Rio Puerco

Resource Management Draft Plan &
Environmental Impact Statement

Volume III

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Rio Puerco Field Office

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A CULTURAL RESOURCES ON NON-BLM LANDS LISTED ON THE NRHP

Table A.1: Cultural Resources on non-BLM Lands

County	Resource Name	Address	City	Listed	Multiple
Bernalillo	Carnes, Chester, House	701 13th St., NW	Albuquerque	12/1/1980	Albuquerque Downtown Neighborhoods MRA
Bernalillo	Eighth Street-Forrester District	Roughly bounded by Mountain Rd., Lomas Blvd., Forrester and 7th Sts.	Albuquerque	12/1/1980	Albuquerque Downtown Neighborhoods MRA
Bernalillo	Fourth Ward District	Roughly bounded by Central Ave., Lomas Blvd., 8th and 15th Sts.	Albuquerque	12/1/1980	Albuquerque Downtown Neighborhoods MRA
Bernalillo	Gurule, Delfinia, House	306 16th St., NW	Albuquerque	12/1/1980	Albuquerque Downtown Neighborhoods MRA
Bernalillo	Harwood School	1114 7th St., NW	Albuquerque	12/1/1980	Albuquerque Downtown Neighborhoods MRA
Bernalillo	Hayden, A. W., House	609 Marble St., NW	Albuquerque	12/1/1980	Albuquerque Downtown Neighborhoods MRA
Bernalillo	LaGlorieta House	1801 Central Ave., NW	Albuquerque	8/19/1983	Albuquerque Downtown Neighborhoods MRA
Bernalillo	LeFeber, Charles, House	313 5th St.	Albuquerque	12/1/1980	Albuquerque Downtown Neighborhoods MRA
Bernalillo	Lopez, Hilario, House	208 16th St., NW	Albuquerque	12/1/1980	Albuquerque Downtown Neighborhoods MRA
Bernalillo	Mann, Henry, House	723 14th St., NW	Albuquerque	12/1/1980	Albuquerque Downtown Neighborhoods MRA
Bernalillo	Spitz, Berthold, House	323 N. 10th St.	Albuquerque	12/22/1977	Albuquerque Downtown Neighborhoods MRA

County	Resource Name	Address	City	Listed	Multiple
Bernalillo	Tafoya, Domingo, House	10021 Edith Blvd., NE	Alameda	11/17/1980	Albuquerque North Valley MRA
Bernalillo	Anaya, Gavino, House	2939 Duranes Rd., NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Armijo, Juan Cristobal, Homestead	207 Griegos Rd., NE	Albuquerque	9/30/1982	Albuquerque North Valley MRA
Bernalillo	Barela, Adrian, House	7618 Guadalupe Trail, NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Barela-Bledsoe House	7017 Edith Blvd., NE	Albuquerque	3/12/1979	Albuquerque North Valley MRA
Bernalillo	Chavez, Juan de Dios, House	205 Griegos Rd., NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Chavez, Juan, House	7809 4th St., NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Chavez, Rumaldo, House	10023 Edith Blvd., NE	Albuquerque	11/24/1980	Albuquerque North Valley MRA
Bernalillo	De Garcia, Tomasa Griego, House	6939 Edith Blvd., NE	Albuquerque	6/19/1979	Albuquerque North Valley MRA
Bernalillo	Dietz, Robert, Farmhouse	4117 Rio Grande Blvd., NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Foraker, C. M., Farmhouse	905 Menaul Blvd., NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Garcia, Juan Antonio, House	7442 Edith Blvd., NE	Albuquerque	9/28/1982	Albuquerque North Valley MRA
Bernalillo	Gomez, Refugio, House	7604 Guadalupe Trail, NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Grande, Charles, House	4317 Grande St., NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Kromer House	1024 El Pueblo Rd., NW	Albuquerque	10/4/1982	Albuquerque North Valley MRA

County	Resource Name	Address	City	Listed	Multiple
Bernalillo	Los Candelarias Chapel-San Antonio Chapel	1934 Candelaria Rd., NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Los Duranes Chapel	2601 Indian School Rd., NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Los Griegos Historic District	Griegos Rd. and Rio Grande Blvd.	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Los Tomases Chapel	3101 Los Tomases, NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Lucero y Montoya, Francisco, House	9742 4th St., NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Menaul School Historic District	Roughly bounded by Broadway, Claremont, Edith, and Menaul Aves. and 301 Menaul Blvd., NE	Albuquerque	2/14/1983	Albuquerque North Valley MRA
Bernalillo	Nordhaus, Robert, House	6900 Rio Grande Blvd., NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Our Lady of Mt. Carmel Church	7813 Edith Blvd., NE	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Romero, Felipe, House	7522 Edith Blvd., NE	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Shalit, Samuel, House	5209 4th St., NW	Albuquerque	2/9/1984	Albuquerque North Valley MRA
Bernalillo	Zeiger, Charles, House	3200 Edith Blvd., NE	Albuquerque	4/27/1984	Albuquerque North Valley MRA
Bernalillo	Los Poblanos Historic District	NM 194	Los Ranchos	5/27/1982	Albuquerque North Valley MRA
Bernalillo	Barelas--South Fourth Street Historic District	4th St. from Stover Ave. to Bridge St.	Albuquerque	7/24/1997	Auto-oriented Commercial Development in Albuquerque MPS

County	Resource Name	Address	City	Listed	Multiple
Bernalillo	Hendren Building	3001 Monte Vista Blvd. NE	Albuquerque	1/27/2000	Auto-oriented Commercial Development in Albuquerque MPS
Bernalillo	Huning Highlands Conoco Service Station	601 Coal Ave. SE	Albuquerque	7/19/2006	Auto-oriented Commercial Development in Albuquerque MPS
Bernalillo	Southern Union Gas Company Building	723 Silver Ave. SW	Albuquerque	3/31/2004	Buildings Designed by John Gaw Meem MPS
Bernalillo	Rio Puerco Bridge	I-40 over the Rio Puerco	Albuquerque	7/15/1997	Historic Highway Bridges of New Mexico MPS
Bernalillo	Newlander Apartments	616 Coal Ave.	Albuquerque	1/27/2000	Multi-unit Dwellings in Albuquerque, New Mexico MPS
Bernalillo	Willis, J.R., House and La Miradora Apartments	310 Rio Grande Blvd., SE	Albuquerque	9/1/2005	Multi-unit Dwellings in Albuquerque, New Mexico MPS
Bernalillo	Coronado School	601 4th St., SW	Albuquerque	11/22/1996	New Deal in New Mexico MPS
Bernalillo	Roosevelt Park	Jct. of Coal and Spruce Aves., SE	Albuquerque	11/22/1996	New Deal in New Mexico MPS
Bernalillo	West San Jose School	1701 4th St., SW	Albuquerque	11/22/1996	New Deal in New Mexico MPS
Bernalillo	Art Annex	NE corner of Central Ave. and Terrace St., UNM	Albuquerque	9/22/1988	New Mexico Campus Buildings Built 1906--1937 TR
Bernalillo	Carlisle Gymnasium	UNM campus W of Yale Blvd.	Albuquerque	9/22/1988	New Mexico Campus Buildings Built 1906--1937 TR
Bernalillo	Estufa	SE corner of University Blvd. and Grand Ave., UNM	Albuquerque	9/22/1988	New Mexico Campus Buildings Built 1906--1937 TR
Bernalillo	President's House	NE corner of Roma Ave. and Yale Blvd., UNM	Albuquerque	9/22/1988	New Mexico Campus Buildings Built 1906--1937 TR

County	Resource Name	Address	City	Listed	Multiple
Bernalillo	Raynolds, Sara, Hall	UNM campus on Terrace St. north of Central Ave.	Albuquerque	9/22/1988	New Mexico Campus Buildings Built 1906--1937 TR
Bernalillo	Scholes Hall	UNM campus S of Roma Ave.	Albuquerque	9/22/1988	New Mexico Campus Buildings Built 1906--1937 TR
Bernalillo	San Antonio Church and Cemetery	Jct. of NM 14 and NM 536, NW corner	San Antonito	1/16/1997	Religious Properties of New Mexico MPS
Bernalillo	Aztec Auto Court	3821 Central Ave. NE.	Albuquerque	11/22/1993	Route 66 through New Mexico MPS
Bernalillo	Cottage Bakery	2000 Central Ave. SE.	Albuquerque	11/22/1993	Route 66 through New Mexico MPS
Bernalillo	De Anza Motor Lodge	4301 Central Ave. NE	Albuquerque	4/30/2004	Route 66 through New Mexico MPS
Bernalillo	El Campo Tourist Courts	5800 Central Ave. SW	Albuquerque	1/13/1994	Route 66 through New Mexico MPS
Bernalillo	El Vado Auto Court	2500 Central Ave. SW.	Albuquerque	11/22/1993	Route 66 through New Mexico MPS
Bernalillo	Enchanted Mesa Trading Post	9612 Central Ave. SE.	Albuquerque	1/9/1998	Route 66 through New Mexico MPS
Bernalillo	Hilltop Lodge	5410 Central Ave. SW.	Albuquerque	1/9/1998	Route 66 through New Mexico MPS
Bernalillo	Jones Motor Company	3226 Central Ave. SE.	Albuquerque	11/22/1993	Route 66 through New Mexico MPS
Bernalillo	La Mesa Motel	7407 Central Ave. NE.	Albuquerque	11/22/1993	Route 66 through New Mexico MPS
Bernalillo	La Puerta Lodge	9710 Central Ave. SE.	Albuquerque	1/9/1998	Route 66 through New Mexico MPS
Bernalillo	Luna Lodge	9019 Central Ave. NE	Albuquerque	6/11/1998	Route 66 through New Mexico MPS

County	Resource Name	Address	City	Listed	Multiple
Bernalillo	Maisel's Indian Trading Post	510 Central Ave. SW.	Albuquerque	11/22/1993	Route 66 through New Mexico MPS
Bernalillo	Modern Auto Court	3712 Central Ave. SE.	Albuquerque	11/22/1993	Route 66 through New Mexico MPS
Bernalillo	New Mexico Madonna of the Trail	Jct. of Marble Ave. and 4th St.	Albuquerque	3/21/2006	Route 66 through New Mexico MPS
Bernalillo	Pig 'n Calf Lunch	2106 Central Ave. SE.	Albuquerque	2/15/1994	Route 66 through New Mexico MPS
Bernalillo	Route 66, State maintained from Albuquerque to Rio Puerco	Rte. 66. West Central exit at I-40 to the Rio Puerco Bridge	Albuquerque	11/19/1997	Route 66 through New Mexico MPS
Bernalillo	Tewa Lodge	5715 Central Ave. NE	Albuquerque	6/11/1998	Route 66 through New Mexico MPS
Bernalillo	Tower Courts	2210 Central Ave. SW.	Albuquerque	11/22/1993	Route 66 through New Mexico MPS
Bernalillo	Aldo Leopold Neighborhood Historic District	105-135 Fourteenth St., SW	Albuquerque	10/16/2002	Twentieth Century Suburban Growth of Albuquerque MPS
Bernalillo	Manzano Court Addition Historic District	1000-1025 Manzano Court NW	Albuquerque	10/14/2004	Twentieth Century Suburban Growth of Albuquerque MPS
Bernalillo	Monte Vista and College View Historic District	Roughly bounded by Girard and Lomas Blvds, Morningside Dr., Copper Ave., Campus and Monte Vista Blvds.	Albuquerque	8/3/2001	Twentieth Century Suburban Growth of Albuquerque MPS
Bernalillo	Monte Vista Fire Station	3201 Centra Ave. NE	Albuqerque	3/19/1987	

County	Resource Name	Address	City	Listed	Multiple
Bernalillo	Albuquerque Municipal Airport Building, Old	2920 Yale Blvd. SE.	Albuquerque	5/5/1989	
Bernalillo	Albuquerque Veterans Administration Medical Center	2100 Ridgecrest, SE	Albuquerque	8/19/1983	
Bernalillo	Armijo, Salvador, House	618 Rio Grande Blvd., NW	Albuquerque	10/8/1976	
Bernalillo	ATSF Locomotive No. 2926	1600 Twelfth St. NW	Albuquerque	10/1/2007	
Bernalillo	Bottger, Charles A., House	110 San Felipe, NW	Albuquerque	3/7/1983	
Bernalillo	Building at 701 Roma NW	701 Roma, NW	Albuquerque	2/28/1985	
Bernalillo	Castle Apartments	1410 Central SW	Albuquerque	2/13/1986	
Bernalillo	Davis House	704 Parkland Circle, SE	Albuquerque	11/17/1980	
Bernalillo	Eller Apartments	113-127 8th St., SW	Albuquerque	1/12/1984	
Bernalillo	Employees' New Dormitory and Club	Albuquerque Indian School Campus	Albuquerque	7/26/1982	
Bernalillo	Federal Building	421 Gold Ave., SW	Albuquerque	11/22/1980	
Bernalillo	First Methodist Episcopal Church	3rd St. and Lead Ave.	Albuquerque	11/7/1976	
Bernalillo	First National Bank Building	217-233 Central Ave., NW	Albuquerque	2/2/1979	
Bernalillo	Gladding, James N., House	643 Cedar St., NE	Albuquerque	11/17/1980	
Bernalillo	Hope Building	220 Gold St., SW	Albuquerque	8/29/1980	

County	Resource Name	Address	City	Listed	Multiple
Bernalillo	Hudson House	817 Gold Ave., SW	Albuquerque	2/24/1982	
Bernalillo	Huning Highlands Historic District	Bounded by Grand Ave., I-25, Iron Ave. and AT & SF RR	Albuquerque	11/17/1978	
Bernalillo	Jonson Gallery and House	1909 Las Lomas Rd. NE	Albuquerque	2/22/2002	
Bernalillo	Kimo Theater	421 Central Ave.	Albuquerque	5/2/1977	
Bernalillo	Kress, S. H., Building	414--416 Central Ave., SW	Albuquerque	4/19/1984	
Bernalillo	Las Imagines Archeological District--Albuquerque West Mesa Escarpment	Address Restricted	Albuquerque	11/19/1986	
Bernalillo	Lembke House	312 Laguna St., SW	Albuquerque	11/25/1980	
Bernalillo	Leverett, William J., House	301 Dartmouth NE	Albuquerque	2/13/1986	
Bernalillo	Lewis, Charles W. Building	1405--1407 2nd St., SW	Albuquerque	7/3/1979	
Bernalillo	McCanna-Hubbell Building	418--424 Central, SW	Albuquerque	5/13/1982	
Bernalillo	Milne, John, House	804 Park Ave. SW	Albuquerque	2/13/1986	
Bernalillo	Monte Vista School	3211 Monte Vista Blvd., NE	Albuquerque	8/12/1981	
Bernalillo	National Humane Alliance Animal Fountain	615 Virginia Ave. SE	Albuquerque	9/30/1986	
Bernalillo	New Mexico-Arizona Wool Warehouse	520 1st St., NW	Albuquerque	7/23/1981	

County	Resource Name	Address	City	Listed	Multiple
Bernalillo	Nob Hill Business District	3500 Central Ave. SE	Albuquerque	3/18/1994	
Bernalillo	Occidental Life Building	119 3rd Ave., SW	Albuquerque	1/30/1978	
Bernalillo	Old Armijo School	1021 Isleta Blvd., SE	Albuquerque	9/16/1982	
Bernalillo	Old Hilton Hotel	125 2nd St., NW	Albuquerque	3/2/1984	
Bernalillo	Old Post Office	123 4th St.	Albuquerque	11/17/1980	
Bernalillo	O'Rielly, J. H., House	220 9th St., NW	Albuquerque	1/29/1979	
Bernalillo	Our Lady of the Angels School	320 Romero St., NW	Albuquerque	11/29/1984	
Bernalillo	Pacific Desk Building	213-215 Gold Ave., SW	Albuquerque	9/30/1980	
Bernalillo	Pearce, John, House	718 Central Ave., SW	Albuquerque	11/22/1980	
Bernalillo	Petroglyph National Monument	6001 Unser Blvd. NW	Albuquerque	6/27/1990	
Bernalillo	Piedras Marcadas Pueblo (LA 290)	Address Restricted	Albuquerque	3/2/1990	
Bernalillo	Pyle, Ernie, House	900 Girard Blvd., SE	Albuquerque	9/22/1997	
Bernalillo	Rancho de Carnue Site	Address Restricted	Albuquerque	5/4/1977	
Bernalillo	Rosenwald Building	320 Central Ave., SW	Albuquerque	6/29/1978	
Bernalillo	Saint Joseph 1930 Hospital	715 Grand, NE	Albuquerque	5/27/1982	
Bernalillo	San Felipe de Neri Church	Old Town Plaza, NW	Albuquerque	10/1/1969	
Bernalillo	San Ignacio Church	1300 Walter St., NE	Albuquerque	8/21/1979	
Bernalillo	Santa Barbara School	1420 Edith Blvd., NE.	Albuquerque	9/28/1989	
Bernalillo	Second United Presbyterian Church	812 Edith Blvd., NE	Albuquerque	12/6/1984	

County	Resource Name	Address	City	Listed	Multiple
Bernalillo	Shoup Boardinghouse	707 1st St., SW	Albuquerque	2/17/1983	
Bernalillo	Silver Hill Historic District	Roughly bounded by Central Ave., Yale Blvd., Lead Ave., and Sycamore St.	Albuquerque	9/18/1986	
Bernalillo	Simms Building	400 Gold Ave. SW	Albuquerque	2/2/1998	
Bernalillo	Skinner Building	722--724 Central Ave. and 108 8th St., SW	Albuquerque	11/22/1980	
Bernalillo	Solar Building	213 Truman St., NE.	Albuquerque	10/10/1989	
Bernalillo	Southwestern Brewery and Ice Company	601 Commercial St., NE	Albuquerque	3/30/1978	
Bernalillo	Springer Building	121 Tijeras Ave., NE	Albuquerque	11/18/1980	
Bernalillo	Spruce Park Historic District	Roughly bounded by University Blvd., Grand Ave., Las Lomas Rd. and Cedar St.	Albuquerque	7/6/1982	
Bernalillo	Superintendent's House, Atlantic & Pacific Railroad	1023 S. 2nd St.	Albuquerque	1/20/1978	
Bernalillo	Vigil, Antonio, House	413 Romero St.	Albuquerque	5/5/1978	
Bernalillo	Washington Apartments	1002--1008 Central Ave., SW	Albuquerque	2/19/1982	
Bernalillo	Werner-Gilchrist House	202 Cornell, SE	Albuquerque	8/2/1982	
Bernalillo	Hodgin Hall	University of New Mexico campus	Albuquerque Mountain	1/30/1978	
Bernalillo	Isleta Pueblo	U.S. 85	Isleta	9/5/1975	
Bernalillo	Holy Child Church	Off I-40	Tijeras	3/8/1978	

County	Resource Name	Address	City	Listed	Multiple
Bernalillo	Tijeras Pueblo Archeological Site	Address Restricted	Tijeras	11/17/2005	
Cibola	Bowlin's Old Crater Trading Post	7650 Frontage Rd.	Bluewater	3/21/2006	Route 66 through New Mexico MPS
Cibola	Route 66, State maintained from Milan to Continental Divid	Along Rte. 66, W of Milan to Continental Divide	Continental Divide	11/19/1997	Route 66 through New Mexico MPS
Cibola	Route 66 Rural Historic District: Laguna to McCarty's	NM 124 between the I-40 interchanges	Cubero	1/13/1994	Route 66 through New Mexico MPS
Cibola	Route 66, State Maintained from McCartys to Grants	Rte 66, from E of McCartys to E of Grants	Grants	11/19/1997	Route 66 through New Mexico MPS
Cibola	Candelaria Pueblo	Address Restricted	Grants	3/10/1983	
McKinley	Fort Wingate Archeological Site	Address Restricted	Fort Wingate	10/10/1980	Anasazi Sites Within the Chacoan Interaction Sphere TR
McKinley	Peggy's Pueblo	Address Restricted	Zuni	8/16/1994	Anasazi Sites Within the Chacoan Interaction Sphere TR
McKinley	McKinley County Courthouse	205--209 W. Hill St.	Gallup	2/15/1989	County Courthouses of New Mexico TR
McKinley	Chief Theater	228 W. Coal Ave.	Gallup	5/16/1988	Downtown Gallup MRA
McKinley	Cotton, C. N., Warehouse	101 N. Third St.	Gallup	1/14/1988	Downtown Gallup MRA
McKinley	Drake Hotel	216 E. Sixty-sixth Ave.	Gallup	1/14/1988	Downtown Gallup MRA
McKinley	El Morro Theater	205--209 W. Coal Ave.	Gallup	5/16/1988	Downtown Gallup MRA
McKinley	El Rancho Hotel	100 E. Sixty-sixth Ave.	Gallup	1/14/1988	Downtown Gallup MRA
McKinley	Grand Hotel	306 W. Coal Ave.	Gallup	5/25/1988	Downtown Gallup MRA

County	Resource Name	Address	City	Listed	Multiple
McKinley	Harvey Hotel	408 W. Coal Ave.	Gallup	5/25/1988	Downtown Gallup MRA
McKinley	Lebanon Lodge No. 22	106 W. Aztec	Gallup	2/14/1989	Downtown Gallup MRA
McKinley	Palace Hotel	236 W. Sixty-sixth Ave.	Gallup	5/16/1988	Downtown Gallup MRA
McKinley	Rex Hotel	300 W. Sixty-sixth	Gallup	1/14/1988	Downtown Gallup MRA
McKinley	US Post Office	201 S. First St.	Gallup	5/25/1988	Downtown Gallup MRA
McKinley	White Cafe	100 W. Sixth-sixth Ave.	Gallup	1/14/1988	Downtown Gallup MRA
McKinley	Redwood Lodge	907 E. 66 Ave.	Gallup	2/13/1998	Route 66 through New Mexico MPS
McKinley	State Maintained Route 66--Manuelito to the Arizona Border	W side of the Manuelito grade separation SW to AZ border	Mentmore	11/22/1993	Route 66 through New Mexico MPS
McKinley	Route 66, State maintained from Iyanbito to Rehobeth	Rte. 66, from Iyanbito Interchange at I-40 to State Police Stn. Rehobeth	Rehobeth	11/19/1997	Route 66 through New Mexico MPS
McKinley	Herman's, Roy T., Garage and Service Station	NM 122, 150 yds. W of I-40 exit	Thoreau	11/22/1993	Route 66 through New Mexico MPS
McKinley	Cousins Bros. Trading Post	768 A-D Cousins Rd.	Chi Chil Tah	3/22/2006	
McKinley	Fort Wingate Historic District	NM 400	Fort Wingate	5/26/1978	
McKinley	Southwestern Range and Sheep Breeding Laboratory Historic District	Fort Wingate Work Center, Cibola National Forest	Fort Wingate	5/30/2003	
McKinley	Halona Pueblo	Zuni	Gallup	2/10/1975	
McKinley	Ashcroft--Merrill Historic District	Jct. of Bloomfield and McNeil Sts.	Ramah	7/27/1990	

County	Resource Name	Address	City	Listed	Multiple
McKinley	Vogt, Evon Zartman, Ranch House	1 mi. S of Ramah, 500 ft. E of NM 53	Ramah	2/4/1993	
Sandoval	Archeological Site No. AR-03-10-03-620	Address Restricted	Jemez Springs	4/19/1990	Jemez Cultural Developments in North-Central New Mexico MPS
Sandoval	Borrego Mesa Agricultural Site	Address Restricted	Jemez Springs	4/19/1990	Jemez Cultural Developments in North-Central New Mexico MPS
Sandoval	Jemez Cave	Address Restricted	Jemez Springs	4/19/1990	Jemez Cultural Developments in North-Central New Mexico MPS
Sandoval	Virgin Mesa Rock Art Site	Address Restricted	Jemez Springs	4/19/1990	Jemez Cultural Developments in North-Central New Mexico MPS
Sandoval	Amoxiumqua Site (FS-530, LA481)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Archeological Site FS-18, LA-5920	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Archeological Site FS-199, LA-135	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Archeological Site FS-3	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Archeological Site FS-535, LA-385	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Archeological Site FS-554, LA-386	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Archeological Site FS-574	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Archeological Site FS-575	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Archeological Site FS-580, LA-137	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR

County	Resource Name	Address	City	Listed	Multiple
Sandoval	Archeological Site FS-647, LA-128	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Archeological Site FS-688	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Archeological Site FS-689, LA-403	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Archeological Site FS-8	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Astialakwa Archeological District (FS-360, LA-1825)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Boletsakwa Site (FS-2, LA-136)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Forset Service Archeological Site No. FS-7	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Guacamayo Site (FS0572, LA-189)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Hanakwa Site (FS-578)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Hot Springs Pueblo (FS-505, Bj-73)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Kiashita Site	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Kiatsukwa Site (FS-31 and 504, LA-132 and 133)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Kwastiyukwa Site (FS-11, LA-482)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR

County	Resource Name	Address	City	Listed	Multiple
Sandoval	Nanishagi Site (FS-320, LA-541)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Patokwa Site (FS-5, LA-96)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Pejunkwa Site (FS-571, LA-130)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Tostaskwinu Site (FS-579, LA-479)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Tovakwa Site	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Unshagi Site (FS-337, LA-123)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Wabakwa Site (FS-400, LA-478)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Wahajhamka (FS-573)	Address Restricted	Jemez Springs	5/21/1984	Jemez Springs Pueblo Sites TR
Sandoval	Roosevelt School	Calle Malinche	Bernalillo	3/15/1996	New Deal in New Mexico MPS
Sandoval	Holiday Mesa Logging Camp	Address Restricted	Jemez Springs	9/11/1992	Railroad Logging Era Resources of the Canon de San Diego Land Grant in North--Central New Mexico MPS
Sandoval	Virgin Canyon Logging Camp No. 1	Address Restricted	Jemez Springs	9/11/1992	Railroad Logging Era Resources of the Canon de San Diego Land Grant in North--Central New Mexico MPS
Sandoval	Virgin Mesa Logging Camp No. 1	Address Restricted	Jemez Springs	9/11/1992	Railroad Logging Era Resources of the Canon de San Diego Land Grant in North--Central New Mexico MPS

County	Resource Name	Address	City	Listed	Multiple
Sandoval	Virgin Mesa Logging Camp No. 2	Address Restricted	Jemez Springs	9/11/1992	Railroad Logging Era Resources of the Canon de San Diego Land Grant in North--Central New Mexico MPS
Sandoval	Virgin Mesa Logging Camp No. 3	Address Restricted	Jemez Springs	9/11/1992	Railroad Logging Era Resources of the Canon de San Diego Land Grant in North--Central New Mexico MPS
Sandoval	Santo Domingo Indian Trading Post	Rt. 66 crossing of AT&SF RR tracks at Domingo	Domingo	1/9/1998	Route 66 through New Mexico MPS
Sandoval	Pueblo of Santo Domingo (Kiua)	35 mi. NE of Albuquerque, off I-25	Albuquerque	12/12/1973	
Sandoval	Abenicio Salazar Historic District	U.S. 85	Bernalillo	6/6/1980	
Sandoval	Jemez Pueblo	28 mi. N of Bernalillo on NM 4	Bernalillo	5/2/1977	
Sandoval	Kuaua Ruin	Address Restricted	Bernalillo	1/1/1976	
Sandoval	Our Lady of Sorrows Church	U.S. 85	Bernalillo	4/29/1977	
Sandoval	Sandia Cave	Address Restricted	Bernalillo	10/15/1966	
Sandoval	Tamaya	N of Bernalillo	Bernalillo	11/1/1974	
Sandoval	Zia Pueblo	18 mi. W of Bernalillo on NM 44	Bernalillo	4/3/1973	
Sandoval	Espinaso Ridge Pueblo	Address Restricted	Budagher's	1/27/1984	
Sandoval	Pueblo Tuerto	Address Restricted	Budagher's	1/19/1984	
Sandoval	Big Bead Mesa	Address Restricted	Casa Salazar	10/15/1966	
Sandoval	San Ysidro Church	Church Rd.	Corrales	7/30/1980	

County	Resource Name	Address	City	Listed	Multiple
Sandoval	San Juan Mesa Ruin	Address Restricted	Jemez Spring	7/9/1970	
Sandoval	Jemez State Monument	NM 4	Jemez Springs	3/14/1973	
Sandoval	Bandelier National Monument	12 mi. S of Los Alamos on NM 4	Los Alamos	10/15/1966	
Sandoval	San Jose de las Huertas	Address Restricted	Placitas	7/5/1990	
Sandoval	Cochiti Pueblo	27 mi. SW of Santa Fe on the Rio Grande	Santa Fe	11/20/1974	
Sandoval	Tonque Pueblo	Address Restricted	Tejon Grant	1/12/1984	
Torrance	Evans, Greene, Garage	Jct. of Broadway and Rt. 66, NW corner	Moriarty	11/22/1993	Route 66 through New Mexico MPS
Torrance	Abo	3 mi. W of Abo on U.S. 60	Abo	10/15/1966	
Torrance	Moriarty Eclipse Windmill	2 (3.2 km) W of Moriarty off NM 222	Moriarty	6/4/1979	
Torrance	Mountainair Municipal Auditorium	SW corner of Roosevelt Ave. and Beal St.	Mountainair	4/30/1987	
Torrance	Rancho Bonito	S of Mountainair on Gran Quivera Rd.	Mountainair	11/29/1978	
Torrance	Shaffer Hotel	Broadway St.	Mountainair	11/15/1978	
Torrance	Quarai	1 mi. S of Punta de Agua	Punta de Agua	10/15/1966	
Valencia	San Mateo Archeological Site	Address Restricted	San Mateo	5/17/1979	Anasazi Sites Within the Chacoan Interaction Sphere TR (AD)
Valencia	Otero's 66 Service	100 Main St.	Los Lunas	2/13/2003	Route 66 through New Mexico MPS
Valencia	San Estevan del Rey Mission Church	On NM 23	Acoma	4/15/1970	

County	Resource Name	Address	City	Listed	Multiple
Valencia	Baca, Miguel E., House	NM 47	Adelino	12/11/1978	
Valencia	Laguna Pueblo	45 mi. W of Albuquerque off U.S. 66	Albuquerque	6/19/1973	
Valencia	Belen Hotel	200 Becker Ave.	Belen	11/12/1980	
Valencia	Chaves, Felipe, House	325 Lala St.	Belen	7/4/1980	
Valencia	Harvey, Belen, House	104 N. 1st St.	Belen	10/28/1983	
Valencia	Acoma	13 mi. S of Casa Blanca on NM 23	Casa Blanca	10/15/1966	
Valencia	El Morro National Monument	2 mi. W of El Morro Via NM 53	El Morro	10/15/1966	
Valencia	Village of Encinal Day School	NW of Encinal	Encinal	8/8/1980	
Valencia	San Jose de la Laguna Mission and Convento	Address unknown at this time	Laguna Pueblo	1/29/1973	
Valencia	Atchison, Topeka, and Santa Fe Railroad Depot	U.S. 85	Los Lunas	8/1/1979	
Valencia	Luna, Tranquilino, House	SW of Los Lunas at jct. of U.S. 85 and NM 6	Los Lunas	4/16/1975	
Valencia	Wittwer, Dr. William Frederick, House	NM 6, W of US 85	Los Lunas	2/27/1987	
Valencia	El Cerro Tome Site	.5 mi. E of jct. of NM 47 and Tome Hill Rd.	Tome	7/9/1996	
Valencia	Los Ojuelos (The Springs)	Address Restricted	Tome	12/10/1987	
Valencia	Tome Jail	Tome Plaza	Tome	10/5/1977	

County	Resource Name	Address	City	Listed	Multiple
Valencia	Hawikuh	12 mi. SW of Zuni, Zuni Indian Reservation	Zuni	10/15/1966	
Valencia	Zuni-Cibola Complex	Address Restricted	Zuni	12/2/1974	

B DESCRIPTION OF GRAZING ALLOTMENTS BY ACREAGE AND AUMS

Table B.1: Acres and AUMs of Grazing Allotments

Allotment No.	Allotment Name	Public Acres	Private Acres	State Acres	Tribal Acres	Permitted Public AUMs
1	Continental Divide	7,530	1,101	-	-	1,121
2	Shroyer Community	4,605	280	-	-	744
3	Pelon Community	7,513	-	-	162	1,053
4	Starr Community	12,734	1,736	1,622	-	1,511
5	Dry Springs	6,413	1,277	-	-	573
6	Tres Hermanos	3,487	560	-	-	657
7	Chiuilla Community	9,284	1,599	-	-	1,827
8	Ojo De Los Pinos	5,875	641	-	-	558
9	Horn Arroyo	4,741	-	-	-	552
10	Brandy	22,983	2,913	2,485	-	2,835
11	Dos Valles	20,319	4,182	758	-	3,142
12	Lagunitas Community	1,074	1,737	-	-	103
14	Nacimiento Community	1,442	1,289	-	-	229
15	Valle San Isidro	1,837	160	-	-	296
16	Fork Rock Mesa	798	1,595	-	-	106
17	Mesa Portales	1,929	884	-	-	327
18	Forty Four	2,400	2,272	62	-	312
19	Senorito Community	669	271	-	-	124
20	San Pablo Comm	917	496	-	-	93
23	Eagle Mesa	12,424	3,239	-	-	1,643
24	Ridge Top	1,367	630	-	-	133
26	Los Pinos Arroyo	1,721	3,066	-	-	174
27	Dry Well	2,442	120	-	-	423
28	Piedra Lumbre Community	4,867	2,580	640	-	645
29	Coal Creek	5,034	1,690	572	-	483
31	Canada Candelaria	3,689	1,556	-	-	616
32	Cerro Colorados	8,293	8,003	2,472	-	1,284
33	Cebo Community	7,192	664	-	-	1,140
34	Twin Butte	7,846	644	571	10	1,436
35	Torreon Wash	4,813	1,436	1,890	188	691
36	Arroyo Empedrado	6,149	1,118	659	-	876
37	North San Luis Mesa Community	2,250	-	-	-	264
38	San Luis Community	5,230	-	-	-	904
39	Cachulie	9,546	65	-	-	1,596
40	Lost Valley Community	11,635	52	745	-	2,366
41	Cerro Cuate	2,539	623	682	-	409
42	Azabache	12,224	2,306	788	336	1,722

Allotment No.	Allotment Name	Public Acres	Private Acres	State Acres	Tribal Acres	Permitted Public AUMs
43	Chico Crossing Community	13,319	1,597	645	-	1,889
44	Cabezon Peak Community	4,090	781	103	-	573
45	Arroyo Alamito	3,989	-	-	-	783
46	San Ysidro Pasture Community	5,518	-	-	-	852
47	Guadalupe	6,458	1,456	1,921	-	580
48	Mesa Cortada	11,549	476	-	-	1,436
49	El Banquito	15,063	-	-	-	1,656
50	Ignacio Chavez Grant Community	17,696	77	-	-	1,812
50	Cerro Tinaja Community	1,312	950	-	-	241
51	Cerro Salado	10,789	333	300	-	1,176
53	Canon Del Camino	5,106	104	-	-	788
55	Corrales Tierra	570	-	-	-	120
56	Pipeline	8,863	-	493	-	1,233
57	Cucho Arroyo	6,376	645	147	-	683
58	Mighty Mite	1,114	-	-	-	125
59	Rio Salado	1,175	351	-	326	216
60	Rock House Community	9,008	755	1,598	3,174	776
61	Wilson Canyon	1,441	275	610	-	240
62	Casa Salazar	1,551	161	-	-	192
63	Tapia Arroyo	1,571	549	483	-	160
64	San Ysidro Community	4,449	40	-	-	227
65	Long Ridge	2,415	747	631	-	307
67	Sanchez (3)	480	-	617	-	47
68	South Divide Community	2,477	616	-	-	368
69	Middle San Luis	872	633	1,068	-	84
70	South San Luis	916	308	-	-	108
71	Agua Bonita	1,538	330	1,471	-	297
72	Jones Canyon Community	5,013	616	517	-	573
73	Pozo Seco	1,893	329	608	-	204
74	Valdez #3	7,007	-	-	-	1,380
75	Valle (Chamisa)	2,857	640	-	-	444
76	Salty Flats	538	149	-	-	65
78	Bernalillito	1,652	1,318	-	-	191
110	Armijo	2,780	148	1,117	1,817	416
111	Canada Alamos	4,295	3,512	-	201	660
112	Pino Spring	2,285	1,178	-	-	422
113	Cocina Allotment	4,579	2,122	1,551	-	792
114	Daniel Gonzales	829	2,523	44	25	111
116	Canada Del Ojo	6,288	624	586	57	738
118	Ortiz Mountain	5,301	1,395	-	-	536
120	Tejon	62	-	-	-	12
122	Tent Rocks	2,083	192	-	-	157

Allotment No.	Allotment Name	Public Acres	Private Acres	State Acres	Tribal Acres	Permitted Public AUMs
123	Peralta	2,659	565	-	-	159
142	Cerro Cochino	158	681	-	-	24
156	Spear M Ranch	2,899	486	641	-	331
201	Cerritos De Jaspe	8,826	2,003	-	-	1,499
202	Brights Well	298	315	-	-	48
203	El Malpais	135,150	44,921	3,275	-	16,908
204	Raney Allotment	1,915	618	-	-	303
205	Los Pilares	13,341	117	-	7,948	1,521
206	Little Hole In Wall	318	316	-	-	36
207	Cerro Brillante	21,946	1,150	-	-	3,573
208	Loma Montosa	7,537	11,131	-	-	949
209	Techado Mesa	34,172	1,064	-	-	4,654
210	Los Cerros	41,158	3,475	-	-	7,755
211	Ventana Ridge	2,671	427	642	7,803	204
212	Mesa Carrizo	15,596	25,567	5,365	661	2,133
214	Cold Canyon	728	692	-	-	84
215	Cerro Verde	27,199	2,059	3,467	-	3,091
216	Cerro Del Oro	20,005	21,070	5,409	202	3,018
217	Hidden Mountain	318	2,514	305	-	24
218	Arroyo Colorado	46,275	1,542	11,170	13,559	5,549
219	Harrington	13,129	286	3,978	21,068	1,365
220	Tsidu-Weza	315	310	-	-	81
221	Petoch Wash	5,033	2,812	-	-	669
222	Chical	1,631	788	-	16,446	180
225	Mystery Mountain	145	-	-	-	12
226	Arrossa Individual	645	-	-	-	72
228	Chavez Draw	77	4,554	391	-	12
229	Espinoso	96	468	-	-	12
230	Rim Rock	1,517	635	-	-	99
231	Marmon Ranch	1,289	166	647	-	151
330	Manuel Lopez	898	-	-	-	72
331	Driggers	268	634	-	-	60
332	R. Lovato	286	160	-	-	60
333	R. Taylor	376	663	-	-	54
334	W.A. Muller	-	399	-	-	24
335	Archuleta Bros.	109	150	-	-	12
337	Antonio Duran	48	155	-	-	14
338	Zuni Canyon	906	2,901	627	-	83
340	Aparcio Gurule	71	157	-	-	24
341	Lovato A	59	321	-	-	24
342	Juan Baca	78	123	-	-	24
343	Black Bear	48	47	-	-	12

Allotment No.	Allotment Name	Public Acres	Private Acres	State Acres	Tribal Acres	Permitted Public AUMs
344	A Gurule	58	118	-	-	24
345	Herrera	152	567	-	-	36
347	Rito De Los Pinos	41	229	-	-	12
348	Leonard Casaus	33	6	-	-	12
349	La Jara Creek	37	167	-	-	12
357	My Buddy	34	74	-	-	12
370	Sanchez (15)	1,539	-	-	-	228
371	Esteban Herrera	479	3,178	3,913	-	72
373	King Brothers Ranch	325	-	-	-	36
375	Cuba Mesa	36	218	-	-	12
425	T A	1,182	4,625	1,173	-	272
426	E V A	1,882	260	-	-	133
427	Ojo Hallado	8,525	2,107	6,006	-	1,590
428	Tailings Pond	1,477	6,928	638	-	306
429	Reynold Draw	638	612	-	-	108
430	Hondo Canyon	2,805	4,526	1,245	-	396
431	M.B.S.	2,641	2,122	487	1,593	384
432	San Mateo	1,532	5,904	-	-	312
433	Rest Stop	167	-	-	-	24
435	E J O	146	70	-	-	12
436	Montano	1,477	846	6,231	-	288
437	V M	452	933	-	-	24
438	Monument Lake	3,200	5,332	-	-	472
440	Mcbride Trust	192	55	-	626	11
442	West Grants Ridge	295	-	-	-	60
443	G R G	2,684	6,568	925	-	492
444	Trujillo Draw	1,820	1,301	3,429	-	324
445	E R I	899	1,955	-	-	156
446	E C	340	1,261	-	-	60
447	Cordova Ranch	815	-	-	-	1,896
448	Four Daughters	4,789	16,551	1,605	-	312
450	Blackjack Arroyo	407	173	-	-	60
457	Palomas	624	-	-	-	89
552	Los Tanos	1,666	160	-	-	321
727	Abrahames Lease	40	3,927	565	-	12
737	Ault Lease	3,835	-	-	-	720
739	Tabet Draw	78	2,246	629	-	12
749	Rutledge Lease	800	3,197	160	-	144
754	Berkshire Green	320	802	-	-	60
755	Mountainair Lease	81	658	-	-	12
762	Abo Lease	278	199	-	-	84
793	Fulfer Lease	169	633	-	-	48

Allotment No.	Allotment Name	Public Acres	Private Acres	State Acres	Tribal Acres	Permitted Public AUMs
796	Gallegos E. Lease	1,096	1,223	771	-	180
824	S H /	961	1,461	-	-	180
825	Nabay Hindi & Sons	2,296	9,095	-	-	576
849	Luna Lease	798	-	-	-	144
868	Moe Lease	319	825	507	-	36
871	M Montano Lease	297	53	-	-	36
878	L R Nix Lease	80	554	-	-	24
885	C.A. Pohl Lease	139	1,356	-	-	24
924	Wessely Lease	29	159	-	-	10
925	Stevens Lease	230	3,222	23	-	59
927	F.Torres	78	691	-	-	12
948	Arroyo Chinchonte	32	564	-	-	12
971	Lomos Altos	591	-	-	-	36
972	Las Huertas Creek	2,525	817	-	150	386
6006	Marquez	3,285	7,355	-	-	504
6019	Tanner Lease	626	1,375	-	-	96
6025	D. P. Elkins	326	6,560	1,445	813	48
6026	D. J. Elkins	157	-	-	-	24
6027	L. E. Elkins	2,350	7,792	627	2,381	360
6032	Grieve-Chaco	318	6,582	673	16	36
6035	Navajo Tribe Hospah	1,098	1,325	628	2,043	120
6036	Tom	1,055	-	241	316	144
6047	Wilson	206	-	-	-	36
6052	Tanner-Chaco	156	-	157	-	12
6053	Smouse Lease	592	787	-	-	108
6055	Divide	2,040	23,276	4,676	1,534	312
6062	Andrews	282	259	-	-	48
6063	Escondida Ranch	681	682	-	-	156
6064	D Berryhill	1,824	6,916	2,544	1,803	276
6065	Ambrosia Lake	3,482	7,652	639	232	564
6066	Roundy	253	16	-	-	36
6069	Cowboy	200	-	-	155	24
6070	Mccauley	761	-	-	330	96
6071	Turpen	337	6,518	-	-	35
6072	Bass	298	3,808	631	-	84
6073	Ford	631	854	-	-	96
6075	Navarre	158	3,765	-	-	24
6078	Elkins	849	4,970	-	801	288
6079	Mesa Montanosa 24	796	2,509	1,906	-	108
6081	Se Ambrosia Lake	1,527	9,665	1,243	-	276
6082	Fernandez Company	3,639	129,465	13,154	171	847
6084	Pena	6,262	13,808	2,528	-	1,200

Allotment No.	Allotment Name	Public Acres	Private Acres	State Acres	Tribal Acres	Permitted Public AUMs
6085	Mesa Montanosa 30	923	1,565	-	-	168
6086	Section 22	270	2,126	-	-	36
6092	Clawson	339	2,846	1,262	1,666	48
6118	Sw Ambrosia Lake	210	1,922	656	1,016	36
6119	Casamero 8	2,021	7,433	1,253	-	192
19420	Standing Rock	897	742	-	73	153
22264	Staircase	183	-	-	-	100
22338	Cerro Bandera	433	-	-	-	46
Total		**921,097**	**921,097**	**574,258**	**126,943**	**89,702**

C EXAMPLES OF PRESCRIBED GRAZING SYSTEMS

C.1 Rest-Rotation Grazing

Under a rest-rotation grazing system, grazing is deferred on various parts of an allotment during succeeding years, and the deferred parts are allowed complete rest for one or more years (Society for Range Management 1974). The allotment is divided into pastures, usually with comparable grazing capacities. Each pasture is systematically grazed and rested so that livestock production and other resource values are provided for, while the vegetation cover is simultaneously maintained or improved. This practice provides greater protection of the soil resource against wind and water erosion (Johnson 1965; Hormay 1970; Ratliff; Reppert and McConnen 1972; Ratliff and Reppert 1974).

Any of several rest-rotation grazing systems may be used, depending upon the objectives for the allotment and the number of pastures.

C.2 Deferred Rotation Grazing

Deferred rotation is the discontinuance of grazing on different parts of an allotment in succeeding years. This allows each pasture to rest successively during the growing season to permit seed production, establishment of seedlings, and restoration of plant vigor (Society for Range Management 1974). One or more pastures are grazed during the spring, while the remaining one or more pastures are rested until after seed ripening of key species, and the grazed. Deferred rotation grazing differs from rest-rotation grazing in that no yearlong rest is provided.

C.3 Deferred Grazing

Deferred grazing is the discontinuance of grazing by livestock on an area for a specified period of time during the growing season. Under this system, grazing would begin after key plants have reached an advanced stage of development in their annual growth cycle. The growing season rest provided by this system promotes plant reproduction, establishment of new plants, or restoration of the vigor of old plants (American Society of Range Management 1964).

C.4 Alternate Grazing

Alternate grazing is grazing by livestock every other season, with the area being rested in the alternate year. Stoddard, Smith, and Box (1975) describe this system:

> Rotation grazing, or alternate grazing, involves subdividing the range into units and regrazing one range unit, then another in regular succession. The rotation system of grazing is based upon the assumption that animals in large numbers make more uniform use of the forage, and that rest from grazing is beneficial to the plant, even though it must support a greater number of animals in the shorter time during which it is grazed. Certainly, proper rotation grazing results in more uniform utilization. Large numbers of animals in small units are forced to spread over the entire area and to use the available forage more uniformly. Trampling is reduced because animals are held on small areas where feed is more abundant, and hence less travel is necessary.

C.5 Short-Duration, High-Intensity Grazing

High-intensity grazing permits short-duration grazing with a higher rate than would be considered normal. The purpose of this type of system is to obtain uniform use of all plants, desirable and undesirable alike, and to prevent regrazing on regrowth of the most desirable plants. This system allows desirable plants to compete for nutrients on an equal basis with less desirable plants.

D RANGELAND IMPROVEMENTS

D.1 Introduction

The following is a discussion of typical design features and construction practices for the rangeland improvements and treatments that would be considered when implementing Alternatives B, C, or D of this RMP. There are many special design features not specifically discussed in this appendix that can be made part of a project's design. One example of a special design feature would be the use of a specific color of fence post to blend with the surrounding environment and thereby mitigate some of the visual impact of the fence. These mitigating design features would be developed, if needed, for individual projects at the time an environmental assessment is written.

D.2 Structural Improvements

D.2.1 Fences

Fences would be constructed to divide allotments into pastures and to control livestock. Most fences would be of three or four wires with steel posts spaced sixteen and one-half feet apart with intermediate wire stays. Where fences may impair the movement of wildlife, they would be no more than 42 inches in height and the top two strands would be at least 12 inches apart, with the bottom wire smooth and at least 16 inches above the ground. Where appropriate on key big game areas, the top wire would also be smooth. Existing fences which create wildlife movement problems would be modified. Proposed fence lines would not be bladed or scraped. Gates or cattleguards would be installed where fences cross existing roads.

D.2.2 Spring Development

Springs would be developed or redeveloped using a backhoe to install a buried collection system, usually consisting of a perforated pipe and a collection box. Collection boxes are normally made of fiberglass with a cover and a fitting to which a delivery pipe is connected. A short pipeline would be installed to deliver water to a trough for use by livestock and wildlife. Normally the spring area would be fenced to exclude livestock following development.

D.2.3 Pipelines

Wherever possible, water pipelines would be buried. The trench would be excavated with a backhoe, ditchwitch, ripper tooth, or with similar equipment. The pipe would be placed in the trench and the excavated material used as backfill at a depth dependent on the depth of the frost line in the winter. Flexible or rigid plastic would be used depending on the system design. Pipelines would have water tanks spaced as needed to meet management objectives.

D.2.4 Wells

Well locations would be selected based on well site investigations which would predict the depth to reliable aquifers. All applicable State laws and regulations that apply to the development of ground water would be observed, including water rights acquisition.

D.3 Nonstructural Improvements

D.3.1 Burning

Burning is normally proposed to reduce the amount of big sagebrush. Burning would normally be done during April-May or September-October, depending on the specific prescription written for each area, desired results, weather, and moisture conditions. Burn plans would be developed for each burn.

D.3.2 Plowing and Seeding

Most of the sites to be treated are in poor or fair vegetative condition and have a low potential to improve under other management practices. Most of the existing vegetation would be eliminated during seedbed preparation, and the site would be seeded with species adapted to the site. The final selection of species to be seeded would depend on the planned use of the site and the management objectives for the allotment. Seed would be drilled wherever possible.

D.3.3 Interseeding

This treatment differs from plowing and seeding in that existing vegetation is not eliminated during seedbed preparation. Desirable plant species would be interseeded with existing vegetation. A range drill would be used to interseed strips. Broadcast seedings might be used as well. Species to be seeded would be selected to meet management objectives developed for the allotment.

D.3.4 Vegetation Treatments

Poisonous or noxious plants are controlled where any infestations occur. In addition, the BLM cooperates with other affected landowners in controlling infestations on relatively large areas. Chemical vegetation treatments would conform to all applicable State and Federal regulations. Biological controls would also be considered where practical. Mechanical controls including but not limited to; masticating, chaining, cabling, and pushing could be used in areas where suitable.

D.3.5 Standard Operating Procedures

The following procedures would be followed in construction of all management facilities and for vegetation manipulations.

1. Specific projects would be assessed individually through environmental assessments to determine whether they would have adverse environmental impacts.

2. Roads or trails would not normally be constructed to new construction on project sites. Use of existing roads and trails would be encouraged.

3. To comply with the National Historic Preservation Act of 1966, 36 CFR 800, and Executive Order 11593, all areas where ground is to be disturbed by range developments would be inventoried for prehistoric and historic features. Where feasible, all cultural resources located by this inventory would be avoided. The results of the inventory and determinations of eligibility for the National Register of Historic Places would be forwarded to the New Mexico State Historic Preservation Officer for comment.

   If cultural resources are found to be eligible for the National Register and cannot be avoided, a determination of the effect of the project on the resource(s), including appropriate mitigating measures if necessary, would be done in consultation with the New Mexico Historic Preservation Officer and the Advisory Council on Historic Preservation. No action affecting the resource would be taken until the Advisory Council has had the opportunity to make comments.

   If buried cultural remains are encountered during construction, the operator would temporarily discontinue construction until the BLM evaluated the discovery and determined the appropriate action.

4. No action would be taken by the BLM that could jeopardize the continued existence of any Federally-listed threatened or endangered plant or animal species. An endangered species clearance with the U.S. Fish and Wildlife Service (FWS) would be required before any part of the proposal or alternatives would be implemented that could affect an endangered species or its habitat.

   In situations where data are insufficient to make an assessment of proposed actions, surveys of potential habitats would be made before a decision is made to take any action that could affect threatened or endangered species. Should the BLM determine that there could be an effect on a Federally-listed species, formal consultation with the FWS would be initiated. In the interim period before formal consultation, the BLM would not take any action that would make an irreversible or irretrievable commitment of resources that would foreclose the consideration of modifications or alternatives to the proposed action. When the FWS opinion is received, if it should indicate the action would be likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat, the action would be abandoned or altered as necessary. All procedures thus described are in compliance with BLM Manual, Section 6840.

   The BLM also would comply with any State laws applying to animal or plant species identified by the State of New Mexico as being threatened or endangered (in addition to the Federally-listed species).

5. All wilderness values would be protected on lands under wilderness review or study. Guidelines in the Interim Management Policy (USDI, BLM 1979b) would be followed for all Wilderness Interim Management Areas. No impairing projects would be allowed in these areas.

6. All actions would consider the BLM's Visual Resource Management criteria.

7. Wildlife escape devices would be installed and maintained in water troughs.

8. In crucial wildlife habitat (when identified), (e.g., winter ranges, fawning, calving areas), construction work on projects would be scheduled during seasons when the animals are not concentrated to avoid or minimize disturbances.
9. After construction, any disturbed areas would be revegetated with a mixture of bureau approved/ certified noxious weed seed free grasses, forbs, and shrubs as appropriate to the specific site.
10. Vegetative manipulation projects would done, when possible, in irregular patterns, creating more edge than strip and block manipulation, with islands of vegetation left for cover.
11. Chemical treatment would consist of applying approved chemicals to control noxious or invasive plants. Before chemicals are applied, the BLM would comply with Department of the Interior regulations. All chemical applications would be preceded by an approved Pesticide Use Proposal. All applications of pesticides would be under the supervision of a certified chemical applicator. All applications would be carried out in compliance with the New Mexico pesticide laws.

D.4 Prevention of Noxious Weed Spread through Surface Disturbing Activities.

1. Inventory the proposed route or site for the presence of noxious weeds. Noxious weeds are those listed on the current New Mexico Noxious Weed List or on the current Federal Noxious Weed List. The following noxious weeds have been identified as occurring on lands within the boundaries of the Rio Puerco Field Office (AFO):
   - Russian Knapweed (*Centaurea repens*)
   - Musk Thistle (*Carduus nutans*)
   - Bull Thistle (*Cirsium vulgare*)
   - Canada Thistle (*Cirsium arvense*)
   - Scotch Thistle (*Onopordum acanthium*)
   - Hoary Cress (*Cardaria draba*)
   - Perennial Pepperweed (*Lepidium latifolium*)
   - Halogeton (*Halogeton glomeratus*)
   - Spotted Knapweed (*Centaurea maculosa*)
   - Dalmation Toadflax (*Linaria genistifolia*)
   - Yellow Toadflax (*Linaria vulgaris*)
   - Camelthorn (*Alhagi pseudalhagi*)
   - Yellow Starthistle (*Centaurea solstitialis*)
   - Saltcedar (*Tamarix spp*.)
   - African Rhue (*Peganum harmala*)
   - Tree of Heaven (*Ailanthus altissima*)

- Poison Hemlock (*Conium maculatum*)
- Downy Brome (*Bromus tectorum*)

2. Construction equipment should be inspected and cleaned prior to coming onto the work site. This is especially important on vehicles from out of state or if coming from a weed infested area.
3. If fill dirt or gravel will be required, the source needs to be noxious weed free.
4. The site should be monitored for the life of the project for the presence of noxious weeds (includes maintenance & construction activities). If weeds are found, the RPFO will be notified and the RPFO will determine the best method for the control of the particular weed species.
5. If the work site is abandoned, the area shall be reclaimed and revegetated with the species specified by the RPFO. All seed shall be certified weed free. Area will be monitored to determine the success of the revegetation, and will be reseeded if necessary.

E ALLOTMENT MANAGEMENT CATEGORY AND APPLICABLE LAND USE PLAN

Table E.1: Management Category and Land Use Plan

Allotment #	Allotment Name	Unit	Management Category	Sec 3/15	EIS/RMP
1	Continental Divide	4	M	3	Rio Puerco Grazing EIS
2	Shroyer Community	4	M	3	Rio Puerco Grazing EIS
3	Pelon Community	4	I	3	Rio Puerco Grazing EIS
4	Starr Community	4	I	3	Rio Puerco Grazing EIS
5	Dry Springs	4	M	3	Rio Puerco Grazing EIS
6	Tres Hermanos	4	M	3	Rio Puerco Grazing EIS
7	Chiuilla Community	4	M	3	Rio Puerco Grazing EIS
8	Ojo De Los Pinos	4	I	3	Rio Puerco Grazing EIS
9	Horn Arroyo	4	I	3	Rio Puerco Grazing EIS
10	Brandy	4	I	3	Rio Puerco Grazing EIS
11	Dos Valles	4	M	3	Rio Puerco Grazing EIS
12	Lagunitas Community	4	C	3	Rio Puerco Grazing EIS
14	Nacimiento Community	4	C	3	Rio Puerco Grazing EIS
15	Valle San Isidro	4	M	3	Rio Puerco Grazing EIS
16	Fork Rock Mesa	4	C	3	Rio Puerco Grazing EIS
17	Mesa Portales	4	M	3	Rio Puerco Grazing EIS
18	Forty Four	4	I	3	Rio Puerco Grazing EIS
19	Senorito Community	4	I	3	Rio Puerco Grazing EIS
20	San Pablo Comm	4	M	3	Rio Puerco Grazing EIS
23	Eagle Mesa	4	I	3	Rio Puerco Grazing EIS
24	Ridge Top	4	I	3	Rio Puerco Grazing EIS
26	Los Pinos Arroyo	4	C	3	Rio Puerco Grazing EIS
27	Dry Well	4	I	3	Rio Puerco Grazing EIS
28	Piedra Lumbre Community	4	I	3	Rio Puerco Grazing EIS
29	Coal Creek	4	M	3	Rio Puerco Grazing EIS
31	Canada Candelaria	4	C	3	Rio Puerco Grazing EIS
32	Cerro Colorados	4	I	3	Rio Puerco Grazing EIS
33	Cebo Community	4	M	3	Rio Puerco Grazing EIS
34	Twin Butte	4	M	3	Rio Puerco Grazing EIS
35	Torreon Wash	4	M	3	Rio Puerco Grazing EIS
36	Arroyo Empedrado	4	I	3	Rio Puerco Grazing EIS
37	North San Luis Mesa Community	4	M	3	Rio Puerco Grazing EIS
38	San Luis Community	4	M	3	Rio Puerco Grazing EIS
39	Cachulie	4	I	3	Rio Puerco Grazing EIS
40	Lost Valley Community	4	M	3	Rio Puerco Grazing EIS
41	Cerro Cuate	4	M	3	Rio Puerco Grazing EIS
42	Azabache	4	I	3	Rio Puerco Grazing EIS
43	Chico Crossing Community	4	I	3	Rio Puerco Grazing EIS
44	Cabezon Peak Community	4	M	3	Rio Puerco Grazing EIS

Allotment #	Allotment Name	Unit	Management Category	Sec 3/15	EIS/RMP
45	Arroyo Alamito	4	I	3	Rio Puerco Grazing EIS
46	San Ysidro Pasture Community	4	I	3	Rio Puerco Grazing EIS
47	Guadalupe	4	I	3	Rio Puerco Grazing EIS
48	Mesa Cortada	4	I	3	Rio Puerco Grazing EIS
49	El Banquito	4	I	3	Rio Puerco Grazing EIS
50	Ignacio Chavez Grant Community	4	I	3	Rio Puerco Grazing EIS
50	Cerro Tinaja Community	4	I	3	Rio Puerco Grazing EIS
51	Cerro Salado	4	M	3	Rio Puerco Grazing EIS
53	Canon Del Camino	4	I	3	Rio Puerco Grazing EIS
55	Corrales Tierra	4	M	3	Rio Puerco Grazing EIS
56	Pipeline	4	I	3	Rio Puerco Grazing EIS
57	Cucho Arroyo	4	M	3	Rio Puerco Grazing EIS
58	Mighty Mite	4	C	3	Rio Puerco Grazing EIS
59	Rio Salado	4	M	3	Rio Puerco Grazing EIS
60	Rock House Community	4	M	3	Rio Puerco Grazing EIS
61	Wilson Canyon	4	I	3	Rio Puerco Grazing EIS
62	Casa Salazar	4	M	3	Rio Puerco Grazing EIS
63	Tapia Arroyo	4	C	3	Rio Puerco Grazing EIS
64	San Ysidro Community	4	C	3	Rio Puerco Grazing EIS
65	Long Ridge	4	M	3	Rio Puerco Grazing EIS
67	Sanchez (3)	4	M	3	Rio Puerco Grazing EIS
68	South Divide Community	4	I	3	Rio Puerco Grazing EIS
69	Middle San Luis	4	M	3	Rio Puerco Grazing EIS
70	South San Luis	4	C	3	Rio Puerco Grazing EIS
71	Agua Bonita	4	M	3	Rio Puerco Grazing EIS
72	Jones Canyon Community	4	I	3	Rio Puerco Grazing EIS
73	Pozo Seco	4	I	3	Rio Puerco Grazing EIS
74	Valdez #3	4	C	3	Rio Puerco Grazing EIS
75	Valle (Chamisa)	4	C	3	Rio Puerco Grazing EIS
76	Salty Flats	4	C	3	Rio Puerco Grazing EIS
78	Bernalillito	4	M	3	Rio Puerco Grazing EIS
110	Armijo	4	I	3	RPRMP Vegetative Uses Area
111	Canada Alamos	4	I	3	RPRMP Vegetative Uses Area
112	Pino Spring	4	I	3	RPRMP Vegetative Uses Area
113	Cocina Allotment	4	I	3	RPRMP Vegetative Uses Area
114	Daniel Gonzales	4	C	3	RPRMP Vegetative Uses Area
116	Canada Del Ojo	4	I	3	RPRMP Vegetative Uses Area
118	Ortiz Mountain	5	M	3	RPRMP Vegetative Uses Area
120	Tejon	5	M	3	RPRMP Vegetative Uses Area
122	Tent Rocks	4	I	3	Kasha-Katuwe Tent Rocks EIS
123	Peralta	4	I	3	Kasha-Katuwe Tent Rocks EIS
142	Cerro Cochino	4	I	3	Rio Puerco Grazing EIS
156	Spear M Ranch	2	M	3	East Socorro Grazing EIS
201	Cerritos De Jaspe	1	M	3	El Malpais EIS

Allotment #	Allotment Name	Unit	Management Category	Sec 3/15	EIS/RMP
202	Brights Well	1	M	3	El Malpais EIS
203	El Malpais	1	I	3	El Malpais EIS
204	Raney Allotment	1	M	3	El Malpais EIS
205	Los Pilares	1	I	3	El Malpais EIS
206	Little Hole In Wall	1	M	3	El Malpais EIS
207	Cerro Brillante	1	I	3	El Malpais EIS
208	Loma Montosa	1	I	3	El Malpais EIS
209	Techado Mesa	1	I	3	El Malpais EIS
210	Los Cerros	1	I	3	El Malpais EIS
211	Ventana Ridge	1	M	3	El Malpais EIS
212	Mesa Carrizo	2	I	3	East Socorro Grazing EIS
214	Cold Canyon	2	M	3	East Socorro Grazing EIS
215	Cerro Verde	2	I	3	East Socorro Grazing EIS
216	Cerro Del Oro	2	I	3	East Socorro Grazing EIS
217	Hidden Mountain	2	M	3	East Socorro Grazing EIS
218	Arroyo Colorado	2	I	3	East Socorro Grazing EIS
219	Harrington	2	I	3	East Socorro Grazing EIS
220	Tsidu-Weza	2	C	3	East Socorro Grazing EIS
221	Petoch Wash	2	M	3	East Socorro Grazing EIS
222	Chical	1	C	15	El Malpais EIS
225	Mystery Mountain	2	C	15	East Socorro Grazing EIS
226	Arrossa Individual	1	M	3	West Socorro Grazing EIS
228	Chavez Draw	3	C	15	RPRMP Vegetative Uses Area
229	Espinoso	3	C	15	RPRMP Vegetative Uses Area
230	Rim Rock	1	I	3	West Socorro Grazing EIS
231	Marmon Ranch	2	M	3	East Socorro Grazing EIS
330	Manuel Lopez	NA	C	15	RPRMP Vegetative Uses Area
331	Driggers	NA	C	15	RPRMP Vegetative Uses Area
332	R. Lovato	NA	C	15	RPRMP Vegetative Uses Area
333	R. Taylor	NA	C	15	RPRMP Vegetative Uses Area
334	W.A. Muller	NA	C	15	RPRMP Vegetative Uses Area
335	Archuleta Bros.	NA	C	15	RPRMP Vegetative Uses Area
337	Antonio Duran	NA	C	15	RPRMP Vegetative Uses Area
338	Zuni Canyon	1	C	15	West Socorro Grazing EIS
340	Aparcio Gurule	NA	C	15	RPRMP Vegetative Uses Area
341	Lovato A	NA	C	15	RPRMP Vegetative Uses Area
342	Juan Baca	NA	C	15	RPRMP Vegetative Uses Area
343	Black Bear	NA	C	15	RPRMP Vegetative Uses Area
344	A Gurule	NA	C	15	RPRMP Vegetative Uses Area
345	Herrera	4	C	15	RPRMP Vegetative Uses Area
347	Rito De Los Pinos	4	C	15	RPRMP Vegetative Uses Area
348	Leonard Casaus	4	C	15	RPRMP Vegetative Uses Area
349	La Jara Creek	NA	C	15	RPRMP Vegetative Uses Area
357	My Buddy	NA	C	15	RPRMP Vegetative Uses Area

Allotment #	Allotment Name	Unit	Management Category	Sec 3/15	EIS/RMP
370	Sanchez (15)	4	C	15	RPRMP Vegetative Uses Area
371	Esteban Herrera	2	C	15	RPRMP Vegetative Uses Area
373	King Brothers Ranch	4	C	15	RPRMP Vegetative Uses Area
375	Cuba Mesa	4	C	15	RPRMP Vegetative Uses Area
425	T A	2	C	15	West Socorro Grazing EIS
426	E V A	1	C	15	West Socorro Grazing EIS
427	Ojo Hallado	1	M	15	West Socorro Grazing EIS
428	Tailings Pond	1	C	15	West Socorro Grazing EIS
429	Reynold Draw	1	C	15	West Socorro Grazing EIS
430	Hondo Canyon	1	C	15	West Socorro Grazing EIS
431	M.B.S.	1	C	15	West Socorro Grazing EIS
432	San Mateo	1	C	15	West Socorro Grazing EIS
433	Rest Stop	1	C	15	West Socorro Grazing EIS
435	E J O	2	C	15	West Socorro Grazing EIS
436	Montano	1	C	15	West Socorro Grazing EIS
437	V M	1	C	15	West Socorro Grazing EIS
438	Monument Lake	1	C	15	El Malpais EIS
440	Mcbride Trust	1	C	15	West Socorro Grazing EIS
442	West Grants Ridge	1	C	15	West Socorro Grazing EIS
443	G R G	1	C	15	West Socorro Grazing EIS
444	Trujillo Draw	1	C	15	West Socorro Grazing EIS
445	E R I	1	C	15	West Socorro Grazing EIS
446	E C	1	C	15	West Socorro Grazing EIS
447	Cordova Ranch	3	C	15	West Socorro Grazing EIS
448	Four Daughters	2	C	15	East Socorro Grazing EIS
450	Blackjack Arroyo	1	C	15	West Socorro Grazing EIS
457	Palomas	1	C	15	El Malpais EIS
552	Los Tanos	5	C	15	RPRMP Vegetative Uses Area
727	Abrahames Lease	3	C	15	RPRMP Vegetative Uses Area
737	Ault Lease	3	C	15	RPRMP Vegetative Uses Area
739	Tabet Draw	3	C	15	RPRMP Vegetative Uses Area
749	Rutledge Lease	3	C	15	RPRMP Vegetative Uses Area
754	Berkshire Green	3	C	15	RPRMP Vegetative Uses Area
755	Mountainair Lease	3	C	15	RPRMP Vegetative Uses Area
762	Abo Lease	3	C	15	RPRMP Vegetative Uses Area
793	Fulfer Lease	3	C	15	RPRMP Vegetative Uses Area
796	Gallegos E. Lease	5	C	15	RPRMP Vegetative Uses Area
824	S H /	3	C	15	RPRMP Vegetative Uses Area
825	Nabay Hindi & Sons	3	C	15	RPRMP Vegetative Uses Area
849	Luna Lease	3	C	15	RPRMP Vegetative Uses Area
868	Moe Lease	3	C	15	RPRMP Vegetative Uses Area
871	M Montano Lease	5	C	15	RPRMP Vegetative Uses Area
878	L R Nix Lease	3	C	15	RPRMP Vegetative Uses Area
885	C.A. Pohl Lease	3	C	15	RPRMP Vegetative Uses Area

Allotment #	Allotment Name	Unit	Management Category	Sec 3/15	EIS/RMP
924	Wessely Lease	5	C	15	RPRMP Vegetative Uses Area
925	Stevens Lease	3	C	15	RPRMP Vegetative Uses Area
927	F.Torres	3	C	15	RPRMP Vegetative Uses Area
948	Arroyo Chinchonte	3	C	15	RPRMP Vegetative Uses Area
971	Lomos Altos	5	C	15	RPRMP Vegetative Uses Area
972	Las Huertas Creek	5	C	15	RPRMP Vegetative Uses Area
6006	Marquez	NA	C	15	FFORMP Vegetative Uses Area
6019	Tanner Lease	NA	C	15	FFORMP Vegetative Uses Area
6025	D. P. Elkins	NA	I	15	FFORMP Vegetative Uses Area
6026	D. J. Elkins	NA	I	15	FFORMP Vegetative Uses Area
6027	L. E. Elkins	NA	I	15	FFORMP Vegetative Uses Area
6032	Grieve-Chaco	NA	C	15	FFORMP Vegetative Uses Area
6035	Navajo Tribe Hospah	NA	C	15	FFORMP Vegetative Uses Area
6036	Tom	NA	C	15	FFORMP Vegetative Uses Area
6047	Wilson	NA	C	15	FFORMP Vegetative Uses Area
6052	Tanner-Chaco	NA	C	15	FFORMP Vegetative Uses Area
6053	Smouse Lease	NA	C	15	FFORMP Vegetative Uses Area
6055	Divide	NA	C	15	FFORMP Vegetative Uses Area
6062	Andrews	1	C	15	FFORMP Vegetative Uses Area
6063	Escondida Ranch	NA	C	15	FFORMP Vegetative Uses Area
6064	D Berryhill	NA	C	15	FFORMP Vegetative Uses Area
6065	Ambrosia Lake	NA	C	15	FFORMP Vegetative Uses Area
6066	Roundy	NA	C	15	FFORMP Vegetative Uses Area
6069	Cowboy	NA	C	15	FFORMP Vegetative Uses Area
6070	Mccauley	NA	C	15	FFORMP Vegetative Uses Area
6071	Turpen	1	C	15	FFORMP Vegetative Uses Area
6072	Bass	1	C	15	FFORMP Vegetative Uses Area
6073	Ford	1	C	15	FFORMP Vegetative Uses Area
6075	Navarre	1	C	15	FFORMP Vegetative Uses Area
6078	Elkins	NA	C	15	FFORMP Vegetative Uses Area
6079	Mesa Montanosa 24	1	C	15	FFORMP Vegetative Uses Area
6081	Se Ambrosia Lake	NA	C	15	FFORMP Vegetative Uses Area
6082	Fernandez Company	NA	C	15	FFORMP Vegetative Uses Area
6084	Pena	NA	C	15	FFORMP Vegetative Uses Area
6085	Mesa Montanosa 30	NA	C	15	FFORMP Vegetative Uses Area
6086	Section 22	NA	C	15	FFORMP Vegetative Uses Area
6092	Clawson	1	C	15	West Socorro Grazing EIS
6118	Sw Ambrosia Lake	NA	C	15	FFORMP Vegetative Uses Area
6119	Casamero 8	NA	C	15	FFORMP Vegetative Uses Area
19420	Standing Rock	4	C	15	RPRMP Vegetative Uses Area
22264	Staircase	1	C	15	West Socorro Grazing EIS
22338	Cerro Bandera	1	I	15	West Socorro Grazing EIS

F FUNDAMENTALS OF RANGELAND HEALTH AND STANDARDS AND GUIDELINES

The Standards and Guidelines for livestock grazing on Bureau of Land Management lands in New Mexico were approved in January 2001. The standards were written to accomplish the four fundamentals of rangeland health.

The fundamentals of rangeland health are basic components of healthy rangelands. The four fundamentals of rangeland health, as identified in 43 CFR 4180.1 are:

- Watersheds are in, or are making significant progress toward, properly functioning condition.
- Ecological processes are maintained, or there is significant progress toward their attainment.
- Water quality complies with, or is making significant progress toward achieving, state standards.
- Habitats of protected species are maintained or are making significant progress toward being restored.

Standards for public land health are expressions of the level of physical and biological condition or degrees of function required for healthy and sustainable lands, and define minimum resource conditions that must be achieved. The New Mexico Standards are:

- *Upland Sites Standard*: Upland ecological sites are in a productive and sustainable condition within the capability of the site. Upland soils are stabilized and exhibit infiltration and permeability rates that are appropriate for the soil type, climate, and landform. The kind, amount, and/or pattern of vegetation provide protection on a given site to minimize erosion and assist in meeting State and Tribal water quality standards.

- *Biotic Communities, Including Native, Threatened, Endangered, and Special Status Species Standard*: Ecological processes such as hydrologic cycle, nutrient cycle, and energy flow support productive and diverse native biotic communities, including special status, threatened, and endangered species appropriate to the site and species. Desired plant community goals maintain and conserve productive and diverse populations of plants and animals, which sustain ecological functions and processes.

- *Riparian Sites Standard*: Riparian areas are in a productive, properly functioning, and sustainable condition, within the capability of that site. Adequate vegetation of diverse age and composition is present that will withstand high stream flow, capture sediment, provide for groundwater recharge, provide habitat and assist in meeting State and Tribal water quality standards.

Guidelines are practices, methods, or techniques determined to be appropriate to ensure that standards can be met or that significant progress can be made toward meeting those standards.

Assessments of rangeland health interpret the degree to which the integrity of the soil, biotic (vegetative), and hydrologic processes of rangeland ecosystems are sustained. An

interdisciplinary team (ID team) conducts a field assessment(s) to examine the current soil site stability, biotic integrity, and hydrologic function attributes that are present on the allotment. Seventeen individual factors (indicators) are assessed to rate the soil, biotic and hydrologic attributes. These indicators are examined and assigned one of five condition categories based upon the degree of departure from the range site description. The possible degrees of departure range from “none to slight” to “extreme”.

A range site is a distinctive kind of rangeland that, in the absence of abnormal disturbance and physical site deterioration, has the potential to support a native plant community typified by an association of species capable of occupying the site. The Soil Conservation Service (now Natural Resource Conservation Service) developed range site descriptions based on relic areas and historical knowledge. A range site description identifies the soil characteristics, potential natural plant community, and potential cover by species, potential annual production, and other pertinent information for each site.

The interdisciplinary rangeland health assessment is used to determine if the site (watershed, allotment or pasture) meets the New Mexico standards and the fundaments of rangeland health. The final determination of whether a site does or does not meet the New Mexico standards and fundaments of rangeland health is based on 1) the degree of departure from the range site description for the soil site stability, biotic integrity, and hydrologic function attributes; 2) how well the site meets the definition of a fundamentally healthy site, as identified in 43 CFR 4180.1 and; 3) other information such as monitoring data. If an allotment, or a portion of the allotment, is determined to be in a condition that does not meet the New Mexico standards and /or the fundamentals of rangeland health, the causal factor(s) is identified. If current livestock management is determined to be a causal factor, the authorized officer is required to take appropriate management action, no later than the start of the next grazing year, to make significant progress towards achieving the fundamentals of rangeland health and New Mexico standards (43 CFR 4180.1 and 4180.1(c)).

G FLUID MINERAL DEVELOPMENT BEST MANAGEMENT PRACTICES

Best management practices (BMPs) are innovative, dynamic, and economically feasible mitigation measures applied on a site-specific basis to reduce, prevent, or avoid adverse environmental or social impacts. BMPs are applied to management actions to aid in achieving desired outcomes for safe, environmentally sound resource development by preventing, minimizing, or mitigating adverse impacts and reducing conflicts. For each management action, a number of BMPs may be applied as necessary to mitigate expected impacts. The following lists BMPs that may be applied to mitigate impacts of fluid mineral activities. Other resource disciplines have developed BMPs that may be applied to appropriate activities. For instance, the Clean Water Act includes BMPs that are frequently included as mitigation for various proposed actions, including fluid minerals actions. This list is not all-inclusive and may be modified over time as conditions change and new practices are identified. The current BMPs are listed here to show what mitigation measures are commonly implemented to reduce the impact of fluid mineral development. These procedures are based on WO IM 2007-021 and the *Surface Operating Standards and Guidelines for Oil and Gas Development (Gold Book, 4th ed., 2007).*

G.1 General BMPs

G.1.1 Cultural Resources

If subsurface cultural resources are unearthed during reclamation operations, activity in the vicinity of the cultural resource will cease and a BLM representative will be notified immediately. Pursuant to 43 CFR 10.4, the holder of a surface use authorization must notify the authorized officer, by telephone, with written confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony. Further, the operator must stop activities in the vicinity of the discovery and protect it for 30 days or until notified to proceed by the authorized officer.

G.1.2 Paleontological Resources

The holder shall immediately notify the BLM Authorized Officer of any paleontological resources discovered as a result of operations under this authorization. The holder shall suspend all activities in the vicinity of such discovery until notified to proceed by the Authorized Officer and shall protect the discovery from damage or looting. The holder may not be required to suspend all operations if activities can be adjusted to avoid further impacts to a discovered locality or be continued elsewhere. The Authorized Officer will evaluate, or will have evaluated, such discoveries as soon as possible, but not later than 10 working days after being notified. Appropriate measures to mitigate adverse effects to significant paleontological resources will be determined by the Authorized Officer after consulting with the operator. Within 10 days, the operator will be allowed to continue construction through the site, or will be given the choice of either (1) following the Authorized Officer’s instructions for stabilizing the fossil resource in place and avoiding further disturbance to the fossil resource, or (2) following the Authorized

Officer's instructions for mitigating impacts to the fossil resource prior to continuing construction through the project area.

G.1.3 Invasive and Noxious Weed Management

All surface disturbing equipment should be inspected and cleaned prior to coming onto public lands. This is especially important on vehicles from a weed infested area.

Holders of surface use authorizations are responsible for control of invasive and noxious weeds on disturbed and reclaimed areas within the limits of the well pad, associated road ROW corridors.

If fill dirt or gravel is brought onto public lands, the source needs to be noxious weed free.

All seed shall be certified noxious weed free. There shall be no primary or secondary noxious weeds in the seed mixture. Seed labels from each bag shall be available for inspection while seed is being sown, and seed labels shall be given to the authorized officer when seeding is complete.

All seed, hay, straw, mulch, or other vegetative material transported and used on public land for site stability, rehabilitation, or project facilitation shall be certified noxious weed free.

Use of pesticides will comply with all applicable Federal and State laws. Pesticides will be used only in accordance with their registered use within limitations imposed by the Secretary of the Interior. Prior to the use of pesticides, the operator will obtain approval of a Pesticide Use Proposal (PUP) showing the type and quantity of material to be used, pests to be controlled, method of application, locations of storage and disposal of containers, and any other information deemed necessary by the Authorized Officer.

All pesticide applicators should hold a valid New Mexico Qualified Supervisor license or Certified Operator license, and the license should be valid for the applicable pesticide application category. For all areas treated, Pesticide Application Records (BLM Form 3-3-94) should be submitted to the BLM Rio Puerco Field Office by November 1 of each year. Pesticide Application Records should be completed no later than 14 days following the pesticide application and should be maintained for ten years.

Construction sites should be monitored for the life of the project for the presence of invasive/noxious weeds (includes maintenance and construction activities). If weeds are found, the BLM must be notified and it will determine the best method for the control of the particular weed species.

G.1.4 Wildlife and Sensitive Species Management

If any dead or injured threatened, endangered, proposed, or candidate species is found during construction or operation, the U.S. Fish and Wildlife Service's New Mexico Field Office and the BLM Rio Puerco Field Office must be notified within 24 hours. If any dead or injured sensitive species is located during construction or operation, the BLM Rio Puerco Field Office must be notified within 24 hours.

If an undocumented raptor nest is located during project construction or operation, the BLM Rio Puerco Field Office must be notified within 24 hours.

Prior to the initiation of a surface-disturbing activity, including geophysical operations, project areas designated by the authorized officer will require a survey for raptor nests or active prairie dog towns. Surveys will be conducted by professional biologists approved by the Authorized Officer. All raptor nests and active prairie dog towns will be avoided by the distances and seasonal periods listed below.

- Eagle – 0.5 mile, February 1-July 15
- Prairie Falcon – 0.5 mile, March 1-August 1
- Ferruginous Hawk – 0.5 mile, February 1-July 15
- Aplomado Falcon – 0.5 mile, January 1-July 31
- Gunnison Prairie Dog – 0.25 mile, February 15-June 15
- Black-Tailed Prairie Dog – 0.25 mile, January 1-June 15
- All other raptor species – 0.5 mile, during observed nest establishment through fledgling

Long duration land use activities will not be allowed to occur within the species-specific spatial buffer zone of active nests or occupied prairie dog towns listed above. Short duration activities will be avoided within the species-specific spatial buffer zones during the dates listed above. Short duration activities will be limited to the spatial buffer zone outside of the boundary of the occupied prairie dog town and will not occur within the occupied town. All other raptor species nests will be avoided by the spatial buffer zone only during the period listed above, regardless of the duration of the activity. Before land use activities can commence a raptor and prairie dog survey must be completed.

A short duration activity is defined as an activity that would begin outside of a given breeding season and end prior to initiation of a given breeding season. A long duration activity is defined as an activity which would continue into or beyond a given nesting/breeding season. An active nest is defined as any nest that has been occupied in the last seven years. A nest will be determined to be active or inactive by the authorized officer. Surveys will be conducted by professional biologists approved by the authorized officer.

All fences must be constructed to BLM Rio Puerco Field Office fence specifications to mitigate impacts to wildlife.

In areas where habitat and/or rangeland enhancement projects have been implemented, with the exception of large landscape projects (prescribed burns, chemical treatments, and mechanical treatments), adverse impacts to the landscape will be avoided by minimizing or excluding certain surface-disturbing activities that may degrade the objectives or intent of the project. Exceptions to this requirement will be considered on a case-by-case basis.

Tree and vegetation clearing will be limited to the minimum area required, except where vegetative objectives have been established for elimination or reduction in vegetative density.

Power lines will be constructed to standards outlined in the most recent version of "Suggested Practices for Raptor Protection on Power Lines" published by the Edison Electric Institute/Raptor Research Foundation, unless otherwise agreed to by the authorized officer. The holder is responsible for demonstrating that power pole designs not meeting these standards are raptor safe. Such proof will be provided by a raptor expert approved by the authorized officer. The BLM reserves the right to require modifications or additions to power line structures, should they be necessary to ensure the safety of large perching birds. The modifications and/or additions will be made by the holder without liability or expense to the United States.

All equipment installed on Federal lands will be constructed to prevent birds and bats from entering them and, to the extent practical, to discourage perching and nesting.

Open top tanks, reserve pits, disposal pits, or other open tanks or pits will be required to be equipped to deter entry by birds, bats, or other wildlife. Tanks and pits must also have escape ramps when applicable.

Piping of produced liquids to centralized tank batteries offsite is recommended to reduce traffic to individual wells.

Transportation planning is recommended to reduce road density and traffic volumes.

Noise reduction techniques and designs are recommended to reduce the impact of sound to wildlife.

G.1.5 Visual Resource Management Class II and III Areas Management

Bury distribution power lines and flow lines in or adjacent to access roads is recommended to reduce visible ROW corridors and to reduce total surface disturbance.

Repeat elements of form, line, color, and texture to blend facilities and access roads with the surrounding landscape.

Paint all above-ground structures, production equipment, tanks, transformers, and insulators not subject to safety requirements to blend with the natural color of the landscape, using paint that is a non-reflective "standard environmental color" selected by the BLM authorized officer.

Avoid facility placement on steep slopes, ridge tops, and hilltops to reduce visibility from below.

Screen facilities from view by placing facilities behind topographic or vegetation features.

Follow contours of the land when selecting locations for access roads and well pads to reduce unnecessary disturbance and increase reclamation success.

Reclaim unnecessary access roads as soon as possible to the original contour.

Use road surfacing of a similar color to adjacent dominant soil and vegetation colors.

Avoid locating pads in areas visible from primary roads and highways.

Use subsurface or low-profile facilities to prevent protrusion above the horizon line when viewed from any primary road or highway.

Locate wells away from prominent features, such as rock outcrops.

Use of submersible pumps and partial or below-grade wellheads is recommended in VRM Class II or III areas.

G.2 Site Location and Pre-Construction BMPs

Plans of Development (PODs) are encouraged to minimize unnecessary disturbance. Field development plans should address sensitive area avoidance or mitigation, potential road, utility, and well locations, road classes, and plans for interim and final reclamation.

Dual completion, re-completion, commingling (both down-hole and at the surface), the drilling of multiple wells from a single location, and centralized tank batteries will be encouraged and permitted in order to reduce the number of new well pads and consequent surface disturbance. This will reduce impacts to soil and vegetation, reduce air impacts caused by dust, reduce habitat fragmentation, and offer less opportunity for the spread of noxious weeds.

Operators will be encouraged to unitize in areas of dense development to increase management efficiency and facilitate operations in sensitive areas. Unitization is the process by which multiple lease holders in a geographic area share facilities so as to reduce surface disturbance caused by multiple duplicate facilities such as pipelines and compressor stations.

The holder shall protect existing telephone, telegraph, and transmission lines, roads, trails, fences, ditches, and like improvements during construction, operation, maintenance, and termination of the system. Holder shall not obstruct any road or trail without the prior approval of the authorized officer. Damage caused by holder to utilities and improvements shall be promptly repaired by holder to a condition which is satisfactory to the authorized officer.

Pipelines associated with oil and gas activities will follow existing roads and rights-of-way corridors where possible to minimize surface disturbance.

The burial of pipelines associated with oil and gas exploration, development, production, and transportation is preferred. Pipelines greater than 4 inches in nominal diameter, all injection lines, and gas lines with a pressure greater than 125 pounds per square inch must be buried and constructed of steel. The use of plastic pipe will be approved by the authorized officer on a case-by-case basis.

Holder is responsible to contact the grazing lessee(s) named below, prior to crossing any fence on public land or any fence between public and private land, and to offer the lessee(s) an opportunity to be present when the fence cut(s) is made so the lessee(s) can be satisfied that the fence is adequately braced and secured.

No gravel or other related minerals from new or existing pits on Federal land will be used in construction of roads, well sites, etc., without prior approval from the Surface Managing Agency.

G.3 Construction BMPs

G.3.1 Earth Work

With the overall objective of minimizing surface disturbance and retaining land stability and productivity, the operator shall utilize equipment that is appropriate to the scope and scale of work being done for roads and well pads (utilize equipment no larger than needed for the job).

Reduce the size of the well pad whenever possible, without compromising safety.

The holder shall remove only the minimum amount of vegetation necessary for the construction of structures and facilities. Topsoil shall be conserved during excavation and reused as cover on disturbed areas to facilitate regrowth of vegetation.

Only excavate topsoil and subsoil where it is absolutely necessary. Consider brush-beating, mowing, and/or parking on vegetation for surface disturbing activities. No construction or routine maintenance activities shall be performed during periods when excessive ruts will be created because the soil is too wet to adequately support construction equipment.

Consider measures to reduce the size of well pad needed for operations, such as using closed-loop drilling with tanks instead of a lined earthen reserve pit.

Construct reserve pits within the cut side of the well pad in order to facilitate reclamation.

Disturbed areas should be contoured to blend with the natural topography. Blending is defined as reducing form, line, and color contrast associated with the surface disturbance. Disturbance should be contoured to match the original topography, where matching is defined as reproducing the original topography and eliminating form, line, and color caused by the disturbance as much as possible

Remove all available topsoil from constructed well locations including areas of cut and fill, and stockpile at the site. Topsoil will be pushed from the center of the pad outwards to create a topsoil berm around the edge of the pad. This reduces the amount of soil movement necessary to create stockpiles. Topsoil will also be salvaged for use in reclamation on all other areas of surface disturbance (roads, etc.). Clearly segregate topsoil from excess spoil material. Any topsoil stockpiled for one year or longer will be signed and stabilized with annual ryegrass or other suitable cover crop.

The operator will not push soil material and overburden over side slopes or into drainages. All soil material disturbed will be placed in an area where it can be retrieved without creating additional undue surface disturbance and where it does not impede watershed and drainage flows.

During construction, emissions of particulate matter from well pad and road construction will be minimized by application of water or other non-saline dust suppressants with at least 50 percent control efficiency. Dust inhibitors (surfacing materials, non-saline dust suppressants, and water) will be used as necessary on unpaved roads that present a fugitive dust problem. The use of chemical dust suppressants on public surface will require prior approval from the BLM Authorized Officer.

G.3.2 Site maintenance

Operators may not leave unattended personal property on public lands administered by the BLM for a period of more than 48 hours without written permission of the authorized officer, with the exception that vehicles may be parked in designated parking areas for up to 14 consecutive days. Unattended personal property is subject to disposition under the Federal Property and Administrative Services Act of 1949 as amended.

All unguarded pits (reserve/production/blow) containing liquids will be fenced with woven wire. Drilling pits will be fenced on three sides and once the rig leaves location, the fourth side will be fenced. All fencing must be a legal fence in accordance with New Mexico State Law. Liquids in pits will be allowed to evaporate, or be properly disposed of, before pits are filled and recon toured. Under no circumstances will pits be cut and drained. Aeration of pit fluids must be confined within pit area. Upon completion of the well the reserve pit will be covered with screening or netting and remained covered until the pit is reclaimed. All production pits will be covered with screening or netting.

At a minimum, all pits must meet NMOCD “Pit Rule” and guidance requirements for maintenance and closure.

No excess equipment may be stored on the well site.

G.3.3 Spill Prevention and Containment

Oil and fuel for equipment and vehicles must be carefully handled and disposed to prevent soil or water contamination.

Develop a spill contingency plan which identifies all actions to be taken in the event of a chemical spill including phone numbers for Federal, State, and local agencies which must be notified.

Berms or firewalls will be constructed around all storage facilities sufficient in size to contain the storage capacity of tanks, or the combined capacity of tanks if a rupture could drain more than one tank. Berm walls will be compacted with appropriate equipment to assure proper construction.

Store chemicals within secondary containment in case of a spill

Any spilled or leaked oil, produced water or treatment chemicals must be reported in accordance with NTL-3A and immediately cleaned up in accordance with BLM requirements. This includes clean-up and proper disposition of soils contaminated as a result of such spills/leaks.

The operator and their contractors shall ensure that all use, production, storage, transport and disposal of hazardous and extremely hazardous materials associated with the drilling, completion and production of these wells will be in accordance with all applicable existing or hereafter promulgated federal, state and local government rules, regulations and guidelines. All project-related activities involving hazardous materials will be conducted in a manner to minimize potential environmental impacts. In accordance with OSHA requirements, a file will be maintained onsite containing current Material Safety Data Sheets (MSDS) for all chemicals,

compounds and/or substances that are used in the course of construction, drilling, completion and production operations.

G.3.4 Waste Management

Well area and lease premises will be maintained in a workmanlike manner with due regard to safety, conservation and appearance.

All liquid waste, completion fluids, and drilling products associated with oil and gas operations will be contained and then buried in place, or removed and deposited in an approved disposal site.

Waste materials shall be disposed of promptly at an appropriate waste-disposal site. "Waste" means all discarded matter, including human waste, trash, garbage, refuse, oil drums, petroleum products, ashes, and equipment.

Cans, rubbish, and other trash shall not be discarded, buried, or dumped on public lands or related waters. Wet garbage such as egg shells, orange peels, leftover solid food, bones, melon rinds, etc., must be carried out. Trash cleanup at campsites and day use areas will include all litter or discarded items including small items such as bottle caps and cigarette butts.

G.4 Access Road BMPs

G.4.1 Road Design & Planning

Base road design criteria and standards on road management objectives such as traffic requirements of the proposed activity and the overall transportation objectives, and minimizing damage to the environment.

Construction and other project-related traffic will be restricted to approved routes. Cross-country vehicle travel will not be allowed

Design roads to minimize total disturbance, to conform to the surrounding topography, and to minimize disruption of natural drainage patterns.

Locate roads on stable terrain such as ridge tops, natural benches, and flatter transitional slopes near ridges and valley bottoms and moderate side slopes and away from slumps, slide prone areas, concave slopes, clay beds, and where rock layers dip parallel to the slope. Locate roads on well-drained soil types and avoid wet areas.

Minimize the number of unimproved stream crossings. When a culvert or bridge is not feasible, locate drive-through (low water crossings) on stable rock portions of the drainage channel. Harden crossings with the addition of rock and gravel if necessary. Use angular rock if available.

Those segments of road where grade is in excess of ten percent for more than 300 feet shall be designed by a professional engineer.

Companies will contact the appropriate county transportation department to pursue development of maintenance agreements to ensure county roads are adequately maintained for the projected increase in use.

G.4.2 Road Construction

Construct roads for surface drainage by using out-slopes, crowns, grade changes, drain dips, water bars and/or in-sloping to ditches as appropriate.

Construct roads when soils are dry and not frozen. When soils or road surfaces become saturated to a depth of 3 inches, BLM-authorized activities should be limited or cease unless otherwise approved by the authorized officer.

Retain vegetation on cut slopes unless it poses a safety hazard or restricts maintenance activities. Roadside brushing of vegetation should be done in a way that prevents disturbance to root systems and visual intrusions (i.e., avoid using excavators for brushing).

Retain adequate vegetation between roads and streams to filter runoff caused by roads.

Strip and stockpile topsoil ahead of construction of new roads, if feasible. Reapply soil to cut and fill slopes prior to revegetation

Establish adapted vegetation on all cuts and fill immediately following road construction and maintenance.

The minimum diameter for culverts will be 18 inches. However, all culverts will be appropriately sized in accordance with standards in BLM Manual 9113.

Culverts will be placed on channel bottoms on firm, uniform beds, which have been shaped to accept them, and aligned parallel to the channel to minimize erosion. Backfill will be thoroughly compacted.

G.4.3 Road Maintenance

Roads shall be maintained in order to preserve the functioning of drainage features, culverts, and surfacing.

Consider improving inadequately surfaced roads that are to be left open to public traffic during wet weather with gravel or pavement to minimize sediment production and maximize safety.

Replace undersized culverts and repair or replace damaged culverts and downspouts. Provide energy dissipaters at culvert outlets or drainage dips.

G.4.4 Road Reclamation

Any roads used exclusively for construction purposes shall be adequately closed to all vehicular travel, and rehabilitated after completion of construction. The manner of closure shall be determined in conjunction with a representative of the authorized officer.

At the time that final well pad reclamation takes place, the access road and any associated ROW corridors will be recontoured to match the surrounding topography, ripped to a depth of 24 inches, installed with water bars, and seeded with a BLM-designated seed mixture.

All ripped surfaces are to be protected from vehicular travel by erection of a sturdy physical barrier, such as a dead-end ditch with an earthen barricade, gates, large berms, trenches, logs, stumps, brush piles or rock boulders to accomplish permanent closure. The operator is responsible for preventing vehicle travel on reclaimed areas.

If road reclamation has not been achieved after two growing seasons, re-seeding may be necessary.

G.5 Interim Reclamation BMPs

Interim Reclamation – Includes disturbed areas that may be redisturbed during operations and will be redisturbed at final reclamation to achieve restoration of the original landform and a natural vegetative community. Interim reclamation will be judged successful when the BLM authorized officer determines that disturbed areas not needed for active, long-term production operations or vehicle travel have been recontoured, protected from erosion, and revegetated with a self-sustaining, vigorous, diverse, native (or as otherwise approved) plant community sufficient to minimize visual impacts, provide forage, stabilize soils, and impede the invasion of noxious, invasive, and non-native weeds.

Interim reclamation of the well and access road will begin as soon as practicable after a well is placed in production. Interim reclamation will include road cuts and fills and will extend to within close proximity of the wellhead and production facilities.

Facilities will be grouped on the pads to allow for maximum interim reclamation. Production facilities (including dikes) must be placed on the cut portion of the location and a minimum of 15 feet from the toe of the back cut unless otherwise approved by the BLM Authorized Officer

Salvaging and spreading topsoil will not be performed when the ground or topsoil is frozen or too wet to adequately support construction equipment or so dry that dust clouds greater than 30 feet tall are created. If such equipment creates ruts in excess of four (4) inches deep, the soil will be deemed too wet.

G.6 Production and Maintenance BMPs

At a minimum, all pits must meet NMOCD “Pit Rule” and guidance requirements for maintenance and closure.

Mud and blow pits will be constructed so as not to leak, break or allow discharge of liquids or produced solids. At least half of the capacity of the reserve pit must be in cut. The top of the outside wall of reserve pit should be smoothed-off with a minimum of one blade width. The pit should have adequate capacity to maintain 2 feet of free board. Pits are not to be located in natural drainages. Pit walls are to be "walked down" by a crawler type tractor following construction and prior to usage. Any plastic material used to line pits must be removed to below-

ground level before pits are covered. The final grade of reserve pit (after reclamation) shall allow for drainage away from pit area.

Remote monitoring of wells and related production equipment is encouraged to reduce wildlife disturbance and road deterioration.

Minimize noise in sensitive wildlife habitats. Consider using noise reduction mufflers, earthen berms, walls, sheds, and/or distance to reduce sound levels. Consider requiring vent stack/exhaust stack coverings on heater-treater/separator units to prevent wildlife from entering.

All production related pits and tanks, regardless of size, will be covered and fenced to exclude wildlife.

G.7 Final Reclamation BMPs

If necessary after reclamation, a BLM-standard barbed wire fence will be constructed to exclude livestock for a minimum of at least two successful growing seasons.

Reclaimed soil will be free of contaminants and will have adequate depth, texture, and structure to provide for successful vegetation reclamation. Vegetation reclamation will be considered successful when healthy, mature perennials are established with a composition and density that closely approximates the surrounding vegetation as prescribed by the BLM, and the reclamation area is free of noxious weeds.

Seeding shall be accomplished between July 1 and September 15 (later date may be extended on a case-by-case basis with authorized officer approval).

For drill seeding, compacted areas shall be ripped to a depth of 24 inches and disked to a depth of six inches before seeding. Seed with a disk-type drill with two boxes for various seed sizes. The drill rows shall be eight to ten inches apart. The seed shall be planted at not less than one-half inch deep or more than one inch deep. The seeder shall be followed with a drag, packer, or roller to ensure uniform coverage of the seed, and adequate compaction. Drilling shall be done on the contour where possible, not up and down the slope.

For broadcast seeding, the site shall be ripped to a depth of 24 inches, then a pitter, dimpler, or similar equipment should be used to create depressions in the soil to catch seeds and water. The teeth of a track hoe bucket or the tracks of a dozer or backhoe can also be used. Seeding is accomplished by use of a cyclone hand seeder or similar broadcast seeder. Seed shall then be covered to the depth described above by whatever means is practical, i.e. hand raked. If the seed is not covered, the prescribed seed mixture amount (pounds/acre/PLS) will be doubled.

Seeding shall be repeated if a satisfactory stand is not obtained as determined by the authorized officer upon evaluation after the second growing season.

H FLUID MINERAL SPECIAL LEASE STIPULATIONS

H.1 Background

When the BLM offers a parcel of land for lease, the BLM can attach special lease stipulations that augment the protections offered by the standard lease terms and conditions (BLM Form 3100-11). A lease stipulation is an enforceable term of the lease contract and supersedes any inconsistent provisions of the standard lease form. Only lease stipulations that have been reviewed and approved via the land use planning process may be attached to fluid mineral leases. The stipulations currently used by the RPFO are described in the 1992 Oil and Gas Amendment. For the revision of this RMP, resource specialists have revised the current stipulations in order to provide protection of other resources and resource uses.

H.1.1 Standard Lease Terms and Conditions

Standard lease terms and conditions can be found on the "Offer to Lease and Sale for Oil and Gas" form, (BLM Form 3100-11), and in 43 CFR Part 3101—Issuance of Leases. The provisions most relevant to surface management of fluid mineral development are the following:

- 43 CFR Part 3101.1-2: "…measures shall be deemed consistent with lease rights granted provided that they do not: require relocation of proposed operations by more than 200 meters; require that operations be sited off the leasehold; or prohibit new surface disturbing operations for a period in excess of 60 days in any lease year."
- Sec. 6, BLM Form 3100-11: "Lessee must conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users…"
- Sec. 12, BLM Form 3100-11: "At such time as all or portions of this lease are returned to the lessor, lessee must…reclaim the land as specified by lessor…"

H.1.2 Types of Lease Stipulations

A "no surface occupancy," or NSO, stipulation precludes any surface disturbance within the area specified in the stipulation. The fluid minerals within the lease may be accessed by directional drilling from areas outside the leasehold that are open to surface occupancy. NSO stipulations are considered to be a major constraint on fluid mineral leasing and development.

A "controlled surface use," or CSU, stipulation allows surface disturbance within the specified area, but requires the lessee to comply with specific measures beyond standard terms and conditions in order to provide adequate protection for other resources or resource uses. The type of specific requirements will vary depending upon the resource being protected and are described in the text of each stipulation. CSU stipulations are a moderate constraint on fluid mineral leasing and development.

A "timing limit stipulation," or TLS, precludes surface-disturbing activities during a particular time frame in order to protect a particular resource. The specified time frame and the location for which the time frame applies will vary depending upon the resource being protected. TLS

stipulations are a moderate constraint on fluid mineral leasing and development. Overlapping moderate constraints (CSU or TLS) are also considered a major constraint to fluid mineral leasing and development.

A "lease notice," or LN, may also be attached to a lease, but is only informational and has no legal consequences. A LN may be attached to a lease by the authorized officer to "convey certain operational, procedural, or administrative requirements relative to lease management within the terms and conditions of the standard lease form." (43 CFR Part 3101.1-3)

H.1.3 Waivers, Exceptions and Modifications

Waivers, exceptions, and modifications provide a means by which adaptive management can be applied to oil and gas leasing and development. A stipulation may be subject o modification or waiver only if the authorized officer determines that the factors leading to its inclusion in the lease have changed sufficiently to make the protection provided by the stipulation no longer justified or if proposed operations would not cause unacceptable impacts (43 CFR Part 3101.1-4). The stipulations listed in a land use plan should include the criteria for granting waivers, exceptions, or modifications, and whether public review is required. Waivers, exceptions, and modifications are described in detail in IM-2008-032, Exceptions, Waivers, and Modifications of Fluid Minerals Stipulations and Conditions of Approval, and Associated Rights-of-way Terms and Conditions.

Exception: A one-time exemption for a particular site within the leasehold; exceptions are determined on a case-by-case basis; the stipulation continues to apply to all other sites within the leasehold. An exception is a limited type of waiver.

Modification: A change to the provisions of a lease stipulation, either temporarily or for the term of the lease. Depending on the specific modification, the stipulation may or may not apply to all sites within the leasehold to which the restrictive criteria are applied.

Waiver: A permanent exemption from a lease stipulation. The stipulation no longer applies anywhere in the leasehold.

In the past, waivers, exceptions, and modifications have been used to reduce restrictions on fluid mineral development. However, in accordance with IM-2010-117, Oil and Gas Leasing Reform, waivers, exceptions, and modifications should also now be used to allow for increased levels of resource protection, should changing circumstances warrant it. The stipulations below reflect this change.

It is the responsibility of the lessee to provide any surveys, environmental analyses, protection plans, or similar products required in lease stipulations. Any such products should be completed by an individual qualified to carry out the needed analysis.

H.1.4 Existing Leases

The lease stipulations proposed here cannot be retroactively applied to existing leases, although best management practices and/or conditions of approval may be utilized to address and minimize impacts to resources of concern. Leases expire after 10 years if not extended by production of oil or gas (or other various circumstances). If a lease expires and the parcel is

offered again, the proposed lease stipulations approved in the RMP revision would apply. Leases issued prior to the approval of the revised RPFO RMP may have stipulations attached that came from the 1992 Oil and Gas Amendment. Those lease stipulations, if attached, will continue to apply to those leases until lease expiration.

H.2 RPFO Proposed Lease Stipulations

Lease stipulations proposed in Alternatives B, C, and D are listed below. For a complete description of the lease stipulations in Alternative A (No Action), please see the 1992 Oil and Gas Amendment.

H.2.1 Wildlife and Sensitive Species Stipulations

H.2.1.1 CSU—Designated Special Status Species Measures (Alts. B, C)

Surface-disturbing and disruptive activities may be controlled or excluded within 0.25 mile of special status species populations or the activity delayed 90 days within identified habitat (including designated critical habitat for threatened and endangered species) or active reproductive grounds of species with current or proposed federal, state, or BLM protection.

Objective: To maintain habitat for designated special status species and comply with the Endangered Species Act.

Exception: The authorized officer may grant an exception if an environmental review determines that the action, as proposed or conditioned, would not impair the function or utility of the site for current or subsequent use by designated sensitive species. The exception may apply to either the boundary of the affected area or the duration of the restriction if an environmental analysis determines that the special status species use an area smaller, or larger, than the 0.25 mile radius, or if the species are present for a period shorter or longer than 90 days. The burden of providing information to support this determination will be borne by the lessee.

Modification: The authorized officer may modify the area subject to the stipulation, or the duration of the stipulation, if an environmental analysis finds that a portion of the CSU area is nonessential, or that the proposed action could be conditioned so as not to impair the function or utility of the site for current or subsequent use by special status species. This modification could either reduce or expand the area and duration of the restrictions. The burden of providing information to support this determination will be borne by the lessee.

Waiver: The stipulation may be waived if, after consulting with the BLM Wildlife Biologist State Office Program Lead, the New Mexico Department of Game and Fish, and the U.S. Fish and Wildlife Service, it is determined that the described lands are incapable of serving as habitat for special status species and that these areas no longer warrant consideration as special status species habitat.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.1.2 CSU—Rare Plant Resource Values (alternatives vary by application)

Portions of the lease area contain rare plant species that require special protection to prevent further degradation or damage and to promote population viability. These protections may include, but are not limited to, conducting surveys for plant species prior to commencement of any surface disturbing activities; fencing or netting to protect plant populations; and timing restrictions.

Objective: To protect rare plant species population viability in areas managed for this resource value (including, but not limited to, ACECs managed for rare plant values), and to comply with the Endangered Species Act and BLM policy as they pertain to rare plant species.

Exception: An exception to this condition may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action can be adequately mitigated.

Modification: The boundaries of the affected area may be modified if the authorized officer determines that a portion of the lease area no longer contains rare plants. The burden of providing information to support this determination will be borne by the lessee. The boundaries of the affected area may also be expanded if the authorized officer determines that such measures are necessary to provide adequate protection for rare plant resources.

Waiver: The boundaries of the affected area may be modified if the authorized officer determines that the lease area no longer contains rare plant species. The burden of providing information to support this determination will be borne by the lessee. The boundaries of the affected area may also be expanded if the authorized officer determines that such measures are necessary to provide adequate protection for rare plant species.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.1.3 NSO—Rare Plant Resource Values (alternatives vary by application)

No surface occupancy will be allowed within the lease area in order to protect rare plant species
Objective: To protect rare plant species population viability in areas managed for this resource value (including, but not limited to, ACECs managed for rare plant values), and to comply with the Endangered Species Act and BLM policy as they pertain to rare plant species.

Exception: An exception to this condition may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action can be adequately mitigated.

Modification: The boundaries of the affected area may be modified if the authorized officer determines that a portion of the lease area no longer contains rare plants. The burden of providing information to support this determination will be borne by the lessee. The boundaries of the affected area may also be expanded if the authorized officer determines that such measures are necessary to provide adequate protection for rare plant resources.

Waiver: The boundaries of the affected area may be modified if the authorized officer determines that the lease area no longer contains rare plant species. The burden of providing information to support this determination will be borne by the lessee. The boundaries of the affected area may also be expanded if the authorized officer determines that such measures are necessary to provide adequate protection for rare plant species.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.1.4 TLS—Raptor Nests (Alts. B, C, D)

Prior to survey/flagging locations for pads, routes for roads, and any other preliminary activity, the project area will be surveyed for raptor nests. Surveys will be conducted by professional biologists approved by the Authorized Officer. All raptor nests and bald eagle wintering areas will be avoided within a distance and time frame appropriate for the species, as specified by the Authorized Officer. These distances range from 0.25 mile to 1.0 mile and the time restrictions range from January 1 to July 31.

Long-term surface use activities will not be allowed within the species-specific spatial buffer zone of active nests. Short-term activities will be avoided within the species-specific spatial buffer zones during the corresponding time restriction. All other raptor species nests will be avoided by the spatial buffer zone specified by the Authorized Officer, regardless of the duration of the activity.

A short-term activity is defined as an activity which would begin outside of a given breeding season and end prior to initiation of a given breeding season. A long-term activity is defined as an activity which would continue into or beyond a given nesting/breeding season. An active nest is defined as any nest that has been occupied in the last seven years. A nest will be determined active or inactive by the Authorized Officer.

Objective: To protect raptor nesting activity, and to comply with the Migratory Bird Treaty Act.

Exception: An exception to this condition may be granted by the authorized officer if the lessee submits a plan which demonstrates that the impacts from the proposed action can be adequately mitigated. The exception may apply to either the boundary of the affected area or the duration of the restriction if an environmental analysis determines that the buffer area required for a raptor nest is smaller or larger than the buffer radius specified in the original stipulation, or if the raptor nesting period is different than the period specified in the original stipulation. The burden of providing information to support this determination will be borne by the lessee.

Modification: The authorized officer may modify the area subject to the stipulation, or the duration of the stipulation, if an environmental analysis finds that a portion of the TLS area is nonessential, or that the proposed action could be conditioned so as not to impair the function or utility of the area for current or subsequent use by nesting raptors. This modification could either reduce or expand the area and duration of the restrictions. The burden of providing information to support this determination will be borne by the lessee.

Waiver: The stipulation may be waived if, after consulting with the New Mexico Department of Game and Fish and the BLM Wildlife Biologist State Office Program Lead, it is determined that

the described lands are incapable of serving as raptor nesting areas and that these areas no longer warrant consideration as raptor nesting habitat.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.1.5 CSU—Prairie Dog Towns (Alts. B, C, D)

Surface-disturbing and disruptive activities may be controlled or excluded (Alt. B: 0.5 mi. from; Alt. C: 0.25 mi. from; Alt. D: within) prairie dog towns, if an activity would adversely impact prairie dogs and/or associated species.

Objective: To protect prairie dog colonies and habitat for associated species.

Exception: An exception to this condition may be granted by the authorized officer if the lessee submits a plan which demonstrates that the impacts from the proposed action can be adequately mitigated. The exception may apply to the boundary of the affected area if an environmental analysis determines that the area required to protect a prairie dog colony is smaller or larger than the area specified in the original stipulation. The burden of providing information to support this determination will be borne by the lessee.

Modification: The boundaries of the affected area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting prairie dogs. The burden of providing information to support this determination will be borne by the lessee. The boundaries of the affected area may also be expanded if the authorized officer determines that such measures are necessary to provide adequate protection for prairie dog populations.

Waiver: This stipulation may be waived if, after consulting with the New Mexico Department of Game and Fish and the BLM Wildlife Biologist State Office Program Lead, it is determined that the described lands are no longer occupied by prairie dogs and thus do not warrant consideration for protection.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.1.6 TLS—Big Game Winter Range (Alts. B, C)

Surface-disturbing and disruptive activities are prohibited from November 15 to April 30 within winter range for mule deer, elk and antelope. Travel on identified designated roads may include these timing restrictions or limited site visits.

Objective: To protect mule deer, elk, and antelope winter range from disturbance during the winter use season, and to facilitate long-term maintenance of wildlife populations.

Exception: An exception to this condition may be granted by the authorized officer if the lessee submits a plan which demonstrates that impacts from the proposed action can be adequately mitigated. The exception may apply to either the boundary of the affected area or the duration of the restriction if an environmental analysis determines that the area required for big game winter range is smaller or larger than the area specified in the original stipulation, or if the time period

when the range is occupied by big game is different than the period specified in the original stipulation. The burden of providing information to support this determination will be borne by the lessee.

Modification: The boundaries of the affected area may be modified if the authorized officer determines that the area utilized as winter range by big game species has shifted. The dates for the timing restriction may be modified if new wildlife use information indicates that the November 15 to April 30 dates are not valid for the area. The burden of providing information to support this determination will be borne by the lessee.

Waiver: This stipulation may be waived if, after consulting with the New Mexico Department of Game and Fish and the BLM Wildlife Biologist State Office Program Lead, it is determined that the described lands are no longer occupied by big game species and thus do not warrant consideration for protection.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.1.7 TLS—Big Game Fawning/Calving Range (Alts. B, C)

Surface-disturbing and disruptive activities are prohibited at the times specified below within fawning/calving habitat for mule deer, elk, and antelope. Travel on identified designated roads may include these timing restrictions or limited site visits.

- Mule Deer: May 1 to August 31
- Elk: May 1 to June 30
- Antelope: May 1 to July 15

Objective: To protect mule deer, elk, and antelope fawning/calving habitat from disturbance, and to facilitate long-term maintenance of wildlife populations.

Exception: An exception to this condition may be granted by the authorized officer if the lessee submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated. The exception may apply to either the boundary of the affected area or the duration of the restriction if an environmental analysis determines that the area required for big game fawning/calving range is smaller, larger, or shifted relative to the area specified in the original stipulation, or if the time period when the range is occupied by fawning/calving big game is different than the period specified in the original stipulation. The burden of providing information to support this determination will be borne by the lessee.

Modification: The boundaries of the affected area may be modified if the authorized officer determines that the area utilized by fawning/calving big game species has shifted. The dates for the timing restriction may be modified if new wildlife use information indicates that the specified dates are not valid for the area. The burden of providing information to support this determination will be borne by the lessee.

Waiver: This stipulation may be waived if, after consulting with the New Mexico Department of Game and Fish and the BLM Wildlife Biologist State Office Program Lead, it is determined that

the described lands are no longer occupied by fawning/calving big game species and thus do not warrant consideration for protection.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.1.8 CSU—Wildlife Habitat Projects (Alts. B, C)

Surface-disturbing or long-term noise producing activities which exceed a noise level of 75dbA, measured at the perimeter of the 200-meter protective spatial buffer, will not be allowed within 200 meters of existing or planned wildlife habitat improvement projects. If the 75dbA noise level is determined to not provide adequate protection from the auditory impact created by lease operations, a stricter level shall be applied as a condition of approval for lease operations. A more restrictive spatial buffer may be applied where the 200-meter spatial buffer has been documented to not provide adequate protection. Use and occupancy within the 200-meter spatial buffer will be authorized only when lessee/ operator demonstrates that the area is essential for operations and when the lessee/operator submits a satisfactory surface use and operations plan, which adequately protects resources of concern.

Objective: Protection of wildlife habitat enhancement projects for purposes of preventing further habitat fragmentation and loss of use of otherwise suitable/effective habitat.

Exception: An exception to this condition may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the affected area may be modified if the authorized officer determines that portions of the area no longer contain wildlife habitat project areas. The boundaries of the affected area may also be expanded if the authorized officer determines that such measures are necessary to provide adequate protection for wildlife enhancement projects.

Waiver: This condition may be waived if the authorized officer determines that the affected area no longer contains wildlife habitat project areas. The boundaries of the affected area may also be expanded if the authorized officer determines that such measures are necessary to provide adequate protection for wildlife enhancement projects.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.1.9 CSU—Wildlife Resource Values (application varies by alternative)

All or portions of the lease area contain special wildlife habitat features that require special protection to prevent further degradation or damage. These protections may include, but are not limited to, conducting surveys for plant, animal, or other species prior to commencement of any surface disturbing activities; the inclusion of noise abatement structures, additional fencing or netting; and timing restrictions.

Applications for surface-disturbing or long-term noise producing activities, which exceed a noise level of 75dbA at the edge of the well pad, will be authorized only when lessee/operator

demonstrates that the area is essential for operations and when the lessee/operator submits a satisfactory surface use and operations plan that provides protection for these special resource values. If the 75dbA noise level is determined to not provide adequate protection from the auditory impact created by lease operations, a stricter level shall be applied as a condition of approval for lease operations. The BLM Authorized Officer will work with the lease holder on a case-by-case basis to achieve an acceptable level of noise mitigation.

Objective: To protect wildlife habitat and maintain wildlife population viability in areas managed for this resource value (including, but not limited to, ACECs managed for this value).
Exception: An exception to this condition may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action can be adequately mitigated.

Modification: The boundaries of the affected area may be modified if the authorized officer determines that portions of the lease area no longer contain wildlife resource values. The burden of providing information to support this determination will be borne by the lessee. The boundaries of the affected area may also be expanded if the authorized officer determines that such measures are necessary to provide adequate protection for wildlife resource values.

Waiver: The boundaries of the affected area may be modified if the authorized officer determines that the lease area no longer contains wildlife resource values. The burden of providing information to support this determination will be borne by the lessee. The boundaries of the affected area may also be expanded if the authorized officer determines that such measures are necessary to provide adequate protection for wildlife resource values.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.1.10 NSO—Wildlife Resource Values (application varies by alternative)

Within areas managed for wildlife resource values, surface-disturbing activities will be prohibited.

Objective: To protect wildlife habitat and maintain wildlife population viability in areas managed for this resource value (including, but not limited to, ACECs managed for this value).
Exception: An exception to this condition may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action can be adequately mitigated.

Modification: The boundaries of the affected area may be modified if the authorized officer determines that portions of the lease area no longer contain wildlife resource values. The burden of providing information to support this determination will be borne by the lessee. The boundaries of the affected area may also be expanded if the authorized officer determines that such measures are necessary to provide adequate protection for wildlife resource values.

Waiver: The boundaries of the affected area may be modified if the authorized officer determines that the lease area no longer contains wildlife resource values. The burden of providing information to support this determination will be borne by the lessee. The boundaries

of the affected area may also be expanded if the authorized officer determines that such measures are necessary to provide adequate protection for wildlife resource values.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.2 Riparian Area Stipulations

H.2.2.1 NSO—Streams, riparian & wetland areas, & 100-year floodplains (Alt. B)

Surface-disturbing activities are prohibited within 100-year floodplains or within 0.25 mi. of the channels of ephemeral, intermittent, and perennial streams, or within 0.25 mi. of the outer margins of riparian and wetland areas.

Objective: To protect the unique biological and hydrological features associated with steams, riparian/wetland areas, and 100-year floodplains.

Exception: An exception to this condition may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated. Mitigation may include a bunker or dual-walled drum to prevent/contain any potential spill. An exception may also be allowed when the surface of the site is 20 feet higher than the channel (out of the floodplain). The boundary of the affected area may also be expanded if the authorized officer determines that a larger area than is specified in the original lease stipulation requires no surface occupancy in order to protect streams, riparian areas, wetland areas, and the 100-year floodplain from the impacts of development.

Modification: The area affected by this condition may be modified by the authorized officer if it is determined that portions of the area do not include riparian/wetland areas. The burden of providing information to support this determination will be borne by the lessee. The boundary of the affected area may also be expanded if the authorized officer determines that a larger area than is specified in the original lease stipulation requires no surface occupancy in order to protect streams, riparian areas, wetland areas, and the 100-year floodplain from the impacts of development.

Waiver: This condition may be waived by the authorized officer if it is determined that the affected area does not include streams or riparian/wetland areas. The burden of providing information to support this determination will be borne by the lessee. The boundary of the affected area may also be expanded if the authorized officer determines that a larger area than is specified in the original lease stipulation requires no surface occupancy in order to protect streams, riparian areas, wetland areas, and the 100-year floodplain from the impacts of development.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.2.2 CSU—Streams, riparian & wetland areas, & 100-year floodplains (Alt. C)

Surface-disturbing activities should be avoided within 100-year floodplains or within 0.25 mi. of the channels of ephemeral, intermittent, and perennial streams, or within 0.25 mi. of the outer margins of riparian and wetland areas.

Long-term noise-producing activities which exceed a noise level of 75 A-weighted decibels (75dbA), measured at the perimeter of a 400-meter protective spatial buffer, will not be allowed within 400 meters of riparian areas (springs, seeps, tanks, rivers, streams, playas, canyon bottoms, and floodplains). If the 75dbA noise level is determined to not provide adequate protection from the auditory impact created by lease operations, a stricter level shall be applied prior to authorizing lease operations. The BLM Authorized Officer will work with lease holder on a case-by-case basis to achieve an acceptable level of noise mitigation. A more restrictive spatial buffer may be applied where the 400-meter spatial buffer has been documented to not provide adequate protection.

Objective: To protect the unique biological and hydrological features associated with steams, riparian/wetland areas, and 100-year floodplains, and the protection of riparian habitat for purposes of preventing further habitat fragmentation and loss of use of otherwise suitable/effective habitat.

Exception: An exception to this condition may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action on soil, water, and wildlife resources can be adequately mitigated. Mitigation may include a bunker or dual-walled drum to prevent/contain any potential spill, noise abatement, or other measures. An exception may also be allowed when the surface of the site is 20 feet higher than the channel (out of the floodplain). The boundary of the affected area may also be expanded if the authorized officer determines that a larger area than is specified in the original lease stipulation requires no surface occupancy in order to protect streams, riparian areas, wetland areas, and the 100-year floodplain from the impacts of development.

Modification: The area affected by this condition may be modified by the authorized officer if it is determined that portions of the area do not include riparian/wetland areas. The burden of providing information to support this determination will be borne by the lessee. The boundary of the affected area may also be expanded if the authorized officer determines that a larger area than is specified in the original lease stipulation requires no surface occupancy in order to protect streams, riparian areas, wetland areas, and the 100-year floodplain from the impacts of development.

Waiver: This condition may be waived by the authorized officer if it is determined that the affected area does not include streams or riparian/wetland areas. The burden of providing information to support this determination will be borne by the lessee. The boundary of the affected area may also be expanded if the authorized officer determines that a larger area than is specified in the original lease stipulation requires no surface occupancy in order to protect streams, riparian areas, wetland areas, and the 100-year floodplain from the impacts of development.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.3 Soil and Slope Stipulations

H.2.3.1 CSU—Steep slopes, 15-30% (Alts. B, C)

Prior to surface-disturbing activities on slopes between 15% and 30%, a certified engineering and reclamation plan must be approved by the authorized officer. This plan must demonstrate how the following will be accomplished:

- Site productivity will be restored.
- Surface runoff will be adequately controlled.
- The site and adjacent areas will be protected from accelerated erosion, such as rilling, gullying, piping, slope failure, and mass wasting.
- Nearby watercourses will be protected from sedimentation. Water quality and quantity will be in conformance with state and federal water quality laws.
- Surface-disturbing activities will not be conducted during extended wet periods.
- Construction or reclamation will not be allowed when soils are frozen.
- The operator must also provide an evaluation of past practices on similar terrain and be able to demonstrate success under similar conditions.

Objective: To maintain soil productivity, provide necessary protection to prevent excessive soil erosion on steep slopes, and to avoid areas subject to slope failure, mass wasting, piping, and/or having excessive reclamation problems.

Exception: None.

Modification: The area affected by this condition may be modified by the authorized officer if it is determined that portions of the lease area do not include slopes between 15% and 30%. The burden of providing information to support this determination will be borne by the lessee.

Waiver: This condition may be waived by the authorized officer if it is determined that the lease area does not include slopes between 15% and 30%. The burden of providing information to support this determination will be borne by the lessee.

Modification or waiver of this stipulation will require a NEPA analysis and 15-day public review.

H.2.3.2 NSO—Steep slopes, greater than 30% (Alts. B, C, D)

Surface-disturbing activities are prohibited on slopes 30% and greater.

Objective: To maintain soil productivity, provide necessary protection to prevent excessive soil erosion on steep slopes, and to avoid areas subject to slope failure, mass wasting, piping, and/or having excessive reclamation problems/failure.

Exception: The authorizing officer may grant an exception to this condition for short distances (less than 300 feet) for pipelines if the operator submits a certified engineering and reclamation plan that clearly demonstrates impacts from the proposed actions are acceptable or can be adequately mitigated. This plan must include and demonstrate how the following will be accomplished:

- Site productivity will be restored.
- Surface runoff will be adequately controlled.
- The site and adjacent areas will be protected from accelerated erosion, such as rilling, gullying, piping, and slope failure and mass wasting.
- Nearby water sources will be protected from sedimentation. Water quality and quantity will be in conformance with state and federal water quality laws.
- Site-specific analysis of soil physical, chemical and mechanical (engineering) properties and behavior will be conducted.
- Surface-disturbing activities will not be conducted during extended wet periods.
- Reclamation will not be allowed when soils are frozen.
- The operator must also provide an evaluation of past practices on similar terrain and be able to demonstrate success under similar conditions.

Modification: The area affected by this condition may be modified by the authorized officer if it is determined that portions of the area do not include slopes 30% and greater. The burden of providing information to support this determination will be borne by the lessee.

Waiver: This condition may be waived by the authorized officer if it is determined that the affected area does not include slopes 30% and greater. The burden of providing information to support this determination will be borne by the lessee.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 15-day public review.

H.2.3.3 CSU—Low Reclamation Opportunity (Alts. B, C)

Surface disturbing-activities occurring in areas designated by the USDA NRCS Soil Survey as having a low restoration opportunity listed as “poor” or “not rated” may require additional measures to stabilize construction sites and reclaim sites no longer in use. (“Not rated” areas are included because these are areas that do not have topsoil.) These additional measures may increase the cost and duration of stabilization and reclamation efforts.

Objective: To prevent soil erosion and waterway sedimentation, enhance reclamation success, and limit the cumulative impact of oil and gas development by ensuring that well pads are reclaimed to BLM standards.

Exception: No exceptions may be granted because the qualifications that would meet the criteria for an exception, such as submitting a detailed reclamation plan showing how the operator intends to comply with BLM reclamation standards, would likely meet the requirements of this stipulation.

Modification: A modification may be granted if the authorized officer determines that portions of the area do not include areas classified as low reclamation opportunity (according to the USDA NRCS definition). The burden of providing information to support this determination will be borne by the lessee.

Waiver: A waiver may be granted if the authorized officer determines that the affected area does not include areas classified as low reclamation opportunity (according to the USDA NRCS definition). The burden of providing information to support this determination will be borne by the lessee.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.3.4 CSU—Biological Soil Crusts (Alt. D)

Surface-disturbing activities will be subject to limitations beyond those provided for in standard terms and conditions in areas managed for biological soil crust resources. These limitations may include, but are not limited to, restricting vehicle traffic to existing roads wherever possible, minimizing the size of well pad construction, and ceasing work when soils are wet. Any additional surveys, mitigation measures, or monitoring activities required as a result of surface-disturbing activities in these areas will be at the cost of the lessee.

Objective: The protection of biological soil crust structural integrity and diversity.

Exception: An exception may be granted if the lessee submits a plan demonstrating that the proposed action can occur without impacting biological soil crusts.

Modification: The boundary of the area affected by this stipulation may be modified if the authorized officer determines that there are no biological soil crusts within portions of the lease area. The burden of providing information to support this determination will be borne by the lessee. The boundary of the area affected may also be expanded if the authorized officer determines that such an action is required to protect biological soil resources.

Waiver: The boundary of the area affected by this stipulation may be modified if the authorized officer determines that there are no biological soil crusts within the lease area. The burden of providing information to support this determination will be borne by the lessee. The boundary of the area affected may also be expanded if the authorized officer determines that such an action is required to protect biological soil resources.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.3.5 NSO—Biological Soil Crusts (Alts. B, C)

Surface-disturbing activities will be prohibited in areas managed for biological soil crust resources.

Objective: The protection of biological soil crust structural integrity and diversity.

Exception: An exception may be granted if the lessee submits a plan demonstrating that the proposed action can occur without impacting biological soil crusts.

Modification: The boundary of the area affected by this stipulation may be modified if the authorized officer determines that there are no biological soil crusts within portions of the lease area. The burden of providing information to support this determination will be borne by the lessee. The boundary of the area affected may also be expanded if the authorized officer determines that such an action is required to protect biological soil resources.

Waiver: The boundary of the area affected by this stipulation may be modified if the authorized officer determines that there are no biological soil crusts within the lease area. The burden of providing information to support this determination will be borne by the lessee. The boundary of the area affected may also be expanded if the authorized officer determines that such an action is required to protect biological soil resources.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.4 Cultural Resource Stipulations

H.2.4.1 CSU—National Register of Historic Places (Alts. B, C, D)

Surface-disturbing activities will be subject to limitations in areas near cultural resource sites that are eligible for, or are listed on, the National Register of Historic Places.

Objective: To protect cultural resource sites that are eligible for, or listed on, the National Register of Historic Places.

Exception: An exception to this stipulation may be granted if the lessee submits a plan demonstrating that impacts from the proposed action can be adequately mitigated. The authorized officer may require the lessee to fund a cultural resources inventory to make this determination.

Modification: A modification may be granted if the authorized officer determines that portions of the lease area contain no NRHP-eligible or NRHP-listed sites. The authorized officer may require the lessee to fund a cultural resources inventory to make this determination.

Waiver: A modification may be granted if the authorized officer determines that the lease area contains no NRHP-eligible or NRHP-listed sites. The authorized officer may require the lessee to fund a cultural resources inventory to make this determination.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.4.2 CSU—Cultural Resource Values (application varies by area)

Surface disturbing activities will be subject to restrictions beyond standard lease terms and conditions within areas managed for cultural resource values. Access to the leases in these areas will be limited to routes designated in the approved permit for lease operations. Applications for

surface disturbing aspects of lease development will be evaluated for potential proximity to sensitive nationally significant cultural resources (known and suspected) and could require expanded pre-field records search, subsurface testing and/or metal detector survey in addition to routine cultural resource surface inventory for compliance with Section 106 of the NHPA, the costs of which will be borne by the lessee. This could result in extended time frames for processing authorizations for development activities. All proposed surface-disturbing aspects of lease development will be located to avoid and/or protect the cultural resources present.

Objective: Protection of highly significant and sensitive historic and prehistoric resources that might not be detected by means of standard Class III cultural resource inventory from direct and indirect effects of lease development.

Exception: Requests for exception would be based on a case-by-case basis sensitivity evaluation and on available information regarding site-specific soil stability, site probability and any proposal for alternate forms of mitigation.

Modification: The boundaries of the affected areas may be modified if the authorized officer determines that there are no significant cultural resources present in portions of the lease. The burden of providing information to support this determination will be borne by the lessee.

Waiver: None

Exception or modification of this stipulation will require a NEPA analysis and 30-day public review.

NSO—Cultural Resource Values (application varies by area)

Surface disturbing activities will be prohibited within areas managed for cultural resource values.
Objective: Protection of highly significant and sensitive historic and prehistoric resources that might not be detected by means of standard Class III cultural resource inventory from direct and indirect effects of lease development.

Exception: None.

Modification: The boundaries of the affected areas may be modified if the authorized officer determines that there are no significant cultural resources present in portions of the lease. The burden of providing information to support this determination will be borne by the lessee.

Waiver: The boundaries of the affected areas may be modified if the authorized officer determines that there are no significant cultural resources present in the lease. The burden of providing information to support this determination will be borne by the lessee.

Modification or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.5 Geological Resource Stipulations

H.2.5.1 NSO—Cave & Karst (Alt. B)

All or portions of the lease are located in a potential cave or karst occurrence area. Surface occupancy is prohibited within 200 meters of known cave entrances, passages or aspects of significant caves, or significant karst features. Within this area, cave or karst features such as sinkholes, passages, and large rooms may be encountered from the surface to a depth of as much as 2,000 feet, within areas ranging from a few acres to hundreds of acres.

Objective: To protect the structural integrity of cave and karst geologic structures and the biological diversity therein from the impacts of oil and gas development.

Exception: An exception may be granted if the lessee submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: A modification may be granted if the authorized officer determines that there are no cave or karst features within portions of the lease area. The authorized officer may require the lessee to fund a survey to make this determination.

Waiver: A modification may be granted if the authorized officer determines that there are no cave or karst features within the lease area. The authorized officer may require the lessee to fund a survey to make this determination.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 15-day public review.

H.2.5.2 CSU—Cave & Karst (Alt. C)

All or portions of the lease are located in a potential cave or karst occurrence area. Surface occupancy will be strictly controlled within 200 meters of known cave entrances, passages or aspects of significant caves, or significant karst features. Within this area, cave or karst features such as sinkholes, passages, and large rooms may be encountered from the surface to a depth of as much as 2,000 feet, within areas ranging from a few acres to hundreds of acres. Due to the sensitive nature of the cave or karst systems, special protective measures may be developed during environmental analyses and be required as part of approvals for drilling or other operations on this lease. These measures could include changes in drilling operations, special casing and cementing programs, modifications in surface activities, or other reasonable measures to mitigate impacts to cave or karst values.

Objective: To protect the structural integrity of cave and karst geologic structures and the biological diversity therein from the impacts of oil and gas development.

Exception: An exception may be granted if the lessee submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: A modification may be granted if the authorized officer determines that there are no cave or karst features within portions of the lease area. The authorized officer may require the lessee to fund a survey to make this determination.

Waiver: A modification may be granted if the authorized officer determines that there are no cave or karst features within the lease area. The authorized officer may require the lessee to fund a survey to make this determination.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 15-day public review.

H.2.5.3 CSU—Geologic Resource Values (application varies by area)

In areas managed for special geologic resource values, surface-disturbing activities may be restricted beyond what is required in standard terms and conditions. These restrictions may include, but are not limited to, designing developments in such a way that special geologic features are not impacted directly or indirectly.

Objective: The protection of special geologic resource values in areas managed for this value (includes, but is not limited to, ACECs managed for this value).

Exception: An exception to this condition may be granted if the lessee submits a plan demonstrating that the proposed action will not adversely impact geologic resource values, or that any impacts can be adequately mitigated.

Modification: A modification of this condition may be granted if the authorized officer determines that there are not geologic resource values within portions of the lease area. The burden of providing information to support this determination will be borne by the lessee. The boundaries affected by this condition may also be expanded if the authorized officer determines that such a measure is necessary to provide adequate protection of geologic resource values.

Waiver: A waiver of this condition may be granted if the authorized officer determines that there are not geologic resource values within the lease area. The burden of providing information to support this determination will be borne by the lessee. The boundaries affected by this condition may also be expanded if the authorized officer determines that such a measure is necessary to provide adequate protection of geologic resource values.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 15-day public review.

H.2.5.4 NSO—Geologic Resource Values (application varies by area)

In areas managed for special geologic resource values, surface-disturbing activities will be prohibited.

Objective: The protection of special geologic resource values in areas managed for this value (includes, but is not limited to, ACECs managed for this value).

Exception: An exception to this condition may be granted if the lessee submits a plan demonstrating that the proposed action will not adversely impact geologic resource values, or that any impacts can be adequately mitigated.

Modification: A modification of this condition may be granted if the authorized officer determines that there are not geologic resource values within portions of the lease area. The burden of providing information to support this determination will be borne by the lessee. The boundaries affected by this condition may also be expanded if the authorized officer determines that such a measure is necessary to provide adequate protection of geologic resource values.

Waiver: A waiver of this condition may be granted if the authorized officer determines that there are not geologic resource values within the lease area. The burden of providing information to support this determination will be borne by the lessee. The boundaries affected by this condition may also be expanded if the authorized officer determines that such a measure is necessary to provide adequate protection of geologic resource values.

Exception, modification, or waiver of this condition will require analysis according to NEPA and a 15-day public review.

H.2.6 Paleontological Stipulations

H.2.6.1 CSU—Paleontological Resources, PFYC Class IV and V Areas (Alts. B, C)

In areas of paleontological sensitivity (Potential Fossil Yield Classification [PFYC] Classes IV and V), a determination will be made by the BLM as to whether a survey by a qualified paleontologist (Qualification identified in BLM Handbook 8270) is necessary prior to the disturbance. In some cases, construction monitoring, project relocation, data recovery, or other mitigation will be required to ensure that significant paleontological resources are avoided or recovered during construction. Any significant fossils or localities previously known or discovered during the survey will be avoided by the permitted activity, or fully mitigated prior to allowing the activity to proceed. Surface occupancy or use is subject to the following special operating constraints:

- Restrict vehicles to existing roads and trails.
- Require a paleontological clearance on surface disturbing activities.

Objective: To protect paleontological resources from the impacts of oil and gas development.

Exception: An exception may be granted if the lessee submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: A modification may be granted if the authorized officer determines that no sensitive paleontological resources would be impacted by proposed activities in portions of the lease area. The burden of providing information to support this determination will be borne by the lessee.

Waiver: A waiver may be granted if the authorized officer determines that no sensitive paleontological resources are located in the lease area. The burden of providing information to support this determination will be borne by the lessee.

Exception, modification, or waiver of this stipulation will require a NEPA analysis and 30-day public review.

H.2.6.2 CSU—Paleontological Resource Values (application varies by area)

Within areas managed for paleontological resource values, a pedestrian survey must be conducted for paleontological material, using a qualified paleontologist, prior to any surface disturbing activity (qualification identified in BLM Handbook 8270). The survey will be used to determine appropriate level of mitigation during construction activities and production stages of the lease. A report on the results of the paleontological survey must be submitted to BLM as part of the permit application for the proposed lease activity.

Objective: Protection of paleontological resource values in areas managed for these values (including, but not limited to, ACECs)**.**

Exception: An exception may be granted if the lessee submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: A modification may be granted if the authorized officer determines that no sensitive paleontological resources would be impacted by proposed activities in portions of the lease area. The burden of providing information to support this determination will be borne by the lessee.

Waiver: A waiver may be granted if the authorized officer determines that no sensitive paleontological resources are located in the lease area. The burden of providing information to support this determination will be borne by the lessee.

Exception, modification, or waiver of this condition will require analysis according to NEPA and a 30-day public review.

H.2.6.3 NSO—Paleontological Resource Values (application varies by area)

Within areas managed for paleontological resource values where extraordinary paleontological resources exist, no surface occupancy will be allowed.

Objective: Protection of paleontological resource values in areas managed for these values (including, but not limited to, ACECs)**.**

Exception: An exception may be granted if the lessee submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: A modification may be granted if the authorized officer determines that no sensitive paleontological resources would be impacted by proposed activities in portions of the lease area. The burden of providing information to support this determination will be borne by the lessee.

Waiver: A waiver may be granted if the authorized officer determines that no sensitive paleontological resources are located in the lease area. The burden of providing information to support this determination will be borne by the lessee.

Exception, modification, or waiver of this condition will require analysis according to NEPA and a 30-day public review.

H.2.7 Recreation Stipulations

H.2.7.1 NSO—Developed Recreation Areas (Alts. B, C)

Surface-disturbing activities are prohibited within 0.25 mile of designated recreation areas.
Objective: To protect developed recreation areas and undeveloped recreation areas receiving concentrated public use.

Exception: An exception to this condition may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The boundaries of the affected area may be modified by the authorized officer if the recreation area boundaries are changed.

Waiver: This condition may be waived if the authorized officer determines that the affected area no longer contains developed recreation areas.

Exception, modification, or waiver of this condition will require analysis according to NEPA and a 30-day public review.

H.2.8 Socioeconomic Stipulations

H.2.8.1 NSO—Aviation facilities (Alts. B, C, D)

No occupancy or other activity on the surface of areas within 0.25 mi. of an airport or aviation facility.

Objective: To preserve the safety of aviation activities in and near airports. This includes, but is not limited to, the following airports: Cuba Airport and Double Eagle Airport.

Exception: None.

Modification: The boundaries of the affected area may be modified by the authorized officer if the airport boundaries are changed.

Waiver: This condition may be waived if the authorized officer determines that the affected area no longer contains an airport.

Modification or waiver of this stipulation will require a NEPA analysis and 15-day public review.

H.2.8.2 NSO—Churches and cemeteries (Alts. B, C, D)

No surface occupancy will be allowed near churches or cemeteries. The lessee may be required to conduct surveys to verify the presence of churches and/or cemeteries.

Objective: To preserve the cultural, historical, and personal values contained within such areas.

Exception: None.

Modification: A modification may be granted if the authorized officer determines that there are no churches or cemeteries within portions of the lease area. The burden of providing information to support this determination will be borne by the lessee.

Waiver: A waiver may be granted if the authorized officer determines that there are no churches or cemeteries within the lease area. The burden of providing information to support this determination will be borne by the lessee.

Modification or waiver of this condition will require analysis according to NEPA and a 30-day public review.

H.2.8.3 CSU—Residential interface (Alts. B, C)

Areas of BLM mineral ownership intermingled with private lands may require screening, buffering, noise abatement, or site relocation beyond that which is allowed under the standard lease terms.

Objective: To protect the private residences from being impacted by oil and gas development. This stipulation gives the BLM the authority to relocate or modify the site more than it permitted in the standard lease terms.

Exception: An exception may be granted if the lessee provides a plan demonstrating that the impacts of the proposed action will not impact private residences or the impacts are acceptable.

Modification: A modification may be granted if the authorized officer determines that there are no private residences within portions of the lease. The burden of providing information to support this determination will be borne by the lessee.

Waiver: A modification may be granted if the authorized officer determines that there are no private residences within the lease. The burden of providing information to support this determination will be borne by the lessee.

Exception, modification, or waiver of this condition will require analysis according to NEPA and a 30-day public review.

H.2.8.4 LN—Split Estate (Alts. B, C)

APDs or project Plans of Development (PODs) on split-estate lands would not be approved unless the operator a) certifies that a surface owner agreement has been reached or b) certifies in a statement that an agreement could not be reached and that the operator would comply with the provisions of the law or the regulations governing the federal or Indian right of re-entry to the surface under 43 CFR 3814.

Objective: To ensure proper surface owner notification by operators.

Exception: None.

Modification: None.

Waiver: None.

H.2.8.5 NSO—Health & Safety (Alts. B, C, D)

Within areas managed for the maintenance of public health and safety, no surface occupancy will be allowed.

Objective: To protect public health and safety within areas managed for this value. These areas include, but are not limited to, the Legacy Uranium Mines ACEC.

Exception: None.

Modification: None.

Waiver: None.

H.2.9 Vegetation & Forestry Stipulations

H.2.9.1 CSU—Lease Reclamation (Alts. B, C)

The subject properties contain wells, roads and/or facilities that were not plugged and/or reclaimed to current standards. Unless the facilities (well pad and road) are put to a beneficial and direct use under the new lease within two years of lease issuance, the lessee shall plug, remediate and reclaim the facilities within two years of lease issuance. If an extension is requested, the lessee must submit a detailed plan (including dates) prior to the two year deadline. All plugging, remediation, and reclamation shall be performed in accordance with BLM requirements and be approved in advance by the Authorized Officer. The well(s) to be plugged and reclaimed are as follows: {*insert detailed location description*}. The facilities to be reclaimed are as follows: {*insert detailed location description*}.

Objective: Reduction of cumulative impacts of oil and gas development on public health & safety, vegetation, soils, wildlife, visual resources, and livestock grazing.

Exception: None.

Modification: A modification may be granted if it is found that parts of the reclamation needs identified have been resolved, or if the lessee can demonstrate that the cumulative impact of on other resources is not significant.

Waiver: A waiver may be granted if it is found that the reclamation needs identified have been resolved, or if the lessee can demonstrate that the cumulative impact of the incomplete reclamation on other resources is not significant.

Modification or waiver of this condition will require analysis according to NEPA and a 30-day public review.

H.2.9.2 NSO—Ponderosa Pine (Alts. B, C)

The subject properties contain Ponderosa pine (*Pinus ponderosa*) trees. For the purpose of preserving wildlife habitat, no surface occupancy for fluid mineral development will be allowed within vegetation types that contain Ponderosa pine.

Objective: The preservation of wildlife habitat and Ponderosa pine age class diversity.

Exception: None.

Modification: A modification may be granted if the authorized officer determines that there are no Ponderosa pine trees in portions of the lease area. The lessee may be required to demonstrate the absence of Ponderosa pine trees by conducting a forest inventory.

Waiver: A waiver may be granted if the authorized officer determines that there are no Ponderosa pine trees in the lease area. The lessee may be required to demonstrate the absence of Ponderosa pine trees by conducting a forest inventory.

Modification or waiver of this condition will require analysis according to NEPA and a 30-day public review.

H.2.10 Minerals Stipulations

H.2.10.1 CSU—Plan of Development (Alts. B, C)

A plan of development (POD) for the entire lease must be submitted for review and approval, including NEPA analysis, by the BLM authorized officer, PRIOR to approval of development (APD or Sundry Notice) actions. The POD must indicate planned access to well facilities (roads, pipelines, power lines), and the approximate location of well sites. Should it become necessary to amend the POD, the amendment must be approved prior the approval of subsequent development action. Deviations from a current POD are not authorized until an amended POD has been approved by BLM.

Objective: To limit the cumulative effects of oil and gas development by planning the development of oil and gas fields in such a manner that limits surface disturbance, and to promote a more efficient NEPA process.

Exception: A POD is not necessary if the lease is developed as part of a unitization agreement.

Modification: A modification may be granted if the lessee submits a plan for future submission of a POD (for instance, after the drilling of an initial test well).

Waiver: None.

Exception or modification of this condition will require analysis according to NEPA and a 30-day public review.

H.2.10.2 CSU—Orphan wells (Alts. B, C)

The subject parcel is known to contain an unplugged well. For the purpose of protection of public health and safety, the lessee shall provide for proper plugging of the following abandoned wells: {*provide specific location information here*}, unless the lessee will re-enter the well within two years of lease issuance.

Objective: To protect the health and safety of the human environment, wildlife, and subsurface geologic features, and to reduce the cumulative impact of oil and gas development.

Exception: None.

Modification: A modification may be granted if the lessee demonstrates that the subject wells are plugged to BLM standards.

Waiver: A waiver may be granted if the authorized officer determines that there are no unplugged wells within the lease.

Modification or waiver of this condition will require analysis according to NEPA and a 30-day public review.

H.3 State Office Stipulations

This section describes the stipulations created by the BLM New Mexico State Office. Because these stipulations are created at the State Office, the RPFO cannot revise these in this RMP. However, these stipulations are available for our use to protect resources and resource uses as appropriate and are provided here for reference.

H.3.1 LN—Coal Protection (NM-8-LN)

Federal coal resources exist on this lease. Operations authorized by this lease may be altered or modified by the authorized officer (at the address shown below) in order to conserve and protect the mineral resources and provide for simultaneous operations.

H.3.2 LN—Drainage (NM-10-LN)

All or part of the lands contained in this lease are subject to drainage by well(s) located adjacent to this lease. The lessee shall be required within 6 months of lease issuance to submit to the AO plans for protecting the lease from drainage. Compensatory royalty will be assessed effective the expiration of this 6-month period if no plan is submitted. The plan must include either an Application for Permit to Drill (APD) a protective well, or an application to communitize the lease so that it is allocated production from a protective well off the lease. Either of these options may include obtaining a variance to State-spacing for the area. In lieu of this plan, the lessee shall be required to demonstrate that a protective well would have little or no chance of encountering oil and gas in quantities sufficient to pay in excess the costs of protecting the lease from drainage or an acceptable justification why a protective well would be uneconomical, the lessee shall be obligated to pay compensatory royalty to the Minerals Management Service at a rate to be determined by the AO.

H.3.3 CSU—Highway Material Site Right-of-Way (NM-4-CSU)

The lessee/operator shall conduct operations in conformity with the following requirements:

1. The New Mexico State Highway Department will have unrestricted rights of ingress and egress to the right-of way.
2. The lessee/operator will not conflict with the right of the New Mexico State Highway Department to remove any road-building materials from the right-of-way.

3. The New Mexico State Highway Department reserves the right to set up, operate, and maintain such facilities as are reasonable to expedite the removal, production, and use of the materials; and the lessee shall not interfere with the Highway Department's use of the property for such purposes.
4. The lessee/operator will make no excavations and erect no structures on the right-of-way that might be adverse to the use and interest of the land by the New Mexico State Highway Department.

H.3.4 NSO—Continental Divide Trail (NM-6-NSO)

No occupancy or other surface disturbance will be allowed within 1000 feet of the Continental Divide National Scenic Trail Treadway. This distance may be modified when specifically approved in writing by the Bureau of Land Management.

H.3.5 NSO—Occupied Structures and Dwellings (NM-12-NSO)

Occupied Structures and Dwellings - All or a portion of the lease contains dwellings or structures occupied by one or more persons. No Surface Occupancy is allowed on the portion of the lease described below. These restricted lands may be developed by directional drilling from outside the restricted area. For the Purpose of: Lessening the impacts caused by mineral resource development on a place of residence and the occupants within.

H.3.6 NSO—Pooling Purposes Only (NM-9-NSO)

No surface occupancy or use is allowed on the lease. The purpose of this lease is solely for participation in a unit or for pooling purposes.

H.3.7 LN—Cultural Resources (NM-11-LN)

All development activities proposed under the authority of this lease are subject to compliance with Section 106 of the NHPA and Executive Order 13007. The lease area may contain historic properties, traditional cultural properties (TCP's), and/or sacred sites currently unknown to the BLM that were not identified in the Resource Management Plan or during the lease parcel review process. Depending on the nature of the lease developments being proposed and the cultural resources potentially affected, compliance with Section 106 of the National Historic Preservation Act and Executive Order 13007 could require intensive cultural resource inventories, Native American consultation, and mitigation measures to avoid adverse effects—the costs for which will be borne by the lessee. The BLM may require modifications to or disapprove proposed activities that are likely to adversely affect TCP's or sacred sites for which no mitigation measures are possible. This could result in extended time frames for processing authorizations for development activities, as well as changes in the ways in which developments are implemented.

H.4 Washington Office Stipulations

This section describes the stipulations created by the BLM Washington Office. Because these stipulations are created at the Washington Office, the RPFO cannot revise these in this RMP.

However, these stipulations are available for our use to protect resources and resource uses as appropriate and are provided here for reference.

H.4.1 Endangered Species Act – Section 7 Consultation (WO-ESA-7)

The lease area may now or hereafter contain plants, animals or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat. BLM will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. § 1531 et seq., including completion of any required procedure for conference or consultation.

H.4.2 Bureau of Reclamation – Section 7 Consultation (WO-BOR-7)

The lands encompassed by this lease are managed by the U. S. Bureau of Reclamation and contain riparian and aquatic habitat that may be suitable for special status species. No surface disturbing activities will be authorized on this lease unless and until a Biological Evaluation has been completed that meets requirements of the U. S. Fish and Wildlife Service. BLM may require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat.

H.4.3 Cultural Resources and Tribal Consultation Stipulation

This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders. The BLM will not approve any ground-disturbing activities that may affect any such properties or resources until it completes its obligations (e.g., State Historic Preservation Officer (SHPO) and tribal consultation) under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized, or mitigated.

I SOIL AND WATER

I.1 Major Soil Mapping Units, Soil Names, and Surface Textures

Table I.1: Major Soil Mapping Units, Soil Names, and Surface Textures

Soil Map Unit Name and Number	Prevalent Surface Texture(s)	Occurrence
Rock outcrop–Nogal (s5169)	Sandy loam	Prevalent map units in Planning Unit 1
Viuda–Rock outcrop–Penistaja (s5160)	Very cobbly sandy loam, sandy loam	
Raton-Lava flows–Charo (s5167)	Very cobbly loam, cobbly loam	
Valnor-Techado–Rock outcrop-Mirabal–Kenray–Cinnadale (s5171)	Gravelly very fine sandy loam, clay loam, channery clay loam, fine sand, very gravelly loam	
Rock outcrop–Laporte (s5164)	Gravelly loam	
Rock outcrop–Charo–Cebolleta (s5206)	Very cobbly loam, loam, cobbly clay loam, cobbly loam	
Teco–Rock outcrop–Montecito-Cabezon–Atarque (s5170)	Sandy loam, very cobbly loam, fine sandy loam, clay loam	
Zia–Sandoval–Rock outcrop (s5235)	Sandy loam, fine sandy loam, loam, silt loam, clay loam	Prevalent map units in Planning Unit 2
Rock outcrop–Poley–Flaco–Berto (s5166)	Very cobbly loam, cobbly loam, loam, very cobbly clay	
Suwanee–Shiprock–Navajo–Grieta (s5162)	Silty clay loam, sandy loam, loamy fine sand, loam	
Rock outcrop–Charo–Cebolleta (s5206)	Very cobbly loam, loam, cobbly clay loam, cobbly loam	
Skyvillage–Rock outcrop–Mion–Hagerman-Bond (s5205)	Fine sandy loam, sandy loam, loam	
Winona–Tanbark–Rock outcrop–Rizozo (s5208)	Very gravelly loam, loam, sandy loam	
Oelop–Harvey–Chilton (s5209)	Loam, gravelly loam, very gravelly loam	
Willard–-Manzano–Karde (s5302)	Loam, clay loam, fine sandy loam, loamy fine sand	Prevalent map units in Planning Unit 3
Tapia–Pastura–Kim–Harvey–Dean (s5304)	Loam, fine sandy loam	
La Fonda–Alicia (s5306)	Loam, fine sandy loam, gravelly loam, silt loam	
Zia–Sandoval–Rock outcrop (s5235)	Sandy loam, fine sandy loam, loam, silt loam, clay loam	Prevalent map units in Planning Unit 4
Sparank–Sandoval–Querencia (s5233)	Loam, fine sandy loam, silty clay loam, sandy loam	
Royosa–Pinitos (s5192)	Loam, fine sand	

Soil Map Unit Name and Number	Prevalent Surface Texture(s)	Occurrence
Weska–Travessilla–Rock outcrop–Oelop (s5177)	Sandy loam, silty clay loam, silt loam, loam	
Tsosie–Councelor–Blancot (s5253)	Fine sandy loam	
Sandoval–Rock outcrop–Poley–Orejas (s5226)	Loam, cobbly loam, very cobbly loam	
Sparham–Pinitos–Menefee–Badland (s5190)	Clay loam, loam, silt loam, sandy loam	
Witt–Harvey–Cascajo (s5241)	Very gravelly sandy loam, fine sandy loam, loam, very gravelly fine sandy loam, cobbly loam	Prevalent map units in Planning Unit 5
Sparank–Sandoval–Querencia (s5233)	Loam, fine sandy loam, silty clay loam, sandy loam	
Witt–Ildefonso–Harvey (s5240)	Cobbly loam, loam	

Table I.2: County Water Use within the Planning Area

County	Surface Water (Acre-Feet)		Groundwater (Acre-Feet)		Total Use (Acre-Feet)	
Bernalillo	1995	2005	1995	2005	1995	2005
Commercial	0	0	3,723	6,555	3,723	6,555
Domestic	0	0	2,162	6,037	2,162	6,037
Industrial	0	0	779	1,130	779	1,130
Irrigated Agriculture	65,221	41,549	3,893	2,371	69,114	43,950
Livestock	40	16	769	362	809	378
Mining	0	0	352	917	352	917
Power	0	0	253	363	253	363
Public Water Supply	0	46	135,468	114,611	135,468	114,657
Reservoir Evaporation	0	0	0	0	0	0
County Totals	65,261	41,611	147,399	132,346	212,660	173,957
Cibola	1995	2005	1995	2005	1995	2005
Commercial	0	0	31	69	31	69
Domestic	0	0	969	1169	969	1,169
Industrial	0	0	58	1172	58	1,172
Irrigated Agriculture	3,082	1,681	2,333	4,012	5,415	5,693
Livestock	49	42	201	175	250	217
Mining	0	0	319	0	319	0
Power	0	0	0	0	0	0
Public Water Supply	0	0	2,840	3,484	2,840	3,484
Reservoir Evaporation	1,080	1,080	0	0	1,080	1,080
County Totals	4,211	2,803	6,751	10,081	10,962	12,884
McKinley	1995	2005	1995	2005	1995	2005
Commercial	0	0	90	184	90	184
Domestic	0	0	2,839	3,623	2,839	3,623
Industrial	0	0	1,059	1,056	1,059	1,056

County	Surface Water (Acre-Feet)		Groundwater (Acre-Feet)		Total Use (Acre-Feet)	
Irrigated Agriculture	4,768	1,183	0	0	4,768	1,183
Livestock	96	51	389	209	485	260
Mining	0	0	3,242	2,725	3,242	2,725
Power	0	0	3,148	3,998	3,148	3,998
Public Water Supply	0	0	5,381	4,713	5,381	4,713
Reservoir Evaporation	0	0	0	0	0	0
County Totals	4,864	1,234	16,148	16,508	21,012	17,742
Sandoval	1995	2005	1995	2005	1995	2005
Commercial	10	10	646	2,632	656	2,642
Domestic	0	0	2,529	2,754	2,529	2,754
Industrial	0	0	1,319	3,880	1,319	3,880
Irrigated Agriculture	54,529	53,719	899	663	55,428	54,382
Livestock	100	57	268	72	368	129
Mining	0	0	23	688	23	688
Power	0	0	0	0	0	0
Public Water Supply	126	145	15,201	13,716	15,327	13,861
Reservoir Evaporation	15,033	5,215	0	0	15,033	5,215
County Totals	69,798	59,146	20,885	24,405	90,683	83,551
Torrance	1995	2005	1995	2005	1995	2005
Commercial	0	0	88	384	88	384
Domestic	0	0	745	1,007	745	1,007
Industrial	0	0	17	17	17	17
Irrigated Agriculture	0	0	45,170	42,879	45,170	42,879
Livestock	30	49	280	587	310	636
Mining	0	0	0	74	0	74
Power	0	0	0	0	0	0
Public Water Supply	0	0	983	1,221	983	1,221
Reservoir Evaporation	0	0	0	0	0	0
County Totals	30	49	47,283	46,169	47,313	46,218
Valencia	1995	2005	1995	2005	1995	2005
Commercial	0	0	1075	1592	1075	1592
Domestic	0	0	3303	3926	3303	3926
Industrial	0	0	39	63	39	63
Irrigated Agriculture	182,710	177,082	8,666	9,134	191,376	186,216
Livestock	27	34	695	877	722	911
Mining	0	0	4	3	4	3
Power	0	0	0	0	0	0
Public Water Supply	0	0	4,917	5,624	4,917	5,624
Reservoir Evaporation	0	0	0	0	0	0
County Totals	182,737	177,116	18,699	21,219	201,436	198,335

Source: NMOSE 2008. All data are expressed in acre-feet.

I.2 Descriptions of the USGS Cataloging Units *(8-digit* HUC) with highest acreage of BLM-administered land.

I.2.1 Rio Puerco Watershed (USGS Cataloging Unit 13020204)

The Rio Puerco watershed is 7,350 square miles with headwaters near Cuba, New Mexico in northern Sandoval County. As the Rio Puerco descends to the Rio Grande at Bernardo, it receives surface flows from the adjacent Rio San Jose and Arroyo Chico watersheds, in addition to many, smaller, ephemeral streams and dry washes. The Rio Puerco is an ephemeral stream over much of its length. USGS records indicate that it frequently is dry from late fall to late spring. In the Planning Area, a significant amount of BLM-administered lands occur in the northern one-third of the watershed. Several gauging stations provide streamflow data.

USGS gauging station 08352500 (Rio Puerco at Rio Puerco, New Mexico) operated from 1935 to 1976. An examination of the mean monthly statistics shows a high of 259 ***cubic feet per second*** (cfs) in August to a low of 1.1 cfs in December. The watershed drains 5,460 square miles and includes the influence of the Arroyo Chico Watershed, discussed below.

USGS gauging station USGS 08334000 (Rio Puerco above Arroyo Chico near Guadalupe, New Mexico) has operated from 1952 to the present, and an examination of the mean monthly statistics shows a high of 24 cfs in August to a low of 1.2 cfs in December. The watershed at this point drains 420 square miles with a significant amount of BLM-administered lands contributing.

USGS gauging station 08353000 (Rio Puerco near Bernardo, New Mexico) is at the mouth of the entire watershed, but the period of record is short, from 2001 to 2007.

I.2.2 Arroyo Chico Watershed (USGS Cataloging Unit 13020205)

The Arroyo Chico watershed is bounded on the west by the Continental Divide and is tributary to the Rio Puerco. A significant amount of BLM-administered lands occur in the Torreon Wash portion of the watershed. USGS gauging station 08340500 (Arroyo Chico near Guadalupe, New Mexico) has operated from 1943 to 1986, and from 2006 until present at the mouth of the watershed where it joins the Rio Puerco. An examination of the mean monthly statistics shows a high of 102 cfs in August to a low of 1.6 cfs in December. The watershed drains 1,390 square miles of mostly semi-arid rangeland along with some higher elevation plateau terrain on the north side of Mount Taylor near Grants, New Mexico.

I.2.3 Rio San Jose Watershed (USGS Cataloging Unit 13020207)

The Rio San Jose Watershed is bounded on the west by the Continental Divide and is tributary to the Rio Puerco. The majority of BLM land within the watershed is the checkerboard area in eastern Cibola County south and east of the Laguna Pueblo and Acoma Pueblo Nations, respectively. The USGS gauging station farthest downstream is 08351500 (Rio San Jose at Correo, New Mexico) with a period of record from 1943 to 1994. An examination of the mean monthly discharge statistics shows a high of 49 cfs in August to a low of 2.9 cfs in December. The watershed drains 2,530 square miles of mostly semi-arid rangeland along with some higher elevation forested terrain on the south side of Mount Taylor and the north side of the Zuni

Mountains near Grants, New Mexico. USGS gauging station 08343500 (Rio San Jose Near Grants, New Mexico) also has a significant period of record (1937-2004), and shows mean monthly discharge high of 8.7 cfs in August to a low of 5.0 cfs in December. The contributing drainage area at this station is 1,170 square miles and also reflects the surface water flows of the highest terrain (parts of the Cibola National Forest) in the watershed.

J RIO PUERCO FIELD OFFICE SPECIAL STATUS SPECIES LIST

Table J.1: Special Status Species by County

Common Name	Scientific Name	County	Status
New Mexico meadow jumping mouse	*Zapus hudsonius luteus*	Bernalillo, Sandoval, Valencia	Federal Candidate
Rio Grande cutthroat trout	*Oncorhynchus clarki virginalis*	Sandoval	Federal Candidate
Yellow billed cuckoo	*Coccyzus americanus*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	Federal Candidate
Zuni bluehead sucker	*Catostomus discobolus*	Cibola, McKinley	Federal Candidate
Black-footed ferret	*Mustela nigripes*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	Federal Endangered
Rio Grande silvery minnow	*Hybognathus amarus*	Bernalillo, Sandoval, Valencia	Federal Endangered
Southwestern willow flycatcher	*Empidonax traillii extimus*	Bernalillo, Cibola, McKinley, Sandoval, Valencia	Federal Endangered
Mountain plover	*Charadrius montanus*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	Federal Proposed
Acoma fleabane	*Erigeron acomanus*	Cibola, McKinley	Federal Species of Concern
American peregrine falcon	*Falco peregrinus anatum*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	Federal Species of Concern
Arctic peregrine falcon	*Falco peregrinus tundrius*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	Federal Species of Concern
Baird's sparrow	*Ammodramus baridii*	Bernalillo, Sandoval, Torrance, Valencia	Federal Species of Concern
Bell's vireo	*Vireo bellii*	Valencia	Federal Species of Concern
Black tern	*Chlidonias niger*	Bernalillo, McKinley, Torrance	Federal Species of Concern
Black-tailed prairie dog	*Cynomys ludovicianus*	Torrance	Federal Species of Concern
Cebolleta southern pocket gopher	*Thomomys umbrinus paguatae*	Cibola	Federal Species of Concern
Cinder phacelia	*Phacelia serrata*	Cibola	Federal Species of Concern
Dwarf mildweed	*Asclepias uncialis var uncialis*	Torrance	Federal Species of Concern
Goat Peak pika	*Ochotona princeps nigrescens*	Sandoval	Federal Species of Concern
Gypsum phacelia	*Phacelia sp. nov.*	Cibola, Sandoval	Federal Species of Concern
Gypsum townsendia	*Townsendia gypsophila*	Sandoval	Federal Species of Concern
Jemez Mountain salamander	*Plethodon neomexicanus*	Sandoval	Federal Species of Concern

Common Name	Scientific Name	County	Status
Knight's milkvetch	*Astragalus knightii*	Sandoval	Federal Species of Concern
Millipede	*Comanchelus chihuanus*	Bernalillo, Valencia	Federal Species of Concern
New Mexico silverspot butterfly	*Speyeria nokomis nitocris*	Cibola, McKinley, Sandoval	Federal Species of Concern
Northern goshawk	*Accipiter gentilis*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	Federal Species of Concern
Parish's alkali grass	*Puccinellia parishii*	McKinley, Sandoval	Federal Species of Concern
Pecos River muskrat	*Ondatra zibethicus ripensis*	Bernalillo, Valencia	Federal Species of Concern
Rio Grande sucker	*Catostomus plebeius*	Cibola, Sandoval	Federal Species of Concern
San Juan checkerspot butterfly	*Euphydryas anicia chuskae*	McKinley	Federal Species of Concern
Sivinski's fleabane	*Erigeron sivinskii*	McKinley	Federal Species of Concern
Townsend's big-eared bat	*Corynorhinus townsendii*	Bernalillo, Sandoval	Federal Species of Concern
Western burrowing owl	*Athene cunicularia hypugaea*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	Federal Species of Concern
Mexican spotted owl	*Strix occidentalis lucida*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	Federal Threatened
Pecos sunflower	*Helianthus paradoxus*	Cibola	Federal Threatened
Zuni fleabane	*Erigeron rhizomatus*	Cibola, McKinley	Federal Threatened
Millipede (no common name)	*Comanchelus chihuanus (Formerly Totecus chihuanas)*	Bernalillo, Valencia	RPFO Bureau Sensitive
Ferruginous Hawk	*Buteo regalis*	McKinley	RPFO Bureau Sensitive
Northern Goshawk	*Accipiter gentilis*	Bernalillo, Cibola, McKinley, Sandoval, Torrance	RPFO Bureau Sensitive
Black Tern	*Chlidonias niger surinamensis*	Bernalillo, McKinley, Torrance	RPFO Bureau Sensitive
White-faced Ibis	*Plegadis chihi*	Bernalillo, McKinley, Sandoval, Valencia	RPFO Bureau Sensitive
Western Burrowing Owl	*Athene cunicularia hypugea*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	RPFO Bureau Sensitive
Loggerhead Shrike	*Lanius ludovicianus*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	RPFO Bureau Sensitive
Mountain plover	*Charadrius montanus*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	RPFO Bureau Sensitive
Gray vireo	*Vireo vivinior*	Bernalillo, Cibola, McKinley, Sandoval	RPFO Bureau Sensitive
Baird's Sparrow	*Ammodramus bairdii*	Bernalillo, Sandoval, Torrance, Valencia	RPFO Bureau Sensitive

Common Name	Scientific Name	County	Status
Flathead chub	*Platygobio (Hybopsis) gracilis*	Bernalillo, Sandoval, Valencia	RPFO Bureau Sensitive
Zuni bluehead sucker	*Catostomus discobolus yarrowi*	Cibola, McKinley	RPFO Bureau Sensitive
Cebolleta southern pocket gopher	*Thomomys umbrinus paquatae*	Cibola	RPFO Bureau Sensitive
New Mexican jumping mouse	*Zapus hudsonius luteus*	Bernalillo, Sandoval, Valencia	RPFO Bureau Sensitive
Pecos River muskrat	*Ondatra zibethicus ripensis*	Valencia	RPFO Bureau Sensitive
Fringed myotis	*Myotis thysanodes*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	RPFO Bureau Sensitive
Long-eared myotis	*Myotis evotis*	Cibola, McKinley, Sandoval, Valencia	RPFO Bureau Sensitive
Long-legged myotis	*Myotis volans*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	RPFO Bureau Sensitive
Occult myotis	*Myotis lucifugus occultus*	Bernalillo, Cibola, McKinley, Sandoval	RPFO Bureau Sensitive
Small-footed myotis	*Myotis ciliolabrum*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	RPFO Bureau Sensitive
Yuma myotis	*Myotis yumanensis*	Bernalillo, Cibola, Sandoval, Valencia	RPFO Bureau Sensitive
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	Bernalillo, Cibola, Sandoval	RPFO Bureau Sensitive
Spotted bat	*Euderma maculatum*	Bernalillo, Cibola, Sandoval, Valencia	RPFO Bureau Sensitive
Big free-tailed bat	*Nyctinomops macrotis*	Bernalillo, Cibola, Sandoval, Valencia	RPFO Bureau Sensitive
Acoma fleabane	*Erigeron acomanus*	Cibola, Mckinley	RPFO Bureau Sensitive
Cinder phacelia	*Phacelia serrata*	Cibola	RPFO Bureau Sensitive
Grama grass cactus	*Pediocactus papyracanthus*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	RPFO Bureau Sensitive
Gypsum townsendia	*Townsendia gypsophila*	Sandoval	RPFO Bureau Sensitive
Knight's milk-vetch	*Astragalus knightii*	Sandoval	RPFO Bureau Sensitive
Sivinski's fleabane	*Erigeron sivinskii*	McKinley	RPFO Bureau Sensitive
Sand-tufted verbena	*Abronia bigelovii*	Sandoval	RPFO Bureau Sensitive
Wright's nipple cactus	*Mammillaria wrightii*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	RPFO Bureau Sensitive
Santa Fe milk-vetch	*Astragalus feensis*	Bernalillo, Sandoval, Torrance	RPFO Bureau Sensitive
New Mexico spiny milk-vetch	*Astragalus kentrophyta var. neomexicana*	McKinley, Sandoval	RPFO Bureau Sensitive
Tufted evening primrose	*Oenothera caespitosa*	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	RPFO Bureau Sensitive

Common Name	Scientific Name	County	Status
Texas horned lizard	*Phrynosoma cornutum*	Cibola, Torrance	RPFO Bureau Sensitive

K NOXIOUS WEEDS

K.1 New Mexico Noxious Weed List

This weed list, which originated from the New Mexico Department of Agriculture, was last updated in April of 2009. It categorizes species in Classes A, B, and C, depending on whether it is currently present in New Mexico, and to what degree.

K.1.1 Class A Species

Class A species are currently not present in New Mexico, or have limited distribution. Preventing new infestations of these species and eradicating existing infestations is the highest priority.

Table K.1: Class A Noxious Weed Species

Common Name	Scientific Name
Alfombrilla	*Drymaria arenariodes*
Black henbane	*Hyoscyamus niger*
Camelthorn	*Alhagi psuedalhagi*
Canada thistle	*Cirsium arvense*
Dalmation toadflax	*Linaria dalmatica*
Diffuse knapweed	*Centaurea diffusa*
Dyer's woad	*Isatis tinctoria*
Eurasian watermilfoil	*Myriophyllum spicatum*
Giant salvinia	*Salvinia molesta*
Hoary cress	*Cardaria spp.*
Hydrilla	*Hydrilla verticllata*
Leafy spurge	*Euphorbia esula*
Oxeye daisy	*Leucanthemum vulgare*
Parrotfeather	*Myriophyllum aquaticum*
Purple loosestrife	*Lythrum salicaria*
Purple starthistle	*Centaurea calcitrapa*
Ravenna grass	*Saccharum ravennae*
Scotch thistle	*Onopordum acanthium*
Spotted knapweed	*Centaurea biebersteinii*
Yellow starthistle	*Centaurea solstitialis*
Yellow toadflax	*Linaria vulgaris*

K.1.2 Class B Species

Class B Species are limited to portions of the state. In areas with severe infestations, management should be designed to contain the infestation and stop any further spread.

Table K.2: Class B Noxious Weed Species

Common Name	Scientific Name
African rue	*Peganum harmala*
Chicory	*Cichorium intybus*
Halogeton	*Halogeton glomeratus*
Malta starthistle	*Centaurea melitensis*
Musk thistle	*Carduus nutans*

Common Name	Scientific Name
Perennial pepperweed	*Lepidium latifolium*
Russian knapweed	*Acroptilon repens*
Poison hemlock	*Conium maculatum*
Teasel	*Dipsacus fullonum*
Tree of heaven	*Ailanthus altissima*

K.1.3 Class C Species

Class C species are wide-spread in the state. Management decisions for these species should be determined at the local level, based on feasibility of control and level of infestation.

Table K.3: Class C Noxious Weed Species

Common Name	Scientific Name
Bull thistle	*Cirsium vulgare*
Cheatgrass	*Bromus tectorum*
Jointed goatgrass	*Aegilops cylindrica*
Russian olive	*Elaeagnus angustifolia*
Saltcedar	*Tamarix spp.*
Siberian elm	*Ulmus pumila*

K.1.4 Watch List Species

Watch List species are species of concern in the state. These species have the potential to become problematic. More data is needed to determine if these species should be listed. When these species are encountered, please document their location and contact appropriate authorities.

Table K.4: Watch List Species

Common Name	Scientific Name
Crimson fountaingrass	*Pennisetum setaceum*
Giant cane	*Arundo donax*
Meadow knapweed	*Centaurea pratensis*
Pampas grass	*Cortaderia sellonana*
Quackgrass	*Elytrigia repens*
Sahara mustard	*Brassica tournefortii*
Spiny cocklebur	*Xanthium spinosum*
Wall rocket	*Diplotaxis tenuifolia*

K.2 Noxious Weed Control Standard Operating Procedures

Those standard operating procedures (SOPs) found in Instruction Memorandum NM-010-99-01 (Weed Prevention Schedule for Albuquerque Field Office) will be followed:

- Ensure equipment involved in land disturbing actions, be clean of noxious weed seeds or propagative parts prior to entry on site. When working in areas with noxious weeds equipment should be cleaned prior to moving off site.
- Survey and inventory proposed work areas for noxious weeds; take reasonable measures to avoid spread of noxious weeds found (i.e. - cleaning equipment with pressure washers, stockpiling overburden material for later treatment, avoiding driving through weed

patches).The following noxious weeds have been identified as occurring on lands within the boundaries of the Albuquerque Field Office (AFO).

1. Russian Knapweed (*Centaurea repens*)
2. Musk Thistle *(Carduus nutans)*
3. Bull Thistle (*Cirsium vulgare)*
4. Canada Thistle (*Cirsium arvense)*
5. Scotch Thistle *(Onopordum acanthium)*
6. Hoary Cress *(Cardaria draba)*
7. Perennial Pepperweed *(Lepidium latifolium)*
8. Halogeton (*Halogeton glomeratus)*
9. Spotted Knapweed *(Centaurea maculosa*
10. Dalmation Toadflax *(Linaria genistifolia)*
11. Yellow Toadflax *(Linaria vulgaris)*
12. Camelthorn *(Alhagi pseudalhagi)*
13. Yellow Starthistle *(Centaurea solstitialis)*
14. Saltcedar *(Tamarix spp.)*
15. Diffuse Knapweed (*Centaurea diffusa*)
16. Cheatgrass (*Bromus tectorum*)
17. Tree of Heaven (*Ailanthus altissima*)
18. African Rue (*Peganum harmala*)

- Use only certified weed free erosion control and re-vegetation materials (e.g. mulch, seed, natural fiber mats).
- If fill dirt or gravel will be required, the source needs to be noxious weed free.
- The site should be monitored for the life of the project for the presence of noxious weeds (includes maintenance & construction activities). If weeds are found the AFO will be notified and the AFO will determine the best method for the control of the particular weed species.
- Reclamation and revegetation of the work site will use species specified by the AFO. All seed shall be certified weed free. The area will be monitored to determine the success of the revegetation, and revegetation will continue until successful.

K.3 Weed Prevention Schedule

Table K.5: Weed Prevention Schedule

Prevention Activity	When	Staff
Re-establish vegetation on all areas of soil disturbance. Proper dates and the seeding mix to be used will be provided by the Albuquerque Field Office. Only certified weed free seed and mulch will be used in the re-establishment of vegetation. All reseeded sites should be monitored and permit holder notified if spot reseeding is required.	All Year	Lands and Minerals, Watershed, Engineering Teams
Include weed prevention and treatment in all mining plans of operation and reclamation plans. Retain bonds for weed control until	All Year	Lands and Minerals

Prevention Activity	When	Staff
the site is returned to vegetative conditions matching the surrounding area. Method of treatment for any infestations must be approved by the Albuquerque Field Office.		Team
Require that all archaeological site excavations greater than 1/4 acre be reclaimed. Dates of seeding and seed mix to be used will be provided by the Albuquerque Field Office. Seed must be certified weed free.	All Year	Cultural Team

K.4 Albuquerque Field Office Seed Mixtures

The following seed mixtures with allowable listed substitutions will be recommended for use within the AFO administrative area. All seed used in reclamation projects shall be certified noxious weed free prior to use.

K.4.1 Grassland Vegetation Type (Sagebrush Draws)

Table K.6: Seed Mix for the Grassland Vegetation Type

Common Name	Variety	Drilled Rate	Broadcast Rate	% for Mix	Lbs/Acre
Alkali Sacaton	Salado	0.5	1.0	15%	0.2
Western Wheatgrass	Arriba	8.0	17.0	25%	4.3
Galleta	Viva	6.0	11.0	20%	2.2
Blue Grama	Lovington	1.5	2.5	25%	0.6
Scarlet Globemallow		4.0	8.0	5%	0.4
Blue Flax	Appar	8.0	16.0	10%	1.6
Annual Rye	Gulf	4.0	8.0		8.0

Annual Rye Grass is included as a 1st year cover crop.

K.4.2 Piñon-Juniper Vegetation Type

Table K.7: Seed Mix for the Piñon-Juniper Vegetation Type

Common Name	Variety	Drilled Rate	Broadcast Rate	% for Mix	Lbs/Acre
Mountain Brome	Bromar	11.0	25.0	15%	3.8
Western Wheatgrass	Arriba	8.0	17.0	25%	4.3
Galleta	Viva	6.0	11.0	20%	2.2
Blue Grama	Lovington	1.5	2.5	25%	0.6
American Vetch		4.0	8.0	5%	0.4
Rocky Mtn Penstemon	Bandera	3.0	6.0	10%	0.6
Annual Rye	Gulf	4.0	8.0		8.0

Annual Rye Grass is included as a 1st year cover crop.

K.4.3 High Elevation Vegetation Type

Table K.8: Seed Mix for the High Elevation Vegetation Type

Common Name	Variety	Drilled Rate	Broadcast Rate	% for Mix	Lbs/Acre
Mountain Brome	Bromar	11.0	25.0	15%	3.8
Western Wheatgrass	Arriba	8.0	17.0	25%	4.3
Arizona Fescue	Redondo	2.0	3.0	20%	2.2
June Grass		0.5	1.0	25%	0.3
American Vetch		4.0	8.0	5%	0.4
Scarlet Penstemon		3.0	6.0	10%	0.6
Annual Rye	Gulf	4.0	8.0		8.0

Annual Rye Grass is included as a 1st year cover crop.

K.4.4 Alternative Species for Consideration

Table K.9: Alternative Species tor Consideration

Common Name	Scientific Name
Grass: Sand Dropseed	*Sporobolus cryptandrus*
Forbs: Desert Marigold	*Baileya multiradiata*
Rocky Mountain Beeplant	*Cleome serrulata*
Purple Coneflower	*Echinacea purpurea*
California Poppy	*Eschscholtzia californica*
Annual Sunflower	*Helianthus annuus*
Yellow Evening Primrose	*Oenothera biennis*
Purple Prairie Clover	*Petalostemum prupureum*
Prairie Coneflower	*Ratibida columnaris*
Desert Globemallow	*Sphaeralcea ambigua*
Purple Verbena	*Verbena stricta*

L PLANT COMMUNITIES AND WILDLIFE FOR THE MAJOR ECOSYSTEMS OF THE RIO PUERCO

L.1 The Sagebrush/Grass Ecosystem

The sagebrush/grass ecosystem or sagebrush steppe comprises roughly 20% or 164 square miles of the upper Rio Puerco watershed. It is found mainly in the upland valleys with piñon-juniper woodlands on the ridges, mesas, and mesa side slopes closely associated with it. This area may be the farthest south and east population of the big sagebrush/grass ecotype in the United States.

Geographically, this area extends north and south from the continental divide west of Cuba, N.M., south approximately 31 miles (near the village of San Luis, N.M.). It ranges from the western foot of the Nacimiento Mountains on the east westward to near Torreon, N.M. This area is described broadly as the southeast portion of the Colorado Plateau.

This ecosystem can be further classified vegetatively as the shrubland formation, the Artemisia subformation, and the tridentata series.

Francis (1986) classified nine communities in the area:

- Artemisia tridentata/Bouteloua gracilis-Hilaria jamesii
- Artemisia tridentata-Gutierrezia sarothrae/Bouteloua gracilis-Hilaria jamesii
- Artemisia tridentata/Bouteloua gracilis-Hilaria jamesii-Sporobolus airoides
- Artemisia tridentata-Gutierrezia sarothrae/Hilaria jamesii-Sporobolus airoides,
- Artemisia tridentata-Gutierrezia sarothrae/Bouteloua gracilis-Agropyron smithii
- Artemisia tridentata/Sporobolus cryptandrus-Oryzopsis hymenoides
- Artemisia tridentata-Chrysothamnus parryi/Aristida fendleriana-Bouteloua gracilis
- Artemisia arbuscula nova-A. tridentata/Agropyron cristatum-A. smithii
- Artemisia arbuscula nova-Gutierrezia sarothrae/Bouteloua gracilis-Hilaria jamesii

The sagebrush/grass ecosystem occurs on eleven ecological sites that include: WP-1 Clayey, WP-1 Clayey Upland, WP-1 Salty Bottomland, WP-l Swale, WP-1 Loamy Upland, WP-1 Loamy, WP-1 Deep Sandy Upland, WP-l Sand Plains, WP-1 Sandy, WP-l Shallow Upland, and WP-1 Gravelly Slopes.

L.1.1 Soils

The sagebrush/grass ecosystem occurs on the following soils from the Sandoval County Soil Survey and the Cabezon Soil Survey:

Alluvial land	Berent loamy fine sand
Billings silty clay loam, alkali and gullied land	Billings and Persayo silty clay loams
Fronton-Travessilla-Persayo assoc.	Fruitland sandy loam
Las Lucas loam	Las Lucas-Persayo assoc.
Penistija fine sandy loam	Penistija-Berent assoc.

Alluvial land
Penistija-Sandstone outcrop assoc.
Prewitt loam and gullied land
Sparham clay
Orlie-Sparham assoc.
Pinitos loam
Vessilla-Menefee-Orlie assoc.
Berent loamy fine sand
Persayo-Shale outcrop assoc.
Ravola silty clay loam and gullied land
Orlie-Sparham clay
Orlie loam
Blancot-Councelor-Tsosie assoc.

L.1.2 Vegetation

The U.S. Forest Service found the following mean annual production in the nine plant communities:

Table L.1: Mean Annual Plant Production by Plant Community

Species	Pounds/Acre
Western Wheatgrass	20.1
Blue grama	50.4
Galleta grass	23.2
Alkali sacaton	20.8
Bottlebrush squirreltail	8.8
Broom snakeweed	31.4
Annuals	7.5
Other species	98.8
Total (not including sagebrush)	**263.1**

The BLM measured a mean annual production for big sagebrush in the upper Rio Puerco watershed to be 32 pounds per acre (air dry). If 32 is added to the total mean above for mainly understory grasses and forbs, then the total herbaceous and sagebrush production would be 295.1 pounds/acre/year.

The most important vegetative attribute for watershed stabilization is cover. A study of several relic areas in different States showed the following:

Table L.2: Vegetative Cover by State

State	Cover	
	Grass	Sagebrush
Idaho	60%	20%
	41%	28%
Northern Utah		9-39%
Southeast Oregon	75%	25%
Nevada	78%	13%

The US Forest Service Range Experimental Station measured a mean of 62.2% grass cover, 30% sagebrush cover for a 67%/32% grass/shrub ratio, 18.8% total plant cover, 11.3% letter, 0.1% rock, and 30.25% total cover for the Upper Rio Puerco.

The RPFO multi-disciplinary team decided that the desirable sagebrush cover should be somewhere between 16 to 22 percent. If an area exceeds this, best management practices will be applied to bring it up to standards.

Valley bottoms in this ecotype should have big sagebrush removed completely, where possible. This is especially true where no defined channel has been cut and the area may support a grassland.

Four seral communities or condition classes can be described for the sagebrush/grass ecosystem in the upper Rio Puerco watershed, low seral, mid seral, high seral, and the potential plant community.

L.1.2.1 Low Seral

This community includes big sagebrush with a good understory of perennial grasses and forbs. It should have a Shrub cover of 10-30%. Several species of shrubs may be present, including big sagebrush, winterfat, fourwing saltbush, shadscale, rabbitbrush, horsebrush, black greasewood, and plains prickly pear. Soils and watershed conditions should remain unchanged or stable. Wildlife habitat is relatively good for most species, with a high biodiversity. This community provides good stream bank vegetation adjacent to riparian areas. It also provides good diversity and quality of wildlife habitat. Vegetation and litter provide high infiltration with a relatively low runoff potential and erosion potential. In general, the community provides The potential for prescribed fire is good. Plant cover is as follows: herbaceous cover of 63-74%, sagebrush cover of 10-25%, litter of 16-20%, and rock of 0.1-0.5%. Table L.3 shows the production by species:

Table L.3: Low Seral Production by Species

Species	Pounds/Acre Air dry
Western wheatgrass	40-55
Alkali sacaton	20-150
Galleta grass	40-65
Bottlebrush squirreltail	20-25
Blue grama	18-50
Broom snakeweed	10-15
Annuals	2-5
Big sagebrush	10-18
Other species*	300-400

L.1.2.2 Mid Seral

In this community, big sagebrush is present with a sparse understory of perennial grasses and forbs. The shrub cover is 20-40%, mostly consisting of big sagebrush. Few soil erosion problems exist on level- to nearly-level sites; however, erosion may be severe on steeper sites. Wildlife habitat quality has been reduced for most species, but may provide good habitat for some species. When adjacent to riparian habitat, this community may cause increased sediment loads in stream channels. The quality of livestock forage may be reduced from a loss of perennial grasses and forbs. There is a lower diversity of herbaceous plant cover. Infiltration is moderate to

low, but varies with soil type and litter cover. Runoff potential is moderate to high and erosion may be severe on steeply sloped sites or unchanged on nearly level sites. The potential for prescribed fire is fair. Plant cover is as follows: herbaceous cover 36-62%, sagebrush cover 26-30%, litter 9-15%, rock 0%. Table L.4 shows the production by species:

Table L.4: Mid Seral Production by Species

Species	Pounds/Acre Air Dry
Western wheatgrass	5-15
Alkali sacaton	5-12
Galleta grass	20-33
Bottlebrush squirreltail	15-30
Blue grama	45-60
Broom snakeweed	25-35
Annuals	5-10
Big sagebrush	25-35
Other species*	49-150

L.1.2.3 High Seral

This community includes dense sagebrush with few perennial herbaceous plants. Many annual plants may occur depending on the amount of spring moisture. Abundant reproduction is apparent for the big sagebrush, with several age classes occurring. Shrub cover is 30-60%, and almost exclusively sagebrush. There may also be extensive areas of rabbitbrush. This stage provides poor habitat for most wildlife species; however, it may provide good winter range for pronghorn and mule deer. There is a high potential for erosion. Usually, there is an increased sediment load to streams and arroyos. As riparian vegetation is lost, water temperature increases, more bank cutting occurs, and velocity of flows increase. This stage provides a low quality of livestock forage with little herbaceous understory. There are high interception losses because of shrub density. Low infiltration between shrubs due to lack of herbaceous plants. Runoff potential is high on sloped sites. Rills and flow patterns evident, along with pedestaled plants. The potential for prescribed fire is low; such a fire will probably burn only under high temperatures and high wind conditions. Before prescribed fire can be used, the site may have to be treated with a herbicide first. Plant cover is as follows: herbaceous cover 10-35%, sagebrush cover 31-45%, litter 7-14%, rock 0.1-0.5%. Table L.5 shows the production by species.

Table L.5: High Seral Production by Species

Species	Pounds/Acre Air
Western wheatgrass	0-5
Alkali sacaton	2-5
Galleta grass	3-13
Bottlebrush squirreltail	0-5
Blue grama	2-20
Broom snakeweed	36-47
Annuals	15-25

Species	Pounds/Acre Air
Big sagebrush	35-50
Other species*	25-35

L.1.2.4 Potential Plant Community

In this community, little or no herbaceous understory is present, with a dense cover of big sagebrush 30 years of age or older. Sagebrush cover is over 50%. Piñon and juniper trees have begun to invade the area at the upper elevations. There is low quality wildlife habitat for most species. This stage may provide seasonal forage for herbivores (mule deer and pronghorn) and seeds for grainivores. This stage is often accompanied by loss of much of the riparian vegetation, associated with entrenched gullies or stream channels that have had a lowering of the water table. Sagebrush and rabbitbrush invade the riparian zones and replace riparian species, such as cottonwoods and willows. There will be poor water quality in streams, with high sediment loads occurring. The community will have low biodiversity with a low number of migrant birds. Livestock forage is of poor quality in monotypic sagebrush stands. Almost no perennial and annual herbaceous plants are present, with bare ground exposed in interspaces. There is a possibility of severe erosion, including high sheet and rill erosion of soil occurring on colluvial and alluvial slopes. Extensive soil capping is in evidence. There is poor infiltration with high runoff potential, except in coppice mounds of dead shrubs. This is a vegetative plant community that is highly resistant to fires. Brush control may have to be accompanied by seeding because there is no understory seed source. Plant cover is as follows: herbaceous cover 2-9%, sagebrush cover 46-75%, litter 4-6%, rock 0.1-0.5%. Table L.6 shows production by species.

Table L.6: Potential Plant Community Production by Species

Species	Pounds/Acre Air Dry
Western wheatgrass	0-1
Alkali sacaton	0-1
Galleta grass	4-1
Bottlebrush squirreltail	2-3
Blue grama	2-3
Broom snakeweed	45-55
Annuals	25+
Big sagebrush	50+
Other species*	2-3

*The most important other species, based upon cover, frequency, density, and importance value in the plant community are:

Buckwheats, asters	Crested wheatgrass	Fendler threeawn
Globe mallow	Goldenweeds	Indian ricegrass
Loco weeds	Mat muhly	Needle & thread grass
New Mexico feathergrass	Parrey rabbitbrush	Prickly pear, etc
Prickly phlox	Red threeawn	Rubber rabbitbrush
Sand dropseed	Spike dropseed	Tumble grass

L.1.3 Wildlife

The following wildlife is associated with the sagebrush/grass ecosystem in the upper Rio Puerco area of New Mexico.

L.1.3.1 Mammals

Badger	Big brown bat	Bobcat
Botta's pocket gopher	Brush mouse	Coyote
Deer mouse	Elk	Ground squirrel
Gunnison's prairie dog	Kit fox	Little brown Myotis
Mule deer	Pallid bat	Plains pocket mouse
Pronghorn	Rock squirrel	Silky pocket mouse
Southern plains wood rat	Striped skunk	Western harvest mouse
White footed deer mouse	White-tailed antelope	

L.1.3.2 Birds

American kestrel	Ash throated flycatcher	Barn swallow
Bewick's wren	Black throated sparrow	Black-chinned humming bird
Black-headed grosbeak	Black-throated gray warbler	Blue grosbeak
Blue-gray gnatcatcher	Brewer's blackbird	Brewer's sparrow***
Broad-tailed humming bird	Brown-headed cowbird	Burrowing owl
Chipping sparrow	Common night hawk	Common poor-will
Common raven	Coopers' hawk	Dark-eyed junco
European starling	Golden eagle	Green-tailed towhee
Horned lark ***	House finch	House wren
Ladder-backed woodpecker	Loggerhead shrike	Marsh hawk
Merlin	Mockingbird	Morning dove
Northern flicker	Northern oriole	Orange crowned warbler
Plain titmouse	Prairie falcon	Red-breasted nuthatch
Red-tailed hawk	Robin	Rock wren
Rufous humming bird	Rufous-sided towhee	Sage sparrow ***
Sage thrasher ***	Say's Phoebe	Scott's oriole
Sharp-shinned hawk	Solitary vireo	Vesper sparrow ***
Western Bluebird	Western meadow lark	Western wood pewee
White crowned sparrow	White-breasted nuthatch	White-throated swift

***obligates or facultative species that spend some or all their time in the ecotype

L.1.3.3 Lizards

Checkered whiptail	Collard lizard	Great plains skink
Lesser earless lizard	Little striped whiptail	Many-lined skink
New Mexico whiptail	Plateau whiptail	Short-horned lizard
Side-blotched lizard	Tree lizard	

L.1.3.4 Snakes

Desert striped whipsnake Gopher (bull) snake Western (prairie) rattlesnake
Western diamondback rattlesnake

L.1.3.5 Amphibians

Plains spadefoot toad Western spadefoot toad Woodhouse's toad

L.1.4 Desired Plant Community

The desired plant community for the sagebrush/grass ecosystem in the upper Rio Puerco watershed in New Mexico should have the following elements:

- Range condition: Low seral, as previously described, with 16-25% big sagebrush cover . If cover of big sagebrush exceeds this range, then brush control should be scheduled.
- Mosaic pattern of sagebrush and herbaceous understory
- High biodiversity of wildlife including the listed obligate and facultative species

L.2 The Piñon and Juniper Ecosystem

Piñon-juniper (P-J) woodlands cover approximately 18% of the upper Rio Puerco watershed. Approximately 14% of this total is considered "manageable" using criteria of density and quality. The remaining is juniper savanna more suitable for grazing management than woodland products.

Elevations range from 6,600 to 7,400 feet. Frost-free days range from 100 to 140 (mean 120 days). Annual precipitation for a normal year ranges from 10 to 16 inches (mean 13 in.). For a drought year it ranges from 8 to 14 inches (mean 11 inches). Snowfall ranges from 25 to 40 inches falling from October through March.

There is a vegetative continuum in the upper Rio Puerco from lower to higher elevation and from south to north. This continuum goes generally from grasslands, to juniper savanna, to juniper dominated P-J, to piñon dominated P-J, to ponderosa pine forests.

Characteristics that differentiate grasslands from woodlands are: Woodland sites have 6% or more ground cover of stones or bedrock, slopes range from 9 to 15 percent, piñon pine is present, a mixture of rock and soil provides the suitable hydrologic environment for P-J woodland, and the most consistent indicator of an original P-J site is the stoniness or coarseness of the soil.

Woodland vegetation differs from forest vegetation in that the canopies of individual woodland trees rarely touch or overlap and are generally smaller in stature than forest tree species.

Peddie and Moir (1993), and Francis (1986) found the following characteristics of P-J woodlands in New, Mexico for the woodland continuum:

L.2.1.1 Juniper-Savanna Woodland

- 130 trees/Acre or less

- Tree cover 5-30%
- Height of the tallest trees were less than 16 feet
- Mean herbaceous understory production 187.2 pounds/acre, air dry

L.2.1.2 Piñon Pine Dominated woodland

- 170 trees/acre (mean)
- Tree cover 30-50%
- Height of tallest trees 13-26 feet
- Mean herbaceous understory production 108.9 pounds/acre air dry

L.2.1.3 Ponderosa Pine/Mesic (closed woodlands)

- 280 + or - 50 trees/acre
- Tree cover 50-80%
- Height of tallest trees excluding ponderosa pine 23-42 feet Mean herbaceous understory production 143.8 pounds/acre air dry

L.2.1.4 Soils of the Woodlands

Soils are usually shallow and are derived from granite, basalt, limestone, and mixed alluvium. Topographically, they are found on mesa tops, mesa side slopes, ridges, foothills, and colluvial slopes. The following soil mapping units identified in the Cabezon soil survey and the Sandoval county soil survey are occupied by the P-J woodland ecosystem:

Atarque-Menefee-Rock outcrop complex	Basalt Outcrop-Cabezon association
Berent sandstone outcrop association	Billings And Persayo Silty Clay Loam
Councelor-Eslendo-Mespun complex	Hagerman-Bond association
Ildefonso very stony loam	Litle-Persayo association
Montecito complex	Penistaja-Sandstone outcrop association
Persayo Gravely Soils-Shale outcrop association	Persayo-Shale outcrop association
Pinitos Loam	Rock Outcrop Saido complex
Rock Outcrop-Travessilla-Persayo association	Rock Outcrop-Zia complex
Sandstone Outcrop-Travessilla association	Skyvillage-Sandoval-Rock outcrop complex
Travessilla-Persayo-Billings association	Vesilla-Menefee-Orlie association
Vesilla-Menefee-Rock outcrop complex	Zia-Skyvillage-Rock outcrop complex

L.2.1.5 Woodland Characteristics

The piñon-juniper woodland or dwarf conifer ecosystem is characterized by one or more species of piñon pine and juniper. Throughout most of the ecosystem, junipers outnumber piñons.

The Colorado piñon (*Pinus edulis*) is the common denominator in most piñon-juniper stands. Piñons range between 9 and 35 feet tall and 5 to 18 inches in diameter. In the average P-J stand

in New Mexico, piñons account for 61% of the trees and are most common in the smaller size classes. The average stand contains 462 trees and 90 square feet of basal area per acre. Piñon saplings grow 4-6 inches in height annually. Mature piñon grow 2-4 inches in height annually. On better sites, piñon can grow to 12 inches in diameter within 150 years. The proportion of piñon in the stand increases with increased elevation and moisture until it becomes the primary species at about 7.200 feet. Seed crops occur every 4 to 7 years depending upon the weather, site conditions, and insect herbivory. Trees start bearing cones at 25 years, but production peaks when trees are 75 to 100 years old. They can reach ages of over 400 years. Cones require three growing seasons to mature and contain about 20 seeds. A productive tree can produce about 20 pounds of seed, and an acre can yield about 300 pounds of seed. Mature seed release starts in mid-September and can continue for a 50-day period.

The three most common junipers associated with the piñon are one-seed (*Juniperus monosperma*), Rocky mountain (*J. scopulorum*) and Utah juniper *(J. osteosperma*). Alligator juniper (*J. deppeana*) is common further south in Cibola County, both east and west of El Malpais.

Junipers are multi-stemmed trees less than 40 feet in height. Junipers are generally more drought tolerant than piñons, and tend to predominate on drier sites. Junipers generally grow slower than piñon. They grow 4 inches in height annually up to age 40, 1.3 inches from 40 to 80 and 0.7 inches from 80 to 300. Annual diameter growth (for Rocky Mountain juniper) is about 0.08 inches up to 170 years of age and 0.03 inches afterward. In the average P-J stand in New Mexico, junipers makeup slightly more than half of the basal area and 47% of the stand cubic feet volume.

One-seeded juniper taproots of mature trees are 18 inches to 12 feet in length. Lateral roots are 2.5 to 3 times as long as the tree is tall, usually in the surface 3 feet of the soil and roost concentrated in the surface 6 inches.

A 1975 range inventory of the upper Rio Puerco watershed showed the following species composition in P-J woodland sites:

Table L.7: Species Composition of P-J Sites of the Upper Rio Puerco Watershed, 1975

Species	Percent Composition
All juniper species	27
Piñon pine	23
Blue grama	14
Big sagebrush	9
Galleta grass	6
Broom snakeweed	5
All oak species	3
Ponderosa pine	1
Black grama	1
Prickly pear	1
Fringed sage and Bigelow sage	1

Species	Percent Composition
Mountain mahogany	1
Threeawn species	1
Sand dropseed	1
Bottlebrush squirreltail	1
Prairie junegrass	1
Sideoats grama	1
Western wheatgrass	1
Needle-and-thread grass and New Mexico feathergrass	1

The 1975 survey also found the following (mean) percent cover:

Table L.8: Mean Percent Cover within P-J Sites, Upper Rio Puerco, 1975

Cover	Percent
Forage vegetation	12.7
Total vegetation	30.3
Litter	20.9
Gravel	9.2
Cobble/Stone	6.7
Bare Ground	32.5

Francis (1986) found the following woodland communities:

Juniper Savanna
Major understory species based upon importance value ranking:
Blue grama
Galleta grass
Broom snakeweed
Sand dropseed

Cover	Percent
Total Plant	13.3
Tree (Juniper)	5.7
Shrub	.9
Herbaceous	6.7
Litter	7.9
Rock	11.4
Bare Soil	74.0

Juniper Dominated Woodland
Major understory species based upon importance value ranking:

Blue grama
Galleta grass
Broom snakeweed
Sand dropseed
Big sagebrush
New Mexico feathergrass
Red threeawn
Baby white aster
Black grama
Bottlebrush squirreltail
Sideoats grama
Western wheatgrass

Cover	Percent
Total plant	15.9
Tree	3.4
Shrub	5.1
Herbaceous	7.4
Litter	16.1
Rock	10.0
Bare Soil	66.4

Piñon Dominated Woodland

Major understory species based upon importance value ranking:

Blue grama
Galleta grass
Buckwheat species
Hairy gold aster
James eriogonum
Plains pricklypear
Broom snakeweed
Sedge species
Gambel's oak
Baby white aster
Sand dropseed
Ephedra species
Greene’s rabbitbrush
Indian ricegrass
Hymenoxys species

Cover	Percent
Total plant	11.9
Tree	4.7
Shrub	2.7
Herbaceous	4.5
Litter	6.5
Rock	8.3
Bare Soil	80.8

Common Woodland Products:

- Fuelwood - The P-J ecosystem provides heating and cooking fuel for thousands of households in the area. The present and future demand for piñon pine and juniper fuel wood will probably remain high because there is no suitable alternative.
- Fence Posts - The "cedar" (juniper) post fenced the west and will continue to be used for line posts and brace posts.

- Christmas Trees - For many people, there is no true Christmas without a piñon or juniper tree. Their popularity is growing and BLM has provided suitable areas, especially in old tree chainings where young (20 year old) trees have re-invaded the sites. Pruning piñon pine will improve a stand if the objective is for Christmas tree production.
- Nuts - Piñon nuts have been a staple food for Indian people from time immemorial and a delicacy for the white man. They are nutritious and delicious and there growing popularity has created a high demand for this crop.
- Ornamental Wildlings - The piñon pine is widely used for landscaping and this use is increasing in the Albuquerque metropolitan area.

L.2.2 Wildlife

The following lists of mammals, birds, lizards, snakes, and amphibians are common to the P-J woodlands in the Rio Puerco watershed. Other uncommon, largely migratory species, found occasionally in this ecosystem are not listed.

Woodland mammals

Little-brown myotis
Long-eared myotis
Big brown bat
Hoary bat
Woodland cottontail rabbit
Colorado chipmunk
White-tailed antelope groundsquirrel
Rock squirrel
Botta’s pocket gopher
Silky pocket mouse
Western harvest mouse
Deer mouse
Piñon mouse
White-footed deer mouse
White-throated woodrat
Southern plains woodrat
Stephen's woodrat
House mouse
Porcupine
Coyote
Gray fox
Badger
Striped skunk
Mountain lion
Bobcat
Mule deer
Elk

Woodland Birds

Sharp-shinned hawk
Cooper's hawk
Red-tailed hawk
Golden eagle
Prairie falcon
Merlin
Great horned owl
Wild turkey
Common poor-will
Common nighthawk
White-throated swift
Black-chinned hummingbird
Broad-tailed hummingbird
Northern flicker
Acorn woodpecker
Ladder-backed woodpecker
Casin's kingbird
Ash throated flycatcher
Hammonds flycatcher
Western wood pewee
Barn swallow
Cliff swallow
Stellers Jay
Piñon Jay
Common raven
Plain titmouse
Lead colored bushtit
Bewick's wren
Robin
Blue-gray gnatcatcher
Solitary vireo
Orange crowned warbler
Black--throated gray warbler
Scott's oriole
Black-headed grosbeak
House finch
Green-tailed towhee
Rufous-sided towhee
Brown towhee
Rufous-crowned sparrow
Dark-eyed Junco
Chipping sparrow
White-crowned sparrow
Townsend's solitaire

* Obligate woodland species

Piñon jays and scrub jays disperse piñon seeds.

Townsend's solitaire, cottontail, coyote and mice disperse juniper seeds.

Woodland

Lizards

Collard lizard
Eastern fence lizard
Short-horned lizard
Tree lizard
Side-blotched lizard
Little striped whiptail
Plateau whiptail
Checkered whiptail
Great plains skink
Many-lined skink

Snakes
Night snake
Desert-striped whipsnake
Gopher (bull) snake
Prairie rattlesnake
Western diamondback rattlesnake

Amphibians
Red spotted toad
Woodhouse's toad

For browsing wildlife, the winter forage from woody plants is the major value of the P-J woodland ecosystem. Dietary studies in New Mexico woodlands show the following in descending order of utilization:

Mountain mahogany
Gray oak
Birdsbill day flower
Morning glory
Spiderwort
Deer vetch

Woodland management in the Rio Puerco watershed should take into account certain damaging agents:

Piñon Pine
Piñon sawfly (*Neodiprion edulicolus*)
Piñon tip moth (*Dioryctria albovittella*)
Piñon needle scale (*Matsucoccus acalyptus*)
Cone moth (*Eucasma bobana*)
Piñon Ips (*Ips confusus*)
Piñon dwarf mistletoe (*Arceuthobium divaricatum*)

Woodpeckers and porcupines also cause considerable damage to piñon pine.

Junipers
Twig beetles (*Phloeosinios spp*.)
Twig girdlers (*Stylox app*.)
Rusts (*Gymnosporanqium spp*.)
True mistletoes (*Phorandendron spp*.)

L.2.3 Desired Plant Communities

Piñon Dominated Woodland

Cover	Percent Composition (by weight)	
Trees	65	
Piñon pine	43	
Juniper species	22	
Shrubs	14	
Big sagebrush		Mountain mahogany
Yucca		Skunkbush sumac
Prickly pear cactus		Bitterbrush
Fringed sage		Winterfat
Wavy leaf oak		Apache plume
Grasses or Grasslikes	30	
Blue grama		Needle & thread
Galleta		Western wheatgrass
Indian ricegrass		Mutton bluegrass
Littleseed ricegrass		Dryland sedge
Bottlebrush squirreltail		Prairie junegrass
Forbs	5	
Groundsel		Salsify
Indian paintbrush		Hymenoxys sp.
Buckwheat		Deer vetch
Multiflower gilia		Wright's silktassel
Penstemon sp.		Herbaceous sages
Sego lily		Spiderwort
Fleabane sp.		Bird's bill/dayflower
Four O'clock		

Cover	Percent
Total Plant	11.9
Tree	4.7
Shrub	2.7
Herbaceous	4.5
Litter	6.5
Rock	8.3
Bare Soil	73.3 or less

Juniper Dominated Woodland	Percent Composition By Weight	
Trees	65	
One-seed juniper	43	
Piñon pine	22	
Shrubs	14	
Bigelow sage		Shrub live oak
Fringed sage		Gray oak
Cliffrose		Winterfat
Skunkbush sumac		Fourwing saltbush
Mountain mahogany		
Grasses	30	
Blue grama		Sideoats grama
Galleta		Hairy grama
Alkali sacaton		Black grama
New Mexico feathergrass		Wolftail
Indian ricegrass		Thurber muhly
Forbs	5	
Wormwood		Buckwheat species
Sego lily		Salsify
Globemallow		Indian' paintbrush
Fleabane species		Hymenoxys species
Groundsel species		Gilia species
Four-o'clock		Penstemon species

Cover	Percent
Total Plant	15.1
Tree	4.2
Shrub	3.7
Herbaceous	7.2
Litter	13.4
Rock	10.5
Bare Soil	69.0

The percent species composition for trees, shrubs, grasses, and forbs are meant to be a mean on either side of which there is an acceptable range of 5-10 percent variation. The same holds true for the percent cover figures.

L.2.4 Treatment Recommendations

L.2.4.1 Wildlife

General guidelines for treatments designed to improve wildlife habitat include:

1. Minimum cover for wildlife in the P-J woodland ecosystem should be at least 50 acres in size and not less than 600 feet wide.
2. Provide travel or escape routes for movement of animals between the various islands and fingers of unmolested habitat cover.
3. Facilitate distribution of wildlife use through arrangement of openings and cover in relation to water and available forage supplies. Established routes of game travel (where known or suspected) should be given special consideration in laying out corridors.
4. Provide thermal cover (shelter) as an aid to the maintenance of constant body temperature by maintaining an adequate quantity of large trees of all species which provide both aerial cover and ground litter.
5. Old piñon pines with large trunks should not be removed unless more than 10 per acre are present. Larger snags should be retained as potential turkey roost trees, raptor nest sites, and other trees important to wildlife.
6. When clearing piñon-juniper stands, up to 10 large piñon trees per acre may be retained
7. All stringers and groves of ponderosa pine interspersed with woodland should be retained, including snags and any understory cover of ponderosa pine reproduction, unless they are diseased or infected with some damaging agent.
8. Treatment patterns or boundaries should be undulating to create optimum "edge" and uneven margins.
9. Water developments should be included in or adjacent to cover areas whenever possible.
10. Treatments should occur 100 to 200 feet away from rimrock areas.

L.2.4.2 Silviculture

The Rocky Mountain Forest and Range Experiment Station recommends the following silviculture methods for improving P-J woodlands that have a high site productivity for growing wood products. High site woodlands can produce wood products on a sustainable yield basis. These usually are found in the piñon dominated woodlands. The main goal is to obtain satisfactory tree regeneration for the future.

1. The two-step shelterwood method appears to work best for even age stand management. The even-aged system produces stands in which all trees are about the same age; that is, the difference in age between trees forming the main crown canopy level will usually not exceed 20 percent of the rotation length. The shelterwood cutting method is any regeneration cutting in a more or less_ mature stand, designed to establish a new crop under the protection of the old. The resultant crop will be even-aged. The shelterwood cutting method is characterized by a series' of cuts called the preparatory cut, seed cut, and-removal cut.

2. The single-tree selection method works beat of the uneven-aged methods.
3. The uneven-aged system involves manipulation of a forest to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. The single-tree selection cutting involves removal of selected trees from specified size or age classes over the entire stand area in order to meet a predetermined goal of size or age distribution and species composition in the remaining stand.
4. Thinning for herbaceous improvement should not remove more than 65 percent of net crown cover.
5. Leave the best trees with largest crowns on a spacing of 20 x 20 feet to 30 x 30 feet.
6. Limit opening size to four to ten acres.
7. Lop and scatter is the preferred method of slash disposal outside of the WUI.

L.2.4.3 Slash Disposal

The following recommendations are specifically for slash disposal following a silviculture thinning method:

1. Lop and scatter of slash may reduce erosion, provide micro-climate conditions conducive to establishing a herbaceous understory, and prepare the fuel bed for broadcast burning.
2. For pile burning of slash, piles should not placed under trees to be retained and pile size should be regulated in relation to predicated heat intensity with a general standard of less than 125 cubic feet per pile.
3. For chipping of slash, chip depth should not exceed 2 inches with no one area deeper than 6 inches. For mastication of slash, mulched material should be less than 3 inches deep on average.

L.2.4.4 Watershed Stabilization

Because the P-J woodlands will be managed under silviculture methods, large-scale tree chainings, tree crushing, cabling, and dozer pushing will not be considered for best management practices.

Emphasis will be placed on water control projects in smaller gully systems and the use of slash windrows on side slopes and gullies. Roads that are not needed will be abandoned and reclaimed.

L.2.4.5 Visual Resource Management

Tree thinning in the P-J woodlands will give them a more open, park-like appearance and be more pleasing to the eye.

L.3 The Grassland Ecosystem

L.3.1 Introduction

Grasslands make up approximately 38 percent of the upper Rio Puerco watershed in New Mexico. Much of this grassland has been invaded by broom snakeweed. It is dominant in approximately 17 percent of the grasslands. Approximately 11 percent of the grasslands were pitted or ripped during the 1950's.

Francis (1986) classified the area into grasslands, shrublands, and treeland. He also divided the area into five landform classes. For the purposes of this paper we will discuss the following six subformations within the grassland ecosystem:

1. Colluvial grasslands dominated by grama grasses and galleta grass (Bouteloua and Hilaria).
2. Colluvial grasslands dominated by winterfat (Ceratoides).
3. Lower colluvial and alluvial grasslands dominated by rabbitbrush-species. (Chrysothamnus)
4. Lower colluvial and alluvial grasslands dominated by saltbush species (Atriplex).
5. Alluvial grasslands dominated by dropseeds (Sporobolus).
6. Alluvial grasslands dominated by greasewood (Sarcobatus).

L.3.2 Soils

The following grassland soil-mapping units were recorded from the Cabezon and Sandoval County Soil Surveys:

Basalt outcrop-Cabezon assoc.
Billings silty clay loam, alkali, and gullied land
Doak-Betonnie fine sandy loamy
Ildefonso very stony loam
Litle silty clay
Penistaja-Bond assoc.
Persayo gravelly soils--Shale outcrop assoc.
Pinavetes-Galisteo, moderately saline, sodic assoc.
Ravola silty clay loam, alkali, and gullied land
Shavano-Berent assoc.
Sparank silty clay loam
Travissilla-Persayo-Billings assoc.
Billings and Persayo silty clay loamy
Cabezon-Basalt outcrop assoc.
Hagerman-Bond assoc.
Las Lucas soils
Litle-Las Lucas-Persayo
Penistaja-Hagerman assoc.
Pinavetes loamy sand
Querencia-Zia complex
Sandoval fine sandy loam
Sparank clay loam, moderately saline, sodic
Torreon loam

Greasewood dominated grassland soils:

- Christianburg clay and gullied land
- Navajo clay and gullied land
- Fruitland-Slickspot assoc.

Saltbush dominated grassland soils:

- Alkali alluvial land
- San Mateo loam

Winterfat Dominated grassland soils:

- Quarencia loam

Rabbitbrush dominated grassland soils:

- Billings silty clay loam and gullied land
- Little-Persayo assoc.

Snakeweed dominated grassland soils:

- Rock outcrop-Travessilla-Persayo assoc.

L.3.3 Species Composition and Cover

The following species composition and cover was observed in a 1975 forage inventory of the upper Rio Puerco watershed:

Major Species	Percent Species Composition
Broom snakeweed	23
Blue grama	20
Galleta grass	19
Alkali sacaton	11
Ring muhly	4
Red threeawn	2
Bottlebrush squirreltail	2
Sand dropseed	2
Crested wheatgrass	2
Fourwing saltbush	2
Winterfat	2
Western wheatgrass	1
Indian ricegrass	1
Fringed sage	1
Shadscale	1
Rubber rabbitbrush	1
Prickly pear	1
Cholla cactus	1
One-seed juniper	1

The remaining 3 percent was made up of black grama, sideoats grama, New México feather grass, big sagebrush, Louisiana wormwood, and piñon pine. Other species found in trace amounts (less than 1%) were: Sideoats grama, hairy grama, sandhill muhly, mountain muhly, mat muhly, spike dropseed, needle & thread grass, sleepy grass, salt grass, burro grass, vine mesquite, plains lovegrass, cheat grass, buckwheats, Parry rabbitbrush, Douglas rabbitbrush, broom dalea, Mormon tea, wolfberry, shrub liveoak, and black greasewood

Alluvial grasslands dominated by greasewood (1975):

Major Species	Percent Composition
Black greasewood	56
Alkali sacaton	18
Shadscale	7
Western wheat grass	3
Fourwing saltbush	3
Galleta grass	2
Broom snakeweed	2
Blue grama	1
Parry rabbitbrush	1
Obovate saltbush	1
Bottlebrush squirreltail	1
Russian thistle	1

Cover (1975)	Percent
Total plant	26.9
Forage vegetation	18.3
Litter	19.6
Small rock (gravel)	3.9
Large rock (cobble/stone)	0.8
Bare soil	48.6
Average slope	3.2

The remaining 4 percent was red threeawn, mat muhly, ring mutely, pale wolfberry, and walking stick cholla.

Alluvial grasslands dominated by saltbush (1975):

Major Species	Percent Composition
Fourwing saltbush	58
Alkali sacaton	15
Broom snakeweed	5
Blue grama	5
Galleta grass	5
Russian thistle	3

Major Species	Percent Composition
Sand dropseed	2
Black greasewood	1
Shadscale	1
Bottlebrush squirreltail	1
Western wheatgrass	1

The remaining 3 percent was mat muhly, crested wheatgrass, red threeawn, Indian ricegrass, spike dropseed, New Mexico feathergrass, obovate saltbush, rubber rabbitbrush, Douglas rabbitbrush, winterfat, and walking stick cholla.

The following cover, density, frequency, and composition rankings were compiled from the Phyto-Edaphic Communities of the Upper Rio Puerco Watershed, New Mexico by Richard E. Francis (A 10 year research study).

1. Colluvial grasslands dominated by grama grasses and galleta (Bouteloua and Hilaria). The following species are ranked in order of their importance. The percent mean cover, density and frequency are listed:

Species	Cover	Density	Frequency
Blue grama	27.6	32.0	15.8
Galleta grass	23.9	31.3	22.6
Alkali sacaton	10.2	4.7	6.8
Sand dropseed	5.5	7.1	13.9
Broom snakeweed	9.6	2.3	9.0
Black grama	5.7	6.0	4.9
New Mexico feathergrass	1.2	1.6	1.8
Ring muhly	1.2	1.4	1.4
Western wheatgrass	.2	1.3	.5
Fourwing saitbush	1.1	.1	.5
Bottlebrush squirreltail	.3	.5	2.5
Cholla cactus	1.0	.2	.8

Cover (mean)	Percent
Total plant	32.9
Tree	0.1
Shrub	2.0
Herbaceous	14.5
Litter	4.8
Rock	5.6
Bare soil	73.6

The following production was measured for colluvial grassland sites:

Species	Pounds/Acre Air Dry
Western wheatgrass	9.9
Blue grama	93.8
Galleta grass	48.9
Alkali sacaton	50.9
Bottlebrush squirreltail	9.4
Annuals	10.5
Other species	127.1
Total	330.0

2. Colluvial grasslands dominated by winterfat (Ceratoides):

Species	Pounds/Acre Air Dry
Western wheat grass	0.5
Blue grama	45.4
Galleta grass.	61.6
Alkali sacaton	43.6
Bottlebrush squirreltail	17.0
Annuals	2.8
other species	79.0
Total	249.9

Species	Cover	Density	Frequency
Galleta grass	24.2	38.8	23.6
Blue grama	27.7	35.8	14.3
Broom snakeweed	18.8	6.7	16.9
Winterfat	10.0	2.7	10.1
Total plant cover	.7	2.0	7.0
Tree cover			
Shrub cover			
Herbaceous cover			
Litter			
Rock			
Bare soil			
Bottlebrush squirreltail			
Alkali sacaton	5.4	1.6	2.4
Indian ricegrass	1.3	1.5	4.5

The BLM production studies showed a mean production of winterfat to be 15 pounds/acre for colluvial grasslands.

3. Lower colluvial and alluvial grasslands dominated by rabbitbrush species (chrysothamnus):

Species	Cover	Density	Frequency
Blue grama	58.3	58.3	36.2
Western wheatgrass	5.0	20.7	14.0
Galleta grass	7.2	9.3	10.0
Rabbitbrush species	17.6	0.2	3.7
Sand dropseed	1.8	4.0	13.0
Alkali sacaton	2.7	.9	2.6
Mat muhly	2.2	2.7	4.8
Threeawn species	0.7	0.6	2.7

Cover (mean)	Percent
Total plant cover	38.1
Tree cover	0
Shrub cover	7.7
Herbaceous cover	30.5
Litter	17.0
Rock	.03
Bare soil	56.0

The following production was measured for rabbitbrush-dominated grasslands:

Species	Pounds/Acre Air Dry
Western wheatgrass	59.8
Blue grama	162.5
Galleta grass	27.1
Alkali sacaton	16.5
Bottlebrush squirreltail	7.7
Annuals	15.9
Other species	76.5
Total	366.0

BLM production studies showed a mean production of rabbitbrush species to be 20 pounds/acre.

4. Lower colluvial and alluvial grasslands dominated by saltbushes (Atriplex):

Species	Cover	Density	Frequency
Alkali sacaton	17.6	8.1	18.9
Galleta grass	8.0	21.2	9.9
Obovate saltbush	15.5	7.4	12.5
Fourwing saltbush	24.3	4.5	4.2
Broom snakeweed	9.2	3.3	9.9
Spike dropseed	2.6	4.8	7.9

Species	Cover	Density	Frequency
Sand dropseed	1.0	6.2	6.8
Moundscale	4.7	1.9	1.8
Mockheather (Frankenia)	5.3	0.4	1.2
Saltgrass	0.1	3.3	2.8
Mesa dropseed	1.2	1.5	2.4
Winterfat	0.3	1.1	2.8
Fendler threeawn	0.8	1.9	1.5
Globe mallow	0.2	0.6	1.4
Small soapweed	1.0	0.3	0.7
Shadscale	0.4	0.1	0.5
Vine mesquite	0.1	0.5	0.2

Cover	Percent
Total plant cover	14.3
Tree cover	0
Shrub cover	9.6
Herbaceous cover	4.7
Litter	7.0
Rock	0.8
Bare soil	87.4

The following production was measured for grasslands dominated by saltbushes (Atriplex):

Species	Pounds/Acre Air Dry
Western wheat grass	2.1
Blue grama	13.1
Galleta grass	36.4
Alkali sacaton	133.3
Bottlebrush squirreltail	5.9
Annuals	29.4
other species	96.3
Total	316.5

BLM production studies showed a mean production of 60 pounds/acre for shadscale and 43 pounds/acre for fourwing saltbush.

5. Alluvial grasslands dominated by alkali sacaton:

Species	Cover	Density	Frequency
Alkali sacaton	65.0	47.6	43.2
Galleta grass	7.6	16.0	11.3
Blue grama	5.9	15.5	7.6
Broom snakeweed	6.0	3.0	7.4

Species	Cover	Density	Frequency
Sand dropseed	2.9	3.3	8.0
Western wheatgrass	2.1	4.9	4.9
Mat muhly	1.4	3.1	1.6
Tumble grass	.5	.9	2.9

The following production was measured for alluvial grasslands dominated by alkali sacaton:

Cover	Percent
Total Plant	20.2
Tree	0
Shrub	1.5
Herbaceous	18.7
Litter	5.7
Rock	0.5
Bare soil	75.1

Species	Pounds/Acre Air Dry
Western wheatgrass	19.9
Blue grama	26.2
Galleta grass	108.9
Alkali sacaton	219.7
Bottlebrush squirreltail	9.6
Annuals	12.7
Other species	45.0
Total	441.8

6. Alluvial grasslands dominated by greasewood (Sarcobatus):

Species	Cover	Density	Frequency
Black greasewood	60.5	30.5	48.5
Shadscale	16.6	23.7	19.5
Bottlebrush squirreltail	13.5	17.3	18.0
Western wheatgrass	*5.2*	*26.5*	*9.0*
Rubber rabbitbrush	2.0	.2	2.0

Cover	Percent
Total plant cover	21.8
Tree cover	0
Shrub cover	18.8
Herbaceous cover	3.0
Litter	11.9
Rock	0
Bare soil	85.1

The following production was measured for alluvial grasslands dominated by greasewood:

Species	Pounds/Acre Air Dry
Western wheatgrass	153.1
Blue grams	20.1
Galleta grass	6.0
Alkali sacaton	50.5
Bottlebrush squirreltail	27.6
Annuals	13.1
Other species	49.5
Total	319.9

BLM found the following mean production for black greasewood: 57 pounds/acre.

The following MLRA based ecological sites were correlated to grassland areas in the upper Rio Puerco:

1. Colluvial grasslands dominated by Bouteloua and Hilaria:

WP-2 Shallow Hills
WP-2 Malpais Breaks
WP-2 Gravely Upland
WP-2 Shale Hills
WP-2 Shallow Sandstone
WP-2 Gyp Hills
WP-2 Deep Sand
WP-2 Sandy
WP-1 & WP-2 Loamy
WP-1 Gravely Slopes
WP-1 Clayey Upland
WP--l Loamy Upland
WP-l
Deep Sandy Upland

2. Colluvial Grasslands dominated by winterfat:
WP-2 Loamy
WP-2 Limy

3. Lower colluvial and alluvial grasslands dominated by rabbitbrush:
WP-l Clayey Upland

4. Lower colluvial and alluvial grasslands dominated by saltbush:
WP-2 Salt Flats
WP-2 Bottomland
WP-2 Swale

5. Alluvial grasslands dominated by alkali sacaton:
WP-2 Salt. Flats
WP-2 Clayey Bottomland
WP-1 & WP-2 Swale

6. Alluvial grasslands dominated by greasewood:
WP-2 Salt Flats
WP-l Salty Bottomland

L.3.4 Common Grassland Wildlife

Mammals

Desert shrew
Little brown myotis
western pipistrelle
Big brown bat
Pallid bat
Cottontail rabbit
Black-tailed jackrabbit
Gunnison's prairie dog
Spotted groundsquirrel
Botta's pocket gopher
Ord's kangaroo rat
Banner-tailed kangaroo rat
Silky pocketmouse
Plains pocketmouse
Western harvest mouse
Deer mouse
White-footed deer mouse
Northern grasshopper mouse
White-throated woodrat
House mouse
Coyote
Badger
Striped skunk
Bobcat
Pronghorn

Birds

Sharp-shinned hawk
Cooper's hawk
Red-tailed hawk
Golden eagle
Burrowing owl
Prairie falcon
American kestrel
Scaled quail
Mountain plover
Morning dove
Roadrunner
Common nighthawk
Northern flicker
Western kingbird
Say's phoebe
Horned lark
Tree swallow
Common raven
Rock wren
Mockingbird
Robin
Loggerhead shrike
European starling
Western meadowlark
Brewer's blackbird
Brown-headed cowbird
Northern oriole
Blue grosbeak
House finch
Lark sparrow
Savannah sparrow
Vesper sparrow *
Cassin's sparrow
Black-throated sparrow
Lark sparrow

Lizards

Lessor earless lizard
Collard lizard
Eastern fence lizard
Short-horned lizard
Tree lizard
Side-blotched lizard
New Mexico whiptail
Little striped whiptail
Plateau whiptail
Checkered whiptail
Great plains skink
Many-lined skink

Snakes

Night snake
Desert striped whipsnake
Long-nosed snake
Western (Prairie) rattlesnake
Western diamondback rattlesnake

Amphibians
Western spadefoot toad
Plains spadefoot toad
Red-spotted toad
Woodhouse's toad

*Obligate or facultative species

L.3.5 Desired Plant Communities

1. Colluvial grasslands dominated by Bouteloua, Hilaria, Ceratoides, and Chrysothamnus.

Ecological Condition	Pounds/Acre
Present (Low to mid-seral)	327
Grazing Management (High seral)	394
Treatment	632

Composition	Percent By Weight Range
Grasses or grasslike	55----73----85
Shrubs	10----19----35
Forbs	5------8----10

Sandy sites--increase in spike dropseed, giant dropseed, Indian ricegrass, sand bluestem, and fourwing saltbush.

Rocky/Gravelv--increase in sideoats grama, little bluestem, hairy grama, wolf tail, black grama, cane bluestem, skunkbrush sumac, shrub live oak, Apache plume, wolfberry, New Mexico desert olive.

Limy--increase in New Mexico feather grass, mesa dropseed, Bigelow sage.

Gypsum soils--Mockheather, sand verbena, gyp dropseed, townsend aster.

2. Alluvial grasslands dominated by alkali sacaton, greasewood, and saltbush.

Ecological Condition	Pounds/Acre
Present (low to mid seral)	388
Grazing management (high seral)	700
Treatment	1,175

Composition	Percent By Weight Range

Grasses or grasslike	70----79----85
Shrubs	10----16----25
Forbs	5------6----10

Bottomlands/Salt Flats--increase vine mesquite, western wheatgrass, creeping muhly, mat muhly, and spike muhly.

As the alkalinity or salt content in the soil increases there will be an increase in salt grass, seepweed, arrow grass, iodine bush, greasewood, and saltcedar.

L.3.6 Wildlife

There should be an increase in nesting of migratory neotropical birds, raptors and pronghorn. A decrease in the number of brown-headed cowbirds. A high seral vegetative diversity will improve the wildlife habitat overall

Watershed Cover

Colluvial grasslands	Acceptable Range of Percent Cover
Total plant cover	18-28
Tree cover	0-0.3
Shrub cover	4-6
Herbaceous cover	11-18
Litter	8-10
Rock	2-3
Bare soil	68-72

Alluvial grasslands	Acceptable Range of Percent Cover
Total plant cover	18-20
Tree cover	0- 0
Shrub cover	4- 10
Herbaceous cover	8-16
Litter	6-8
Rock	0-0.4
Bare soil	73-83

Grasses and forbs halt erosion by the establishment of root systems that hold the soil in place. Quick sprouting varieties can cover the bare soil in a minimum of time. Forbs and grasses not only stop the erosion of the land, but enrich the soil by adding nitrogen through their root systems. Living plants and plant residue (litter) provide ground cover on the surface of the soil, and intercept rainfall and other moisture. The ground cover slows the, flow of water across the surface and increases the rate at which water soaks into the soil. Ground cover can be considered a practical manner of slowing or even eradicating erosion. Rainfall is most erosive when it is most intense. The upper Rio Puerco has a history

of short-duration, high intensity storms. During these storms, grasses and forbs will increase the resistance to eroding water, thus improving the soil and water quality.

Visual Resources

Maintain an open, rolling grassland with as few visual disturbances as possible. Watchable wildlife for the visitor should include pronghorn and numerous raptors and songbirds.

L.4 The Ponderosa Pine Ecosystem

L.4.1 Introduction

The ponderosa pine forests in the upper Rio Puerco are classified as lower montane coniferous forests. The series is Ponderosa Pine-Piñon Pine-Gambel Oak. Elevations range from 7,200 to 8,200 feet.

These forests are relatively warm and dry dominated by ponderosa pine (*Pinus ponderosa*). The climate is borderline for forests, and in the upper Rio Puerco would be considered the lower ponderosa pine forest representation. Warm air and soil temperatures allow a potential growing season of around 180 days. However, available water in upper portions of the soil profile is deficient during the hottest and driest months of May and June. The winters are cold with mean precipitation of 20 inches/year and mean annual temperature of about 43 F. The soil temperature regime is frigid.

There are three subspecies of ponderosa pine. The subspecies native to the Rio Puerco is *Pinus ponderosa subsp. scopulorum*. On the highest northern aspects and near drainages, Douglas fir (*Pseudotsuga menziesii*) and/or quaking aspen (*Populus tremuloides*) may occur, but both are uncommon.

Associated broadleaf trees and shrubs are Gambel and wavy-leafed oaks (*Quercus gambelii, Q. undulata*), wax current (*Ribes cereum*), snowberry (*Symphoricarpus, oreophilia*), wood rose (*Rosa woodsii*), New Mexico locust (*Robinia neomexicana*), rock spiraea (*Holodiscus dumosus*), and Colorado barberry (*Berberis fendleri*). Piñon pine (*Pinus edulis*) and Rocky mountain juniper (*Juniperus scopulorum*) are the two major evergreens associated with ponderosa pine.

Further south in Cibola County, Gray oak (*Quercus grisea*) and Alligator juniper (*Juniperus depeanna*) are more dominant.

Grasses found in the understory include Arizona Fescue (*Festuca arizonica*), Pine dropseed (*Blepharoneuron tricholepis*), Little bluestem (*Schizachyrium scoparius*), Mountain muhly (*Muhlenbergia montana*), Fringed brome (*Bromus ciliatus*), and Threadleaf sedge (*Carex filifolia*) . In the transition zone between P-J woodland and Ponderosa pine, Mutton blue grass (*Poa fendleriana*) and Prairie junegrass (*Koeleria cristata*) are more dominant.

Common forbs are Louisiana wormwood, fringed sagewort, buckwheat, spurge, Indian paintbrush, columbine, geranium, lupine, penstemon, deervetch, cinquefoil, groundsel, big golden pea, spiderwort and salsify.

L.4.2 Ponderosa Pine Forest Soils

The Cabezon and Sandoval County soil surveys correlated four soil mapping units that are associated with ponderosa pine forests in the upper Rio Puerco.

1. Sedmar loamy sand in the Chijuilla-Cuba Mesa area
2. Basalt Outcrop-Orthents-Ustolls complex- I.C. Grant area
3. Orejas Rock outcrop complex- I.C. Grant area
4. Cabezon-Basalt outcrop association- I.C. Grant area

L.4.3 1975 Forage Inventory

The following cover data and species composition was recorded in the upper Rio Puerco area:

		Percent
Forage	vegetation	14
Total	vegetation	35
Litter		33
Small	rock	4
Large	rock	7
Bare soil		21
Mean slope		11

Species	Percent
Ponderosa pine	35.5
Gambel's oak	17.5
Piñon pine	15.0
Blue grama	9.0
Juniper species	6.5
Prairie junegrass	3.0
Western wheat grass	2.5
Mountain mahogany	1.5
Big sagebrush	1.5
Indian ricegrass	1.0
Buckwheat	1.0
Little bluestem	1.0
Mountain muhly	1.0
Pine dropseed	1.0
Threadleaf sedge	1.0
Dwarf rabbitbrush	1.0
Wax currant	1.0

Trace amounts of Arizona fescue, weeping brome, littleseed ricegrass, needle & thread grass, mutton bluegrass, side oats grama, big bluestem, rock spirea and snowberry were recorded.

L.4.4 USFS Research

Francis (1986) recorded data from two Ponderosa communities:

Community No. 1	Percent		
	Cover	Density	Frequency
Ponderosa pine	62.5	.4	2.2
Threadleaf sedge	1.2	23.1	19.7
Pingue	3.0	19.3	24.6
Mutton bluegrass	.6	18.8	14.0
Blue grama	2.2	14.3	8.9
Piñon pine	14.9	.4	1.0
Hairy grama	.6	9.7	5.8
Gambel's oak	8.8	1.3	2.4

Community No. 2	Percent		
	Cover	Density	Frequency
Blue grama	5.8	51.2	18.9
Dwarf rabbitbrush	9.0	17.6	34.3
Piñon pine	33.1	0.0	0.0
Ponderosa pine	27.8	0.0	0.0
Threadleaf sedge	1.2	13.8	10.2
Baby white aster	.3	4.4	7.5
Sand dropseed	1.2	2.8	6.4

Species found in lesser amounts included: One-seed juniper, Utah juniper, Yucca species, mountain mahogany, rubber rabbitbrush, fringed sagewort, big sagebrush, Louisiana wormwood, James eriogonum buckwheat species, pine thermopsis, milkwort, pingue, Junegrass, groundsel, red threeawn, evening primrose, rockcress, aster, pine dropseed, mountain muhly, lupine, bottlebrush squirreltail, foxtail barley, globemallow, geranium, calyophus, Arizona fescue, and pussytoes.

L.4.5 Understory herbaceous production:

Species	Pounds/Acre
Western wheatgrass	18.3
Blue grama	26.1
Galleta grass	21.7
Bottlebrush squirreltail	2.9
Other species **	45.9
Annuals	0.6
Total	115.5

** These include mutton blue grass, little seed rice grass, pine dropseed, prairie junegrass, little bluestem, sideoats grama, mountain muhly, Arizona fescue and others.

L.4.6 Silviculture

Productive forest land is defined as those lands producing more than 20 cubic feet/Acre/Year of wood volume. It is estimated that 50% of the forest land in the upper Rio Puerco area is non-productive.

The following table shows the results of the 1974 BLM Forest inventory. The table represents basal area of all tree species in the area.

Square Feet

Plot No.	Chijuilla-Cuba Mesa Area	I.C. Grant Area
109	18.9	
110		28.4
115	18.0	
116	18.6	
11.7		72.8
118		27.3
127	48.6	
128	32.7	
129		22.2
134	12.6	
136	29.9	
139	16.2	
140	17.9	
141	15.7	
142	29.8	
145	19.5	
146	26.0	
148		72.0
152		46.3
153		51.7
154		39.2
155		82.5
159		45.2
160		45.7
161		62.9
162		16.4
163	28.0	
164		118.8
165		41.8
166		74.1
170	35.4	

Studies show that the combined economic value of grazing and saw log production would be maximum in tree stands having basal area of about 45-60 square feet/Acre. The inventory above shows that the majority of the ponderosa pine in the upper Rio Puerco area was (in 1974) below the recommended basal area. All areas exceeding the recommendation were located on the Ignacio Chavez Grant, which has since been designated wilderness study area.

Historically, in the southwest, the most exceptional conditions for natural regeneration of Ponderosa pine occurred when heavy seed production in the fall of 1918 was followed by a warm, wet spring and summer in 1919. Soil surface conditions were probably also unusually good because of heavy grazing during World War I. As a result, thousands of seedlings per acre were established on most of the open areas of the Ponderosa pine forests.

According to the Soil Conservation Service, Soil Survey of Sandoval County, the site index for ponderosa pine in the Sedmar loamy sand areas of Chijuilla area ranges from 51 to 53. Based on a site index of 50, the potential production per acre of merchantable timber is 2,500 cubic feet or 9,200 board feet (International rule, 1/8-inch kerf) from an even-aged, fully stocked stand of trees 100 years old. The culmination mean annual increment (CMAI) is 38 cubic feet, per acre per year occurring at age 60 or 130 board feet (International rule, 1/8-inch kerf) per acre per year occurring at age 200.

The main concerns in producing and harvesting ponderosa pine in the upper Rio Puerco are:

1. Water erosion
2. Seedling mortality
3. Windthrow hazard
4. Plant competition
5. Slow growth
6. Damaging agents- (disease, and insects)

In the Chijuilla area, seedlings are subject to high mortality rates because of the sandy soils. The low available water capacity reduces seedling survival in areas where understory plants are numerous. Trees are subject to windthrow because of limited rooting depth. Plant competition, from piñon and juniper delays natural regeneration, but does not prevent the eventual development of a fully stocked, normal stand of trees. Brushy plants such as Gambel oak and big sagebrush limit natural regeneration of ponderosa pine. Herbaceous plants also compete for soil moisture for many years after a tree planting. Moderate grazing levels should control understory production and allow tree seedlings a chance to become established.

Tree growth in the upper Rio Puerco is slow therefore thinning should be used to release and accelerate growth on desirable trees.

<u>Damaging Agents</u>

Ponderosa pine foliage feeding insects:

Leaf beetle	Elegant pine weevil
Scarab beetle	Sugarpine tortrix
Pine reproduction weevil	Pine butterfly

Pandora moth Webworm
Douglas-fir tussock moth
Pine tussock moth
Cutworm
Pine needle sheathminer
Needle miners
Pine adelgid
Black pine leaf scale
Pine scale
Pine sawflies

Diseases:

Southwestern dwarf mistletoe *(Arcenthobium vaginatum)*--39% of the Ponderosa pine forests in New Mexico and Arizona are infected.
Root diseases caused by *Armillaria sp.* and *Heterobasidion annosum*.
Stem rusts--*Cronartium arizonicum*. *Peridermium filamentosum*, and *P. harkenessi*.
Needle cast damage by *Lophodermella cerina* and *Davisomycella ponderosae*.
Cankers caused by *Atropellis piniphila*.
Decays such as red rot caused by *Dichomitus squalens*, Red ring rot, *Phellinus pini*, and others.

Other environmental factors that limit ponderosa pine growth:

Climatic extremes
Winter drying
Top kill due to cold
Frost damage to foliage
Drought
Salt toxicity-soil salinity
Hail damage
Air pollution-ozone
Lightning

Wildlife

Mammals:

Merriam shrew
Little brown myotis
Long-eared myotis
Fringed myotis
Long-legged myotis
Small-footed myotis
Spotted bat
Big brown bat
Hoary bat
Cottontail rabbit
Abert's squirrel **
Red (chickoree) squirrel
Cliff chipmunk
Colorado Least chipmunk
Rock squirrel
Golden-mantled ground squirrel
Botta's pocket gopher
Western harvest mouse
Deer mouse
Rock mouse
White-footed deer mouse
White-throated woodrat
Mexican woodrat
Meadow vole
House mouse
Porcupine
Coyote Gray fox

Black bear	Striped skunk	Mule deer
Raccoon	Spotted skunk	Elk
Ringtail	Mountain lion	
Long-tailed weasel	Bobcat	

** obligate species

Birds:

Sharp-shinned hawk	Ladder-backed	Townsend's solitaire
Cooper's hawk	woodpecker	Ruby-crowned
Red tailed hawk	Hairy woodpecker	kinglet
Golden eagle	Cassin's kingbird	Solitary vireo
Peregrine falcon	Western flycatcher	Warbling vireo
Meriam's turkey * &	Hammonds	Orange-crowned
**	flycatcher	warbler
Band-tailed pigeon	Dusky flycatcher	Yellow-rumped
Barn owl	Gray flycatcher	warbler
Screech owl	Black phoebe	Townsend's warbler
Flamulated owl	Western wood pewee	Grace's warbler
Great horned owl	Barn swallow	MacGillivary's
Pigmy owl	Cliff swallow	warbler
Long-eared owl	Violet-green swallow	Western tanager
Saw-whet owl	Steller's jay **	Hepatic tanager
Whip-poor-will	Common raven	Black-headed
White throated swift	Clark's nutcracker	grosbeak
Black-chinned	Mountain chickadee	Lazuli bunting
hummingbird	Bushtit	Cassin's finch
Broad-tailed	White-breasted	House finch
hummingbird	nuthatch	Purple- Lesser
Rufous hummingbird	Pigmy nuthatch	goldfinch
Acorn woodpecker	Brown creeper	Pine siskin
Lewis woodpecker	House wren	Red crossbill
Yellow-bellied	Canon wren	Green-tailed towhee
sapsucker	Rock wren	Dark-eyed junco
Willianson's	Robin	Oregon - Slate-
sapsucker	Hermit thrush	colored junco
Downy woodpecker	Western bluebird	Chipping sparrow

* Meriam's turkeys feed on piñon pine nuts, Gambel's oak acorns, and various grass seeds and Eriogonum during the Fall and Winter.

** Obligate species

Lizards

Eastern fence lizard	Great plains skink
Short-horned lizard	Many-lined skink
Tree lizard	Arizona alligator lizard

Snakes

Night snake	Milk snake
Desert-striped whipsnake	Kingsnake
Mountain patch-nosed snake	Prairie rattlesnake
Gopher (bull) snake	Western diamondback rattlesnake

Amphibians

Woodhouse's toad

Arizona fescue and mountain muhly should be considered key or desired management grass species in the Ponderosa pine ecosystem. Other species almost as important are mutton bluegrass, prairie junegrass, western wheat grass, little bluestem, sideoats grama and pine dropseed.

Growth begins on Arizona-fescue and mountain muhly about mid-April to early May depending on air temperature and precipitation. Despite similar dates for growth initiation, Arizona fescue is a cool season grower and mountain muhly is a warm-season grower on ponderosa pine ranges, one should think of two periods of deferment to maintain vigor of both species. The period for cool season grasses is April 10 to July 1 and the period for warm season grasses is July 15 to October 15.

L.4.7 Fire

Historically, fire has played a major role in the ponderosa pine forest. Climatic wet cycles often followed by dry cycles have set the stage for periodic fires in this ecosystem. When tree litter becomes too deep and numerous, turpenes in the litter inhibit the nitrogen cycle. To maintain the open stands of ponderosa and the herbaceous understory, prescribed fire should be considered in the overall management of the forest. This will prevent conditions building up to a catastrophic wild fire that will damage the watershed.

L.4.8 Visual Resources

Timber harvesting activities can create significant visual impacts due to the scale of actions. Visual impacts of roads are the scenic quality of the road corridor, viewed from the road, and the visibility of the road as a more distant landscape feature.

Initial, disruptive appearance of harvested trees usually seen from roads or other travel is exacerbated by soil disturbance and slash. On the other hand, small scale or selective harvest activities can serve to improve scenic quality of forest areas.

Far views, showing incongruent vegetation patterns or road scars provide negative visual impacts. Timber harvest activities may also impact air and water quality, damaging esthetic values. Livestock production in Ponderosa pine forests takes place primarily in the summer and early fall seasons. While this is also the period of heaviest recreational use, the negative impacts of livestock production on recreation are mostly indirect involving fixed facilities (fences, corrals, buildings, tanks) and induced vegetative changes. On the other hand, the presence of livestock in the forest in common dispersed patterns may contribute a romantic sense of southwestern tradition to wildland recreation experiences.

L.4.9 Desired Plant Community--Percent Composition (By Weight):

Trees---15%
Ponderosa pine
Piñon pine
Gambel's oak
Wavyleaf oak
Gray oak
Rocky mountain juniper
Alligator juniper (Cibola Co.)
Douglas fir
Quaking aspen

Grasses--60%
Arizona fescue
Mountain muhly
Mutton bluegrass
Prairie junegrass
Little bluestem
Pine dropseed
Threadleaf sedge
Hairy grama
Sideoats grama
Western wheat grass
Fox tail barley
Bottlebrush squirreltail
Wolf tail
Nodding brome
Spike muhly
Blue grama

Shrubs--5%
Wax or Squaw currant
Wild rose
Snowberry Rock spirea
Colorado barberry
New Mexico locust
Chokecherry
Mountain mahogany
Elderberry

Forbs--5%
Globe mallow
Wild iris
Western yarrow
Lupine
Deer vetch
Geranium
Golden pea
Penstemon
Filaree
Aster
Rockcress
Strawberry
Louisiana wormwood
Fringed sagewort
Buckwheat
Groundsel
Indian paintbrush
Wild onion

L.5 The Riparian and Wetland Ecosystem

L.5.1 Introduction

Riparian-wetland areas comprise a very small percentage (less than 1 percent in the Rio Puerco Field Office area) of our Public Lands in New Mexico, yet these unique areas have the highest levels of species richness or diversity of all southwest ecosystems. They provide a special niche for flora and fauna not seen in the surrounding, arid, upland landscape. These areas provide sediment control, recharge ground water, and absorb and reduce the energy of floodwaters. They provide water, food, cover, and shade for wildlife and livestock. They are also important focal points for water based recreation activities. Their importance for conserving biodiversity and reducing nonpoint source water pollution is unquestionable.

Water is the primary factor controlling the environment and the associated plant and animal life in the riparian-wetlands. These transitional habitats occur between upland and aquatic environments where the water table is at or near the surface of the land.

Water has a high specific heat, which means that it gains or loses a large amount of heat before its temperature changes appreciably. This property of water moderates seasonal, daily, and local extremes of temperature. Aquatic ecosystems do not show the pronounced microclimatic variability of many terrestrial systems.

The fresh water wetlands can be divided into lacustrine, associated with lakes, riverine, associated with rivers and streams and palustrine, associated with marshes, swamps and bogs.

Most wetlands are dominated by hydrophytes, or wetland plants, these can tolerate various degrees of flooding or live in frequently saturated areas. Most wetlands are characterized by fluctuating water levels and by soils that are distinctly different from those of the dry, adjacent upland areas.

Wetland trees and shrubs have several unusual adaptations for coping with low levels of oxygen. *Some, such as willow and ash, are stimulated when flooded to produce new, air-filled roots to replace those that the floods have killed. Flooding can also promote the growth of tiny openings in the bark, called lenticels, which allow air to move more readily into the plant. And some

species are capable of switching to oxygenless, or anaerobic, respiration. Cottonwoods need periodic flooding for seed germination and seedling establishment.

The gallery forests of Fremont cottonwood which once covered the Rio Puerco floodplains, were often close to early settlements. Trees were cut initially for fuel and shelter purposes such as ceiling beams or "vegas" for adobe buildings. These riparian trees were also cut to clear land for agriculture and urbanization. Much of the heavy utilization of the gallery forest trees had subsided by the beginning of the twentieth century.

The downcutting and entrenchment of the Rio Puerco that began between 1885 and 1890, caused water tables to drop, reducing the extent of the riparian habitat. When the benches and terraces of the Rio Puerco were flooded, cottonwood sprouts and seedlings which are highly relished by livestock were severely browsed along with the willows.

You can see some of the old age survivors today from Cuba to San Luis along the Rio Puerco. Continued destruction of cottonwoods and willows changed the available water regime. This set a perfect stage for the establishment and explosive, expansion of introduced/non-native shrub-tree species such as saltcedar (Tamarix spp.), and Russian olive (Elaeagnus angustifolia).

If gallery forests were allowed to regenerate and mature, the resulting heavy shade would likely curtail the reproductive success of saltcedar and eventually only a few individuals would be left in the understory.

In the Rio Puerco riparian-wetland ecosystem, there are certain plants or organisms that are more important than others. In the Rio Puerco, the Fremont or Rio Grande cottonwood should be the dominant species and form the main tree canopy. Beneath the cottonwoods, a shrubby layer of willows should develop. Below the willows an herbaceous layer of rushes, sedges and other aquatic plants should occur at the water’s edge. This layering of vegetation is referred to as stratification. The Rio Puerco should have all three layers for maximum biodiversity.

The cottonwood/willow communities, once common along the Rio Puerco are now threatened. The loss has been masked to most observers because many “historic” large, old trees remain or have only begun to die, these trees are not being replaced. This decline along some segments of the Rio Puerco is critical to the point of extinction.

Cottonwoods are considered a "keystone species" because the welfare of so many other' plants and animals depend upon them. In many ways riparian species such as large cottonwoods play much the same functional role that old growth species do in the temperate rainforests of the Pacific Northwest. Cottonwoods, because of their potentially large size, serve as virtual condominiums throughout much of the west too dry for extensive forest cover.

Many raptors (hawks, eagles, owls) and great blue herons roost in their branches, woodpeckers and bluebirds nest in cavities in their boles, and even some species of bats hibernate in cavities or under pieces of loose bark on dead trees. They furnish food and dam material for beavers also.

The life of a riverine wetland is influenced by many factors, including rapidity of flow, water temperature, oxygen and nutrient levels, and the nature of the bottom.

Most of the food energy to support the food chain of a riverine ecosystem is not the product of stream-dwelling plants; rather, it is from terrestrial ecosystems. Under natural conditions leaf litter is probably the most important element in the basic nutrition of a stream.

In streams, the main sources of organic input, or food for stream organisms, include partly decomposed leaves or other organic material flowing downstream. This debris, or detritus, may be caught in the nets set by the larvae of such benthic macro invertebrates as caddisflies, stoneflies which also glean the rocks for algae. These insects are in turn consumed by larger animals.

All of the uneaten leaves, as well as twigs and dead branches, that accumulate in the wetland are taken over by the decomposers--bacteria, worms, and benthic macro invertebrates that produce detritus. These creatures use some of the energy that resides in dead plant and animal remains, but in the process, also release mineral nutrients and soluble organic compounds that enable the riparian-wetland ecosystem to be self-perpetuating.

Streams like the Rio Puerco have high suspended sediments and have lower oxygen levels. Many benthic macro invertebrates cannot exist where there are small amounts of dissolved oxygen available on the river bottom.

Riparian-wetlands are living museums, where the dynamics of ecological systems can be taught. These outdoor laboratories can demonstrate such basic ecological principles as energy flow, recycling, and limited carrying capacity.

Riparian-wetlands--(BLM definition)

> "Zones of transition from aquatic to terrestrial ecosystems, whose presence is dependent upon surface and/or subsurface water, and which the influence of water reveals through their existing or potential soil-vegetation complex. Riparian areas may be associated with features, such as lakes, reservoirs, estuaries, potholes, springs, bogs, wet meadows, muskegs, and ephemeral, intermittent or perennial streams."

L.5.2 Desired Plant Communities

The problem in trying to determine a desired plant community, for riparian areas is: What was the community in the pre-disturbance state? A riparian ecosystem is constantly being disturbed. This ecosystem can also be looked at on a continuum ranging from the natural vegetation to the semi-natural to the other end of degraded, where the integrity of the system has totally been destroyed.

Much of the Rio Puerco riparian vegetative communities have been pushed beyond a point where they have lost much of their ecosystem integrity. Native species (Cottonwoods and Willows) have been replaced by exotic invaders (Saltcedar and Russian olive). This loss of native species has caused a reduction in biological diversity of not only plant species but wildlife species. Only fragmented stands of cottonwood/willow stands are now found along streambanks.

It should be ethical and economically beneficial to improve riparian zones in the southwest, even though some benefits are intangible. The following desired plant communities are submitted

depicting general species composition, but no numerical percentages of each species or group of species are shown.

L.5.3 Vegetation

L.5.3.1 Riverine Riparian Plants

Rio Grande cottonwood
Narrowleaf cottonwood
Plains cottonwood
Lanceleaf cottonwood
Coyote willow
Other willows
Choke cherry
Desert olive
Wild rose
New Mexico locust
Currant
Wheat grasses
Blue grass
Bent grasses
Foxtail barley
Desert saltgrass
Mexican lovegrass
Sedges
Rushes
Horsetail
Anemone
Hemlock
Monkshood
Water parsnip
Cinquefoil
Yarrow
Blue-eyed grass
Chickweed
Monkey flower
Wild licorice
Field mint
Butterweed
Self heal
Inkberry
Waterleaf

L.5.3.2 Palustrine (Marsh) Wetlands Plants

Bull rush
Cattail
Water plantain
Spike rush
Mare's tail
Water speedwell
Yellowcress
Pondweed
Smartweed (Knotweed)
Buttercup
Arrowhead Water cress
Bugleweed
Flat sedge
Water parsnip
Beggar ticks

L.5.4 Wildlife

L.5.4.1 Mammals

Little brown myotis
Long-eared myotis
Fringed myotis
Long-legged myotis
Small-footed myotis
Spotted bat
Silver-haired bat
Western pipistrelle
Big brown bat
Beaver

Western harvest mouse
Deer mouse
White-footed deer mouse
White-throated woodrat
Meadow vole
Norway rat
House mouse
Meadow jumping mouse
Porcupine
Coyote
Raccoon
Striped skunk
Bobcat

L.5.4.2 Birds

Great blue heron
Cattle egret
Snowy egret
Black-crowned night heron
Green heron
White faced Ibis
Mallard
Gadwall
Pintail
Green-winged teal
Blue-winged teal
Cinnamon teal
American widgeon
Shoveler
Common goldeneye
Bufflehead
Ruddy duck
Canvasback
Ring-neck duck
Common merganser
Snow Goose
Canada Goose
Turkey vulture
Sharp-shinned hawk
Cooper's hawk
Swainson's hawk
Red-tailed hawk
Ferruginous hawk
Northern harrier (marsh hawk)
Rough legged hawk
Osprey
Golden eagle
Bald eagle
Prairie falcon
Peregrine falcon
American kestrel
Great horned owl
Scaled quail
Wild turkey
Sora rail
Virginia rail
American coot
Sandhill crane
Killdeer
Mountain plover
Solitary sandpiper
Spotted sandpiper
Least sandpiper
Wilson's sandpiper
Long billed curlew
Rock dove
Morning dove
Roadrunner
Common nighthawk
White-throated swift
Black-chinned hummingbird
Broad-tailed hummingbird
Rufous hummingbird
Belted kingfisher
Northern flicker
Western kingbird
Black phoebe
Say's phoebe
Horned lark
Tree swallow
Bank swallow
Barn swallow
Cliff swallow
Violet-green swallow
Common raven
American crow
Marsh wren
Mockingbird
Bendire's thrasher
Robin
Ruby-crowned kinglet
Loggerhead shrike
European starling
Solitary vireo
Orange crowned warbler
Yellowthroat
Yellow-breasted chat
House sparrow
Western meadowlark
Red-winged blackbird
Brewer's blackbird
Brown-headed cowbird
Northern oriole
Western tanager
Lazuli bunting
House finch
Purple finch

Abert's towhee
Savannah sparrow
Song sparrow

L.5.4.3 Reptiles

Lesser earless lizard
Tree lizard
Great plains skink
Many-lined skink

L.5.4.4 Snakes

Gopher (bull) snake
Black-necked garter snake
Western garter snake
Glossy snake
Massasaugua
Black-tailed rattlesnake
Prairie rattlesnake
Western diamondback rattlesnake

L.5.4.5 Amphibians

Tiger salamander
Western spadefoot toad
Plains spadefoot toad
Red-spotted toad
Woodhouse's toad
Leopard frog

L.5.4.6 Macro-invertebrates (scientific names only)

Callibaetis
Zoniagrion
Tubificidae
Physella
Simulium
Argia
Oreodytes
Ceratopogonidae
Gerris
Notonecta
Ophiogomphus
Orthocladiinae
Simuliidae

L.5.4.7 Fish

Fathead minnow
Brown trout
Catfish
Chubs
Shiners
White suckers

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M VEGETATION TREATMENT BEST MANAGEMENT PRACTICES

The following best management practices (BMPs) have been incorporated from the RMP Amendment for Fire and Fuels Management on Public Land in NM & TX, September, 2004.

Table M.1: Vegetation Treatment Best Management Practices, by Method

Resource Element	Prescribed Fire	Mechanical and Manual
Guidance Documents	• BLM handbook H-9214-1 • Prescribed Fire Management 2000	• BLM Manual 1112 (Safety)
General	• Prepare Fire Management Plan. • Use trained personnel with adequate equipment.	• Ensure that power-cutting tools have approved spark arresters. • Wash vehicles and equipment before leaving weed infested areas to avoid infecting weed-free areas. Minimize soil disturbance that may encourage new weeds to develop.
Air Quality (See Manual 7000.)	• Evaluate weather conditions, including wind speed and atmospheric stability, to predict effects of burn and impacts from smoke. • Coordinate burn activities with New Mexico Environment Department. Burn when weather conditions are good for rapid smoke dispersion.	• Minimize generation of dust and exhaust.
Cultural Resources and Native American Religious Concerns (See NM BLM Protocol with State Historic Preservation Office (SHPO) and Manuals 8100 and 8160.)	• Evaluate potential impacts of proposed treatment. • Conduct cultural resource inventories to identify sites at risk from treatment. Develop avoidance measures and project-specific treatment measures to protect sites by reducing fuel loads in the vicinity of at-risk sites. • Consult with SHPO and tribes per NM Statewide Protocol Agreement. In Texas, consult with Texas SHPO for National Register of Historic Places (NRHP) site eligibility and effect. • Monitor effectiveness of site protection measures (Appendix A.5,	• Evaluate potential impacts of proposed treatment. • Conduct cultural resource inventories to identify sites at risk from treatment. Develop avoidance measures and project- specific treatment measures to protect sites by reducing fuel loads in the vicinity of at-risk sites. • Consult with SHPO and tribes per NM Statewide Protocol Agreement. In Texas, consult with Texas SHPO for NRHP site eligibility and effect. • Monitor effectiveness of site protection measures (AppendixA.5, Monitoring and Adaptive

Resource Element	Prescribed Fire	Mechanical and Manual
	Monitoring and Adaptive Management).	Management).
Health and Safety	• Use some form of pre-treatment, such as mechanical or manual treatment, in areas where fire cannot be safely introduced due to hazardous build-up. • Always use appropriate safety equipment and Personal Protective Equipment (PPE). Notify nearby residents who could be affected by smoke.	• Always use appropriate safety equipment and PPE. •
Land Use	• Carefully plan fires in WUI to avoid loss of property. • Notify nearby residents and landowners who could be affected by smoke intrusions or by other fire effects.	
Livestock (See Handbook H-4120-1.)	• Notify permittees of livestock feeding restrictions in treated areas, if necessary. • Provide alternative forage sites for livestock, if use areas burn.	• Notify permittees of livestock feeding restrictions in treated areas, if necessary. • Provide alternative forage sites for livestock, if necessary.
Recreation (See Handbook H-1601-1.)	• Control public access to potential burn areas.	• Control public access until potential treatment hazards no longer exist.
Rights-of-Way	• Avoid or minimize prescribed burning under powerlines.	
Soil	• Minimize broadcast burning on highly erodible soils. • Re-seed if necessary following treatment to encourage revegetation and minimize erosion. • Minimize soil heating by pre-treatment of fuels where practical.	• Implement erosion control measures where heavy equipment is used. • Limit heavy equipment use on slopes greater than 30 percent. • Conduct activities on dry or frozen soil to minimize soil compaction. • Avoid damage to biological crusts.
Vegetation (See Handbook H-4410-1,	• Conduct burn prescriptions to minimize residual damage to desirable trees.	• Minimize disturbance to native vegetation by keeping equipment on existing roads and trails.

Resource Element	Prescribed Fire	Mechanical and Manual
5000, and 9015.)	• Mitigate soil erosion by constructing erosion control structures on any control lines used.	• Reseed skid trails and roads to be closed after operations. • Install erosion control structures on roads used.
Water Resources (See Manual 7000 and Memorandum of Understanding with New Mexico Environment Department.)	• Maintain minimum buffer of 25-50 feet between burn area and water bodies. Minimize burning on hill slopes with high erosion potential and consider revegetation to mitigate. Prevent degradation of groundwater quality whenever practicable, even when WQCC standards allow for further degradation. • Develop site-specific BMPs for actions that degrade groundwater quality through nonpoint source pollution, for groundwater with 10,000 mg/l total dissolved solids (TDS) or less.	• Maintain minimum buffer of 25-50 feet between burn area and water bodies. Reseed skid trails and roads closed after operations. Install erosion control structures on roads used. Prevent degradation of groundwater quality whenever practicable, even when WQCC standards allow for further degradation. • Develop site-specific BMPs for actions that degrade groundwater quality through nonpoint source pollution, for groundwater with 10,000 mg/l TDS or less.
Wildlife (See Manuals 6500 and 6780.)	Avoid treatments during nesting and other critical periods for birds and other wildlife.	• Retain wildlife trees and other unique habitat features where practical. • Vegetation management strategies should be consistent with historical succession and disturbance regimes. • Fuels treatments should consider habitat needs of migratory and non-migratory populations. • Avoid treatments during nesting and other critical periods for birds and other wildlife.

In addition, the following BMPs should be followed in regard to cultural resources and Native American concerns.

Table M.2: Vegetation Treatment BMPs for Cultural Resources and Native American Concerns

Prescribed Fire	Mechanical	Chemical	Biological
• Evaluate potential impacts of proposed treatment. • Conduct cultural resource inventories to identify sites at	• Evaluate potential impacts of proposed treatment. • Conduct cultural resource inventories to identify sites at	• Evaluate potential impacts of proposed treatment. • If application methods involve ground disturbing	• Evaluate potential impacts of proposed treatment. • If application methods involve ground disturbing

Prescribed Fire	Mechanical	Chemical	Biological
risk from treatment. Develop avoidance measures and project-specific treatment measures to protect sites by reducing fuel loads in the vicinity of at-risk sites. • Site protection measures include fire exclusion through mechanical means, black-lining, or wrapping wooden structures, and post-treatment field inspections of sites. • Consult with SHPO and tribes per NM Statewide Protocol Agreement. • Monitor effectiveness of site protection measures.	risk from treatment. Develop avoidance measures and project- specific treatment measures to protect sites by reducing fuel loads in the vicinity of at-risk sites. • Site protection measures may include exclusion of sites from ground disturbing activities, hand-thinning within sites with no ground disturbance, and post-treatment field inspections of sites. • Consult with SHPO and tribes per NM Statewide Protocol Agreement. • Monitor effectiveness of site protection measures.	activities, conduct cultural resource inventories and implement avoidance measures. • Site protection measures may include exclusion of sites from ground disturbing activities and post-treatment field inspections of sites. • Coordinate with Native American groups with traditional use concerns regarding timing of treatment. • Consult with SHPO and tribes per NM Statewide Protocol Agreement. • Monitor effectiveness of site protection measures.	activities, conduct cultural resource inventories as appropriate, and implement avoidance measures. • Site protection measures may include exclusion of sites from ground disturbing activities and post-treatment field inspections of sites. • Coordinate with Native American groups with traditional use concerns regarding timing of treatment. • Consult with SHPO and tribes per NM Statewide Protocol Agreement. • Monitor effectiveness of site protection measures.

N VEGETATION MITIGATION MEASURES

The following mitigation measures have been incorporated from the Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement (PEIS), June 29, 2007, Mitigation Measures: Chapter 3/Appendix)

Table N.1: Vegetation Mitigation Measures, by Affected Resource

Resource	Mitigation Measures
Air Quality	None proposed
Cultural and Paleontological Resources	• Do not exceed the typical application rate when applying 2,4-D, bromacil, diquat, diuron, fluridone, hexazinone, tebuthiuron, and triclopyr in known traditional use areas. • Avoid applying bromacil or tebuthiuron aerially in known traditional use areas. • Limit diquat applications to areas away from high residential and traditional use areas to reduce risks to Native Americans and Alaska Natives.
Fish and other Aquatic Organisms	• Limit the use of diquat in water bodies that have native fish and aquatic resources. • Limit the use of terrestrial herbicides (especially diuron) in watersheds with characteristics suitable for potential surface runoff that have fish-bearing streams during periods when fish are in life stages most sensitive to the herbicide(s) used. • To protect special status fish and other aquatic organisms, implement all conservation measures for aquatic animals presented in the Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment. • Establish appropriate herbicide-specific buffer zones for water bodies, habitats, or fish or other aquatic species of interest (see Final PEIS Appendix C, Table C-16, and recommendations in individual ERAs). • Consider the proximity of application areas to salmonid habitat and the possible effects of herbicides on riparian and aquatic vegetation. Maintain appropriate buffer zones around salmonid-bearing streams (see Appendix C, Table C-16, of the Final PEIS, and recommendations in the individual ERAs). • Avoid using the adjuvant R-11® in aquatic environments, and either avoid using glyphosate formulations containing polyoxyethyleneamine (POEA), or seek to use formulations with the least amount of POEA, to reduce risks to aquatic organisms in

Resource	Mitigation Measures
	aquatic environments. • At the local level, consider effects to special status fish and other aquatic organisms when designing treatment programs.
Health and Human Safety	• Use the typical application rate, where feasible, when applying 2,4-D, bromacil, diquat, diuron, fluridone, hexazinone, tebuthiuron, and triclopyr to reduce risk to occupational and public receptors. • Avoid applying bromacil and diuron aerially. Do not apply sulfometuron methyl aerially. • Limit application of chlorsulfuron via ground broadcast applications at the maximum application rate. • Limit diquat application to ATV, truck spraying, and boat applications to reduce risks to occupational receptors; limit diquat applications to areas away from high residential and subsistence use to reduce risks to public receptors. • Evaluate diuron applications on a site-by-site basis to avoid risks to humans. There appear to be few scenarios where diuron can be applied without risk to occupational receptors. • Do not apply hexazinone with an over-the-shoulder broadcast applicator
Livestock	• Minimize potential risks to livestock by applying diuron, glyphosate, hexazinone, tebuthiuron, and triclopyr at the typical application rate, where feasible. • Do not apply 2,4-D, bromacil, dicamba, diuron, Overdrive®, picloram, or triclopyr across large application areas, where feasible, to limit impacts to livestock, particularly through the contamination of food items. • Where feasible, limit glyphosate and hexazinone to spot applications in rangeland. • Do not aerially apply diquat directly to wetlands or riparian areas used by livestock. • Do not apply bromacil or diuron in rangelands, and use appropriate buffer zones (see Tables 4-12 and 4-14 in Chapter 4 of the Final PEIS) to limit contamination of off-site rangeland vegetation.
Recreation	• Mitigation measures that may apply to recreational resources are associated with human and ecological health (see mitigation measures for Vegetation, Fish and Other Aquatic Resources, Wildlife Resources, and Human Health and Safety).
Social and Economic Values	• None proposed

Resource	Mitigation Measures
Soil Resources	• None proposed
Vegetation	• Minimize the use of terrestrial herbicides (especially bromacil, diuron, and sulfometuron methyl) in watersheds with downgradient ponds and streams if potential impacts to aquatic plants are identified. • Establish appropriate (herbicide-specific) buffer zones (see Tables 4-12 and 4-14 in Chapter 4 of the Final PEIS) around downstream water bodies, habitats, and species/populations of interest. Consult the ecological risk assessments (ERAs) prepared for the PEIS for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios. • Limit the aerial application of chlorsulfuron and metsulfuron methyl to areas with difficult land access, where no other means of application are possible. Do not apply sulfometuron methyl aerially. • To protect special status plant species, implement all conservation measures for plants presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment*.
Visual Resources	• None proposed
Water Resources and Quality	• Establish appropriate (herbicide-specific) buffer zones to downstream water bodies, habitats, and species/populations of interest (see Appendix C of PEIS, Table C-16). • Areas with potential for groundwater for domestic or municipal water use shall be evaluated through the appropriate, validated USEPA model(s) to estimate vulnerability to potential groundwater contamination, and appropriate mitigation measures shall be developed if such an area requires the application of herbicides and cannot otherwise be treated with nonchemical methods.
Wetland and Riparian Areas	• See mitigation for Water Resources and Quality and Vegetation.
Wild Horses and Burros	• Minimize potential risks to wild horses and burros by applying diuron, glyphosate, hexazinone, tebuthiuron, and triclopyr at the typical application rate, where feasible, in areas associated with wild horse and burro use. • Consider the size of the application area when making applications of 2,4-D, bromacil, dicamba, diuron, Overdrive®, picloram, and triclopyr in order to reduce potential impacts to wild horses and burros.

Resource	Mitigation Measures
	• Apply herbicide label grazing restrictions for livestock to herbicide treatment areas that support populations of wild horses and burros. • Where practical, limit glyphosate and hexazinone to spot applications in rangeland. • Do not apply bromacil or diuron in grazing lands within herd management areas (HMAs), and use appropriate buffer zones identified in Tables 4-12 and 4-14 in Chapter 4 of the Final PEIS to limit contamination of vegetation in off-site foraging areas. • Do not apply 2,4-D, bromacil, or diuron in HMAs during the peak foaling season (March through June, and especially in May and June), and do not exceed the typical application rate of Overdrive® or hexazinone in HMAs during the peak foaling season in areas where foaling is known to take place.
Wildlife	• To minimize risks to terrestrial wildlife, do not exceed the typical application rate for applications of dicamba, diuron, glyphosate, hexazinone, tebuthiuron, or triclopyr, where feasible. • Minimize the size of application areas, where practical, when applying 2,4-D, bromacil, diuron, and Overdrive® to limit impacts to wildlife, particularly through contamination of food items. • Where practical, limit glyphosate and hexazinone to spot applications in rangeland and wildlife habitat areas to avoid contamination of wildlife food items. • Avoid using the adjuvant R-11® in aquatic environments, and either avoid using glyphosate formulations containing POEA, or seek to use formulations with the least amount of POEA, to reduce risks to amphibians. • Do not apply bromacil or diuron in rangelands, and use appropriate buffer zones (see Tables 4-12 and 4-14 in Chapter 4 of the Final PEIS) to limit contamination of off-site vegetation, which may serve as forage for wildlife. • Do not aerially apply diquat directly to wetlands or riparian areas. • To protect special status wildlife species, implement all conservation measures for terrestrial animals presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment*.
Wilderness and other Special Areas	• Mitigation measures that may apply to wilderness and other special area resources are associated with human and ecological health and recreation (see mitigation measures for Vegetation, Fish and Other Aquatic Resources, Wildlife Resources,

Resource	Mitigation Measures
	Recreation, and Human Health and Safety).

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