X-16572	X-17492	X-18260
X-14996	X-15465	X-15771	X-16623	X-17505	X-18290
X-15011	X-15472	X-15824	X-16624	X-17513	X-18293
X-15013	X-15527	X-15837	X-16642	X-17522	X-18318
X-15015	X-15553	X-15844	X-16643	X-17526	X-18348
X-15018	X-15562	X-15863	X-16657	X-17536	
X-15026	X-15576	X-15904	X-16695	X-17557	

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