Implementation of the Travel Management Rule
Gila National Forest

WATERSHED and SOILS SPECIALIST REPORT

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Introduction

Watershed and soil resources on Forest system lands are potentially affected by land management and development activities both on and off the forest. The 2005 Travel Management Rule requires that the Gila National Forest designate a system of roads, trails and areas open for motor vehicle use by class of vehicle, and if appropriate, by time of year. The designated roads, trails and areas will be published on a motor vehicle use map which will be available to the public. After routes and areas are designated and the motor vehicle use map published and motor vehicle use not in accordance with these designations will be prohibited. Fixed distance corridors to access campsites and retrieve big game with vehicles are optional under the Travel Management Rule, and the Gila National Forest is analyzing alternatives that incorporate these options into the decision.

This document will present a description of the current conditions related to watershed and soil resources on the Forest. It will then present an analysis of the predicted effects to these resources under each action alternative, including a display of current effects under the No Action Alternative. The predicted effects of the action alternatives will be compared to the option of no action.

Existing Condition

General Description

The Gila National Forest lies in southern Catron, northern Grant, western Sierra, and extreme northeastern Hidalgo counties in southwestern New Mexico. It was established in 1905 and covers approximately 3.3 million acres of public land, making it the sixth largest National Forest in the continental United States. Part of the area, the Gila Wilderness, was established in 1924 as the first designated wilderness by the U.S. federal government. The Aldo Leopold Wilderness and the Blue Range Wilderness are also found within its borders. The Forest Supervisors office is located in Silver City, New Mexico. There are local ranger district offices in Glenwood, Mimbres, Quemado, Reserve, Silver City, and Truth or Consequences. The Forest has 12 mountain ranges and elevations range from approximately 4,160 to 10,770 feet. Precipitation ranges from approximately 11 inches on the northern end of the Forest by Quemado and the very southern end of the Black Range to over 35 inches in the higher elevations of the Mogollon Mountains. The Forest has 5 of the eight life zones identified in the Region 3 General Ecosystem Survey of the Gila National Forest. Lifezones include, semi desert grassland, woodland, ponderosa pine, mixed conifer and spruce fir.

Climate

Precipitation and temperature are tied tightly to elevation gradients on the Gila National Forest. As elevation increases precipitation tends to increases and temperature decreases. Through data analyses of precipitation data from NOAA Weather Stations (New Mexico Climate Summaries http://www.wrcc.dri.edu/summary/climsmnm.html) and NRCS SNOWTEL (http://www.wcc.nrcs.usda.gov/snotel/New_Mexico/new_mexico.html) sites located within the Forest it has been shown that there are orographic effects on precipitation patterns throughout the Forest.

Precipitation patterns on the Forest can be characterized as bimodal in nature. The principal periods of precipitation occur during the monsoon season of July through September. During this period, rainfall is characterized by convective, high intensity, short duration storms that are generally of limited areal extent, averaging an estimated five square miles. During the latter part of this period and continuing on into October; there is also a threat of high intensity, longer duration storms of cyclonic origin associated with Gulf of Mexico and Pacific Ocean hurricanes. These usually do not occur with the same regularity as the monsoon season rains. The second principal period of the bimodal precipitation distribution occurs during the period of December through February, when easterly storm tracks originating over the Pacific Ocean shift over the Forest, allowing widespread precipitation. This precipitation falls typically at higher elevations as snow. The snow pack at this elevation generally develops continuously over this period but melts over a much shorter time span.
(http://www.climas.arizona.edu/learning.html)

In years where there is an associated El Niño in the Southwest, winter precipitation tends to be higher than normal starting in late fall and continuing through the winter months and conversely in years where there is an associated La Niña drier than normal conditions exist from late summer and into the winter months. The warmest months of the year are June and July with daytime temperatures averaging in the 80°s. The coldest months of the year are December and January with daytime temperatures averaging in the 50°s.

Watershed Condition
Watershed condition encompasses both aquatic and terrestrial processes and functions as the quality of water and aquatic habitat is inseparably linked to the integrity of uplands and riparian areas within a watershed. Aspects of a watershed related to geomorphic integrity can be defined in terms of attributes such as slope stability, soil productivity, channel morphology and other upslope, riparian and aquatic habitat characteristics. Hydrologic integrity of a watershed is related primarily to flow, sediment and water quality attributes. Biological integrity can be defined by the aquatic characteristics that influence the diversity and abundance of species. In each case, integrity must be evaluated in the context of the natural disturbance regime, geoclimatic setting and other important factors. The geomorphic, hydrologic, and biologic components are then combined and evaluated as a whole to assess watershed integrity and health.

Hydrologically, the Gila National Forest lands drain into seven major river basins within New Mexico. The northernmost portions of the Forest drain into the Lower Colorado River basin (Little Colorado River) to the north and northwest, and into the San Augustin Plains basin to the northeast. The eastern side of the Forest drains into the Rio Grande basin to the east. The southeastern portion of the Forest drains into the Mimbres basin to the south and southeast, with the southernmost section of the Burro Mountains draining south in the Southwestern Closed basin (Animas Valley). The majority of the Forest, however, drains to the southwest into the Gila River and San Francisco River basins.

Within these river basins, there are 41 fifth code watersheds that intersect portions of the Gila National Forest. These fifth code watersheds can be further divided into sixth code subwatersheds of which there are 190 that intersect Forest lands. These watersheds and

subwatersheds are geographic areas of land, water and biota within the confines of a drainage divide that define the aerial extent of surface water drainage to a point. The percentage of Forest lands that are within these basins range from less than 1% up to 100%. Due to the landscape level scale of this project, the analysis will address effects at the fifth code watershed level, which can range in size from 70,000 acres to 250,000 on the Gila National Forest. A discussion at the sixth code watershed level will occur later in the document in reference to road densities and cumulative watershed effects.

A general assessment of watershed condition of the Forest was completed as part of the Gila National Forest Plan (1986). This assessment was based on whether the existing effective ground cover was adequate to ensure long term soil productivity (existing ground cover greater than tolerance ground cover), and whether ground cover was enough to provide for satisfactory hydrologic function. Acreage was classified as being in one of three condition classes - optimum, satisfactory or unsatisfactory – and then compiled by condition class for each fifth code watershed. Watershed conditions of satisfactory are considered to meet the satisfactory criteria as outlined in the Forest Plan. Watersheds are rated in unsatisfactory condition when optimum and satisfactory condition acres within the watershed are less than the number of acres classified as unsatisfactory.

New assessments of watershed condition are planned for 2011 at the sixth code watershed level. Until these assessments are completed, the existing fifth code assessments are considered current. Forestwide, four fifth code watersheds (10%) are classified in optimum condition, twenty-two fifth code watersheds (52%) are classified in satisfactory condition, and sixteen fifth code watersheds (38%) are classified in unsatisfactory condition.

Table 1. Fifth code watershed condition on Gila National Forest

5th Code Watershed Condition						
Watershed Name	**Watershed Number**	**Total Acres**	**Forest Acres**	**% Forest**	**Condition Class***	**Condition**
Agua Fria Creek	15020003050	194,457	77,084	40	2	Satisfactory
Alamocito Canyon	13020208040	210,758	76,577	36	2	Optimum
Animas Creek	13030101030	218,408	52,716	24	3	Unsatisfactory
Sapillo Creek	15040001070	113,982	112,252	98	3	Unsatisfactory
Bear Creek	15040002050	134,791	67,321	50	3	Unsatisfactory
Berenda Creek	13030103010	227,230	37,655	17	3	Unsatisfactory
Blue Creek	15040004030	299,562	28,253	9	3	Unsatisfactory
Corduroy Canyon	15040001020	202,019	158,504	78	2	Satisfactory
Corral Canyon	15040002030	279,338	50,175	18	3	Satisfactory
Coyote Creek	15020001030	171,035	19,150	11	3	Satisfactory
Cuchillo - Negro Creek	13030101010	252,329	76,201	30	3	Unsatisfactory
Engineer Canyon	15040003020	240,492	6,836	3	3	Unsatisfactory
Ft. Bayard	13030202030	158,542	3,200	2	2	Satisfactory
Hells Hole	15040002020	291,594	12,277	4	2	Satisfactory
Hot/Cold Springs	13030202020	124,880	20,610	17	2	Satisfactory
Largo Creek	15020003060	118,463	75,074	63	2	Satisfactory
Lower San Francisco River	15040004080	241,016	140,747	58	2	Satisfactory

5th Code Watershed Condition						
Watershed Name	**Watershed Number**	**Total Acres**	**Forest Acres**	**% Forest**	**Condition Class***	**Condition**
Mangas Creek	15020003070	257,974	37,231	14	2	Satisfactory
Mangas Valley	15040002040	220,601	50,696	23	3	Unsatisfactory
Mangitas Creek	15020003010	186,016	7,963	4	2	Satisfactory
Middle Fork Gila River	15040001030	218,548	217,831	100	2	Optimum
Middle San Francisco River	15040004050	154,971	150,460	97	2	Satisfactory
Mogollon Creek	15040001060	160,442	151,318	94	2	Satisfactory
Negrito Creek	15040004060	215,491	210,664	98	2	Satisfactory
O Bar O Canyon	15040001010	238,952	93,843	39	2	Satisfactory
Palomas Creek	13030101020	238,213	57,633	24	3	Unsatisfactory
Percha Creek	13030101040	77,125	24,829	32	3	Unsatisfactory
Plains of San Agustin	13020208050	259,021	54,097	21	2	Optimum
Puerto Viejo	13020208010	173,672	5,272	3	2	Satisfactory
Sacaton Canyon	15040002010	144,711	16,807	12	3	Unsatisfactory
Silver City Watershed	13030202040	238,245	26,920	11	2	Satisfactory
Taylor Creek	13030202070	133,293	3,590	3	3	Unsatisfactory
Thompson Canyon	15040003060	296,970	38,772	13	3	Unsatisfactory
Tularosa River	15040004020	194,226	181,860	94	2	Satisfactory
Upper Mimbres River	13030202010	205,915	150,687	73	2	Satisfactory
Upper San Francisco River	15040004010	266,944	206,998	78	2	Satisfactory
Wahoo Canyon	13020211020	257,127	40,715	16	3	Unsatisfactory
Walking X Canyon	15040003010	244,807	13,945	6	3	Unsatisfactory
Wall Lake	15040001040	206,332	205,298	99	2	Satisfactory
West Fork Gila River	15040001050	130,566	128,967	99	2	Optimum
White Signal	13030202120	334,403	4,402	1	3	Unsatisfactory
Whitewater - San Francisco	15040004040	228,309	205,630	90	3	Satisfactory

*CONDITION CLASS:

- Class I – Watersheds that provide a robust basis for sustained production of goods and services. The watershed management is such that no long-term changes are occurring even with major storms. Risks of management-induced deterioration ion watershed condition are very low. These watersheds represent an attainable, desirable condition. They are in dynamic equilibrium as evidenced by a stable drainage network. The response to use is accommodated by the current channel network density size and process.
- Class II – Watersheds that are not attaining the requirements for Class I but do not require capital investment to restore watershed conditions. Watershed conditions can be improved to class I levels through integrated multiple use management. This class includes watersheds where extensive land-disturbing activities are occurring or are scheduled for the near future. Class II watersheds may also include sensitive watersheds that, when subjected to impacts, can quickly fall to Class III conditions.
- Class III – Watersheds that require technological and economically feasible capital investments to restore watershed conditions to a level consistent with management goals. Determination of feasibility must also consider environmental, social, and economic desirability. These land treatments and structural measures are necessary to provide an improved watershed equilibrium that can then enable management, through integrated multiple-resource activities, to attain watershed condition goals.

Vegetation and ground cover play a key role in keeping watersheds intact. In higher elevations where ponderosa pine and mixed conifer stands are found, watershed conditions are typically satisfactory, with thick duff layers and deep soils contributing to stability. In lower elevations, where woodlands are present, soils are often shallow and may be coupled with less ground cover which can lead to more unstable watershed conditions, particularly when subjected to natural or man-caused disturbances.

Wildland fire is probably the most significant natural disturbance that impacts watersheds. Where high intensity wildland fires have occurred over large acreages, watershed conditions can rapidly deteriorate due to sudden lack of vegetative ground cover, lack of rainfall interception, and resultant poor hydrologic conditions. When severe fires create poor hydrologic conditions (<10% of the ground surface covered with plants and litter), surface runoff can increase over 70%, and erosion can increase by three orders of magnitude (DeBano, et al, 1998). Poor hydrologic conditions are likely to occur in any area with high, or even moderate, burn severity.

Anthropogenic disturbances are another key contributor of impacts to watershed conditions. The current transportation system across the Forest is one of the more prominent, land disturbing activities occurring. This system is comprised of open routes (road, trails), motorized cross country travel, and motorized dispersed camping use. The transportation system currently impacts both upland and valley bottom resources. The primary impacts to watershed condition include soil compaction, soil erosion, sedimentation, stream channel degradation, riparian degradation, and vegetation disturbance. High road densities can additionally contribute to unsatisfactory watershed conditions by increasing the connected disturbed areas associated with roads to the drainage network, or increasing the number of stream crossings within a watershed.

Soils

Currently the Forest does not have a completed Terrestrial Ecosystem Survey coverage and associated interpretations completed on the Forest. It does have the General Ecosystem Survey (GES) which is an ecological unit inventory, mapped at 1:250,000 scale. The GES identified 28 distinct ecological map units and associated map unit components over the forest, which indicates high soil variability. GES maps soils, climate, geology, potential natural vegetation and topography. It also provides various map unit interpretations such as soil condition and erosion hazard. Though the GES is a broad scale inventory it is the best available survey currently for the Forest. Soil orders identified in the GES include Alfisols, Inceptisols, Entisols and Mollisols. The Forest has five of the eight life zones identified in the Region 3 General Ecosystem Survey. These include semi desert grassland, woodland, ponderosa pine, mixed conifer and spruce fir. The majority of the soils classified fall into the woodland and forest soil types.

The geology of the Forest can be characterized as extremely variable. The Forest lies within the Mogollon Plateau of the Mogollon-Datil volcanic field. This field became active approximately 40 million years ago. Volcanic units in the Mogollon-Datil volcanic unit field include domes, lava flows, intrusions and many ash flow tuffs. There are eleven calderas within the Mogollon-Datil volcanic field and their associated sheets of ash flow tuff**.** Since the volcanism occurred, the Mogollon-Datil volcanic field has been undergoing Basin and Range extension and faulting, so today an ash sheet that was originally continuous is most likely discontinuously exposed in fault-block mountains separated by down-dropped basins. The area is highly variable as to its surface geology types and associated composition due to the undergoing Basin and Range extension and faulting, in conjunction with erosion. The geology

of the Forest is dominated by rhyolite, rhyolitic tuff and ash flow tuff, andesites, basalt, basaltic andesite, granite, and sedimentary rocks including limestone and gila conglomerate.

It has been noted that soil erosion is higher on soils that were formed and underlain by granite, rhyolitic ashflow tuffs, gila conglomerate and volcanic sediments.

Table 2 displays the GES map units and selected interpretations and associated acres by Map unit.

Table 2. GES map units, interpretations and acres on Gila National Forest

Summary of GES Map Units, Interpretations and Acres on Gila NF							
GES MU	**%Comp**	**Soil Type**	**Texture**	**Veg Type**	**Slope**	**Soil Condition**	**Erosion Hazard**
127.1	60	Typic Ustochrepts	SL	Qutu2	15-40%	Unsatisfactory	Moderate
127.2	30	Typic Haplustalfs	SL	Qutu2	0-15%	Unsatisfactory	Slight
134.1	30	Vertic Haplustalfs	CL	Jumo	0-15%	Unsatisfactory	Slight
134.2	20	Vertic Haplustalfs	CL	Gusa2	0-15%	Unsatisfactory	Slight
134.3	30	Typic Haplustalfs	CL	Jumo	15-40%	Satisfactory	Severe
143.1	30	Vertic Haplustalfs	CL	Prgl2	0-15%	Unsatisfactory	Slight
143.2	30	Aridic Haplustalfs	L	Prgl2	15-40%	Unsatisfactory	Severe
143.3	30	Typic Ustochrepts	L	Qugr3	15-40%	Satisfactory	Severe
144.1	50	Vertic Haplustalfs	CL	Jude2	0-15%	Unsatisfactory	Slight
144.2	40	Typic Haplustalfs	L	Qugr3	15-40%	Satisfactory	Severe
145.1	30	Aridic Haplustalfs	L	Prgl2	40-80%	Unsuited	Severe
145.2	30	Typic Haplustalfs	L	Qugr3	40-80%	Satisfactory	Severe
145.3	15	Rock Outcrop, Conglomerate			80-120%		
145.4	15	Rock Outcrop, Conglomerate			80-120%		
149.1	50	Typic Haplustalfs	L	Qugr3	0-15%	Unsatisfactory	Slight
149.2	40	Lithic Haplustalfs	L	Qugr3	15-40%	Satisfactory	Severe
157.1	30	Typic Eutroboralfs	L	Pipos	15-40%	Satisfactory	Severe
157.2	30	Lithic Haplustalfs	SL	Qugr3	15-40%	Satisfactory	Severe
157.3	20	Typic Haplustalfs	L	Jude2	0-15%	Unsatisfactory	Slight
157.4	20	Rock Outcrop, Conglomerate			80-120%		
158.1	15	Typic Eutroboralfs	L	Pipos	0-15%	Satisfactory	Slight
158.2	30	Typic Eutroboralfs	L	Pipos	15-40%	Satisfactory	Severe
158.3	30	Lithic Haplustalfs	SL	Qugr3	15-40%	Satisfactory	Severe
158.4	25	Rock Outcrop, Conglomerate			80-120%		
160.1	80	Typic Eutroboralfs	L	Pipos	0-15%	Satisfactory	Slight
168.1	30	Typic Haplustalfs	L	Qugr3	40-80%	Satisfactory	Severe
168.2	30	Eutric Glossoboralfs	L	Psmeg	40-80%	Satisfactory	Severe
168.3	15	Rock Outcrop, Basalt			80-120%		
168.4	15	Rock Outcrop, Basalt			80-120%		
181.1	20	Typic Cryoboralfs	L	Pien	0-15%	Satisfactory	Slight
181.2	70	Typic Cryoboralfs	L	Pien	15-40%	Satisfactory	Severe
191.1	40	Mollic Eutroboralfs	CL	Pipos	0-15%	Satisfactory	Slight
191.2	40	Mollic Eutroboralfs	CL	Pipos	15-40%	Satisfactory	Moderate
192.1	30	Utric Glossoboralfs	L	Psmeg	40-80%	Satisfactory	Severe
192.2	30	Mollic Cryoboralfs	L	Pien	40-80%	Satisfactory	Severe

Summary of GES Map Units, Interpretations and Acres on Gila NF							
GES MU	**%Comp**	**Soil Type**	**Texture**	**Veg Type**	**Slope**	**Soil Condition**	**Erosion Hazard**
192.3	15	Rock Outcrop, Basalt			80-120%		
192.4	15	Rock Outcrop, Basalt			80-120%		
196.1	20	Mollic Eutroboralfs	CL	Pipos	0-15%	Satisfactory	Slight
196.2	30	Mollic Eutroboralfs	CL	Pipos	15-40%	Satisfactory	Moderate
196.3	30	Typic Haplustalfs	CL	Jumo	15-40%	Satisfactory	Severe
198.1	40	Eutric Glossoboralfs	L	Psmeg	0-15%	Satisfactory	Slight
198.2	50	Eutric Glossoboralfs	L	Psmeg	15-40%	Satisfactory	Severe
370.1	60	Fluventic Ustochrepts	SL	Quem	2-5%	Satisfactory	Slight
370.2	20	Typic Ustifluvents	SL	Chli2	5-15%	Satisfactory	Slight
371.1	60	Fluventic Ustochrepts	SL	Quem	2-5%	Satisfactory	Slight
371.2	20	Aquic Ustifluvents	SL	Pofr2	0-2%	Satisfactory	Slight
390.1	30	Typic Ustorthents	SL	Qugr3	15-40%	Satisfactory	Moderate
390.2	30	Typic Udorthents	SL	Psmeg	15-40%	Satisfactory	Moderate
390.3	30	Badlands, altered ash			40-80%		
390.4	20	Badlands, altered ash			40-80%		
427.1	30	Aridic Ustochrepts	SL	Prgl2	0-15%	Unsatisfactory	Slight
427.2	30	Typic Ustochrepts	SL	Qugr3	15-40%	Satisfactory	Moderate
427.3	20	Badlands			40-80%		
427.4	20	Badlands			40-80%		
429.1	60	Typic Ustochrepts	SL	Jumo	0-15%	Unsatisfactory	Slight
429.2	30	Fluventic Ustochrepts	SL	Chna2	2-5%	Satisfactory	Slight
435.1	60	Udic Ustochrepts	SL	Pipos	0-15%	Satisfactory	Slight
435.2	40	Typic Ustochrepts	SL	Qugr3	15-40%	Satisfactory	Moderate
452.1	40	Typic Dystrochrepts	SL	Psmeg	40-80%	Satisfactory	Moderate
452.2	30	Dystric Cryochrepts	SL	Pien	40-80%	Satisfactory	Severe
452.3	15	Granite/Rhyolite rock outcrop			80-120%		
452.4	15	Granite/Rhyolite rock outcrop			80-120%		
474.1	30	Lithic Ustochrepts	SL	Fosp2	40-80%	Unsuited	Moderate
474.2	30	Typic Ustochrepts	SL	Qugr3	40-80%	Satisfactory	Moderate
474.3	15	Granite/Rhyolite rock outcrop			80-120%		
474.4	15	Granite/Rhyolite rock outcrop			80-120%		
478.1	30	Lithic Ustochrepts	SL	Fosp2	40-80%	Unsuited	Moderate
478.2	30	Lithic Ustochrepts	SL	Qugr3	40-80%	Unsuited	Severe
478.3	15	Granite/Rhyolite rock outcrop			80-120%		
478.4	15	Granite/Rhyolite rock outcrop			80-120%		
479.1	30	Lithic Ustochrepts	SL	Qugr3	40-80%	Unsuited	Severe
479.2	30	Typic Dystrochrepts	SL	Psmeg	40-80%	Satisfactory	Moderate
479.3	15	Granite/Rhyolite rock outcrop			80-120%		
479.4	15	Granite/Rhyolite rock outcrop			80-120%		
491.1	30	Aridic Ustochrepts	SL	Prgl2	15-40%	Satisfactory	Moderate
491.2	30	Typic Ustochrepts	SL	Qugr3	15-40%	Satisfactory	Severe
491.3	20	Aridic Haplustalfs	SL	Prgl2	0-15%	Unsatisfactory	Slight
501.1	20	Fluventic Haploborolls	L	Popr	2-5%	Unsatisfactory	Slight
501.2	60	Aquic Ustifluvents	SL	Poan3	0-2%	Satisfactory	Slight
560.1	80	Pachic Argiborolls	CL	Fear2	0-15%	Unsatisfactory	Slight
561.1	80	Typic Argiborolls	L	Fear2	0-15%	Unsatisfactory	Slight

The following tables displays acres and percent of Forest by soil condition and erosion hazard by rating:

Table 3. Summary of Soils Conditions on Gila National Forest

Soil Condition	Satisfactory	Unsatisfactory	Unsuited
Acres	1,812,649	861,620	714,928
Percent	53%	25%	21%

Table 4. Summary of Erosion Hazard on Gila National Forest

Erosion Hazard	Slight	Moderate	Severe
Acres	1,517,271	411,958	1,459,967
Percent	45%	12%	43%

The Gila National Forest Plan lists eight management areas on the Forest that contain within them, areas comprised of sensitive soils or highly erosive fragile soils. Table 3 summarizes this information:

Table 5. Summary of Forest Plan Management Areas with Soils Concerns

Forest Plan Management Areas with Soils Concerns								
Direction	**Source**	**Forest**	**Black Range**	**Glenwood**	**Quemado**	**Reserve**	**Silver City**	**Wilderness**
Provide for the management of sensitive soils in all surface disturbing activities to minimize or control erosion. Recognizing increased cost associated with the management of sensitive soils.	LRMP pg 36	X						
• Management area 2B has the Hardcastle area which contains 20,000 acres of very sensitive soils with very high erosion hazard.	LRMP Page 55		X					
• Management area 2H contains Burnt Cabin flats grassland with high erodible soils.	LRMP Page 89		X					
• Management emphasis in 2H is the area contains 20,000 acres of sensitive soils and four erosion control project areas. The areas of sensitive soils will be managed to minimize erosion.	LRMP Page 89		X					
• There are areas within management area 3A which are comprised of fragile, highly erosive rhyolitic, and Gila conglomerate soils.	LRMP Page 95			X				
• Areas within the management area 3B are comprised of fragile, highly erosive soils.	LRMP Page 100				X			
• Areas within the management area 3C are comprised of fragile, highly	LRMP Page 105				X			

Forest Plan Management Areas with Soils Concerns								
Direction	**Source**	**Forest**	**Black Range**	**Glenwood**	**Quemado**	**Reserve**	**Silver City**	**Wilderness**
erosive soils.								
• Areas within the management area 3D are comprised of fragile, highly erosive soils. Erosion in these areas has created a system of gullies which bisect the area and reduce productivity.	LRMP Page 112				X			
• Unstable soils have created unique formations at the base of Escondido Mountain in management area 9A	LRMP Page 252				X			

Vegetation

In 2009, the Region and Forest completed a Mid-Scale Existing Vegetation Mapping project and associated accuracy assessment on the Gila National Forest. The map is a satellite remote sensing product that is polygon based and provides a mid scale map at a scale of 1:100,000. The project incorporated satellite remote sensing and extensive vegetation plot training data that was collected in the field, Forestwide. The training data was used for modeling purposes. A total of 32 dominance types were initially identified on the Forest and these dominance types were field sampled extensively. Dominance types were identified and named according to principal life form and most abundant species occurring within that life form. Life forms mapped include trees, shrubs and grasses. Through the process of performing the accuracy assessment, the initial 32 dominance types were aggregated into map units, for a total of 18 map units in the final product. Products from the Mid-Scale Existing Vegetation project were a map of vegetative cover type by lifeform (tree, shrub, herbaceous) and dominant species, map of vegetative canopy cover classes (10-29%, 30-59% and > 60%) and vegetation structure (dominant tree diameter classes and shrub height).

Table 6 displays the Mid-Scale Existing Vegetation map units and associated acres and percentages of each map unit Forest wide.

Table 6. Mid-Scale Existing Vegetation Map Units on Gila National Forest

Mid-Scale Existing Vegetation Map Units on Gila NF		
Mid-Scale Existing Vegetation Map Unit Descriptions	**Acres**	**Percent**
Sparsely Vegetated (less than 10% canopy cover of any one life form)	6,932	.20
Grasslands	275,388	8.12
Deciduous Shrub mix	19,625	.58
Evergreen Shrub mix	43,949	1.29
Alligator juniper	99,573	2.94
One seed juniper and Pinyon pine	327,368	9.66
Woodlands mixed (combinations of mixes of Pinyon/Juniper/Gray oak)	1,001,191	29.53
Evergreen oak (pure and mixed stands of Gray oak, Silverleaf oak, and Netleaf oak	245,027	7.23
Gambel oak	31,568	.93
Ponderosa pine (pure Ponderosa pine and Pine stands with Alligator juniper or Gambel oak	1,105,016	32.59
Ponderosa pine and Gray oak	14,614	.43
Aspen	8,738	.26
Douglas fir mixed (Douglas fir and combinations of Douglas fir and Ponderosa pine, White pine, Gambel oak)	103,844	3.06
White fir or White fir and Douglas fir mixed.	33,521	.99
Mixed conifer and Gambel oak (mixed combinations of Douglas fir, White fir, Ponderosa pine, White pine with Gambel oak)	51,475	1.52
Mixed conifer and Aspen (mixed combinations of Douglas fir, White fir, White pine, Engelmann spruce, Corkbark fir with Aspen)	8,200	.24
Mixed conifer (mixed combinations of Engelmann spruce, Corkbark fir, White fir, Blue Spruce, Douglas fir	11,764	.35
Engelmann spruce and Corkbark fir	2,540	.07
Water	309	.01
Total	**3,390,642**	

Aquatic Resources

Water resources on the forest include streams, wetlands, riparian areas, lakes, ponds, reservoirs, and numerous stock ponds and tanks. There are approximately 1,171 miles of perennial streams and 541 miles (GIS NHD) of intermittent streams on the forest. The remaining drainages are considered ephemeral, of which there are approximately 12,821 miles of these systems across the Forest. Open water comprises almost 300 surface acres when including Quemado Lake, Snow Lake, and Lake Roberts. In addition, approximately 1,200 surface acres of open water may be associated with stockponds and other storage tanks, when filled to capacity.

Riparian & Wetland

The Forest has many perennial and intermittent streams, and wetlands that provide riparian habitat for terrestrial wildlife, fisheries, avia fauna, and fauna. These unique areas also provide for aesthetic resources, natural water purification processes, flood control, and opportunities for agricultural and recreational uses. Riparian ecosystems essentially

constitute the transition area between the aquatic ecosystem and the adjacent terrestrial system.

Mapping and assessment of these riparian and wetlands ecosystems across the Forest has not been completed, however a considerable amount of data and information has been collected on these areas outside of wilderness areas. Riparian Area Survey and Evaluation System (RASES) assessments have been completed on 326 stream reaches, and Proper Functioning Condition assessments have been completed on 132 stream reaches. The following table provides a summary of PFC ratings across the Forest to date. Ratings of Proper Functioning Condition and Functional at Risk – Upward Trend are considered to be meeting Forest Plan standards. Currently, 64% of the reaches inventoried using the PFC method are meeting Forest Plan standards.

Table 7. Summary of Forest PFC Data

Summary of Forest PFC Data					
Percentages for Riparian PFC Data					
Total Riparian PFC reaches assessed	132				
% of Riparian Reaches Assessed as Proper Functioning Condition		**% of Riparian Reaches Assessed as Functional at Risk w/ Trend**		**% of Riparian Reaches Assessed as Non-Functional**	
Designated at low end	2%	Upward	10%	Trend not designated	8%
Designated low to mid	1%	Downward	14%	Downward	2%
Not otherwise designated	52%	Not Apparent	8%		
		Lower end of class	1%		
		Trend not designated	3%		
Total:	**54%**	**Total:**	**36%**	**Total:**	**10%**

Vegetation types commonly associated with riparian areas on the Gila National Forest include both a woody component and an herbaceous component. Woody species commonly found include narrowleaf and Fremont cottonwood, Arizona and thinleaf alder, baccharis, Arizona walnut, willow species, box elder, velvet ash, and others. Herbaceous species include sedges, rushes, Kentucky bluegrass, deer grass, and other water-loving grasses and forbs.

In effort to quantify acres and location of riparian areas that may be most at risk to negative impacts from motorized vehicles, a riparian risk zone was considered for this analysis. Using existing riparian width data from RASES data, the average width of Forest riparian areas is 155 feet, with a median width of 90 feet. 97% of all riparian areas assessed with RASES have a width of 500 feet or less. Four drainages have reaches measuring over 500 feet, including Mogollon Creek, Gallinas Canyon, Gila River, and South Diamond Creek. Very limited miles of roads are found within these drainages.

Based on the above information, it was determined that a 300’ buffer on either side of perennial and intermittent drainages would be suitable to use as a riparian risk zone,

knowing that a few exceptions occur across the Forest where the riparian zone goes beyond a 600' total width. Although still not quantifying acres of riparian areas found on the Forest, the 300' buffer captures the majority of riparian areas while at the same time providing some level of buffer protection beyond the true riparian zone. Table 5 depicts the range and frequency of widths found on the Gila National Forest.

Table 8. Riparian widths on Gila NF

Width	*Frequency*	*Cumulative %*
25	29	8.90%
50	72	30.98%
75	47	45.40%
100	35	56.13%
150	36	67.18%
200	31	76.69%
250	22	83.44%
300	16	88.34%
350	12	92.02%
400	9	94.79%
450	5	96.32%
500	3	97.24%
1000	4	98.47%
2300	5	100.00%

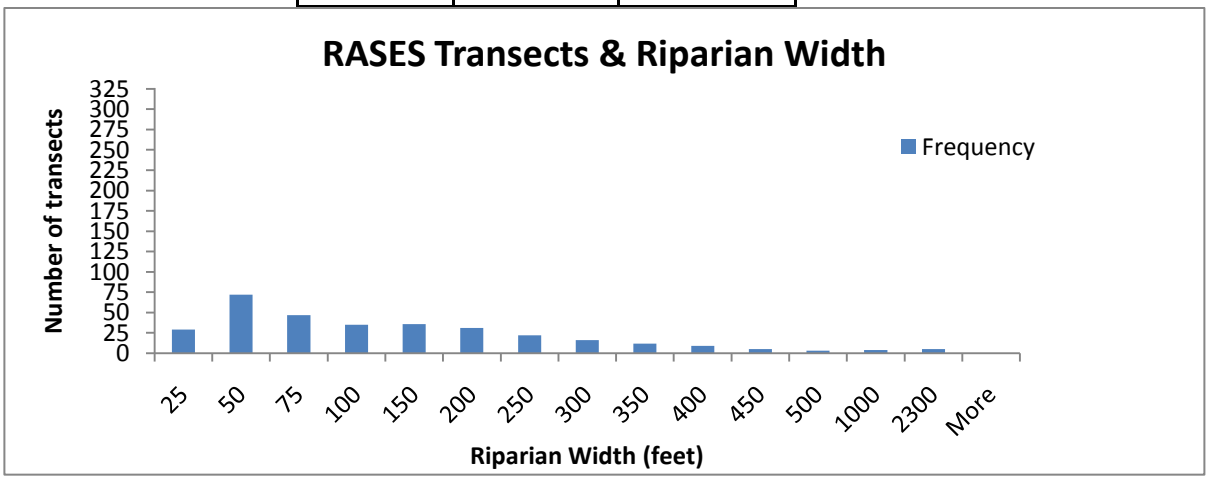


Chart 1. Frequency of riparian widths on Gila National Forest

Wetland areas are typically associated with riparian areas, and can be found adjacent to perennial and intermittent streams, or linked to a perennial spring or seep. Typical vegetation within these wetlands includes sedges and rushes, as well as other water-loving herbaceous plants. The 300' buffer for the riparian risk zone captures most wetland systems on the forest, in particular those associated with stream systems. Wetland conditions across the Forest varies, with some wetlands being intact with limited disturbance, while others have experienced some level of dewatering or degradation due to

ungulate grazing or anthropogenic activities. Exceptions to wetland-type areas found outside of the riparian risk zone are described below.

Note: A GIS review of the four wide-bottomed drainages with riparian widths exceeding 600 feet indicated very limited miles of roads were not captured within the riparian risk zone. All roads adjacent to Gallinas Creek were captured by the buffer. No roads were present adjacent to or within South Diamond Creek. Less than 0.10 mile was outside of the riparian risk zone adjacent to Mogollon Creek (at the confluence of Mogollon Creek and Gila River). Approximately 1.5 miles of motorized routes were not captured in the Gila River mainstem by the riparian risk zone (at Gila River Bird Area; confluence of Mogollon Creek and Gila River; confluence of Turkey Creek and Gila River). All alternatives are compared equally in this analysis, thus the level of change will be relative, regardless of these missing road miles.

Upland Wet Meadows

Upland meadows across the Forest range in elevation from 4,300 feet to 9,600 feet, however the majority of these meadows are located at elevations averaging approximately 7,800 feet. They are typically associated with ponderosa pine and mixed conifer vegetation types. The upland wet meadows typically have bluegrass as one of the dominant herbaceous cover types. To date, the Forest does not have an inventory of these systems, thus other methods were used to aid in their identification.

The U.S. Fish and Wildlife Service is currently mapping wetlands in the United States via a project called the National Wetland Inventory (NWI). Information about this project and data can be found at http://www.fws.gov/Wetlands/Data/Mapper.html. This coverage was used to identify some wet meadows on the Forest, although it did not capture all known areas. The Forest utilized a mapping and digitizing process called "Tasseled Cap" that paired color infrared imagery and a transformation of Landsat imagery data to identify the remaining wet meadows. 103 upland wet meadows were identified, totaling 432 acres across the Forest and averaging in size from 0.2 acres to 69 acres. The average size of these meadows is approximately 4 acres. Review of this exercise still indicates that not all of the upland wet meadows within the Forest have been identified. Additionally, any wet meadows that were associated with riparian areas (streams and rivers) were not digitized in this exercise as they were already encompassed within the riparian risk zones.

Water Quality

The potential adverse effects from forest management activities are non-point sources, as opposed to point sources of water pollution. To ensure compliance with the Clean Water Act, water quality standards are set by the New Mexico Water Quality Control Commission. New Mexico's Surface Water Quality Standards define water quality goals by designating uses for waterbodies, setting criteria to protect those uses, and establishing provisions to perserve water quality. These water quality standards are examined for changes on a 3-year rotating basis. The current standards (2002) are documented in "Standards for Interstate and Intrastate Streams." Under Section 303(d)(1) of the Clean Water Act, states are required to develop a list of waters within a state that are not in compliance with water quality standards and to establish a total maximum daily load (TMDL) for each pollutant. Reaches of streams that are in some state of non-attainment are documented in "Draft 2010-2012 Integrated 303d)/305(b)

List of Impaired Waters" (State of NM, 2010) which was approved in April 2010 by the Water Quality Control Commission . Final approval by EPA is still pending.

Table 6 lists the water bodies that have been currently listed as in non-attainment of state water quality standards, and the probable causes of impairment. Currently there are 29 waterbodies (streams & lakes) within or adjacent to Forest system land that are not meeting State water quality standards. Of these 29 waterbodies, twelve reaches have listed a probable source of impairment as either off-road vehicles, highway/road/bridge runoff, or surface/parking lot runoff. Five of the 29 waterbodies document a probable cause of impairment as turbidity, which may be directly or indirectly linked to roads. Twenty of 29 waterbodies list a probable cause of impairment as water temperature, which may also be indirectly linked to roads if stream channel geometry has been altered due to road-modifed runoff.

Table 9. Summary of Draft 2010-2012 State of New Mexico CWA §303(d)/§305(b) Integrated List & Report

Summary of NM Draft 2010-2012 Impaired Waters on Gila NF					
Basin	**Reach**	**Designated Use (not supporting)**	**Probable Causes of Impairment**	**Probable Sources of Impairment**	**IR Category***
CABALLO	Las Animas Creek (perennial portion R Grande to headwaters)	Marginal Coldwater Aquatic; Life Warmwater Aquatic Life	Benthic-Macroinvertebrate Bioassessments (streams)	Source Unknown	5/5C
MIMBRES	Bear Canyon Reservoir	Coldwater Aquatic Life	Mercury in Tissue; Nutrient/Eutrophication Biological Indicators; Oxygen, Dissolved	Atmospheric Deposition - Toxics; Loss of Riparian Habitat; Rangeland Grazing; Source Unknown	5/5C
	Mimbres River (perennial reaches downstream of Willow Springs)	Coldwater Aquatic Life; Secondary Contact	Fecal Coliform; Nutrient/Eutrophication Biological Indicators; **Temperature, water**	Flow Alterations from Water Diversions; Irrigated Crop Production; On-site Treatment Systems (septic Systems and Similar Decentralized Systems); Rangeland Grazing	5/5B
	Mimbres River (perennial reaches Willow Springs to Cooney Cyn)	High Quality Coldwater Aquatic Life	Nutrient/Eutrophication Biological Indicators; Oxygen, Dissolved; **Temperature, water**	Dredging (E.g. for Navigation Channels); Flow alterations from water diversions; loss of riparian habitat; on-site treatment systems (septic systems and similar decentralized systems; rangeland grazing	5/5B
CARRIZO WASH	None	N/A	N/A	N/A	N/A

Summary of NM Draft 2010-2012 Impaired Waters on Gila NF					
Basin	**Reach**	**Designated Use (not supporting)**	**Probable Causes of Impairment**	**Probable Sources of Impairment**	**IR Category***
UPPER GILA	Black Canyon Creek (East Fork Gila River to headwaters)	High Quality Coldwater Aquatic Life	**Temperature, water**	Habitat Modification - other than Hydromodification; loss of riparian habitat; **off-road vehicles;** rangeland grazing; silviculture, Fire suppression	4A
	Canyon Creek (Middle Fork Gila River to Headwaters)	High Quality Coldwater Aquatic Life	Nutrient/Eutrophication Biological Indicators; **Turbidity**	Loss of riparian habitat; rangeland grazing; streambank modifications/destabilization	4A
	East Fork Gila River (Gila River to headwaters)	High Quality Coldwater Aquatic Life	Aluminum; Benthic-Macroinvertebrate Bioassessments (streams)	**Off-road vehicles**; other recreational pollution sources; silviculture, Fire suppression; source unknown	5/5C
	Gila River (Mogollon Creek to Gila Hot Springs)	Marginal Coldwater Aquatic Life	**Temperature, water**	Source Unknown	5/5B
	Gilita Creek (Middle Fork Gila R to Willow Creek	High Quality Coldwater Aquatic Life	Aluminum; **Temperature, water**	Natural Sources; **Off-road vehicles;** other recreational pollution sources; rangeland grazing; silviculture, Fire suppression	5/5A
	Lake Roberts	Coldwater Aquatic Life	Nutrient/Eutrophication Biological Indicators; pH; **Temperature, water**	Agriculture; impervious **surface/parking lot runoff;** other recreational pollution sources	5/5A
	Middle Fork Gila River (Gila River to headwaters)	High Quality Coldwater Aquatic Life	Aluminum; **Temperature, water; turbidity**	Natural Sources; other recreational pollution sources; silviculture, Fire suppression; Source unknown	5/5B
	Mogollon Creek (perennial reaches abv USGS gage)	High Quality Coldwater Aquatic Life	Aluminum	Mill tailings; **off-road vehicles**; silviculture, fire suppression; streambank modifications/destabilization	4A
	Taylor Creek (Beaver Creek to Wall Lake)	High Quality Coldwater Aquatic Life	Aluminum; **Temperature, water**; **turbidity**	Natural sources; **off-road vehicles;** other recreational pollution sources; rangeland grazing; silviculture, Fire suppression; upstream impoundments (e.g. Pl-566 NRCS structures)	5/5A
	Taylor Creek (perennial reaches above Wall Lake)	High Quality Coldwater Aquatic Life	Aluminum; **Temperature, water**; **turbidity**	Natural sources; rangeland grazing; silviculture, fire suppression	5/5A

Summary of NM Draft 2010-2012 Impaired Waters on Gila NF					
Basin	**Reach**	**Designated Use (not supporting)**	**Probable Causes of Impairment**	**Probable Sources of Impairment**	**IR Category***
	Turkey Creek (Gila River to headwaters)	High Quality Coldwater Aquatic Life	Oxygen, dissolved; **Temperature, water**	Natural sources; silviculture, fire suppression	5/5A
	West Fork Gila River (Cliff Dweller Cyn to headwaters)	High Quality Coldwater Aquatic Life	**Temperature, water**	Source Unknown	5/5B
	West Fork Gila River (East Fork to Middle Fork)	High Quality Coldwater Aquatic Life	**Temperature, water**	Natural sources; **off-road vehicles**; other recreational pollution sources; silviculture, fire suppression	5/5B
UPPER GILA - MANGAS	Bill Evans Lake	Marginal Coldwater Aquatic Life	**Temperature, water**	Source Unknown	5/5A
	Gila River (Mangas Creek to Mogollon Creek)	Marginal Coldwater Aquatic Life; Warmwater Aquatic Life	**Temperature, water**	Source Unknown	5/5B
	Gila River (Red Rock to Mangas Creek)	Marginal Coldwater Aquatic Life; Warmwater Aquatic Life	Nutrient/Eutrophication Biological Indicators; **Temperature, water**	Source Unknown	5/5C
	Mangas Creek (Gila River to Mangas Springs)	Marginal Coldwater Aquatic Life; Warmwater Aquatic Life	Nutrient/Eutrophication Biological Indicators; **Temperature, water**	Source Unknown	5/5A
SAN FRANCISCO	Centerfire Creek (San Francisco River to headwaters)	High Quality Coldwater Aquatic Life	Nutrient/Eutrophication Biological Indicators; pH; Specific Conductance; **Temperature, water**	Natural Sources; **off-road vehicles;** other recreational pollution sources; rangeland grazing; silviculture, fire suppression	5/5A
	Negrito Creek (Tularosa River to confluence of North and South Forks)	High Quality Coldwater Aquatic Life	**Temperature, water**	**Highway/road/bridge runoff** (non-construction related); other recreational pollution sources; rangeland grazing; silviculture, fire suppression	5/5A
	San Francisco River (Centerfire Creek to AZ border)	Coldwater Aquatic Life	**Temperature, water**	rangeland grazing; silviculture, fire suppression	4A

Summary of NM Draft 2010-2012 Impaired Waters on Gila NF					
Basin	**Reach**	**Designated Use (not supporting)**	**Probable Causes of Impairment**	**Probable Sources of Impairment**	**IR Category***
	San Francisco River (Dry Creek to Whitewater Creek)	Marginal Coldwater Aquatic Life; Marginal Warmwater Aquatic Life	Benthic-Macroinvertebrate Bioassessments (streams)	Source Unknown	5/5C
	South Fork Negrito Creek (Negrito Creek to headwaters)	High Quality Coldwater Aquatic Life	**Temperature, water**	**Highway/road/bridge runoff** (non-construction related); Loss of riparian habitat; other recreational pollution sources; rangeland grazing; silviculture, fire suppression	4A
	Tularosa River (San Francisco River to Apache Creek)	High Quality Coldwater Aquatic Life	Specific Conductance	**Highway/road/bridge runoff** (non-construction related); natural sources; rangeland grazing; silviculture, fire suppression	
	Whitewater Creek (San Francisco River to Whitewater Campground)	High Quality Coldwater Aquatic Life	**Turbidity**	Channelization; **highway/road/bridge runoff** (non-construction related); loss of riparian habitat; natural sources; streambank modifications/destabilization	4A
	Whitewater Creek (Whitewater Campground to headwaters)	High Quality Coldwater Aquatic Life	Aluminum	Natural sources; other recreational pollution sources; silviculture, Fire suppression	4A

*

- 4A Impaired for one or more designated uses, but does not require development of a TMDL because TMDL has been completed.
- 4B Impaired for one or more designated uses, but does not require development of a TMDL because other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future.
- 4C Impaired for one or more designated uses, but does not require development of a TMDL because impairment is not caused by a pollutant.
- 5/5A Impaired for one or more designated or existing uses and a TMDL is underway or scheduled.
- 5/5B Impaired for one or more designated or existing uses and a review of the water quality standard will be conducted
- 5/5C Impaired for one or more designated or existing uses and Additional data will be collected before a TMDL is scheduled.

The above list indicates only those waters that have been assessed by the State of New Mexico on the Gila National Forest. However, all ephemeral, intermittent and perennial streams carry storm water runoff that can contribute to water quality impairments. Routes found within or adjacent to these stream systems and/or wetland, riparian and aquatic habitats

pose the most risk of contributing nonpoint source pollution to these resources. Best Management Practices (BMPs) can considerably reduce negative impacts to water quality from motorized routes. Routes on the Gila National Forest vary as to the implementation, and effectiveness of BMPs. Maintenance level 3-5 roads may be maintained more frequently, thus reducing erosion potential, but might still have poorly placed drainage features. Maintenance level 2 roads may see less frequent, if any maintenance, thus increasing the risk for erosion potential. These routes, however, may receive less traffic and imprint a smaller swath of disturbance on the immediate landscape.

Summary of Existing Condition

The following tables provide a synopsis of watershed characteristics Forestwide, as well as a summary of attributes at the fifth code watershed level.

Table 10. Summary of Forestwide Watershed Characteristics

Summary of Forestwide Watershed Characteristics	
Feature	**Characteristics**
Location	• Southwest corner of New Mexico • Mogollon Mountains in north-central portion of Forest • Black Range Mountains along southeastern portion of Forest (Continental Divide) • Approximately 150 miles southwest of Albuquerque • Abuts the Arizona/New Mexico state line
Elevation	• Low end approximately 4,160 feet where the Gila River exits the Forest in the Burro Mountains • High end approximately 10,770 feet at Mogollon Baldy in the central portion of the forest
Climate	• Bi-modal precipitation pattern • Majority of precipitation occurs from July – September (monsoon) • Winter precipitation occurs from December – February, with snowfall occurring above 6,500 feet • Precipitation varies across Forest from 11 inches/ year at the northern end near Quemado and lower Black Range to 35 inches per year at the higher elevations in the Mogollon Mountains.
Aquatic features	• 1171 miles of perennial streams • 541 miles of intermittent streams • 12,820 miles of ephemeral streams • 13 miles of water pipeline • 16 miles of ditches • 289 surface acres of lakes • 432 acres of upland wet meadows
Major drainage basins/rivers	• San Francisco River and its headwaters which flows into Arizona and eventually the Gila River; • Upper Gila River and its headwaters which flows into Arizona and eventually into the Colorado River near Yuma ; • Mimbres River and its headwaters which flows south of the Forest into a closed basin within the Rio Grande region above the International U.S./Mexico border. • Northern most portion of Forest flows northwest into Little

Summary of Forestwide Watershed Characteristics	
Feature	**Characteristics**
	Colorado River via tributaries • Eastern portion of Forest flows east, southeast into Rio Grande via tributaries
Watersheds	• 41 fifth code watersheds that intersect the Forest with average size of 210,000 acres • 190 sixth code watersheds that intersect the Forest with average size of 25,000 acres
Designated uses of water	• Domestic water supply, coldwater aquatic life, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, marginal coldwater aquatic life, marginal warmwater aquatic life, primary contact, secondary contact, warmwater aquatic life, wildlife habitat
Water Quality	• 29 waterbodies within or adjacent to Forest not meeting State water quality standards • 12 of 29 list probable source of impairment as off-road vehicles, highway/road/bridge runoff, or surface/parking lot runoff. • 5 of 29 listed for turbidity which may be linked indirectly to roads • 20 of 29 listed for temperature which may be linked indirectly to roads
Riparian Condition	• 132 reaches assessed using PFC assessment • 54% of these in Proper Functioning Condition • 36% of these Functional at Risk • 10% of these Non-Functional • 64% currently meeting Forest Plan Standards of PFC or FAR-Upward Trend • 326 reaches inventoried using RASES • Average riparian width across Forest is 155 feet • Median riparian width across Forest is 90 feet
Soil Conditions	• satisfactory soil condition = 53% • unsatisfactory soil condition = 25% • unsuited soil condition = 21% • slight erosion hazard = 45% • Moderate erosion hazard = 12% • Severe erosion hazard = 43%
Roads	• More than 5,200 miles of roads and trails, a large portion of which are not paved. • A small portion of the unpaved roads are not system roads - they are created by recreational use.
Existing Forest road density in 5^{th} code watersheds	• 90 % of the 5^{th} code watersheds have a road density of less than 1.0 mile of road per square mile of land (mi/mi^2). • 10% of the 5^{th} code watersheds have road density of 1-2 mi/mi^2. • No 5^{th} code watersheds have a road density of greater than 2 mi/mi^2.
Existing Forest road density in 6^{th} code watersheds	• 76 % of the 6^{th} code watersheds have a road density of less than 1.0 mile of road per square mile of land (mi/mi^2). • 20% of the 6^{th} code watersheds have a road density of 1-2 mi/mi^2. • 4% of the 6^{th} code watersheds have a road density of greater than 2 mi/mi^2)

Climate Change

The U.S. Environmental Protection Agency (EPA) has asserted that scientists know with virtual certainty that human activities are changing the composition of the Earth's atmosphere. It is also documented that "greenhouse" gases, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and hydrofluorocarbons have been increasing (EPA, 2010). The atmospheric buildup of these gases is largely the result of human activities such as the burning of fossil fuels. Greenhouse gases absorb infrared energy that would otherwise be reflected from the earth. As the infrared energy is absorbed, the air surrounding the earth is heated (CARB 2007).

The Southwestern Region of the Forest Service recently released "Southwestern Region Climate Change – Trends and Forest Planning February 2010. The following information is summarized from excerpts of this publication:

> "In the Southwest, climate modelers agree there is a drying trend that will continue well into the latter part of 21st century (IPCC 2007; Seager et al. 2007). The modelers predict increased precipitation, but believe that the overall balance between precipitation and evaporation would still likely result in an overall decrease in available moisture. Regional drying and warming trends have occurred twice during the 20th century (1930s Dust Bowl, and the 1950s Southwest Drought). The current drought conditions "may very well become the new climatology of the American Southwest within a time frame of years to decades". According to recent modeling, the slight warming trend observed in the last 100 years in the Southwest may continue into the next century, with the greatest warming to occur during winter. These climate models depict temperatures rising approximately 5 to 8 degrees Fahrenheit by the end of the century (IPCC 2007). This trend would increase pressures on the region's already limited water supplies, as well as increase energy demand, alter fire regimes and ecosystems, create risks for human health, and affect agriculture (Sprigg 2000).
>
> Average air temperatures are rising, and it is likely that continued warming will accentuate the temperature difference between the Southwest and the tropical Pacific Ocean, enhancing the strength of the westerly winds that carry moist air from the tropics into the Southwest during the monsoon. This scenario may increase the monsoon's intensity, or its duration, or both, in which case floods will occur with greater frequency (Guido 2008). While the region is expected to dry out, it is likely to see larger, more destructive flooding. Along with storms in general, hurricanes and other tropical cyclones are projected to become more intense overall. Arizona and New Mexico typically receive 10 percent or more of their annual precipitation from storms that begin as tropical cyclones in the Pacific Ocean. In fact, some of the largest floods in the Southwest have occurred when a remnant tropical storm hit a frontal storm from the north or northwest, providing energy to empower a remnant tropical storm (Guido 2008).
>
> Most global climate models are not yet precise enough to apply to land management at the ecoregional or National Forest scale. This limits regional and forest-specific analysis of the potential effects from climate change".

Due to the limitations of climate models, as stated above, site-specific analysis of climate change at the Forest level in regards to implementing the travel management rule remains improbable. Several unknowns further limit the discussion and analysis. These include lack of data regarding traffic numbers and projected increases or decreases in motorized visitors or passersby to the Forest, limited data and knowledge of current effects to ecosystem resiliency within the Forest as a result of motorized travel, and limited knowledge of surrounding areas' contributions to current and future climate impacts to assess cumulative effects.

Projected future climate change may affect New Mexico in a variety of ways. Public health can suffer due to an increase in extreme temperatures and severe weather events resulting in escalating transmission of infections, disease, and air pollution. Agriculture is vulnerable to altered temperature and rainfall patterns, and new pest problems. Forest ecosystems could face increased fire hazards and may be more susceptible to pests and diseases. Snowpacks could shrink and winter runoff may start in midwinter, not spring, with rain falling on snow triggering flood events.

While the future of climate change and its effects across the Southwest remains uncertain, it is certain that climate variability will continue to occur across the Gila National Forest. Forest management activities should strive for promoting resilience and resistance of natural resources to impacts of climate change. Implementation should focus on maintenance and restoration of resilient native ecosystems, thus reducing the ecosystems' vulnerability to variations in climate. Diversity remains an integral component in these native ecosystems and synchronization should be avoided so that one failure does not lead to a domino effect. Projects must promote connected landscapes and endeavor to reset significantly disrupted animal and plant communities, thus restoring their flexibility to changes in climate. Management across the Forest will have to respond accordingly to climate change to minimize negative impacts from any ongoing or proposed activity.

Laws, Regulations and Policies

The following section describes relevant direction for watershed and soil resources discusses other management direction including Regional or Washington Office mandates, other applicable laws, etc. that may apply.

Applicable Laws

The Federal Water Pollution Control Act of 1972

Public Law 92-500 as amended in 1977 (Public Law 95-217) and 1987 (Public Law 100-4), also known as the Federal *Clean Water Act (CWA)*: This act provides the structure for regulating pollutant discharges to waters of the United States. The Act's objective is "…to restore and maintain the chemical, physical, and biological integrity of the Nation's waters," and is aimed at controlling point and non-point sources of pollution. The U.S. Environmental Protection Agency (EPA) administers the Act, but many permitting, administrative, and enforcement functions are delegated to State governments. In Arizona, the designated agency for enforcement of the Clean Water Act is the New Mexico Environment Department. The allotment includes perennial waters, intermittent flows, and

ephemeral channels, all of which are covered under the Non-Point Source Management Program and Plan.

Pertinent sections of the Clean Water Act:

- CWA Sections 208 and 319: recognize the need for control strategies for non-point source pollution.
- CWA Section 303(d): requires waterbodies with water quality determined to be either impaired (not fully meeting water quality standards) or threatened (likely to violate standards in the near future), to be compiled by New Mexico Environment Department in a separate list which must be submitted to EPA every two years. These waters are targeted and scheduled for development of water quality improvement strategies on a priority basis.
- TMDLs (Total Maximum Daily Loads): There are several TMDLs written for stream reaches found within the Gila National Forest. These include the following:
    - Temperature TMDLs – Black Canyon Creek, South Fork Negrito Creek, San Francisco River, Taylor Creek;
    - Plant Nutrients TMDLs – Canyon Creek, Centerfire Creek, Mangas Creek, San Francisco River;
    - Turbidity TMDLs – Canyon Creek, Sapillo Creek, Whitewater Creek;
    - Conductivity TMDLs – Centerfire Creek, Tularosa Creek;
    - Metals (Chronic Aluminum) TMDLs – East Fork Gila River, Mogollon Creek, Taylor Creek, Whitewater Creek;
    - Total Organic Carbon TMDLs – Sapillo Creek
- CWA Section 305(b): require that states assess the condition of their waters and produce a biennial report summarizing the findings.
- CWA Section 401: allows states and tribes to review and approve, set conditions on, or deny Federal permits (such as 404 permits) that may result in a discharge to State or Tribal waters, including wetlands. Applications for Section 404 permits are often joint 404/401 permits to ensure compliance at both the State and Federal levels.
- CWA Section 404: outlines the permitting process for dredging or discharging fill material into waters of the U.S., including wetlands. The U.S. Army Corps of Engineers administers the 404 Program.

Organic Administration Act of 1897 (30 Stat. 34 amended; 16 U.S.C. 473-478, 479-482, 551) - Authorized the Secretary of Agriculture to manage the National Forests to improve and protect the forests, to secure favorable conditions of water flow, and to furnish a continuous supply of timber.

Multiple Use Sustained Yield Act of 1960 (74 Stat. 215; 16 U.S.C. 528-531) - Established a policy of multiple use, sustained yield management for the renewable resources of the National Forest System.

National Environmental Policy Act of 1969 (83 Stat. 852 as amended; 42 U.S.C. 4321, 4331-4335, 4341, 4347) - Required that environmental considerations be incorporated into all Federal policies and activities, and required all Federal agencies to prepare environmental impact statements for any actions significantly affecting the environment.

Forest and Rangeland Renewable Resources Planning Act of 1974 (88 Stat. 476 as amended; 17 U.S.C. 1600-1614) - Provided for continuing assessment and long-range planning of the Nation's forest and range renewable resources under the jurisdiction of the Secretary of Agriculture.

National Forest Management Act of 1976 (90 Stat. 2949; 16 U.S.C. 472a, 476, 476 (note), 500, 513-516, 521b, 528 (note), 576b, 594-2 (note), 1600 (note), 1600-1602, 1604, 1606, 1608-1614) - Established additional standards and guidelines for managing the National Forests, including directives for National Forest land management planning, and public participation. It is the primary statute governing the administration of national forests.

Gila National Forest Plan Direction

Riparian

- Forest Plan Amendment No. 10; September 2005; Forestwide; p. 30
  - Manage riparian areas in accordance with legal requirements regarding floodplains, wetlands, wild and scenic rivers, and cultural and other resources.
  - Manage riparian areas to protect the productivity and diversity of riparian-dependent resources by requiring actions within or affecting riparian areas to protect and where applicable, improve dependent resources. Emphasize protection of soil, water, vegetation and wildlife and fish resources prior to implementing projects.
  - Give preferential consideration to resources dependent on riparian areas over other resources. Other resource uses and activities may occur to the extent that they support or do not adversely affect riparian-dependent species.
  - Improve riparian ecosystems in unsatisfactory condition to satisfactory condition.
  - Maintain riparian ecosystems currently in satisfactory condition

- Forest Plan Amendment No. 8; June 1996; Forestwide
  - Emphasize maintenance and restoration of healthy riparian ecosystems through conformance with forest plan riparian standards and guidelines. Management strategies should move degraded riparian vegetation toward good condition as soon as possible. Damage to riparian vegetation, stream banks, and channels should be prevented. Pp. 29b and 29d

- Forest Plan Amendment No. 1; June 1987; Forestwide.
  - Recreation use of riparian zones will be managed to avoid damage to riparian resources. P. 22

- Forest Plan Standards and Guidelines; 1986; Forestwide.
  - Road construction will be avoided in riparian areas. P 38

RNA/Potential Candidate

- Forest Plan Standards and Guidelines; 1986.
    - Management will be to maintain the Gila River Research Natural Area and manage all potential candidate RNAs in their present natural condition. Manage to provide protection to natural features and vegetative communities while providing opportunities for research and education. Quemado, Silver City, Wilderness Districts. P. 49
        - The visual quality objective of preservation will be met.
        - Manage dispersed recreation at low intensity reduced service level.
        - ORV use prohibited**.**
    - Gila River RNA [402 total acres features 125 ac of pinyon-juniper woodland, 52 acres of riparian hardwood, and 225 acres of desert shrub]. Will be maintained as RNA in its natural condition. LRMP management area 7A; Silver City. P 204
    - Turkey Creek (potential candidate) [1,335 acres and features riparian hardwood as a major ecosystem]. This major ecosystem will be maintained in its present natural condition. LRMP management area 8B Wilderness District. p 249
    - Rabbit Trap (potential candidate) [297 acres and features scrub grassland]. Will be maintained as a RNA in its natural condition. LRMP management area 7A. Silver City District p 204
    - Largo Mesa (potential candidate) [300 acres and features classic pinyon-juniper woodlands]. This major ecosystem will be maintained in its present natural condition. LRMP management area 9B; Quemado District p 255
    - Agua Fria Mountain (potential candidate) [350 acres and features mountain grassland as a major ecosystem]. This major ecosystem will be maintained in its present natural condition. LRMP management Area 9B Quemado District 261

Soil and Water

- Forest Plan Standards and Guidelines; 1986.
    - Protect and improve soil resources. Forestwide. p 12
    - Provide for long-term quality waterflow needs through improved management Forestwide. p 12
    - Restore lands in unsatisfactory watershed condition. Forestwide. P 12
    - Provide for the management of sensitive soils in all surface disturbing activities to minimize or control erosion. Recognizing increased cost associated with the management of sensitive soils. Forestwide P. 36
        - Management area 2B has the Hardcastle area which contains 20,000 acres of very sensitive soils with very high erosion hazard. Black Range District. P 55
        - Management area 2H contains Burnt Cabin flats grassland with high erodible soils. Black Range District. P 89
        - Management emphasis in 2H is the area contains 20,000 acres of sensitive soils and four erosion control project areas. The areas of

sensitive soils will be managed to minimize erosion. Black Range District. P 89
- There are areas within management area 3A which are comprised of fragile, highly erosive rhyolitic, and Gila conglomerate soils. Glenwood District. p 95
- Areas within the management area 3B are comprised of fragile, highly erosive soils. Quemado District. p 100
- Areas within the management area 3C are comprised of fragile, highly erosive soils. Quemado District. p 105
- Areas within the management area 3D are comprised of fragile, highly erosive soils. Erosion in these areas has created a system of gullies which bisect the area and reduce productivity. Erosion in these areas has created a system of gullies which bisect the area and reduce productivity. Quemado District. p 112
- Unstable soils have created unique formations at the base of Escondido Mountain in management area 9A. Quemado District. p 252

- Maintain or improve watershed conditions to a satisfactory condition on 70-90 percent of the unsatisfactory watersheds by the end of the fifth decade. This should be accomplished through a combination of resource management and watershed structure. Forestwide. p36
- Through the use of best management practices, the adverse effect of planned activities will be mitigated and site productivity maintained. Soil loss due to management will not exceed soil loss tolerance. Forestwide. p38

Forest Service Manual (FSM) 2500 Watershed and Air Management

Contains legal authorities, objectives, policies, responsibilities, instructions, and guidance needed on a continuing basis by Forest Service line officers and primary staff in more than one unit to plan and execute assigned programs and activities. Subsections that apply to this analysis include: 2500—Zero Code; 2510—Watershed Planning; 2520—Watershed Protection and Management; 2530—Water Resource Management; 2550—Soil Management; 2580—Air Resource Management. Complete text can be found at http://fsweb.wo.fs.fed.us/directives/html/fsm2000.shtml

Forest Service Handbook (FSH) (USDA Forest Service, 2000)

The principal source of specialized guidance and instruction for carrying out the direction issued in the FSM. Specialists and technicians are the primary audience of this Handbook direction. Subsections that apply to this analysis include: 2509.16 – Water Resource Inventory Handbook; 2509.18—Soil Management Handbook; 2509.22 – R3 Soil and Water Conservation Handbook; 2509.23 –R3 Riparian Area Handbook. Complete text can be found at http://fsweb.wo.fs.fed.us/directives/html/fsh2000.shtml

Executive Orders 11988 and 11990

(CEQ 1978): ”President Carter issued two Executive Orders last May requiring all executive agencies to take special care when undertaking actions that may affect wetlands or floodplains, directly or indirectly. The orders require agencies to avoid disrupting these areas

wherever there is a practicable alternative, and to minimize any environmental harm that might be caused by federal actions

- *Executive Order 11988, Floodplain Management*, agencies are commanded to "take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains." It requires the agency to determine whether a proposed action will occur in a floodplain, consider alternatives to avoid adverse effects and incompatible development in the floodplain. If the only practicable alternative consistent with the Executive Order requires activity in a floodplain, the agency must design or modify the action to minimize potential harm to or within the floodplain and circulate a notice containing an explanation of why the action is to be located in the floodplain. Early public review of any proposals in floodplains is required (NEPA).

- *Executive Order 11990, Protection of Wetlands*, commands that the agency shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. Specifically, it requires the agency to avoid undertaking or providing assistance for new construction located in wetlands unless there is no practicable alternative to such construction and the proposed action includes all practicable measures to minimize harm to wetlands, which may result from such use. In determining that there is no practicable alternative and all practicable measures to minimize harm have been incorporated, the agency may take into account economic, environmental, and other pertinent factors. There must be early public review of plans or proposals for new construction in wetlands.

Executive Order (EO) 11644 (February 8, 1972) and EO 11989 (May 24, 1977) – Provide direction for Federal agencies to establish policies and provide for procedures to control and direct the use of OHVs on public lands so as to: (1) protect the resources of those lands; (2) promote the safety of all users of those lands; and (3) minimize conflicts among the various users on those lands.

- The Forest Service developed regulations in response to the EOs (36 CFR, 219, 261 and 295). Under those regulations, OHV use can be restricted or prohibited to minimize: (1) damage to the soil, vegetation, watershed and impacts to water quality, or other resources of public lands; (2) harm to wildlife or wildlife habitats; and (3) conflict between the use of OHVs and other types of recreation.

State Non-Point Source (NPS) Management Plan (2009

The purpose of the New Mexico NPS Management Program (NPS Program) is to develop dynamic programs and progressive actions to prevent NPS pollutants from entering both surface and ground water. The NPS Program emphasizes watershed-based planning as a means of coordinating watershed restoration efforts, fostering watershed associations, and encouraging partnership among agencies, nongovernmental organizations, and the public. The NMED coordinates with other land management agencies that have established resource protection programs and activities. USFS is a designated management agency for NPS control in New Mexico. Responsibilities of USFS include control, abatement, and prevention of NPS pollution resulting from all activities conducted in National Forests. Water quality concerns identified in National Forests include sediment and nutrient inputs from grazing and foraging

activities, road construction and maintenance, timber harvest, and mining. Recreation impacts, largely related to sediment and litter impacts, occur in virtually all easily accessible lakes and along many accessible streams.

Memorandum of Agreement on Fostering Collaboration and Efficiencies to Address Water Quality Impairments on National Forest System Lands.
Document signed in 2007 between U.S. Forest Service and the U.S. Environmental Protection Agency. Purpose: to coordinate between agencies and address issues of water quality impairment regarding 303(d) list, as well as TMDLs. The leading cause of water quality impairments on National Forest lands includes temperature, excess sediment, and habitat modification. These issues are to be addressed via BMPs as much as possible. In terms of this project analysis area, BMPs can be applied to soil and watershed condition and are applicable everywhere.

Methodology and Analysis Process

The analysis area under consideration for direct and indirect impacts is all forest lands interior to the Forest boundary. Cumulative impacts will be considered for all fifth code watersheds intersecting the Gila National Forest that have more than 10% of lands managed by the Forest.

Data Sources
Data sources for this analysis included existing surveys, inventories and data bases incorporated into the Gila NF GIS layers:

- Roads, associated maintenance levels, road widths and road miles from the Gila NF Infra Database (see engineering section).
- General Ecosystem Survey (GES) soil map unit properties and interpretations
- Riparian Area Survey and Evaluation System (RASES)
- Gila NF Mid-Scale Existing Vegetation Map
- Integrated 303(d)/305(b) List of Impaired Waters" (State of NM, draft 2010)
- National Wetlands Inventory (U.S. Fish and Wildlife Service)
- Upland Wet Meadow digitizing project (Forest project)
- Forest Stream Crossing Survey
- User created routes inventory (Forest and Public)
- 5^{th} and 6^{th} code HUCs
- Forest Riparian risk zones (assumptions) and 300 foot buffer
- Perennial, intermittent, ephemeral NHD information

Other data sources:

- Proper Functioning Condition Assessments (PFC) *(Technical Reference 1737-15 and 16, Riparian Area Management. A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic and Lentic Areas. 126 pages).*
- Connected disturbed area inventory
- Coarse filter information derived for travel management planning

General Assumptions:

- Public education, compliance, and enforcement of regulations will generally limit public travel to designated routes.
- The action alternatives involve the closure of routes to vehicle use by the public and not the physical removal (decommissioning) or roads. The removal of roads typically involves the extraction of culverts, the ripping of the road surface, and in some cases the re-contouring of the ground surface to blend in with the natural topography. It typically can take more than 20 years for closed roads to revegetate to background conditions, if traffic is successfully eliminated.
- Closed routes without fixed barriers are expected to revegetate minimally. These routes will not disappear from the landscape until decommissioned, and will continue to be a source of sediment and erosion to some degree.
- Unauthorized routes may not be in an acceptable condition, as they were created without engineering design.
- An undetermined amount of unauthorized routes exist that are not included in any current inventory.
- Miles by traffic use are unknown. Traffic use on maintenance level 2 routes and user-created routes is generally low, and traffic use on maintenance levels 3, 4, and 5 routes is generally moderate.
- Sediment is the major pollutant from native-surface roads. Most other pollutants from roads, such as trace metals and man-made chemicals are attached to sediment (Gucinski and others 2001; Dissmeyer 2000). Thus, the relative effects of the alternatives with regard to sediment apply to trace metals and man-made chemicals.
- The effects of roads on the peak flows on streams and the subsequent conditions of aquatic habitat are minor. Research on small watersheds typically has shown that peak flows do not increase until more than 12 percent of the watershed is covered with roads and other impermeable areas (Ziemer, 1981), such as roads, landings, parking lots, and buildings.
- Disturbance within 300 feet of streams has the greatest potential to impact water quality, via overland flow (Burroughs and King, 1989, Belt, O'Laughlin and Merrill, 1992).
- The most important factors that influence the risk of adverse effects to water quality from unpaved roads are related to the length (and associated acres) of unpaved roads near a stream, the distance of the unpaved roads from a stream, and the number of times that unpaved roads cross the stream.
- The reduction or elimination of vehicle traffic on a road or trail near a stream will result in less sediment delivered from the road to the stream over time. This relates to the reduction of the amount of loose material on the road surface and also the increase in the amount of vegetative litter and other cover on the road surface. Erosion rates from a closed road may decrease to near background levels as the density of vegetation on the surface of the road increase (Dissmeyer, 2000).
- Riparian risk zones are considered areas within 300' of perennial and intermittent streams. Average riparian width based on RASES data across the Forest is 155 feet. This risk zone is assumed to be inclusive of +97% of all riparian areas across the forest, minus four of the larger riverine systems.
- Existing road system has already committed soil resources to loss of productivity.

- Average road widths assumed by road maintenance level.
- Routes that are connected to the drainage network provide some level of sediment transport, regardless of whether drainage is perennial, intermittent, or ephemeral. These sediment inputs vary based on duration and frequency of flow events. During short duration, high intensity storm events, ephemeral drainages can carry a considerable amount of sediment, some of it generated by roads.
- Administrative or "written authorization use" roads are considered level 2 routes.

Data Limitations:

- The General Ecosystem Survey
    - The GES map and associated soil interpretations were used to evaluate soils on the Forest. The GES is mapped at a scale of 1:250,000 and was designed for general assessments and evaluation of projects at the landscape or Forest wide level similar to the scope of the proposed action. It is key to acknowledge that the GES is a very broad scale survey (1 inch = approximately 4 miles) and many differences in soils, geology and topography can occur within very short distances.
- Incomplete Forestwide coverage of riparian and wetland mapping and assessments
- Cumulative watershed effects analyzed at 5th code watershed level

Issue Statements

1. The proposed motorized routes specifically the type, extent, level of use and location of motorized routes may lead to resource, recreation, social and economic impacts.
2. Motorized dispersed camping with proposed designated corridors and areas may lead to resource, recreation, social and economic impacts.
3. The proposed motorized big game retrieval may lead to resource, recreation, social and economic impacts.
4. The proposed designated areas, specifically for OHV activities may lead to resource, recreation, social and economics.

Key Indicators

Key indicators for water and soil resources were selected that affect aspects of watershed condition, including soil condition, riparian and wetland vegetation, water quality, and road and trail conditions.

Soils

Indicator Measure:

- Relative risk of motorized disturbance in soils identified as having moderate and severe GES erosion potential.

Criteria for measure:

- Acres of disturbance from motorized routes in areas with moderate and severe GES erosion classes
- Acres of potential disturbance from motorized big game retrieval, motorized dispersed camping, and motorized areas in areas with moderate and severe GES erosion classes

Indicator Measure:

- Relative risk of motorized disturbance in soils identified as having unsatisfactory and unsuited GES soil conditions.

Criteria for measure:

- Acres of disturbance from motorized routes in areas having unsatisfactory and unsuited GES soil condition classes
- Acres of potential disturbance from motorized big game retrieval, motorized dispersed camping and motorized areas in areas having unsatisfactory and unsuited GES soil condition classes

Riparian and Wetland Vegetation

Indicator measure:

- Relative risk of motorized disturbance in wetlands, wet meadows, and riparian areas

Criteria for measure:

- Acres of disturbance from motorized routes within identified wetland, wet meadows and riparian risk zones.
- Acres of potential disturbance from motorized big game retrieval, motorized dispersed camping, and motorized areas within identified wetland, wet meadows and riparian risk zones.

Water Quality

Indicator measure:

- Relative risk of motorized disturbance impacting perennial streams, intermittent streams, and 303(d) streams,

Criteria for measure:

- Number of stream crossings on perennial, intermittent, 303d streams
- Miles of perennial, intermittent, and 303(d) streams potentially impacted by motorized routes, motorized big game retrieval, motorized dispersed recreation, and motorized areas.

Road and Trail Condition (hydrologic connectivity)

Indicator measure:

- Relative risk of motorized disturbance to disrupt watershed function

Criteria for measure:

- Acres of disturbance from routes Forestwide (including all routes still connected to stream system)
- Acres of potential disturbance from motorized big game retrieval, motorized dispersed camping, and motorized areas Forestwide.
- Route density by 5^{th} code watershed (including all routes still connected to stream system).

Effects

Each of the alternatives are analyzed in the following sections to determine if there is potential for the changes proposed under each alternative to impact critical ecological functions that affect watershed condition and health. The components reviewed in this analysis include soil resources, riparian and wetland resources, and water quality. Other

factors related to road and trail conditions were examined to evaluate the relative risk of motorized uses to disrupt hydrologic function and potentially impact watershed health.

Effects to Soils

The effects to soils by motorized uses on native surface routes are directly related to the impact the road footprint has on the landscape, as well as the impact the vehicle has both directly, and indirectly, on the ground itself. This project will result in a change in the levels of use of a particular road, however no alternative poses decommissioning or obliteration of any roads to return them to a more natural state. Tables 11-20 provide a summary of acres of motorized routes that pose a relative risk of adverse impacts to soils, by alternative, as well as potential acres that may be impacted by motorized dispersed recreation, motorized areas, and motorized big game retrieval.

A discussion follows Table 20 of potential soil impacts under each Alternative, however a brief summary of these effects are described below:

- This project does not address decommissioning; all road scars will remain, with the addition of a few roads added to the system (i.e. converting of decommissioned to motorized route or trail). Until decommissioned, the roads will remain in passive storage, still having compacted soils, loss of soil productivity, concentrated runoff resulting in erosion and sediment production, and lack of vegetative ground cover. Due to compaction and loss of soil productivity of roads, natural revegetation of the road will be a slow process. In areas of low freeze/thaw such as in the Southwest, research supports that it takes many years for compacted soils to begin to break up.

- In reviewing only motorized routes and the reduction in relative risk to the soil resource, Alternative E indicates the largest reduction in acres impacted on soils with moderate or severe erosion hazard and unsatisfactory or unsuited soils. Alternative D shows the next largest reduction, followed by Alternatives F and G, which are virtually the same. Alternative C shows little change (+1%) from the No Action Alternative.

- Alternatives D (-98%), E (-100%) and G (-97%) show significant reduction in potential acres of disturbance on soils with moderate or severe erosion hazard ratings from motorized big game retrieval, followed by Alternatives F (-50%) and Alternative C (-22%).

- Alternatives D (-97%), E (-100%) and G (-96%) show significant reduction in potential acres of disturbance on soils with unsuited or unsatisfactory soil condition ratings from motorized big game retrieval, followed by Alternatives F (-42%) and Alternative C (-19%).

- All alternatives show significant reduction (>94%) in potential acres of disturbance to soils having moderate or severe erosion hazard ratings and soils with unsatisfactory or unsuited soil condition ratings by motorized dispersed camping.

- Alternatives D and E completely removed the 38 areas from soils having moderate or severe erosion hazard ratings and soils with unsatisfactory or unsuited soil condition ratings, while Alternatives G, F, and C show no change from the No Action Alternative.

- The one ATV/motorcycle area does not impact soils having moderate or severe erosion hazard. However in Alternatives C, F, and G the proposed site is located on soils having unsatisfactory or unsuited soil condition ratings.

Table 11. Acres of Motorized Routes Located on Soils with Moderate or Severe Erosion Hazard Ratings

Forestwide Acres of motorized routes located on soils with moderate or severe erosion hazard ratings with potential to cause further erosion or negative impacts (% increase or decrease from No Action)	**Acres**	**Change in Acres from No Action**	**% Increase or decrease from No Action**
Alternative B – No Action	2,454		
Alternative C	2,493	+39	+1%
Alternative D	1,778	-676	-28%
Alternative E	1,438	-1016	-41%
Alternative F	2,002	-452	-18%
Alternative G	2,064	-390	-16%

*Erosion Hazard refers to the relative susceptibility of an area to sheet and rill erosion upon removal of ground cover and is influenced by slope.

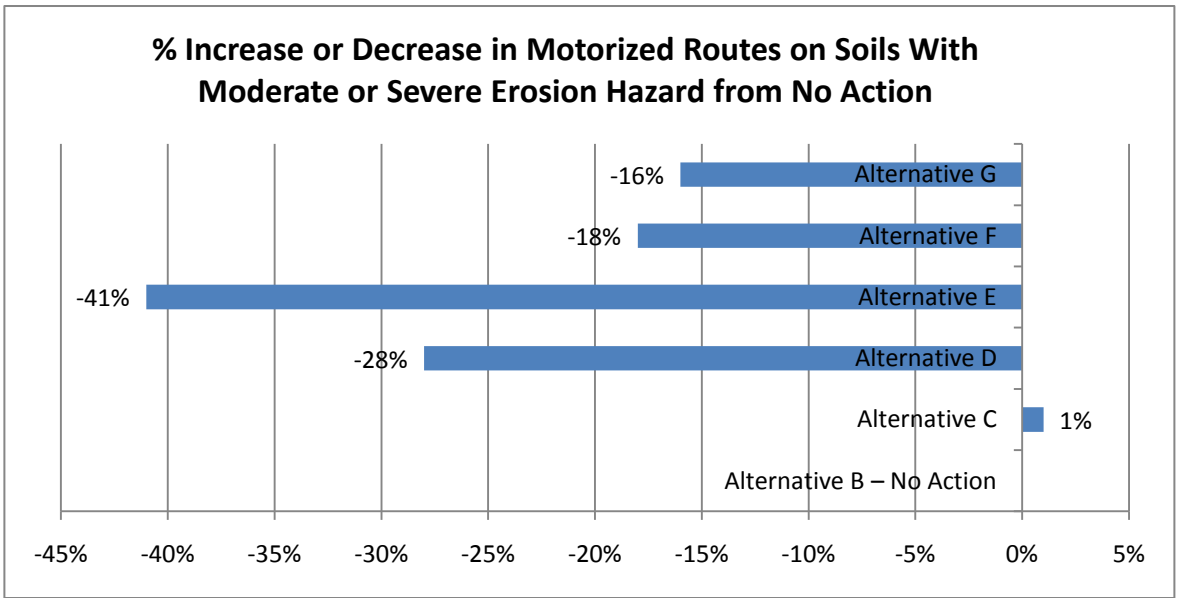


Table 12. Acres of Motorized Routes Located on Soils with Unsatisfactory or Unsuited Soil Condition Ratings

Forestwide Acres of disturbance (motorized routes) located on soils with unsatisfactory or unsuited soil condition ratings with potential to cause further erosion and negative impacts (% increase or decrease from No Action)	**Acres**	**Change in Acres from No Action**	**% Increase or decrease from No Action**
Alternative B – No Action	2,855		
Alternative C	2,840	-15	-1%
Alternative D	2,212	-643	-23%
Alternative E	1,907	-948	-33%
Alternative F	2,335	-520	-18%
Alternative G	2,372	-483	-17%

*Satisfactory = Current Soil Loss < Tolerance Soil Loss > or = Natural Soil Loss
Unsatisfactory =Current Soil Loss>Tolerance Soil Loss> or =Natural Soil Loss
Unsuited= Current Soil Loss> Tolerance Soil Loss<Natural Soil Loss

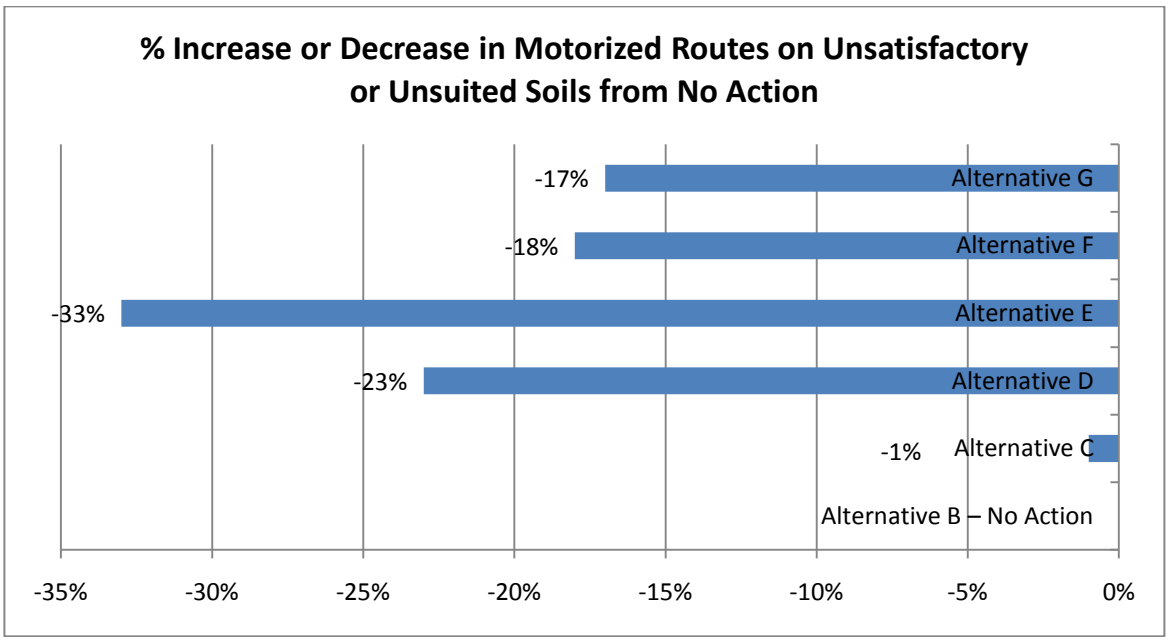


Table 13. Potential Acres Impacted by Motorized Big Game Retrieval to Soils with Moderate or Severe Erosion Hazard Ratings by Alternative

Forestwide Potential acres impacted by motorized big game retrieval to soils with moderate or severe erosion hazard ratings with potential to cause further erosion or negative impacts (% increase or decrease from No Action)	**Acres**	**Change in Acres from No Action**	**% Increase or decrease from No Action**
Alternative B – No Action	1,208,889		
Alternative C	948,817	-260,072	-22%
Alternative D	29,316	-1,179,573	-98%
Alternative E	0	-1,208,889	-100%
Alternative F	602,771	-606,118	-50%
Alternative G	31,192	-1,177,697	-97%

*Erosion Hazard refers to the relative susceptibility of an area to sheet and rill erosion upon removal of ground cover and is influenced by slope.

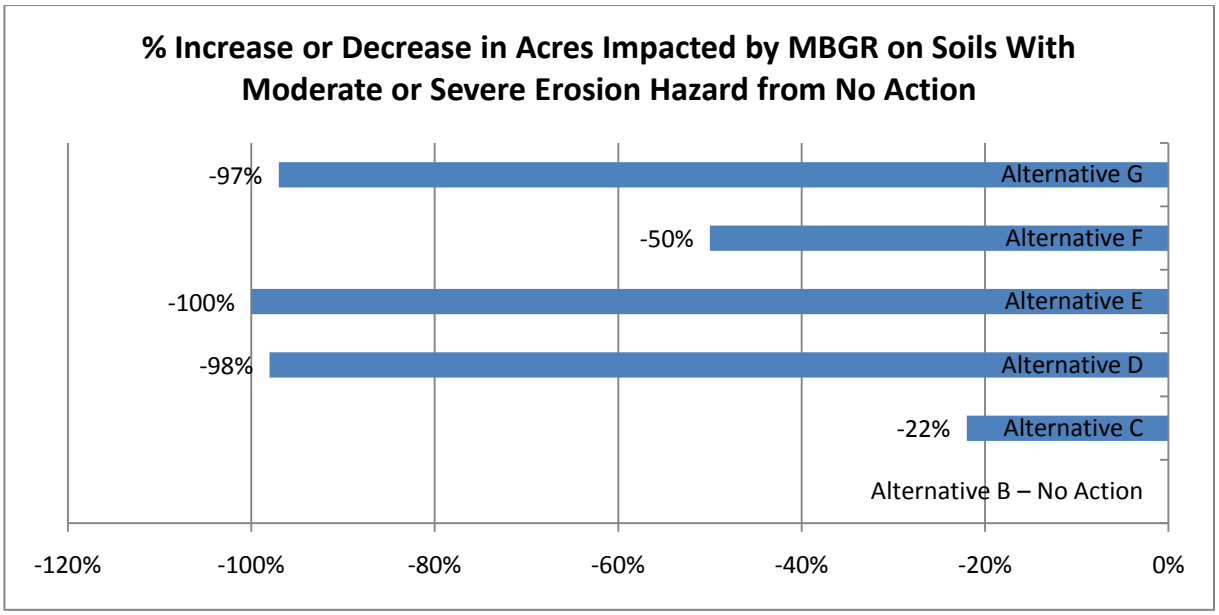


Table 14. Potential Acres Impacted by Motorized Big Game Retrieval to Soils with Unsatisfactory or Unsuited Soil Condition Ratings

Forestwide Potential acres impacted by motorized big game retrieval to soils with unsatisfactory or unsuited soil condition ratings with potential to cause further erosion and negative impacts (% increase or decrease from No Action)	**Acres**	**Change in Acres from No Action**	**% Increase or decrease from No Action**
Alternative B – No Action	1,161,540		
Alternative C	946,631	-214,909	-19%
Alternative D	36,580	-1,124,960	-97%
Alternative E	0	-1,161,540	-100%
Alternative F	678,542	-482,998	-42%
Alternative G	41,198	-1,120,342	-96%

*Satisfactory = Current Soil Loss < Tolerance Soil Loss > or = Natural Soil Loss
Unsatisfactory =Current Soil Loss>Tolerance Soil Loss> or =Natural Soil Loss
Unsuited= Current Soil Loss> Tolerance Soil Loss<Natural Soil Loss

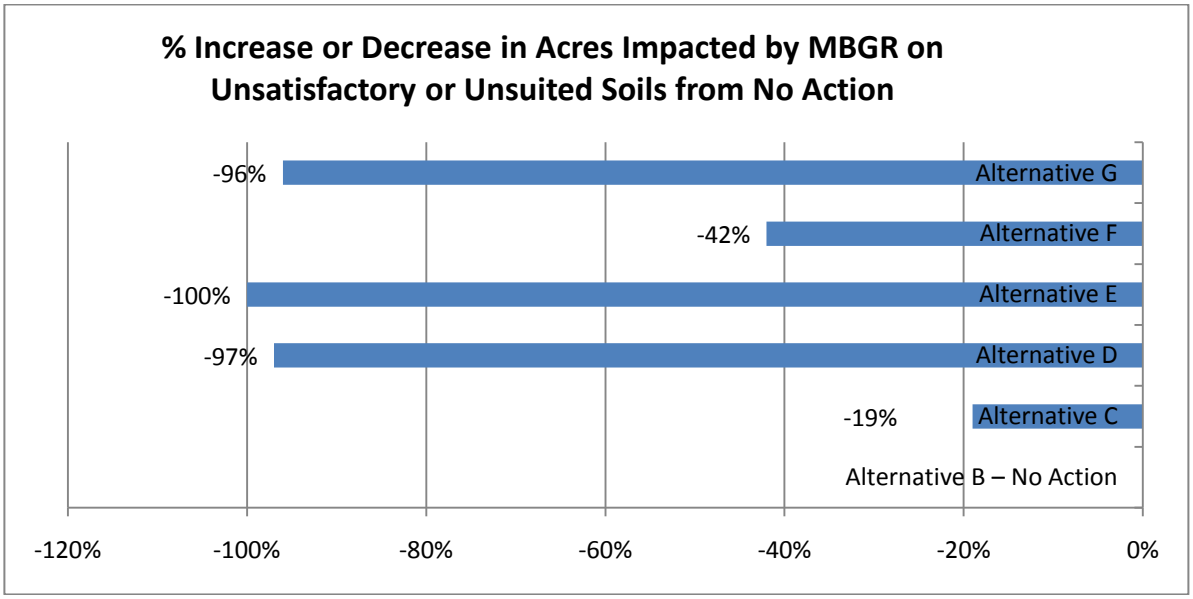


Table 15. Potential Acres Impacted by Motorized Dispersed Camping and Permitted Parking to Soils with Moderate or Severe Erosion Hazard Ratings

Forestwide	Acres Motorized Dispersed Camping	Change in Acres from No Action	% Increase or decrease from No Action	Acres of Permitted Parking (1 vehicle length)	Change in Acres from No Action	% Increase or decrease from No Action	Total Acres of Motorized Dispersed Camping and Permitted Parking Combined	Total % Increase or decrease from the No Action
Alternative B – No Action	1,208,889							
Alternative C	35,515	-1,173,374	-97%	14,678	-1,194,211	-99%	50,193	-96%
Alternative D	29,316	-1,179,573	-98%	9,564	-1,199,325	-99%	38,880	-97%
Alternative E	0	-1,208,889	-100%	11,599	-1,197,290	-99%	11,599	-99%
Alternative F	33,748	-1,175,141	-97%	10,814	-1,198,075	-99%	44,562	-96%
Alternative G	31,192	-1,177,697	-97%	11,052	-1,197,837	-99%	42,244	-97%

*Erosion Hazard refers to the relative susceptibility of an area to sheet and rill erosion upon removal of ground cover and is influenced by slope.

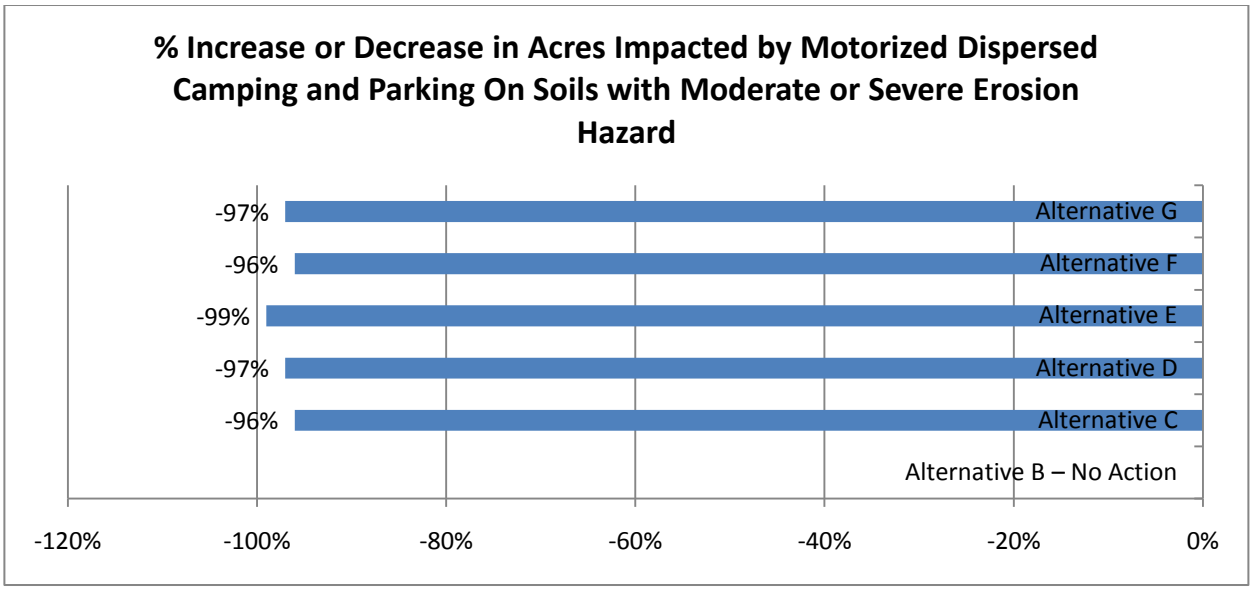


Table 16. Potential Acres Impacted Motorized Dispersed Camping and Areas Where the Park 1 Vehicle Length Off of Road to Soils with Unsatisfactory or Unsuited Soil Condition Ratings

Forestwide	Acres Motorized Dispersed Camping	Change in Acres from No Action	% Increase or decrease from No Action	Acres of Permitted Parking (1 vehicle length)	Change in Acres from No Action	% Increase or decrease from No Action	Total Acres of Motorized Dispersed Camping and Permitted Parking Combined	Total % Increase or decrease from the No Action
Alternative B – No Action	1,161,540							
Alternative C	48,874	-1,112,666	-96%	18,321	-1,143,219	-98%	67,195	-94%
Alternative D	36,580	-1,124,960	-97%	14,505	-1,147,035	-99%	51,085	-96%
Alternative E	0	-1,161,540	-100%	18,225	-1,143,315	-98%	18,225	-98%
Alternative F	44,888	-1,116,652	-96%	14,471	-1,147,069	-99%	59,359	-95%
Alternative G	41,198	-1,120,342	96%	14,914	-1,146,626	-99%	56,112	-95%

*Satisfactory = Current Soil Loss < Tolerance Soil Loss > or = Natural Soil Loss
Unsatisfactory =Current Soil Loss>Tolerance Soil Loss> or =Natural Soil Loss
Unsuited= Current Soil Loss> Tolerance Soil Loss<Natural Soil Loss

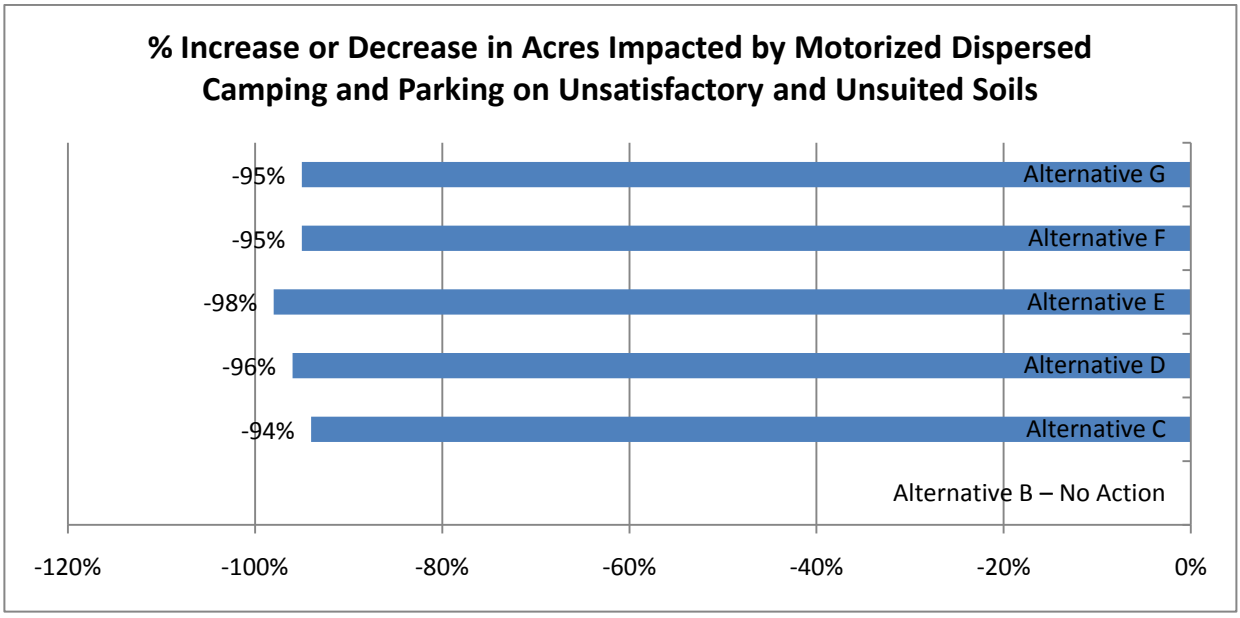


Table 17. Acres Impacted by Motorized Camping Areas to Soils with Moderate or Severe Erosion Hazard Ratings

Forestwide Acres impacted by motorized camping areas to soils with moderate or severe erosion hazard ratings with potential to cause further erosion or negative impacts (% increase or decrease from No Action)	**Acres**	**Change in Acres from No Action**	**% Increase or decrease from No Action**
Alternative B – No Action	10.9		
Alternative C	10.9	0	0%
Alternative D	0	-10.9	-100%
Alternative E	0	-10.9	-100%
Alternative F	10.9	0	0%
Alternative G	10.9	0	0%

*Erosion Hazard refers to the relative susceptibility of an area to sheet and rill erosion upon removal of ground cover and is influenced by slope.

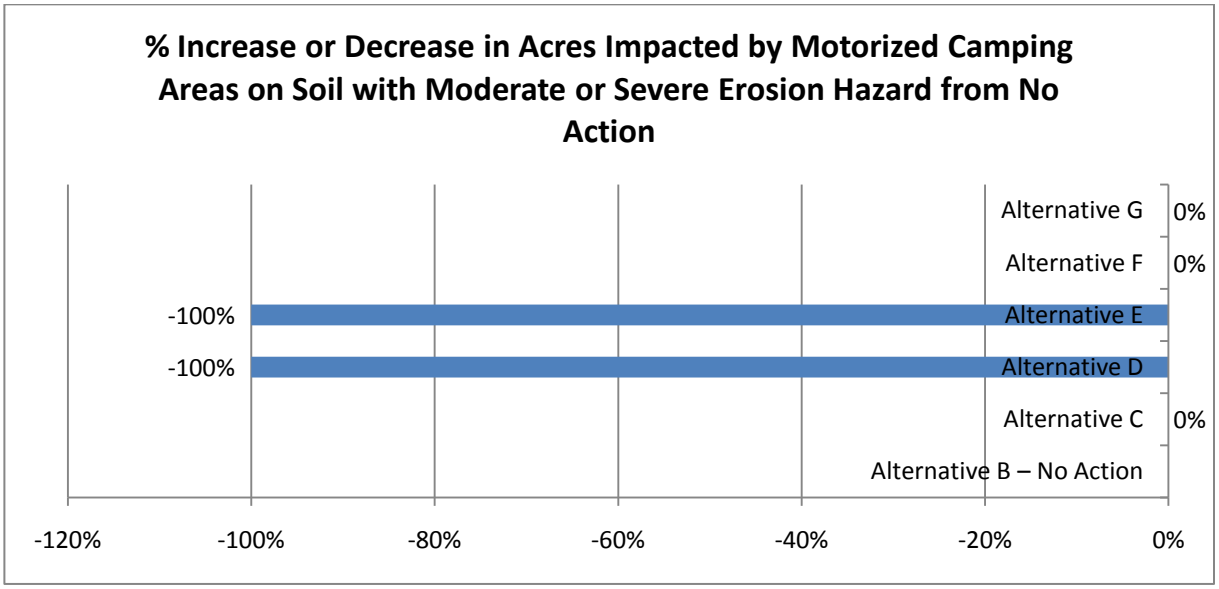


Table 18. Acres Impacted by Motorized Camping Areas to Soils with Unsatisfactory or Unsuited Soil Condition Ratings

Forestwide Acres impacted by motorized camping areas to soils with unsatisfactory or unsuited soil condition ratings with potential to cause further erosion and negative impacts (% increase or decrease from No Action)	**Acres**	**Change in Acres from No Action**	**% Increase or decrease from No Action**
Alternative B – No Action	9.56		
Alternative C	9.56	0	0%
Alternative D	0	-9.56	-100%
Alternative E	0	-9.56	-100%
Alternative F	9.56	0	0%
Alternative G	9.56	0	0%

*Satisfactory = Current Soil Loss < Tolerance Soil Loss > or = Natural Soil Loss
Unsatisfactory =Current Soil Loss>Tolerance Soil Loss> or =Natural Soil Loss
Unsuited= Current Soil Loss> Tolerance Soil Loss<Natural Soil Loss

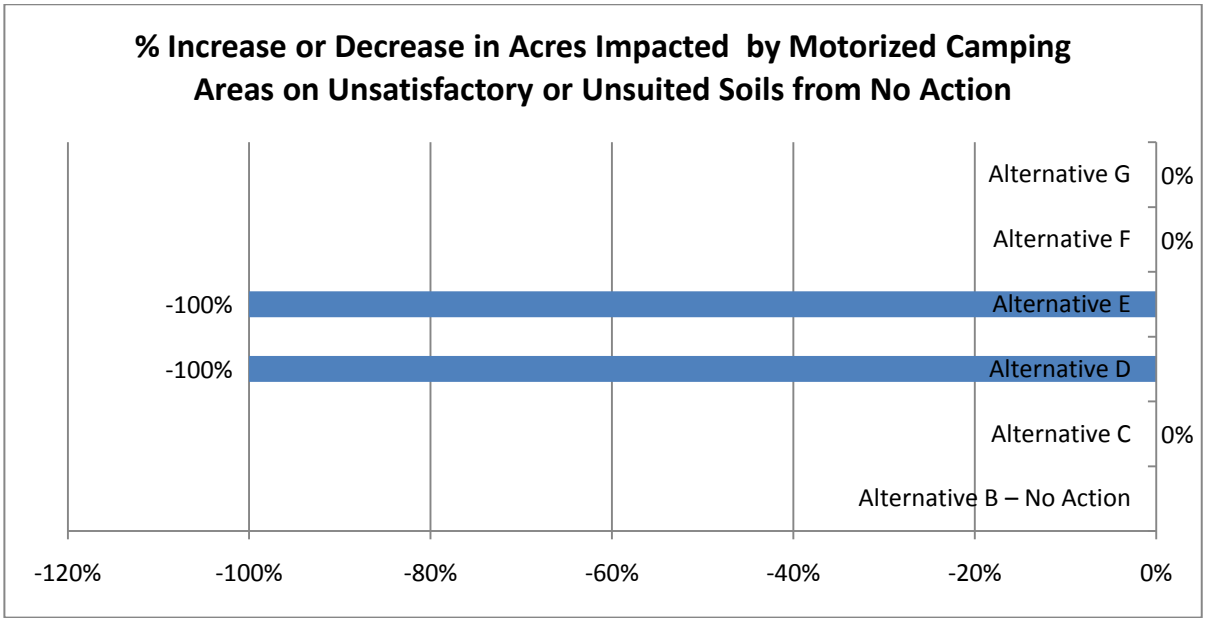


Table 19. Acres Impacted by Motorized Play Area to Soils with Moderate or Severe Erosion Hazard Ratings

Forestwide Acres impacted by motorized play area to soils with moderate or severe erosion hazard ratings with potential to cause further erosion or negative impacts (% increase or decrease from No Action)	**Acres**	**Change in Acres from No Action**	**% Increase or decrease from No Action**
Alternative B – No Action	0		
Alternative C	0	0	0%
Alternative D	0	0	0%
Alternative E	0	0	0%
Alternative F	0	0	0%
Alternative G	0	0	0%

*Erosion Hazard refers to the relative susceptibility of an area to sheet and rill erosion upon removal of ground cover and is influenced by slope.

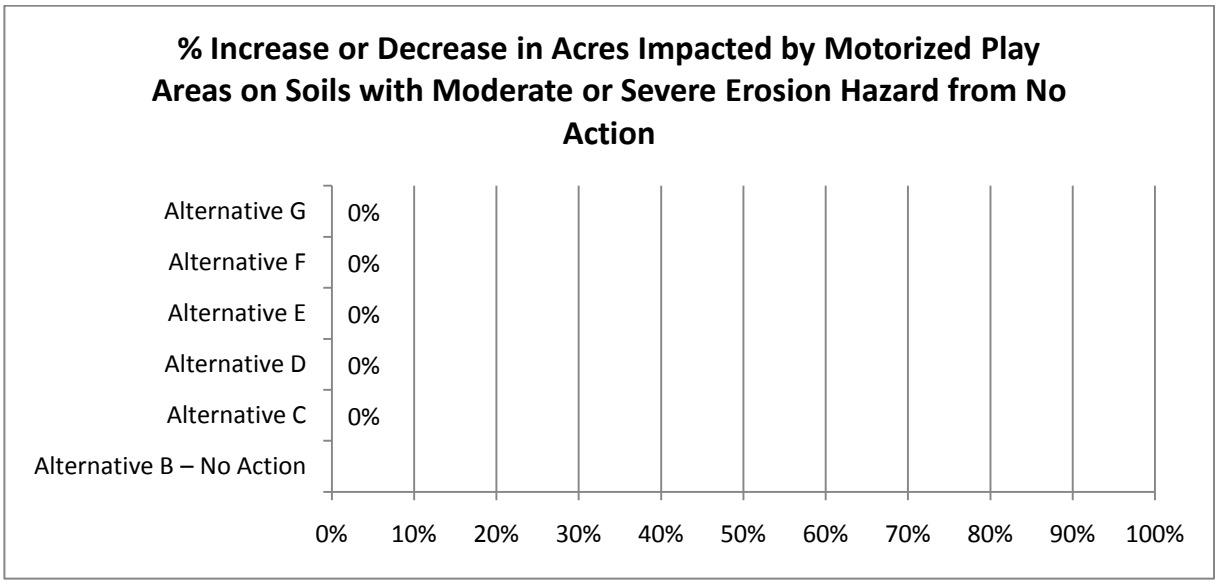
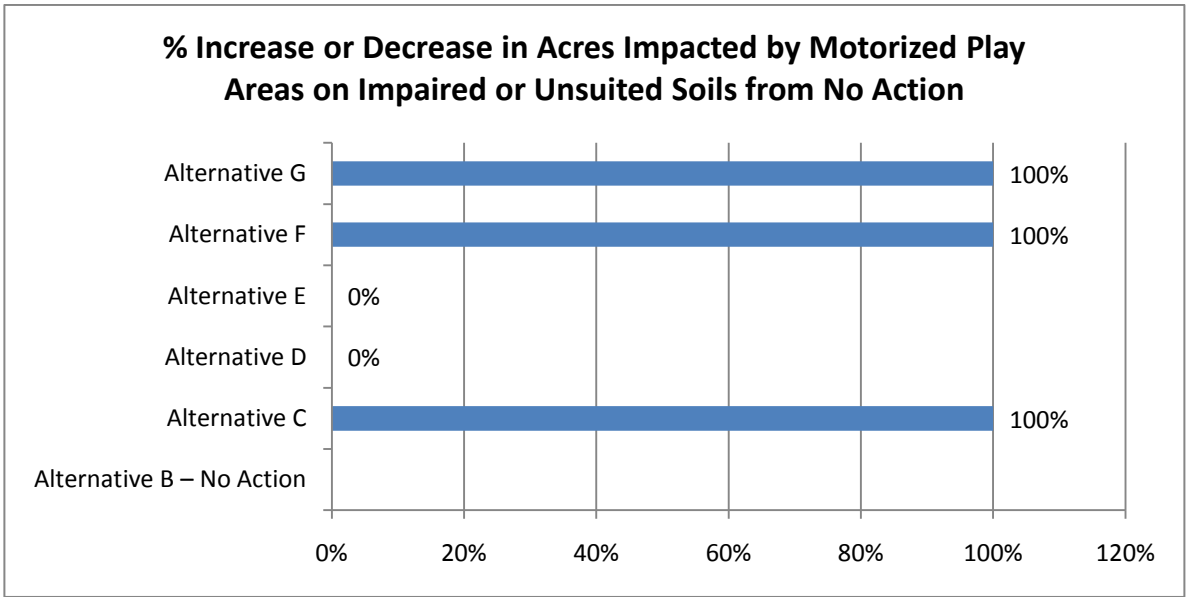


Table 20. Acres Impacted by Motorized Play Area to Soils with Unsatisfactory or Unsuited Soil Condition Ratings

Forestwide Acres impacted by motorized play area to soils with unsatisfactory or unsuited soil condition ratings with potential to cause further erosion and negative impacts (% increase or decrease from No Action)	**Acres**	**Change in Acres from No Action**	**% Increase or decrease from No Action**
Alternative B – No Action	0		
Alternative C	3.31	+3.31	+100%
Alternative D	0	0	0%
Alternative E	0	0	0%
Alternative F	3.31	+3.31	+100%
Alternative G	3.31	+3.31	+100%

*Satisfactory = Current Soil Loss < Tolerance Soil Loss > or = Natural Soil Loss
Unsatisfactory =Current Soil Loss>Tolerance Soil Loss> or =Natural Soil Loss
Unsuited= Current Soil Loss> Tolerance Soil Loss<Natural Soil Loss



General Direct and Indirect Effects of Motorized Routes Common to all Alternatives including the No Action:

Effects that will carry out throughout all alternatives are related to soil compaction, loss of soil productivity, concentrated runoff resulting in erosion and sediment production, and loss of vegetative ground cover of existing routes. The presence of roads across the Gila National Forest has already resulted in negative impacts to the soil resource. With the implementation of any of the action alternatives, there will be a continued commitment of the soil resource and associated negative impacts, with effects remaining the same, increasing, or decreasing.

Impacts to the soil resource will vary to some degree by alternative, with the potential for negative impacts varying by the number of roads that will remain open for motorized use, acres available for motorized cross country travel, acres of motorized dispersed camping and motorized areas affected by parking one vehicle length of off road in each proposal. Negative effects are not limited to the road prism alone, but include direct and indirect effects to areas adjacent to the motorized route. Roads are a major source of sediment and contribute more off site sediment than any other land management activity (Gibbons and Salo 1973, Meehan 1991).

Soil compaction is a direct result of the weight of a motor vehicle and its wheels coming into contact with the surface of the ground. The heavier the vehicle the more contact pressure (pounds per square inch) is exerted by the tire on the ground surface. As tire width increases in relation to the weight of the vehicle, less contact pressure (psi) is exerted by the tire on the ground surface. Soil compaction occurs when soil particles are pressed together reducing the amount and size of pore spaces between soil particles. The higher the clay content of a soil the more susceptible they are to compaction. When soils are wet they are much more susceptible to compaction, and to a greater depth, than when dry. As a result of soil compaction, a series of additional direct impacts occur to soils, including, but not limited to decreased soil porosity, increased soil bulk density, reduced infiltration rates, increased surface runoff, increased surface erosion, reduced nutrient cycling, and reduced plant growth. Compacted soils can persist for many years and variables such as how severely a soil was compacted and to what depth compaction occurred dictate time of recovery. Compaction of soils by motorized use results in a series of indirect effects that can be detrimental to soil productivity, watershed condition, and water quality.

Loss of soil productivity occurred when the route was established, and is still occurring to varying degrees. In addition, loss of soil productivity to areas adjacent to motorized routes has and is still occurring. Factors that contribute to loss of soil productivity of the motorized route, or to areas adjacent to motorized routes include: inadequate maintenance, inadequate drainage, poor route and or drainage design, and poor route location. Loss of soil productivity to areas adjacent to motorized routes occurs as sheet, rill and gully erosion.

Concentrated runoff resulting in soil erosion and sediment production is the primary agent of erosion and sediment production on native surface motorized routes and areas adjacent to, or connected, to the route. Factors that influence the degree of concentrated runoff include: drainage features, route design, route location, and maintenance levels. Though concentrated runoff is the primary source of soil loss and erosion from native road surfaces, soil loss also occurs in the form of dust from motorized routes. The release of dust into the air is a result of the interaction of tires on the native road surface and the mechanical displacement of soil particles. Wind is another agent that can remove soil particles from motorized routes. These are typically smaller soil particles, but as wind velocity increases larger soil particles become more susceptible to being removed from the route.

Loss of vegetative ground cover has occurred on all motorized routes. Maintenance level 3 and 4 roads are typically bladed every year or so and are generally void of vegetative ground cover. Maintenance level 1 and 2 routes receive less frequent maintenance, have lower use

levels, and have varying degrees of vegetative ground cover associated with the road prism. Vegetative ground cover assists in reducing the effects of erosion from concentrated flows and wind on motorized routes and areas adjacent to them.

General Direct and Indirect Effects of Motorized Off-Road Travel Common to all Alternatives including the No Action

The effects described below will remain the same for any changes described in each alternative. However the degree of the effect will vary by the Alternative based on the change in route miles and permitted cross country travel.

Effects of motorized off road travel by all vehicle types (for the purpose of camping, parking, game retrieval and recreational use) to soil productivity include soil compaction, loss of vegetative ground cover, decreased soil porosity, increased soil bulk density, displacement of litter or duff layer leaving bare soil exposed, soil displacement, reduced infiltration rates, decreased plant growth, disturbance to soil biotic crusts and reduced nutrient cycling. All of these lead to increased and concentrated overland flow and sediment transport to downslope areas and connected stream courses following storm events, which pose a risk to long term soil productivity, downstream water quality and overall watershed condition. Impacts from motorized off road travel are most pronounced when soils are wet, and are minimized under dry soil conditions. Typically, a single one time pass on a piece of ground has minimal effects to vegetation and the soil resource. It is when there are repeated passes or when a new route is established that negative effects start to occur to vegetation and the soil resource. Slope also plays a critical role on the magnitude of the effects that cross country travel has on vegetation and soil productivity. As slope increases that a vehicle is traveling on, either parallel or perpendicular to, the greater the amount of ground disturbance that occurs. Due to wheel slip or churn and the forces of gravity, more vegetation, litter and soil is displaced. This leaves bare soil exposed that can potentially be moved off site, and may lead to accelerated erosion, consequently reducing soil productivity, soil quality and overall watershed condition. Off road travel on soils with moderate or high erosion hazard are more likely to induce accelerated erosion, runoff and sediment delivery into connected stream courses. On soils with slight erosion hazard, the direct impacts of cross country travel activities are not expected to result in accelerated soil erosion but will cause loss of soil productivity when vegetative ground cover is removed, soil is compacted or rutting occurs. Cross country travel on soils with unsatisfactory or unsuited soil condition ratings are more likely to realize negative impacts in the form of loss of soil productivity and erosion than travel on soils with satisfactory soil condition ratings.

Alternative B No Action Alternative

Effects to soil resources as a result of current routes and unlimited cross country travel on the Forest are detailed above in the Effects of Motorized Routes Common to All Alternatives and Effects of Motorized Off-Road Travel Common to all Alternatives. With this alternative there are 5,221 miles of motorized routes under Forest Service jurisdiction and 7,682 acres of disturbance associated with these routes. Cross country travel by motor vehicles is permitted in all areas, except designated Wilderness, roads, trails, or areas specified in Forest Orders, and restricted off-road vehicle areas identified in the Forest Land Management Plan. Cross country travel includes access for motorized big game retrieval and motorized dispersed

recreation and camping. Under this alternative, 2,441,804 acres could potentially be impacted by cross country travel. Under the No Action alternative, continued, unrestricted motorized dispersed camping would continue off of approximately 5221 miles of routes.

Effects Unique to each Action Alternative

Each action alternative is evaluated based on the potential risk to soil resources relative to the change from the No Action alternative, using the indicators discussed in the "Methodology" section. The effects noted above that are common to all alternatives will be rated as having potential to be equal to, greater than, or less than baseline effects. This estimate is based on the potential acres of disturbance that are possible under each of the action alternatives.

Alternative C

Motorized Routes

Under this alternative there are a total of 6783 acres of disturbance associated with proposed motorized routes. Of these total acres, 2,493 acres are located on soils with moderate or severe erosion hazard ratings and 2,840 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized routes are described in the Effects of Existing Routes Common to all Alternatives section, and apply to this issue. This alternative has the greatest number of motorized routes under any action alternative. For soils having moderate or severe erosion hazard ratings, the number of motorized routes increases slightly from the No Action Alternative. For soils that have unsatisfactory or unsuited ratings, there is a 1% decrease from the No Action Alternative.

Motorized Dispersed Camping Corridors (300 ft camping corridor along designated routes)

Under this alternative there are a total of 110,780 acres that could potentially be impacted within motorized dispersed camping corridors. Of these total acres, 35,515 acres are located on soils with moderate or severe erosion hazard ratings and 48,874 acres are located on soils with unsatisfactory or unsuited soil condition ratings. In addition to the potential affected camping corridor areas there is motorized parking allowed for recreational purposes of up to one vehicle length off of motorized routes. There are a total of 41,515 acres that could potentially be impacted by this activity. Of these total acres, 14,678 acres are located on soils with moderate or severe erosion hazard and 18,321 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized off road travel are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this issue. For this and all other action alternatives, there is a large reduction in potential acres impacted by motorized dispersed camping to soils with moderate and severe erosion hazard ratings and unsatisfactory and unsuited soil condition ratings. At the landscape scale, all action alternatives are very similar, with % decreases ranging from -94% to -99%.

Motorized Big Game Retrieval (one mile from motorized roads, all big game species)

Under this alternative there are a total of 2,076,414 acres that could potentially be impacted by motorized big game retrieval. Of these total acres, 948,817 acres are located on soils with moderate or severe erosion hazard ratings and 946,631 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized cross county travel are described above in the effects common to all alternatives, and apply to this issue. This

alternative reduces potential motorized big game retrieval impacts to soils having moderate or severe erosion hazard ratings by 22%, and to soils having unsatisfactory or unsuited soil condition rating by 19%, which are the least amount of reductions of any action alternative.

Motorized Areas (38 traditional camping areas and 1 ATV/motorcycle area)
Under this alternative there are 38 historic camping areas totaling approximately 33 acres that will be available and intended for motorized dispersed camping throughout the Forest. The majority of these sites are less than 1 acre in size. Some of these sites are somewhat hardened will others are not. Limited ATV activity has occurred on these sites in the past, and it is anticipated that activity will continue to be limited. Camping in these areas would continue to remove the vegetative ground cover, litter layer and compact soils and potentially leave ruts during wet periods which would result in a loss of soil productivity. These camping areas are located on relatively flat gentle ground were soils have a slight to moderate erosion hazard. The effects of motorized camping are described above in the Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this alternative. From the No Action Alternative, Alternative C has no change in effects to soils with moderate and severe erosion hazard ratings, and to soils with unsatisfactory and unsuited soil ratings, similar to Alternatives F and G.

There is 1 area open to ATV and motorcycle use (approximately 3.31 acres) located near Reserve. This area is a borrow pit site located by the old landfill. Currently there is little to no vegetative cover at this site. The effects of an ATV/motorcycle play area would include and is not limited to: continued loss of soil productivity, continued lack of vegetative ground cover, accelerated sheet and wind erosion, soil compaction, soil displacement and potential sedimentation to adjacent drainage system. The ATV/motorcycle area does not impact soils with moderate or severe erosion hazard rating under any alternative, as they are not present in this location. The area is located within soils having unsatisfactory and unsuited soil condition rating, thus this represents 100% increase from the No Action, similar to Alternatives F and G.

Alternative D
Motorized Routes
Under this alternative there are a total of 5,083 acres of disturbance associated with proposed motorized routes. Of these total acres, 1,778 acres are located on soils with moderate or severe erosion hazard ratings and 2,212 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized routes are described in the Effects of Existing Routes Common to all Alternatives section, and apply to this issue. In soils having moderate or severe erosion hazard ratings, acres are reduced by 28% from the No Action Alternative, which is the second largest reduction behind Alternative E. In soils with unsatisfactory and unsuited soil condition ratings, motorized routes are reduced by 23%, which is the second largest reduction behind Alternative E.

Motorized Dispersed Camping Corridors (300 ft camping corridor along designated routes)
Under this alternative there are a total of 85,921 acres that could potentially be impacted within motorized dispersed camping corridors. Of these total acres, 29,316 acres are located on soils with moderate or severe erosion hazard ratings and 36,580 acres are located on soils

with unsatisfactory or unsuited soil condition ratings. In addition to the potential affects to the camping corridor areas there is motorized off-road parking allowed for recreational purposes of up to one vehicle length off of motorized routes. There are a total of 30,218 acres that could potentially be impacted by this activity. Of these total acres, 9,564 acres are located on soils with moderate or severe erosion hazard and 14,505 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized cross county travel are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this issue. For all action alternatives, there is a large reduction in potential acres impacted by motorized dispersed camping to soils with moderate and severe erosion hazard ratings and unsatisfactory and unsuited soil condition ratings. At the landscape scale, all action alternatives are very similar, with % decreases ranging from -94% to -99%.

Motorized Big Game Retrieval (in the 300 foot designated camping corridors, deer and elk)
Under this alternative there are a total of 85,921 acres that could potentially be impacted by motorized big game retrieval. Of these total acres, 29,316 acres are located on soils with moderate or severe erosion hazard ratings and 36,580 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized cross county travel are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this issue. This alternative reduces potential motorized big game retrieval impacts to soils having moderate or severe erosion hazard ratings by 98%, and to soils having unsatisfactory or unsuited soil condition rating by 97%, which is similar to Alternative E and G. This is a greater reduction than Alternatives C and F.

Motorized Areas (camping areas or ATV/motorcycle area)
Under this alternative there would be no Areas, representing a 100% reduction from the No Action Alternative, thus no adverse impacts to soils. This alternative is similar to Alternative E.

Alternative E
Motorized Routes
Under this alternative there are a total of 4,170 acres of disturbance associated with proposed motorized routes. Of these total acres, 1,438 acres are located on soils with moderate or severe erosion hazard ratings and 1,907 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized routes are described in the Effects of Existing Routes Common to all Alternatives section, and apply to this issue. From the No Action Alternative, this alternative has the largest reduction of motorized routes impacting soils with moderate or severe erosion hazard ratings at 41%. It also has the largest reduction (-33%) in motorized routes impacting soils with unsatisfactory or unsuited soil condition ratings.

Motorized Dispersed Camping Corridors
Under this alternative there would be no Motorized Dispersed Camping Corridors though there would be motorized off road parking for recreational purposes of up to one vehicle length off of motorized routes. There are a total of 36,341 acres that could potentially be impacted by this activity. Of these total acres, 11,599 acres are located on soils with moderate or severe erosion hazard and 18,225 are located on soils with unsatisfactory or unsuited soil

condition ratings. The effects of motorized cross county travel are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this issue. For all action alternatives, there is a large reduction in acres impacted by motorized dispersed camping to soils with moderate and severe erosion hazard ratings and unsatisfactory and unsuited soil condition ratings. At the landscape scale, all action alternatives are very similar, with % decreases in potential impacts ranging from -94% to -99%.

Motorized Big Game Retrieval
Under this alternative there would be no motorized big game retrieval, thus no potential adverse impacts to soils. This alternative reduces potential motorized big game retrieval impacts to soils having moderate or severe erosion hazard ratings by 100%, and to soils having unsatisfactory or unsuited soil condition rating by 100%, which is similar to Alternative E and G and greater than Alternatives C and F.

Motorized Areas (camping areas or ATV/motorcycle area)
Under this alternative there would be no Areas, representing a 100% reduction from the No Action Alternative, thus no adverse impacts to soils. This alternative is similar to Alternative D.

Alternative F
Motorized Routes
Under this alternative there are a total of 5,562 acres of disturbance associated with proposed motorized routes. Of these total acres, 2,003 acres are located on soils with moderate or severe erosion hazard ratings and 2,335 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized routes are described in the Effects of Existing Routes Common to all Alternatives section, and apply to this issue. In soils with moderate and severe erosion hazard ratings, and unsatisfactory and unsuited soil condition ratings, this alternative has less reduction in acres impacted by motorized routes than Alternatives D and E, but more reduction than Alternative C. This alternative has a similar reduction in acres impacted by motorized routes to Alternative F.

Motorized Dispersed Camping Corridors (300 ft camping corridor along designated routes)
Under this alternative there are a total of 104,390 acres that could potentially be impacted in motorized dispersed camping corridors. Of these total acres, 33,748 acres are located on soils with moderate or severe erosion hazard ratings and 44,888 acres are located on soils with unsatisfactory or unsuited soil condition ratings. In addition to the potential affects to the camping corridor areas there is motorized parking allowed for recreational purposes of up to one vehicle length off of motorized routes. There are a total of 31,579 acres that could potentially be impacted by this activity. Of these total acres, 10,814 acres are located on soils with moderate or severe erosion hazard and 14,471 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized cross county travel are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this issue. For all action alternatives, there is a large reduction in acres impacted by motorized dispersed camping to soils with moderate and severe erosion hazard ratings and unsatisfactory and unsuited soil condition ratings. At the landscape scale, all action alternatives are very similar, with % decreases ranging from -94% to -99%.

Motorized Big Game Retrieval (one half mile from motorized routes, elk only)
Under this alternative there are a total of 1,501,870 acres that could potentially be impacted by motorized big game retrieval. Of these total acres, 602,771 acres are located on soils with moderate or severe erosion hazard ratings and 678,542 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized cross county travel are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this issue. This alternative reduces potential motorized big game retrieval impacts to soils having moderate or severe erosion hazard ratings by 50%, and to soils having unsatisfactory or unsuited soil condition rating by 42%. This is a greater reduction than Alternative C, but less reduction than Alternatives D, E and G.

Motorized Areas (38 historic camping areas and 1 ATV/motorcycle area)
Under this alternative there are 38 historic camping areas totaling approximately 33 acres that will be available and intended for motorized dispersed camping throughout the Forest. Some of these sites are somewhat hardened will others are not. Limited ATV activity has occurred on these sites in the past, and it is anticipated that activity will continue to be limited. Camping in these areas would continue to remove the vegetative ground cover, litter layer and compact soils and potentially leave ruts during wet periods which would result in a loss of soil productivity. These camping areas are located on relatively flat gentle ground were soils have a slight to moderate erosion hazard. The effects of motorized camping are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this alternative. From the No Action Alternative, Alternative F has no change in effects to soils with moderate and severe erosion hazard ratings, and to soils with unsatisfactory and unsuited soil ratings, similar to Alternatives C and G.

There is 1 ATV/motorcycle area is approximately 3.31 acres and located just out of Reserve. The effects of the ATV/motorcycle area is described in Alternative C and applies to this alternative. The area does not impact soils with moderate or severe erosion hazard rating under any alternative, as they are not present in this location. The ATV/motorcycle area is located within soils having unsatisfactory and unsuited soil condition rating, thus this represents 100% increase from the No Action, similar to Alternatives C and G.

Alternative G
Motorized Routes
Under this alternative there are a total of 5,634 acres of disturbance associated with proposed motorized routes. Of these total acres, 2,064 acres are located on soils with moderate or severe erosion hazard ratings and 2,372 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized routes are described in the Effects of Existing Routes Common to all Alternatives section, and apply to this issue. In soils with moderate and severe erosion hazard ratings, and unsatisfactory and unsuited soil condition ratings, this alternative has less reduction in acres impacted by motorized routes than Alternatives D and E, but more reduction than Alternative C. This alternative has a similar reduction in acres impacted by motorized routes to Alternative F.

Motorized Dispersed Camping Corridors (300 ft camping corridor along designated routes)

Under this alternative there are a total of 95,994 acres that could potentially be impacted within motorized dispersed camping corridors. Of these total acres, 31,192 acres are located on soils with moderate or severe erosion hazard ratings and 41,198 acres are located on soils with unsatisfactory or unsuited soil condition ratings. In addition to the potential affects to the camping corridor areas there is motorized off-road parking allowed for recreational purposes of up to one vehicle length off of motorized routes. There are a total of 32,743 acres that could potentially be impacted by this activity. Of these total acres, 11,052 acres are located on soils with moderate or severe erosion hazard and 14,914 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized off road travel are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this issue. For all action alternatives, there is a large reduction in potential acres impacted by motorized dispersed camping to soils with moderate and severe erosion hazard ratings and unsatisfactory and unsuited soil condition ratings. At the landscape scale, all action alternatives are very similar, with % decreases ranging from -94% to -99%.

Motorized Big Game Retrieval (in the 300 foot designated camping corridors)
Under this alternative there are a total of 95,994 acres that could potentially be impacted by motorized big game retrieval. Of these total acres, 31,192 acres are located on soils with moderate or severe erosion hazard ratings and 41,198 acres are located on soils with unsatisfactory or unsuited soil condition ratings. The effects of motorized cross county travel are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this issue. This alternative reduces potential motorized big game retrieval impacts to soils having moderate or severe erosion hazard ratings by 97%, and to soils having unsatisfactory or unsuited soil condition rating by 96%, which is similar to Alternatives D and E and greater than Alternatives C and F.

Motorized Areas (38 traditional camping areas and 1 ATV/motorcycle area)
Under this alternative there are 38 historic camping areas totaling approximately 33 acres that will be available and intended for motorized dispersed camping throughout the Forest. Some of these sites are somewhat hardened will others are not. Limited ATV activity has occurred on these sites in the past, and it is anticipated that activity will continue to be limited. Camping in these areas would continue to remove the vegetative ground cover, litter layer and compact soils and potentially leave ruts during wet periods which would result in a loss of soil productivity. These camping areas are located on relatively flat gentle ground were soils have a slight to moderate erosion hazard. The effects of camping areas are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this alternative. From the No Action Alternative, Alternative G has no change in effects to soils with moderate and severe erosion hazard ratings, and to soils with unsatisfactory and unsuited soil ratings, similar to Alternatives C and F.

There is 1 ATV/motorcycle area that totals approximately 3.31 acres located outside of Reserve. The effects of the ATV/motorcycle area is described in Alternative C and applies to this alternative. The area does not impact soils with moderate or severe erosion hazard rating under any alternative, as they are not present in this location. The area is located within soils having unsatisfactory and unsuited soil condition rating, thus this represent 100% increase from the No Action, similar to Alternatives C and G.

Effects to Riparian and Wetland Vegetation

Each of the action alternatives was analyzed to determine if there is potential for motorized vehicle travel on the Gila National Forest to impact riparian and wetland vegetation. The effects to riparian and wetland vegetation by motorized uses are related to the impacts of the road prism across wet surfaces, disturbance of riparian vegetation, compaction of soils and streambanks, and concentration of flows into these areas. The wet nature of these areas provides an increased level of resiliency to irreversible, adverse impacts, and often increases the opportunity for recovery, more so than drier, upland sites. These areas will often recover to a more natural state in a shorter period of time. Koury and Natharius (Personal observations 2010) have observed on the Gila National Forest and other southwestern forests indicate that once roads are closed in riparian areas and wetlands, many of these will naturally self-decommission through regrowth of vegetation, exposure to flood flows, and re-establishment of streambanks and floodplains, or a combination of these. Thus, closed roads were considered a net benefit to riparian and wetland areas, and the acres associated with roads proposed for closure within these sensitive areas were removed from the calculations of route impacts. This does not suggest, however, that all closed roads will no longer have adverse impacts on wetlands and riparian areas. Instead, while some closed roads will continue to negatively impact these areas, the level of impact is anticipated to be reduced across the Forest due to natural recovery of many sites.

The area used in this analysis utilized a riparian risk zone that encompassed a 300-foot buffer on both sides of all identified perennial and intermittent drainages on the Forest, as well as the areas identified as wetlands. The riparian risk zone does not constitute the true acres of riparian areas on the Forest, but rather presents a conservative estimate of acres where riparian vegetation would be found within.

Tables 21-28 provide a summary of the proposed changes in acres of motorized routes by alternative that may impact riparian and wetlands areas, as well as potential acres that may be impacted by motorized dispersed recreation, motorized big game retrieval, and motorized areas. A discussion follows Table 28 of potential impacts to riparian and wetland resources under each Alternative, however a brief summary of these effects are described below, based on a change from the No Action Alternative:

In summary, for riparian risk zones:

- Alternative E reduces acres of motorized routes within *riparian risk zones* by 40%, followed by Alternative D (-30%). Alternatives F and G show similar reductions (-18%) and Alternative C shows little reduction (-4%) in motorized routes within *riparian risk zones* from the No Action Alternative. All alternatives significantly (>90%) reduce potential acres impacted by motorized dispersed camping and motorized areas within *riparian risk zones*. Alternatives E, D, and G significantly (>90%) reduce potential acres impacted by motorized big game retrieval within *riparian risk zones*. Alternatives F (-53%) and Alternative C (-34%) follow.

In summary, for identified wetlands:

- All alternatives except C significantly (>50%) reduce acres of motorized routes within identified *wetlands*. Alternative C shows no change from the No Action Alternative. All alternatives significantly (>85%) reduce potential acres impacted by motorized dispersed camping and motorized areas within identified *wetlands*. Alternatives E, D, and G significantly (>85%) reduce potential acres impacted by motorized big game retrieval within *wetlands*. Alternatives F (-7%) and C (-2%) minimally reduce potential acres impacted by motorized big game retrieval within *wetlands*, and are similar to the No Action Alternative.

Table 21. Miles and acres of motorized routes within riparian risk zone

Forestwide Miles and Acres of Roaded Disturbance within Riparian Risk Zones	Miles	Change in Miles from No Action	% Increase or decrease from No Action	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	302			454		
Alternative C	302	<-1	0	436	-18	-4%
Alternative D	209	-93	-31%	318	-136	-30%
Alternative E	163	-139	-46%	254	-200	-44%
Alternative F	246	-56	-19%	372	-82	-18%
Alternative G	242	-60	-20%	366	-88	-19%

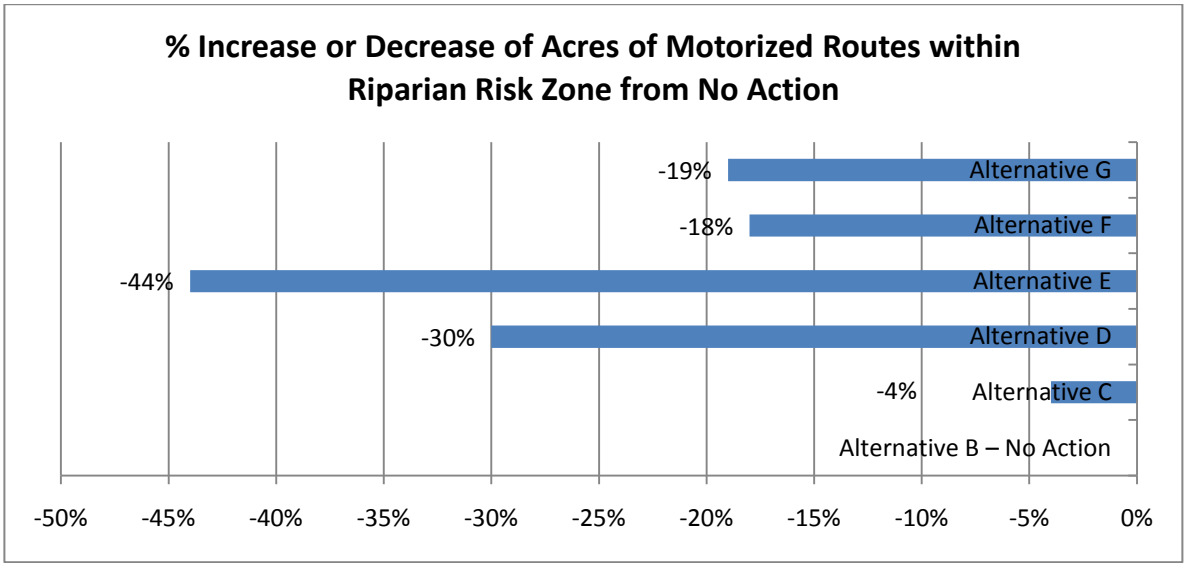


Table 22. Acres of motorized dispersed camping within riparian risk zone

Forestwide Acres of Riparian Risk Zone within Motorized Dispersed Camping Corridors	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	63,018		
Alternative C	4,228	-58,790	-93%
Alternative D	2,262	-60,756	-96%
Alternative E	0	-63,018	-100%
Alternative F	3,518	-59,500	-94%
Alternative G	2,946	-60,072	-95%

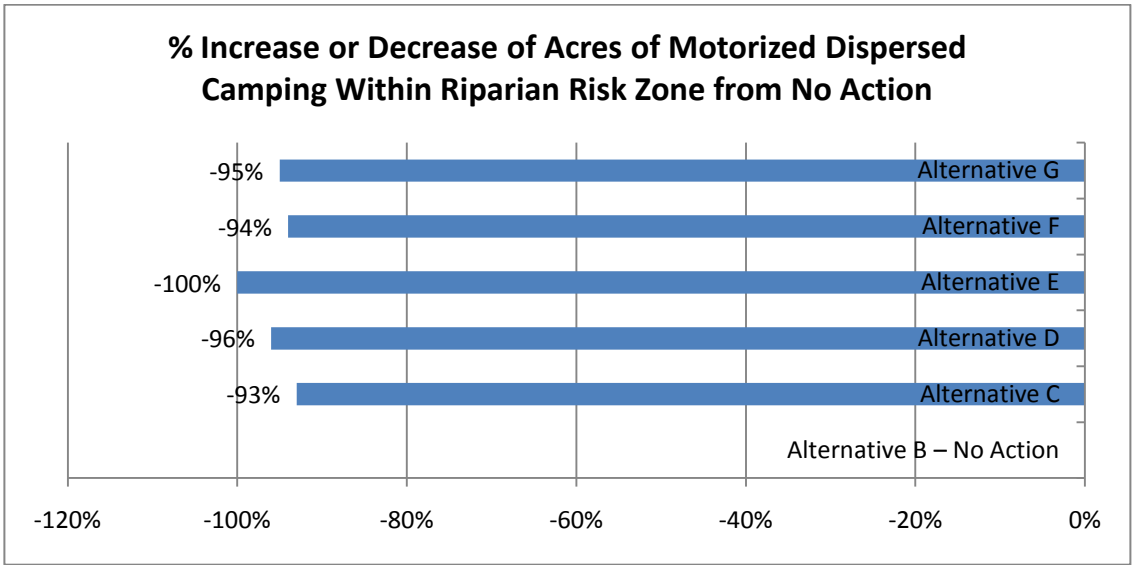


Table 23. Acres of motorized big game retrieval within riparian risk zone

Forestwide Acres of Riparian Risk Zone within motorized big game retrieval	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	63,018		
Alternative C	41,519	-21,499	-34%
Alternative D	2,262	-60,756	-96%
Alternative E	0	-63,018	-100%
Alternative F	29,903	-33,115	-53%
Alternative G	2,946	-60,072	-95%

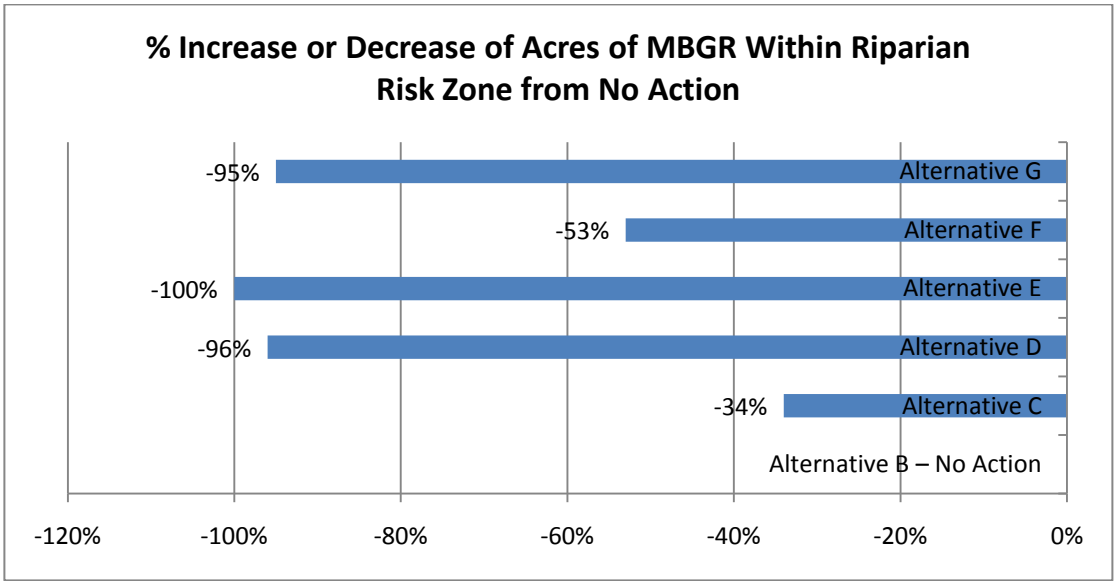


Table 24. Acres of motorized areas within riparian risk zone

Forestwide Acres of Riparian Risk Zones within Motorized Areas	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	63,018		
Alternative C	.19*	-63,018	-100%
Alternative D	.19*	-63,018	-100%
Alternative E	.19*	-63,018	-100%
Alternative F	.19*	-63,018	-100%
Alternative G	.19*	-63,018	-100%

*By SA Creek (Off of CAT-B007/B012)

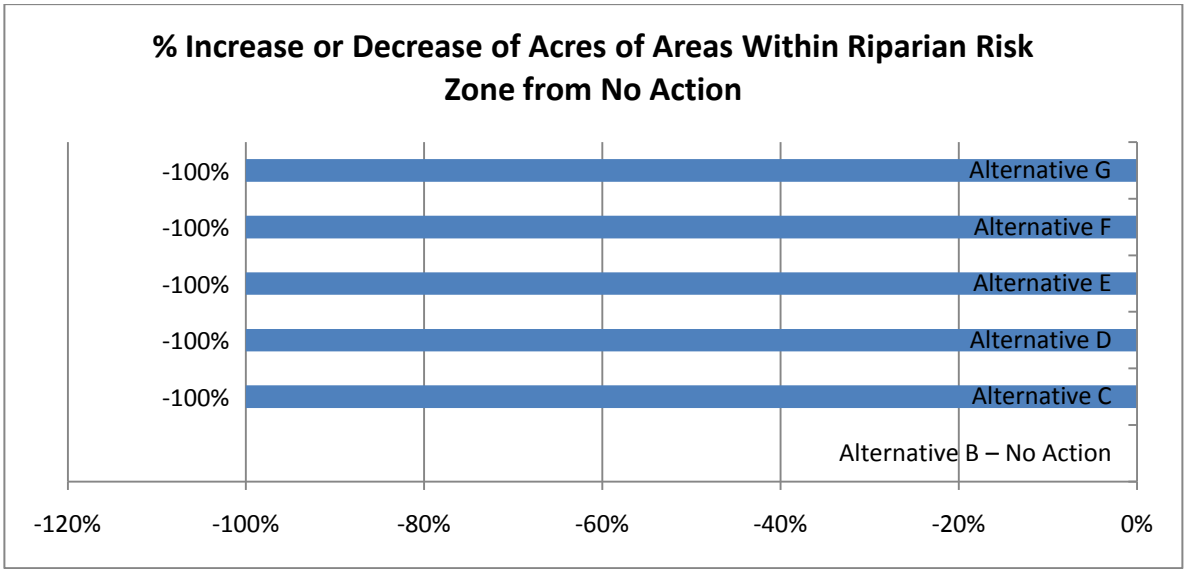


Table 25. Miles and acres of motorized routes within identified wetlands

Forestwide Miles and Acres of Roaded Disturbance within Wetlands	Miles	Change in Miles from No Action	% Increase or decrease from No Action	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	0.91			1.33		
Alternative C	0.91	0	0%	1.33	0	0%
Alternative D	0.44	-0.47	-52%	0.64	-0.69	-52%
Alternative E	0.38	-0.53	-58%	0.56	-0.77	-58%
Alternative F	0.44	-0.47	-52%	0.64	-0.69	-52%
Alternative G	0.44	-0.47	-52%	0.64	-0.69	-52%

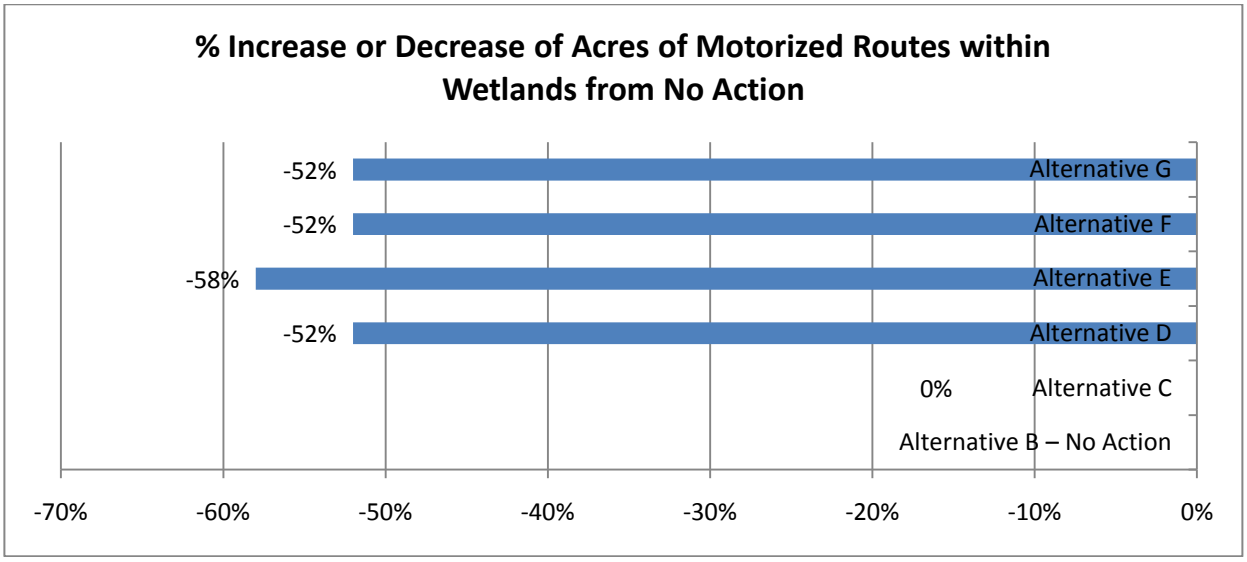


Table 26. Acres of motorized dispersed camping within identified wetlands

Forestwide Acres of Wetlands potentially impacted by dispersed camping corridors	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	353		
Alternative C	44	-309	-88%
Alternative D	38	-315	-89%
Alternative E	0	-353	-100%
Alternative F	42	-311	-88%
Alternative G	41	-312	-88%

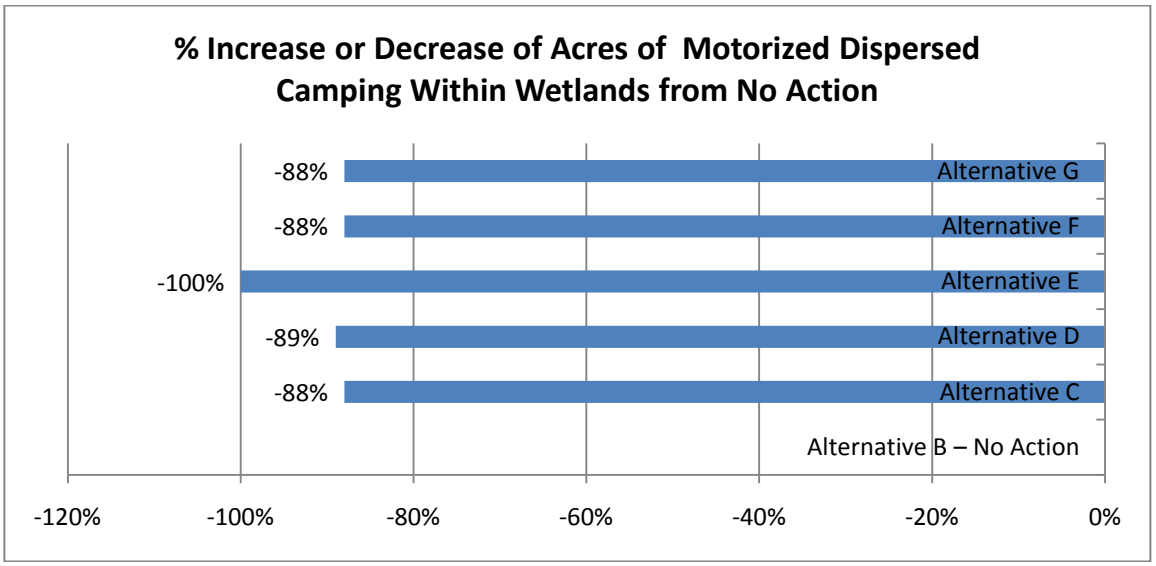


Table 27. Acres of motorized big game retrieval within identified wetlands

Forestwide Acres of wetlands potentially impacted by motorized big game retrieval	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	353		
Alternative C	345	-8	-2%
Alternative D	39	-314	-89%
Alternative E	0	-353	-100%
Alternative F	328	-25	-7%
Alternative G	41	-312	-88%

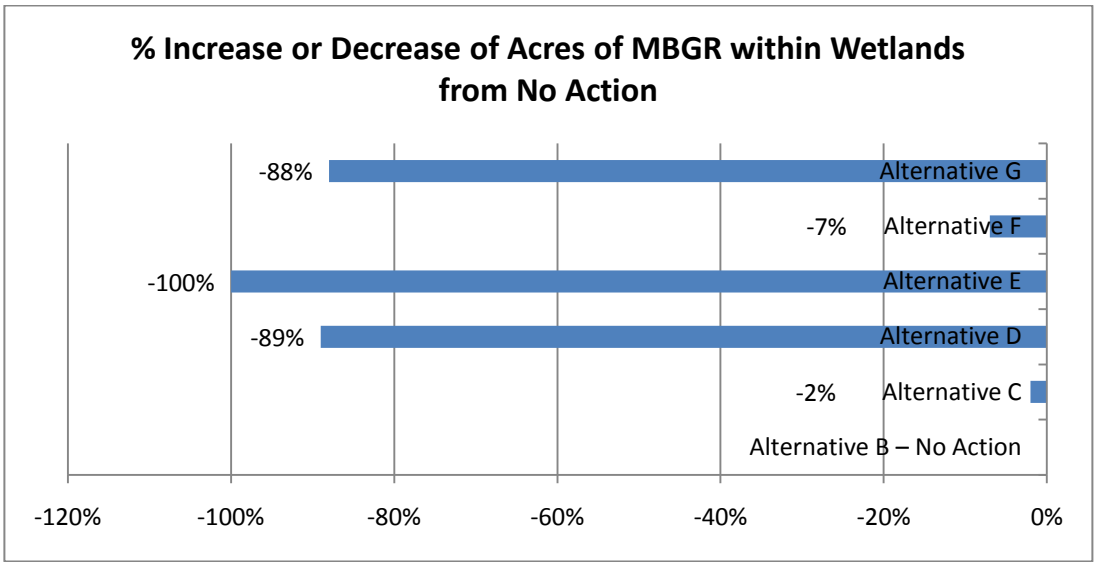
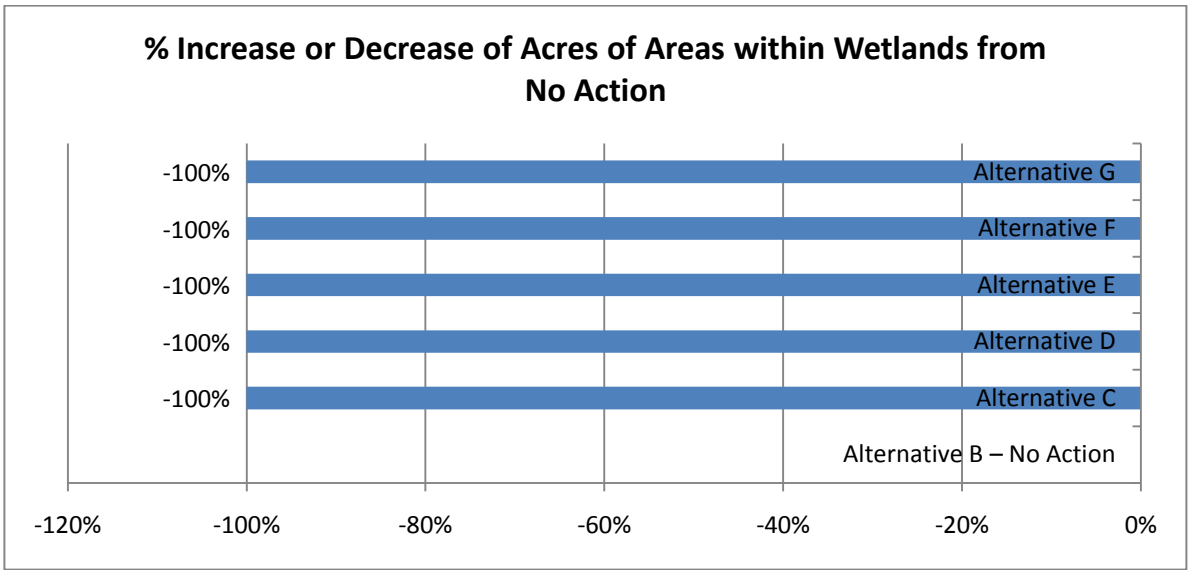


Table 28. Acres of motorized areas within identified wetlands

Forestwide Acres of Wetlands potentially impacted by areas	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	353		
Alternative C	0	-353	-100%
Alternative D	0	-353	-100%
Alternative E	0	-353	-100%
Alternative F	0	-353	-100%
Alternative G	0	-353	-100%



General Direct and Indirect Effects Common to All Alternatives including the No Action Alternative:
The effects described below will remain the same for any changes described in each alternative. However the degree of the effect will vary by the Alternative based on the change in route miles and permitted cross country travel.

Although riparian and wetland areas occupy less than 1 percent of the lands managed by the Gila National Forest, they are key to productive fisheries and wildlife habitat; they attenuate flooding; and they provide quality water for downstream users, continuous ground water recharge, and diverse scenery and recreation sites.

Motorized uses can affect riparian and wetland areas directly or indirectly by inducing changes to natural hydrologic functions. These uses can result in modification of surface and subsurface drainage patterns which can result in changes in moisture regimes of these areas.

Routes can directly damage riparian vegetation within or near the stream channel. A reduction of riparian function may result by the action of tires churning up and removing vegetation and causing streambank alteration. Soil rutting, compaction and detachment, and accelerated erosion may occur, as well as sediment transport and sediment deposition occurring into connected waters, reducing water quality on-site and downstream. Roads that are adjacent to, or that intersect portions of, wetlands alter surface hydrology and water flow causing loss of water storage, vegetative productivity and wetland function. Continued driving in stream channels would directly breakdown streambanks that provide for riparian function and aquatic habitat.

Many wetlands and upland meadows across the Forest have road access and provide easy opportunity for motorized dispersed camping and motorized big game retrieval. Motorized uses in these areas pose the greatest threat to soil productivity, vegetation and wildlife, versus motorized uses in other vegetation types. Repeated motor vehicle use can cause soil compaction which can have a long-term adverse effect. Personal observations (Koury and Natharius) indicate that it usually takes several motorized passes to remove or destroy vegetation. The size of vehicle also influences the level of disturbance in these sensitive areas as larger and heavier vehicles most often leave more negative impacts that smaller ATVs.

Adverse impacts to riparian areas and wetlands related to motorized travel off of designated routes can range from high to low. Riparian areas tend to be a natural draw for concentration of motorized non-motorized recreation. In areas where travel off of designated routes is high, levels of negative typically increase, while low concentration areas may show incidental impacts. Wetlands on the Forest, typically have low concentrations of motorized travel off of designated routes, however the level of disturbance can be more severe due to the sensitive nature of soils in these areas to rutting and compaction. Personal observations (Koury and Natharius) on the Gila National Forest indicate that adverse effects to riparian areas and wetlands from travel off of designated routes are minimal. Travel off of designated routes is mostly infrequent and/or a one-time occurrence, with little compaction occurring or permanent tracks created. In a few locations, motorized users have created visible routes that get repeatedly used for motor vehicle use for such things as big game hunting, antler hunting, and unrestricted cross-country travel.

Alternative B – No Action

Impacts to riparian and wetland vegetation as a result of current motorized use on the Forest are detailed above in the Effects Common to All Alternatives. Under Forest Service jurisdiction, there are currently 302 miles of open routes that create 454 acres of roaded disturbance within riparian risks zones. In identified wetlands, there is less than 1 mile of open routes, which translates to 1.3 acres. Cross country travel by motorized vehicles is permitted in all areas, except designated Wilderness, roads, trails, or areas specified in Forest Orders, and restricted off-road vehicle areas identified in the Forest Land Management Plan. This cross country travel includes access for motorized big game retrieval, motorized dispersed recreation and motorized camping and ATV/motorcycle areas. Currently, cross country travel associated with motorized big game retrieval, motorized dispersed recreation, and motorized areas has the potential to impact 63,018 acres within riparian risk zones, and 353 acres within identified wetlands.

Effects Unique to each Action Alternative

Each action alternative will be evaluated based on the potential risk to riparian and wetland resources relative to the change from the No Action alternative. The effects common to all alternatives will have the potential to either increase, decrease or remain the same, based on the change from the No Action Alternative. The relative risk of change from baseline is derived based on the potential acres of disturbance that are possible under each of the action alternatives.

Alternative C

Motorized Routes – In riparian risk zones, acreages potentially impacted by motorized routes is similar to the No Action Alternative, with 4% decrease. In wetlands, the acreage remains the same as the No Action Alternative. This alternative provides the least reduction of potential impacts to riparian areas and wetlands of any action alternative

Motorized Dispersed Recreation (300' corridor designated along specific routes) — in riparian risk zones, this alternative reduces the acreage available for potential impacts from motorized dispersed recreation by 93% from the No Action Alternative, which is similar to all action alternatives. In wetlands, the acreage is reduced by 88%, which is similar to Alternatives C, D, F, and G, but less than Alternative E.

Motorized Big Game Retrieval (1 mile corridor for elk, deer, bear, mountain lion, javelina, pronghorn)—in riparian risk zones, this alternative reduces the acreage available for potential impacts from motorized big game retrieval by 34% from the No Action Alternative, which is the least of any action alternative. In wetlands, the acreage is reduced by 2%, which is the least reduction of any action alternative, and similar to the No Action Alternative and Alternative F.

Motorized Areas (39 areas: 1 motorcycle/ATV; 38 camping)—The Travel Management Rule defines 'areas' as open to all motorized vehicle use. The 38 camping areas proposed in this alternative are existing sites with traditional use related to camping. The majority of these sites are less than 1 acre in size. The motorcycle/ATV area covers approximately 3.3 acres and is not located within a riparian risk zone or identified wetland. In riparian risk zones and wetlands, this alternative virtually eliminates the acres of motorized areas available for potential impacts, similar to all action alternatives.

Alternative D

Motorized Routes— in riparian risk zones, acreages potentially impacted by motorized routes is reduced by 30% from the No Action Alternative, which is the second largest reduction behind Alternative E, but more reduction than F and G. In wetlands, the acreage is reduced by 52% from the No Action, similar to Alternatives E, F, and G.

Motorized Dispersed Recreation (300' corridor designated along specific routes) — in riparian risk zones, this alternative reduces the acreage available for potential impacts from motorized dispersed recreation by 96% from the No Action Alternative, which is similar to all action alternatives. In wetlands, the acreage is reduced by 89%, which is similar to Alternatives C, F, and G, but less of a reduction than Alternative E.

Motorized Big Game Retrieval (within 300' dispersed camping corridor) —In riparian risk zones, this alternative reduces the acreage available for potential impacts from motorized big game retrieval by 96% from the No Action Alternative, which is similar to Alternatives E and G. In wetlands, the acreage is reduced by 89%, which is similar to Alternatives E and G, less of a reduction than Alternative E, but more of a reduction than Alternative C.

Motorized Areas (no areas designated)—there would be no potential adverse impacts within riparian risk zones or identified wetlands due to motorized camping areas under this alternative. In riparian risk zones and wetlands, this alternative eliminates the acres of motorized areas available for potential impacts, similar to all action alternatives.

Alternative E

Motorized Routes— in riparian risk zones, acreages potentially impacted by motorized routes is reduced by 44% from the No Action Alternative, which is the largest reduction of any alternative. In wetlands, the acreage is reduced by 58%, which is the largest reduction of any alternative, however still similar to Alternatives D, F and G.

Motorized Dispersed Recreation (No camping corridors designated) — There would be no potential adverse effects within riparian risk zones or identified wetlands under this alternative. This alternative reduces the acreage available for potential impacts to riparian areas and wetlands from motorized dispersed recreation by 100%, which is the largest reduction of all action alternatives.

Motorized Big Game Retrieval (No motorized big game retrieval permitted)—There would be no potential adverse effects within riparian risk zones or identified wetlands under this alternative. In riparian risk zones, this alternative reduces the acreage available for potential impacts from motorized big game retrieval by 100% from the No Action Alternative, which is slightly more of a reduction than Alternatives D and G. In wetlands, the acreage is reduced by 100%, which is slightly more than Alternatives D and G, and significantly more than Alternatives C and F.

Motorized Areas (no areas designated) – Same as Alternative D— There would be no potential adverse impacts within riparian risk zones or identified wetlands due to motorized camping areas under this alternative. In riparian risk zones and wetlands, this alternative eliminates the acres of motorized areas available for potential impacts, similar to all action alternatives.

Alternative F

Motorized Routes— in riparian risk zones, acreages potentially impacted by motorized routes is reduced by 18%, which less than Alternatives D and E, but similar to Alternative G. In wetlands, the acreage is reduced by 52%, similar to Alternatives D, E, and G.

Motorized Dispersed Recreation (300' corridor designated along specific routes) — in riparian risk zones, this alternative reduces the acreage available for potential impacts from motorized dispersed recreation by 94% from the No Action Alternative, which is similar to all

action alternatives. In wetlands, the acreage is reduced by 88%, which is similar to Alternatives C, D, and G, but less of a reduction than Alternative E.

Motorized Big Game Retrieval (within ½ mile of motorized routes, elk only) — in riparian risk zones, this alternative reduces the acreage available for potential impacts from motorized big game retrieval by 53% from the No Action Alternative, which is less than Alternatives D, E, and G, but more than Alternative C. In wetlands, the acreage is reduced by 7%, which is similar to the No Action Alternative and Alternative D. This is significantly less of a reduction than Alternatives D, E, and G.

Motorized Areas (39 areas: 1 motorcycle/ATV; 38 camping)—same as Alternative C—the motorcycle/ATV area is not located within a riparian area or wetland. In riparian risk zones and wetlands, this alternative virtually eliminates the acres of motorized areas available for potential impacts, similar to all action alternatives.

Alternative G

Motorized Routes— in riparian risk zones, acreages potentially impacted by motorized routes is reduced by 19%, which is less than Alternatives D and E, but similar to Alternative F. In wetlands, the acreage is reduced by 52%, similar to Alternatives D, E, and F.

Motorized Dispersed Recreation (300' corridor designated along specific routes) — in riparian risk zones, this alternative reduces the acreage available for potential impacts from motorized dispersed recreation by 95% from the No Action Alternative, which is similar to all action alternatives. In wetlands, the acreage is reduced by 88%, which is similar to Alternatives C, D, and F, but less than Alternative E.

Motorized Big Game Retrieval (within 300' dispersed camping corridor) —
In riparian risk zones, this alternative reduces the acreage available for potential impacts from motorized big game retrieval by 95% from the No Action Alternative, which is similar to Alternatives D, and E. In wetlands, the acreage is reduced by 88%, which is similar to Alternatives D and E, less of a reduction than Alternative E, but more of a reduction than Alternative C.

Motorized Areas (39 areas: 1 motorcycle/ATV; 38 camping)—same as Alternative C – The motorcycle/ATV area is not located within a riparian area or identified wetland. In riparian risk zones and identified wetlands, this alternative virtually eliminates the acres of motorized areas available for potential impacts from motorized areas, similar to all action alternatives.

Effects to Water Quality

Each of the alternatives was analyzed to determine if there is potential for motor vehicle travel on the Gila National Forest to impact water quality. Water quality was evaluated on all perennial, intermittent, and impaired (303d) waters. Analysis of effects to these waters was based on motorized uses and their proximity to drainages, concentration of flows into streams, and stream crossings that disturb stream bottom sediments. Impaired waters were analyzed separately to see how the action alternatives compared to the No Action Alternative regarding impacts to streams currently not meeting State Water Quality Standards.

Literature supports that disturbance within 300 feet of streams has the greatest potential to impact water quality, via overland flow (Burroughs and King, 1989, Belt, O'Laughlin and Merrill, 1992). The analysis area for water quality was designed by buffering 300 feet on either side of perennial, intermittent, and impaired streams. Closed roads within this buffer were considered a net benefit to water quality due to limiting the use on the road, and the restriction of motorized stream crossings on these routes. Acres associated with roads proposed for closure were removed from the calculations of route impacts on water quality.

Tables 29-38 provide a summary of stream crossings, as well as miles of stream that may be impacted by motorized routes, motorized dispersed recreation, motorized big game retrieval, and motorized areas. A discussion follows Table 38 of potential impacts to water quality under each Alternative, however a brief summary of these effects, based on a change from the No Action Alternative are described below:

- Alternative E provides the most reduction (>50%) of motorized crossings on perennial and intermittent streams, followed by Alternative D (-37%) and Alternatives G (-19%) and F (-17%). Alternative C reduces motorized crossings at -8%, which is the least of any action alternative. Alternatives D, E, F, and G are similar in reduction of motorized crossings on impaired streams (≈21% reduction from No Action). Alternative C reduces motorized crossings on impaired streams by 12%. Alternative E reduces miles of perennial and intermittent streams potentially impacted by motorized routes by 44%, and reduces potential impacts to impaired streams by 24%, which is the most of any action alternative. Alternative D provides the second largest reduction in potential effects: perennial and intermittent streams (-30%); impaired streams (-21%). Alternatives F and G show similar reductions (-19%), followed by Alternative C which shows a reduction of 7% from the No Action Alternative.
- All alternatives almost completely remove motorized camping areas from perennial, intermittent streams, and impaired streams. All alternatives significantly (>90%) reduce potential impacts from motorized dispersed recreation on perennial, intermittent, and impaired streams. Alternatives E, D, and G significantly (>90%) reduce potential impacts from motorized big game retrieval on perennial, intermittent and impaired streams. Alternative F provides for the next largest reduction (≈45%) followed by Alternative C (≈20%).

For all action alternatives, less motorized routes would be designated for motor vehicle use within 300 feet of perennial, intermittent, and impaired streams. Reducing the acres of roads and motorized trails within this buffer strip is anticipated to improve water quality by reducing the relative risk of routes adjacent to the streams. In addition, less access to these areas would allow these routes to reestablish vegetation, reduce sediment yields, and improve channel and riparian conditions over time.

It is important to note, however, that, until hydrologically disconnected, closed routes will continue to be pathways for flow and sediment to enter the stream system to some extent, as recovery times can take decades. All of the action alternatives involve the closure of roads to motorized use rather than decommissioning (physical removal). In some instances, the relative risk of sedimentation may increase due to problems associated with lack of consistent

maintenance, while in others the relative risk may decrease dramatically due to rapid recovery of a riparian area to more natural conditions.

All Perennial and Intermittent Waters

Table 29. Number of NFS motorized route stream crossings on perennial and intermittent streams

	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
Total Number of Crossings	**919**	**850**	**577**	**428**	**761**	**743**
Change in number of motorized crossings on perennial and intermittent		-69	-342	-491	-158	-176
Expressed as a Percent (+ or –) of the No Action Alternative		-8%	-37%	-53%	-17%	-19%

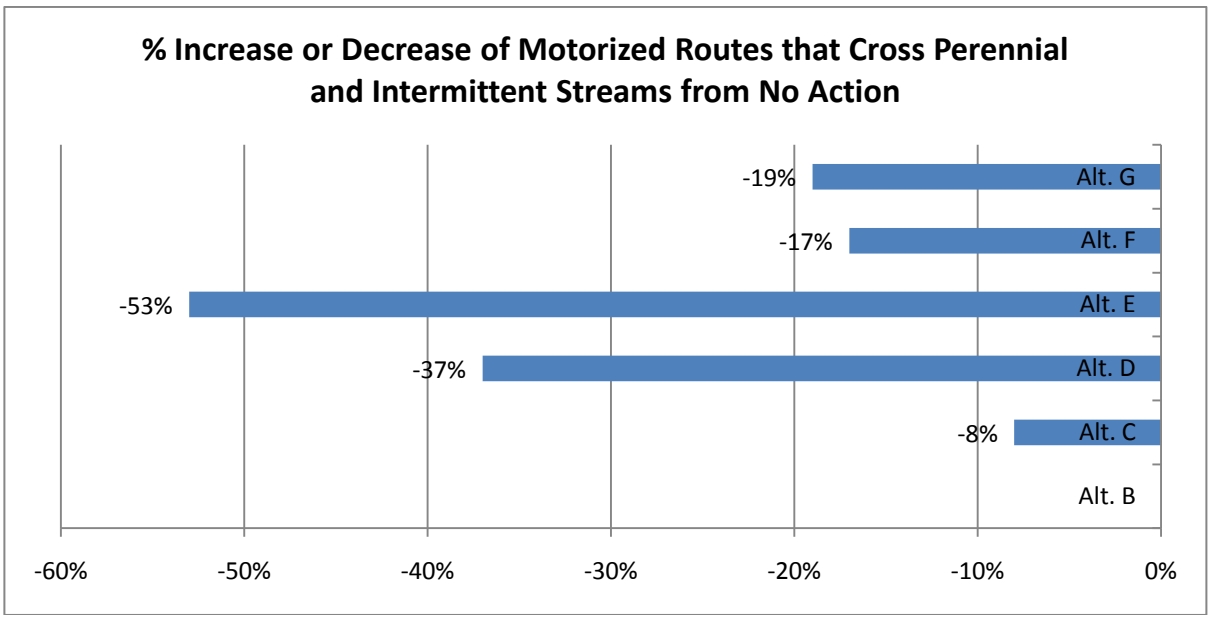


Table 30. Miles of Perennial and Intermittent Streams potentially impacted by motorized routes

Miles of Perennial and Intermittent Streams potentially impacted by Motorized Routes						
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Agua Fria Creek	0.14	0.14	0.14	0.14	0.14	0.14
Apache Creek	0.21	0.21	0.21	0.21	0.21	0.21
Bear Creek	7.68	4.58	3.29	2.48	4.24	4.24
Bearwallow Creek	0.65	0.65	0.65	0.65	0.65	0.65
Beaver Creek	1.55	1.55	1.55	0	1.55	1.55
Berenda Creek	2.04	2.04	2.04	2.04	2.04	2.04
Big Dry Creek	4.20	4.20	4.20	2.60	4.20	4.20
Cameron Creek	0.12	0.12	0.12	0.12	0.12	0.12
Carbonate Creek	1.62	1.62	1.32	1.27	1.62	1.62
Cave Creek	0.42	0.42	0	0	0.42	0.42
Centerfire Creek	0.89	0.57	0.89	0.89	0.89	0.89
Cherry Creek	0.87	1.00	0.87	0.63	0.87	0.87
Chloride Creek	8.18	8.18	8.18	8.18	8.18	8.18
Circle Seven Creek	4.99	3.06	1.76	1.76	2.74	2.74
Coal Creek	2.86	2.86	2.86	2.86	2.86	2.86
Copper Creek	6.88	6.79	6.79	5.27	6.79	6.79
Cow Creek	1.07	1.07	1.07	1.07	1.07	1.07
Coyote Creek	0.24	0.24	0.24	0	0.24	0.24
Diamond Creek	0.55	0.55	0.55	0.55	0.55	0.55
Dillman Creek	1.22	1.22	0.91	0.39	0.91	0.91
Dry Blue Creek	3.55	2.87	2.43	0	2.87	2.87
East Fork Gila River	2.31	2.31	2.31	2.31	2.31	2.31
East Fork Mimbres River	0.74	0.74	0.63	0	0.63	0.63
Escondido Creek	0.39	0	0	0	0	0
Gila River	1.02	1.67	1.34	1.34	1.34	1.34
Gilita Creek	4.79	4.79	3.93	1.58	3.93	3.93
Hoyt Creek	0.81	0.81	0.68	0.68	0.81	0.81
Indian Creek	0.42	0.42	0.38	0.35	0.38	0.38
Iron Creek	1.33	1.33	0.60	0.44	0.60	0.60
Jenkins Creek	1.78	1.78	1.78	1.71	1.78	1.78
Largo Creek	0.50	0.50	0.50	0.50	0.50	0.50
Las Animas Creek	4.09	4.09	4.09	4.09	4.09	4.09
Little Cherry Creek	1.70	1.70	1.70	1.70	1.70	1.70
Little Dry Creek	1.20	1.20	1.20	1.18	1.20	1.20
Little Turkey Creek	0.21	0.21	0.16	0.02	0.16	0.16
Mangas Creek	2.42	2.42	1.69	0.11	1.29	1.29
Meadow Creek	2.88	2.88	1.20	0.93	1.20	1.20

Miles of Perennial and Intermittent Streams potentially impacted by Motorized Routes						
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Middle Fork Gila River	0.21	0.21	0.21	0.21	0.21	0.21
Middle Percha Creek	1.99	1.99	1.29	1.29	1.99	1.99
Mimbres River	3.01	1.03	1.03	1.03	1.03	1.03
Mineral Creek	2.61	2.61	2.61	2.44	2.61	2.61
Mogollon Creek	0.27	0.27	0.27	0.27	0.27	0.27
Morgan Creek	1.59	1.59	0.04	0.04	1.59	1.59
Mule Creek	1.49	1.49	0.40	0.40	0.90	1.43
Negrito Creek	0.55	0.55	0.55	0.55	0.55	0.55
North Fork Negrito Creek	6.90	6.90	2.59	0.35	2.60	5.74
North Fork Palomas Creek	6.24	6.16	2.78	2.78	6.16	6.16
North Fork Walnut Creek	1.79	1.79	0.09	0.09	0.63	0.63
North Percha Creek	0.37	0.37	0.37	0.37	0.37	0.37
North Seco Creek	1.35	1.35	1.35	1.35	1.35	1.35
Pine Cienega Creek	0.50	0.21	0.14	0.12	0.14	0.14
Poverty Creek	0.21	0.21	0.21	0.21	0.21	0.21
Pueblo Creek	0.46	0.46	0.46	0.46	0.46	0.46
Quaking Aspen Creek	2.31	2.31	2.31	2.31	2.31	2.31
Romero Creek	0.71	0.71	0.71	0.71	0.71	0.71
S A Creek	3.09	3.09	1.83	0	2.45	1.80
Sacaton Creek	1.47	1.29	0.14	0.14	0.78	0.78
San Francisco River	21.99	21.79	13.84	12.66	21.79	14.01
Silver Creek	2.80	1.21	1.21	1.21	1.21	1.21
Smith Creek	1.95	1.53	0.34	0.16	0.76	0.34
South Fork Cuchillo Negro Creek	1.41	1.41	1.41	1.41	1.41	1.41
South Fork Negrito Creek	3.10	3.10	2.99	2.78	3.10	3.10
South Fork Palomas Creek	1.72	1.72	1.72	1.72	1.72	1.72
South Fork Whitewater Creek	0.15	0.15	0	0	0.15	0.15
South Percha Creek	0	0.21	0.21	0.21	0.21	0.21
Stone Creek	0.00	0.00	0.00	0.00	0.00	0.00
Sycamore Creek	0.01	0.01	0.01	0.01	0.01	0.01
Taylor Creek	4.94	4.59	0.86	0.86	0.86	0.86
Tierra Blanca Creek	1.33	1.13	0	0	1.13	1.13
Trout Creek	1.68	1.41	0.53	0.53	0.53	0.53
Tularosa River	2.52	2.52	2.52	2.15	2.52	2.52
Turkey Creek	4.27	6.13	2.70	2.70	2.70	2.70
Turkey Run	5.86	5.86	5.86	0.56	5.86	5.86
Twin Sisters Creek	0.24	0.07	0	0	0.07	0.07
Walnut Creek	0.60	0.60	0.60	0.60	0.60	0.60
West Fork Gila River	0.99	0.99	0.99	0.99	0.99	0.99

Miles of Perennial and Intermittent Streams potentially impacted by Motorized Routes						
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
West Fork Pueblo Creek	0.01	0.01	0.01	0.01	0.01	0.01
Whiskey Creek	0.73	0.73	0.73	0.73	0.73	0.73
Whitewater Creek	0.62	0.62	0.16	0.16	0.62	0.62
Willow Creek	3.82	4.30	4.30	3.63	4.30	4.30
(blank)	116.41	123.45	80.71	65.90	96.37	96.33
Grand Total	**290.74**	**288.89**	**203.32**	**162.13**	**240.00**	**234.81**
Change in miles of perennial and intermittent streams potentially impacted by motorized routes		-1.85	-87.42	-128.61	-50.74	-55.94
Expressed as a Percent (+ or –) of the No Action Alternative		-1%	-30%	-44%	-17%	-19%

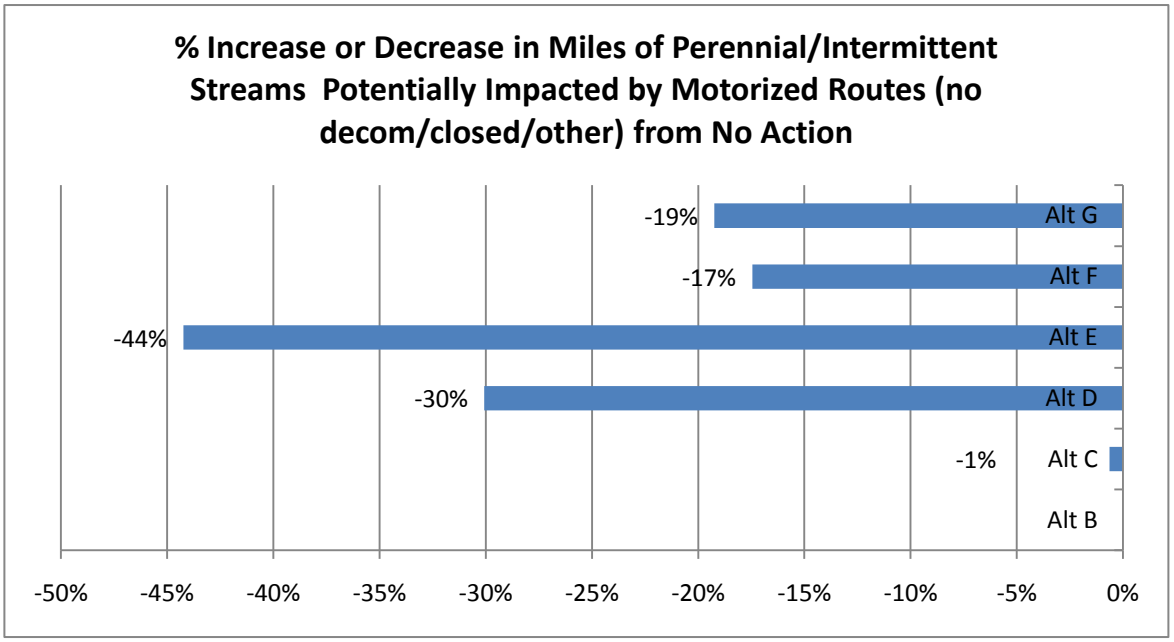


Table 31. Miles of Perennial and Intermittent Streams potentially impacted by motorized dispersed camping

Miles of Perennial and Intermittent Streams potentially impacted by Motorized Dispersed Camping						
Perennial and Intermittent Streams	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Agua Fria Creek	0.63	0	0	0	0	0
Apache Creek	1.86	0.37	0.37	0	0.37	0.37
Bear Creek	6.64	0.16	0	0	0.16	0.16
Bearwallow Creek	5.12	0	0	0	0	0
Beaver Creek	5.26	0	0	0	0	0
Berenda Creek	4.43	0.63	0.63	0	0.63	0.63
Big Dry Creek	6.10	1.60	0	0	1.60	0
Blue River	0.44	0	0	0	0	0
Byers Run	2.29	0	0	0	0	0
Cameron Creek	0	0	0	0	0	0
Campbell Blue Creek	0.38	0	0	0	0	0
Canyon Creek	0.48	0	0	0	0	0
Carbonate Creek	3.12	1.27	1.27	0	1.27	1.27
Cave Creek	0.46	0.42	0	0	0.42	0.42
Centerfire Creek	2.36	0.02	0	0	0.02	0
Cherry Creek	4.77	0.31	0.31	0	0.31	0.31
Chloride Creek	8.18	0	0	0	0	0
Circle Seven Creek	6.80	2.74	1.76	0	2.74	2.74
Coal Creek	2.86	0	0	0	0	0
Copper Creek	10.40	0.36	0.36	0	0.36	0.36
Copperas Creek	0.36	0	0	0	0	0
Cow Creek	4.64	1.07	0.95	0	1.07	1.07
Coyote Creek	0.24	0.24	0.24	0	0.24	0.24
Deep Creek	10.27	0	0	0	0	0
Devils Creek	5.34	0	0	0	0	0
Diamond Creek	3.73	0.55	0.55	0	0.41	0.41
Dillman Creek	6.45	0.75	0.75	0	0.75	0.75
Dry Blue Creek	4.43	0	0	0	0	0
East Fork Gila River	9.12	0.16	0.16	0	0.16	0.16
East Fork Mimbres River	11.47	0	0	0	0	0
Escondido Creek	0.35	0	0	0	0	0
Foxtail Creek	0.82	0	0	0	0	0
Gila River	10.44	0.24	0.24	0	0.24	0.24
Gilita Creek	5.10	1.92	0	0	1.92	1.92
Hoyt Creek	2.05	0	0	0	0	0
Indian Creek	1.45	0.11	0.11	0	0.11	0.11
Iron Creek	2.49	0	0	0	0	0

Miles of Perennial and Intermittent Streams potentially impacted by Motorized Dispersed Camping						
Perennial and Intermittent Streams	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Jenkins Creek	4.29	1.54	1.54	0	1.54	1.54
Largo Creek	5.19	0	0	0	0	0
Las Animas Creek	3.69	0	0	0	0	0
Little Bear Creek	2.46	0	0	0	0	0
Little Cherry Creek	1.67	0	0	0	0	0
Little Creek	0.20	0	0	0	0	0
Little Deep Creek	3.04	0	0	0	0	0
Little Dry Creek	1.20	0.02	0	0	0.02	0
Little Mineral Creek	2.24	0	0	0	0	0
Little Turkey Creek	1.56	0	0	0	0	0
Little Whitewater Creek	3.19	0	0	0	0	0
Mangas Creek	2.67	0	0	0	0	0
Marshall Creek	0.14	0	0	0	0	0
Meadow Creek	8.78	1.20	1.20	0	1.20	1.20
Middle Fork Gila River	0.81	0	0	0	0	0
Middle Percha Creek	1.64	1.07	0	0	1.07	1.07
Middle Seco Creek	1.73	0	0	0	0	0
Mimbres River	3.25	0.05	0	0	0.05	0.05
Mineral Creek	19.04	0.58	0.58	0	0.58	0.58
Mogollon Creek	4.68	0	0	0	0	0
Morgan Creek	3.10	0.50	0	0	0.50	0.50
Mule Creek	7.89	0.06	0	0	0	0
Negrito Creek	10.98	0	0	0	0	0
Noland Creek	1.58	0	0	0	0	0
North Fork Mineral Creek	0.23	0	0	0	0	0
North Fork Negrito Creek	7.21	0	0	0	0	0
North Fork Palomas Creek	7.66	1.77	1.77	0	1.77	1.77
North Fork Walnut Creek	3.40	0	0	0	0	0
North Percha Creek	1.33	0	0	0	0	0
North Seco Creek	3.36	0	0	0	0	0
Pace Creek	2.36	0	0	0	0	0
Pine Cienega Creek	2.44	0.09	0	0	0	0
Poverty Creek	6.77	0	0	0	0	0
Pueblo Creek	11.67	0	0	0	0	0
Quaking Aspen Creek	2.31	0.93	0.93	0	0.93	0.93
Rain Creek	0.37	0	0	0	0	0
Romero Creek	2.08	0	0	0	0	0
S A Creek	5.93	1.80	0	0	1.80	0
Sacaton Creek	3.38	0	0	0	0	0

Miles of Perennial and Intermittent Streams potentially impacted by Motorized Dispersed Camping						
Perennial and Intermittent Streams	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
San Francisco River	60.58	8.43	0.09	0	1.08	0.09
Sapillo Creek	0.40	0	0	0	0	0
Silver Creek	11.65	0.14	0	0	0.14	0
Slate Creek	0.60	0	0	0	0	0
Smith Creek	3.28	0.23	0.23	0	0.23	0.23
South Fork Cuchillo Negro Creek	4.02	0	0	0	0	0
South Fork Mineral Creek	0.07	0	0	0	0	0
South Fork Negrito Creek	9.78	0.53	0.31	0	0.43	0.31
South Fork Palomas Creek	4.12	0.03	0.03	0	0.03	0.03
South Fork Whitewater Creek	0.27	0	0	0	0	0
South Percha Creek	4.03	0	0	0	0	0
Stone Creek	1.68	0	0	0	0	0
Sycamore Creek	7.50	0	0	0	0	0
Taylor Creek	14.72	0	0	0	0	0
Tierra Blanca Creek	5.80	0	0	0	0.36	0.36
Trout Creek	16.42	0.17	0.17	0	0.17	0.17
Tularosa River	11.22	0.37	0	0	0.17	0.37
Turkey Creek	7.77	0	0	0	0	0
Turkey Run	7.42	0	0	0	0	0
Twin Sisters Creek	0.35	0	0	0	0	0
Walnut Creek	2.16	0.60	0.60	0	0.60	0.60
West Fork Gila River	2.84	0.32	0	0	0	0
West Fork Pueblo Creek	1.58	0.01	0	0	0.01	
Whiskey Creek	2.26	0	0	0	0	0
Whitewater Creek	3.66	0	0	0	0	0
Willow Creek	4.09	0.07	0.07	0	0.07	0.07
(blank)	366.53	30.56	18.13	0	26.65	22.68
Grand Total	**861.63**	**64.00**	**33.34**	**0**	**52.19**	**43.72**
Change in miles of perennial and intermittent streams potentially impacted by motorized dispersed camping		-797.63	-828.29	-861.63	-809.44	-817.91
Expressed as a Percent (+ or –) of the No Action Alternative		-93%	-96%	-100%	-94%	-95%

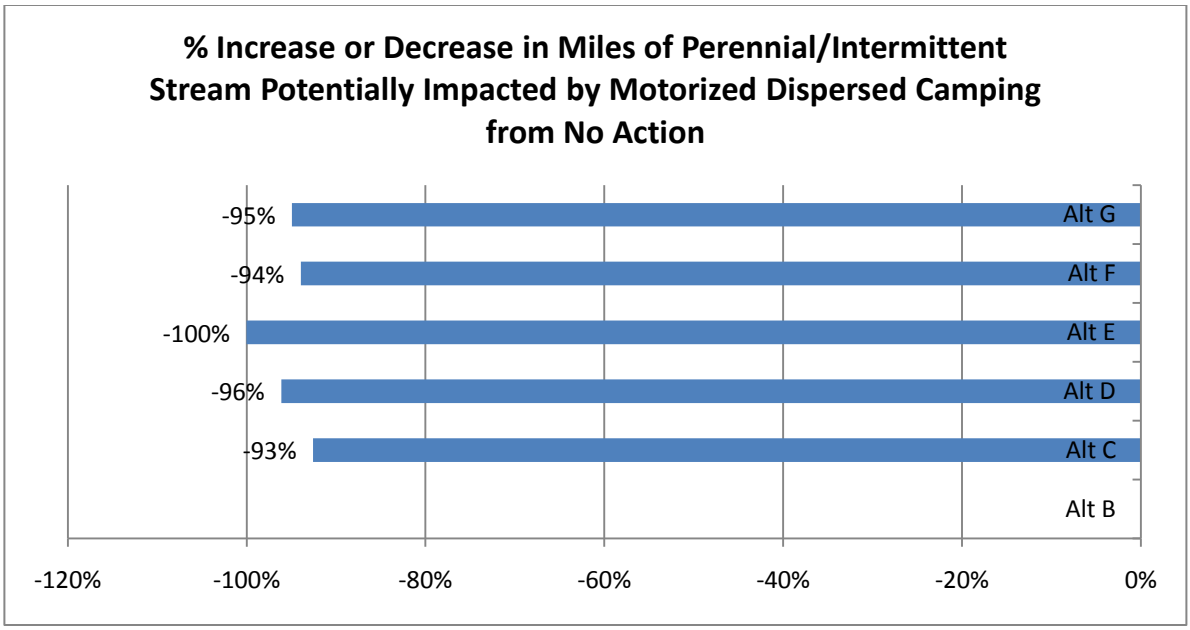

% Increase or Decrease in Miles of Perennial/Intermittent Stream Potentially Impacted by Motorized Dispersed Camping from No Action
-95%
-94%
-100%
-96%
-93%
Alt G
Alt F
Alt E
Alt D
Alt C
Alt B
-120%
-100%
-80%
-60%
-40%
-20%
0%

Table 32. Miles of Perennial and Intermittent Streams potentially impacted by motorized big game retrieval

Miles of Perennial and Intermittent Streams Potentially Impacted by MBGR						
Perennial and Intermittent Streams	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Agua Fria Creek	0.63	0.63	0	0	0.63	0
Apache Creek	1.86	1.86	0.37	0	1.86	0.37
Bear Creek	6.64	3.40	0	0	2.79	0.16
Bearwallow Creek	5.12	4.77	0	0	1.80	0
Beaver Creek	5.26	5.26	0	0	3.62	0
Berenda Creek	4.43	1.52	0.63	0	1.09	0.63
Big Dry Creek	6.10	5.21	0	0	2.88	0
Blue River	0.44	0.44	0	0	0.44	0
Byers Run	2.29	0	0	0	0	0
Cameron Creek	0	0	0	0	0	0
Campbell Blue Creek	0.38	0.38	0	0	0.38	0
Canyon Creek	0.48	0.48	0	0	0.14	0
Carbonate Creek	3.12	2.64	1.27	0	2.06	1.27
Cave Creek	0.46	0.46	0	0	0.46	0.42
Centerfire Creek	2.36	2.31	0	0	2.02	0
Cherry Creek	4.77	4.53	0.31	0	4.53	0.31
Chloride Creek	8.18	8.18	0	0	8.18	0
Circle Seven Creek	6.80	5.56	1.76	0	3.75	2.74
Coal Creek	2.86	0.92	0	0	0.13	0
Copper Creek	10.40	10.40	0.36	0	10.14	0.36
Copperas Creek	0.36	0.36	0	0	0.36	0
Cow Creek	4.64	3.91	0.95	0	1.82	1.07
Coyote Creek	0.24	0.24	0.24	0	0.24	0.24
Deep Creek	10.27	6.34	0	0	2.75	0
Devils Creek	5.34	3.18	0	0	1.37	0
Diamond Creek	3.73	3.73	0.55	0	2.66	0.41
Dillman Creek	6.45	6.45	0.75	0	5.74	0.75
Dry Blue Creek	4.43	1.47	0	0	0.66	0
East Fork Gila River	9.12	5.31	0.16	0	2.93	0.16
East Fork Mimbres River	11.47	10.91	0	0	7.28	0
Escondido Creek	0.35	0.35	0	0	0.27	0
Foxtail Creek	0.82	0.82	0	0	0	0
Gila River	10.44	6.85	0.24	0	4.04	0.24
Gilita Creek	5.10	5.10	0	0	5.10	1.92
Hoyt Creek	2.05	0.52	0	0	0.20	0
Indian Creek	1.45	1.45	0.11	0	1.45	0.11
Iron Creek	2.49	2.49	0	0	2.49	0

Miles of Perennial and Intermittent Streams Potentially Impacted by MBGR						
Perennial and Intermittent Streams	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Jenkins Creek	4.29	4.29	1.54	0	4.21	1.54
Largo Creek	5.19	5.19	0	0	5.19	0
Las Animas Creek	3.69	0	0	0	0	0
Little Bear Creek	2.46	0	0	0	0	0
Little Cherry Creek	1.67	1.67	0	0	1.67	0
Little Creek	0.20	0.20	0	0	0.20	0
Little Deep Creek	3.04	0	0	0	0	0
Little Dry Creek	1.20	1.20	0	0	0.90	0
Little Mineral Creek	2.24	2.24	0	0	0.50	0
Little Turkey Creek	1.56	0.30	0	0	0.30	0
Little Whitewater Creek	3.19	3.19	0	0	3.19	0
Mangas Creek	2.67	2.67	0	0	2.67	0
Marshall Creek	0.14	0	0	0	0	0
Meadow Creek	8.78	8.57	1.20	0	5.19	1.20
Middle Fork Gila River	0.81	0.81	0	0	0.57	0
Middle Percha Creek	1.64	1.64	0	0	1.64	1.07
Middle Seco Creek	1.73	0	0	0	0	0
Mimbres River	3.25	3.25	0	0	1.52	0.05
Mineral Creek	19.04	8.81	0.58	0	3.89	0.58
Mogollon Creek	4.68	2.69	0	0	1.43	0
Morgan Creek	3.10	3.10	0	0	2.71	0.50
Mule Creek	7.89	6.46	0	0	3.31	0
Negrito Creek	10.98	3.36	0	0	0.96	0
Noland Creek	1.58	0.81	0	0	0.29	0
North Fork Mineral Creek	0.23	0	0	0	0	0
North Fork Negrito Creek	7.21	7.21	0	0	5.58	0
North Fork Palomas Creek	7.66	4.27	1.77	0	2.94	1.77
North Fork Walnut Creek	3.40	3.40	0	0	2.11	0
North Percha Creek	1.33	1.33	0	0	0.43	0
North Seco Creek	3.36	0.93	0	0	0	0
Pace Creek	2.36	1.19	0	0	0	0
Pine Cienega Creek	2.44	2.44	0	0	1.14	0
Poverty Creek	6.77	6.77	0	0	3.94	0
Pueblo Creek	11.67	7.96	0	0	3.68	0
Quaking Aspen Creek	2.31	2.31	0.93	0	2.31	0.93
Rain Creek	0.37	0.37	0	0	0.37	0
Romero Creek	2.08	2.08	0	0	2.08	0
S A Creek	5.93	5.93	0	0	5.69	0
Sacaton Creek	3.38	3.38	0	0	1.88	0

Miles of Perennial and Intermittent Streams Potentially Impacted by MBGR						
Perennial and Intermittent Streams	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
San Francisco River	60.58	50.51	0.09	0	31.42	0.09
Sapillo Creek	0.40	0.40	0	0	0.40	0
Silver Creek	11.65	11.52	0	0	10.77	0
Slate Creek	0.60	0	0	0	0	0
Smith Creek	3.28	3.28	0.23	0	3.28	0.23
South Fork Cuchillo Negro Creek	4.02	1.05	0	0	0	0
South Fork Mineral Creek	0.07	0	0	0	0	0
South Fork Negrito Creek	9.78	9.78	0.31	0	8.45	0.31
South Fork Palomas Creek	4.12	2.53	0.03	0	1.97	0.03
South Fork Whitewater Creek	0.27	0.27	0	0	0.20	0
South Percha Creek	4.03	4.03	0	0	2.57	0
Stone Creek	1.68	1.68	0	0	0.63	0
Sycamore Creek	7.50	0	0	0	0	0
Taylor Creek	14.72	13.33	0	0	2.01	0
Tierra Blanca Creek	5.80	4.30	0	0	1.96	0.36
Trout Creek	16.42	16.42	0.17	0	14.24	0.17
Tularosa River	11.22	9.45	0	0	5.84	0.37
Turkey Creek	7.77	3.31	0	0	1.47	0
Turkey Run	7.42	6.65	0	0	6.10	0
Twin Sisters Creek	0.35	0	0	0	0	0
Walnut Creek	2.16	2.16	0.60	0	1.05	0.60
West Fork Gila River	2.84	2.84	0	0	2.84	0
West Fork Pueblo Creek	1.58	1.58	0	0	1.58	0
Whiskey Creek	2.26	2.26	0	0	0.86	0
Whitewater Creek	3.66	3.66	0	0	2.69	0
Willow Creek	4.09	4.09	0.07	0	4.09	0.07
(blank)	366.53	287.97	18.13	0	205.47	22.68
Grand Total	**861.63**	**671.51**	**33.34**	**0**	**468.62**	**43.72**
Change in miles of perennial and intermittent streams potentially impacted by motorized big game retrieval		-190.12	-828.29	-861.63	-393.01	-817.91
Expressed as a Percent (+ or –) of the No Action Alternative		-22%	-96%	-100%	-46%	-95%

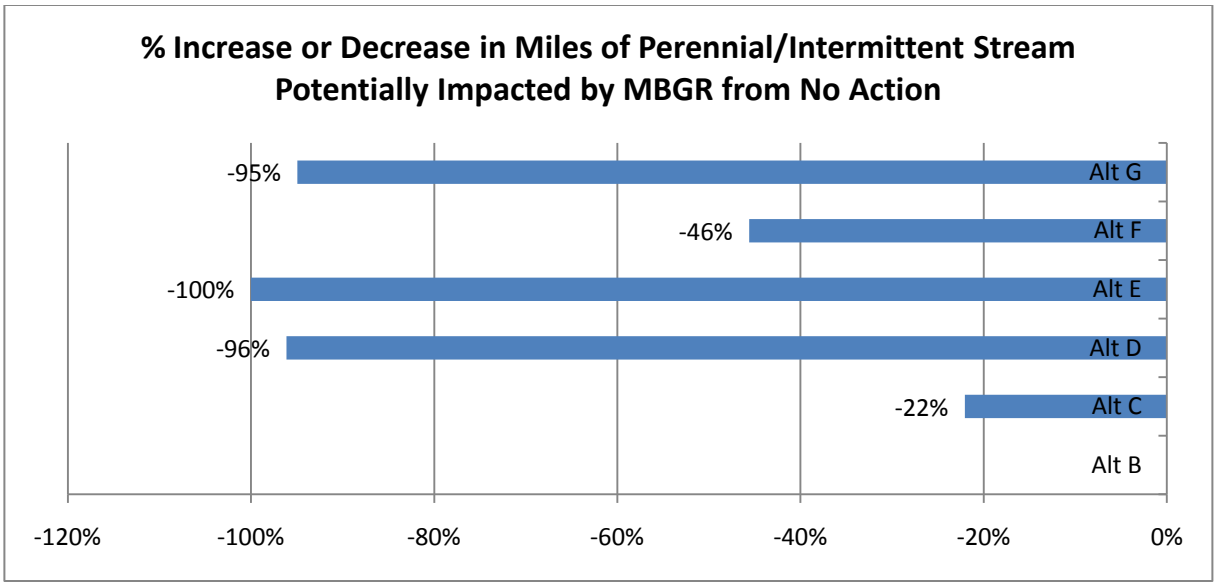
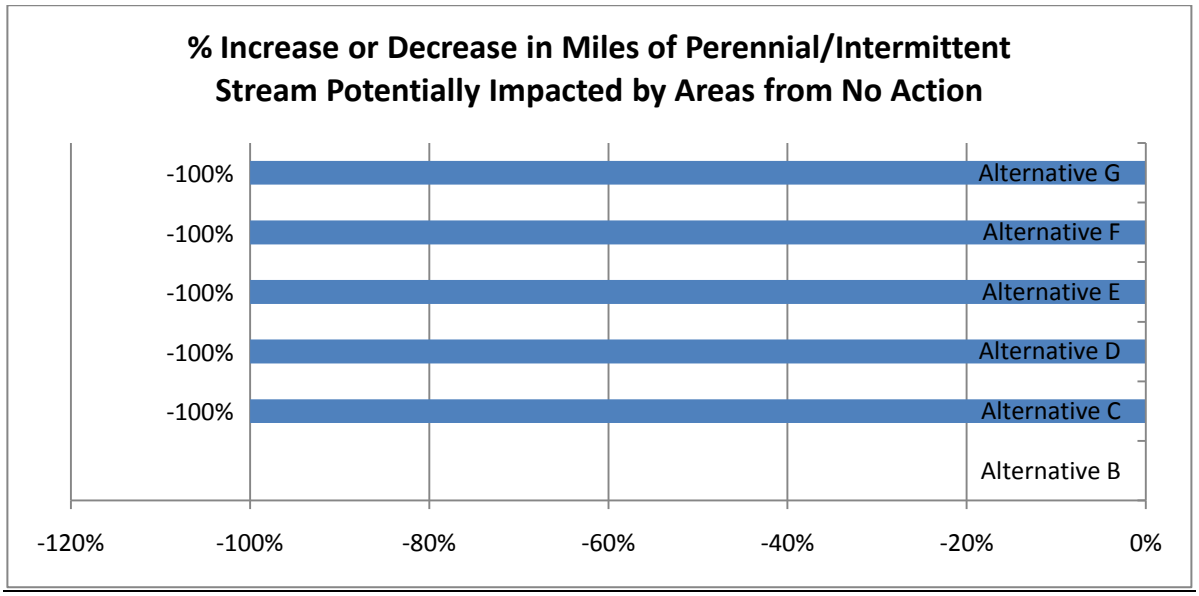

% Increase or Decrease in Miles of Perennial/Intermittent Stream Potentially Impacted by MBGR from No Action
-95%
Alt G
-46%
Alt F
-100%
Alt E
-96%
Alt D
-22%
Alt C
Alt B
-120%
-100%
-80%
-60%
-40%
-20%
0%

Table 33. Miles of Perennial and Intermittent Stream potentially impacted by Motorized Areas

Water Body	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
All Perennial and Intermittent Streams (including SA Creek)	861.63					
S A Creek		0.03	0	0	0.03	0.03
Grand Total	**861.63**	**0.03**	**0**	**0**	**0.03**	**0.03**
Change in miles of perennial and intermittent streams potentially impacted by motorized areas		-861.6	-861.63	-861.63	-861.6	-861.6
Expressed as a Percent (+ or –) of the No Action Alternative		-100%	-100%	-100%	-100%	-100%



Impaired (303d) waters

Table 34. Number of Stream Crossings on Impaired (303d) Waters

	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
# of Stream Crossings on 303d streams	**78**	**69**	**62**	**62**	**62**	**62**
Change in # of Stream Crossings on 303d streams		-9	-16	-16	-16	-16
Expressed as a Percent (+ or –) of the No Action Alternative		-12%	-21%	-21%	-21%	-21%

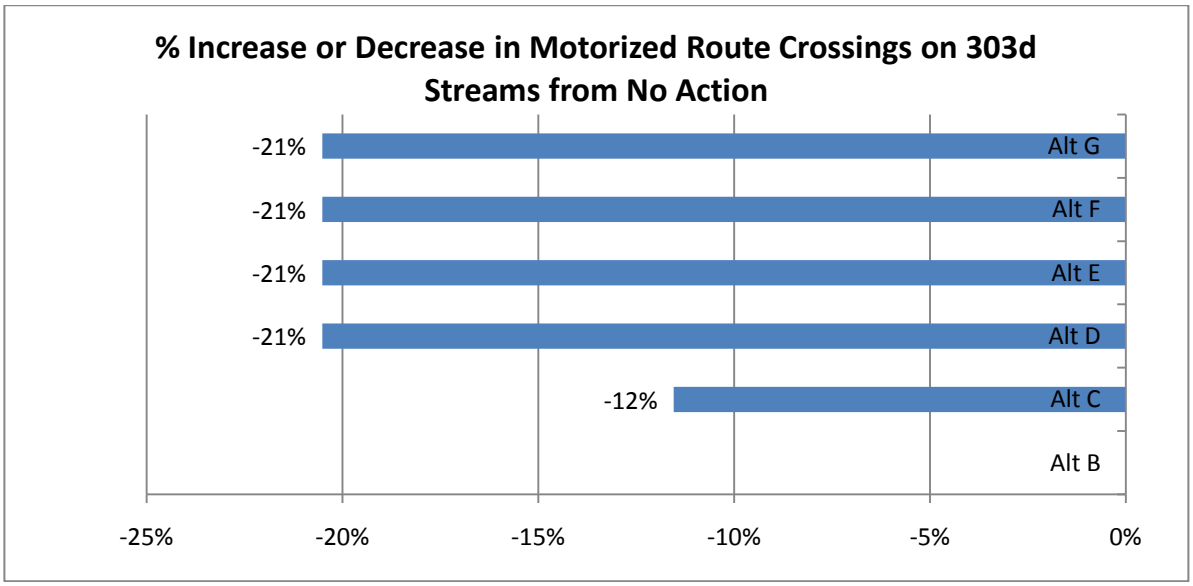


Table 35. Miles of Impaired (303d) Waters Potentially Impacted by Motorized Routes

Miles of Impaired Waters Potentially Impacted by Motorized Routes						
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Black Canyon Creek (East Fork Gila River to headwaters)	1.12	1.18	1.18	1.09	1.18	1.18
Canyon Creek (Middle Fork Gila River to headwaters)	2.79	2.79	2.79	2.62	2.79	2.79
Centerfire Creek (San Francisco R to headwaters)	3.58	3.26	2.24	2.24	2.24	2.24
East Fork Gila River (Gila River to headwaters)	2.22	2.22	2.22	2.22	2.22	2.22
Gila River (Mangas Creek to Mogollon Creek)	0.44	0.44	0.31	0.31	0.31	0.31
Gila River (Mogollon Creek to Gila Hot Springs)	0.51	1.20	1.00	1.00	1.00	1.00
Gila River (Red Rock to Mangas Creek)	0.07	0.07	0.07	0.00	0.07	0.07
Gilita Creek (Middle Fork Gila R to Willow Creek)	0.02	0.02	0.02	0.02	0.02	0.02
Lake Roberts	0.03	0.03	0.03	0.03	0.03	0.03
Las Animas Creek (perennial portion R Grande to headwaters)	4.11	4.11	4.11	4.11	4.11	4.11
Middle Fork Gila River (Gila River to headwaters)	0.30	0.30	0.30	0.30	0.30	0.30
Mimbres R (Perennial reaches Willow Springs to Cooney Cyn)	6.76	4.89	4.89	4.89	4.89	4.89
Mogollon Creek (Perennial reaches abv USGS gage)	0.24	0.24	0.24	0.24	0.24	0.24
Negrito Creek (Tularosa River to confl of N and S forks)	0.50	0.50	0.50	0.50	0.50	0.50
San Francisco River (Centerfire Creek to AZ border)	1.68	1.68	1.68	1.03	1.68	1.68
San Francisco River (Dry Creek to Whitewater Creek)	0.43	0.23	0.23	0.21	0.23	0.23
South Fork Negrito Creek (Negrito Creek to headwaters)	8.72	8.72	8.04	8.04	8.62	8.62
Taylor Creek (Beaver Creek to Wall Lake)	0.08	0.08	0.08	0.08	0.08	0.08
Taylor Creek (Perennial reaches abv Wall Lake)	7.27	5.86	1.99	1.99	1.99	1.99
Tularosa River (San Francisco R to Apache Creek)	1.93	1.93	1.93	1.57	1.93	1.93
Turkey Creek (Gila River to headwaters)	0.23	0.23	0.23	0.23	0.23	0.23
West Fork Gila R (Cliff Dweller Cyn to headwaters)	0.04	0.04	0.04	0.04	0.04	0.04
West Fork Gila R (East Fork to Middle Fork)	0.69	0.69	0.69	0.69	0.69	0.69
Whitewater Creek (San Francisco R to Whitewater Campgrd)	0.17	0.17	0.17	0.17	0.17	0.17
Whitewater Creek (Whitewater Campgrd to headwaters)	0.46	0.46	0.00	0.00	0.46	0.46
Grand Total	**44.40**	**41.35**	**34.98**	**33.62**	**36.03**	**36.03**
Change in # of Total Miles 303d stream miles potentially impacted		-3	-9	-11	-8	-8
Expressed as a Percent (+ or –) of the No Action Alternative		-7%	-21%	-24%	-19%	-19%

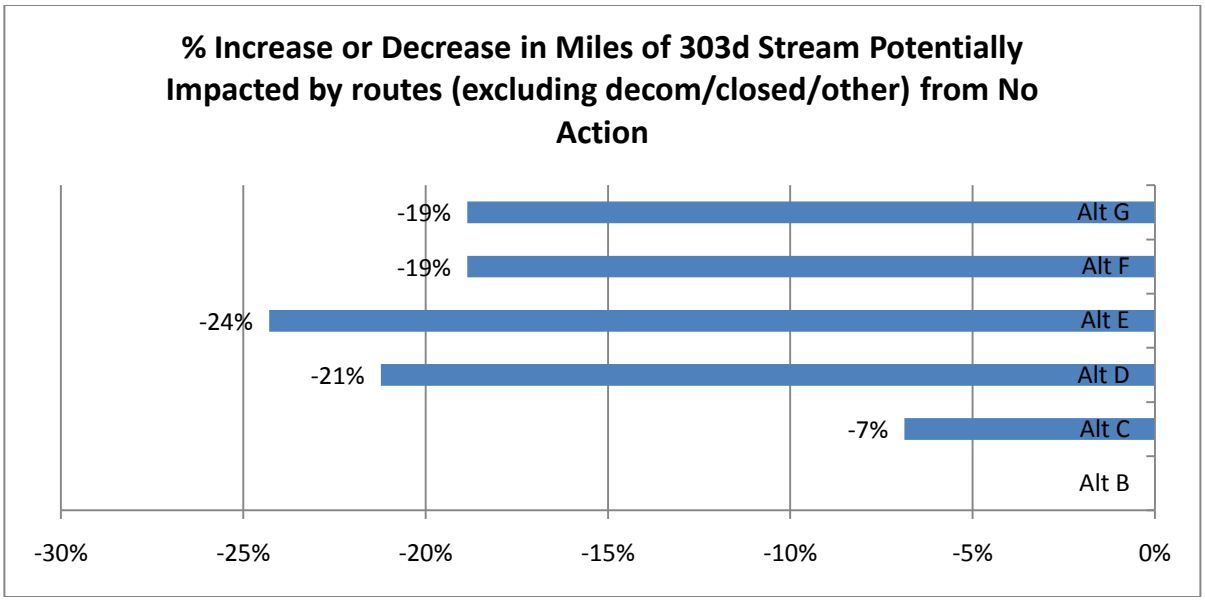

% Increase or Decrease in Miles of 303d Stream Potentially Impacted by routes (excluding decom/closed/other) from No Action
-19%
-19%
-24%
-21%
-7%
Alt G
Alt F
Alt E
Alt D
Alt C
Alt B
-30%
-25%
-20%
-15%
-10%
-5%
0%

Table 36. Miles of Impaired (303d) Waters Potentially Impacted by Motorized Dispersed Camping

Miles of Impaired Waters Potentially Impacted by Motorized Dispersed Camping						
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Black Canyon Creek (East Fork Gila River to headwaters)	2.49	0.70	0.70	0	0.70	0.70
Canyon Creek (Middle Fork Gila River to headwaters)	9.27	0.35	0	0	0.35	0.35
Centerfire Creek (San Francisco R to headwaters)	7.98	0.89	0	0	0.89	0
East Fork Gila River (Gila River to headwaters)	8.76	0.14	0.14	0	0.14	0.14
Gila River (Mangas Creek to Mogollon Creek)	1.04	0.23	0.23	0	0.23	0.23
Gila River (Mogollon Creek to Gila Hot Springs)	5.54	0	0	0	0	0
Gila River (Red Rock to Mangas Creek)	3.65	0	0	0	0	0
Gilita Creek (Middle Fork Gila R to Willow Creek)	0.38	0	0	0	0	0
Lake Roberts	0.36	0	0	0	0	0
Las Animas Creek (perennial portion R Grande to headwaters)	3.65	0	0	0	0	0
Mangas Creek (Gila River to Mangas Springs)	0.05	0	0	0	0	0
Middle Fork Gila River (Gila River to headwaters)	0.58	0	0	0	0	0
Mimbres R (Perennial reaches Willow Springs to Cooney Cyn)	5.66	2.19	2.15	0	2.19	2.19
Mogollon Creek (Perennial reaches abv USGS gage)	4.66	0	0	0	0	0
Negrito Creek (Tularosa River to confl of N and S forks)	10.50	0	0	0	0	0
San Francisco River (Centerfire Creek to AZ border)	9.27	0.21	0.09	0	0.09	0.09
San Francisco River (Dry Creek to Whitewater Creek)	4.01	0.02	0	0	0.02	0
South Fork Negrito Creek (Negrito Creek to headwaters)	13.74	1.40	0.50	0	1.41	1.41
Taylor Creek (Beaver Creek to Wall Lake)	1.50	0	0	0	0	0
Taylor Creek (Perennial reaches abv Wall Lake)	18.00	0	0	0	0	0
Tularosa River (San Francisco R to Apache Creek)	8.92	0.36	0	0	0.21	0.36
Turkey Creek (Gila River to headwaters)	0.28	0	0	0	0	0
West Fork Gila R (Cliff Dweller Cyn to headwaters)	0	0	0	0	0	0
West Fork Gila R (East Fork to Middle Fork)	1.84	0.35	0	0	0	0
Whitewater Creek (San Francisco R to Whitewater Campgrd)	1.37	0	0	0	0	0
Whitewater Creek (Whitewater Campgrd to headwaters)	2.21	0	0	0	0	0
Grand Total	**125.72**	**6.84**	**3.81**	**0**	**6.23**	**5.46**
Change in # of Total Miles 303d stream miles potentially impacted		-119	-122	-126	-119	-120
Expressed as a Percent (+ or –) of the No Action Alternative		-95%	-97%	-100%	-95%	-96%

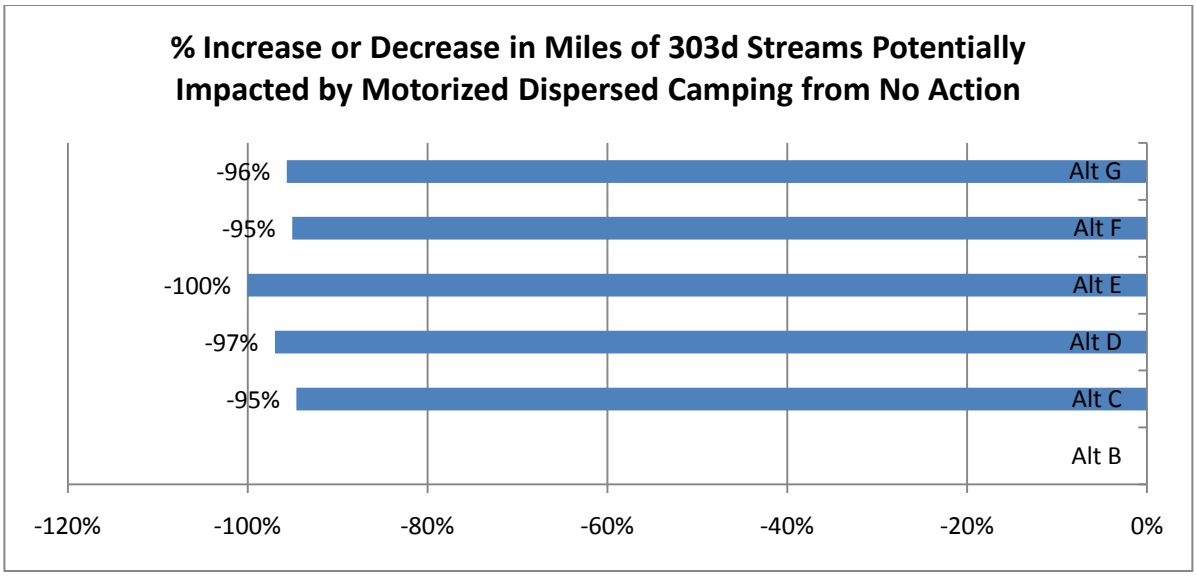

% Increase or Decrease in Miles of 303d Streams Potentially Impacted by Motorized Dispersed Camping from No Action
-96%
-95%
-100%
-97%
-95%
Alt G
Alt F
Alt E
Alt D
Alt C
Alt B
-120%
-100%
-80%
-60%
-40%
-20%
0%

Table 37. Miles of Impaired (303d) Waters Potentially Impacted by Motorized Big Game Retrieval

Miles of Impaired Waters Impacted by MBGR						
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Black Canyon Creek (East Fork Gila River to headwaters)	2.49	2.41	0.70	0	2.11	0.70
Canyon Creek (Middle Fork Gila River to headwaters)	9.27	9.27	0	0	8.65	0.35
Centerfire Creek (San Francisco R to headwaters)	7.98	7.91	0	0	6.84	0
East Fork Gila River (Gila River to headwaters)	8.76	4.95	0.14	0	2.65	0.14
Gila River (Mangas Creek to Mogollon Creek)	1.04	1.04	0.23	0	1.04	0.23
Gila River (Mogollon Creek to Gila Hot Springs)	5.54	4.63	0	0	2.92	0
Gila River (Red Rock to Mangas Creek)	3.65	1.05	0	0	0	0
Gilita Creek (Middle Fork Gila R to Willow Creek)	0.38	0.38	0	0	0.34	0
Lake Roberts	0.36	0.36	0	0	0.36	0
Las Animas Creek (perennial portion R Grande to headwaters)	3.65	0	0	0	0	0
Mangas Creek (Gila River to Mangas Springs)	0.05	0.05	0	0	0.05	0
Middle Fork Gila River (Gila River to headwaters)	0.58	0.58	0	0	0.58	0
Mimbres R (Perennial reaches Willow Springs to Cooney Cyn)	5.66	5.66	2.15	0	4.25	2.19
Mogollon Creek (Perennial reaches abv USGS gage)	4.66	2.68	0	0	1.43	0
Negrito Creek (Tularosa River to confl of N and S forks)	10.50	3.14	0	0	0.88	0
San Francisco River (Centerfire Creek to AZ border)	9.27	8.29	0.09	0	6.37	0.09
San Francisco River (Dry Creek to Whitewater Creek)	4.01	4.01	0	0	2.27	0
South Fork Negrito Creek (Negrito Creek to headwaters)	13.74	13.74	0.50	0	12.50	1.41
Taylor Creek (Beaver Creek to Wall Lake)	1.50	1.50	0	0	1.10	0
Taylor Creek (Perennial reaches abv Wall Lake)	18.00	16.58	0	0	1.50	0
Tularosa River (San Francisco R to Apache Creek)	8.92	7.08	0	0	3.72	0.36
Turkey Creek (Gila River to headwaters)	0.28	0.28	0	0	0	0
West Fork Gila R (Cliff Dweller Cyn to headwaters)	0	0	0	0	0	0
West Fork Gila R (East Fork to Middle Fork)	1.84	1.84	0	0	1.84	0
Whitewater Creek (San Francisco R to Whitewater Campgrd)	1.37	1.37	0	0	1.30	0
Whitewater Creek (Whitewater Campgrd to headwaters)	2.21	2.21	0	0	1.33	0
Grand Total	**125.72**	**101.03**	**3.81**	**0**	**64.02**	**5.46**
Change in number of 303d stream miles potentially impacted		-25	-122	-126	-62	-120
Expressed as a Percent (+ or –) of the No Action Alternative		-20%	-97%	-100%	-49%	-96%

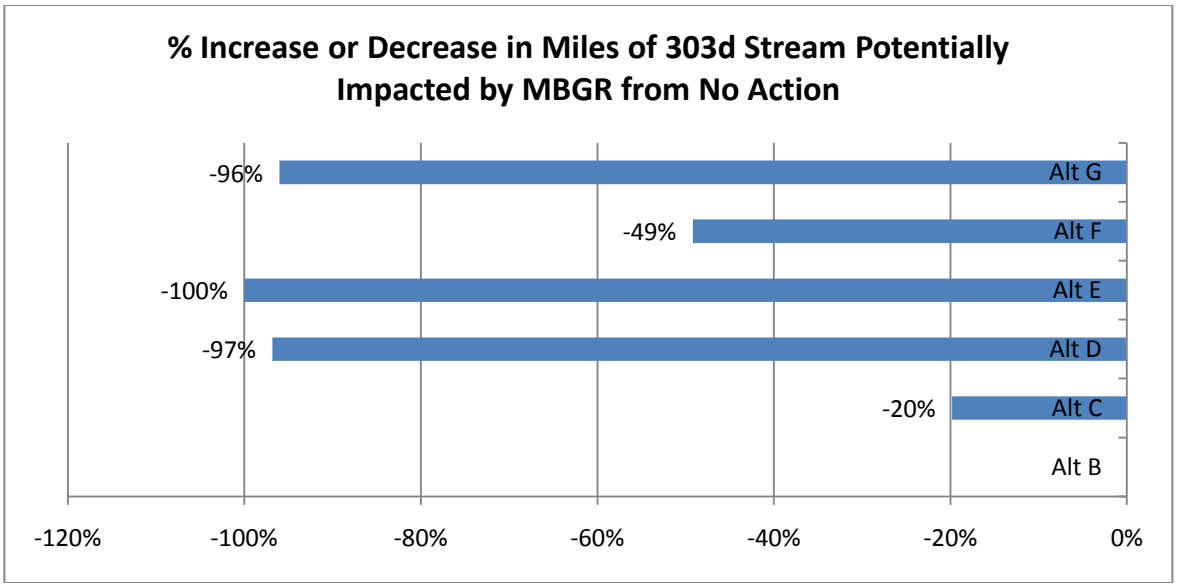
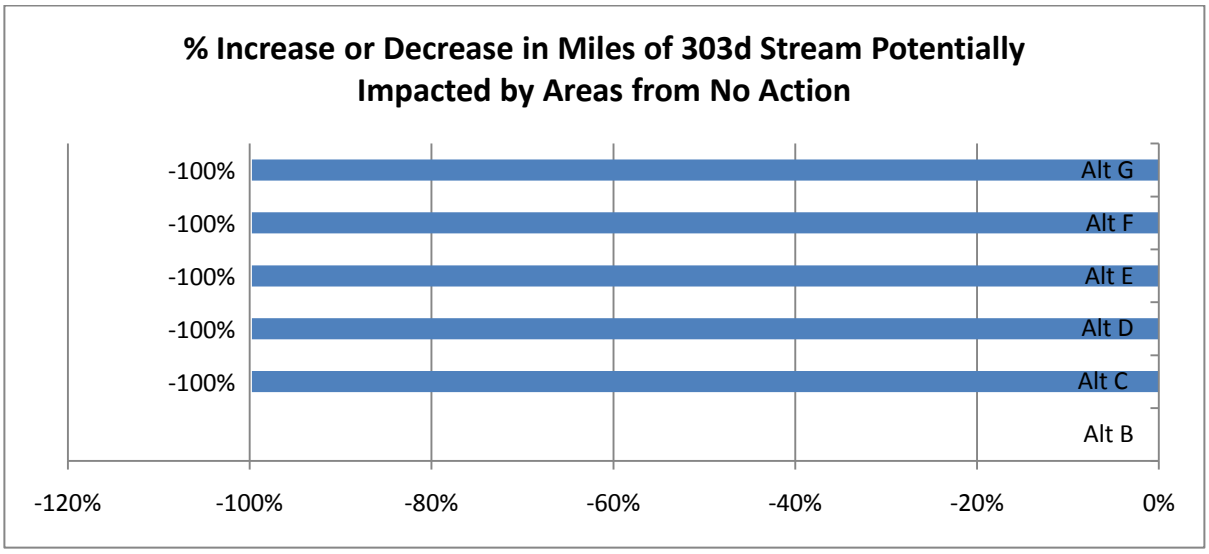


Table 38. Miles of Impaired (303d) Waters Potentially Impacted by Areas

Row Labels	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
All Impaired Waters	126.0					
Mimbres R (Perennial reaches Willow Springs to Cooney Cyn)		0.30	0.3	0	0	0.3
Grand Total		**0.30**	**0.3**	**0**	**0**	**0.3**
Change in number of 303d stream miles potentially impacted		-125.70	-125.70	-126	-126	-125.70
Expressed as a Percent (+ or –) of the No Action Alternative		-100%	-100%	-100%	-100%	-100%



General Direct and Indirect Effects Common to All Alternatives including the No Action:

The effects described below will remain the same for any changes described in each alternative. However the degree of the effect will vary by the Alternative based on the change in route miles and permitted cross country travel.

The primary effect to water quality related to motorized uses is sedimentation originating from road erosion. Numerous researchers have established that roads are a major source of sediment delivered to streams in otherwise relatively undisturbed watersheds, such as forests and rangelands. In addition, research has concluded that sediment from roads can result in adverse effects to streams and aquatic habitat (MacDonald and Stednick 2003; Gucinski and others 2001; Dissmeyer 2000; Meehan 1991). Motorized uses can affect water quality both directly through the physical crossing of a route on a stream, and indirectly through the connectivity of the road system to the drainage network. The further away a road is from a stream channel, the less risk there is of direct deposits of sediment into the drainage. Roads constructed near a stream pose a higher relative risk to water quality and to modifying hydrologic response of streamflow from runoff events. When located close to a stream channel, there is less available vegetation and land surface to buffer or capture the transport of eroded material and other pollutants that may become mobilized during runoff events. In addition, because routes intercept and concentrate water, the closer they are to a drainage channel, the quicker water is delivered to the stream channel, potentially increasing runoff response. This can lead to higher peak flows, which may then lead to a higher risk of channel erosion. Parent material that the road bed is situated on can also influence effects that a road or trail has on erosion and sedimentation. On the Gila National Forest, roads situated on decomposing granite or some types of rhyolite are highly susceptible to rutting and erosion. Water temperature issues may also arise if roads are located adjacent to stream channels where riparian vegetation is removed to accommodate the road or where stream channel geometry has been altered, creating a wider, more shallow channel.

Stream crossings create the most vulnerable point on the stream channel to adverse impacts from motorized use. The effects from stream crossings are two-fold. They directly impact the stream by the action of vehicle tires disturbing and mobilizing stream bottom sediments. This effect is typically short-lived, provided there is not continual traffic going across the stream. Crossings, additionally, indirectly effect water quality by providing a direct flow path from the route into the stream, without any vegetative buffer that might filter out suspended sediments in runoff events. This flow path, until hydrologically disconnected, will continue to funnel sediment–laden runoff into the stream.

Motorized use adjacent to and within drier, ephemeral channels can also move large and small bedload material, which becomes further mobilized during large rain events. Streambanks that have been disturbed in these dry channels are left with bare soil that has an increased potential for future erosion and bank destabilization. This can lead to lateral cutting, widening of channels and increases in sediment in the channel that moves downstream. While ephemeral channels do not transport sediment most of the year, they still remain an integral part of the watershed's conduit system to carry runoff, and sediment, during storm

events. Ephemeral channels have proven to be very efficient transporters of muddy water, as evidenced in particular during summer monsoon storms on the Gila National Forest.

Research also indicates that sediment movement off of roads is related to levels of maintenance, road drainage, and amount of use of a road (Clinton and Vose, 2003; Maholland and Bullard, 2005, Reid and Dunne, 1984). High traffic use typically delivers more sediment to stream courses than low traffic use. Successfully closed roads are assumed to deliver the lowest amount of sediment to stream courses compared to low or high traffic use on all road types. Native surfaced and unauthorized roads produce and deliver more sediment than improved, gravel roads. In-sloped, bar ditched roads produce more sediment than all other roads types. Thus, reduction of miles of native-surfaced maintenance level 2 roads is anticipated to decrease road erosion and sedimentation delivery more than restricting traffic on improved, graveled Forest level 3, 4, and 5 roads, however this amount has not been quantified. These effects also apply to motorized trails, but may vary depending on level of use, size of trail and location.

Cross country travel impacts on water quality on the Gila National Forest can range from high to low, but in general are typically minimal. Short-lived negative impacts occur when motorists cross live streams in effort to retrieve big game animals or to reach a desired camping spot. These crossings are most often one-time passes that do not create a permanent route. Damage to riparian vegetation and streambanks may also occur, creating a nickpoint that may be vulnerable during higher flows. At current use levels, personal observations(Koury and Natharius) across the Forest indicate that motorized dispersed camping and motorized big game retrieval is infrequent enough that negligible adverse effects are occurring due to these activities. All action alternatives have significantly reduced the acreage available for motorized dispersed camping and motorized big game retrieval, thus having less opportunity for negative impacts to occur.

Alternative B – No Action

Impacts to water quality as a result of current motorized use on the Forest are detailed above in the Effects Common to All Alternatives. Across the Gila National Forest, there are 918 motorized stream crossings that impact perennial and intermittent streams. Of these 918 motorized crossings, 78 of these crossings impact impaired (303d) waterbodies. Approximately 291 miles of perennial and intermittent streams are at risk from impacts related to motorized routes within 300 feet. Approximately 44 miles of impaired water bodies are at risk from impacts related to motorized routes within 300 feet of the channel.

Cross country travel by motorized vehicles is permitted in all areas, except designated Wilderness, roads, trails, or areas specified in Forest Orders, and restricted off-road vehicle areas identified in the Forest Land Management Plan. This cross country travel includes access for motorized big game retrieval, motorized dispersed recreation and motorized camping and ATV/motorcycle areas. Currently, cross country travel associated with motorized dispersed camping, motorized big game retrieval, and motorized areas (both camping and ATV/motorcycle) has the potential to impact approximately 862 miles of perennial and intermittent streams and approximately 126 miles of impaired water bodies.

Effects Unique to each Action Alternative

Each action alternative will be evaluated based on the potential risk to water quality relative to the change from the No Action alternative. The effects common to all alternatives will have the potential to either increase, decrease or remain the same, based on the change from the No Action Alternative. The relative risk of change from baseline is derived based on the potential miles of impacted of stream impacts and stream crossings that are possible under each of the action alternatives.

Alternative C

Motorized Routes – This alternative has the least reduction of potential impacts to perennial, intermittent, and impaired streams by motorized routes of all action alternatives. It reduces potential impacts to perennial and intermittent stream crossings by 8% (-69 crossing) from the No Action Alternative, and by 12% (-9 crossings) from impaired water bodies. Miles of perennial and intermittent streams potentially impacted by motorized routes is similar to the No Action Alternative, with a 1% decrease in potential impacts to perennial and intermittent streams, and a 7% decrease in potential impacts from impaired water bodies.

Motorized Dispersed Recreation (300' corridor designated along specific routes)—Miles of perennial, intermittent, and impaired streams potentially impacted by motorized dispersed recreation is decreased by greater than 90% under all action alternatives, with Alternative E having the greatest reduction and Alternative C, having the least reduction.

Motorized Big Game Retrieval (1 mile corridor for elk, deer, bear, mountain lion, javelina, pronghorn)—Miles of perennial and intermittent streams potentially impacted by motorized big game retrieval decreases by 22%, under this alternative, which is the least of any action alternative. Miles of impaired waterbodies with potential impacts by motorized big game retrieval is decreased by 20% from the No Action Alternative, which is the least of any action alternative.

Motorized Areas (39 areas: 1 motorcycle/ATV; 38 camping)—The Travel Management Rule defines 'areas' as open to all motorized vehicle use. The 38 camping areas proposed in this alternative are existing sites with traditional use related to camping. The majority of these sites are less than 1 acre in size. The motorcycle/ATV area covers approximately 3.3 acres, however it is not within 300 feet of any perennial, intermittent, or 303(d) stream. Miles of perennial, intermittent, and 303(d) streams potentially impacted by motorized camping areas are virtually eliminated under all action alternatives.

Alternative D

Motorized Routes— Motorized stream crossings are reduced by 37% (-342 crossings) on perennial and intermittent streams, which is the second largest reduction of all action alternatives, behind Alternative E. Motorized stream crossing are reduced by 21% (-16 crossings) on impaired water bodies, which is the same as Alternatives E, F, and G. Under this alternative, miles of perennial and intermittent streams potentially impacted by motorized routes are reduced by 30%, which is the second largest reduction behind Alternative E. Miles of impaired waterbodies with potential impacts from motorized routes decrease by 21% from

the No Action Alternative, which is the second largest reduction of any action alternative, behind Alternative E.

Motorized Dispersed Recreation (300' corridor designated along specific routes) — Miles of perennial, intermittent, and impaired streams potentially impacted by motorized dispersed recreation is decreased by greater than 90% under all action alternatives, with Alternative E having the greatest reduction and Alternative C, having the least reduction.

Motorized Big Game Retrieval (within 300' dispersed camping corridor) — Miles of perennial, intermittent, and impaired streams potentially impacted by motorized big game retrieval decreases by greater than 95% under Alternatives D, E, and G, making them all similar, and with greater reductions than Alternatives F and C.

Motorized Areas (no areas designated)—there would be no potential adverse impacts to perennial, intermittent, or 303d streams due to camping areas under this alternative. Miles of perennial, intermittent, and 303(d) streams potentially impacted by motorized camping areas are virtually eliminated under all action alternatives.

Alternative E

Motorized Routes— Motorized stream crossings are reduced by 53% (-491 crossings) on perennial and intermittent streams, which is the largest reduction of all action alternatives. Motorized stream crossing are reduced by 21% (-16 crossings) on impaired water bodies, which is the same as Alternatives D, F, and G. under this alternative, miles of perennial and intermittent streams potentially impacted by motorized routes is reduced by 44%, which is the most under any action alternative. Miles of impaired waterbodies with potential impacts decrease by 24% from the No Action Alternative, which is the most under any action alternative.

Motorized Dispersed Recreation (No camping corridors designated)— There would be no potential adverse impacts to perennial, intermittent, or 303d streams due to motorized dispersed recreation under this alternative. Miles of perennial, intermittent, and impaired streams potentially impacted by motorized dispersed recreation is decreased by greater than 90% under all action alternatives, with Alternative E having the greatest reduction and Alternative C, having the least reduction.

Motorized Big Game Retrieval (No motorized big game retrieval permitted)— There would be no potential adverse impacts to perennial, intermittent, or 303d streams due to motorized big game retrieval under this alternative. Miles of perennial, intermittent, and impaired streams potentially impacted by motorized big game retrieval decreases by greater than 95% under Alternatives D, E, and G, making them all similar, and with greater reductions than Alternative C and F.

Motorized Areas (no areas designated) – Same as Alternative D— There would be no potential adverse impacts to perennial, intermittent, or 303d streams due to motorized camping areas under this alternative. Miles of perennial, intermittent, and 303(d) streams

potentially impacted by motorized camping areas are virtually eliminated under all action alternatives.

Alternative F

Motorized Routes— Motorized stream crossings are reduced by 17% (-158 crossings) on perennial and intermittent streams, which is the fourth largest reduction of all action alternatives, similar to Alternative G. Motorized stream crossing are reduced by 21% (-16 crossings) on impaired water bodies, which is the same as Alternatives D, E, and G. Under this alternative, miles of perennial and intermittent streams potentially impacted by motorized routes are reduced by 17%, which the fourth largest reduction of any action alternative, and similar to Alternative G. Miles of impaired waterbodies with potential impacts decrease by 19% from the No Action Alternative, which is similar to Alternative G.

Motorized Dispersed Recreation (300' corridor designated along specific routes) — Miles of perennial, intermittent, and impaired streams potentially impacted by motorized dispersed recreation is decreased by greater than 90% under all action alternatives, with Alternative E having the greatest reduction and Alternative C, having the least reduction.

Motorized Big Game Retrieval (within ½ mile of motorized routes, elk only)— Miles of perennial and intermittent streams potentially impacted by motorized big game retrieval decreases by 46% under this alternative, which is greater than Alternative C, and less than Alternatives D, E, and G. Miles of impaired waterbodies with potential impacts is decreased by 49%, which is greater than Alternative C and less than Alternatives D, E, and G.

Motorized Areas (39 areas: 1 motorcycle/ATV; 38 camping)—same as Alternative C—the motorcycle/ATV area is not located adjacent to a perennial, intermittent, or 303d stream. Miles of perennial, intermittent, and 303(d) streams potentially impacted by motorized camping areas are virtually eliminated under all action alternatives.

Alternative G

Motorized Routes— Motorized stream crossings are reduced by 19% (-176 crossings) on perennial and intermittent streams, which is the third largest reduction of all action alternatives, similar to Alternative F. Motorized stream crossing are reduced by 21% (-16 crossings) on impaired water bodies, which is the same as Alternatives D, E, and F. Under this alternative, miles of perennial, intermittent, and 303d streams potentially impacted by motorized routes are reduced by 19%, which is the thirds largest reduction of any action alternative and similar to Alternative F.

Motorized Dispersed Recreation (300' corridor designated along specific routes) — Miles of perennial, intermittent, and impaired streams potentially impacted by motorized dispersed recreation is decreased by greater than 90% under all action alternatives, with Alternative E having the greatest reduction and Alternative C, having the least reduction.

Motorized Big Game Retrieval (within 300' dispersed camping corridor) — Miles of perennial, intermittent, and impaired streams potentially impacted by motorized big game

retrieval decreases by greater than 95% under Alternatives D, E, and G, making them all similar, and with greater reductions than Alternative C and F.

Areas (39 areas: 1 motorcycle/ATV; 38 camping) — same as Alternative C and F—the motorcycle/ATV area is not located adjacent to a perennial, intermittent, or 303d stream. Miles of perennial, intermittent, and 303(d) streams potentially impacted by motorized camping areas are virtually eliminated under all action alternatives.

Effects to Watershed Health from Road and Trail Condition

Each of the alternatives was analyzed to determine if there is potential for motorized uses on the Gila National Forest to affect the integrity of a watershed. The indirect effects to watershed condition related to motorized routes are primarily related to the level of disturbance the road has created on the landscape and the ensuing hydrologic disruption created. This disruption can lead to concentration of flows, movement of sediment, and impacts to riparian areas, aquatic resources and water quality, all of which contribute to watershed health. While this project proposes to change the number of routes open for motorized use, it does not propose to decommission or obliterate any routes that will be closed. Decommissioning of a road is defined as "activities that result in the stabilization and restoration of unneeded roads to a more natural state" (36 CFR 212.1, Forest service Manual 7705-Transportation System [USDA FS 2003]). The Draft Implementation Guide for Assessing and Tracking Changes to Watershed Condition (cite) states that "properly closed roads should be hydrologically disconnected from the stream network. If roads have a closure order but are still contributing to hydrological damage they should be considered open for the purposes of road density calculations."

For this portion of the analysis, closed roads are still considered as land disturbance that have the potential to impact watershed health across the Forest. Miles and acres associated with closed roads are included in the following tables of calculations. This is viewed from a landscape level and does not discount negative effects that may be more quickly reversed in riparian areas and wetlands, and water quality improvements that may occur from closed routes. It is just one of many factors that must be considered when assessing watershed condition.

Tables 39-43 provide a summary of effects from motorized routes that have the potential to impact watershed conditions, Forestwide, by alternative compared to the No Action Alternative. A discussion follows Table 43 of potential impacts to watershed condition under each Alternative, however a brief summary of these effects, based on a change from the No Action Alternative are described below:

- This project does not address decommissioning; all road scars will remain, with the addition of a few roads added to the system (i.e. converting of decommissioned to motorized route or trail). For the majority of motorized routes in the uplands, the changing of designation of road will result in minor change on the landscape until the road is decommissioned or removed from passive storage. At a landscape level, there is little to no change from existing road and trail condition, as result of changes in route designation under any alternative. There will be little to no change in road

densities under any alternative as routes will remain hydrologically connected until decommissioned.

- Alternatives D, E, and G significantly (>90%) reduce the acres of potential disturbance by motorized big game retrieval. Alternative F moderately (-38%) reduces potential disturbance by motorized big game retrieval. Alternative C reduces potential disturbance by motorized big game retrieval by 15%. All alternatives significantly (90%) reduce acres of potential disturbance by motorized dispersed camping. Motorized camping areas are eliminated under Alternative D and E, and almost eliminated under Alternatives C, F and G, as only 31 acres would remain.

Table 39 Forestwide Miles/Acres of Route Disturbance that Affects Watershed Health

Forestwide Miles and Acres of Roaded Disturbance	Miles	Change in Miles from No Action	% Increase or decrease from No Action	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	5221			7,682		
Alternative C	5290	+69	+1%	7,787	+105	+1%
Alternative D	5233	+12	0%	7,762	+80	+1%
Alternative E	5222	+1	0%	7,742	+60	0%
Alternative F	5234	+13	0%	7,760	+78	+1%
Alternative G	5234	+13	0%	7,761	+79	+1%

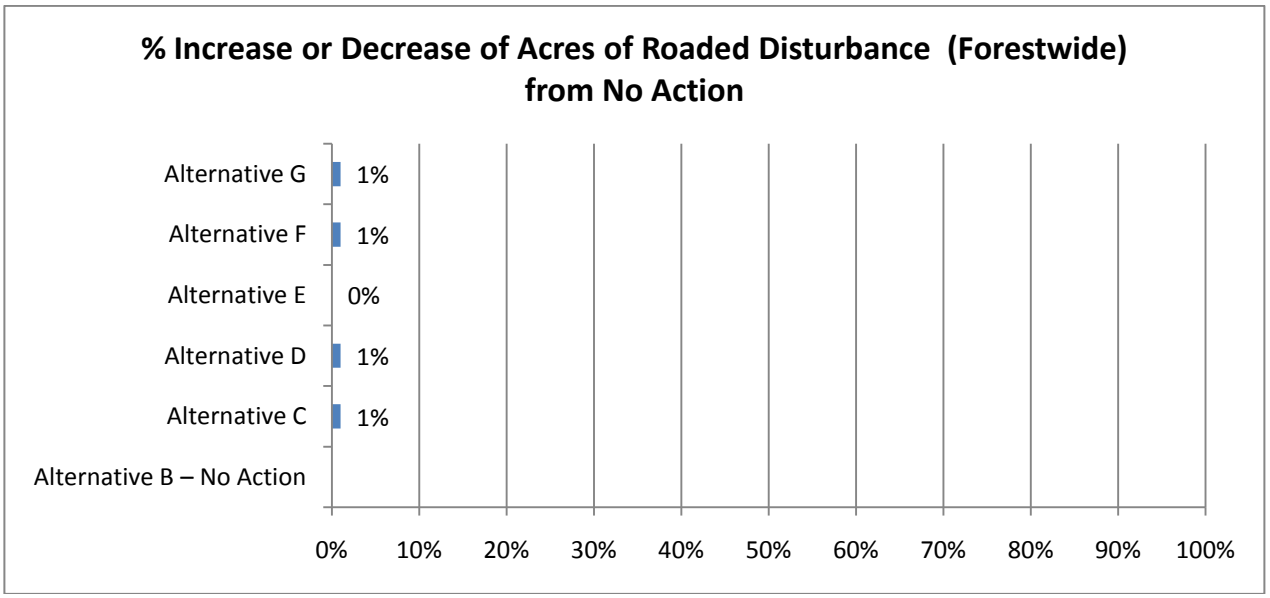


Table 40 Forestwide Acres of Potential Disturbance from Motorized Dispersed Recreation

Forestwide Miles and Acres of Roaded Disturbance	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	2,441,804		
Alternative C	110,780	-2,331,024	-96%
Alternative D	85,921	-2,355,883	-96%
Alternative E	0	-2,441,804	-100%
Alternative F	104,390	-2,337,414	-96%
Alternative G	95,994	-2,345,810	-96%

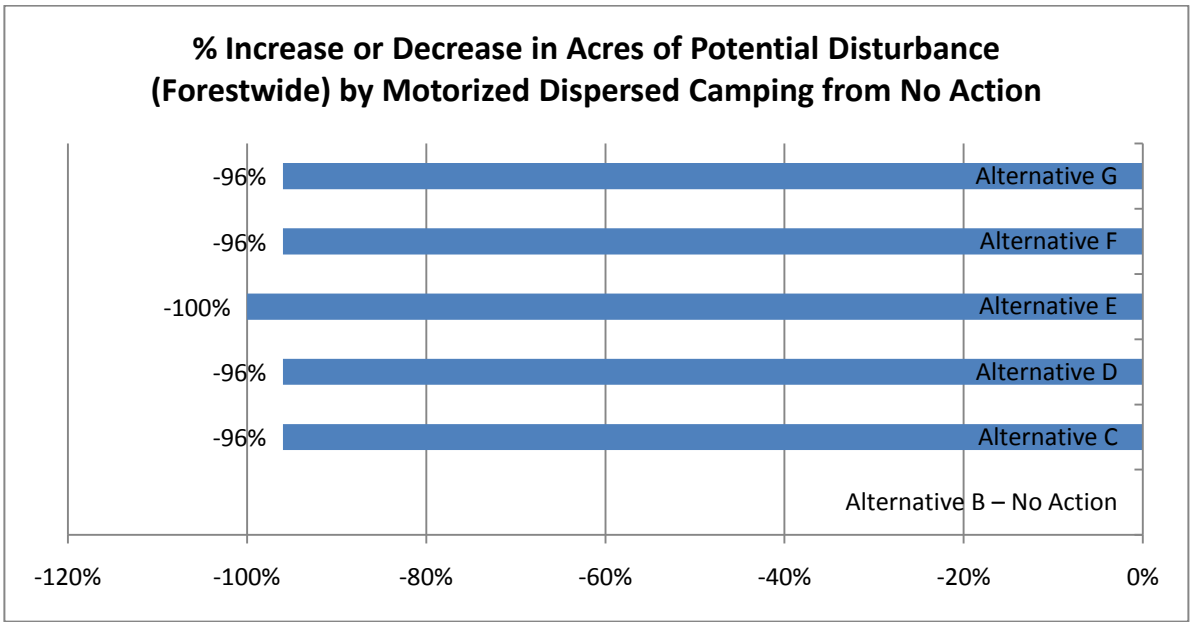


Table 41 Forestwide Acres of Potential Disturbance from Motorized Big Game Retrieval

Forestwide Miles and Acres of Roaded Disturbance	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	2,441,804		
Alternative C	2,076,414	-365,390	-15%
Alternative D	85,921	-2,355,883	-96%
Alternative E	0	-2,441,804	-100%
Alternative F	1,501,870	-939,934	-38%
Alternative G	95,994	-2,345,810	-96%

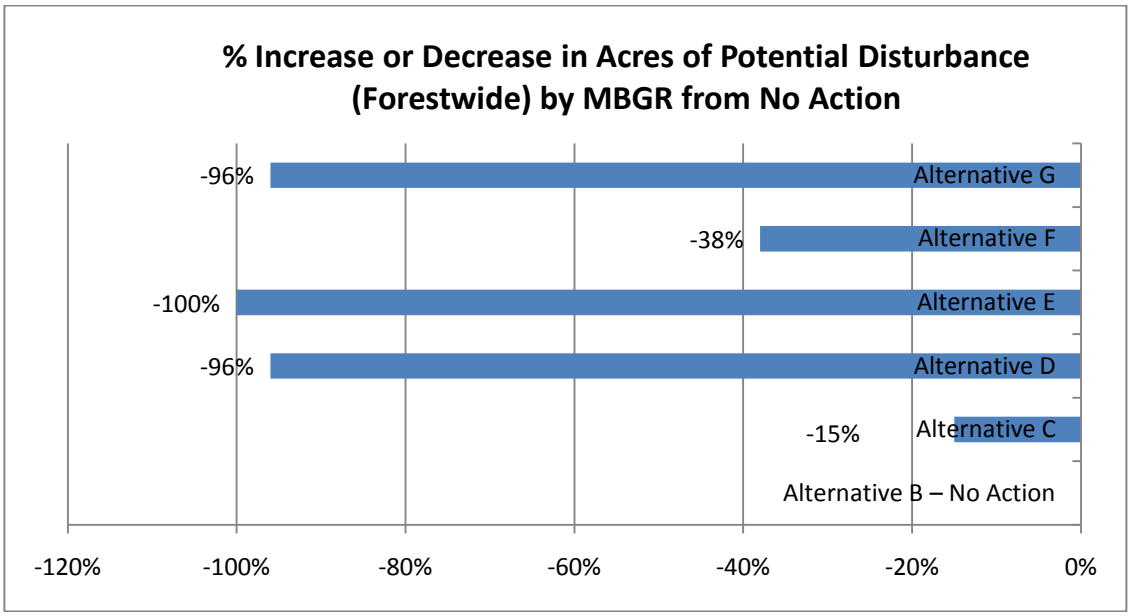


Table 42. Forestwide Acres of Potential Disturbance from Motorized Areas

Forestwide Miles and Acres of Roaded Disturbance	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	2,441,804		
Alternative C	31	-2,441,768	≈-100%
Alternative D	0	-2,441,804	-100%
Alternative E	0	-2,441,804	-100%
Alternative F	31	-2,441,768	≈-100%
Alternative G	31	-2,441,768	≈-100%

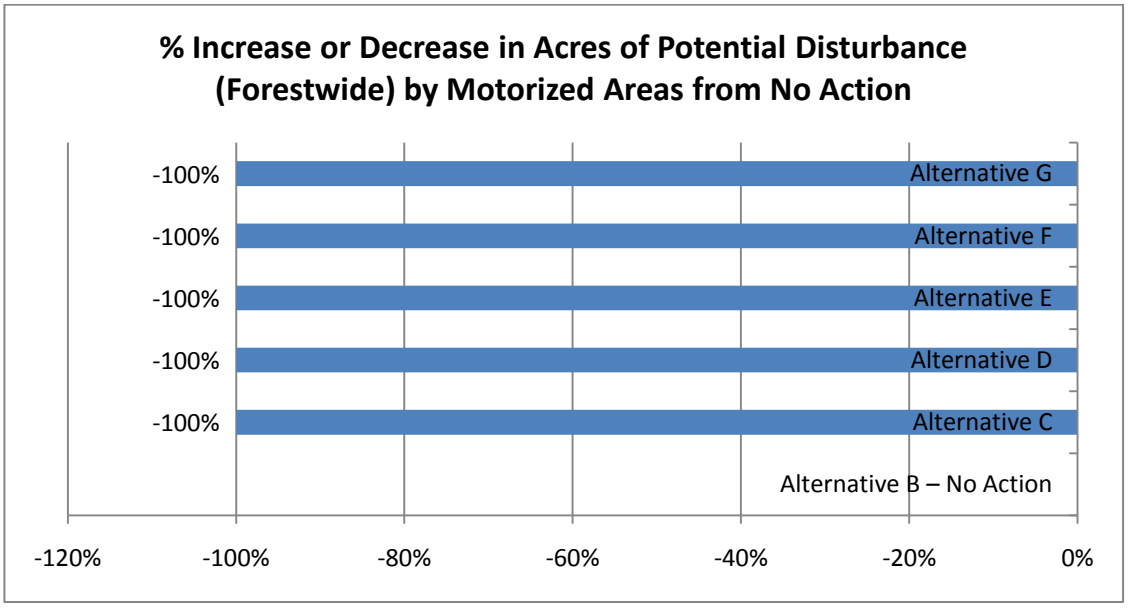
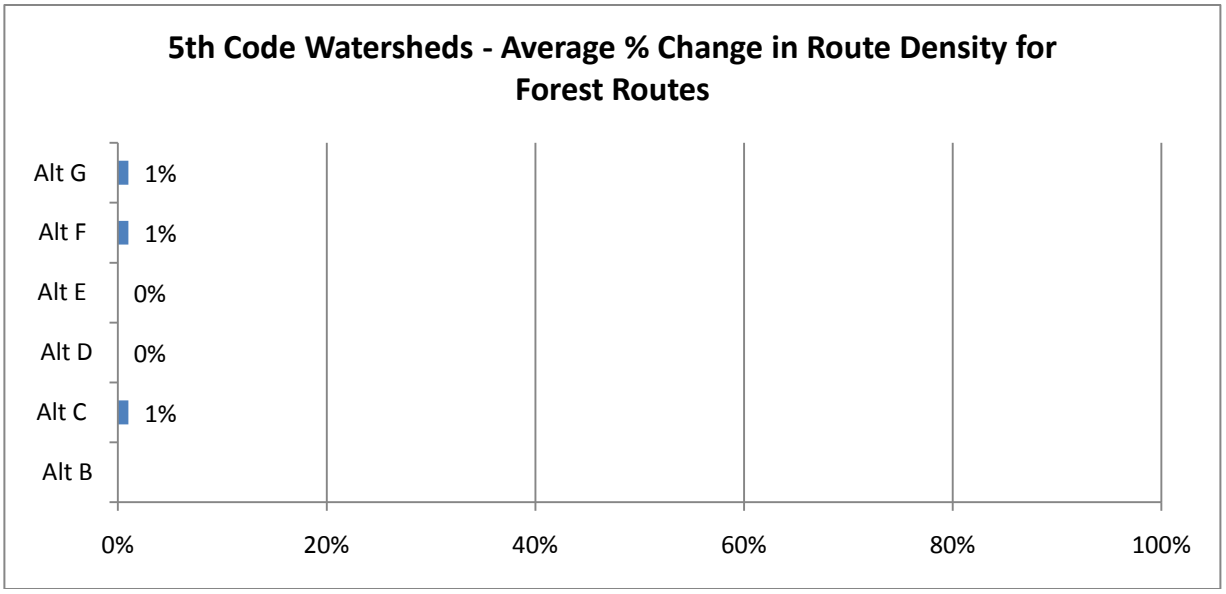


Table 43. Forestwide Route Density

Motorized Forest Service Route Density (including proposed closed roads that have not been hydrologically disconnected)						
5th Code Watershed	Alt B (mi/m²)	Alt C (mi/m²)	Alt D (mi/m²)	Alt E (mi/m²)	Alt F (mi/m²)	Alt G (mi/m²)
Agua Fria Creek 1502000305	0.46	0.46	0.46	0.45	0.46	0.46
Alamocito Canyon 1302020804	0.72	0.72	0.72	0.72	0.72	0.72
Animas Creek 1303010103	0.03	0.03	0.03	0.03	0.03	0.03
Bear Creek 1504000205	0.27	0.31	0.29	0.29	0.29	0.29
Berenda Creek 1303010301	0.09	0.10	0.09	0.09	0.09	0.09
Blue Creek 1504000403	0.11	0.11	0.10	0.10	0.11	0.11
Corduroy Canyon 1504000102	0.92	0.93	0.93	0.93	0.93	0.93
Corral Canyon 1504000203	0.13	0.15	0.13	0.13	0.13	0.13
Coyote Creek 1502000103	0.20	0.20	0.20	0.20	0.20	0.20
Cuchillo - Negro Creek 1303010101	0.20	0.20	0.20	0.20	0.20	0.20
Engineer Canyon 1504000302	0.04	0.04	0.04	0.04	0.04	0.04
Ft. Bayard 1303020203	0.05	0.05	0.05	0.05	0.05	0.05
Hells Hole 1504000202	0.00	0.00	0.00	0.00	0.00	0.00
Hot/Cold Springs 1303020202	0.08	0.08	0.08	0.08	0.08	0.08
Largo Creek 1502000306	0.97	0.97	0.97	0.97	0.97	0.97
Lower San Francisco River 1504000408	0.60	0.60	0.60	0.60	0.60	0.60
Mangas Creek 1502000307	0.29	0.29	0.29	0.29	0.29	0.29
Mangas Valley 1504000204	0.29	0.40	0.34	0.30	0.37	0.36
Mangitas Creek 1502000301	0.10	0.10	0.10	0.10	0.10	0.10
Middle Fork Gila River 1504000103	0.98	0.98	0.98	0.98	0.98	0.98
Middle San Francisco River 1504000405	0.94	0.97	0.94	0.94	0.95	0.95
Mogollon Creek 1504000106	0.02	0.02	0.02	0.02	0.02	0.02
Negrito Creek 1504000406	1.66	1.71	1.70	1.66	1.71	1.71
O Bar O Canyon 1504000101	0.52	0.52	0.52	0.52	0.52	0.52
Palomas Creek 1303010102	0.10	0.10	0.10	0.10	0.10	0.10
Percha Creek 1303010104	0.18	0.19	0.18	0.18	0.18	0.18
Plains of San Agustin 1302020805	0.30	0.30	0.30	0.30	0.30	0.30
Puerto Viejo 1302020801	0.06	0.06	0.06	0.06	0.06	0.06
Sacaton Canyon 1504000201	0.21	0.21	0.21	0.21	0.21	0.21
Sapillo Creek 1504000107	1.02	1.07	1.03	1.02	1.02	1.02
Silver City Watershed 1303020204	0.17	0.17	0.17	0.17	0.17	0.17
Thompson Canyon 1504000306	0.21	0.23	0.23	0.21	0.23	0.23
Tularosa River 1504000402	1.45	1.45	1.45	1.44	1.45	1.45
Upper Mimbres River 1303020201	0.56	0.68	0.57	0.57	0.57	0.57
Upper San Francisco River 1504000401	1.24	1.24	1.24	1.24	1.24	1.24
Wahoo Canyon 1302021102	0.17	0.17	0.17	0.17	0.17	0.17
Walking X Canyon 1504000301	0.09	0.10	0.10	0.09	0.10	0.10

Motorized Forest Service Route Density (including proposed closed roads that have not been hydrologically disconnected)						
5th Code Watershed	**Alt B (mi/m²)**	**Alt C (mi/m²)**	**Alt D (mi/m²)**	**Alt E (mi/m²)**	**Alt F (mi/m²)**	**Alt G (mi/m²)**
Wall Lake 1504000104	0.16	0.16	0.16	0.16	0.16	0.16
West Fork Gila River 1504000105	0.03	0.03	0.03	0.03	0.03	0.03
White Signal 1303020212	0.03	0.03	0.03	0.03	0.03	0.03
Whitewater - San Francisco 1504000404	0.62	0.63	0.62	0.61	0.63	0.63
Average % change per watershed in route density		**+1%**	**0%**	**0%**	**+1%**	**+1%**



General Direct and Indirect Effects Common to All Alternatives:
Effects to watershed condition that will carry throughout all alternatives are related to the impact routes can have on watershed conditions across the landscape. Roads affect watershed condition because more sediment is contributed to streams from roads and road construction than any other land management activity. Roads directly alter natural sediment and hydrologic regimes by changing streamflow patterns and amounts, sediment loading, transport, and deposition, channel morphology and stability, water quality and riparian conditions within a watershed (Gibbons and Salo 1973, Dunne and Leopold 1978, Copstead et al. 1997). Road maintenance can also increase sediment routing to streams by creating areas prone to surface runoff, altering slope stability in cut and fill areas, and altering drainage patterns (Reid and Dunne 1984, Megahan 1978, Burroughs and King, 1989, Luce and Black 2001). Road density is known to play a dominant role in human-induced augmentation of sediment supply by erosion and mass wasting in upland forested landscapes in the Pacific Northwest (Cederholm et al. 1981, Furniss et al. 1991) and it reasonable to assume that similar relationships exist elsewhere. Road-related mass soil movements can continue for decades after roads have been constructed and long-term slope failures frequently occur following road construction and timber harvest (Megahan and Bohn 1989).

Any road segment that, during high runoff event has a continuous surface flow path between the road prism and a natural stream channel is a hydrologically connected road segment. The proximity of roads to streams is a surrogate for identifying hydrologically connected roads to streams. Road closures do not immediately eliminate hydrologic impacts. Rather, the disturbed surface takes years to stabilize, which depends on the level of success in the closure, underlying soils, vegetative regrowth, and other such factors. Roads, including those behind gates and dropped from inventories, continue to produce sediment until they are totally revegetated. Proper road obliteration or decommissioning, which returns the road bed and fill slope to the contours of the land and replaces culverts with natural stream channels, offers the best opportunity to restore health to heavily roaded watersheds and to aquatic habitat downstream.

Across several million acres of the Gila National Forest, the combined total acres of motorized roads and trails can impact the integrity of a watershed. Unpaved roads, of which are the majority of Forest system roads, are particularly vulnerable to rainfall, and the ensuing runoff that erodes the road surface. Both paved and unpaved roads concentrate and accelerate flow, which can further erode unarmored surfaces including the road bed, road fills, cut hillslopes, and unarmored outlets to drainage features. Without any means of detention such as vegetation or sediment basins, roads can efficiently convey sediment directly into the drainage network, including all ephemeral, intermittent, and perennial streams. Road widths on this Forest range, on average from 3 feet for motorcycle trails to 20+ feet on maintenance level 5 roads, at the expense of vegetation and ground cover. In addition, the road prism of cut, fill, and travel surface typically disturb and occupy a wider area than trails primarily used for non-motorized travel. Road widths on maintenance level 2 roads can become wider when traveled on during wet periods, as motorists often drive around large mud puddles, creating a secondary route adjacent to the primary route.

Routes also disrupt a watershed's natural hydrologic flow by capturing surface and subsurface runoff on hillslopes. This interrupts natural flow paths to the stream system. Unmitigated, the captured runoff can be delivered to stream systems more rapidly, at higher rates of flow, and can impact the timing and magnitude of natural stream flows. Stream channels will respond to significant increases in flow rates by widening or deepening in order to carry these greater flowrates. When a road is cut across a hillside, it often intercepts subsurface water flow and runs it down ditches and through culverts. It then picks up sediment and is joined by sediment-laden runoff from the roadbed and cut banks before running into a stream. Increased deposits of sediment into a watershed's entire drainage network can come from roads and trails that are directly and indirectly connected to a channel. In addition, roads constructed on unstable slopes can add to structural instability of these areas, leading to landslides and greater sources of sediments.

Road impacts can persist long after a travelway is closed unless measures are taken to disconnect runoff pathways into a stream channel and/or onto a road surface. Proper design and location of travelways can significantly reduce the risk of flood flows, slope failures, sedimentation, and stream channel degradation. This includes avoidance of steep slopes, high-erosion hazard areas, stream channels, riparian and wetland areas, and areas of high mass

movement potential. When roads are properly planned, constructed, and maintained, their long-term impacts on watershed resources, whether or not they are open or closed to travel, are effectively reduced.

Watershed conservation practices and forest plan standards and guidelines prescribe extensive measures to protect soil, riparian, wetland, and aquatic resources. Generally, adverse impacts on these resources can be minimized when all applicable measures are applied and effective. However, there is always a risk that these protective measures will fail to be fully effective. Alternatives that propose lesser densities of roads may decrease the risk of adverse impacts on aquatic and riparian resources, and ultimately, water quality.

Cross-country travel across the entire analysis area would potentially cause adverse impacts to a watershed, especially those with vulnerable resources such as sensitive soils, riparian areas, wetlands, and aquatic resources. Continued cross country use may result in additional unauthorized trails simply from the continued act of riding over the same area several times. As this activity is not regulated or constructed to Forest standards, it is difficult for the Forest Service to limit or control. As evidenced by existing unauthorized trails, these new trails will typically lack proper planning and design to limit the negative effects on soil and water resources. Currently, the Gila National Forest has seen minimal adverse impacts related to cross country travel for dispersed camping and big game retrieval. Cross country use on this Forest is infrequent and dispersed enough that few permanent tracks are created, based on Forest staff observations. Some situations do exist, however, where local residents have created an "undesignated" route based on a favorite destination off of a designated route.

Alternative B – No Action

Impacts to watershed health as a result of road and trail condition on the Forest are detailed above in the Effects Common to All Alternatives. Across the Gila National Forest, there are 5,221 miles of routes (7,682 acres) that have the potential to impact watershed health.

Cross country travel by motorized vehicles is permitted in all areas, except designated Wilderness, roads, trails, or areas specified in Forest Orders, and restricted off-road vehicle areas identified in the Forest Land Management Plan. This cross country travel includes access for motorized big game retrieval, motorized dispersed recreation and motorized camping and ATV/motorcycle areas. Currently, cross country travel associated with motorized dispersed camping, motorized big game retrieval, and motorized areas (both camping and ATV/motorcycle) has the potential to impact approximately 2,441,804 acres of Forest system lands.

Effects Unique to each Action Alternative

Each action alternative will be evaluated based on the potential risk to watershed health relative to the change from the No Action alternative. The effects common to all alternatives will have the potential to either increase, decrease or remain the same, based on the change from the No Action Alternative. The relative risk of change from baseline is derived based on the potential acres of watershed under each of the action alternatives.

Alternative C

Motorized Routes – Acres of watershed impacted by roads and trails that are open and closed (but not decommissioned), increases by 1%, which is slightly higher than the No Action Alternative and Alternative E, but the same as Alternatives D, F and G. The average % change in 5th code watershed route densities for Forest-managed roads would increase by ≈ 1% , similar to Alternatives F and G. (Note: These figures represent a relative change across the landscape, as they do not account for the route changes occurring within wetlands, riparian areas, or adjacent to perennial, intermittent or impaired streams, which have been considered a net benefit when closed).

Motorized Dispersed Recreation (300' corridor designated along specific routes)—Forestwide acres of watershed potentially impacted by motorized dispersed recreation is decreased by more than 95% under all action alternatives, with Alternative E showing the largest reduction.

Motorized Big Game Retrieval (1 mile corridor for elk, deer, bear, mountain lion, javelina, pronghorn)— Forestwide acres of watershed potentially impacted by motorized big game retrieval decreases by 15% under this alternative, which is the least of any action alternative.

Motorized Areas (39 areas: 1 motorcycle/ATV; 38 camping)—The Travel Management Rule defines 'areas' as open to all motorized vehicle use. The 38 camping areas proposed in this alternative are existing sites with traditional use related to camping. The majority of these sites are less than 1 acre in size. The motorcycle/ATV area covers approximately 3.3 acres. Forestwide acres of watershed potentially impacted by motorized camping areas are virtually eliminated under this alternative, with only 31 acres remaining available across the Forest, similar to Alternatives F and G.

Alternative D

Motorized Routes— Acres of watershed impacted by roads and trails that are open and closed (but not decommissioned), increases by 1%, which is slightly higher than the No Action Alternative and Alternative E, but the same as Alternatives C, F and G. The average % change in 5th code watershed route densities for Forest-managed roads would remain the same (0% increase) as the No Action Alternative and Alternative E, which is less than Alternatives C, F and G. (Note: These figures represent a relative change across the landscape, as they do not account for the route changes occurring within wetlands, riparian areas, or adjacent to perennial, intermittent or impaired streams, which have been considered a net benefit when closed).

Motorized Dispersed Recreation (300' corridor designated along specific routes) — Forestwide acres of watershed potentially impacted by motorized dispersed recreation is decreased by more than 95% under all action alternatives, with Alternative E showing the largest reduction.

Motorized Big Game Retrieval (within 300' dispersed camping corridor) — Forestwide acres of watershed potentially impacted by motorized big game retrieval decreases by 96% under this alternative, which is similar to Alternatives E and G.

Motorized Areas (no areas designated)—there would be no potential adverse impacts to watershed health across the Forest due to camping areas under this alternative, similar to Alternative E.

Alternative E

Motorized Routes— Acres of watershed impacted by roads and trails that are open and closed (but not decommissioned), remains the same (0% increase) as the No Action Alternative, which is less than Alternatives C, D, F, and G. Route densities across the Forest would remain the same (0% increase) as the No Action Alternative, similar to Alternative D. This is less than Alternatives C, F, and G.

Motorized Dispersed Recreation (No camping corridors designated) — There would be no potential adverse impacts to watershed health due to motorized dispersed recreation under this alternative. Forestwide acres of watershed potentially impacted by motorized dispersed recreation is decreased by more than 95% under all action alternatives, with Alternative E showing the largest reduction.

Motorized Big Game Retrieval (No motorized big game retrieval permitted)— There would be no potential adverse impacts to watershed health due to motorized big game retrieval under this alternative. This alternative is similar to Alternatives D and G, which both reduce potential acres of disturbance by 96%.

Motorized Areas (no areas designated) – Same as Alternative D— There would be no potential adverse impacts to watershed health due to motorized camping areas under this alternative, similar to Alternative D.

Alternative F

Motorized Routes— Acres of watershed impacted by roads and trails that are open and closed (but not decommissioned), increases by 1%, which is slightly higher than the No Action Alternative and Alternative E, but the same as Alternatives C, D and G. The average % change in 5th code watershed route densities for Forest-managed roads would increase by 1%, similar to Alternatives C and G. (Note: These figures represent a relative change across the landscape, as they do not account for the route changes occurring within wetlands, riparian areas, or adjacent to perennial, intermittent or impaired streams, which have been considered a net benefit when closed).

Motorized Dispersed Recreation (300’ corridor designated along specific routes) — Forestwide acres of watershed potentially impacted by motorized dispersed recreation is decreased by more than 95%, under all action alternatives, with Alternative E showing the largest reduction.

Motorized Big Game Retrieval (within ½ mile of motorized routes, elk only)— Forestwide acres of watershed potentially impacted by motorized big game retrieval decreases by 38%, under this alternative, which is less of a reduction than Alternatives D, E, and G, but greater than Alternative C.

Motorized Areas (39 areas: 1 motorcycle/ATV; 38 camping)—same as Alternative C—Forestwide acres of watershed potentially impacted by motorized camping areas are virtually eliminated under this alternative, with only 31 acres remaining across the entire Forest, similar to Alternatives C and G.

Alternative G

Motorized Routes— Acres of watershed impacted by roads and trails that are open and closed (but not decommissioned), increases by 1%, which is slightly higher than the No Action Alternative and Alternative E, but the same as Alternatives C, D and F. The average % change in 5th code watershed route densities for Forest-managed roads would increase by 1%, similar to Alternatives C and F. (Note: These figures represent a relative change across the landscape, as they do not account for the route changes occurring within wetlands, riparian areas, or adjacent to perennial, intermittent or impaired streams, which have been considered a net benefit when closed).

Motorized Dispersed Recreation (300' corridor designated along specific routes) — Forestwide acres of watershed potentially impacted by motorized dispersed recreation is decreased by more than 95%, under all action alternatives, with Alternative E showing the largest reduction.

Motorized Big Game Retrieval (within 300' dispersed camping corridor) — Forestwide acres of watershed potentially impacted by motorized big game retrieval decreases by 96% under this alternative, which is similar to Alternatives D and E.

Motorized Areas (39 areas: 1 motorcycle/ATV; 38 camping) — same as Alternative C and F—Forestwide acres of watershed potentially impacted by motorized camping areas are virtually eliminated under this alternative, with only 31 acres remaining across the Forest.

Note:
If closed routes across the Forest are eventually decommissioned and hydrologically disconnected from the drainage network, it would then be considered a net benefit to this component of watershed health. Tables 44 and 45 display the potential for beneficial impacts, if closed routes are decommissioned in the future.

Table 44 Miles and Acres of Motorized Routes on Gila National Forest if Closed Routes are Decommissioned in Future.

Forestwide Miles and acres of disturbance of motorized routes by proposal and percent increase or decrease from the No Action Miles and Acres of Roaded Disturbance	Miles	Change in Miles from No Action	% Increase or decrease from No Action	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	5,221			7,682		
Alternative C	4,634	-587	-11%	6,835	-847	-11%
Alternative D	3,443	-1,778	-34%	5,191	-2,491	-32%
Alternative E	2,758	-2,463	-47%	4,219	-3,463	-45%
Alternative F	3,810	-1,411	-27%	5,711	-1,971	-26%
Alternative G	3,789	-1,432	-27%	5,682	-2,000	-26%

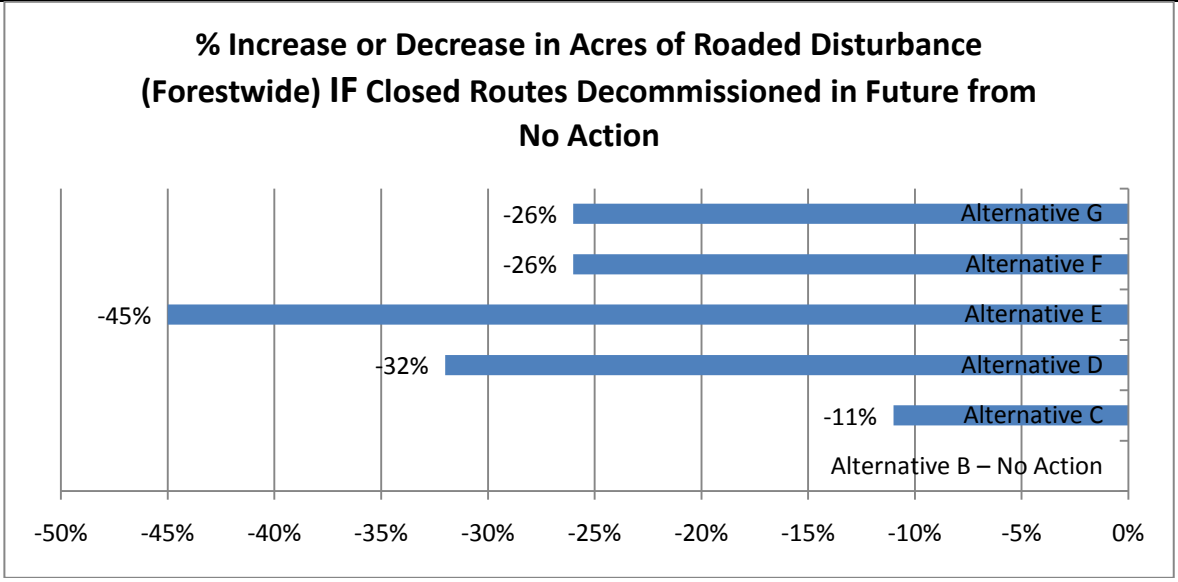
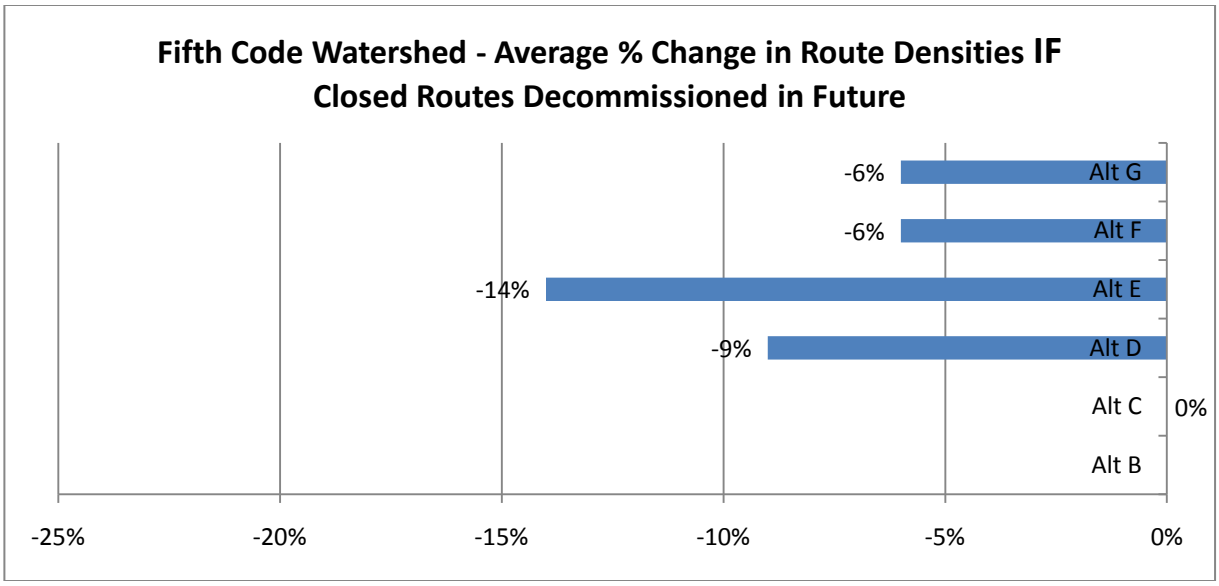


Table 45 Motorized Forest Service Route Densities on Gila National Forest if Closed Routes are Decommissioned in Future (hydrologically disconnected)

Motorized Forest Service Route Densities on GNF if Closed Roads are Decommissioned in Future						
5th Code Watershed	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Agua Fria Creek 1502000305	0.40	0.40	0.32	0.29	0.34	0.33
Alamocito Canyon 1302020804	0.67	0.65	0.45	0.38	0.49	0.48
Animas Creek 1303010103	0.03	0.03	0.02	0.02	0.03	0.03
Bear Creek 1504000205	0.25	0.26	0.19	0.18	0.19	0.19
Berenda Creek 1303010301	0.09	0.09	0.06	0.06	0.08	0.08
Blue Creek 1504000403	0.09	0.09	0.07	0.05	0.08	0.08
Corduroy Canyon 1504000102	0.86	0.82	0.59	0.50	0.72	0.72
Corral Canyon 1504000203	0.12	0.14	0.09	0.06	0.10	0.10
Coyote Creek 1502000103	0.12	0.12	0.07	0.05	0.08	0.08
Cuchillo - Negro Creek 1303010101	0.19	0.17	0.14	0.13	0.15	0.15

Motorized Forest Service Route Densities on GNF if Closed Roads are Decommissioned in Future						
5th Code Watershed	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Engineer Canyon 1504000302	0.04	0.04	0.03	0.03	0.03	0.03
Ft. Bayard 1303020203	0.05	0.05	0.03	0.03	0.03	0.03
Hells Hole 1504000202	0.00	0.00	0.00	0.00	0.00	0.00
Hot/Cold Springs 1303020202	0.08	0.08	0.05	0.05	0.07	0.07
Largo Creek 1502000306	0.85	0.85	0.65	0.58	0.65	0.65
Lower San Francisco River 1504000408	0.59	0.56	0.44	0.38	0.46	0.45
Mangas Creek 1502000307	0.26	0.25	0.19	0.14	0.19	0.19
Mangas Valley 1504000204	0.28	0.39	0.25	0.14	0.29	0.29
Mangitas Creek 1502000301	0.09	0.09	0.07	0.06	0.07	0.07
Middle Fork Gila River 1504000103	0.88	0.87	0.63	0.41	0.71	0.73
Middle San Francisco River 1504000405	0.82	0.84	0.65	0.52	0.71	0.72
Mogollon Creek 1504000106	0.02	0.02	0.01	0.01	0.01	0.02
Negrito Creek 1504000406	1.30	1.35	1.01	0.64	1.19	1.19
O Bar O Canyon 1504000101	0.50	0.50	0.36	0.28	0.45	0.45
Palomas Creek 1303010102	0.09	0.08	0.05	0.05	0.08	0.08
Percha Creek 1303010104	0.17	0.17	0.12	0.12	0.15	0.15
Plains of San Agustin 1302020805	0.29	0.28	0.22	0.16	0.23	0.23
Puerto Viejo 1302020801	0.05	0.05	0.04	0.04	0.04	0.04
Sacaton Canyon 1504000201	0.20	0.19	0.12	0.09	0.13	0.13
Sapillo Creek 1504000107	1.02	1.05	0.71	0.49	0.82	0.82
Silver City Watershed 1303020204	0.11	0.10	0.08	0.08	0.08	0.08
Thompson Canyon 1504000306	0.17	0.19	0.13	0.10	0.14	0.14
Tularosa River 1504000402	1.39	1.36	1.09	0.98	1.14	1.12
Upper Mimbres River 1303020201	0.56	0.67	0.43	0.32	0.48	0.48
Upper San Francisco River 1504000401	1.04	1.02	0.77	0.65	0.84	0.81
Wahoo Canyon 1302021102	0.15	0.08	0.07	0.07	0.08	0.08
Walking X Canyon 1504000301	0.08	0.09	0.06	0.04	0.06	0.06
Wall Lake 1504000104	0.16	0.16	0.15	0.15	0.15	0.15
West Fork Gila River 1504000105	0.03	0.02	0.02	0.02	0.02	0.02
White Signal 1303020212	0.02	0.02	0.01	0.01	0.01	0.01
Whitewater - San Francisco 1504000404	0.57	0.59	0.50	0.45	0.52	0.52
Average % change per watershed in motorized route density		0%	-9%	-14%	-6%	-6%



Cumulative Effects

Cumulative effects are often assessed by watershed, or, as a portion of a specific watershed. This type of assessment addresses the incremental impacts of an action when added to other past, present, and foreseeable future actions, regardless of what entity is or has undertaken the action(s). A watershed cumulative impact can be defined as the total impact, positive or negative, on runoff, erosion, water yield, floods, and/or water quality that result from the incremental impact of a proposed action, when added to other past, present and reasonably foreseeable future actions occurring within the same natural drainage basin (watershed) (1978 CEQ definition of cumulative impacts). Cumulative watershed effects are defined as the impact of activities on surface runoff and erosion, water yield, peak flows and flooding, channel stability, sedimentation and water quality. Activities that influence these effects can include timber harvest, grazing, roads, fire, mining, recreational activities, and other land disturbing actions that remove vegetation and litter which can expose or compact soil. Loss of vegetation and exposed soil can result in reduced interception and transpiration rates and increase surface runoff and erosion.

The Gila National Forest currently has 29 water bodies that are listed as not meeting New Mexico State Water Quality Standards. The majority of these streams originates on Forest system lands, and flow through land managed by the Gila National Forest. It is only reasonable to consider that cumulative impacts of past Forest activities, as well as ongoing Forest activities, have played a role in some of these listings. While difficult to quantify or measure cumulative effects, it is possible to estimate acres of disturbance across a watershed and estimate which activities may have the greatest influence in cumulatively impacting watershed health.

To estimate cumulative effects for this project, a preliminary screening procedure (adapted from the Apache/Sitgreaves National Forests Cumulative Watershed Effects Analysis Procedure, 2004) was used that was designed to indicate the possibility of adverse effects occurring as a result of cumulative watershed impacts. The procedure looks at activities within Gila National Forest watersheds to assess if the amount of activities has resulted in

land disturbance that has reached or exceeded a threshold of concern. This procedure is based on equivalent disturbed area within a watershed, which includes the area associated with ground disturbing activities, within the past 25 years. A recovery factor is used to reflect dissipation of effects over a 2 to 25 year period, depending on the severity of the activity. Activities are then converted into equivalent disturbed area (EDA), using roads as an index. EDA is a means to display disturbed areas in a watershed on an equal basis. Roads can be assigned a rating of 1 (based on curve number rationale), and all other activities can be assigned a rating that is proportional to 1. The threshold level was set at 15% for this project, where cumulative impacts of a watershed area are in a disturbed condition. Meeting this threshold does not necessarily indicate that a level has been passed where cumulative effects are significantly adverse, however it is used as an indicator that land disturbing activities may be approaching a level where a watershed may begin to lose its resiliency to change. If a threshold of concern is approached, then it may lead to development of a new alternative, modification of an existing alternative, or a more detailed hydrologic analysis to determine if cumulative effects are adverse and significant.

Cumulative effects were analyzed at the 5^{th} code watershed, which is reasonable for a landscape level project. One limitation of the procedure used, however, is that it was developed for watershed sizes comparative to a 6^{th} code watershed level. To compensate for this, where specific 5^{th} code watersheds indicated higher levels of disturbance, a closer look at the 6^{th} code level was examined to assess if activities were concentrated enough in one location to create concern for adverse impacts. While the large scale at which the fifth code watershed is delineated is so large that it does not allow accurate determination of effects of a specific project proposal, it is still considered relevant in a broad look at cumulative impacts across the Gila National Forest. Another constraint of doing the analysis at this scale is that observable impacts (beneficial or detrimental) at the outlet of a 5^{th} code watershed would likely be diluted over such a large area.

Examples of activities that occur in a watershed and their associated equivalent disturbed area factor are included in Table 46. A complete list of EDA factors used for this analysis is included in Appendix A.

Table 46. Examples of Activity and EDA Factors*

ACTIVITY	EDA Factor
Open Roads	1.0
Closed Roads	0.90
Partial cuts	0.15 - 0.35
Non-regenerated timber stands	1.0
Wildland Fire (high intensity)	0.5
Urban settings (houses, etc)	0.4 – 1.0
Heavy use sites	0.7
Firewood (green use areas)	0.15
Mining milling and manufacturing sites	1.0

*grazing EDA factor currently not developed.

The EDA analysis was performed on all 5th code watersheds that intersect the Gila National Forest, where Forest ownership is 8% or greater. 33 fifth code watersheds met these criteria. Watersheds that were eliminated from the EDA analysis include Blue Creek, Engineer Canyon, Ft. Bayard, Hells Hole, Mangitas Creek, Puerto Viejo, Walking X, and White Signal. However, a narrative describing all known past, present, and reasonably foreseeable future activities was prepared for all 41 5th code watersheds intersecting the Gila National Forest. These narratives can be found in Appendix C, and were used as a basis for compiling information to use in the EDA analysis. All EDA analysis for the 33 watersheds is included in Appendix D.

The EDA analysis was performed for two years, 2010 and 2025, to assess change over a 15-year period. Existing cumulative impacts were assessed for the No Action Alternative to determine if any of the Gila National Forest's watersheds were already approaching, or exceeding, a level of disturbance that would cause concern.

Tables 47 and 48 provide the percent of equivalent disturbed areas calculated for 2010 and 2025, respectively. None of the 5th code watersheds approached the 15% disturbance threshold, which was expected due to the dilution effect of these large watersheds. Review of Alternative B identifies three watersheds having disturbance levels above 3%: Corduroy Canyon at 8.6%, Negrito Creek at 5.7%, and Upper San Francisco at 3.4%. A closer look was taken at these three watersheds to see how large a role that roads (all ownerships) are playing in watershed disturbance. A review of road densities at the 5th code level (Table 49) indicates that the Upper San Francisco River 5th code watershed has the second highest road density (1.83 mi/mi^2) of all Forest watersheds. The Negrito Creek watershed has the fourth highest road density (1.73 mi/mi^2), and the Corduroy Canyon watershed has a density of 1.21 mi/mi^2, which is close to the Forest average 5th code watershed road density of 1.14 mi/mi^2.

Breaking these densities down even further, 6th code watershed densities were evaluated using the criteria established in the Draft Implementation Guide for Assessing and Tracking Changes to Watershed Condition. The Guide uses a Road and Trail Network Indicator as one of twelve factors to consider in assessing 6th code watershed condition. This indicator identifies the following three condition ratings for road densities:

- <1 mi/mi^2 = Good (Functioning Properly)
- 1 mi/mi^2 – 2.4 mi/mi2 = Fair (Functioning at Risk)
- >2.4 mi/mi^2 = Poor (Impaired)

Using these criteria, within the Corduroy Canyon 5th code watershed , five 6th code watersheds are rated as Fair and two are rated as Good. Within the Negrito Creek 5th code watershed, two 6th code watersheds are rated Poor, three are rated Fair, and three are rated as Good. Within the Upper San Francisco River 5th code watershed, two 6th code watersheds are rated as Poor, seven are rated as Fair, and one is rated as Good. (Appendix B contains a complete list of all 6th code road densities). Closed roads were still considered a part of the road system for the density calculations, as decommissioning of closed roads is currently not scheduled or planned as part of this project.

These results initiated a further look at the Negrito Creek and Upper San Francisco 5th code watersheds, as road densities were high in four of the 6th code watersheds. Neither of these two watersheds has any acres of Wilderness and activities appear to be well-distributed across the watershed versus confined to smaller areas, such as one or two 6th code watersheds. Under existing condition, 7% of the disturbance acres in the Negrito Creek watershed are a result of motorized routes, while 14% of the disturbance acres in the Upper San Francisco watershed are a result of motorized routes. These two watersheds have hosted the majority of past and present timber harvesting activities on the Forest, with roads having been constructed to accommodate this action. While timber harvesting activities are not as prevalent today as they were in the 1980s and 1990s, a majority of the timber-related roads are still in use and are contributing to cumulative watershed impacts and high road densities. The majority of disturbance acres in both watersheds are a result of past and present vegetation treatment activities, including fire. In the 2025 EDA analysis, cumulative effects diminish, however it is unforeseen what levels of disturbance that future activities may bring. While not currently approaching a threshold of concern at the fifth code level, these two watersheds provide opportune locations to prioritize future decommissioning activities to further alleviate cumulative watershed impacts and reduce road densities.

Table 47. Equivalent Disturbed Area % (2010)

% Total Equivalent Disturbed Area - 2010									
Hydrologic Unit Code	**Watershed**	**% Forest Ownership**	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**	**Threshold for EDA**
1502000305	Agua Fria Creek	42%	0.80%	0.78%	0.41%	0.39%	0.68%	0.41%	15%
1302020804	Alamocito Canyon	37%	2.31%	2.29%	1.96%	1.94%	2.21%	1.97%	15%
1303010103	Animas Creek	24%	0.42%	0.39%	0.38%	0.38%	0.39%	0.38%	15%
1504000205	Bear Creek	53%	0.77%	0.54%	0.28%	0.28%	0.41%	0.28%	15%
1303010301	Berenda Creek	17%	0.55%	0.49%	0.39%	0.39%	0.44%	0.39%	15%
1504000102	Corduroy Canyon	80%	8.63%	8.56%	7.92%	7.90%	8.39%	7.93%	15%
1504000203	Corral Canyon	18%	1.38%	1.34%	1.23%	1.22%	1.28%	1.23%	15%
1502000103	Coyote Creek	8%	0.58%	0.58%	0.51%	0.50%	0.56%	0.51%	15%

% Total Equivalent Disturbed Area - 2010									
Hydrologic Unit Code	Watershed	% Forest Ownership	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G	Threshold for EDA
1303010101	Cuchillo - Negro Creek	31%	0.73%	0.59%	0.43%	0.43%	0.51%	0.43%	15%
1303020202	Hot/Cold Springs	17%	0.47%	0.39%	0.31%	0.31%	0.33%	0.31%	15%
1502000306	Largo Creek	68%	1.29%	1.25%	0.72%	0.69%	1.11%	0.72%	15%
1504000408	Lower San Francisco River	50%	0.91%	0.87%	0.52%	0.50%	0.77%	0.52%	15%
1502000307	Mangas Creek	15%	0.64%	0.64%	0.50%	0.50%	0.61%	0.50%	15%
1504000204	Mangas Valley	25%	2.22%	2.20%	2.01%	1.99%	2.14%	2.01%	15%
1504000103	Middle Fork Gila River	100%	1.82%	1.81%	1.33%	1.31%	1.73%	1.34%	15%
1504000405	Middle San Francisco River	100%	2.64%	2.40%	1.69%	1.68%	2.13%	1.69%	15%
1504000106	Mogollon Creek	95%	0.07%	0.06%	0.06%	0.02%	0.04%	0.02%	15%
1504000406	Negrito Creek	100%	5.65%	5.49%	4.71%	4.66%	5.31%	4.72%	15%
1504000101	O Bar O Canyon	47%	0.96%	0.94%	0.57%	0.56%	0.85%	0.58%	15%
1303010102	Palomas Creek	24%	0.48%	0.45%	0.37%	0.37%	0.41%	0.37%	15%
1303010104	Percha Creek	34%	0.54%	0.52%	0.30%	0.30%	0.45%	0.31%	15%
1302020805	Plains of San Agustin	23%	0.54%	0.53%	0.35%	0.33%	0.48%	0.35%	15%
1504000201	Sacaton Canyon	12%	0.39%	0.37%	0.31%	0.30%	0.35%	0.31%	15%
1504000107	Sapillo Creek	100%	1.28%	1.27%	0.70%	0.66%	1.12%	0.71%	15%
1303020204	Silver City Watershed	13%	0.76%	0.76%	0.73%	0.73%	0.74%	0.73%	15%
1504000306	Thompson Canyon	14%	1.76%	1.76%	1.64%	1.63%	1.72%	1.64%	15%
1504000402	Tularosa River	100%	2.73%	2.68%	1.84%	1.78%	2.51%	1.85%	15%
1303020201	Upper Mimbres River	75%	0.95%	0.78%	0.33%	0.31%	0.58%	0.34%	15%
1504000401	Upper San Francisco River	84%	3.40%	3.34%	2.65%	2.62%	3.16%	2.66%	15%
1302021102	Wahoo Canyon	16%	0.47%	0.40%	0.13%	0.13%	0.36%	0.32%	15%
1504000104	Wall Lake	100%	0.18%	0.17%	0.14%	0.05%	0.14%	0.06%	15%
1504000105	West Fork Gila River	100%	0.03%	0.03%	0.02%	0.02%	0.03%	0.02%	15%
1504000404	Whitewater - San Francisco	92%	2.92%	2.86%	2.29%	2.26%	2.73%	2.29%	15%

Table 48. Equivalent Disturbed Area % in 15 years (2025)

Total Equivalent Disturbed Area % -2025								
Hydrologic Unit Code	Watershed	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G	Threshold for EDA
1502000305	Agua Fria Creek	0.80%	0.75%	0.38%	0.35%	0.65%	0.38%	15%
1302020804	Alamocito Canyon	0.99%	0.96%	0.61%	0.58%	0.86%	0.62%	15%
1303010103	Animas Creek	0.36%	0.33%	0.32%	0.32%	0.32%	0.32%	15%
1504000205	Bear Creek	0.76%	0.52%	0.26%	0.25%	0.39%	0.26%	15%
1303010301	Berenda Creek	0.55%	0.49%	0.39%	0.38%	0.43%	0.39%	15%

Total Equivalent Disturbed Area % -2025								
Hydrologic Unit Code	**Watershed**	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**	**Threshold for EDA**
1504000102	Corduroy Canyon	2.17%	2.10%	1.42%	1.39%	1.91%	1.45%	15%
1504000203	Corral Canyon	0.59%	0.55%	0.43%	0.43%	0.49%	0.44%	15%
1502000103	Coyote Creek	0.50%	0.50%	0.42%	0.41%	0.47%	0.42%	15%
1303010101	Cuchillo - Negro Creek	0.71%	0.56%	0.40%	0.40%	0.48%	0.40%	15%
1303020202	Hot/Cold Springs	0.47%	0.39%	0.31%	0.30%	0.33%	0.31%	15%
1502000306	Largo Creek	1.01%	0.97%	0.41%	0.37%	0.80%	0.41%	15%
1504000408	Lower San Francisco River	0.71%	0.66%	0.30%	0.27%	0.56%	0.30%	15%
1502000307	Mangas Creek	0.63%	0.62%	0.48%	0.47%	0.59%	0.48%	15%
1504000204	Mangas Valley	0.98%	0.96%	0.76%	0.74%	0.89%	0.77%	15%
1504000103	Middle Fork Gila River	0.90%	0.89%	0.37%	0.33%	0.78%	0.40%	15%
1504000405	Middle San Francisco River	1.50%	1.25%	0.53%	0.50%	0.98%	0.54%	15%
1504000106	Mogollon Creek	0.07%	0.06%	0.06%	0.02%	0.04%	0.02%	15%
1504000406	Negrito Creek	2.12%	1.96%	1.13%	1.04%	1.75%	1.17%	15%
1504000101	O Bar O Canyon	0.76%	0.74%	0.36%	0.34%	0.65%	0.37%	15%
1303010102	Palomas Creek	0.45%	0.42%	0.34%	0.34%	0.39%	0.35%	15%
1303010104	Percha Creek	0.53%	0.51%	0.29%	0.28%	0.43%	0.29%	15%
1302020805	Plains of San Agustin	0.51%	0.49%	0.30%	0.28%	0.44%	0.31%	15%
1504000201	Sacaton Canyon	0.36%	0.35%	0.27%	0.26%	0.32%	0.27%	15%
1504000107	Sapillo Creek	1.03%	1.01%	0.41%	0.34%	0.84%	0.43%	15%
1303020204	Silver City Watershed	0.71%	0.71%	0.68%	0.67%	0.69%	0.68%	15%
1504000306	Thompson Canyon	0.74%	0.75%	0.62%	0.60%	0.70%	0.62%	15%
1504000402	Tularosa River	1.64%	1.58%	0.71%	0.64%	1.39%	0.72%	15%
1303020201	Upper Mimbres River	0.92%	0.74%	0.28%	0.25%	0.54%	0.29%	15%
1504000401	Upper San Francisco River	1.51%	1.44%	0.73%	0.68%	1.25%	0.74%	15%
1302021102	Wahoo Canyon	0.47%	0.40%	0.31%	0.31%	0.36%	0.32%	15%
1504000104	Wall Lake	0.18%	0.17%	0.14%	0.04%	0.14%	0.05%	15%
1504000105	West Fork Gila River	0.03%	0.03%	0.02%	0.02%	0.03%	0.02%	15%
1504000404	Whitewater - San Francisco	1.33%	1.27%	0.69%	0.66%	1.13%	0.69%	15%

Table 49. Fifth Code Watershed Road Densities (all ownerships; including proposed closed roads)

5th Code Road Densities (all ownerships) – ranked from highest to lowest						
Fifth Code Watershed	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Silver City Watershed	2.25	2.26	2.26	2.26	2.26	2.26
Upper San Francisco River	1.83	1.84	1.84	1.84	1.84	1.84
Ft. Bayard	1.83	1.83	1.83	1.83	1.83	1.83
Negrito Creek	1.73	1.78	1.77	1.73	1.78	1.78

5th Code Road Densities (all ownerships) – ranked from highest to lowest						
Fifth Code Watershed	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Tularosa River	1.71	1.71	1.71	1.70	1.71	1.71
Mangas Creek	1.70	1.70	1.70	1.70	1.70	1.70
Largo Creek	1.56	1.56	1.56	1.56	1.56	1.56
Coyote Creek	1.45	1.45	1.45	1.45	1.45	1.45
Puerto Viejo	1.44	1.44	1.44	1.44	1.44	1.44
Alamocito Canyon	1.42	1.42	1.42	1.42	1.42	1.42
Cuchillo - Negro Creek	1.36	1.36	1.36	1.36	1.36	1.36
Agua Fria Creek	1.36	1.36	1.36	1.35	1.36	1.36
Mangitas Creek	1.34	1.34	1.34	1.34	1.34	1.34
White Signal	1.33	1.33	1.33	1.33	1.33	1.33
Berenda Creek	1.30	1.32	1.31	1.31	1.31	1.31
Corduroy Canyon	1.21	1.21	1.21	1.21	1.21	1.21
Mangas Valley	1.21	1.31	1.25	1.21	1.28	1.27
Sapillo Creek	1.20	1.25	1.20	1.20	1.20	1.20
Middle San Francisco River	1.19	1.21	1.18	1.18	1.20	1.20
Palomas Creek	1.17	1.17	1.17	1.17	1.17	1.17
Walking X Canyon	1.15	1.16	1.16	1.15	1.16	1.16
Wahoo Canyon	1.08	1.08	1.08	1.08	1.08	1.08
Engineer Canyon	1.08	1.08	1.08	1.08	1.08	1.08
Middle Fork Gila River	1.08	1.07	1.08	1.07	1.07	1.08
Hot/Cold Springs	1.04	1.04	1.04	1.04	1.04	1.04
Whitewater - San Francisco	1.03	1.04	1.03	1.02	1.04	1.04
Upper Mimbres River	1.03	1.14	1.03	1.03	1.03	1.03
O Bar O Canyon	1.02	1.02	1.02	1.02	1.02	1.02
Thompson Canyon	1.01	1.02	1.02	1.01	1.02	1.02
Percha Creek	0.99	1.00	0.99	0.99	0.99	0.99
Hells Hole	0.99	0.99	0.99	0.99	0.99	0.99
Sacaton Canyon	0.98	0.98	0.98	0.98	0.98	0.98
Animas Creek	0.96	0.96	0.96	0.96	0.96	0.96
Bear Creek	0.94	0.98	0.95	0.95	0.95	0.95
Lower San Francisco River	0.92	0.92	0.93	0.92	0.92	0.93
Taylor Creek	0.91	0.91	0.91	0.91	0.91	0.91
Plains of San Agustin	0.84	0.84	0.84	0.84	0.84	0.84
Corral Canyon	0.62	0.65	0.62	0.62	0.63	0.63
Blue Creek	0.49	0.49	0.49	0.48	0.49	0.49
Wall Lake	0.18	0.18	0.18	0.18	0.18	0.18
Mogollon Creek	0.08	0.08	0.08	0.08	0.08	0.08
West Fork Gila River	0.07	0.07	0.07	0.07	0.07	0.07
Average 5th Code Road Density	1.14	1.15	1.15	1.14	1.15	1.15

5th Code Road Densities (all ownerships) – ranked from highest to lowest						
Fifth Code Watershed	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Median 5th Code Road Density	1.09	1.14	1.09	1.09	1.09	1.09

Summary of Cumulative Effects

Past and on-going activities on the Gila National Forest include a variety of actions such as fuelwood harvest, timber sale activities, mining, prescribed burns, fires, road and trail construction, rangeland grazing, hunting/camping, wildlife use, OHV use, other recreational uses, and water impoundments. Current timber sale activities have been minimal and small, and fuelwood cutting has been dispersed and would continue to be. Mining activities do occur within many of the watersheds, but to a minimal extent on Forest.
Existing Forest roads receive periodic maintenance designed to improve drainage and reduce excessive runoff and sediment into connected drainages. Future runoff and sediment are not expected to increase on existing improved Forest roads.

Current road density within many watersheds is low, although roads are one of the larger contributors of sediment to the drainage network. As noted prior, 29 stream reaches are currently not attaining State Water Quality Standards, having sedimentation and temperature issues. With many roads across the Forest lacking adequate drainage features, roads have been identified by the State as being one probable source of impairment. Water quality issues would continue to be a concern in these watersheds for stream reaches that are impaired and for those that have designated or occupied habitat for threatened, endangered, and/or sensitive species. While other perennial streams are not listed as impaired, many of these stream reaches have not yet been assessed by the State of New Mexico. Sediment input would still remain a concern in all perennial and intermittent streams impacted by routes.

Livestock grazing across the Forest has seen reductions, with added measures taken to either exclude riparian areas or implement riparian specific management along streams. Future impacts should be consistent with current impacts. Fires managed for Resource Benefit and vegetation treatments would continue to play a role in these watersheds, when possible, in attempts to restore ecosystem health. There are several localized areas across the Forest at high risk for current and/or future resource degradation without attention to Best Management Practices. In particular those areas having sensitive soils, riparian areas, and wetlands would be most vulnerable.

Reasonable foreseeable actions that are expected to occur include reauthorization of livestock grazing allotments, vegetation management projects, watershed and road/trail improvement projects, and development of recreational opportunities. In addition, the adjacent Apache-Sitgreaves National Forests are conducting a similar travel management analysis, and are expected to reduce impacts from motorized routes, as well as pose some restrictions on cross-country motorized travel. This neighboring Forest shares several 5th code watersheds with the Gila National Forest, and improvements on its adjacent Forest lands would have beneficial cumulative impacts, watershed-wide.

Existing watershed and soil conditions that have been described in Alternative B – No Action can be viewed as a collective assessment of all prior activities, both natural and

human caused, that have cumulatively impacted watershed and soil resources. Considering all natural and human impacts that have occurred and continue to occur on 5th code watersheds across the Gila National Forest, cumulative effects on these watersheds have not surpassed a threshold that threatens to undermine their resilience to change. This does not advocate that adverse affects have not occurred, or would not continue to occur due to land management activities; but simply, that the cumulative impacts of these activities have been moderated through natural processes and/or man-made mitigation measures. As noted in the above previous discussion, a few watersheds do have acres of disturbance that would be of concern if all activities were centrally located. Careful planning should occur in these watersheds to ensure that future projects are spread out over space and time. Some programs and activities, Forestwide, may continue to have localized short-term adverse effects to watershed and soil resources, however the cumulative effects of past, present and reasonable foreseeable future activities, including the reduction of open, motorized roads and trails and cross-country travel through designation under the Travel Management Rule, are generally beneficial.

In comparison to Alternative B – No Action, all alternatives provide for a net decrease in adverse cumulative watershed impacts by reducing miles of motorized routes and limiting acreage available for cross country travel. Closing of routes provides for the greatest benefit to riparian and wetland resources, and water quality improvement, which all alternatives accomplish to varying extents. Recovery, in particular, in the uplands will be slow until routes are returned to a more natural state, either through decommissioning or natural processes. Limiting cross country travel will reduce adverse cumulative watershed impacts slightly, as this activity currently has minimal impacts across the Forest.

Implementation of Alternative E provides the most reduction of adverse cumulative impacts to watershed and soil resources Forest-wide by eliminating motorized cross-country travel and reducing the most miles of open roads and use. Alternative D provides the second most reduction of cumulative impacts by eliminating motorized cross country travel outside of the 300' motorized camping corridor and providing for the second most reduction of motorized route. Alternatives F and G, provide for reduction of adverse cumulative watershed impacts by reducing similar miles of open routes, although not as much as Alternatives E and D. Alternative G, furthermore, eliminates cross country travel outside of the 300 motorized dispersed camping corridors, similar to Alternative D, while Alternative F provides for cross country travel within a ½ mile corridor. Alternative C, while reducing motorized routes, provides for the least reduction of open routes of all alternatives, and allows the most cross country travel of any action alternative. Overall, no increase in adverse cumulative impacts to soil resources, riparian and wetland resources, and water quality or quantity would be expected with implementation of any of the action alternatives.

Irreversible and/or Irretrievable Commitment of Resource

Alternative B (No Action) already possesses an intrinsic commitment of the soil resource. Undoubtedly, it would be very difficult, if not impossible, to reverse, retrieve, or restore soil productivity back to its original condition if, hypothetically, all routes were removed. Continuation of unlimited motorized cross-country travel would allow for the opportunity of new soil resource degradation to occur, possibly having irreversible and/or irretrievable impacts.

The selection of any of the action alternatives will affirm the above-mentioned commitment of the soil resource for whichever motorized routes are included in the selected alternative. In considering all routes, both open and closed, every action alternative proposes an overall increase in associated acres (see Table 39). While however minor these proposals are, and considering that none of these new acres are located in riparian areas, wetlands areas, or adjacent to perennial, intermittent, or impaired waters, there would still be a new disturbance of soil. This disturbance may or may not be irreversible or irretrievable, depending on: 1) conditions of the route when traveled (wet or dry); 2) the amount of compaction created; 3) associated loss of soil productivity; and 4) related sediment losses or erosion created from the new route. Soil could be irretrievably lost and carried down the watershed, resulting in on-site loss of soil productivity. Compacted soils could take decades to improve soil properties, and while not irreversible, would be considered a long-term impact. Site-specific evaluation would be appropriate during establishment of these new routes to insure that mitigation measures are in place to protect from such irreversible and/or irretrievable losses.

Consistency Review of Laws, Regulations and Policies

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
Forest Plan	*Forest Plan Amendment No. 10; September 2005; Forestwide; P.30* • Manage riparian areas in accordance with legal requirements regarding floodplains, wetlands, wild and scenic rivers, and cultural and other resources. • Manage riparian areas to protect the productivity and diversity of riparian-dependent resources by requiring actions within or affecting riparian areas to protect and where applicable, improve dependent resources. Emphasize protection of soil, water, vegetation and wildlife and fish resources prior to implementing projects. • Give preferential consideration to resources dependent on riparian areas over other resources. Other resource uses and activities may occur to the extent that they support or do not adversely affect riparian-dependent species. • Improve riparian ecosystems in unsatisfactory condition to satisfactory condition. • Maintain riparian ecosystems currently in satisfactory condition	In all Action alternatives, travel routes that are currently within riparian risk zones would continue to impact these resources. All action alternatives show a reduction in motorized routes within riparian risk zones and wetlands compared to the No Action alternative. All Action alternatives show a reduction in motorized route stream crossings compared to the No Action alternative. All Action alternatives show a reduction in motorized dispersed camping and big game retrieval compared to the No Action alternative.

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
		All Alternatives are moving towards meeting Forest Plan Standards and Guides.
Forest Plan	*Forest Plan Amendment No. 8; June 1996; Forestwide* • Emphasize maintenance and restoration of healthy riparian ecosystems through conformance with forest plan riparian standards and guidelines. Management strategies should move degraded riparian vegetation toward good condition as soon as possible. Damage to riparian vegetation, stream banks, and channels should be prevented. Pp. 29b and 29d	In all Action alternatives, travel routes that are currently within riparian risk zones would continue to impact these resources. All action alternatives show a reduction in motorized routes within riparian risk zones and wetlands compared to the No Action alternative. All Action alternatives show a reduction in motorized route stream crossings compared to the No Action alternative. All Action alternatives show a reduction in motorized dispersed camping and big game retrieval compared to the No Action alternative. All Alternatives except C are moving towards meeting Forest Plan Standards and Guides.
Forest Plan	*Forest Plan Amendment No. 1; June 1987; Forestwide*. • Recreation use of riparian zones will be managed to avoid damage to riparian resources. P. 22	In all Action alternatives, travel routes that are currently within riparian risk zones would continue to impact these resources. All action alternatives

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
		realize a reduction in motorized recreation and motorized dispersed camping . This is an improvement over the No Action alternative and is moving towards meeting Forest Plan Standards and Guides.
Forest Plan	*Forest Plan Standards and Guidelines; 1986; Forestwide.* • Road construction will be avoided in riparian areas. P 38	All Action alternatives meet Forest Plan Standards and guidelines.
Forest Plan	*Forest Plan Standards and Guidelines; 1986.* • Management will be to maintain the Gila River Research Natural Area and manage all potential candidate RNAs in their present natural condition. Manage to provide protection to natural features and vegetative communities while providing opportunities for research and education. Quemado, Silver City, Wilderness Districts. P. 49 o The visual quality objective of preservation will be met. o Manage dispersed recreation at low intensity reduced service level. o ORV use prohibited**.** • Gila River RNA [402 total acres features 125 ac of pinyon-juniper woodland, 52 acres of riparian hardwood, and 225 acres of desert shrub]. Will be maintained as RNA in its natural condition. LRMP management area 7A; Silver City. P 204 • Turkey Creek (potential candidate) [1,335 acres and features riparian hardwood as a major ecosystem]. This major ecosystem will be maintained in its present natural condition. LRMP management area 8B Wilderness District. p 249 • Rabbit Trap (potential candidate) [297 acres and features scrub grassland]. Will be maintained as a RNA in its natural condition. LRMP management area 7A. Silver City District p 204 • Largo Mesa (potential candidate) [300 acres and features classic pinyon-juniper woodlands]. This major ecosystem will be maintained in its present natural condition. LRMP management	All Action alternatives meet Forest Plan Standards and guidelines.

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
	area 9B; Quemado District p 255 • Agua Fria Mountain (potential candidate) [350 acres and features mountain grassland as a major ecosystem]. This major ecosystem will be maintained in its present natural condition. LRMP management Area 9B Quemado District 261	
Forest Plan	*Forest Plan Standards and Guidelines; 1986.* • Protect and improve soil resources. Forestwide. p 12 • Provide for long-term quality waterflow needs through improved management Forestwide. p 12 • Restore lands in unsatisfactory watershed condition. Forestwide. P 12 • Provide for the management of sensitive soils in all surface disturbing activities to minimize or control erosion. Recognizing increased cost associated with the management of sensitive soils. Forestwide P. 36 o Management area 2B has the Hardcastle area which contains 20,000 acres of very sensitive soils with very high erosion hazard. Black Range District. P 55 o Management area 2H contains Burnt Cabin flats grassland with high erodible soils. Black Range District. P 89 o Management emphasis in 2H is the area contains 20,000 acres of sensitive soils and four erosion control project areas. The areas of sensitive soils will be managed to minimize erosion. Black Range District. P 89 o There are areas within management area 3A which are comprised of fragile, highly erosive rhyolitic, and Gila conglomerate soils. Glenwood District. p 95 o Areas within the management area 3B are comprised of fragile, highly erosive soils. Quemado District. p 100 o Areas within the management area 3C are comprised of fragile, highly erosive soils. Quemado District. p 105 o Areas within the management area 3D are comprised of fragile, highly erosive soils. Erosion in these areas has created a system of gullies which bisect the area	All action alternatives realize a reduction of motorized routes within Management areas that have sensitive soils associated with them. Collectively all Alternatives are an improvement over the No Action alternative and are moving towards meeting Forest Plan Standards and Guides.

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
	and reduce productivity. Erosion in these areas has created a system of gullies which bisect the area and reduce productivity. Quemado District. p 112 o Unstable soils have created unique formations at the base of Escondido Mountain in management area 9A. Quemado District. p 252 • Maintain or improve watershed conditions to a satisfactory condition on 70-90 percent of the unsatisfactory watersheds by the end of the fifth decade. This should be accomplished through a combination of resource management and watershed structure. Forestwide. p36 • Through the use of best management practices, the adverse effect of planned activities will be mitigated and site productivity maintained. Soil loss due to management will not exceed soil loss tolerance. Forestwide. p38	
Clean Water Act	*Pertinent sections of the Clean Water Act:* • CWA Sections 208 and 319: recognize the need for control strategies for non-point source pollution. • CWA Section 303(d): requires waterbodies with water quality determined to be either impaired (not fully meeting water quality standards) or threatened (likely to violate standards in the near future), to be compiled by New Mexico Environment Department in a separate list which must be submitted to EPA every two years. These waters are targeted and scheduled for development of water quality improvement strategies on a priority basis. • TMDLs (Total Maximum Daily Loads): There are several TMDLs written for stream reaches found within the Gila National Forest. These include the following: o Temperature TMDLs – Black Canyon Creek, South Fork Negrito Creek, San Francisco River, Taylor Creek; o Plant Nutrients TMDLs – Canyon Creek, Centerfire Creek, Mangas Creek, San Francisco River; o Turbidity TMDLs – Canyon Creek, Sapillo Creek, Whitewater Creek;	The Travel Management Rule is compliant with the *Federal Water Pollution Control Act of 1972*. In all Action alternatives, travel routes that are currently within riparian risk zones would continue to potentially have an effect on water quality. All Action alternatives show a reduction in stream crossings, motorized routes and motorized dispersed camping (within 300 ft of 303d listed stream) on listed 303d streams compared to the No Action alternative. All Action alternatives realize a reduction in

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
	○ Conductivity TMDLs – Centerfire Creek, Tularosa Creek; ○ Metals (Chronic Aluminum) TMDLs – East Fork Gila River, Mogollon Creek, Taylor Creek, Whitewater Creek; ○ Total Organic Carbon TMDLs – Sapillo Creek • CWA Section 305(b): require that states assess the condition of their waters and produce a biennial report summarizing the findings. • CWA Section 401: allows states and tribes to review and approve, set conditions on, or deny Federal permits (such as 404 permits) that may result in a discharge to State or Tribal waters, including wetlands. Applications for Section 404 permits are often joint 404/401 permits to ensure compliance at both the State and Federal levels. • CWA Section 404: outlines the permitting process for dredging or discharging fill material into waters of the U.S., including wetlands. The U.S. Army Corps of Engineers administers the 404 Program.	motorized routes and motorized camping within riparian risk zones and motorized route stream crossings compared to the No Action alternative.
National Environmental Policy Act of 1969	<u>*National Environmental Policy Act of 1969*</u> (83 Stat. 852 as amended; 42 U.S.C. 4321, 4331-4335, 4341, 4347) – Required that environmental considerations be incorporated into all Federal policies and activities, and required all Federal agencies to prepare environmental impact statements for any actions significantly affecting the environment.	The Travel Management Rule is compliant with the *National Environmental Policy Act of 1969.*
National Forest Management Act of 1976	<u>*National Forest Management Act of 1976*</u> (90 Stat. 2949; 16 U.S.C. 472a, 476, 476 (note), 500, 513-516, 521b, 528 (note), 576b, 594-2 (note), 1600 (note), 1600-1602, 1604, 1606, 1608-1614) – Established additional standards and guidelines for managing the National Forests, including directives for National Forest land management planning, and public participation. It is the primary statute governing the administration of national forests.	The Travel Management Rule complied with the *National Forest Management Act of 1976*
Executive Orders 11988 and 11990	<u>*Executive Orders 11988 and 11990*</u> • (CEQ 1978): ”President Carter issued two Executive Orders last May requiring all executive agencies to take special care when undertaking actions that may affect wetlands or floodplains, directly or indirectly. The orders require agencies to avoid disrupting these areas	The Travel Management Rule is compliant with *Executive Orders 11988 and 11990* With the exception of

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
	wherever there is a practicable alternative, and to minimize any environmental harm that might be caused by federal actions • *Executive Order 11988, Floodplain Management*, agencies are commanded to "take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains." It requires the agency to determine whether a proposed action will occur in a floodplain, consider alternatives to avoid adverse effects and incompatible development in the floodplain. If the only practicable alternative consistent with the Executive Order requires activity in a floodplain, the agency must design or modify the action to minimize potential harm to or within the floodplain and circulate a notice containing an explanation of why the action is to be located in the floodplain. Early public review of any proposals in floodplains is required (NEPA). • *Executive Order 11990, Protection of Wetlands*, commands that the agency shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. Specifically, it requires the agency to avoid undertaking or providing assistance for new construction located in wetlands unless there is no practicable alternative to such construction and the proposed action includes all practicable measures to minimize harm to wetlands, which may result from such use. In determining that there is no practicable alternative and all practicable measures to minimize harm have been incorporated, the agency may take into account economic, environmental, and other pertinent factors. There must be early public review of plans or proposals for new construction in wetlands.	alternative C all other Action alternatives reduced the amount of motorized routes in riparian risk zones and wetlands compared to the No Action alternative. All Action alternatives reduced the amount of motorized dispersed camping and big game retrieval riparian risk zones and wetlands compared to the No Action altrernative.
Executive Order (EO) 11644 (February 8, 1972) and EO 11989 (May 24, 1977)	*Executive Order (EO) 11644 (February 8, 1972) and EO 11989 (May 24, 1977)* – Provide direction for Federal agencies to establish policies and provide for procedures to control and direct the use of OHVs on public lands so as to: (1) protect the resources of those lands; (2) promote the safety of all users of those lands; and (3) minimize conflicts among the various users on those	The Travel Management Rule complies with *Executive Order (EO) 11644 (February 8, 1972) and EO 11989 (May 24, 1977)*

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
	lands. • The Forest Service developed regulations in response to the EOs (36 CFR, 219, 261 and 295). Under those regulations, OHV use can be restricted or prohibited to minimize: (1) damage to the soil, vegetation, watershed and impacts to water quality, or other resources of public lands; (2) harm to wildlife or wildlife habitats; and (3) conflict between the use of OHVs and other types of recreation.	

Conclusions about Alternative Effects

All action alternatives provide for some level of beneficial watershed and soil impacts by reducing acres available to motorized cross country travel, including motorized dispersed recreation and motorized big game retrieval, across the Forest. In addition, all alternatives reduce miles of motorized routes open to the public, which reduces the relative risk of negative impacts to riparian areas, wetlands, and water quality. No decommissioning of roads will occur as the result of implementation of any action alternative, thus road densities and road and trail conditions will continue to impact overall watershed health similar to existing condition

In comparing alternatives, Alternative E provides the greatest opportunity for beneficial impacts to the resource as a result of implementation of the travel management rule. Alternative E has the greatest reduction in acres of disturbance related to motorized routes and the least available acreage to motorized cross country travel that can disturb these resources. The only motorized cross country travel available is within the 1-vehicle length parking width available off of all motorized routes

Alternative D provides the second greatest opportunity for beneficial impacts to watershed and soils resources. It has the second largest reduction in motorized routes and similar to Alternative E, does not allow for cross country travel outside of the 1-vehicle parking width.

Alternatives F and G also would provide for beneficial impacts, however not to the extent of Alternatives D and E. Alternatives F and G are similar in almost all respect, with the exception of motorized big game retrieval, where Alternative G further restricts this corridor to ½ mile, versus 1 mile in Alternative F. Observable differences between these two alternatives related to motorized big game retrieval would be slight, as current observable impacts from this activity are minimal on the Gila National Forest.

Alternative C provides for the least amount of beneficial impacts to watershed and soil resources, and a slight improvement over the No Action Alternative as it reduces the least amount of motorized routes. It does restrict motorized country travel, similar to Alternative F, however again, this activity currently has minimal watershed and soil impacts on the Forest.

Cumulative effects are summarized in the above-titled section. All action alternatives are consistent with law, regulation and policy.

Best Available Science

This evaluation was developed in consideration of the best available science and is consistent with the Gila National Forest Land and Resource Management Plan, as amended. It includes use of current (web-posted) data and reports available from various state and federal government agencies including: New Mexico Environment Department; U.S. Environmental Protection Agency; Forest Service directives (manuals and handbooks); current and past inventory, monitoring, and administrative information; and use of current literature endorsed by the Southwestern Region Forest Service. A list of references is available, with websites as available.

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APPENDIX A

Cumulative Watershed Effects
Analysis Procedures
Updated July 2010 - Gila National Forest
(By: Amanda Ruzicka, Carolyn Koury, Gabe Partido, Laura Vallejos, and Mike Natharius)

Type of Disturbance	Disturbed Area Factor	Recovery Period (years)
Roads and Trails		
Open	1.00	
None		
Closed (not decommissioned)	0.90	25
Closed or Abandoned & Obliterated (treated)	0.10	25
Abandoned (not treated)	0.50	25
Harvest or Timber Cutting Methods		
Tractor Clearcut Logging		
No Slash Treatment (S.T)	0.30	25
Mechanical slash treatment	0.45	25
Broadcast burn slash treatment	0.38	25
Sanitation – salvage	0.20	25
Disease Control	0.10	25
Tractor Partial Cut (select, intermediate, etc.)		
No Slash Treatment	0.15-0.22	25
With 50W Pile & Burn	0.23-0.30	25
Single/group/select cut	0.15	25
Improvement cut	0.15	25
Shelterwood cut	0.15	25
Overstory removal	0.15	25
Understory removal	0.10	25
Commercial thin	0.25	25
Precommercial thin	0.10	25
Wildlife habitat rehabilitate openings	0.10	25
Regeneration cut	0.10	25
Encroachment Control	0.10	25
Cable Clearcut		
No Slash Treatment	0.25	25
Prescribed burn	0.35	25
Cable Partial Cut		
No Slash Treatment	0.25	25
Prescribed burn	0.28	25
Hand Precommercial thinning (no skidding)	0.10	25
Recreation and Administrative Sites (Direct Area Assessment)	0-1.0	none

Wildfire		
Crown or High Intensity	0.50	25
Moderate Intensity	0.10	10
Low intensity	0.05	5
Prescribed Burn		
Broadcast burn	0.08	10
Hand Pile and burn	0.05	5
Light intensity broadcast burn	0.05	2
Fuel Breaks (cat- pile and burn piles)	0.12	4
Slash Treatments		
Machine Piles only (no burn)	0.03	5
Burn Piles only	0.06	5
Other		
Rearrangement of fuels	0.04	25
Tall brush treatment	0.10	25
Yarding	0.06	25
Ripping	0.20	25
Range Control Vegetation	0.25	25
Range Cover Manipulation	0.25	25
Seeding or Reseeding	0.08	25
Manual Tree Planting	0.06	25
Firewood Use Areas		
Green Use Areas	0.15	25
Free Use Areas	0.15	25
WUI Treatments (2002-2006)	0.24	25
WUI Treatments (2007 – Present)	0.15-0.22	25

Data taken from Apache-Sitgreaves N. F. March 1991, Updated April 1991 A/S;
References: Klock, 1985; Modoc N.V., 1987; Kuehn, Eldorado N. F., 1998

APPENDIX B

6th Code Watershed Route Densities – All Ownerships (including proposed closed routes)

6th Code Watershed	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G	Parent 5th Code Watershed	Rating
130302020401	6.11	6.11	6.11	6.11	6.11	6.11	Silver City Watershed	poor
130302020301	4.38	4.38	4.38	4.38	4.38	4.38	Ft Bayard	poor
150400040601	3.25	3.25	3.25	3.25	3.25	3.25	Negrito Creek	poor
150400040602	3.22	3.22	3.22	3.22	3.22	3.22	Negrito Creek	poor
150400040106	2.91	2.91	2.91	2.91	2.91	2.91	Upr SFR	poor
150400020401	2.49	2.95	2.75	2.51	2.88	2.84	Mangas Valley	poor
130202080401	2.48	2.48	2.48	2.48	2.48	2.48	Alamocito	poor
150400040107	2.41	2.41	2.41	2.41	2.41	2.41	Upr SFR	poor
150400040207	2.39	2.39	2.39	2.39	2.39	2.39	Tularosa River	fair
130302020403	2.36	2.36	2.36	2.36	2.36	2.36	Silver City Watershed	fair
150400010302	2.35	2.35	2.35	2.35	2.35	2.35	Middle Fork Gila River	fair
150400010303	2.30	2.30	2.30	2.30	2.30	2.30	Middle Fork Gila River	fair
150400010301	2.27	2.27	2.27	2.27	2.27	2.27	Middle Fork Gila River	fair
130202080404	2.26	2.26	2.26	2.26	2.26	2.26	Alamocito	fair
130302020404	2.23	2.25	2.25	2.25	2.25	2.25	Silver City Watershed	fair
150400040105	2.21	2.21	2.21	2.21	2.21	2.21	Upr SFR	fair
150200030701	2.18	2.18	2.18	2.18	2.18	2.18	Mangas Creek	fair
150400040603	2.15	2.15	2.15	2.15	2.15	2.15	Negrito Creek	fair
150200010302	2.13	2.13	2.13	2.13	2.13	2.13	Coyote Creek	fair
130302020408	2.09	2.12	2.09	2.09	2.09	2.09	Silver City Watershed	fair
130202080403	2.04	2.04	2.04	2.04	2.04	2.04	Alamocito	fair
150400040109	2.03	2.05	2.05	2.05	2.05	2.05	Upr SFR	fair
150200010301	2.01	2.01	2.01	2.01	2.01	2.01	Coyote Creek	fair
150400040201	2.01	2.01	2.01	2.01	2.01	2.01	Tularosa River	fair
150400040203	2.00	2.00	2.00	1.95	2.00	2.00	Tularosa River	fair
130202080501	1.99	1.99	1.99	1.99	1.99	1.99	Plains of San Augustin	fair
150200030601	1.98	1.98	1.98	1.98	1.98	1.98	Largo Creek	fair
150400040102	1.92	1.92	1.92	1.92	1.92	1.92	Upr SFR	fair
150400010203	1.90	1.90	1.90	1.90	1.90	1.90	Corduroy Cyn	fair
130302021202	1.87	1.87	1.87	1.87	1.87	1.87	White Signal	fair
150400040205	1.87	1.87	1.87	1.87	1.87	1.87	Tularosa River	fair
150400040202	1.83	1.83	1.83	1.83	1.83	1.83	Tularosa River	fair
150400040204	1.80	1.80	1.80	1.80	1.80	1.80	Tularosa River	fair
150200030501	1.79	1.79	1.79	1.79	1.79	1.79	Agua Fria Creek	fair
150200030101	1.79	1.79	1.79	1.79	1.79	1.79	Mangitas Creek	fair
150400010204	1.77	1.77	1.77	1.77	1.77	1.77	Corduroy Cyn	fair
150400040407	1.75	1.78	1.78	1.77	1.78	1.78	Whitewater-SFR	fair

150200030502	1.74	1.74	1.74	1.74	1.74	1.74	Agua Fria Creek	fair
150400040208	1.73	1.73	1.73	1.73	1.73	1.73	Tularosa River	fair
150400040804	1.73	1.73	1.73	1.73	1.73	1.73	Lower SFR	fair
150400020402	1.71	1.81	1.75	1.71	1.75	1.75	Mangas Valley	fair
150400040404	1.70	1.71	1.70	1.70	1.70	1.71	Whitewater-SFR	fair
150400040108	1.69	1.69	1.69	1.69	1.69	1.69	Upr SFR	fair
130302020102	1.69	1.69	1.69	1.69	1.69	1.69	Upr Mimbres River	fair
130302020406	1.69	1.69	1.69	1.69	1.69	1.69	Silver City Watershed	fair
150400010110	1.68	1.68	1.68	1.68	1.68	1.68	O Bar O Cyn	fair
150400010701	1.68	1.68	1.69	1.68	1.68	1.68	Sapillo Creek	fair
150400040104	1.67	1.67	1.67	1.67	1.67	1.67	Upr SFR	fair
130202080104	1.63	1.63	1.63	1.63	1.63	1.63	Puerto Viejo	fair
150400040505	1.61	1.61	1.61	1.61	1.61	1.61	Middle SFR	fair
150400040501	1.60	1.60	1.57	1.57	1.60	1.60	Middle SFR	fair
150400040803	1.60	1.60	1.60	1.60	1.60	1.60	Lower SFR	fair
150400010106	1.57	1.57	1.57	1.57	1.57	1.57	O Bar O Cyn	fair
150200030602	1.54	1.54	1.54	1.54	1.54	1.54	Largo Creek	fair
150400040103	1.54	1.54	1.54	1.54	1.54	1.54	Upr SFR	fair
150400040604	1.54	1.65	1.65	1.54	1.65	1.65	Negrito Creek	fair
150200030503	1.51	1.51	1.51	1.45	1.51	1.51	Agua Fria Creek	fair
150200030604	1.50	1.50	1.50	1.50	1.50	1.50	Largo Creek	fair
150400030601	1.49	1.60	1.60	1.50	1.57	1.57	Thompson Cyn	fair
150400030101	1.48	1.54	1.54	1.48	1.54	1.54	Walking X Cyn	fair
130302020104	1.48	1.59	1.49	1.49	1.49	1.49	Upr Mimbres River	fair
130202110206	1.47	1.47	1.47	1.47	1.47	1.47	Wahoo Canyon	fair
150200030708	1.45	1.45	1.45	1.45	1.45	1.45	Mangas Creek	fair
150400020103	1.44	1.44	1.44	1.44	1.45	1.44	Sacaton Cyn	fair
130202080509	1.43	1.43	1.43	1.43	1.43	1.43	Plains of San Augustin	fair
150400030604	1.42	1.42	1.42	1.42	1.42	1.42	Thompson Cyn	fair
150400010305	1.42	1.42	1.42	1.42	1.42	1.42	Middle Fork Gila River	fair
150400030603	1.40	1.42	1.42	1.40	1.42	1.42	Thompson Cyn	fair
130302021201	1.40	1.41	1.41	1.40	1.41	1.41	White Signal	fair
130202080402	1.38	1.38	1.38	1.38	1.38	1.38	Alamocito	fair
150400030209	1.36	1.36	1.36	1.36	1.36	1.36	Engineer Cyn	fair
150400040403	1.32	1.32	1.32	1.32	1.32	1.32	Whitewater-SFR	fair
150400040408	1.32	1.40	1.40	1.32	1.40	1.40	Whitewater-SFR	fair
130202080405	1.31	1.31	1.31	1.31	1.31	1.31	Alamocito	fair
130301010103	1.30	1.30	1.30	1.30	1.30	1.30	Cuchillo-Negro	fair
150400030201	1.30	1.30	1.30	1.30	1.30	1.30	Engineer Cyn	fair
130202110203	1.30	1.30	1.30	1.30	1.30	1.30	Wahoo Canyon	fair
150200030506	1.29	1.29	1.29	1.29	1.29	1.29	Agua Fria Creek	fair

150400010703	1.26	1.28	1.26	1.26	1.26	1.26	Sapillo Creek	fair
130202110211	1.26	1.26	1.26	1.26	1.26	1.26	Wahoo Canyon	fair
150400040605	1.26	1.26	1.26	1.26	1.26	1.26	Negrito Creek	fair
150400040111	1.25	1.26	1.26	1.25	1.25	1.26	Upr SFR	fair
150400030602	1.25	1.30	1.30	1.25	1.33	1.33	Thompson Cyn	fair
150400040302	1.25	1.24	1.21	1.10	1.24	1.24	Blue Creek	fair
150400040206	1.24	1.24	1.24	1.24	1.24	1.24	Tularosa River	fair
130202110209	1.23	1.24	1.24	1.24	1.24	1.24	Wahoo Canyon	fair
150400020404	1.23	1.53	1.27	1.23	1.36	1.36	Mangas Valley	fair
150400020502	1.23	1.23	1.23	1.23	1.23	1.23	Bear Creek	fair
150400010108	1.20	1.20	1.20	1.20	1.20	1.20	O Bar O Cyn	fair
150400010704	1.20	1.27	1.20	1.20	1.20	1.20	Sapillo Creek	fair
150400040808	1.19	1.19	1.19	1.19	1.19	1.19	Lower SFR	fair
150400040209	1.18	1.20	1.20	1.18	1.20	1.20	Tularosa River	fair
130202110210	1.17	1.19	1.19	1.19	1.19	1.19	Wahoo Canyon	fair
150400010102	1.17	1.17	1.17	1.17	1.17	1.17	O Bar O Cyn	fair
150400010202	1.15	1.15	1.15	1.15	1.15	1.15	Corduroy Cyn	fair
150400040504	1.14	1.15	1.14	1.14	1.14	1.14	Middle SFR	fair
130301030104	1.13	1.13	1.13	1.13	1.13	1.13	Berenda Creek	fair
150400020505	1.11	1.11	1.11	1.11	1.11	1.11	Bear Creek	fair
130301010105	1.11	1.11	1.11	1.11	1.11	1.11	Cuchillo-Negro	fair
150200030702	1.10	1.10	1.10	1.10	1.10	1.10	Mangas Creek	fair
150200030505	1.10	1.10	1.10	1.10	1.10	1.10	Agua Fria Creek	fair
150400010705	1.08	1.34	1.08	1.08	1.08	1.08	Sapillo Creek	fair
130301010401	1.08	1.12	1.08	1.08	1.08	1.08	Percha Creek	fair
130301030103	1.07	1.07	1.07	1.07	1.07	1.07	Berenda Creek	fair
130301010204	1.06	1.06	1.06	1.06	1.06	1.06	Palomas Creek	fair
150400040802	1.05	1.05	1.05	1.05	1.05	1.05	Lower SFR	fair
150400010201	1.03	1.04	1.04	1.04	1.04	1.04	Corduroy Cyn	fair
150400010207	1.03	1.05	1.05	1.05	1.05	1.05	Corduroy Cyn	fair
150200030507	1.03	1.03	1.03	1.03	1.03	1.03	Agua Fria Creek	fair
130202080407	1.02	1.02	1.02	1.02	1.02	1.02	Alamocito	fair
150400010103	1.01	1.01	1.01	1.01	1.01	1.01	O Bar O Cyn	fair
150400010105	1.00	1.00	1.00	1.00	1.00	1.00	O Bar O Cyn	fair
130202110205	0.99	1.00	1.00	1.00	1.00	1.00	Wahoo Canyon	fair
150200030504	0.99	0.99	0.99	0.99	0.99	0.99	Agua Fria Creek	good
150400020101	0.99	0.99	0.99	0.99	0.99	0.99	Sacaton Cyn	good
130302020105	0.99	1.10	1.01	1.01	1.01	1.01	Upr Mimbres River	good
130302020103	0.98	1.33	0.99	0.98	0.99	0.99	Upr Mimbres River	good
130301010101	0.97	0.97	0.97	0.97	0.97	0.97	Cuchillo-Negro	good
150400020403	0.97	0.97	0.97	0.97	0.97	0.97	Mangas Valley	good

150400010205	0.96	0.96	0.96	0.96	0.96	0.96	Corduroy Cyn	good
150400020304	0.93	0.94	0.93	0.93	0.94	0.94	Corral Cyn	good
150400010107	0.93	0.93	0.93	0.93	0.93	0.93	O Bar O Cyn	good
150400020501	0.92	1.04	0.96	0.96	0.96	0.96	Bear Creek	good
150400020504	0.89	0.90	0.90	0.90	0.90	0.90	Bear Creek	good
150400040405	0.88	0.90	0.90	0.90	0.90	0.90	Whitewater-SFR	good
150400040606	0.88	0.88	0.88	0.88	0.88	0.88	Negrito Creek	good
150400030208	0.87	0.87	0.87	0.87	0.87	0.87	Engineer Cyn	good
150200030707	0.87	0.87	0.87	0.87	0.87	0.87	Mangas Creek	good
150400010109	0.84	0.84	0.84	0.84	0.84	0.84	O Bar O Cyn	good
130302020201	0.84	0.84	0.84	0.84	0.84	0.84	Hot/Cold Springs	good
150400040806	0.83	0.83	0.83	0.83	0.83	0.83	Lower SFR	good
150200030603	0.82	0.82	0.82	0.82	0.82	0.82	Largo Creek	good
150400020405	0.82	0.82	0.82	0.82	0.82	0.82	Mangas Valley	good
130301010106	0.82	0.82	0.82	0.82	0.82	0.82	Cuchillo-Negro	good
130301030102	0.81	0.86	0.81	0.81	0.81	0.81	Berenda Creek	good
150400010206	0.78	0.78	0.78	0.78	0.78	0.78	Corduroy Cyn	good
150400040503	0.78	0.87	0.78	0.78	0.78	0.78	Middle SFR	good
150400040805	0.76	0.76	0.77	0.76	0.76	0.77	Lower SFR	good
150400020104	0.76	0.77	0.76	0.76	0.77	0.77	Sacaton Cyn	good
150400040304	0.76	0.76	0.75	0.75	0.76	0.76	Blue Creek	good
130302020106	0.73	0.86	0.73	0.73	0.73	0.73	Upr Mimbres River	good
150400010104	0.73	0.73	0.73	0.73	0.73	0.73	O Bar O Cyn	good
130301010303	0.73	0.73	0.73	0.73	0.73	0.73	Animas Creek	good
130202080406	0.73	0.73	0.73	0.73	0.73	0.73	Alamocito	good
130301010202	0.72	0.72	0.72	0.72	0.72	0.72	Palomas Creek	good
150400010304	0.72	0.72	0.72	0.72	0.72	0.72	Middle Fork Gila River	good
150400040110	0.71	0.71	0.71	0.71	0.71	0.71	Upr SFR	good
150400020408	0.70	0.70	0.70	0.70	0.70	0.70	Mangas Valley	good
150400040303	0.70	0.71	0.70	0.70	0.71	0.71	Blue Creek	good
130302020302	0.69	0.69	0.69	0.69	0.69	0.69	Ft. Bayard	good
130302020701	0.69	0.69	0.69	0.69	0.69	0.69	Taylor Creek	good
130301010402	0.68	0.68	0.68	0.68	0.68	0.68	Percha Creek	good
150400010702	0.67	0.67	0.67	0.67	0.67	0.67	Sapillo Creek	good
130302020202	0.67	0.67	0.67	0.67	0.67	0.67	Hot/Cold Springs	good
150400020309	0.67	0.67	0.67	0.67	0.67	0.67	Corral Cyn	good
130301010102	0.64	0.70	0.64	0.63	0.64	0.64	Cuchillo-Negro	good
150400020305	0.63	0.68	0.63	0.63	0.63	0.63	Corral Cyn	good
150400020301	0.61	0.61	0.61	0.61	0.61	0.61	Corral Cyn	good
130301010107	0.60	0.60	0.60	0.60	0.60	0.60	Cuchillo-Negro	good
150400020303	0.60	0.78	0.60	0.60	0.66	0.66	Corral Cyn	good

150400040401	0.58	0.58	0.53	0.52	0.58	0.58	Whitewater-SFR	good
150400040607	0.56	0.68	0.56	0.56	0.68	0.68	Negrito Creek	good
150400040502	0.55	0.60	0.55	0.55	0.60	0.60	Middle SFR	good
130301010203	0.54	0.54	0.54	0.54	0.54	0.54	Palomas Creek	good
130301030101	0.52	0.58	0.56	0.56	0.56	0.56	Berenda Creek	good
150400010307	0.52	0.52	0.52	0.52	0.52	0.52	Middle Fork Gila River	good
150400040801	0.52	0.52	0.52	0.52	0.52	0.52	Lower SFR	good
150400040402	0.49	0.49	0.49	0.49	0.49	0.49	Whitewater-SFR	good
150400040807	0.49	0.49	0.49	0.49	0.49	0.49	Lower SFR	good
130202080502	0.47	0.47	0.47	0.47	0.47	0.47	Plains of San Augustin	good
130302020101	0.47	0.47	0.47	0.47	0.47	0.47	Upr Mimbres River	good
150400020503	0.46	0.46	0.46	0.46	0.46	0.46	Bear Creek	good
150400010506	0.41	0.41	0.41	0.41	0.41	0.41	West Fork Gila River	good
150400040406	0.38	0.38	0.36	0.36	0.38	0.38	Whitewater-SFR	good
150400010405	0.37	0.37	0.37	0.37	0.37	0.37	Wall Lake	good
150400010607	0.29	0.29	0.29	0.29	0.29	0.29	Mogollon Creek	good
150400010606	0.29	0.29	0.29	0.29	0.29	0.29	Mogollon Creek	good
150400020205	0.25	0.25	0.25	0.25	0.25	0.25	Hells Hole	good
150400010406	0.24	0.24	0.24	0.24	0.24	0.24	Wall Lake	good
150400010409	0.24	0.24	0.24	0.24	0.24	0.24	Wall Lake	good
150400010408	0.24	0.25	0.25	0.25	0.25	0.25	Wall Lake	good
150400040608	0.21	0.37	0.34	0.21	0.37	0.37	Negrito Creek	good
150400010608	0.21	0.21	0.21	0.21	0.21	0.21	Mogollon Creek	good
150400010404	0.19	0.19	0.19	0.19	0.19	0.19	Wall Lake	good
150400010407	0.16	0.16	0.16	0.16	0.16	0.16	Wall Lake	good
150400010306	0.15	0.15	0.15	0.15	0.15	0.15	Middle Fork Gila River	good
130301010302	0.15	0.15	0.15	0.15	0.15	0.15	Animas Creek	good
130301010301	0.12	0.12	0.12	0.12	0.12	0.12	Animas Creek	good
150400040305	0.11	0.11	0.11	0.11	0.11	0.11	Blue Creek	good
130301010201	0.09	0.09	0.09	0.09	0.09	0.09	Palomas Creek	good
150400010402	0.09	0.09	0.09	0.09	0.09	0.09	Wall Lake	good
150400010504	0.08	0.08	0.08	0.08	0.08	0.08	West Fork Gila River	good
150400010601	0.03	0.03	0.03	0.03	0.03	0.03	Mogollon Creek	good
150400010309	0.02	0.02	0.02	0.02	0.02	0.02	Middle Fork Gila River	good
150400010605	0.00	0.00	0.00	0.00	0.00	0.00	Mogollon Creek	good
150400010604	0.00	0.00	0.00	0.00	0.00	0.00	Mogollon Creek	good