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, any 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 Supervisor's 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 feet to 10,770 feet. Annual 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 increase and temperature decreases. Through 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 these higher elevations generally develops continuously over this period but melts over a much shorter time span. (The University of Arizona. Climate Assessment for the Southwest (CLIMAS). http://www.climas.arizona.edu/sw-climate)

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 49 fifth code watersheds that intersect portions of the Gila National Forest (see Figure 1). These fifth code watersheds can be further divided into sixth code subwatersheds of which there are 202 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.

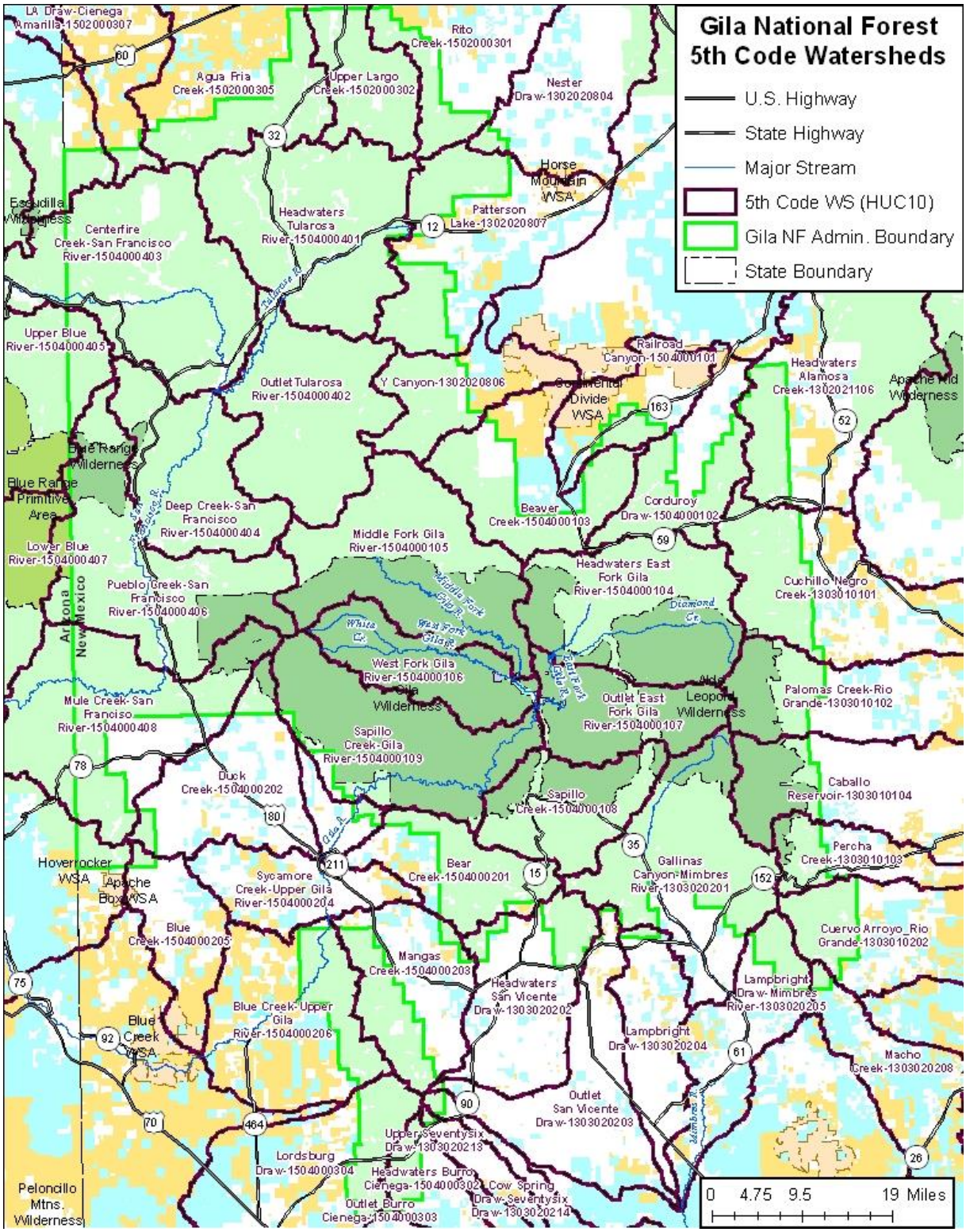

Figure 1. Gila National Forest 5th Code Watersheds

Three classes are used to describe watershed condition (USDA Forest Service 2004, FSM 2521.1):

1. Class 1 watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.
2. Class 2 watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.
3. Class 3 watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.

In March 2011, watershed condition classification was completed across the Gila National Forest at the subwatershed level (6th code). The watersheds were classified as being in one of the three condition classes noted above, as translated to functionality.

- Class 1 = Functioning Properly,
- Class 2 = Functioning at Risk, and
- Class 3 = Impaired Function.

The percentage of Forest lands that are within these subwatersheds ranges from less than 1% up to 100%. This analysis will address effects at the sixth code watershed level, which can range in size from 7,000 acres to 40,000 acres on the Gila National Forest.

Table 1 provides the Watershed Scores for each 6th code watershed, which are tracked to one decimal point and reported as Watershed Condition Classes 1, 2, or 3. Class 1 (Functioning Properly) = scores of 1.0 to 1.6, Class 2 (Functioning at Risk) = scores from 1.7 to 2.2, and Class 3 (Impaired Function) = scores from 2.3 to 3.0.

Table 1. Sixth Code Watershed Condition Classification

6th Code Hydrologic Unit Code	6th Code Name	Total Watershed Acres	Forest Service Acres	% Forest Service Managed	Watershed Score	Watershed Condition Rating
130202080401	Bear Canyon	11,713	4,482	38%	1.2	Functioning Properly
130202080601	La Jolla Canyon	36,919	36,561	99%	1.2	Functioning Properly
130202080603	Y Canyon	37,118	15,547	42%	1.1	Functioning Properly
130202080701	Alamocito Creek	23,057	8,583	37%	1.3	Functioning Properly
130202080704	Patterson Canyon	28,514	18,832	66%	1.6	Functioning Properly
130202080705	Dark Canyon	15,823	6,697	42%	1.1	Functioning Properly
130202080706	Patterson Lake	27,972	11,201	40%	1.2	Functioning Properly
130202080707	Long Canyon	22,685	21,751	96%	1.3	Functioning Properly
130202080708	T H Canyon	36,839	11,077	30%	1.2	Functioning Properly

6th Code Hydrologic Unit Code	6th Code Name	Total Watershed Acres	Forest Service Acres	% Forest Service Managed	Watershed Score	Watershed Condition Rating
130202110603	Little Pigeon Canyon-Alamosa Creek	22,528	8,377	37%	1.3	Functioning Properly
130202110606	Wahoo Canyon-Alamosa Creek	32,902	16,958	52%	1.8	Functioning at Risk
130202110608	Wildhorse Canyon	39,927	14,773	37%	1.4	Functioning Properly
130301010101	Turkey Creek	21,723	18,365	85%	1.9	Functioning at Risk
130301010102	Poverty Creek	35,310	16,880	48%	1.7	Functioning at Risk
130301010103	Chloride Creek	24,140	18,439	76%	1.9	Functioning at Risk
130301010104	South Fork Cuchillo Negro Creek	20,211	14,404	71%	1.6	Functioning Properly
130301010105	Monument Creek	12,155	3,656	30%	1.2	Functioning Properly
130301010106	Monument Creek-Cuchillo Negro Creek	20,819	4,190	20%	1.2	Functioning Properly
130301010204	Mud Spring Canyon	11,472	11,467	100%	1.3	Functioning Properly
130301010205	Circle Seven Creek	11,766	11,346	96%	1.7	Functioning at Risk
130301010206	North Fork Palomas Creek	27,789	15,511	56%	1.8	Functioning at Risk
130301010207	South Fork Palomas Creek	34,038	19,425	57%	1.7	Functioning at Risk
130301010301	South Percha Creek	24,253	12,764	53%	1.6	Functioning Properly
130301010302	North Percha Creek	22,160	11,975	54%	1.6	Functioning Properly
130301010401	North Seco Canyon	18,438	14,024	76%	1.6	Functioning Properly
130301010403	Seco Creek	37,048	3,686	10%	1.1	Functioning Properly
130301010404	Holden Prong	15,685	15,684	100%	1.5	Functioning Properly
130301010405	Cave Creek	16,675	3,647	22%	1.4	Functioning Properly
130301010406	Headwaters Los Animas Creek	24,292	15,876	65%	1.9	Functioning at Risk
130301020201	Trujillo Canyon Creek	32,247	10,632	33%	1.7	Functioning at Risk
130301020203	Headwaters Tierra Blanca Creek	11,256	11,078	98%	1.6	Functioning Properly

6th Code Hydrologic Unit Code	6th Code Name	Total Watershed Acres	Forest Service Acres	% Forest Service Managed	Watershed Score	Watershed Condition Rating
130301020204	Outlet Tierra Blanca Creek	29,717	4,403	15%	1.6	Functioning Properly
130301020207	Jaralosa Creek	18,385	2,363	13%	1.2	Functioning Properly
130301020208	Headwaters Berrenda Creek	24,593	9,035	37%	1.3	Functioning Properly
130302020101	Powderhorn Canyon-Mimbres River	34,729	34,279	99%	1.9	Functioning at Risk
130302020102	Allie Canyon-Mimbres River	39,102	37,796	97%	1.9	Functioning at Risk
130302020103	Sheppard Canyon-Mimbres River	35,244	28,414	81%	1.8	Functioning at Risk
130302020104	Noonday Canyon	16,291	12,847	79%	1.1	Functioning Properly
130302020105	Noonday Canyon-Mimbres River	28,928	12,813	44%	1.8	Functioning at Risk
130302020106	Gallinas Canyon	34,647	25,202	73%	1.5	Functioning Properly
130302020201	Rio de Arenas	16,513	956	6%	1.7	Functioning at Risk
130302020203	Pipeline Draw-San Vicente Draw	35,244	7,053	20%	1.7	Functioning at Risk
130302020204	Cameron Creek	35,845	19,233	54%	1.8	Functioning at Risk
130302020401	Headwaters Lampbright Draw	26,603	2,348	9%	1.8	Functioning at Risk
130302020501	Gavilan Arroyo	20,633	8,258	40%	1.1	Functioning Properly
130302020502	Gavilan Arroyo-Mimbres River	31,702	12,417	39%	1.7	Functioning at Risk
130302020801	Upper Macho Creek	37,179	3,635	10%	1.1	Functioning Properly
130302021402	Headwaters Cow Spring Draw	22,450	3,068	14%	1.9	Functioning at Risk
150200010301	Hay Vega	7,091	2,774	39%	1.3	Functioning Properly
150200030101	Upper Mangas Creek	36,461	21,071	58%	1.3	Functioning Properly
150200030102	Middle Mangas Creek	33,640	5,753	17%	1.2	Functioning Properly
150200030103	Lower Mangas Creek	28,229	2,013	7%	1.3	Functioning Properly
150200030109	Escondido Creek	17,746	8,337	47%	1.3	Functioning Properly
150200030201	El Caso Spring Canyon	24,237	24,158	100%	1.3	Functioning Properly

6th Code Hydrologic Unit Code	6th Code Name	Total Watershed Acres	Forest Service Acres	% Forest Service Managed	Watershed Score	Watershed Condition Rating
150200030202	Sawmill Canyon-Largo Creek	26,736	24,333	91%	1.7	Functioning at Risk
150200030203	Paradise Canyon-Largo Creek	20,410	17,393	85%	1.9	Functioning at Risk
150200030204	Rito Creek-Largo Creek	26,866	9,301	35%	1.3	Functioning Properly
150200030501	Harris Creek-Agua Fria Creek	30,966	27,829	90%	1.3	Functioning Properly
150200030502	Demetrio Creek	16,664	9,824	59%	1.4	Functioning Properly
150200030503	Demetrio Creek-Agua Fria Creek	19,677	7,219	37%	1.3	Functioning Properly
150200030504	Gatlin Lake	25,398	18,432	73%	1.2	Functioning Properly
150200030505	Mangitas Creek	23,059	9,451	41%	1.2	Functioning Properly
150200030506	Cerro La Mula	38,047	3,750	10%	1.3	Functioning Properly
150200030703	Cow Springs Draw	31,270	7,917	25%	1.7	Functioning at Risk
150400010102	Middle Railroad Canyon	26,133	10,592	41%	1.2	Functioning Properly
150400010103	Lower Railroad Canyon	27,413	1,856	7%	1.2	Functioning Properly
150400010201	Upper Corduroy Draw	30,787	6,852	22%	1.3	Functioning Properly
150400010202	South Water Canyon	24,613	19,482	79%	1.2	Functioning Properly
150400010203	Middle Corduroy Draw	24360	11,917	49%	1.1	Functioning Properly
150400010204	Lower Corduroy Draw	31,222	29,978	96%	1.4	Functioning Properly
150400010301	Horse Camp Canyon	15,088	10,983	73%	1.1	Functioning Properly
150400010303	O Bar O Canyon	39,459	18,137	46%	1.2	Functioning Properly
150400010304	Houghton Canyon	22,024	20,277	92%	1.2	Functioning Properly
150400010305	Houghton Canyon-Beaver Creek	38,264	30,235	79%	1.2	Functioning Properly
150400010401	Hoyt Creek	26,989	26,772	99%	1.7	Functioning at Risk
150400010402	Taylor Creek	37,953	37,487	99%	2.1	Functioning at Risk
150400010403	Taylor Creek-Beaver Creek	26,631	26,354	99%	1.4	Functioning Properly

6th Code Hydrologic Unit Code	6th Code Name	Total Watershed Acres	Forest Service Acres	% Forest Service Managed	Watershed Score	Watershed Condition Rating
150400010404	Headwaters Diamond Creek	20,884	20,879	100%	1.4	Functioning Properly
150400010405	South Diamond Creek	25,575	25,570	100%	1.2	Functioning Properly
150400010406	Outlet Diamond Creek	24,858	24,800	100%	1.6	Functioning Properly
150400010407	Diamond Creek-East Fork Gila River	30,838	30,217	98%	2.1	Functioning at Risk
150400010501	T Bar Canyon	26,558	26,474	100%	1.8	Functioning at Risk
150400010502	Gilita Creek	25,227	25,159	100%	2.1	Functioning at Risk
150400010503	Snow Canyon	31,338	31,331	100%	2.3	Impaired Function
150400010504	Canyon Creek	29,967	29,731	99%	1.8	Functioning at Risk
150400010505	Canyon Creek-Middle Fork Gila River	32,431	32,430	100%	1.5	Functioning Properly
150400010506	Indian Creek Canyon	21,855	21,688	99%	1.5	Functioning Properly
150400010507	Indian Creek Canyon-Middle Fork Gila River	21,394	21,393	100%	1.5	Functioning Properly
150400010508	Big Bear Canyon-Middle Fork Gila River	29,939	29,787	100%	1.6	Functioning Properly
150400010601	White Creek	13,954	13,952	100%	1.1	Functioning Properly
150400010602	Headwaters West Fork Gila River	23,172	23,169	100%	1.3	Functioning Properly
150400010603	Little Creek	26,770	26,737	100%	1.5	Functioning Properly
150400010604	Outlet West Fork Gila River	39,986	38,139	95%	1.6	Functioning Properly
150400010701	Tom Moore Canyon	13,521	13,516	100%	1.1	Functioning Properly
150400010702	Headwaters Black Canyon	21,611	21,611	100%	1.4	Functioning Properly
150400010703	Apache Creek	15,152	15,152	100%	1.4	Functioning Properly
150400010704	Outlet Black Canyon	34,945	34,905	100%	1.6	Functioning Properly
150400010705	Black Canyon-East Fork Gila River	19,072	18,629	98%	2	Functioning at Risk
150400010801	Rocky Canyon	15,145	15,145	100%	1.8	Functioning at Risk

6th Code Hydrologic Unit Code	6th Code Name	Total Watershed Acres	Forest Service Acres	% Forest Service Managed	Watershed Score	Watershed Condition Rating
150400010802	Rocky Canyon-Sapillo Creek	29,717	29,257	99%	1.6	Functioning Properly
150400010803	Lake Roberts-Sapillo Creek	23,355	22,798	98%	2	Functioning at Risk
150400010804	Copperas Creek-Sapillo Creek	16,744	15,917	95%	1.5	Functioning Properly
150400010805	Sheep Corral Canyon-Sapillo Creek	25,628	25,628	100%	1.5	Functioning Properly
150400010901	Sapillo Creek-Gila River	26,512	26,512	100%	1.4	Functioning Properly
150400010902	Hells Canyon-Gila River	25,230	25,230	100%	1.3	Functioning Properly
150400010903	Turkey Creek	32,955	32,917	100%	1.6	Functioning Properly
150400010904	Upper Mogollon Creek	34,691	34,593	100%	1.5	Functioning Properly
150400010905	Middle Mogollon Creek	25,222	22,064	88%	1.5	Functioning Properly
150400010906	Lower Mogollon Creek	19,593	14,670	75%	1.5	Functioning Properly
150400010907	Mogollon Creek-Gila River	25,547	25,130	98%	1.3	Functioning Properly
150400020101	Upper Bear Creek	38,337	32,672	85%	1.8	Functioning at Risk
150400020102	Middle Bear Creek	28,789	21,141	73%	1.4	Functioning Properly
150400020103	Lower Bear Creek	36,786	9,913	27%	1.7	Functioning at Risk
150400020201	Headwaters Buckhorn Wash	26,681	5,640	21%	1.5	Functioning Properly
150400020203	Sacaton Creek	25,976	7,945	31%	1.8	Functioning at Risk
150400020204	Headwaters Duck Creek	31,665	3,312	11%	1.8	Functioning at Risk
150400020301	Willow Creek-Mangas Creek	34,820	14,185	41%	2	Functioning at Risk
150400020302	McKeafer Canyon-Mangas Creek	28,438	8,767	31%	1.8	Functioning at Risk
150400020303	Ash Spring Canyon-Mangas Creek	29,274	16,244	56%	1.7	Functioning at Risk
150400020304	Schoolhouse Canyon-Mangas Creek	37,984	11,344	30%	1.2	Functioning Properly
150400020401	Bear Creek-Upper Gila River	30,996	3,599	12%	1.7	Functioning at Risk

6th Code Hydrologic Unit Code	6th Code Name	Total Watershed Acres	Forest Service Acres	% Forest Service Managed	Watershed Score	Watershed Condition Rating
150400020501	Cherry Creek-Blue Creek	36,778	3,428	9%	1.2	Functioning Properly
150400020601	Bear Canyon-Upper Gila River	26,245	23,162	88%	1.4	Functioning Properly
150400020602	Swan Canyon	25,966	14,679	57%	1.8	Functioning at Risk
150400020603	Swan Canyon-Upper Gila River	27,891	8,137	29%	1.4	Functioning Properly
150400020804	Apache Creek	39,082	15,891	41%	1.9	Functioning at Risk
150400030201	Hall Draw-Burro Cienega	24,914	13,856	56%	1.9	Functioning at Risk
150400030203	Ninetysix Creek	31,662	3,741	12%	1.9	Functioning at Risk
150400030401	Gold Hill Canyon-Lordsburg Draw	33,193	7,039	21%	1.9	Functioning at Risk
150400030402	Hoodoo Canyon-Lordsburg Draw	28,013	3760	13%	1.9	Functioning at Risk
150400030403	Headwaters Thompson Canyon	25,150	20,067	80%	1.7	Functioning at Risk
150400030404	Outlet Thompson Canyon	23,416	4,945	21%	1.9	Functioning at Risk
150400030405	Thompson Canyon-Lordsburg Draw	29,209	5,780	20%	2	Functioning at Risk
150400040101	Sand Flat Canyon	22,384	20,447	91%	1.3	Functioning Properly
150400040102	Canon Del Buey	17,587	17,547	100%	1.7	Functioning at Risk
150400040103	Negro Canyon-Tularosa River	35731	33,548	94%	1.7	Functioning at Risk
150400040104	Whiskey Creek	28,846	26,685	93%	1.3	Functioning Properly
150400040105	Hardcastle Canyon	31,723	30,087	95%	1.7	Functioning at Risk
150400040106	Apache Creek	28,793	26,343	92%	1.9	Functioning at Risk
150400040107	Apache Creek-Tularosa River	29,272	27,387	94%	1.8	Functioning at Risk
150400040108	Cold Springs Canyon-Tularosa River	30,958	29,882	97%	2.1	Functioning at Risk
150400040201	Long Canyon-Tularosa River	33,493	32,058	96%	1.6	Functioning Properly
150400040202	Headwaters North Fork Negrito Creek	20,415	20,224	99%	1.8	Functioning at Risk

6th Code Hydrologic Unit Code	6th Code Name	Total Watershed Acres	Forest Service Acres	% Forest Service Managed	Watershed Score	Watershed Condition Rating
150400040203	South Fork Negrito Creek	31,684	31,212	99%	1.9	Functioning at Risk
150400040204	Outlet North Fork Negrito Creek	24,172	24,043	100%	2	Functioning at Risk
150400040205	Sign Camp Canyon	26,232	26,214	100%	1.6	Functioning Properly
150400040206	Negrito Creek	25,665	25,405	99%	1.7	Functioning at Risk
150400040207	Negrito Creek-Tularosa River	22,470	21,267	95%	1.9	Functioning at Risk
150400040302	Trout Creek	20,934	19,861	95%	1.8	Functioning at Risk
150400040303	Stone Creek-San Francisco River	35,768	33,348	93%	2	Functioning at Risk
150400040304	Spur Draw	26,175	21,523	82%	1.9	Functioning at Risk
150400040305	SA Creek	22,558	21,830	97%	2	Functioning at Risk
150400040306	Headwaters Centerfire Creek	18,532	17,578	95%	1.7	Functioning at Risk
150400040307	Outlet Centerfire Creek	20,588	17,858	87%	1.9	Functioning at Risk
150400040308	Big Canyon-San Franciso River	16,416	15,610	95%	1.6	Functioning Properly
150400040309	Starkweather Canyon	25,274	24,340	96%	1.7	Functioning at Risk
150400040310	Largo Canyon	21,759	21,000	97%	1.8	Functioning at Risk
150400040311	Cienega Canyon-San Francisco River	36,080	32,999	92%	2	Functioning at Risk
150400040401	Headwaters Saliz Canyon	26,225	26,113	100%	1.5	Functioning Properly
150400040402	Outlet Saliz Canyon	14,049	13,719	98%	1.7	Functioning at Risk
150400040403	Saliz Canyon-San Francisco River	36,824	35,063	95%	1.9	Functioning at Risk
150400040404	Devils Creek	22,762	22,762	100%	1.5	Functioning Properly
150400040405	Deep Creek	30,512	29,150	96%	1.9	Functioning at Risk
150400040406	Devils Creek-San Francisco River	22,917	22,341	98%	1.8	Functioning at Risk
150400040502	Dry Blue Creek	25,047	24,719	99%	1.9	Functioning at Risk
150400040601	Upper Pueblo Creek	21,553	21,541	100%	1.7	Functioning at Risk

6th Code Hydrologic Unit Code	6th Code Name	Total Watershed Acres	Forest Service Acres	% Forest Service Managed	Watershed Score	Watershed Condition Rating
150400040602	Lower Pueblo Creek	29,506	29,506	100%	1.8	Functioning at Risk
150400040603	Keller Canyon	24,803	24,091	97%	1.3	Functioning Properly
150400040604	Vigil Canyon	25,882	25,475	98%	1.7	Functioning at Risk
150400040605	Mineral Creek	32,908	30,100	92%	2.1	Functioning at Risk
150400040606	Wendy Flat-San Francisco River	22,811	20,553	90%	2.1	Functioning at Risk
150400040607	Whitewater Creek	34,866	33,008	95%	1.8	Functioning at Risk
150400040608	South Dugway Creek-San Francisco River	34,019	31,818	94%	2.2	Functioning at Risk
150400040801	Little Dry Creek	33,236	14,819	45%	1.6	Functioning Properly
150400040802	Big Dry Creek	25,063	24,529	98%	1.6	Functioning Properly
150400040803	Pine Cienega Creek	25,984	12,854	50%	1.2	Functioning Properly
150400040804	Upper Mule Creek	20,282	13,458	66%	1.2	Functioning Properly
150400040805	Lower Mule Creek	13,799	6,626	48%	1.2	Functioning Properly
150400040806	Citizen Canyon	14,782	14,782	100%	1.3	Functioning Properly
150400040807	Big Pine Canyon-San Francisco River	30,090	30,039	100%	1.8	Functioning at Risk

Note: The 2010 Draft Watershed and Soils specialist report and the 2010 Draft Environmental Impact Statement were analyzed at the 5th code watershed scale, due to the landscape level of analysis and existing information at the time. New 6th code watershed classifications completed in 2011 are used in this analysis as this information reflects the most up-to-date watershed condition classification for the Gila National Forest, with the overall analysis still being conducted at the landscape scale.

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, hydrophobic soils conditions 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 recreation 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 (USDA Forest Service 1991). 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 (Ratte et.al 1989). 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 geologic erosional processes. 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.

There are 7,948 on the Gila National Forest that does not have GES data or interpretations associated with them. These acres are associated with the Fort Bayard area on the Silver City District and areas associated with the Forest Boundary. Table 2 displays the GES map units and selected interpretations and associated acres by Map unit.

Table 2. 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%		

GES MU	%Comp	Soil Type	Texture	Veg Type	Slope	Soil Condition	Erosion Hazard
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
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

GES MU	%Comp	Soil Type	Texture	Veg Type	Slope	Soil Condition	Erosion Hazard
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: The Gila National Forest Plan (1986) lists eight management areas on the Forest that contain within them, areas comprised of sensitive soils or highly erosive fragile soils. Table 5 summarizes this information:

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%

Table 5. Forest Plan Management Areas with Soils Concerns

Direction	Source	Forest	Black Range	Glen-wood	Quemado	Reserve	Silver City	Wilder-ness
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 erosive soils.	LRMP Page 105				X			
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).

In 2012, the Whitewater-Baldy Complex wildfire burned approximately 300,000 acres on the Glenwood, Reserve, and Wilderness Ranger Districts. This included a large portion of the western side of the Gila Wilderness. A majority of the high severity burn was within high elevation mixed conifer. Following the fire, a mapping update was completed in January 2013, reflecting the changes to the existing vegetation types within the burned area. The following table displays the pre and post fire acres of mid-scale existing vegetation types found on the Forest.

Table 6 displays the Forest wide Mid-Scale Existing Vegetation map units and associated acres and percentages of each map unit pre and post 2012 Whitewater Baldy Fire.

Table 6. 2012 Midscale Existing Vegetation Map Units on Gila NF (Pre and Post 2012 Whitewater-Baldy Complex Fire)

Map Unit	Pre-Fire Acres	Pre-Fire Percent	Post Fire Acres	Post-Fire Percent
alligator juniper	99,573	2.9%	99,139	2.92%
aspen	8,723	0.25%	7,775	0.23%
Corkbark fir and Engelmann spruce	2,540	0.075%	898	0.03%
mixed conifer and aspen (mixed combinations of Douglas fir, white fir, white pine, Engelmann spruce, corkbark fir with aspen)	8,108	.24%	4,257	0.13%
deciduous shrub mix	19,625	0.58%	19,625	0.58%
douglas-fir mix (Douglas fir and combination of Douglas fir and ponderosa pine, white pine and Gambel oak)	101,190	2.98%	86,500	2.55%
evergreen oak mix (pure and mixed stands of gray oak, silverleaf oak, and netleaf oak)	245,016	7.23%	222,752	6.57%
evergreen shrub mix	43,949	1.3%	43,830	1.29%
Gambel oak	31,568	.93%	30,961	0.91%
mixed conifer and Gambel oak (mixed combinations of Douglas fir, white fir, ponderosa pine, white pine with Gambel oak)	51,320	1.5%	49,273	1.45%
Grasslands	283,040	8.35%	283,040	8.35%
Grasslands-stand replacement & seeded (Whitewater-Baldy Fire)			18,460	0.54%
one-seed juniper and piñon pine	327,367	9.7%	327,116	9.65%
woodlands mixed (combinations of mixes of piñon pine, juniper, and gray oak)	1,001,190	29.5%	994,512	29.33%
ponderosa pine-gray oak	14,614	.43%	13,851	0.41%
ponderosa pine (either pure ponderosa pine stands or stands with alligator juniper or Gambel oak)	1,100,728	32.5%	1,093,410	32.25%
sparsely vegetated	6,932	.20%	6,932	0.20%
sparsely vegetated-recent stand replacement (Whitewater-Baldy Fire)			59,017	1.74%
mixed conifer (mixed combinations of Engelmann Spruce, corkbark fir, white fir, blue spruce and Douglas fir)	11,688	.34%	6,048	0.18%
lakes	309	0.01%	309	0.01%
white fir or white fir and Douglas fir mixed	33,164	.98%	22,939	0.68%
Total			3,390,642	100%

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, Wetlands, and Upland Wet Meadows

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.

A Region 3 riparian vegetation mapping project (RMAP) was initiated in 2009 and was completed in 2011 and made available to the Gila National Forest in November of 2011.

RMAP used a combination of GIS, remote sensing, photo interpretation in conjunction with high resolution infrared photography and other ancillary data sources to map riparian vegetation communities region wide at a scale of 1:12,000. An independent accuracy assessment was completed to determine overall map performance in regards to map themes. Based on a random sample of 258 map polygons, the overall area-weighted user accuracy was estimated at 81%. On the Gila National Forest there are 14 map units. Table 7 below lists the map units and the associated acres and percentages of each map unit Forest wide.

Wetlands and upland wet 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. These are included in the RMAP assessment under herbaceous riparian.

Table 7. Riparian Vegetation Communities on Gila National Forest

Map Unit	Riparian Vegetation	Acres	Percent
110	Arizona Alder	2,703	4.43%
130	Desert Willow	11,447	18.75%
170	Fremont Cottonwood-Oak	85	0.14%
180	Fremont Cottonwood-Shrub	3,123	5.12%
190	Herbaceous Riparian	2,603	4.26%
230	Narrowleaf Cottonwood-Shrub	26,679	43.71%
270	Sycamore-Fremont Cottonwood	10,204	16.72%
280	Upper Montane Conifer/Willow	670	1.10%
290	Willow/Thinleaf Alder	1,083	1.77%
300	Arizona Walnut	1,427	2.34%
310	Elm/Eastern Cottonwood	33	0.05%
340	Sparsely Vegetated	10	0.02%
350	Ponderosa Pine/Willow	886	1.45%
410	Historic Riparian/Residential Urban	83	0.14%
Total Acres		61,037	100%

Assessment of riparian and wetland ecosystems across the Forest has not been completed, however a considerable amount of data and information has been collected on these areas Forestwide. As of 2010, Riparian Area Survey and Evaluation System (RASES) assessments have been completed on 326 stream reaches, and Proper Functioning Condition (PFC) 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. Some of the ancillary data from this RASES and PFC information was incorporated into the RMAP assessment.

Table 8. Summary of Forest PFC Data (%)[1]

% 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%

[1] Total Riparian PFC reaches assessed = 132.

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 preserve water quality. These water quality standards are examined for changes on a 3-year rotating basis. The current standards (2013) are documented in "Standards for Interstate and Intrastate Surface Waters" (State of New Mexico 2013). 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 "State of New Mexico CWA 303 (d)/ 305(b) Integrated List and Report; 2012-2014 US EPA-Approved" (State of New Mexico 2012).

Table 9 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 28 waterbodies (streams & lakes) within or adjacent to Forest system land that are not meeting State water quality standards. Of these 28 waterbodies, eleven reaches have listed a probable source of impairment as either off-road vehicles or highway/road/bridge runoff.

The list in Table 9 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. 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.

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. Current Forest Service policy directs compliance with required CWA permits and State regulations and requires the use of BMPs to control nonpoint source pollution to meet applicable water quality standards and other CWA requirements (FS-990a - USDA Forest Service 2012). This project proposes no ground disturbance; it only specifies where people are allowed to drive. BMPs will likely be incorporated into restoration decisions that will follow the decision on Travel Management.

Table 9. Summary of 2012-2014 State of New Mexico CWA §303(d)/§305(b) Integrated List & Report

Basin	Reach	Designated Use (not supporting)	Probable Causes of Impairment	Probable Sources of Impairment	IR Category*
CABALLO	Las Animas Creek (perennial portion Rio 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 Fish Tissue; Temperature, water; Nutrient/Eutrophication Biological Indicators	Atmospheric Deposition - Toxics; Loss of Riparian Habitat; Rangeland Grazing; Source Unknown	5/5A
	Cold Springs Creek	Coldwater Aquatic Life	Cadmium; lead	Source Unknown	5/5A
	Gallinas Creek	Coldwater Aquatic Life	Nutrient/Eutrophication Biological Indicators	Source Unknown	5/5C
	San Vicente Arroyo	Warmwater Aquatic Life	Nutrient/Eutrophication Biological Indicators	Source Unknown	5/5C
	Mimbres River (perennial reaches Willow Springs to Cooney Cyn)	High Quality Coldwater Aquatic Life	Temperature, water	Source Unknown	5/5B
CARRIZO WASH	None	N/A	N/A	N/A	N/A
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

Basin	Reach	Designated Use (not supporting)	Probable Causes of Impairment	Probable Sources of Impairment	IR Category*
	Gila River (Mogollon Creek to East and West Fork Gila River)	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
	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 headwaters)	High Quality Coldwater Aquatic Life	Aluminum; Temperature, water; turbidity	Natural sources; off-road vehicles; other recreational pollution sources; rangeland grazing; silviculture, Fire suppression;	5/5A
	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 (Middle Fork 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	Gila River (Red Rock to Mangas Creek)	Marginal Coldwater Aquatic Life; Warmwater Aquatic Life	Nutrient/Eutrophication Biological Indicators; Temperature, water	Source Unknown	5/5C
	Gila River (Mangas Creek to Mogollon Creek)	Marginal Coldwater life;Warmwater Aquatic Life	Temperature, water	Source Unknown	5/5B
	Mangas Creek (Gila	Marginal Coldwater	Nutrient/Eutrophication Biological	Impacts from abandoned	5/5A

Basin	Reach	Designated Use (not supporting)	Probable Causes of Impairment	Probable Sources of Impairment	IR Category*
	River to Mangas Springs)	Aquatic Life; Warmwater Aquatic Life	Indicators; Temperature, water	minelands (inactive); loss of riparian habitat, natural sources, onsite treatment systems (septic systems and similar decentralized systems); other recreational pollution sources; rangeland grazing	
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	Benthic-Macroinvertebrates Bioassessments (streams); Temperature, water	rangeland grazing; silviculture, fire suppression	5/5C
	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	4A
	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

Basin	Reach	Designated Use (not supporting)	Probable Causes of Impairment	Probable Sources of Impairment	IR Category*
	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 Total Maximum Daily Load (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.

Outstanding National Resource Waters (ONRWs)

In 2011, the New Mexico Environmental Department, Surface Water Quality Bureau, had all perennial rivers and streams located in wilderness areas statewide designated as Outstanding National Resource Waters (ONRWs).

The criteria for ONRW designations in New Mexico are set forth in the Water Quality Standards at Section 20.6.4.9.B NMAC (State of New Mexico 2013) (http://www.nmcpr.state.nm.us/nmac/parts/title20/20.006.0004.htm), which provides that a surface water of the state, or a portion of a surface water of the state, may be designated as an ONRW where the Water Quality Control Commission determines that the designation is beneficial to the State of New Mexico, and:

1) The water is a significant attribute of special trout waters, national or state park, national or state monument, national or state wildlife refuge or designated wilderness area, or is part of a designated wild river under the federal Wild and Scenic Rivers Act; and

2) The water has exceptional recreational or ecological significance; or

3) The existing water quality is equal to or better than the numeric criteria for protection of aquatic life uses, recreational uses, and human health uses, and the water has not been significantly modified by human activities in a manner that substantially detracts from its value as a natural resource.

Tables 10 and 11 provide lists of all ONRWs found in the wilderness areas of the Gila National Forest.

Table 10. Outstanding National Resource Waters (Streams)

Stream Name	ONRW Stream Miles
Apache Creek	5.89
Aspen Canyon	2.56
Big Dry Creek	8.07
Black Canyon	20.13
Bonner Canyon	2.03
Brush Canyon	1.02
Burnt Canyon	2.87
Byers Run	1.04
Canyon Creek	3.85
Chicken Coop Canyon	1.42
Circle Seven Creek	2.03
Clear Creek	4.54
Cooper Canyon	0.64
Corral Canyon	0.27
Cow Creek	1.91
Cub Creek	4.09
Diamond Creek	12.59
East Fork Gila River	12.57
Falls Canyon	1.23

Stream Name	ONRW Stream Miles
Fisherman Canyon	0.22
Flower Canyon	0.67
Gila River	32.53
Gilita Creek	6.03
Holden Prong	4.75
Indian Canyon	3.15
Indian Creek	6.26
Iron Creek	11.51
Langstroth Canyon	3.24
Las Animas Creek	2.50
Lilley Canyon	0.78
Lipsey Canyon	1.11
Little Creek	9.20
Little Dry Creek	1.48
Little Turkey Creek	1.31
Little Whitewater Creek	1.82
Lookout Canyon	1.04
McKenna Creek	0.34
Middle Fork Gila River	35.53
Miller Spring Canyon	2.19
Mimbres River	3.82
Mogollon Creek	11.33
Mud Spring Canyon	0.56
North Fork Mimbres River	0.67
North Fork Palomas Creek	2.85
North Seco Creek	6.05
Panther Canyon	2.40
Pretty Canyon	0.43
Prior Creek	0.96
Pueblo Creek	1.52
Rain Creek	4.97
Raw Meat Creek	2.22
Rocky Canyon	2.07
Running Water Canyon	1.45
Sacaton Creek	1.65
Sapillo Creek	6.21
Sheep Corral Canyon	1.99
Sids Prong	2.00
Skeleton Canyon	2.02
South Animas Canyon	1.10
South Diamond Creek	5.46
South Fork Mimbres River	0.93

Stream Name	ONRW Stream Miles
South Fork Whitewater Creek	3.96
Spider Creek	1.66
Spruce Creek	2.73
Squaw Creek	1.25
Sycamore Canyon	2.89
Trail Canyon	0.73
Trail Creek	0.69
Trout Creek	2.03
Turkey Creek	12.13
Turkey Feather Creek	0.44
Turnbo Canyon	0.27
Victorio Park Canyon	1.73
Water Canyon	2.88
West Fork Gila River	28.59
West Fork Mogollon Creek	7.20
White Creek	7.56
Whitewater Creek	11.31
Willow Creek	1.78
Woodrow Canyon	0.60
Grand Total	367.46

Table 11. Outstanding National Resource Waters -Wetlands

ONRW Wetland Type	ONRW Wetland Acre	ONRW Wetland Count
Freshwater Emergent Wetland	670	147
Freshwater Forested/Shrub Wetland	1,106	387
Freshwater Pond	1	2
Other	1	5
Riverine	537	184
Grand Total	2,315	725

Summary of Existing Condition

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

Table 12. 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 drainages
	13 miles of water pipeline
	16 miles of ditches
	289 surface acres of lakes
	2,603 acres of upland wet meadows (RMAP)
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 Colorado River via tributaries
	Eastern portion of Forest flows east, southeast into Rio Grande via tributaries
Watersheds	202 sixth code watersheds that intersect the Forest with average size of 26,500 acres
	180 watersheds assessed for Watershed Condition Classification:
	98 classified as “functioning properly
	81 classified as “Functioning at Risk”
	1 classified as “Impaired Function”
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

Feature	Characteristics
Water Quality	28 waterbodies within or adjacent to Forest not meeting State water quality standards
	11 of 28 list probable source of impairment as off-road vehicles or highway/road/bridge runoff.
	80 Outstanding National Resource Waters (Streams) totaling 367 miles
	725 Outstanding National Resource Waters (Wetlands) totaling 2,315 acres
Riparian Condition	61,037 acres of riparian vegetation (RMAP)
	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
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 5,100 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 motorized route density in 6th code watersheds (Forest Service and non-Forest Service routes)	43% of the 6th code watersheds have a road density of less than 1.0 mile of road per square mile of land (mi/mi^2).
	51% of the 6th code watersheds have a road density of 1-2.4 mi/mi^2.
	6% of the 6th code watersheds have a road density of greater than 2.4 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.
>
> 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.

A new U.S. Forest Service report predicts that most of the Southwest, parts of California and the southern and central Great Plains will be the most vulnerable areas in the nation to water shortages during the next 60 years. The report, "Vulnerability of U.S. Water Supply to Shortage: A Technical Document Supporting the Forest Service 2010 RPA Assessment"(Foti et al. 2012), affirmed that of 98 river basin assessments across the U.S., the arid and semi-arid regions of the nation are the most vulnerable areas to future water shortages. Although the detailed results differ depending on which scenario is simulated and which climate model is used, the general finding of increasing and substantial vulnerability in the Southwest holds true in all cases.

The National Climate Assessment Development Advisory Committee (NCADAC) has overseen the development of a Draft Climate Report that was recently released for public comment (January 2013). Summarized below are some of the findings from the report.

> "The Southwest is the hottest and driest region in the U.S., where the availability of water has defined its landscapes, history of human settlement, and modern economy. Climate changes pose challenges for an already parched region that is expected to get hotter and, in its southern half, significantly drier. Widespread tree death and fires, which already have caused billions of dollars in economic losses, are projected to increase, forcing wholesale changes to forest

> types, landscapes, and the communities that depend on them. Climate change is increasing the vulnerability of forests to ecosystem change and tree mortality through fire, insect infestations, drought, and disease outbreaks. Western U.S. forests are particularly vulnerable to increased wildfire and insect outbreaks.
>
> Factors affecting tree death, such as drought, higher temperatures, and/or pests and pathogens, are often interrelated, which means that isolating a single cause of mortality is rare (Allen et al. 2010; Dukes et al. 2009; McDowell et al. 2008). However, rates of tree mortality due to one or more of these factors have increased with higher temperatures in western forests (Van Mantgem et al. 2009; Williams et al. 2010) and are well correlated with both rising temperatures and associated increases in evaporative water demand (Williams et al. 2012). Trees die faster when higher temperatures accompany drought; thus a shorter drought can trigger mortality. Short droughts occur more frequently than long droughts, therefore the direct effect of rising temperatures, without a change in drought frequency, could result in substantially greater mortality (Adams et al. 2009). Western forests are currently considered limited by moisture and thereby highly susceptible to future changes in environmental conditions.
>
> Fire naturally shapes southwestern landscapes. Indeed, many Southwest ecosystems depend on periodic wildfire to maintain healthy tree densities, enable seeds to germinate, and reduce pests (Bowman et al. 2009; Keeley and Zedler 2009). Excessive wildfire destroys homes, exposes slopes to erosion and landslides, threatens public health, and causes economic damage (Frisvold et al. 2011; Morton and Global Institute of Sustainable Forestry 2003; Richardson et al. 2011; WFLC 2010). Given strong relationships between climate and fire, even when modified by land use and management, projected climate changes suggest that western forests in the United States will be increasingly affected by large and intense fires that occur more frequently (Bowman et al. 2009; Keane et al. 2009; Littell et al. 2009; Westerling et al. 2011; Williams et al. 2010)."

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.

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 2012 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.

Standards for Interstate and Intrastate Surface Waters, Title 20, Chapter 6, Part 4

The purpose of this statute is to establish water quality standards that consist of the designated use or uses of surface waters of the state, the water quality criteria necessary to protect the use or uses and an antidegradation policy (which includes ONRWs).

Council on Environmental Quality; Regulations for Implementing NEPA; Section 1502.22; Incomplete or unavailable information; [51 FR 15625, Apr. 25, 1986]

When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.

> (a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.

(b) If the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the environmental impact statement:

1. A statement that such information is incomplete or unavailable;
2. a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment;
3. a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and
4. the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, "reasonably foreseeable" includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

(c) The amended regulation will be applicable to all environmental impact statements for which a Notice of Intent (40 CFR 1508.22) is published in the Federal Register on or after May 27, 1986. For environmental impact statements in progress, agencies may choose to comply with the requirements of either the original or amended regulation.

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 at the 6th code watershed level for those watersheds that intersect the Gila National Forest having a substantial land base managed by the Forest.

Note: The 2013 Final Watershed and Soils Specialist report updates the 2010 Draft Watershed and Soils Specialist in the following areas:

1) The 2011 Gila NF Riparian Map (RMAP) replaces the Riparian Risk Zone. Reason: This new data provides an up-to-date, comprehensive, Forestwide coverage of riparian information that was not completed prior to the Draft report.
2) The 2011 Watershed Condition Classification of Forest watersheds at the 6th Code level is used in lieu of 5th code watershed information. Reason: This new evaluation and classification of watershed condition Forestwide updates previous 5th code watershed condition information from 1986. 6th code watershed condition ratings were not completed prior to 2011.
3) The State of New Mexico 2012-2014 Integrated 303(d)/305(b) List of Impaired Waters replaces the State of New Mexico 2010-2012 303(d)/305(b) List of Impaired Waters. Reason: The State of New Mexico is required to issue updated biannual assessments of water quality statewide. This report provides the most up-to-date assessments of water quality on the Gila National Forest.

4) Outstanding National Resource Waters (ONRWs) were designated in 2011 and will be included in the Water Quality analysis. Note: There were no ONRWs on the Gila National Forest prior to 2011.

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) (USDA, 1989)
- Gila NF Mid-Scale Existing Vegetation Map
- Integrated 303(d)/305(b) List of Impaired Waters and Outstanding National Resource Waters (State of NM, 2012)
- Forest Stream Crossing Survey
- User created routes inventory (Forest and Public)
- 6th code Hydrologic Unit Codes
- Forest Riparian Vegetation Map (RMAP)
- Perennial, intermittent, ephemeral NHD information
- 2011 Gila NF Watershed Condition Assessment
- Forest GIS data layers
- Forest FACTS database
- Forest INFRA database

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).
- 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.
- Routes that receive motorized use have the potential to produce more sediment than routes that are not open for motorized use.

- When stream crossings remain evident on the land, it is assumed there is use.
- The Watershed and Soils Specialist Report is analyzed at the landscape level, so the assessment considers effects "in general" across the entire Forest. This report is not intended to address isolated effects at smaller, site-specific locations. This report does acknowledge that impacts may, and do, occur at some of these locations.
- The 2011 Watershed Condition Classification incorporated management activities and watershed events that occurred in the past or that are on-going. The final assessment of watershed condition in 2011 constituted a culmination of these activities and/or events, leading to current watershed condition. The condition classification of each 6th code watershed is considered a result of cumulative watershed effects up to 2011.
- Relative risk is considered the potential impact that can result from one action (alternative) measured against the potential impact that might result from a different action (alternative).
- Parking of one car length off of motorized route is assumed to be 50 feet for purposes of analysis (approximately truck plus trailer length).
- Road miles are converted to acres of disturbance (miles of road x assumed road widths) based on road maintenance levels. The following average road widths were used are found in Table 13.

Table 13. Assumed Average Road Widths by Maintenance Level

Routes	Average Assumed Width of Route (ft)
Single Track Trails	3
Maintenance Level 1 – Decommissioned*	0
Maintenance Level 1 – Closed	12
Maintenance Level 2	12
Maintenance Level 3	14
Maintenance Level 4	20
Maintenance Level 5	20
ATV Trails	8
Non Forest Service Roads	16

*Decommissioned is defined as returning the route to its natural (pre-road) condition.

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.
  - There are 7,948 acres on the Gila National Forest that do not have GES data or interpretations associated with them. These acres are associated with the Fort Bayard area on the Silver City District and areas associated with the Forest Boundary.

- Motorized crossings on ephemeral drainages were not field inventoried. These crossings were determined via a GIS analysis. Motorized routes and ephemeral streams (National Hydrography Dataset) were overlayed, with a motorized crossing point being created where the two lines intersected. This report acknowledges that there may be some errors in motorized crossing numbers as a result of this method.
- The Forest has no data for motorized use levels
- The RMAP riparian mapping project is completed at a scale of 1:12,000. This project was done utilizing GIS, satellite imagery, aerial photography and ancillary data. This project was limited to 24 regional-type map units.
- No data to support sedimentation modeling, thus no effort made to predict sediment increases or decreases.
- The State of New Mexico's GIS 303(d) stream layer was used to evaluate potential impacts to impaired waterbodies from a motorized route system. The State's GIS layer and its narrative describing the listed reach do not always match. This may lead to some errors in miles of stream being impacted and/or stream crossings per listed reach. This report acknowledges that some errors in the 303(d) tables may exist related to this discrepancy.

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 recreation 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.

Relative Risk Analysis

This analysis uses a relative risk method of assessing differences between alternatives. Relative risk is considered the potential impact that can result from one action (alternative) measured against the potential impact that might result from a different action (alternative).

The following method was used for all direct and indirect effects analyses in this report, based on the premise that: A - The effects of a motorized route system, motorized dispersed recreation, motorized big game retrieval, and motorized areas on a key resource are considered the same under all alternatives; and B – More or less of these effects occur, or have the potential to occur, under each alternative, based on each alternative's design.

1) The direct/indirect effects* to the resource are described
2) Measures of the indicator for the resource area are used to compare each action alternative to the No Action Alternative.
3) These results of these measures are compared to determine relative risk
4) Results are summarized under each resource area

*direct/indirect effects –Direct effects are those occurring at the same time and place as the triggering action. Indirect effects are those caused by the action, but that occur at a later time, or at a distance from the triggering action.

Indicators

This analysis prioritizes areas at highest risk for critical resource loss, and examined the relative risk associated with motorized use in these areas. This places the focus on sensitive resources that are guided by law, regulation, and policy. The following indicators for soils and watershed were selected to analyze how a motorized route system has the potential to impact these critical resources. For soil resources, these indicators include the following: 1) motorized disturbance in soils identified as having moderate and severe erosion potential, and 2) motorized disturbance in soils identified as having unsatisfactory and unsuited soil conditions. For watershed resources (riparian areas and water quality), these include the following: 1) motorized disturbance in riparian areas and wetlands/wet meadows, and 2) motorized disturbance in, or adjacent to perennial streams, intermittent streams, 303(d) streams, and ephemeral drainages.

Soil Resources

Erosion Potential

Indicator:

- Motorized disturbance in soils identified as having moderate and severe erosion potential.

Measure:

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

Soil Condition

Indicator:

- Motorized disturbance in soils identified as having unsatisfactory and unsuited soil conditions.

Measure:

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

Water Resources

Riparian Areas and Wetlands/Wet Meadows

Indicator:

- Motorized disturbance to riparian areas and wetlands/wet meadows.

Measure:

- Acres of disturbance from motorized routes within riparian areas and wetlands/wet meadows.
- Acres of potential disturbance from motorized big game retrieval, motorized dispersed camping, and motorized areas within riparian areas and wetlands/wet meadows.

Water Quality

Indicator:

- Motorized disturbance impacting perennial streams, intermittent streams, 303(d) streams, ONRW streams, and ephemeral drainages.

Measure:

- Number of stream crossings on perennial, intermittent, 303(d) streams, ONRW streams, ephemeral drainages
- Miles of perennial streams, intermittent streams, 303(d) streams, and ephemeral drainages potentially impacted by motorized routes, motorized big game retrieval, motorized dispersed recreation, and motorized areas
- Miles of ONRW streams impacted by motorized routes.
- Miles of motorized routes within 300 feet of ONRW wetlands.
- Acres of motorized dispersed recreation, motorized big game retrieval and motorized areas within 300 feet of ONRW streams and wetlands.

Direct and Indirect Effects

Effects to Soil Resources

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. There has been a commitment of the soil resource when the route was established, which resulted in loss of soil productivity and vegetative cover. This commitment, in places, may be irreversible and/or irretrievable due to long-term compaction and off-site soil loss from the road. 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 recreation, acres of big game retrieval and motorized areas affected by parking one vehicle length off of 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 from a motorized routes system 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

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 4,577 miles of motorized routes under Forest Service jurisdiction and 6,863 acres of disturbed ground associated with these routes. Of these 6,836 acres of disturbance 2,468 acres are located on soils with moderate or severe erosion hazard ratings and 2,870 acres are located on soils with unsatisfactory or unsuited soil conditions. 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. Of the 2,441,804 acres that could potentially be impacted by cross country travel, 1,210,241 acres are located on soils with moderate or severe erosion hazard and 1,161,775 acres are located on soils with unsatisfactory or unsuited soil conditions. Under the No Action alternative, continued, unrestricted motorized dispersed recreation would continue off of approximately 4,577 miles of routes.

Effects Unique to each Action Alternative

Each action alternative is evaluated based on the potential risk to the soil resource relative to the risk posed in 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 6,846 acres of disturbed ground associated with proposed motorized routes. Of these total acres, 2,504 acres are located on soils with moderate or severe erosion hazard ratings and 2,874 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 this alternative has a 1% increase from the No Action Alternative. For soils that have unsatisfactory or unsuited ratings, there is essentially no change from the No Action Alternative.

Motorized Dispersed Recreation Corridors (300 ft camping corridor along designated routes). Under this alternative there are a total of 108,060 acres that could potentially be impacted within

motorized dispersed recreation corridors. Of these total acres, 34,241 acres are located on soils with moderate or severe erosion hazard ratings and 46,981 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 54,592 acres that could potentially be impacted by this activity. Of these total acres, 18,712 acres are located on soils with moderate or severe erosion hazard and 23,290 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 recreation 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 percent decreases ranging from 94% to 99%.

Motorized Big Game Retrieval (one mile from motorized routes, all big game species). Under this alternative there are a total of 2,073,825acres that could potentially be impacted by motorized big game retrieval. Of these total acres, 950,931 acres are located on soils with moderate or severe erosion hazard ratings and 949,094 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 21%, and to soils having unsatisfactory or unsuited soil condition rating by 18%, which are the least amount of reductions of any action alternative.

Motorized Areas (36 traditional camping areas and 1 ATV/motorcycle area). Under this alternative there are 36 traditional camping areas totaling approximately 24 acres that will be available and intended for motorized dispersed recreation throughout the Forest. The majority of these sites are less than 1 acre in size. Some of these sites are somewhat hardened due to past use, while others are not. 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 typically have 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. Of the 24 total acres, 9 acres are located on soils with moderate or severe erosion hazard rating and 12 acres are located on soils with unsatisfactory soil conditions, similar to Alternatives F and G.

There is one area open to ATV and motorcycle use (approximately 3 acres) located near Reserve. This area is an old 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, similar to Alternatives F and G.

Alternative D

Motorized Routes. Under this alternative there are a total of 5,192 acres of disturbed ground associated with proposed motorized routes. Of these total acres, 1,829 acres are located on soils with moderate or severe erosion hazard ratings and 2,282 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 26% 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 20%, which is the second largest reduction behind Alternative E.

Motorized Dispersed Recreation Corridors (300 ft camping corridor along designated routes). Under this alternative there are a total of 84,267 acres that could potentially be impacted by motorized dispersed recreation. Of these total acres, 28,200 acres are located on soils with moderate or severe erosion hazard ratings and 35,327 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 39,274acres that could potentially be impacted by this activity. Of these total acres, 12,748 acres are located on soils with moderate or severe erosion hazard and 17,474 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 recreation 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 percent decreases ranging from 94% to 99%.

Motorized Big Game Retrieval (in the 300 foot designated camping corridors, for deer and elk). Under this alternative there are a total of 84,267 acres that could potentially be impacted by motorized big game retrieval. Of these total acres, 28,200 acres are located on soils with moderate or severe erosion hazard ratings and 35,327 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, thus no impacts to soils. This alternative is similar to Alternative E.

Alternative E

Motorized Routes. Under this alternative there are a total of 4,173 acres of disturbed ground associated with proposed motorized routes. Of these total acres, 1,443 acres are located on soils with moderate or severe erosion hazard ratings and 1,908 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 42%. There is also a 34% reduction in motorized routes impacting soils with unsatisfactory or unsuited soil condition ratings, which is the largest reduction of all the alternatives.

Motorized Dispersed Recreation Corridors. Under this alternative there would be no motorized dispersed recreation 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 31,427 acres that could potentially be impacted by this activity. Of these total acres, 10,106 acres are located on soils with moderate or severe erosion hazard and 15,277 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 recreation 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 percent 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 from this activity. 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, thus no impacts to soils. This alternative is similar to Alternative D.

Alternative F

Motorized Routes. Under this alternative there are a total of 5,741 acres of disturbed ground associated with proposed motorized routes. Of these total acres, 2,099 acres are located on soils with moderate or severe erosion hazard ratings and 2,428 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 G.

Motorized Dispersed Recreation Corridors (300 ft camping corridor along designated routes). Under this alternative there are a total of 101,776 acres that could potentially be impacted in motorized dispersed recreation corridors. Of these total acres, 32,442 acres are located on soils with moderate or severe erosion hazard ratings and 43,130 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 43,902 acres that could potentially be impacted by this activity. Of these total acres, 14,724 acres are located on soils with moderate or severe erosion hazard and 18,856 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 recreation 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 percent 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 1,503,239 acres that could potentially be impacted by motorized big game retrieval. Of these total acres, 605,485 acres are located on soils with moderate or severe erosion hazard ratings and 679,407 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 (36 historic camping areas and 1 ATV/motorcycle area). Under this alternative there are 36 historic camping areas totaling approximately 24 acres that will be available and intended for motorized dispersed recreation throughout the Forest. Some of these sites are somewhat hardened, due to past use while others are not. 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. Of the 24 total, acres 9 acres are located on soils with moderate or severe erosion hazard rating and 12 acres are located on soils with unsatisfactory soil conditions. The effects of motorized camping are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this alternative, similar to Alternatives C and G.

There is 1 ATV/motorcycle area is approximately 3 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, similar to Alternatives C and G.

Alternative G

Motorized Routes. Under this alternative there are a total of 5,634 acres of disturbed ground associated with proposed motorized routes. Of these total acres, 2,076 acres are located on soils with moderate or severe erosion hazard ratings and 2,403acres 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 Recreation Corridors (300 ft camping corridor along designated routes). Under this alternative there are a total of 93,871 acres that could potentially be impacted within motorized dispersed recreation corridors. Of these total acres, 29,914 acres are located on soils with moderate or severe erosion hazard ratings and 39,625 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 43,553 acres that could potentially be impacted by this activity. Of these total acres, 14,511 acres are located on soils with moderate or severe erosion hazard and 18,658 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 recreation 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 percent 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 93,871 acres that could potentially be impacted by motorized big game retrieval. Of these total acres, 29,914acres are located on soils with moderate or severe erosion hazard ratings and 39,625 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 Alternatives D and E and greater than Alternatives C and F.

Motorized Areas (36 traditional camping areas and 1 ATV/motorcycle area). Under this alternative there are 36 historic camping areas totaling approximately 24 acres that will be available and intended for motorized dispersed recreation throughout the Forest. Some of these sites are somewhat hardened due to past use while others are not. 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. Of the 24 total acres, 9 acres are located on soils with moderate or severe erosion hazard rating and 12 acres are located on soils with unsatisfactory soil conditions. The effects of camping areas are described above in Effects of Motorized Off Road Travel Common to all Alternatives, and apply to this alternative, similar to Alternatives C and F.

There is 1 ATV/motorcycle area that totals approximately 3 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, similar to Alternatives C and F.

Summary

The effects to soils by a motorized route system 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 motorized route system across the Forest, however no alternative proposes decommissioning or obliteration of any roads to return them to a more natural state. Tables 14- 21 provide a summary of acres of motorized routes by alternative on sensitive soil resources, as well as potential acres that may be impacted by motorized dispersed recreation, motorized areas, and motorized big game retrieval.

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, 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 (-98%) 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 (-21%).

- Alternatives D (-97%), E (-100%) and G (-97%) 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 (-18%).
- 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 36 areas (approximately 24 acres) from soils having moderate or severe erosion hazard ratings and soils with unsatisfactory or unsuited soil condition ratings. Alternatives C, F, and G have effects to 9 acres of soils with soil erosion hazard rating of moderate or severe and 12 acres of soils with unsatisfactory or unsuited soil conditions.

The approximately 3 acre 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 14. Acres of Motorized Routes Located on Soils with Moderate or Severe Erosion Hazard Ratings

Erosion Hazard Rating	Alt B – No Action	Alt C	Alt D	Alt E	Alt F	Alt G
Moderate - Acres	856	905	634	491	696	684
Severe - Acres	1,612	1,600	1,194	952	1,404	1,392
Grand Total Acres	2,468	2,504	1,829	1,443	2,099	2,076
Change in Acres from No Action		36	-639	-1024	-369	-392
% Increase or decrease from No Action		1%	-26%	-42%	-15%	-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 15. Acres of Motorized Routes Located on Soils with Unsatisfactory or Unsuited Soil Condition Ratings

Soil Condition Rating	Alt B – No Action	Alt C	Alt D	Alt E	Alt F	Alt G
Unsatisfactory - Acres	2,404	2,416	1,946	1,631	2,050	2,038
Unsuited - Acres	466	458	336	277	378	365
Grand Total Acres	2,870	2,874	2,282	1,908	2,428	2,403
Change in Acres from No Action		4	-588	-963	-442	-467
% Decrease from No Action		0%	-20%	-34%	-15%	-16%

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

Erosion Hazard Rating	Alt B – No Action	Alt C	Alt D	Alt E	Alt F	Alt G
Moderate - Acres	384,591	321,794	13,248	0	206,032	13,772
Severe - Acres	825,649	629,138	14,952	0	399,453	16,142
Grand Total	1,210,241	950,931	28,200	0	605,485	29,914
Change in Acres from No Action		-259,309	-1,182,041	-1210241	-604,756	-1,180,327
% Decrease from No Action		-21%	-98%	-100%	-50%	-98%

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

Soil Condition Acres	Alt B – No Action	Alt C	Alt D	Alt E	Alt F	Alt G
Unsatisfactory – Acres	731,052	669,737	30,741	0	531,572	34,372
Unsuited - Acres	430,723	279,358	4,586	0	147,835	5,253
Grand Total Acres	1,161,775	949,094	35,327	0	679,407	39,625
Change in Acres from No Action		-212,681	-1,126,448	-1,161,775	-482,368	-1,122,150
% Decrease from No Action		-18%	-97%	-100%	-42%	-97%

*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 18. Potential Acres Impacted by Motorized Dispersed Recreation and Areas where Permitted Parking 1 Vehicle Length Off of Road Apply to Soils with Moderate or Severe Erosion Hazard Rating

Alternative	Acres Motorized Dispersed Camping on soils with moderate or severe erosion hazard rating	Reduction in Acres from No Action	% Decrease from No Action	Acres of Permitted Parking (1 vehicle length) on soils with moderate or severe erosion hazard rating	Reduction in Acres from No Action	% Decrease from No Action	Total Acres of Motorized dispersed recreation and Permitted Parking Combined	Total % Decrease from the No Action
Alternative B – No Action	1,210,241							
Alternative C	34,241	-1,176,000	97%	18,712	-1,191529	98%	52,953	95%
Alternative D	28,200	-1,182,041	98%	12,748	-1,197,493	99%	40,948	97%
Alternative E	0	-1,210,241	100%	10,106	-1,200,135	99%	10,106	99%
Alternative F	32,442	-1,177,799	97%	14,724	-1,195,517	99%	47,166	95%
Alternative G	29,914	-1,180,327	98%	14,511	-1,195,730	99%	44,425	95%

*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 19. Potential Acres Impacted Motorized Dispersed Recreation and Areas where the Permitted Parking 1 Vehicle Length Off of Road Apply to Soils with Unsatisfactory or Unsuited Soil Condition Ratings

Alternative	Acres Motorized Dispersed Camping on soils with unsatisfactory or unsuited soil conditions	Reduction in Acres from No Action	% Decrease from No Action	Acres of Permitted Parking (1 vehicle length) unsatisfactory or unsuited soil conditions	Reduction in Acres from No Action	% Decrease from No Action	Total Acres of Motorized dispersed recreation and Permitted Parking Combined	Total % Decrease from the No Action
Alternative B – No Action	1,161,775							
Alternative C	46,981	-1,114,794	96%	23,290	-1,138,485	98%	70,271	94%
Alternative D	35,327	-1,126,448	97%	17,474	-1,144,301	99%	52,801	95%
Alternative E	0	-1161,775	100%	15,277	-1,146,498	99%	15,277	99%
Alternative F	43,130	-1,118,645	96%	18,856	-1,142919	99%	61,986	95%
Alternative G	39,625	-1,122,150	97%	18,658	-1,143,117	99%	58,283	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 20. 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** **(% Decrease from No Action)**	**Acres**	**Reduction in Acres from No Action**	**% Decrease from No Action**
Alternative B – No Action	1,210241		
Alternative C	9	1,210,232	100%
Alternative D	0	1,210,241	100%
Alternative E	0	1,210,241	100%
Alternative F	9	1,210,232	100%
Alternative G	9	1,210,232	100%

*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 21. 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** **(% Decrease from No Action)**	**Acres**	**Reduction in Acres from No Action**	**% Decrease from No Action**
Alternative B – No Action	1,161,775		100%
Alternative C	12	1,161,763	100%
Alternative D	0	1,161,763	100%
Alternative E	0	1,161,775	100%
Alternative F	12	1,161,763	100%
Alternative G	12	1,161,763	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

Effects to Riparian Areas and Wetlands/Wet Meadows

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

Although riparian and wetland/wet meadow 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.

A motorized route system can affect riparian areas and wetlands/wet meadows directly or indirectly by inducing changes to natural hydrologic functions. Motorized activities on these routes can result in modification of surface and subsurface drainage patterns which can result in changes in moisture regimes of these areas. Motorized 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. Continued driving in and through stream channels can directly breakdown streambanks that provide for riparian function and aquatic habitat. Soil rutting, compaction and detachment of soils, and accelerated erosion may occur, as well as sediment transport and sediment deposition occurring into connected waters, reducing water quality on-site and downstream. Motorized routes that are adjacent to, or that intersect portions of wetlands/wet meadows alter surface hydrology and water flow causing loss of water storage, vegetation productivity and wetland function.

Many wetlands and wet meadows across the Forest have road access and provide easy opportunity for motorized dispersed recreation and motorized big game retrieval. Motorized route systems in these areas pose a threat to soil productivity and vegetation, particularly if several motorized passes remove or destroy vegetation. Repeated motor vehicle activities can cause soil compaction in wetlands and wet meadows, which may result in long-term adverse effects.

Adverse impacts to riparian areas and wetlands/wet meadows related to motorized travel off of designated routes vary in magnitude. Riparian areas tend to be a natural draw for concentration of both motorized and non-motorized recreation. In areas where travel off of designated routes is high, levels of negative impacts 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 and their susceptibility to rutting and compaction. In general, observations on the Gila National Forest indicate that the amount of adverse effects to riparian areas and wetlands, Forestwide, from travel off of designated routes is 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 however, motorized users have created visible routes that get repeatedly used by motorized vehicles for such things as recreation, big game hunting, antler hunting, and unrestricted cross-country travel. These locations, which include popular recreation and camping spots such as sections of the Gila River, Turkey Creek, Little Dry Creek and the San Francisco River, can continue to experience adverse impacts to the riparian areas and associated wetlands, as long as the use is permitted.

Alternative B – No Action

Impacts to riparian and wetland vegetation as a result of the current motorize route system on the Forest are detailed above in the Effects Common to All Alternatives. Under Forest Service jurisdiction, there are currently 299 miles of open routes that create 443 acres of motorized route disturbance within riparian areas. In wetlands/wet meadows, there are 12 miles of motorized routes, which

translates to 18 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 31,581 acres within riparian areas, and 1,568 acres within wetlands/wet meadows.

For all alternatives it is unlikely that all acres of riparian and wetlands/wet meadows are having use by motor vehicles.

Effects Unique to each Action Alternative based on Measure of the Indicator

Each action alternative will be evaluated based on the potential risk to riparian and wetland/wet meadow 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 measure of change from No Action is based on the potential acres of disturbance that are possible under each of the action alternatives. Tables follow the comparison of alternatives and display the miles of motorized routes and/or acreages that motorized activities may impact that would be permitted under each alternative.

Note 1: Acres of wetlands and wet meadows on the Forest are derived from the Forest RMAP assessment under the vegetation type "herbaceous riparian". The acres described in any of the wetland/wet meadow discussion are not "in addition to" acres of riparian, but rather a subset that is included in the riparian discussion. They are looked at separately as a subset, as they are extremely sensitive to ground disturbing actions, including impacts from motorized activities.

Note 2: The starting point for acres of riparian areas in Alternative B – No Action is based on the number or riparian acres in the RMAP assessment minus acres found in wilderness areas, off-road vehicle (prohibited) areas, and research natural areas (proposed and designated).

Alternative C

Motorized Routes. In riparian areas, the acreage potentially impacted by motorized routes (441 acres) is similar to the No Action Alternative (443 acres). In wetlands, the acreage is reduced to 17 acres, which is a 6% reduction from the No Action Alternative (18 acres). 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 areas, the acreage potentially impacted by motorized dispersed recreation (4,357 acres) is less than the No Action Alternative (31,581 acres), which is similar to Alternatives D, F, and G, but less than Alternative E. In wetlands, the acreage is reduced to 296 acres, which is an 81% reduction from the No Action Alternative (1,568 acres), which is similar to Alternatives 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 areas, the acreage potentially impacted by motorized big game retrieval (27,356 acres) is less than the No Action Alternative (31,581 acres), which is the least reduction of all action alternatives. In wetlands, the acreage is reduced to 1,561 acres, which is a 0% reduction from the No Action Alternative (1,568), which is similar to the No Action Alternative and the least reduction of all action alternatives.

Motorized Areas (37 areas: 1 motorcycle/ATV; 36 camping). The Travel Management Rule defines 'areas' as open to all motorized vehicle use. The 36 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 acres and is not located within a riparian area or wetland/wet meadow. Considering the Forest has not previously been closed to this type of activity, the alternatives are measured against the total acres of riparian areas (31,581 acres) and wetlands/wet meadows (1,568 acres) that this type of activity would have been allowed to occur. In riparian areas and wetlands/wet meadows, this alternative virtually eliminates the acres of motorized areas available for potential impacts, similar to all action alternatives.

Alternative D

Motorized Routes. In riparian areas, the acreage potentially impacted by motorized routes (330 acres) is less than the No Action Alternative (443 acres), which is the second largest reduction behind Alternative E. In wetlands, the acreage is reduced to 13 acres, which is a 28% reduction from the No Action Alternative (18 acres), similar to Alternatives F and G.

Motorized Dispersed Recreation (300' corridor designated along specific routes). In riparian areas, the acreage potentially impacted by motorized dispersed recreation (3,334 acres) is less than the No Action Alternative (31,581 acres), which is similar Alternatives C, F, and G, but less than Alternative E. In wetlands, the acreage is reduced to 239 acres, which is an 85% reduction from the No Action Alternative (1,568 acres), which is similar Alternatives C, F, and G, but less than Alternative E.

Motorized Big Game Retrieval (within 300' motorized dispersed recreation corridor for elk, deer, bear, mountain lion, javelina, pronghorn). In riparian areas, the acreage potentially impacted by motorized big game retrieval (3,334 acres) is less than the No Action Alternative (31,581 acres), which is similar to Alternative G. In wetlands, the acreage is reduced to 239 acres, which is a 85% reduction from the No Action Alternative (1,568), which is similar to Alternative G.

Motorized Areas (no areas designated). Motorized areas are not designated under this alternative, thus there would be no potential adverse impacts within riparian areas or wetlands/wet meadows due to motorized areas. In riparian areas and wetlands/wet meadows, this alternative eliminates the acres of motorized areas available for potential impacts, similar to all action alternatives.

Alternative E

Motorized Routes. In riparian areas, the acreages potentially impacted by motorized routes (273 acres) is less than the No Action Alternative (443 acres), which is the largest reduction of any action alternative. In wetlands, the acreage is reduced to 10 acres, which is a 44% reduction from the No Action Alternative (18 acres), and the largest reduction of any action alternative.

Motorized Dispersed Recreation (not motorized dispersed recreation permitted). Motorized dispersed recreation is not permitted under this alternative, thus there would be no potential adverse effects within riparian areas or wetlands/wet meadows. This alternative reduces the acreage available for potential impacts to riparian areas and wetlands/wet meadows 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). Motorized big game retrieval is not permitted under this alternative, thus there would be no potential adverse effects within riparian areas or wetlands/wet meadows. This alternative reduces the acreage available for potential impacts to riparian areas and wetlands/wet meadows from motorized big game retrieval by 100%, which is the largest reduction of all action alternatives.

Motorized Areas (no areas designated). Motorized areas are not designated under this alternative, thus there would be no potential adverse impacts within riparian areas or wetlands/wet meadows due to motorized areas. In riparian areas and wetlands/wet meadows, this alternative eliminates the acres of motorized areas available for potential impacts, similar to all action alternatives.

Alternative F

Motorized Routes. In riparian areas, the acreage potentially impacted by motorized routes (382 acres) is less than the No Action Alternative (443 acres), which is less than Alternatives D and E, but similar to Alternative G. In wetlands, the acreage is reduced to 14 acres, which is a 22% reduction from the No Action Alternative (18 acres), similar to Alternatives D and G.

Motorized Dispersed Recreation (300' corridor designated along specific routes). In riparian areas, the acreage potentially impacted by motorized dispersed recreation (3,828 acres) is less than the No Action Alternative (31,581 acres), which is similar Alternatives C, D, and G, but less than Alternative E. In wetlands, the acreage is reduced to 293 acres, which is an 81% reduction from the No Action Alternative (1,568 acres), which is similar Alternatives C, D, and G, but less than Alternative E.

Motorized Big Game Retrieval (within ½ mile of motorized routes, elk only). In riparian areas, the acreage potentially impacted by motorized big game retrieval (20,565 acres) is less than the No Action Alternative (31,581 acres). In wetlands, the acreage is reduced to 1,485 acres, which is a 5% reduction from the No Action Alternative (1,568), which is similar to Alternative C.

Motorized Areas (37 areas: 1 motorcycle/ATV; 36 camping). The motorcycle/ATV area is not located within a riparian area or wetland/wet meadow. In riparian areas and wetlands/wet meadows, this alternative virtually eliminates the acres of motorized areas available for potential impacts, similar to all action alternatives.

Alternative G

Motorized Routes. In riparian areas, the acreage potentially impacted by motorized routes (374 acres) is less than the No Action Alternative (443 acres), which is less than Alternatives D and E, but similar to Alternative F. In wetlands, the acreage is reduced to 14 acres, which is a 22% reduction from the No Action Alternative (18 acres), similar to Alternatives D and F.

Motorized Dispersed Recreation (300' corridor designated along specific routes). In riparian areas, the acreage potentially impacted by motorized dispersed recreation (3,568 acres) is less than the No Action Alternative (31,581 acres), which is similar Alternatives C, D, and F, but less than Alternative E. In wetlands, the acreage is reduced to 265 acres, which is an 83% reduction from the No Action Alternative (1,568 acres), which is similar Alternatives C, D, and F, but less than Alternative E.

Motorized Big Game Retrieval (within 300' dispersed camping corridor for elk and deer). In riparian areas, the acreage potentially impacted by motorized big game retrieval (3,568 acres) is less than the No Action Alternative (31,581 acres), which is similar to Alternative D. In wetlands, the acreage is reduced to 265 acres, which is an 83% reduction from the No Action Alternative (1,568), which is similar to Alternative D.

Motorized Areas (37 areas: 1 motorcycle/ATV; 36 camping). The motorcycle/ATV area is not located within a riparian area or wetland/wet meadow. In riparian areas and wetlands/wet meadows, this alternative virtually eliminates the acres of motorized areas available for potential impacts from motorized areas, similar to all action alternatives.

Summary

Each of the action alternatives was analyzed to determine how many acres of potential motorized disturbance would be possible relative to the No Action. The effects to riparian areas and wetland/wet meadow vegetation by a motorized route system 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. In general, observations 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. Tables 22-29 provide a summary of potential impacts to riparian areas and wetlands/wet meadows from motorized routes, motorized dispersed recreation, motorized big game retrieval, and motorized areas.

In summary, for riparian areas:

- Alternative E reduces acres of motorized routes within *riparian areas* by 38%, followed by Alternative D (-26%). Alternatives F and G show similar reductions (-14% and -16%, respectively) and Alternative C shows no reduction (0%) in motorized routes within *riparian areas* from the No Action Alternative. All alternatives greatly (>85%) reduce potential acres impacted by motorized dispersed recreation and motorized areas within *riparian areas*. Alternatives D, E, and G greatly (>85%) reduce potential acres impacted by motorized big game retrieval within *riparian areas*. Alternatives F (-35%) and Alternative C (-13%) follow.

In summary, for wetlands/wet meadows:

- All alternatives reduce acres of motorized routes within *wetlands/wet meadows*. Alternative C (-6%) shows little change from the No Action Alternative. Alternatives D, F and G reduce potential acres of disturbance ranging from 22%-28%. Alternative E reduces potential acres impacted by motorized routes by the largest amount (-44%). All alternatives greatly (>80%) reduce potential acres impacted by motorized dispersed recreation and motorized areas within *wetlands/wet meadows*. Alternatives D, E and G greatly (>80%) reduce potential acres impacted by motorized big game retrieval within *wetlands/wet meadows*. Alternatives F (-5%) and C (0%) show little to no reduction in potential acres impacted by motorized big game retrieval within *wetlands/wet meadows*, and are similar to the No Action Alternative.

Table 22. Forestwide: Miles/Acres of motorized routes within riparian areas

Forestwide: Miles/Acres of Motorized Routes within Riparian Areas	Miles	Change in Miles from No Action	% Change in Miles from No Action	Acres	Change in Acres from No Action	% Change in Acres from No Action
Alternative B – No Action	299			443		
Alternative C	308	9	3%	441	-2	0%
Alternative D	222	-77	-26%	330	-113	-26%
Alternative E	182	-117	-39%	273	-170	-38%
Alternative F	260	-39	-13%	382	-61	-14%
Alternative G	254	-45	-15%	374	-69	-16%

Note: although Miles increase in Alternative C, there is a decrease in Acres. This is attributed to an increase in single track (motorcycle) miles that were assumed to have a 3 foot width, and a decrease in Level 2 route miles with an assumed width of 12 feet (see page 41).

Table 23. Forestwide: Acres of motorized dispersed recreation within riparian areas

Acres Motorized Dispersed Recreation within Riparian Areas	Acres	Change in Acres from No Action	% Change No Action
Alternative B – No Action	31,581		
Alternative C	4,357	-27,224	-86%
Alternative D	3,334	-28,247	-89%
Alternative E	0	-31,581	-100%
Alternative F	3,828	-27,753	-88%
Alternative G	3,568	-28,013	-89%

Table 24. Forestwide: Acres of motorized big game retrieval within riparian areas

Acres of MBGR within Riparian Areas	Acres	Change in Acres from No Action	% Change from No Action
Alternative B – No Action	31,581		
Alternative C	27,356	-4,225	-13%
Alternative D	3,334	-28,247	-89%
Alternative E	0	-31,581	-100%
Alternative F	20,565	-11,016	-35%
Alternative G	3,568	-28,013	-89%

Table 25. Forestwide: Acres of motorized areas within riparian areas

Acres of Motorized Areas within Riparian Areas	Acres	Change in Acres from No Action	% Change from No Action
Alternative B – No Action	31,581		
Alternative C	0	-31,581	-100%
Alternative D	0	-31,581	-100%
Alternative E	0	-31,581	-100%
Alternative F	0	-31,581	-100%
Alternative G	0	-31,581	-100%

Table 26. Forestwide: Miles/acres of motorized routes within wetlands/wet meadows

Miles and Acres of motorized routes within Wetlands/Wet Meadows	Miles	Change in Miles from No Action	% Change in Miles from No Action	Acres	Change in Acres from No Action	% Change in Acres from No Action
Alternative B – No Action	12			18		
Alternative C	11	-1	-8%	17	-1	-6%
Alternative D	8	-4	-33%	13	-5	-28%
Alternative E	6	-6	-50%	10	-8	-44%
Alternative F	9	-3	-25%	14	-4	-22%
Alternative G	9	-3	-25%	14	-4	-22%

Table 27. Forestwide: Acres of motorized dispersed recreation within wetlands/wet meadows

Acres of motorized dispersed recreation within wetlands/wet meadows	Acres	Change in Acres from No Action	% Change from No Action
Alternative B – No Action	1,568		
Alternative C	296	-1,272	-81%
Alternative D	239	-1,329	-85%
Alternative E	0	-1,568	-100%
Alternative F	293	-1,275	-81%
Alternative G	265	-1,303	-83%

Table 28. Acres of motorized big game retrieval within wetlands/wet meadows

Acres of MBGR within wetlands/wet meadows	Acres	Change in Acres from No Action	% Change from No Action
Alternative B – No Action	1,568		
Alternative C	1,561	-7	0%
Alternative D	239	-1,329	-85%
Alternative E	0	-1,568	-100%
Alternative F	1,485	-83	-5%
Alternative G	265	-1,303	-83%

Table 29. Acres of motorized areas within identified wetlands/wet meadows

Acres of motorized areas within wetlands/wet meadows	Acres	Change in Acres from No Action	% Change from No Action
Alternative B – No Action	1,568		
Alternative C	0	-1,568	-100%
Alternative D	0	-1,568	-100%
Alternative E	0	-1,568	-100%
Alternative F	0	-1,568	-100%
Alternative G	0	-1,568	-100%

Effects to Water Quality

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

The primary effect to water quality related to a motorized route system is sedimentation originating from road erosion. 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). 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. Motorized routes can cut across hillsides, often intercepting subsurface water flow and running it down ditches and through culverts where it can then pick up sediment and joined 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, 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).

A motorized route system 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. 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). 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. Roads constructed near a stream not only pose a higher risk to water quality, but they can also modify hydrologic response of streamflow from runoff events. 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. Motorized routes can also disrupt a watershed's natural hydrologic flow by capturing surface and subsurface runoff on hillslopes. 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 increases in flow rates by widening or deepening in order to carry these greater flow rates. 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). 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 motorized route has on erosion and sedimentation. On the Gila National Forest, roads situated on decomposing granite and some types of rhyolite are highly susceptible to rutting and erosion. In addition, water temperature issues may also arise if roads are located adjacent to stream channels where riparian vegetation, which provides shade, is removed to accommodate the road, or where stream channel geometry has been altered, creating a wider, more shallow channel. 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).

Stream crossings create the most vulnerable point on the stream channel to adverse impacts from a motorized route system. 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, or up and down

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 routes 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 drier 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 eventually 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 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 routes and unauthorized routes produce and deliver more sediment than improved, gravel roads. In-sloped, bar ditched roads tend to produce more sediment than all other roads types.

Similar to riparian areas and wetlands/wet meadows, adverse impacts to water quality related to motorized travel off of designated routes vary in magnitude. 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. As stated previously, water courses and riparian areas tend to be a natural draw for concentration of both motorized and non-motorized recreation. In areas where travel off of designated routes is high, levels of negative impacts typically increase, while low concentration areas may show incidental impacts. At current use levels in general, observations across the Forest indicate that motorized dispersed recreation and motorized big game retrieval is infrequent enough that impacts are minimal Forestwide. In a few locations however, motorized users have created visible routes that get repeatedly used by motorized vehicles for such things as recreation, big game hunting, antler hunting, and unrestricted cross-country travel. These locations, which include popular recreation and camping spots such as sections of the Gila River, Turkey Creek, Little Dry Creek and the San Francisco River, can continue to experience adverse impacts to the water quality, as long as the use is permitted.

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.

Alternative B – No Action

Impacts to water quality as a result of the current motorized route system on the Forest are detailed above in the Effects Common to All Alternatives. Across the Gila National Forest, there are 8,847 motorized stream crossings that impact perennial and intermittent streams and ephemeral channels. 187 of these crossing are located on impaired 303(d) streams, while the majority of the crossings (7,880) are located on ephemeral channels. There are no stream crossings impacting ONRWs. Approximately 295 miles of perennial and intermittent streams, and 1,771 miles of ephemeral drainages are located within 300 feet of motorized routes. Approximately 47 miles of impaired streams and less than 1 mile of ONRWs are located within 300 feet of a motorized route.

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 recreation, motorized big game retrieval, and motorized areas (both camping and ATV/motorcycle) has the potential to impact approximately 886 miles of perennial and intermittent streams, 9,410 miles of ephemeral channels, and 132 miles of impaired streams.

Effects Unique to each Action Alternative based on Measure of the Indicator

Each action alternative will be evaluated based on the potential risk to water quality 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 measure of change from No Action is based on the difference in miles of stream in each alternative that may be impacted by motorized disturbance. Tables follow the comparison of alternatives and display the miles of motorized routes and/or acreages that motorized activities may impact that would be permitted under each alternative.

Alternative C

Motorized Routes. This alternative shows the least amount of change (relative to the No Action Alternative) in risk of potential impacts to perennial, intermittent, impaired and ephemeral drainages due to motorized routes of all the action alternatives. For all stream channels (perennial, intermittent, and ephemeral), this alternative increases the number of motorized crossings to 9,088 crossings, compared to the No Action Alternative (8,847 crossings). Motorized crossings on impaired streams are reduced to 165 crossings, compared to the No Action Alternative (187 crossings). Miles of perennial and intermittent streams within 300 feet of motorized routes is similar (293 miles) to the No Action Alternative (295 miles), while there is an increase to 1,785 miles of ephemeral channels within 300 feet of motorized routes from the No Action Alternative (1,771 miles). There are 43 miles of impaired water bodies within 300 feet of motorized routes compared to the No Action Alternative (47 miles), while there is less than 0.05 mile of an ONRW stream within 300 feet of a motorized route, comparable to the No Action Alternative (0.17 mile of stream). Overall, potential impacts to ONRWs by motorized routes are negligible under all alternatives, with any adjacent routes being downstream of the ONRW reach. Under all alternatives, miles of motorized routes within 300 feet of ONRW wetlands are reduced to 0.69 miles, from 0.75 miles under the No Action Alternative, thus showing little change.

Motorized Dispersed Recreation (300' corridor designated along specific routes). There are 63 miles of perennial and intermittent stream miles located within areas designated for motorized dispersed recreation compared to the No Action Alternative (886 miles), while there are 582 miles of ephemeral channel found within motorized dispersed recreation zones compared to the No Action

Alternative (9,410 miles). Miles of impaired streams potentially impacted by motorized dispersed recreation is decreased to 6 miles from the No Action Alternative (132 miles), while there are no acres of motorized dispersed recreation with 300 feet of any ONRW stream or ONRW wetland under any alternative. Miles of all stream channels potentially impacted by motorized dispersed recreation is reduced by greater than 90% under all action alternatives, thus there is no meaningful distinction between the alternatives for this issue.

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 is decreased to 688 miles from the No Action Alternative (886 miles), and potential ephemeral channel impacts are decreased to 7,994 miles from the No Action Alternative (9,410 miles), which is the least reduction of any action alternative. Miles of impaired waterbodies with potential impacts by motorized big game retrieval is decreased to 107 miles from the No Action Alternative (132 miles), which is the least of any action alternative. There is little change is potential impacts to ONRWs as the acres of MBGR decrease to 67 acres under Alternative C from the No Action Alternative (70 acres). Acres of MBGR with 300 feet of ONRW wetlands decrease to 38 acres from the No Action Alternative of 96 acres. This represents the least reduction of impacts to ONRW streams and wetlands of any action alternative.

Motorized Areas (37 areas: 1 motorcycle/ATV; 36 camping). The Travel Management Rule defines 'areas' as open to all motorized vehicle use. The 36 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 acres, however it is not within 300 feet of any perennial, intermittent, ephemeral, or 303(d) stream. Miles of perennial, intermittent, ephemeral , 303(d), and ONRW streams and ONRW wetlands potentially impacted by motorized camping areas are virtually eliminated under all action alternatives.

Alternative D

Motorized Routes. Motorized stream crossings are reduced to 6,526 crossings on perennial, intermittent and ephemeral channels compared to the No Action Alternative (8,847 crossings), which is the second largest reduction of all action alternatives, behind Alternative E. Motorized stream crossing are reduced to 144 crossings on impaired water bodies, compared to the No Action Alternative of 187 crossings, which is similar to Alternatives E, F, and G. Miles of perennial and intermittent streams within 300 feet of motorized routes (207 miles) is less than the No Action Alternative (295 miles), while there is a decrease to 1,346 miles of ephemeral channels within 300 feet of motorized routes from the No Action Alternative (1,771 miles). There are 37 miles of impaired water bodies within 300 feet of motorized routes compared to the No Action Alternative (47 miles), while there are no ONRW streams within 300 feet of a motorized route, comparable to Alternative E. See Alternative C for further ONRW discussion.

Motorized Dispersed Recreation (300' corridor designated along specific routes). There are 32 miles of perennial and intermittent stream miles located within areas designated for motorized dispersed recreation compared to the No Action Alternative (886 miles), while there are 445 miles of ephemeral channel found within motorized dispersed recreation zones compared to the No Action Alternative (9,410 miles). Miles of impaired streams potentially impacted by motorized dispersed recreation is decreased to 4 miles from the No Action Alternative (132 miles), while there are no acres of motorized dispersed recreation with 300 feet of any ONRW stream or ONRW wetland under any alternative. Miles of all stream channels potentially impacted by motorized dispersed recreation is reduced by greater than 90% under all action alternatives, thus there is no meaningful distinction between the alternatives for this issue.

Motorized Big Game Retrieval (within 300' dispersed camping corridor). Miles of perennial and intermittent streams potentially impacted by motorized big game retrieval is decreased to 32 miles from the No Action Alternative (886 miles), and potential ephemeral channel impacts are decreased to 445 miles from the No Action Alternative (9,410 miles), which is similar to Alternative G. Miles of impaired waterbodies with potential impacts by motorized big game retrieval is decreased to 4 miles from the No Action Alternative (132 miles), which is similar to Alternative G. There are no acres of MBGR that would have potential impacts to ONRW stream or wetlands under this alternative, similar to Alternatives E and G.

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

Alternative E

Motorized Routes. Motorized stream crossings are reduced to 4,971 crossings on perennial, intermittent and ephemeral channels compared to the No Action Alternative (8,847 crossings), which is the largest reduction of all action alternatives. Motorized stream crossing are reduced to 139 crossings on impaired water bodies, compared to the No Action Alternative of 187 crossings, which is similar to Alternatives D, F, and G. Miles of perennial and intermittent streams within 300 feet of motorized routes (163 miles) is less than the No Action Alternative (295 miles), while there is a decrease to 1,069 miles of ephemeral channels within 300 feet of motorized routes from the No Action Alternative (1,771 miles). There are 35 miles of impaired water bodies within 300 feet of motorized routes compared to the No Action Alternative (47 miles), while there are no ONRW streams within 300 feet of a motorized route, comparable to Alternative D. These are the largest reductions of all action alternatives. See Alternative C for further ONRW discussion.

Motorized Dispersed Recreation (No camping corridors designated). There are 32 miles of perennial and intermittent stream miles located within areas designated for motorized dispersed recreation compared to the No Action Alternative (886 miles), while there are 445 miles of ephemeral channel found within motorized dispersed recreation zones compared to the No Action Alternative (9,410 miles). Miles of impaired streams potentially impacted by motorized dispersed recreation is decreased to 4 miles from the No Action Alternative (132 miles), while there are no acres of motorized dispersed recreation with 300 feet of any ONRW stream or ONRW wetland under any alternative. Miles of all stream channels potentially impacted by motorized dispersed recreation is reduced by greater than 90% under all action alternatives, thus there is no meaningful distinction between the alternatives for this issue.

Motorized Big Game Retrieval (No motorized big game retrieval permitted). There would be no potential adverse impacts to perennial, intermittent, ephemeral, 303(d) or ONRW streams and ONRW wetlands due to motorized big game retrieval under this alternative. Miles of perennial, intermittent, ephemeral, impaired, and ONRW streams, and ONRW wetlands potentially impacted by motorized big game retrieval decreases by 95% or more 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, ephemeral, 303(d) and ONRW streams and ONRW wetlands due to camping areas under this alternative. Miles of perennial, intermittent, ephemeral,

303(d), and ONRW streams and ONRW wetlands potentially impacted by motorized camping areas are virtually eliminated under all action alternatives.

Alternative F

Motorized Routes. Motorized stream crossings are reduced to 7,516 crossings on perennial, intermittent and ephemeral channels compared to the No Action Alternative (8,847 crossings), which is similar to Alternative G. Motorized stream crossing are reduced to 148 crossings on impaired water bodies, which is similar to Alternative G, compared to the No Action Alternative of 187 crossings. Miles of perennial and intermittent streams within 300 feet of motorized routes (247 miles) is less than the No Action Alternative (295 miles), while there is a decrease to 1,502 miles of ephemeral channels within 300 feet of motorized routes from the No Action Alternative (1,771 miles). There are 38 miles of impaired water bodies within 300 feet of motorized routes compared to the No Action Alternative (47 miles), while there is less than 0.05 mile of an ONRW stream within 300 feet of a motorized route, comparable to Alternative C and the No Action Alternative (0.17 mile of stream). See Alternative C for further ONRW discussion.

Motorized Dispersed Recreation (300' corridor designated along specific routes). There are 50 miles of perennial and intermittent stream miles located within areas designated for motorized dispersed recreation compared to the No Action Alternative (886 miles), while there are 555 miles of ephemeral channel found within motorized dispersed recreation zones compared to the No Action Alternative (9,410 miles). Miles of impaired streams potentially impacted by motorized dispersed recreation is decreased to 5 miles from the No Action Alternative (132 miles), while there are no acres of motorized dispersed recreation with 300 feet of any ONRW stream or ONRW wetland under any alternative. Miles of all stream channels potentially impacted by motorized dispersed recreation is reduced by greater than 90% under all action alternatives, thus there is no meaningful distinction between the alternatives for this issue.

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 is decreased to 475 miles from the No Action Alternative (886 miles), and potential ephemeral channel impacts are decreased to 5,872 miles from the No Action Alternative (9,410 miles), which is the second least reduction behind Alternative C. Miles of impaired waterbodies with potential impacts by motorized big game retrieval is decreased to 69 miles from the No Action Alternative (132 miles), which is the second least reduction behind Alternative C. There is a reduction in potential impacts to ONRWs as the acres of MBGR decrease to 28 acres under Alternative C from the No Action Alternative (70 acres). Acres of MBGR with 300 feet of ONRW wetlands decrease to 21 acres from the No Action Alternative of 96 acres. This represents the second least reduction of impacts to ONRW streams and wetlands behind Alternative C.

Motorized Areas (37 areas: 1 motorcycle/ATV; 36 camping). Same as Alternative C—the motorcycle/ATV area is not located adjacent to any stream channels or ONRW wetlands. Miles of perennial, intermittent, ephemeral, 303(d), and ONRW streams and ONRW wetlands potentially impacted by motorized camping areas are virtually eliminated under all action alternatives.

Alternative G

Motorized Routes. Motorized stream crossings are reduced to 7,424 crossings on perennial, intermittent and ephemeral channels compared to the No Action Alternative (8,847 crossings), which is similar to Alternative F. Motorized stream crossing are reduced to 148 crossings on impaired water bodies, which is similar to Alternative G, compared to the No Action Alternative of 187 crossings. Miles of perennial and intermittent streams within 300 feet of motorized routes (240 miles) is less than

the No Action Alternative (295 miles), while there is a decrease to 1,493 miles of ephemeral channels within 300 feet of motorized routes from the No Action Alternative (1,771 miles). There are 38 miles of impaired water bodies within 300 feet of motorized routes compared to the No Action Alternative (47 miles), while there is less than 0.05 mile of an ONRW stream within 300 feet of a motorized route, comparable to Alternatives B, C, and F. See Alternative C for further ONRW discussion.

Motorized Dispersed Recreation (300' corridor designated along specific routes). There are 42 miles of perennial and intermittent stream miles located within areas designated for motorized dispersed recreation compared to the No Action Alternative (886 miles), while there are 512 miles of ephemeral channel found within motorized dispersed recreation zones compared to the No Action Alternative (9,410 miles). Miles of impaired streams potentially impacted by motorized dispersed recreation is decreased to 6 miles from the No Action Alternative (132 miles), while there are no acres of motorized dispersed recreation with 300 feet of any ONRW stream or ONRW wetland under any alternative. Miles of all stream channels potentially impacted by motorized dispersed recreation is reduced by greater than 90% under all action alternatives, thus there is no meaningful distinction between the alternatives for this issue.

Motorized Big Game Retrieval (within 300' dispersed camping corridor). Miles of perennial and intermittent streams potentially impacted by motorized big game retrieval is decreased to 42 miles from the No Action Alternative (886 miles), and potential ephemeral channel impacts are decreased to 512 miles from the No Action Alternative (9,410 miles), which is similar to Alternative D. Miles of impaired waterbodies with potential impacts by motorized big game retrieval is decreased to 6 miles from the No Action Alternative (132 miles), which is similar to Alternative D. There are no acres of MBGR that would have potential impacts to ONRW stream or wetlands under this alternative, similar to Alternatives D and E.

Areas (37 areas: 1 motorcycle/ATV; 36 camping). Same as Alternative C and F—the motorcycle/ATV area is not located adjacent to any stream channels or ONRW wetlands. Miles of perennial, intermittent, ephemeral, 303(d), and ONRW streams and ONRW wetlands potentially impacted by motorized camping areas are virtually eliminated under all action alternatives.

Summary

Each of the alternatives was analyzed to determine if there is potential for a motorized route system on the Gila National Forest to impact water quality. Water quality was evaluated on all perennial, intermittent, impaired (303d), ONRW, and ephemeral waters. Analysis of effects to these waters was based on motorized routes and their proximity to drainages, motorized cross country travel near drainages, and stream crossings if drainages. Impaired waters and ONRWs 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 or requiring the highest level of protection water quality degradation.

The analysis area for water quality was designed by buffering 300 feet on either side of perennial, intermittent, impaired and ephemeral drainages. 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 30-49 provide a summary of stream crossings, as well as miles of drainages that may be impacted by motorized routes, motorized dispersed recreation, motorized big game retrieval, and

motorized areas. A brief summary of these effects, based on a change from the No Action Alternative is described below:

- Alternative E provides the most reduction (-44%) of motorized crossings on perennial, intermittent and ephemeral streams, followed by Alternative D (-26%) and Alternatives G (-16%) and F (-15%). Alternative C increases motorized crossings by 3%. Alternatives D, E, F, and G are similar in reduction of motorized crossings on impaired streams (21%-26% 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 45%, reduces miles of ephemeral channels potentially impacted by motorized routes by 40% and reduces potential miles impacted of impaired streams by 26%, which is the most of any action alternative. Alternative D provides the second largest reduction in potential effects: miles of perennial and intermittent streams (-30%); miles of ephemeral streams (- 24%); miles of impaired streams (-22%). Alternatives F and G are similar with reductions in miles of stream potentially impacted ranging from -16% to -19%, trailed by Alternative C (-1%) which remains similar to the No Action Alternative.
- All action alternatives almost completely remove motorized camping areas from perennial, intermittent streams, and impaired streams. All action alternatives significantly (>90%) reduce potential risk of impacts from motorized dispersed recreation on perennial, intermittent, ephemeral, impaired and ONRW streams and wetlands. Alternatives D, E, and G significantly (>90%) reduce risk of potential impacts from motorized big game retrieval on perennial, intermittent, ephemeral, impaired and ONRW streams and wetlands. Alternative F provides for the next largest reduction followed by Alternative C. Motorized areas are restricted in all action alternatives compared with no limits in Alternative B. By limiting these motorized areas to 39 locations, with all but one being very small in size, indiscriminate motorized use in localized areas is almost eliminated across the Forest, with little risk of impacts remaining to water quality.

For all action alternatives, less motorized routes would be designated for motorized use within 300 feet of perennial, intermittent, and impaired streams. Motorized routes adjacent to ephemeral streams are decreased under all alternatives, with the exception of Alternative C where there would be a slight (1%) increase. Reducing motorized routes within 300 feet of streams is anticipated to improve water quality by limiting opportunities for overland flow to travel down motorized routes and deliver excess runoff and sediment into the drainage network. In addition, restricted 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 risk of sedimentation may increase due to problems associated with lack of consistent maintenance, while in others the risk may decrease dramatically due to rapid recovery of a riparian area to more natural conditions.

All Perennial, Intermittent, and Ephemeral Waters

Table 30. Number of NFS motorized route stream crossings on perennial, intermittent, and ephemeral channels

Stream Crossing Type	Number of Crossings					
	Alt B – No Action	Alt C	Alt D	Alt E	Alt F	Alt G
Perennial/Intermittent Bridge	5	5	5	5	5	5
Perennial/Intermittent Box Culvert	1	1	1	1	1	1
Perennial/Intermittent Metal Culvert	33	32	30	26	32	32
Perennial/Intermittent In Channel Enter	141	123	89	78	109	110
Perennial/Intermittent Low Water crossing-Concrete	1	1	1	1	1	1
Perennial/Intermittent Low Water crossing-Natural	727	667	465	344	613	590
Perennial/Intermittent Low Water crossing-unknown	11	7	6	5	6	6
Perennial/Intermittent other	47	45	34	29	38	43
Perennial/Intermittent Riprap	1	1	0	0	0	0
Ephemeral drainage	7,880	8,206	5,895	4,482	6,711	6,636
Grand Total	8,847	9,088	6,526	4,971	7,516	7,424
Change in number of motorized crossings on perennial, intermittent and ephemeral streams		241	-2,321	-3,876	-1,331	-1,423
Expressed as a Percent (+ or –) of the No Action Alternative		3%	-26%	-44%	-15%	-16%

Table 31. Miles of Perennial and Intermittent Streams potentially impacted by motorized routes (within 300 Feet of Open System NFS Roads)

	Stream Miles					
Water Body	**Alt B-No Action**	**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	7.55	4.45	3.16	2.35	4.10	4.10
Bearwallow Creek	0.65	0.65	0.65	0.65	0.65	0.65
Beaver Creek	1.55	1.55	1.55	0.00	1.55	1.55
Berrenda Creek	2.04	2.04	2.04	2.04	2.04	2.04
Big Dry Creek	4.21	4.21	4.21	2.61	4.21	4.21
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	0.00	0.00	0.42	0.42
Centerfire Creek	0.90	0.57	0.90	0.90	0.90	0.90
Cherry Creek	0.89	1.02	0.89	0.66	0.89	0.89
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	1.34	1.34	1.34	1.34	1.34	1.34
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	0.00	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	0.00	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	0.00	0.63	0.63
Escondido Creek	0.39	0.00	0.00	0.00	0.00	0.00
Gallinas Canyon	1.62	2.98	1.62	1.42	1.62	1.62
Gila River	1.73	1.43	1.03	1.03	1.03	1.03
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	1.83	1.83	1.83	1.75	1.83	1.83
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	1.26	1.26	0.11	0.03	1.26	0.11
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
Middle Fork Gila River	0.20	0.20	0.20	0.20	0.20	0.20

	Stream Miles					
Water Body	**Alt B-No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
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	3.23	3.23	3.23	3.07	3.23	3.23
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	0.21	0.09	0.09	0.21	0.21
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	1.57	1.57	0.46	1.57	1.57
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	0.00	2.45	1.80
Sacaton Creek	1.47	1.29	0.14	0.14	0.78	0.78
San Francisco River	23.27	23.63	15.50	13.72	23.63	15.67
Silver Creek	2.80	1.21	1.21	1.21	1.21	1.21
Smith Creek	1.94	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	0.00	0.00	0.15	0.15
South Percha Creek	0.00	0.28	0.28	0.28	0.28	0.28
Stone Creek	0.00	0.00	0.00	0.00	0.00	0.00
Taylor Creek	4.94	4.59	0.85	0.85	1.14	1.14
Tierra Blanca Creek	1.33	1.13	0.00	0.00	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	2.59	2.59	2.59	2.59
Turkey Run	6.57	6.57	6.57	0.56	6.57	6.57
Twin Sisters Creek	0.24	0.07	0.00	0.00	0.07	0.07
Walnut Creek	2.40	2.40	2.40	2.40	2.40	2.40
West Fork Gila River	0.99	0.99	0.99	0.99	0.99	0.99
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

	Stream Miles					
Water Body	**Alt B-No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Willow Creek	3.82	4.30	4.30	3.62	4.30	4.30
Unnamed	115.90	121.32	79.85	64.73	97.40	97.21
Grand Total	295.44	292.54	206.96	162.77	246.71	240.05
Change in miles of perennial and intermittent streams potentially impacted by motorized routes		-2.90	-88.48	-132.68	-48.73	-55.39
Expressed as a Percent (+ or –) of the No Action Alternative		-1%	-30%	-45%	-16%	-19%

Table 32. Miles of ephemeral drainages potentially impacted by motorized routes ((within 300 Feet of Open System NFS Roads)

	Drainage Miles					
Ephemeral Drainages	**Alt B – No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Grand Total	1,771	1,785	1,346	1,069	1,502	1,493
Change in miles of ephemeral drainages potentially impacted by motorized routes		14	-425	-702	-269	-277
Expressed as a Percent (+ or –) of the No Action Alternative		1%	-24%	-40%	-15%	-16%

Table 33. Miles of Perennial and Intermittent Streams potentially impacted by motorized dispersed Recreation

	Stream Miles					
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Agua Fria Creek	0.63	0.00	0.00	0.00	0.00	0.00
Apache Creek	1.86	0.37	0.37	0.00	0.37	0.37
Bear Creek	14.04	0.16	0.00	0.00	0.16	0.16
Bearwallow Creek	5.12	0.00	0.00	0.00	0.00	0.00
Beaver Creek	5.26	0.00	0.00	0.00	0.00	0.00
Berrenda Creek	4.43	0.63	0.63	0.00	0.63	0.63
Big Dry Creek	6.75	1.60	0.00	0.00	1.60	0.00
Blue River	0.43	0.00	0.00	0.00	0.00	0.00
Byers Run	2.29	0.00	0.00	0.00	0.00	0.00
Campbell Blue Creek	0.37	0.00	0.00	0.00	0.00	0.00
Canyon Creek	0.48	0.00	0.00	0.00	0.00	0.00
Carbonate Creek	3.12	1.27	1.27	0.00	1.27	1.27
Cave Creek	0.46	0.42	0.00	0.00	0.42	0.42
Centerfire Creek	2.37	0.02	0.00	0.00	0.02	0.00
Cherry Creek	4.77	0.31	0.31	0.00	0.31	0.31
Chloride Creek	8.18	0.00	0.00	0.00	0.00	0.00
Circle Seven Creek	6.80	2.26	1.76	0.00	2.26	2.26

	Stream Miles					
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Coal Creek	1.34	0.00	0.00	0.00	0.00	0.00
Copper Creek	10.40	0.36	0.36	0.00	0.36	0.36
Copperas Creek	0.36	0.00	0.00	0.00	0.00	0.00
Cow Creek	4.64	1.07	0.95	0.00	1.07	1.07
Coyote Creek	0.24	0.24	0.24	0.00	0.24	0.24
Deep Creek	10.27	0.00	0.00	0.00	0.00	0.00
Devils Creek	5.34	0.00	0.00	0.00	0.00	0.00
Diamond Creek	3.73	0.55	0.55	0.00	0.41	0.41
Dillman Creek	6.45	0.75	0.75	0.00	0.75	0.75
Dry Blue Creek	4.43	0.00	0.00	0.00	0.00	0.00
East Fork Gila River	9.12	0.16	0.16	0.00	0.16	0.16
East Fork Mimbres River	11.47	0.00	0.00	0.00	0.00	0.00
Escondido Creek	0.35	0.00	0.00	0.00	0.00	0.00
Foxtail Creek	0.83	0.00	0.00	0.00	0.00	0.00
Gallinas Canyon	10.95	0.18	0.18	0.00	0.18	0.18
Gila River	10.44	0.24	0.24	0.00	0.24	0.24
Gilita Creek	5.10	1.92	0.00	0.00	1.92	1.92
Hoyt Creek	2.05	0.00	0.00	0.00	0.00	0.00
Indian Creek	1.45	0.11	0.11	0.00	0.11	0.11
Iron Creek	2.49	0.00	0.00	0.00	0.00	0.00
Jenkins Creek	4.35	1.58	1.58	0.00	1.58	1.58
Largo Creek	5.19	0.00	0.00	0.00	0.00	0.00
Las Animas Creek	3.69	0.00	0.00	0.00	0.00	0.00
Little Bear Creek	3.02	0.00	0.00	0.00	0.00	0.00
Little Cherry Creek	1.67	0.00	0.00	0.00	0.00	0.00
Little Creek	0.20	0.00	0.00	0.00	0.00	0.00
Little Deep Creek	3.04	0.00	0.00	0.00	0.00	0.00
Little Dry Creek	1.25	0.08	0.00	0.00	0.08	0.00
Little Mineral Creek	2.24	0.00	0.00	0.00	0.00	0.00
Little Turkey Creek	2.48	0.00	0.00	0.00	0.00	0.00
Little Whitewater Creek	3.19	0.00	0.00	0.00	0.00	0.00
Mangas Creek	2.90	0.00	0.00	0.00	0.00	0.00
Marshall Creek	0.14	0.00	0.00	0.00	0.00	0.00
Meadow Creek	8.78	1.20	1.20	0.00	1.20	1.20
Middle Fork Gila River	0.81	0.00	0.00	0.00	0.00	0.00
Middle Percha Creek	1.64	1.07	0.00	0.00	1.07	1.07
Middle Seco Creek	1.73	0.00	0.00	0.00	0.00	0.00
Mimbres River	3.25	0.08	0.00	0.00	0.08	0.08
Mineral Creek	19.37	0.58	0.58	0.00	0.58	0.58
Mogollon Creek	4.68	0.00	0.00	0.00	0.00	0.00
Morgan Creek	3.10	0.50	0.00	0.00	0.50	0.50

	Stream Miles					
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Mule Creek	7.89	0.06	0.00	0.00	0.00	0.00
Negrito Creek	10.98	0.00	0.00	0.00	0.00	0.00
Noland Creek	1.57	0.00	0.00	0.00	0.00	0.00
North Fork Mineral Creek	0.23	0.00	0.00	0.00	0.00	0.00
North Fork Negrito Creek	7.21	0.00	0.00	0.00	0.00	0.00
North Fork Palomas Creek	7.66	1.77	1.77	0.00	1.77	1.77
North Fork Walnut Creek	3.40	0.00	0.00	0.00	0.00	0.00
North Percha Creek	1.33	0.00	0.00	0.00	0.00	0.00
North Seco Creek	3.36	0.00	0.00	0.00	0.00	0.00
Pace Creek	2.35	0.00	0.00	0.00	0.00	0.00
Pine Cienega Creek	2.44	0.11	0.00	0.00	0.00	0.11
Poverty Creek	6.77	0.00	0.00	0.00	0.00	0.00
Pueblo Creek	11.67	0.00	0.00	0.00	0.00	0.00
Quaking Aspen Creek	2.31	0.93	0.93	0.00	0.93	0.93
Rain Creek	0.37	0.00	0.00	0.00	0.00	0.00
Romero Creek	2.08	0.00	0.00	0.00	0.00	0.00
S A Creek	5.93	1.80	0.00	0.00	1.80	0.00
Sacaton Creek	3.38	0.00	0.00	0.00	0.00	0.00
San Francisco River	62.16	8.66	0.09	0.00	1.05	0.09
Sapillo Creek	0.55	0.00	0.00	0.00	0.00	0.00
Silver Creek	11.65	0.13	0.00	0.00	0.13	0.00
Slate Creek	0.60	0.00	0.00	0.00	0.00	0.00
Smith Creek	3.28	0.23	0.23	0.00	0.23	0.23
South Fork Cuchillo Negro Creek	4.02	0.00	0.00	0.00	0.00	0.00
South Fork Mineral Creek	0.07	0.00	0.00	0.00	0.00	0.00
South Fork Negrito Creek	9.78	0.53	0.32	0.00	0.43	0.32
South Fork Palomas Creek	4.12	0.03	0.03	0.00	0.03	0.03
South Fork Whitewater Creek	0.27	0.00	0.00	0.00	0.00	0.00
South Percha Creek	4.03	0.00	0.00	0.00	0.00	0.00
Stone Creek	1.66	0.00	0.00	0.00	0.00	0.00
Sycamore Creek	7.50	0.00	0.00	0.00	0.00	0.00
Taylor Creek	14.72	0.00	0.00	0.00	0.00	0.00
Tierra Blanca Creek	5.80	0.00	0.00	0.00	0.00	0.00
Trout Creek	16.42	0.17	0.17	0.00	0.17	0.17
Tularosa River	11.22	0.20	0.00	0.00	0.00	0.20
Turkey Creek	7.77	0.00	0.00	0.00	0.00	0.00
Turkey Run	7.42	0.00	0.00	0.00	0.00	0.00
Twin Sisters Creek	0.35	0.00	0.00	0.00	0.00	0.00
Walnut Creek	3.85	0.60	0.60	0.00	0.60	0.60
West Fork Gila River	2.84	0.32	0.00	0.00	0.00	0.00
West Fork Pueblo Creek	1.58	0.01	0.00	0.00	0.01	0.00

	Stream Miles					
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Whiskey Creek	2.26	0.00	0.00	0.00	0.00	0.00
Whitewater Creek	3.66	0.00	0.00	0.00	0.00	0.00
Willow Creek	4.09	0.07	0.07	0.00	0.07	0.07
(blank)	367.45	29.17	16.74	0.00	25.27	21.15
Grand Total	885.58	62.52	32.17	0.00	50.07	41.54
Change in miles of perennial and intermittent streams potentially impacted by motorized dispersed recreation		-823.06	-853.41	-885.58	-835.51	-844.03
Expressed as a Percent (+ or –) of the No Action Alternative		-93%	-96%	-100%	-94%	-95%

Table 34. Miles of Ephemeral Drainages potentially impacted by Motorized Dispersed Recreation

	Drainage Miles					
	Alt B – No Action	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Drainage Dispersed Camping Miles	9,410	582	445	0	555	512
		-8,827	-8,964	-9,410	-8,854	-8,897
		-94%	-95%	-100%	-94%	-95%

Table 35. Miles of Perennial and Intermittent Streams potentially impacted by motorized big game retrieval

	Stream Miles					
	Alt B	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Agua Fria Creek	0.63	0.63	0.00	0.00	0.63	0.00
Apache Creek	1.86	1.86	0.37	0.00	1.86	0.37
Bear Creek	14.04	8.34	0.00	0.00	4.13	0.16
Bearwallow Creek	5.12	4.77	0.00	0.00	1.81	0.00
Beaver Creek	5.26	5.26	0.00	0.00	3.61	0.00
Berrenda Creek	4.43	1.52	0.63	0.00	1.09	0.63
Big Dry Creek	6.75	5.77	0.00	0.00	3.44	0.00
Blue River	0.43	0.43	0.00	0.00	0.43	0.00
Campbell Blue Creek	0.37	0.37	0.00	0.00	0.37	0.00
Canyon Creek	0.48	0.48	0.00	0.00	0.14	0.00
Carbonate Creek	3.12	2.64	1.27	0.00	2.06	1.27
Cave Creek	0.46	0.46	0.00	0.00	0.46	0.42
Centerfire Creek	2.37	2.32	0.00	0.00	2.02	0.00
Cherry Creek	4.77	4.53	0.31	0.00	4.53	0.31
Chloride Creek	8.18	8.18	0.00	0.00	8.18	0.00
Circle Seven Creek	6.80	5.56	1.76	0.00	3.75	2.26
Coal Creek	1.34	0.09	0.00	0.00	0.09	0.00
Copper Creek	10.40	10.40	0.36	0.00	10.14	0.36

	Stream Miles					
	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Copperas Creek	0.36	0.36	0.00	0.00	0.36	0.00
Cow Creek	4.64	3.91	0.95	0.00	1.82	1.07
Coyote Creek	0.24	0.24	0.24	0.00	0.24	0.24
Deep Creek	10.27	6.34	0.00	0.00	2.75	0.00
Devils Creek	5.34	3.18	0.00	0.00	1.37	0.00
Diamond Creek	3.73	3.73	0.55	0.00	2.66	0.41
Dillman Creek	6.45	6.45	0.75	0.00	5.74	0.75
Dry Blue Creek	4.43	1.47	0.00	0.00	0.66	0.00
East Fork Gila River	9.12	5.31	0.16	0.00	2.93	0.16
East Fork Mimbres River	11.47	10.91	0.00	0.00	7.29	0.00
Escondido Creek	0.35	0.35	0.00	0.00	0.27	0.00
Foxtail Creek	0.83	0.83	0.00	0.00	0.00	0.00
Gallinas Canyon	10.95	8.54	0.18	0.00	5.12	0.18
Gila River	10.44	6.85	0.24	0.00	4.04	0.24
Gilita Creek	5.10	5.10	0.00	0.00	5.10	1.92
Hoyt Creek	2.05	0.52	0.00	0.00	0.20	0.00
Indian Creek	1.45	1.45	0.11	0.00	1.45	0.11
Iron Creek	2.49	2.49	0.00	0.00	2.49	0.00
Jenkins Creek	4.35	4.35	1.58	0.00	4.27	1.58
Largo Creek	5.19	5.19	0.00	0.00	5.19	0.00
Little Cherry Creek	1.67	1.67	0.00	0.00	1.67	0.00
Little Creek	0.20	0.20	0.00	0.00	0.20	0.00
Little Dry Creek	1.25	1.25	0.00	0.00	0.96	0.00
Little Mineral Creek	2.24	2.24	0.00	0.00	0.51	0.00
Little Turkey Creek	2.48	0.52	0.00	0.00	0.30	0.00
Little Whitewater Creek	3.19	3.19	0.00	0.00	3.19	0.00
Mangas Creek	2.90	2.90	0.00	0.00	2.90	0.00
Meadow Creek	8.78	8.57	1.20	0.00	5.19	1.20
Middle Fork Gila River	0.81	0.81	0.00	0.00	0.57	0.00
Middle Percha Creek	1.64	1.64	0.00	0.00	1.64	1.07
Mimbres River	3.25	3.25	0.00	0.00	1.52	0.08
Mineral Creek	19.37	9.15	0.58	0.00	4.07	0.58
Mogollon Creek	4.68	2.69	0.00	0.00	1.43	0.00
Morgan Creek	3.10	3.10	0.00	0.00	2.71	0.50
Mule Creek	7.89	6.46	0.00	0.00	3.31	0.00
Negrito Creek	10.98	3.36	0.00	0.00	0.96	0.00
Noland Creek	1.57	1.57	0.00	0.00	0.29	0.00
North Fork Negrito Creek	0.23	7.21	0.00	0.00	5.58	0.00
North Fork Palomas Creek	7.66	4.27	1.77	0.00	2.94	1.77
North Fork Walnut Creek	3.40	3.40	0.00	0.00	1.44	0.00
North Percha Creek	1.33	1.33	0.00	0.00	0.43	0.00

	Stream Miles					
	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
North Seco Creek	3.36	0.93	0.00	0.00	0.00	0.00
Pace Creek	2.35	1.19	0.00	0.00	0.00	0.00
Pine Cienega Creek	2.44	2.44	0.00	0.00	1.14	0.11
Poverty Creek	6.77	6.77	0.00	0.00	3.94	0.00
Pueblo Creek	11.67	7.96	0.00	0.00	3.68	0.00
Quaking Aspen Creek	2.31	2.31	0.93	0.00	2.31	0.93
Rain Creek	0.37	0.37	0.00	0.00	0.37	0.00
Romero Creek	2.08	2.08	0.00	0.00	2.08	0.00
S A Creek	5.93	5.93	0.00	0.00	5.70	0.00
Sacaton Creek	3.38	3.38	0.00	0.00	1.88	0.00
San Francisco River	62.16	52.08	0.09	0.00	31.61	0.09
Sapillo Creek	0.55	0.55	0.00	0.00	0.55	0.00
Silver Creek	11.65	11.52	0.00	0.00	10.77	0.00
Smith Creek	3.28	3.28	0.23	0.00	3.28	0.23
South Fork Cuchillo Negro Creek	4.02	1.05	0.00	0.00	0.00	0.00
South Fork Negrito Creek	9.78	9.78	0.32	0.00	8.45	0.32
South Fork Palomas Creek	4.12	2.53	0.03	0.00	1.97	0.03
South Fork Whitewater Creek	0.27	0.27	0.00	0.00	0.20	0.00
South Percha Creek	4.03	4.03	0.00	0.00	2.57	0.00
Stone Creek	1.66	1.66	0.00	0.00	0.63	0.00
Taylor Creek	14.72	13.34	0.00	0.00	2.26	0.00
Tierra Blanca Creek	5.80	4.30	0.00	0.00	1.96	0.00
Trout Creek	16.42	16.42	0.17	0.00	14.24	0.17
Tularosa River	11.22	9.45	0.00	0.00	5.84	0.20
Turkey Creek	7.77	3.31	0.00	0.00	1.47	0.00
Turkey Run	7.42	8.18	0.00	0.00	7.07	0.00
Walnut Creek	3.85	3.85	0.60	0.00	2.14	0.60
West Fork Gila River	2.84	2.84	0.00	0.00	2.84	0.00
West Fork Pueblo Creek	1.58	1.58	0.00	0.00	1.58	0.00
Whiskey Creek	2.26	2.26	0.00	0.00	0.86	0.00
Whitewater Creek	3.66	3.66	0.00	0.00	2.69	0.00
Willow Creek	4.09	4.09	0.07	0.00	4.09	0.07
(blank)	367.45	284.23	16.74	0.00	203.15	21.15
Grand Total	885.58	687.56	32.17	0.00	475.82	41.54
		-198.02	-853.41	-885.58	-409.75	-844.03
		-22%	-96%	-100%	-46%	-95%

Table 36. Miles of Ephemeral Drainage potentially impacted by Motorized Big Game Retrieval

	Stream Miles					
	Alt B	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Ephemeral Miles in MBGR	9,410	7,996	445	0	5,872	512
		-1,414	-8,965	-9,410	-3,538	-8,898
		-15%	-95%	-100%	-38%	-95%

Table 37. Miles of Perennial and Intermittent Stream potentially impacted by Motorized Areas (within 300 ft. of Proposed Motorized Areas)

	Stream Miles					
	Alt B	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
All Perennial/Intermittent Waters	886					
S A Creek		0.03	0	0	0.03	0.03
Grand Total		0.03	0	0	0.03	0.03
		-885.97	-886.00	-886.00	-885.97	-885.97
		-100%	-100%	-100%	-100%	-100%

Table 38. Miles of Ephemeral Drainages potentially impacted by Motorized Areas (within 300 ft. of Proposed Motorized Areas)

	Drainage Miles					
Water Body	**Alt B – No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
All Intermittent Miles	*9,410*					
Mimbres River		0.14	0	0	0.14	0.14
S A Creek		0.05	0	0	0.05	0.05
(blank)		1.67	0.00	0.00	1.67	1.67
Grand Total		1.86	0.00	0.00	1.86	1.86
		-9,408	-9,410	-9,410	-9,408	-9,408
		-100%	-100%	-100%	-100%	-100%

Impaired (303d) waters

Table 39. Number of Stream Crossings on Impaired Water Bodies

	Number of Crossings					
Impaired Water Body and Crossing Type	**Alt B – No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Black Canyon Creek (East Fork Gila River to headwaters)	6	8	8	8	8	8
Bridge	1	1	1	1	1	1
Ephemeral	3	4	4	4	4	4
LowWater-Nat.	2	3	3	3	3	3
Canyon Creek (Middle Fork Gila River to headwaters)	6	6	6	3	6	6
Ephemeral	6	6	6	3	6	6
Centerfire Creek (San Francisco R to headwaters)	18	17	8	8	8	8
Ephemeral	15	15	5	5	5	5
LowWater-Nat.	3	2	3	3	3	3
East Fork Gila River (Gila River to headwaters)	6	6	6	6	6	6
Culv-CMP	1	1	1	1	1	1
LowWater-Nat.	5	5	5	5	5	5
Gila River (Mogollon Ck to East and West Forks of Gila R)	8	6	6	6	6	6
Ephemeral	1	1	1	1	1	1
LowWater-Nat.	7	5	5	5	5	5
Las Animas Creek (perennial portion R Grande to headwaters)	32	32	32	32	32	32
Ephemeral	11	11	11	11	11	11
InChannel-Enter	4	4	4	4	4	4
LowWater-Nat.	17	17	17	17	17	17
Mimbres R (Perennial reaches Willow Springs to Cooney Cny)	45	30	29	28	30	30
Ephemeral	30	30	29	28	30	30
InChannel-Enter	3					
LowWater-Nat.	12					
Mogollon Creek (Perennial reaches abv USGS gage)	2	2	2	2	2	2
InChannel-Enter	1	1	1	1	1	1
Probable	1	1	1	1	1	1
Negrito Creek (Tularosa River to confl of N and S forks)	5	5	5	5	5	5
LowWater-Nat.	5	5	5	5	5	5
San Francisco River (Centerfire Creek to AZ border)	5	6	6	5	6	6
Ephemeral	2	2	2	2	2	2
LowWater-Nat.	2	3	3	2	3	3

	Number of Crossings					
Impaired Water Body and Crossing Type	**Alt B – No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Probable	1	1	1	1	1	1
South Fork Negrito Creek (Negrito Creek to headwaters)	29	29	27	27	29	29
Bridge	1	1	1	1	1	1
Culv-CMP	2	2	2	2	2	2
Ephemeral	19	19	17	17	19	19
LowWater-Nat.	5	5	5	5	5	5
Probable	2	2	2	2	2	2
Taylor Creek (Perennial reaches Beaver Creek to headwaters)	18	12	5	5	5	5
Ephemeral	6	1	1	1	1	1
LowWater-Nat.	11	11	4	4	4	4
LowWater-Not Visited	1					
Tularosa River (San Francisco R to Apache Creek)	2	2	2	2	2	2
LowWater-Conc.	1	1	1	1	1	1
LowWater-Nat.	1	1	1	1	1	1
Turkey Creek (Gila River to headwaters)	2	1				
LowWater-Nat.	2	1				
West Fork Gila R (East Fork to Middle Fork)	2	2	2	2	2	2
Bridge	1	1	1	1	1	1
LowWater-Nat.	1	1	1	1	1	1
Whitewater Creek (Whitewater Campgrd to headwaters)	1	1			1	1
Ephemeral	1	1			1	1
Grand Total	187	165	144	139	148	148
		-22	-43	-48	-39	-39
		-12%	-23%	-26%	-21%	-21%

Table 40. Miles of Impaired (303d) Waters Potentially Impacted by Motorized Routes (within 300 ft. of NFS Open System Roads)

	Stream Miles					
Impaired Water Body	**Alt B – No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Black Canyon Creek (East Fork Gila River to headwaters)	1.07	1.13	1.13	1.04	1.13	1.13
Canyon Creek (Middle Fork Gila River to headwaters)	2.79	2.77	2.77	2.57	2.77	2.77
Centerfire Creek (San Francisco R to headwaters)	3.84	3.52	2.33	2.33	2.40	2.33
East Fork Gila River (Gila River to headwaters)	2.31	2.31	2.31	2.31	2.31	2.31
Gila River (Mangas Creek to Mogollon Creek)	0.45	0.45	0.32	0.32	0.32	0.32
Gila River (Mogollon Ck to East and West Forks of Gila R)	1.28	0.98	0.72	0.72	0.72	0.72
Gila River (Red Rock to Mangas Creek)	0.00	0.00	0.00	0.00	0.00	0.00
Gilita Creek (Middle Fork Gila R to Willow Creek)	0.03	0.03	0.03	0.03	0.03	0.03
Las Animas Creek (perennial portion R Grande to headwaters)	4.15	4.15	4.15	4.15	4.15	4.15
Middle Fork Gila River (Gila River to headwaters)	0.20	0.20	0.20	0.20	0.20	0.20
Mimbres R (Perennial reaches Willow Springs to Cooney Cny)	6.69	4.70	4.70	4.70	4.70	4.70
Mogollon Creek (Perennial reaches abv USGS gage)	0.27	0.27	0.27	0.27	0.27	0.27
Negrito Creek (Tularosa River to confl of N and S forks)	0.55	0.55	0.55	0.55	0.55	0.55
San Francisco River (Centerfire Creek to AZ border)	1.80	2.36	2.31	1.03	2.36	2.36
San Francisco River (Dry Creek to Whitewater Creek)	0.44	0.24	0.24	0.21	0.24	0.24
South Fork Negrito Creek (Negrito Creek to headwaters)	9.34	9.34	8.67	8.67	9.24	9.24
Taylor Creek (Perennial reaches Beaver Creek to headwaters)	7.79	6.37	2.43	2.43	2.72	2.72
Tularosa River (San Francisco R to Apache Creek)	2.19	2.19	2.19	1.82	2.19	2.19
Turkey Creek (Gila River to headwaters)	0.25	0.25	0.14	0.14	0.14	0.14
West Fork Gila R (East Fork to Middle Fork)	0.76	0.76	0.76	0.76	0.76	0.76
West Fork Gila R (Middle Fork to headwaters)	0.23	0.23	0.23	0.23	0.23	0.23
Whitewater Creek (San Francisco R to Whitewater Campgrd)	0.16	0.16	0.16	0.16	0.16	0.16
Whitewater Creek (Whitewater Campgrd to headwaters)	0.45	0.45	0.00	0.00	0.45	0.45

	Stream Miles					
Impaired Water Body	**Alt B – No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Grand Total	47.06	43.41	36.62	34.65	38.04	37.97
		-3.64	-10.44	-12.41	-9.01	-9.08
		-8%	-22%	-26%	-19%	-19%

Table 41. Miles of Impaired (303d) Waters Potentially Impacted by Motorized Dispersed Recreation

	Stream Miles					
Impaired Water Body	**Alt B – No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Black Canyon Creek (East Fork Gila River to headwaters)	2.57	0.71	0.71	0.00	0.71	0.71
Canyon Creek (Middle Fork Gila River to headwaters)	9.49	0.37	0.00	0.00	0.37	0.37
Centerfire Creek (San Francisco R to headwaters)	8.26	0.02	0.00	0.00	0.02	0.00
Cold Springs Creek (Hot Springs Creek to headwaters)	1.84	0.00	0.00	0.00	0.00	0.00
East Fork Gila River (Gila River to headwaters)	9.12	0.16	0.16	0.00	0.16	0.16
Gila River (Mangas Creek to Mogollon Creek)	1.05	0.24	0.24	0.00	0.24	0.24
Gila River (Mogollon Ck to East and West Forks of Gila R)	5.67	0.00	0.00	0.00	0.00	0.00
Gila River (Red Rock to Mangas Creek)	3.71	0.00	0.00	0.00	0.00	0.00
Gilita Creek (Middle Fork Gila R to Willow Creek)	0.33	0.00	0.00	0.00	0.00	0.00
Las Animas Creek (perennial portion R Grande to headwaters)	3.70	0.00	0.00	0.00	0.00	0.00
Mangas Creek (Gila River to Mangas Springs)	0.05	0.00	0.00	0.00	0.00	0.00
Middle Fork Gila River (Gila River to headwaters)	0.81	0.00	0.00	0.00	0.00	0.00
Mimbres R (Perennial reaches Willow Springs to Cooney Cny)	5.73	2.23	2.15	0.00	2.23	2.23
Mogollon Creek (Perennial reaches abv USGS gage)	4.68	0.00	0.00	0.00	0.00	0.00
Negrito Creek (Tularosa River to confl of N and S forks)	10.98	0.00	0.00	0.00	0.00	0.00
San Francisco River (Centerfire Creek to AZ border)	9.43	0.20	0.09	0.00	0.09	0.09
San Francisco River (Dry Creek to Whitewater Creek)	4.07	0.03	0.00	0.00	0.03	0.00
South Fork Negrito Creek (Negrito Creek to headwaters)	14.78	1.55	0.53	0.00	1.55	1.55
Taylor Creek (Perennial reaches	19.91	0.00	0.00	0.00	0.00	0.00

	Stream Miles					
Impaired Water Body	**Alt B – No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Beaver Creek to headwaters)						
Tularosa River (San Francisco R to Apache Creek)	9.21	0.20	0.00	0.00	0.00	0.20
Turkey Creek (Gila River to headwaters)	0.28	0.00	0.00	0.00	0.00	0.00
West Fork Gila R (East Fork to Middle Fork)	1.93	0.32	0.00	0.00	0.00	0.00
West Fork Gila R (Middle Fork to headwaters)	0.91	0.00	0.00	0.00	0.00	0.00
Whitewater Creek (San Francisco R to Whitewater Campgrd)	1.41	0.00	0.00	0.00	0.00	0.00
Whitewater Creek (Whitewater Campgrd to headwaters)	2.25	0.00	0.00	0.00	0.00	0.00
Grand Total	132.18	6.02	3.87	0.00	5.38	5.54
		-126.16	-128.31	-132.18	-126.80	-126.65
		-95%	-97%	-100%	-96%	-96%

Table 42. Miles of Impaired (303d) Waters Potentially Impacted by Motorized Big Game Retrieval

	Stream Miles					
Impaired Water Body	**Alt B – No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Black Canyon Creek (East Fork Gila River to headwaters)	2.57	2.49	0.71	0	2.17	0.71
Canyon Creek (Middle Fork Gila River to headwaters)	9.49	9.49	0.00	0	8.87	0.37
Centerfire Creek (San Francisco R to headwaters)	8.26	8.21	0.00	0	7.08	0.00
Cold Springs Creek (Hot Springs Creek to headwaters)	1.84	1.84	0.00	0	0.79	0.00
East Fork Gila River (Gila River to headwaters)	9.12	5.31	0.16	0	2.93	0.16
Gila River (Mangas Creek to Mogollon Creek)	1.05	1.05	0.24	0	1.05	0.24
Gila River (Mogollon Ck to East and West Forks of Gila R)	5.67	4.73	0.00	0	2.99	0.00
Gila River (Red Rock to Mangas Creek)	3.71	1.07	0.00	0	0.00	0.00
Gilita Creek (Middle Fork Gila R to Willow Creek)	0.33	0.33	0.00	0	0.33	0.00
Mangas Creek (Gila River to Mangas Springs)	0.05	0.05	0.00	0	0.05	0.00
Middle Fork Gila River (Gila River	0.81	0.81	0.00	0	0.57	0.00

	Stream Miles					
Impaired Water Body	**Alt B – No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
to headwaters)						
Mimbres R (Perennial reaches Willow Springs to Cooney Cny)	5.73	5.73	2.15	0	4.25	2.23
Mogollon Creek (Perennial reaches abv USGS gage)	4.68	2.69	0.00	0	1.43	0.00
Negrito Creek (Tularosa River to confl of N and S forks)	10.98	3.36	0.00	0	0.96	0.00
San Francisco River (Centerfire Creek to AZ border)	9.43	8.42	0.09	0	6.44	0.09
San Francisco River (Dry Creek to Whitewater Creek)	4.07	4.07	0.00	0	2.33	0.00
South Fork Negrito Creek (Negrito Creek to headwaters)	14.78	14.78	0.53	0	13.54	1.55
Taylor Creek (Perennial reaches Beaver Creek to headwaters)	19.91	18.54	0.00	0	3.42	0.00
Tularosa River (San Francisco R to Apache Creek)	9.21	7.42	0.00	0	3.80	0.20
Turkey Creek (Gila River to headwaters)	0.28	0.28	0.00	0	0.00	0.00
West Fork Gila R (East Fork to Middle Fork)	1.93	1.93	0.00	0	1.93	0.00
West Fork Gila R (Middle Fork to headwaters)	0.91	0.91	0.00	0	0.91	0.00
Whitewater Creek (San Francisco R to Whitewater Campgrd)	1.41	1.41	0.00	0	1.33	0.00
Whitewater Creek (Whitewater Campgrd to headwaters)	2.25	2.25	0.00	0	1.37	0.00
Grand Total	132.18	107.15	3.87	0	68.54	5.54
		-25.03	-128.31	-132.18	-63.64	-126.65
		-19%	-97%	-100%	-48%	-96%

Table 43. Miles of Impaired (303d) Waters Potentially Impacted by Areas (within 300 Ft of Proposed Motorized Areas)

	Stream Miles					
	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
All Impaired Waters	132					
Mimbres R (Perennial reaches Willow Springs to Cooney Cny)		0.14	0	0	0.14	0.14
Grand Total		0.14	0	0	0.14	0.14
		-131.86	-132	-132	-131.86	-131.86
		-100%	-100%	-100%	-100%	-100%

Outstanding National Resource Waters

Table 44. Miles of ONRW Streams within 300 Feet of Motorized Routes (within 300 Feet of Motorized Routes)

	Stream Miles					
	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Circle Seven Creek	0.04	0.00	0.00	0.00	0.00	0.00
North Fork Palomas Creek	0.13	0.05	0.00	0.00	0.05	0.05
Grand Total	0.17	0.05	0.00	0.00	0.05	0.05
		-0.13	-0.17	-0.17	-0.13	-0.13
		-72%	-100%	-100%	-72%	-72%

Table 45. Acres of Motorized Dispersed Recreation within 300 feet of ONRW Stream

	Acres Motorized Dispersed Recreation					
Water Body	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Big Dry Creek	3.13	0	0	0	0	0
Black Canyon	9.54	0	0	0	0	0
Byers Run	3.18	0	0	0	0	0
Canyon Creek	3.26	0	0	0	0	0
Circle Seven Creek	3.12	0	0	0	0	0
Cow Creek	3.29	0	0	0	0	0
East Fork Gila River	3.61	0	0	0	0	0
Gila River	6.64	0	0	0	0	0
Gilita Creek	5.82	0	0	0	0	0
Indian Canyon	3.63	0	0	0	0	0
Las Animas Creek	3.27	0	0	0	0	0
Little Creek	3.33	0	0	0	0	0
Little Turkey Creek	4.12	0	0	0	0	0
Little Whitewater Creek	3.28	0	0	0	0	0
Middle Fork Gila River	2.60	0	0	0	0	0
Mud Spring Canyon	2.26	0	0	0	0	0
North Fork Palomas Creek	3.16	0	0	0	0	0
North Seco Creek	1.00	0	0	0	0	0

	Acres Motorized Dispersed Recreation					
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Pueblo Creek	2.11	0	0	0	0	0
Rain Creek	3.60	0	0	0	0	0
South Fork Whitewater Creek	3.25	0	0	0	0	0
Trout Creek	3.11	0	0	0	0	0
Turkey Creek	3.36	0	0	0	0	0
Whitewater Creek	3.94	0	0	0	0	0
Willow Creek	3.27	0	0	0	0	0
Grand Total	90.89	0	0	0	0	0
		-90.89	-90.89	-90.89	-90.89	-90.89
		-100%	-100%	-100%	-100%	-100%

Table 46. Acres of Motorized Big Game Retrieval within 300 feet of ONRW Stream

	Acres MBGR					
Water Body	**Alt B**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Big Dry Creek	3.13	3.13	0.00	0.00	0.00	0.00
Black Canyon	9.54	6.44	0.00	0.00	3.29	0.00
Canyon Creek	3.26	3.26	0.00	0.00	0.00	0.00
Cow Creek	3.29	3.29	0.00	0.00	0.00	0.00
Gila River	6.64	6.64	0.00	0.00	3.40	0.00
Gilita Creek	5.82	5.82	0.00	0.00	3.14	0.00
Little Creek	3.33	3.33	0.00	0.00	3.33	0.00
Little Turkey Creek	4.12	4.12	0.00	0.00	4.12	0.00
Little Whitewater Creek	3.28	3.28	0.00	0.00	3.28	0.00
Middle Fork Gila River	2.60	2.60	0.00	0.00	0.00	0.00
Mud Spring Canyon	2.26	2.26	0.00	0.00	0.00	0.00
Pueblo Creek	2.11	2.11	0.00	0.00	0.00	0.00
Rain Creek	3.60	3.60	0.00	0.00	3.60	0.00
South Fork Whitewater Creek	3.25	3.25	0.00	0.00	0.08	0.00
Trout Creek	3.11	3.11	0.00	0.00	0.10	0.00
Turkey Creek	3.36	3.36	0.00	0.00	0.00	0.00
Whitewater Creek	3.94	3.94	0.00	0.00	0.00	0.00
Willow Creek	3.27	3.27	0.00	0.00	3.27	0.00
Grand Total	69.91	66.81	0.00	0.00	27.61	0.00
		-3.10	-69.91	-69.91	-42.30	-69.91
		-4%	-100%	-100%	-61%	-100%

*There are no motorized areas proposed under any alternative that would impact an ONRW stream.

Table 47. Miles of Road Within 300 feet of ONRW Wetland

	Road Miles					
	Alt B	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Miles Motorized Routes adjacent to ONRW	0.75	0.69	0.69	0.69	0.69	0.69
		-0.06	-0.06	-0.06	-0.06	-0.06
		-7%	-7%	-7%	-7%	-7%

Table 48. Acres of Motorized Dispersed Recreation within 300 Ft. ONRW Wetland

	Acres Motorized Dispersed Recreation					
	Alt B	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Acres Motorized Dispersed Recreation adjacent to ONRW	96.33	0.00	0.00	0.00	0.00	0.00
		-96.33	-96.33	-96.33	-96.33	-96.33
		-100%	-100%	-100%	-100%	-100%

Table 49. Acres of MBGR within 300 feet of ONRW Wetland

	Acres MBGR					
	Alt B	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Acres MBGR adjacent to ONRW	96.33	38.35	0.00	0.00	20.63	0.00
		-57.98	-96.33	-96.33	-75.70	-96.33
		-60%	-100%	-100%	-79%	-100%

* There are no Motorized Areas proposed under any alternative that would impact an ONRW wetland.

Conclusions about Effects of Action Alternatives

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 acres associated with motorized routes open to the public, which reduces the relative risk of negative impacts to soil resources, riparian areas, wetlands, and water quality. It is recognized that there are, and will continue to be, localized direct and indirect negative impacts to watershed and soil resources as a result of a motorized route system, in particular in popular recreation and camping areas.

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 respects, with the exception of motorized big game retrieval, where Alternative G further restricts this corridor to the 300 foot motorized dispersed recreation corridor, versus a ½ mile corridor 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 very few acres associated with motorized routes. It does restrict motorized cross country travel, similar to Alternative F, however again, this activity currently has minimal watershed and soil impacts on the Forest.

During the comment period for the Draft EIS, many concerns and issues related to motor vehicle use and access to the lower San Francisco River were received. The concerns and issues generated the need for the Forest to specifically address and analyze the effects of the alternatives in this particular area and associated routes.

Watershed Analysis of the San Francisco River Wilderness Study Area and Potential Impacts from Implementation of the Travel Management Rule

Each of the alternatives was analyzed to determine if there is potential for a motorized route system on the Gila National Forest to impact the San Francisco River Wilderness Study Area (WSA) relative to water quality and riparian values.

Water Quality

There are currently 40 motorized route crossings within the WSA. Alternative E provides the most reduction (-100%) of these motorized crossings by eliminating all motorized access down to the San Francisco River WSA. Alternatives D and G are close behind with a reduction of 98% of motorized crossings. The only remaining crossing in these two alternatives would be on Big Dry Creek at its confluence with the San Francisco River. Alternatives C and F do not eliminate any of the existing motorized crossings. Alternatives E, D, and G provide the most opportunity to reduce direct impacts to water quality as mobilization of stream bottom sediments from motorized traffic would be greatly limited with the reduction and/or elimination of stream crossings. In addition, once recovery of riparian vegetation occurs at the ingress and egress point of the crossings, this vegetation can serve as a filter for sediment movement that may occur during precipitation events along current route/crossing paths.

A small reach (0.23 miles) of the San Francisco River within the WSA is documented on New Mexico's 2012-2014 303(d) list of impaired waterbodies. Alternative E would eliminate all motorized routes within 300 feet of this listed reach. The remaining alternatives (C, D, F, and G) would eliminate 88% (0.20 miles) of the motorized routes within 300 feet of this listed reach. All five alternatives provide a major reduction in the length of motorized routes adjacent to the impaired reach of the San Francisco River within the WSA. This reduction in routes reduces the risk for potential road-related sediment to enter this reach of the river.

There are currently 9.95 miles of perennial, intermittent, and ephemeral waterbodies within the San Francisco River WSA. In review of motorized routes within 300 feet of these water bodies, Alternative E eliminates all motorized routes within the 300 feet. Alternatives D and G are close behind with a reduction of 93% of motorized routes within the 300 feet. Alternatives C and F reduce a minor amount (-2%) of motorized routes within the 300 foot width. Alternatives E, D, and G provide the most opportunity to reduce the risk for potential road-related sediment to enter into the drainage network. Hydrologic impacts would not be immediately eliminated, but would rather be dependent on natural recovery and successful revegetation of the current route paths.

Riparian Areas

There are currently 11 acres associated with motorized routes within riparian areas located in the San Francisco River WSA. Alternative E eliminates motorized routes within the WSA, thus providing a 100% reduction of acres associated with these routes. Alternatives D and G are close behind with a reduction of 91% of acres associated with motorized routes. Alternatives C and F reduce a minor amount (-3%) of acres associated with motorized routes within riparian areas. Alternatives E, D, and G provide the greatest opportunity to reduce the risk of negative impacts to riparian areas from motorized routes, thus increasing the opportunity for riparian habitat restoration. The wet nature of riparian areas provides an increased level of resiliency to irreversible impacts, and often increases the opportunity for recovery. Disturbed riparian habitat in the San Francisco River WSA may recover to a more natural state in a shorter period of time than a disturbed site in a drier, upland location.

Summary

Overall, Alternative E, D, and G greatly reduce the potential risk of impacts to water quality and riparian areas within the San Francisco River WSA, as motorized access would either be eliminated in its entirety (Alternative E) within the WSA, or limited to Dry Creek and small spur roads at the confluence of Big Dry Creek and the San Francisco River (Alternatives D and G). Alternatives C and F provide little to no reduction in risk of potential impacts to water quality and riparian areas, as motorized access would continue down Big Dry Creek and along the San Francisco River for over eight miles within the WSA.

The following tables (50-53) provide further information related to motorized routes within the San Francisco River WSA and potential impacts to water quality and riparian areas.

Table 50. San Francisco River WSA Impaired Waterbody Miles within 300 Ft Buffer of Open, Motorized Routes

	Acres					
Impaired Water bodies within 300 Feet of Motorized Route	**Alt B - No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
San Francisco River (Dry Creek to Whitewater Creek)	0.23	0.03	0.03	0.00	0.03	0.03
Grand Total	0.23	0.03	0.03	0.00	0.03	0.03
		-0.20	-0.20	-0.23	-0.20	-0.20
		-88%	-88%	-100%	-88%	-88%

Table 51. San Francisco River WSA Motorized Stream Crossings

	Acres					
Motorized Route Stream Crossings	**Alt B - No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Water Body	40	40	1	0	40	1
Big Dry Cr.	1	1	1	0	1	1
San Francisco River	33	33	0	0	33	0
Unnamed	6	6	0	0	6	0
Grand Total	40	40	1	0	40	1
		0	-39	-40	0	-39
		0%	-98%	-100%	0%	-98%

Table 52. San Francisco River WSA Stream Miles within 300 Feet of Open, Motorized Routes

	Acres					
Waterbodies	**Alt B- No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Perennial	9.05	8.85	0.51	0.00	8.85	0.51
Mule Creek	0.06	0.06	0.00	0.00	0.06	0.00
San Francisco River	8.66	8.46	0.51	0.00	8.46	0.51
Unnamed	0.33	0.33	0.00	0.00	0.33	0.00
Intermittent	0.11	0.11	0.11	0.00	0.11	0.11
Big Dry Creek	0.11	0.11	0.11	0.00	0.11	0.11
Ephemeral	0.79	0.79	0.11	0.00	0.79	0.11
Unnamed	0.79	0.79	0.11	0.00	0.79	0.11
Grand Total	9.95	9.75	0.73	0.00	9.75	0.73
		-0.20	-9.22	-9.95	-0.20	-9.22
		-2%	-93%	-100%	-2%	-93%

Table 53. San Francisco River WSA Acres of Motorized Routes within Riparian Areas

	Acres					
Habitat Type and Route Designation	**Alt B – No Action**	**Alt C**	**Alt D**	**Alt E**	**Alt F**	**Alt G**
Sycamore/Fremont Cottonwood	11.06	10.76	0.99	0.00	10.76	0.99
Motorized	11.06	10.76	0.67	0.00	10.76	0.67
Unauthorized route proposed to be motorized	0.00	0.00	0.32	0.00	0.00	0.32
Grand Total	11.06	10.76	0.99	0.00	10.76	0.99
		-0.30	-10.07	-11.06	-0.30	-10.07
		-3%	-91%	-100%	-3%	-91%

Soils Analysis of the San Francisco Wilderness Study Area

Each of the alternatives was evaluated to determine the effects of a motorized route system on the Gila National Forest to the San Francisco Wilderness Study Area in regards to impacts to soils. Tables 54 and 55 show the route prism acres by alternative that are located on soils with moderate and severe erosion hazard ratings and soils with unsatisfactory and unsuited soil condition ratings.

Table 54. Route Prism Acres by GTES Moderate and Severe Erosion Hazard Rating

	GTES Route Acres				
	Alt B	**Alt C**	**Alt D**	**Alt F**	**Alt G**
Severe rating/acres	12.04	11.74	1.12	11.74	1.12

Table 55. Route Prism Acres by GTES Unsuited and Unsatisfactory Soil Condition Rating

	GTES Route Acres				
Alternative	**Alt B**	**Alt C**	**Alt D**	**Alt F**	**Alt G**
Unsuited rating/ acres	12.04	11.74	1.12	11.74	1.12

Alternatives B, C and F have the largest impact to soils with moderate and high erosion potential and unsuited and unsatisfactory soil condition. Alternatives D and G have the least impact to soils with the above mentioned ratings.

Cumulative Effects

Watershed cumulative effects analyses for the Implementation of the Travel Management Rule on the Gila National Forest was conducted at the 6th code watershed level. This analysis was done at a broad scale using the 2011 Watershed Condition Classification and is included as a separate report to this analysis, entitled "Watershed, Soil and Aquatics Cumulative Effects Report". The cumulative effects analysis is based on full implementation of an alternative selected, and a project period of 10 years following the decision. The following information provides a summary of the Cumulative Effect report's findings.

Alternative Comparison

The information found in the Watershed, Soils and Aquatics Cumulative Effects report describes how implementation of a motorized route system and cross country travel across the Forest would have the

ability to impact attributes that are used to assess watershed condition. Each alternative was then compared to Alternative B – No Action, to assess which one provided the greatest opportunity to reduce existing cumulative impacts related to motorized routes and cross country travel. The following tables (56-58) provide a summary of miles and or acres of potential impacts by a motorized route system, Forestwide, as well as acres available to cross country motorized travel, by alternative. Simply, the less motorized disturbance to watershed, soil, and aquatic resources, the less opportunity for negative cumulative impacts to occur, and the greater the opportunity for beneficial effects to transpire.

Table 56. Forestwide Miles and Acres of Motorized Routes

	Alt. B-No Action	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G	Alt. B-No Action	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G
	Miles						Acres					
NFS Motorized Roads	4,573	4,234	2,943	2,290	3,329	3,300	6,863	6,367	4,488	3,537	5,049	5,007
NFS Administrative Roads	0	212	382	439	328	327	0	311	559	642	481	480
<50" Motorized Trail	16	140	124	2	178	178	15	160	156	2	222	222
Single Track Motorized Trail	0	64	0	0	0	0	0	23	0	0	0	0
Total NFS Motorized Routes	4,589	4,650	3,449	2,731	3,835	3,805	6,878	6,861	5,203	4,181	5,752	5,709
*CHANGE IN NFS MOTORIZED ROUTES		61	-1,140	-2273	-754	-784		-17	-1,675	-2,697	-1,126	-1,169
Closed NFS Roads	525	646	1,742	2,378	1,381	1,410	763	940	2,534	3,459	2,008	2,051
Total NFS Motorized and Closed Routes	5,114	5,296	5,191	5,109	5,216	5,215	7,641	7,801	7,737	7,640	7,760	7,760
**CHANGE IN NFS ROUTES (motorized and closed) PRESENT ON LANDSCAPE		182	77	-5	102	101		160	96	-1	119	119

***** Note 1: although Miles increase in Alternative C, there is a decrease in Acres. This is attributed to an increase in single track (motorcycle) miles that were assumed to have a 3 foot width, and a decrease in Level 2 route miles with an assumed width of 12 feet (see page 40).

** Note 2: If a closed route has not been decommissioned, it is still considered hydrologically connected to the stream network. The closed route continues to leave a scar on the landscape and may impact watershed conditions until the road bed has returned to a natural state, either over time or via human assistance.

Table 57. Motorized Dispersed Camping and Motorized Area Acres Forestwide

Motorized Dispersed Camping and Area Acres Forestwide	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	2,443,368		
Alternative C	108,207	-2,335,161	-96%
Alternative D	84,388	-2,358,980	-97%
Alternative E	0	-2,443,368	-100%
Alternative F	101,942	-2,341,426	-96%
Alternative G	94,035	-2,349,333	-96%

Table 58. Forestwide Motorized Big Game Retrieval Acres

Forestwide - Motorized Big Game Retrieval Acres	Acres	Change in Acres from No Action	% Increase or decrease from No Action
Alternative B – No Action	2,443,368		
Alternative C	2,078,660	-364,708	-15%
Alternative D	84,388	-2,358,980	-97%
Alternative E	0	-2,443,368	-100%
Alternative F	1,506,574	-936,794	-38%
Alternative G	94,008	-2,349,360	-96%

Alternative B – No Action

The effects of past and present activities to watershed, soil, and aquatic conditions are described in the affected environment section of the FEIS. The reasonably foreseeable activities that are considered for this project are described on page 6 of this document. The motorized route system and unlimited cross country access currently in place on the Gila National Forest contribute, in part, to cumulative impacts on watershed condition. In 2011, 6th code watershed condition classifications incorporated information related to the current motorized route system into the assessment, in addition to information related to eleven other watershed indicators. This recent assessment provides a "baseline" at which to assess all of the action alternatives versus the No Action Alternative.

Under the No Action Alternative, the existing motorized route system in place on the Forest would not change, continuing to impact over 6,900 acres of Forest where the routes are located. Contribution to cumulative impacts of watershed, soil and aquatic resources at the 6th code watershed scale would continue to occur at the current rate, with little to no increases expected. In addition, unlimited cross-country travel would continue across the Forest, outside of wilderness areas. 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, it is difficult for the Forest Service to control negative impacts as they occur. In general, adverse impacts related to cross country travel for motorize dispersed camping and motorized big game retrieval are minimal Forestwide. Some situations do exist, however, where forest users have created an "undesignated" route based on a favorite destination off of a designated route. Many of these routes are near favorite waterbodies such as the Gila, San Francisco and Mimbres Rivers, or other favored recreational sites which are often most vulnerable to negative impacts by motorized vehicles.

Implementation of Alternative B – No Action would result in no change in cumulative impacts to watershed, soil and aquatic condition at the 6th code level, and thus no change to watershed condition classification of any watershed.

Alternative C

Alternative C proposes the least decrease in acres impacted by motorized routes across the Forest of all action alternatives. Cross country travel related to motorized dispersed recreation is reduced by 96%, which is comparable to all action alternatives. Cross country travel related to motorized big game retrieval is reduced by 15% which is the least reduction of all action alternatives. Motorized areas (camping and OHV) are limited to 27 acres, similar to Alternatives F and G. Alternative C would be similar to Alternative B – No Action in terms of cumulative effects, with some upward trends in watershed condition realized with reductions of motorized cross country travel. However, these upward trends would be immeasurable at the watershed scale and are not expected to result in large enough improvement to change overall watershed condition classification.

Alternative D

Alternative D proposes the second largest decrease in motorized routes across the Forest, behind Alternative E. Cross country travel related to motorized dispersed recreation is reduced by 97%, which is comparable to all action alternatives. Cross country travel for motorized big game retrieval is reduced by 97%, limiting it only to areas where motorized dispersed recreation is permitted. No motorized areas would be authorized under this alternative. Alternative D is second behind Alternative E in terms of providing the most opportunity to decrease cumulative impacts to watershed, soil and aquatic conditions that may currently be occurring as a result of the Forest's existing motorized route system and unrestricted cross country travel. Alternative D poses the second best opportunity of all alternatives for upward trends to occur in watershed condition, related to the watershed indicators of water quality, water quantity, aquatic habitat, aquatic biota, riparian/wetland condition, roads and trails, soils, and terrestrial invasive species. However, similar to Alternative E, these upward trends are not expected to result in large enough improvement across any individual watershed to change overall watershed condition classification in the next 10 years.

Alternative E

Alternative E proposes the largest decrease in motorized routes across the Forest. In addition, there would be no cross country travel allowed for motorized dispersed camping or motorized big game retrieval. No motorized areas would be authorized under this alternative. The only cross country travel allowed would be for parking a vehicle and/or trailer immediately adjacent to the designated motorized route. With these limitations, Alternative E provides the most opportunity to decrease cumulative impacts to watershed, soil and aquatic conditions that may currently be occurring as a result of the Forest's existing motorized route system and unrestricted cross country travel. Alternative E poses the best opportunity of all alternatives for upward trends to occur in watershed indicators of water quality, water quantity, aquatic habitat, aquatic biota, riparian/wetland condition, roads and trails, soils, and terrestrial invasive species. However, these upward trends are not expected to result in large enough improvement across a watershed within a 10-year period to change overall watershed condition classification.

Alternatives F and G

Alternatives F and G show similar reductions related to acres impacted by motorized routes and acres open to motorized dispersed recreation, behind Alternatives E and D. These two alternatives differ only in acres related to motorized big game retrieval, where Alternative G compares to Alternative D,

with this activity limited to the 300 foot motorized dispersed camping corridor. Alternative F provides for a ½ mile corridor for this activity which results in a 38% reduction of acres compared to Alternative B – No Action. Although there may be some upward trends to the attributes as described in the above section, implementation of either Alternative F or G is not expected to change the overall watershed condition classification in any watershed. Improvements expected in these two alternatives would be less than those expected in Alternatives E or D.

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 fires and wildfires fires, road and trail construction and maintenance, 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, 28 stream reaches are currently not attaining State Water Quality Standards. With many roads across the Forest lacking adequate drainage features, roads have been identified by the State as being one probable source of impairment for some of these streams. 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 likely be reduced slightly by project but 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. Permitted livestock numbers that graze on the Forest have decreased 28% in the last three decades. 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 permits, 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 6th code watersheds with the Gila National Forest, and improvements on its adjacent Forest lands would have beneficial cumulative impacts, watershed-wide.

Existing watershed, soil and aquatic conditions were used to determine current watershed condition classification (Alternative B – existing watershed condition) which can be viewed as a collective assessment of all prior activities, both natural and human caused, that have cumulatively impacted

watershed, soil, and aquatic resources. Careful planning should occur in watersheds that are Functioning at Risk or Impaired 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, soil, and aquatic 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.

None of the action alternatives address decommissioning; all scars from non-motorized routes would remain, with the addition of a few routes to the system (i.e. converting of decommissioned routes to motorized route or trail). For the majority of motorized routes in the uplands, the changing of designation of a route 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 route and trail condition, as a 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. However, motorized route densities decrease in each of the action alternatives providing for reduced motorized use related to those routes that are non-motorized.

In comparison to Alternative B – No Action, all alternatives provide for a net decrease in adverse cumulative watershed impacts by reducing acres related to motorized routes and limiting acreage available for cross country travel. Closing of routes provides for the greatest benefit to aquatic, 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 (with localized exceptions).

Implementation of Alternative E provides the most reduction of adverse cumulative impacts to watershed, soil, and aquatic resources Forest-wide by eliminating motorized cross-country travel and reducing the most miles of motorized routes and acres of motorized cross country travel. 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 routes. 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-foot motorized dispersed recreation corridors, similar to Alternative D, while Alternative F provides for cross country travel within a ½ mile corridor. Alternative C, while slightly reducing acres related to 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 aquatic resources, 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 future 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 miles of routes over Alternative B (No Action) (see Table Below). While however minor these proposals are, and considering that none of these new routes are located in riparian areas, wetlands areas, or adjacent to perennial, intermittent, or impaired waters, there would still be disturbance to and commitment of the soil resource. 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 or Best Management Practices are in place to minimize the effects to the soil resource from such irreversible and/or irretrievable losses.

Table 59. Unauthorized Routes Proposed to be added NFSR

Alternative	Alt B	Alt C	Alt D	Alt E	Alt F	Alt G
Increase in Miles of Unauthorized Routes	0	94	66.2	5.3	83.9	83.2
Increase in Acres of Unauthorized Routes	0	107.6	80.1	7.8	96.6	96.4

Consistency Review of Laws, Regulations and Policies

Table 60. Project Consistency Review Regarding Laws, Regulations and Policies

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
Forest Plan	*Forest Plan Standards and Guidelines, Riparian, 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 areas would continue to impact these resources. All action alternatives show a reduction in motorized routes within riparian areas 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 recreationand big game retrieval compared to the No Action alternative. All Alternatives are moving towards meeting Forest Plan Standards and Guides.
Forest Plan	*Forest Plan Standards and Guidelines, Riparian* ■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 areas would continue to impact these resources. All action alternatives show a reduction in motorized routes within riparian areas 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 recreationand big game retrieval compared to the No Action alternative. All Alternatives except C are moving towards meeting Forest Plan Standards and Guides.

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
Forest Plan	*Forest Plan Standards and Guidelines, Riparian* ■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 areas would continue to impact these resources. All action alternatives realize a reduction in motorized recreation and motorized dispersed recreation. 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 a. The visual quality objective of preservation will be met. b. Manage dispersed recreation at low intensity reduced service level. c. 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 a. 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 b. Management area 2H contains Burnt Cabin flats grassland with high erodible soils. Black Range District. P 89 c. 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 d. There are areas within management area 3A which are comprised of fragile, highly erosive rhyolitic, and Gila conglomerate soils. Glenwood District. p 95 e. Areas within the management area 3B are comprised of fragile, highly erosive soils. Quemado District. p 100 f. Areas within the management area 3C are comprised of fragile, highly erosive soils. Quemado District. p 105 g. 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	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
	productivity. Erosion in these areas has created a system of gullies which bisect the area and reduce productivity. Quemado District. p 112 h. 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: a. Temperature TMDLs – Black Canyon Creek, South Fork Negrito Creek, San Francisco River, Taylor Creek; b. Plant Nutrients TMDLs – Canyon Creek, Centerfire Creek, Mangas Creek, San Francisco River; c. Turbidity TMDLs – Canyon Creek, Sapillo Creek, Whitewater Creek; d. Conductivity TMDLs – Centerfire Creek, Tularosa 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 areas would continue to potentially have an effect on water quality. All Action alternatives show a reduction in stream crossings, motorized routes and motorized dispersed recreation(within 300 ft of 303d listed stream) on listed 303d streams compared to the No Action alternative. All Action alternatives realize a reduction in motorized routes and motorized camping within riparian areas and motorized route stream crossings compared to the No Action alternative.

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
	e. Metals (Chronic Aluminum) TMDLs – East Fork Gila River, Mogollon Creek, Taylor Creek, Whitewater Creek; f. 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.	
National Environmental Policy Act of 1969	*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.	The Travel Management Rule is compliant with the *National Environmental Policy Act of 1969.*
National Forest Management Act of 1976	*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.	The Travel Management Rule complied with the *National Forest Management Act of 1976*
Executive Orders 11988 and 11990	*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	The Travel Management Rule is compliant with *Executive Orders 11988 and 11990* With the exception of alternative C all other Action alternatives reduced the amount of motorized routes in riparian areas and wetlands compared to the No Action alternative. All Action alternatives reduced the amount of motorized dispersed recreationand big game retrieval riparian areas and

Guidance Document	Laws, Regulations and Policies	Travel Management Compliance
	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.	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 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;	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
	and (3) conflict between the use of OHVs and other types of recreation.	

It is the conclusion of this analysis that all action alternatives are consistent with law, regulation and policy.

Effects of Forest Plan Amendments

Amendments 1 thru 6 to the forest plan may have effects because they propose changes in the management of specific areas of the forest. These effects, like those from the proposed action and alternatives, are disclosed as part of the effects analysis above.

Amendment 7 is administrative in nature and not expected to have effects as a result of this project or future projects. This proposed amendment, for the most part, simply updates and provides consistent direction for application of the Forest Plan with the Travel Management.

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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