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U.S. DEPARTMENT OF AGRICULTURE

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

Geologic Soil Groupings for the Pinyon-Juniper Type
on National Forests in New Mexico

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Almost 29 percent of the pinyon-juniper type is on highly unstable geologic formations that contribute to high sediment yields. Sedimentary units make up 54 percent of the acreage in the type, igneous units 39 percent, and Pre-Cambrian formations 7 percent.

KEY WORDS: Geology, watershed management, pinyon-juniper type.

The pinyon-juniper woodland type covers about 17.2 million acres, or about 22 percent, of New Mexico (Dortignac 1960) (fig. 1). Of this total, over 2.8 million acres are within the seven National Forests in the State (table 1). Most of the woodland type occurs at elevations of from 4,000 to 7,500 feet, and often occupies ridges, knolls, breaks, dissected mesa edges, escarpments, and rocky outcrops (Castetter 1956)—sites that frequently contribute high sediment yields. Precipitation over the type ranges from 12 to 20 inches annually, and averages close to 14 inches.

As part of our research program on watershed rehabilitation, we need to know the broad soil groups in the pinyon-juniper type. With this information, we can concentrate our soil stabilization research on those sites and soil types where the results will have the widest applicability, and will be most effective in reducing serious soil erosion problems. This inventory was made to list these groups.

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Table 1.--Pinyon-juniper woodland type on National Forests in New Mexico

National Forest	Size ¹	Pinyon-juniper woodland type	
	--Acres--	-Acres-	-Percent-
Apache ²	616,328	150,270	24.4
Carson	1,440,919	394,616	27.4
Cibola	1,594,086	732,550	46.0
Coronado ²	69,567	6,744	9.7
Gila	2,702,643	931,164	34.4
Lincoln	1,103,220	269,050	24.4
Santa Fe	1,468,999	358,926	24.4
Total	8,995,762	2,843,320	32.0

¹U.S. Department of Agriculture, Forest Service (1970).

²Large portion lies in Arizona.

We used two kinds of maps in our inventory of soil groups. Geologic information was obtained from Dane and Backman's (1965) Geologic Map of New Mexico, while vegetation type maps were those published by the U. S. Forest Service (1962). Geologic and vegetation maps were overlaid, scales were adjusted with a Saltzman overhead projector, and acreage of woodland and geologic groups was measured by dot grid.

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Table 2.--Geologic units in the pinyon-juniper woodland type on the National Forests in New Mexico

Geologic unit	Description	Apache NF		Carson NF		Cibola NF		Coronado NF		Gila NF		Lincoln NF		Santa Fe NF		Total	
		Acres	Pct.	Acres	Pct.	Acres	Pct.	Acres	Pct.	Acres	Pct.	Acres	Pct.	Acres	Pct.	Acres	Pct.
SEDIMENTARY:																	
Alluvium--																	
Recent	Unconsolidated surficial deposits, primarily in flood plains.	16,640	11.07	21,120	5.35	--	--	--	--	21,120	2.26	--	--	2,180	0.60	61,060	2.14
Older	Poorly consolidated surficial deposits, (bolson, pediment, terrace deposits, etc.); includes Gila conglomerate, Carson conglomerate, and Santa Fe group. Locally, some volcanics may occur.	14,720	9.79	140,332	35.56	79,095	10.79	--	--	208,954	22.44	1,920	0.71	79,104	22.03	524,125	18.43
Sandstone	Includes Baca formation, Cub Mountain formation, Mesa Verde group, Dakota sandstone, Glorieta sandstone, Yeso formation, and Sangre de Cristo formation.	--	--	28,800	7.92	191,825	26.18	--	--	3,840	.41	59,520	22.12	35,200	9.80	319,185	11.22
Limestone	San Andres limestone, Madera limestone, and Artesia group.	--	--	--	--	22,280	3.04	--	--	1,920	.20	142,970	53.13	8,960	2.49	176,130	6.19
Shale--																	
Mancos shale ¹	A light- to dark-gray marine shale with interbedded fine-grained sandstone and siltstone.	--	--	25,600	6.48	13,520	1.84	--	--	--	--	10,240	3.80	--	--	49,360	1.73
Morrison formation	A gray, green, tan, and red variegated clay and shale with interbedded gray to red sandstone.	--	--	9,600	2.43	1,280	.17	--	--	--	--	--	--	18,560	5.17	29,440	1.03
Volcanic detritus and pyroclastics ¹	Includes sedimentary facies that occur within the Datil volcanic complex.	21,120	14.05	--	--	--	--	--	--	17,440	1.87	--	--	--	--	38,560	1.35
Red beds ¹	The Triassic Chinle formation and the Permian Abo formation, which are composed of red to brown interbedded shales and sandstones.	--	--	11,520	2.91	25,160	3.43	--	--	--	--	8,960	3.33	25,152	7.00	70,792	2.48
Undifferentiated	Includes the combined Sandia (sandstone) formation and Madera limestone; a sequence of Pennsylvania, Mississippian, and Devonian sandstones, shales, and limestones; and an interbedded sequence of evaporites, shales, and sandstones which comprise the San Rafael group. Because San Jose and Nacimiento formations consist of interbedded shales and sandstones, they are included here.	--	--	94,284	23.89	57,600	7.86	--	--	19,400	2.08	--	--	83,200	23.18	254,484	8.95
IGNEOUS:																	
Datil formation ¹	A thick sequence of extrusive volcanic rocks found in west-central New Mexico; rock types include rhyolite, latite, andesite, and basalt, and occur as tuffs, flows, and breccias.	66,430	44.20	--	--	197,080	26.90	--	--	389,050	41.78	--	--	--	--	652,560	22.95
Volcanics	All extrusive igneous rocks except those of the Datil volcanic complex; rock types include rhyolite, andesite, and basalt, and generally occur as flows and tuffs.	31,360	20.86	26,240	6.64	95,430	13.02	6,744	100.00	151,040	16.22	--	--	79,690	22.20	390,504	13.73
Intrusives	Areas of tertiary intrusive rocks, scattered throughout New Mexico, that occur as stocks, laccoliths, dikes, and sills.	--	--	--	--	8,960	1.22	--	--	18,560	1.99	45,440	16.88	--	--	72,960	2.56
MIXED UNITS:																	
Pre-Cambrian	Includes igneous and metamorphic rock types; igneous is primarily granite; metamorphic are phyllites, schists, gneisses, and quartzites.	--	--	37,120	9.40	40,320	5.50	--	--	99,840	10.72	--	--	26,880	7.48	204,160	7.18
TOTAL		150,270		394,616		732,550		6,744		931,164		269,050		358,926		2,843,320	

¹Delineated separately because they are highly unstable geologic formations and heavy sediment producers.

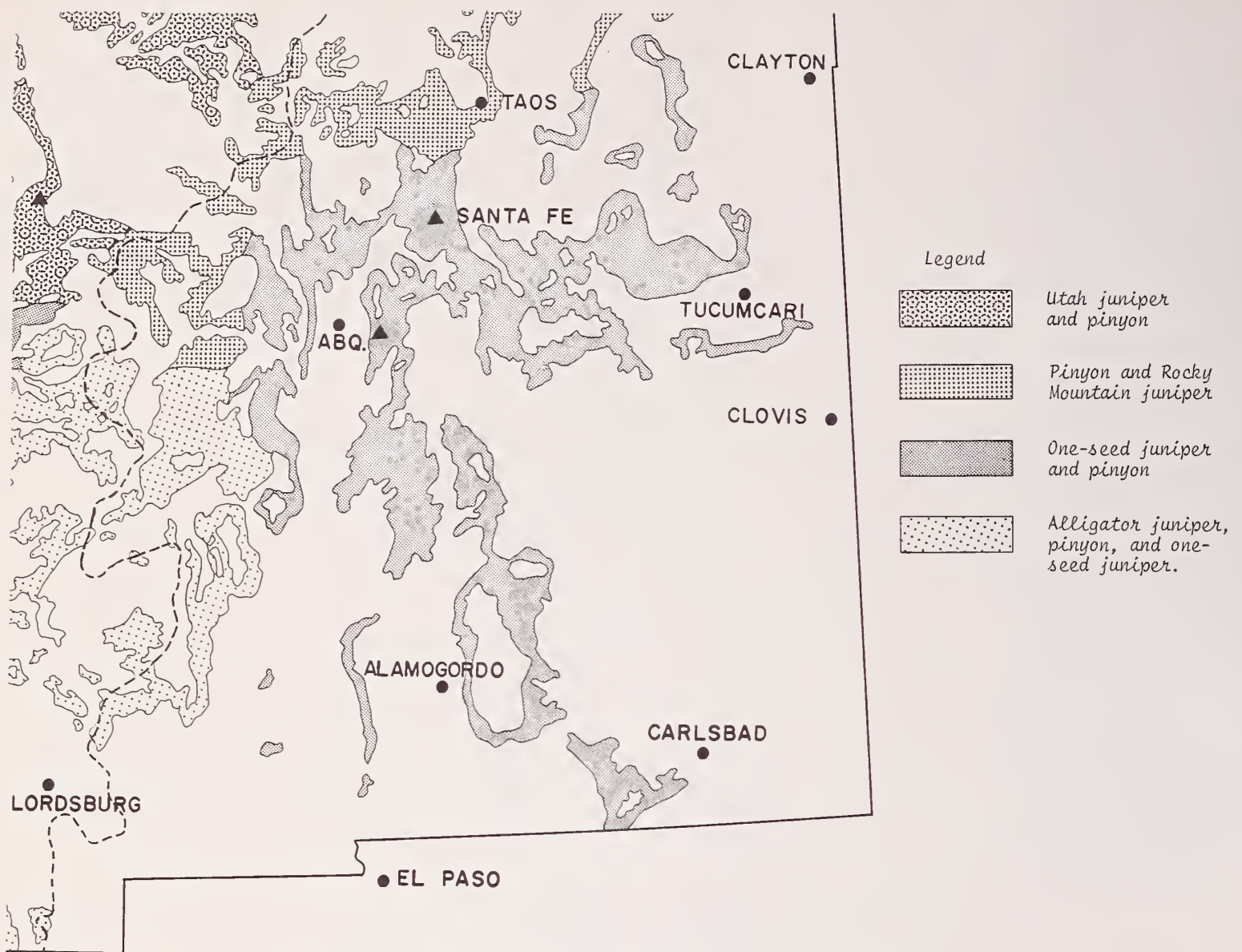


Figure 1.--Distribution of pinyon-juniper in New Mexico.

There are over 120 geologic types identified in New Mexico, almost half of which occur in the woodland type. Many have been consolidated into broad categories in this Note (table 2).

Thirty-two percent of the National Forest system lands in New Mexico support the pinyon-juniper type (table 1). On the five Forests entirely within the State, over 24 percent of each Forest is in this type. On the Cibola, 46 percent of the Forest is classed as woodland.

Almost 29 percent of the pinyon-juniper type is on highly unstable geologic formations that contribute to high sediment yields (table 2). Sedimentary units make up 54 percent of the acreage in the type, igneous units 39 percent, and Pre-Cambrian formations 7 percent.

Older alluvium, sandstones, the Datil formation, and volcanics each make up over 10 percent of the acreage in woodland. The Datil formation, a high sediment producer, makes up 27 percent of the Cibola National Forest woodland and 42 percent of the Gila National Forest woodland type (table 2).

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