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THE FLORA

OF THE

MESILLA VALLEY

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THESIS

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Submitted to

THE REGENTS AND FACULTY

of the

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INTRODUCTION

The first and principal purpose of this article is a portrayal of the Mesilla Valley flora, and a portrayal of it as it is; not as I myself, anyone else, or any theory would have it, but as I have found it to exist and have sketched or noted it to the best of my ability. After having done this by relating carefully observed facts, with no view whatever of verifying any hypothesis, I purpose to offer a few thoughts in explanation of the several, and somewhat sharply marked life zones of this valley.

I shall, in this article, for convenience' sake consider as the Mesilla Valley, that strip of country between the top of the Organ mountains, on the east, and the rim of the mesa west of the Rio Grande, on the west, and extending from the Doña Ana mountains, on the north, to the Franklin mountains, on the southeast, (for exact area see the strip included on the map, by dotted blue line).

I realize that the above mentinned work, when done along with a regular college course, is rather a broad subject for a thesis, but with much assistance and with the college herbarium, which contains an unusually good collection of the plants of this region, I trust that the work has not been altogether without value.

In preparation for this work I have spent most of my spare time since last August collecting plants and other data from this region. After studying the plants by specimen from the herbarium, I have gone out into the field and by riding over the area as much as my time would permit, I have mapped the different zones* either in my memory or on paper.

* I shall in this article use the word zone in its more restricted sense, and although the whole area under consideration is in the Upper Sonoran, I shall speak of the local subdivisions of this zone as the Life Zones of the Mesilla Valley.

Fortunately, this work which is usually the hardest thing to determine in connection with the flora of any given region, was very easy here on account of the striking differences in the vegetative coloring of the several zones, and also because of their sharply marked lines of tension.

Further, I have devoted some little time to the soil questions of these zones, and while I was not able to carry an auger with me, I have, in the best manner I could without it, taken samples from the first foot of each zone and by the use of an electrolitic bridge have determined their relative percentage of soluble salts.

In several cases where the per cent. of soluble salts was too small for quantative analysis by the process used, I have simply cited the resistance offered and it may be well to state here that a high resistance indicates a low per cent. of soluble salts.

GEOLOGICAL REMARKS

The region under consideration, with a maximum width of about 18 miles, and a length of some 20 miles, has an altitudinal variation of about 5,000 ft., ranging from 3,900 ft. in the river bottom, to 8,950 ft. on the top of the highest Organ peak.

The Organ mountains rise very abruptly in a narrow, jagged ridge extending northand south. With a base line varying in length from 6 to 10 miles, they rise in the highest plaees over 3,000 feet above the surrounding mesas. They are also too rocky, in the main, to support much vegetation, many of the peaks being solid, bare granite.

At the western foot of the Organs, the Mesilla Valley mesas set in and extend westward for a distance varying from 6 miles, at their southern end, to about 12 miles toward the north. These so-called mesas

are not true western mesas, on the whole, but have been in many places eroded into low rolling hills, being cut by numerous draws which cross them and act as drains for the Organ mountains and the mesas themselves.

Somewhere near the middle of this mesa land stands a small, limestone hill, known as Little Mountain or Tortugas Hill. It rises abruptly to a height of 600 ft. above the surrounding mesas, and seems from the dip of its strata and by its composition to be an outlier of the carboniferous strata, which Prof. Wooton believes to have covered the Organ mountains before the erosion had exposed their present jagged peaks of granite. Its history does not, however, concern us from a botanical standpoint, and I would here call attention only to its similarity of formation and soil to that of the Pyramid peak hills, which outlie the southern end of the Organ range.

Taking up the topographical features of the river bottom, or valley proper, there are three distinct levels beside the sand dunes. First, the river bed with its adjacent flood plain; second, the old river beds and deserted flood plains; and third, the cultivated areas or highest level of the river bottom. In the broadest place the river bottom is something like 5 miles wide, and, because of the very slight fall in the river bed, there is a tendency of the river to meander; hence, the old river beds and the deserted flood plains.

One other geological feature of the river bottom, which is of interest from the botanical standpoint, is that of its sand dunes. Just at present they are to be found scattered along about on a median line of the river bottom, but their slow and silent journey eastward is quite obvious.

These sand dunes, locally known as the sand hills, are large

piles or heaps of clean river sand, brought and piled up by the prevailing west winds. They sometimes reach a maximum height of about 35 ft., and, although they slope more or less gently to the west, they are as steep on the eastern slope as the sand will lie. Certain of them are definitely known to have moved a distance of 50 or 75 yards in the last four or five years. Others may be seen encroaching upon and even burying trees, and just now, on april 24th, I am sitting on the clean, brown sand in the very top branches of a cottonwood tree, while just beyond, the tops of a salix nigra sticking out of the sand, look more like a clump of young willows than part of a tree.

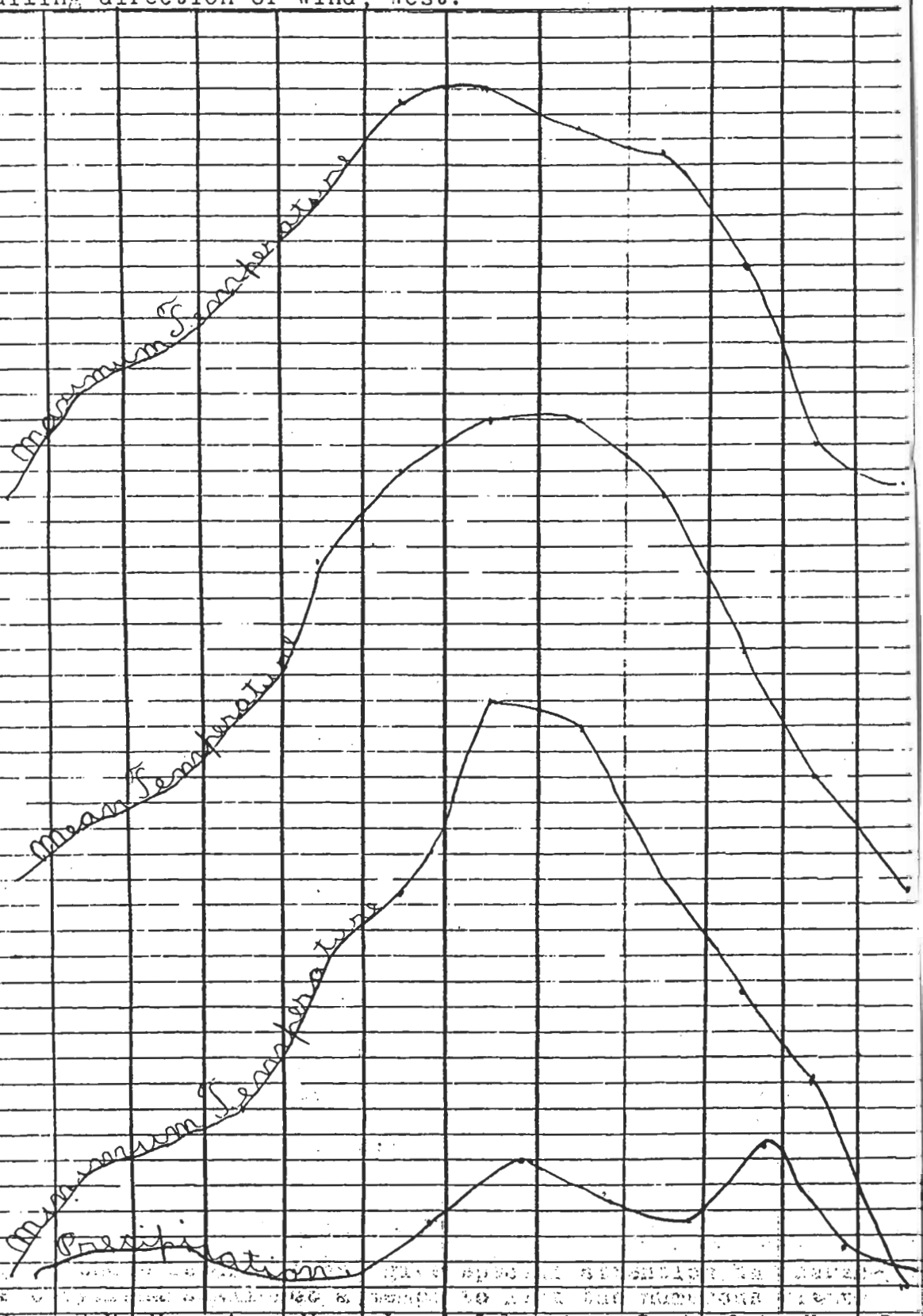
These sand dunes have been of interest from a botanical standpoint because they offer certain conditions upon which one might expect to find a characteristic flora, but strange to say there seems to be no such flora, and after studying them more or less carefully, all the author can say is that where they grow any vegetation at all, it is the same as that of the Cachanilla zone, upon which they rest.

CLIMATE

An extended article might be written upon the climate of this region but a few things only are of special importance in considering its flora. For the purpose of giving these points of special interest, a diagram showing the curves of maximum, mean, and minimum temperature, as well as a curve of precipitation will perhaps be most illustrative. (See Plate I.) In considering these curves, the author has taken data from the New Mexico Section of Climate and Crop Service, and has selected the year 1901 as one typical of the ordinary climatic conditions.

Curves showing temperature and precipitation at [illegible]

F°	Precipitation in inches.	Total precipitation, 11.96 inches. Total snowfall, 1.6 inches. Number of rainy days, 51. Number clear days, 221. Number of partly cloudy days, 72. Number of cloudy days, 72. Prevailing direction of wind, West.
110		
108°		
106°		
104°		
102°		
100°		
98°		
96°		
94°		
92°		
90°		
88°		
86°		
84°		
82°		
80°		
78°		
76°		
74°		
72°		
70°		
68°		
66°		
64°		
62°		
60°		
58°		
56°		
54°		
52°		
50°	10.0	
48°	9.0	
46°	8.5	
44°	8.0	
42°	7.5	
40°	7.0	
38°	6.5	
36°	6.0	
34°	5.5	
32°	5.0	
30°	4.5	
28	4.0	
26°	3.5	
24°	3.0	
22°	2.5	
20°	2.0	
18°	1.5	
16°	1.0	
14°	Less than 1	
12°	Less than .5	
10°	0	



Jan. Feb. Mar. Apr. May. June. July. Aug. Sept. Oct. Nov. Dec

(Plate, 1)

THE LIFE ZONES DESCRIBED

So striking is a zonal distribution of plant life in the Mesilla Valley that most of its life zones may be seen and easily distinguished at a distance of several miles; while an observer traversing the valley may in a distance of less than ten yards, pass from a thick growth of one plant into another zone where the species is hardly, if at all, represented.

In describing these zones, it is most convenient to start at the river's edge, just west of Mesilla, and describe them as we pass eastward, across the river bottom or valley proper, across the mesas or low foothills, and finally up the northwest slope of Organ Peak.*

The Baccharis Zone

Just at the river's edge lies the Baccharis zone, an area covered by a more or less scattering and local growth of Baccharis glutinosa. It might be spoken of as the river sand bars for in many places it has no vegetation at all. The soil is almost pure river sand, carrying from .15 to .25 of one per cent. soluble salts. This sand, though often dry for a few inches on the top, is wet below and the highest parts of the zone do not rise more than two feet above the water table.

Beside the Baccharis, several small annuals may be found growing in this zone between floods, but Baccharis glutinosa is the only shrub and is the characteristic plant. It grows from 5 to 12 feet tall and often so thickly set on certain areas, as to make walking through it rather laborious.

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* I shall, in these descriptions, give special attention to characteristic plants only, and shall not attempt to list the numerous plants which are not distinctive.

The Populus and Salix Zone

Beside the Baccharis zone on the next bench of the flood plains above it, is the Populus and Salix zone. This zone, being from one to two and one half feet above the Baccharis zone, is less often flooded than the latter. Its soil, also, carries a slightly higher percentage of fine particles than the Baccharis zone. Populus Fremontii Wislizeni, Salix nigra and Salix interior, and down about San Miguel I have seen the Populus and Salix nigra, growing to the exclusion of everything else, even salt grass (Distichlis spicta), which is so common upon this zone farther up. The zone is commonly spoken of by the natives and other settlers here, as the bosque and truly no other life zone of the valley is more deserving of the name, which may be translated to mean a leafy solitude.

About San Miguel where the Populus and Salix nigra grow to the exclusion ofpractically all other plants, the zone is much older than it is from Bosque Seco, north, and perhaps shows the normal or mature growth of this level. Along about Mesilla the typical growth is one of numerous small cottonwoods and willows with more or less Baccharis extending into it from the west and about the same amount of Tornillo, (Prosopis pubascensa) from the east. That it is a young zone at the point mentioned is clearly shown by the size of the trees: moreover, it was only in the recent history of the valley that the river changed from its old channel on the eastern side of the valley to one about four miles further west.

The soil of this zone is a light, sandy loam, carrying the second highest percentage of soluble salts of any zone in the valley. The percentages ranges from .55 to .65 per cent.

The Tornillo Zone

Next in sequence from the river level, is the Tornillo zone. It is confined to the old river beds or desertedflood plains, and may be seen from a distance as long, narrow, winding strips, running through the eastern half of the river bottom, and as large, thickly grown areas adjacent to the Populus and Salix zone in the western half. The soil is a sandy loam and carries about .10 of one per cent. soluble salts. On the typical areas, of which there are thousands of acres in this valley, Tornilloand salt grass are about the only two plants that grow in any quantity. In places the tornillo is scattering and in other large areas it is so thick as to be almost impenetrable. It varies in size from small bushes to trees a foot in diameter and 20 feet in height, and is the source of the stove-wood used in the Mesilla Valley.

Some of the cultivated area lies in this zone, and is probably the best farming land in the valley, although the largest and most extensive tracts under cultivation are found in the next higher zone.

The Cachanillo Zone

On the next level, from five to eight feet above the Tornillo zone, is a thick growth of the so-called Cachanillo, (Pluchea sericea) with an occasional bush of the Tornillo, so common below. The soil of the Cachanillo zone varies from a sandy loam to an almost pure sand, and carries too small a percentage of soluble salts to determine by means of the electrolitic bridge. The characteristic shrub is Pluchea sericea, while Sporobolus Wrightii, in scattering bunches is the characteristic grass. Occasional Mesquite and Atriplex bushes may be found upon this zone, and here and there a large cottonwood is to be seen, beside numer-

ous small herbs, but none of these are anywhere characteristic of the zone. The principal growth is the Cachanillo which grows sometimes in scattering bunches, sometimes about as thick as it can stand. This is sometimes called arrow wood and has straight, slender stems, about the size of an arrow, and is from four to six feet in height. Its ashy gre leaves impart to the zone that peculiar color and makes it easily distinguished from the adjacent tornillo, which is a dark, redish brown in winter and a dull green in summer.

The Dondia Zone

Just where the river bottom soil meets the gravelly soil of th mesas and where all of the salts leached out of these first hills or mesas seems to come to the surface, there is a very narrow, and more or less broken, strip to which the Sea blite (Dondia sufrutescens) is most thoroughly adapted. This odd little plant may be found growing in the Tornillo and Cachanillo zone in occasional bunches, or even among the Mesquite of the first foothills, but it seems to grow best in the narrow alkaline strips mentioned above and for this reason I have called this strip the Dondia zone. The soil of this zone varies from a sandy loam to a heavy clay, and carries about 1.81 per cent. soluble salts. Atriplex canescens, and Prosopis glandulosa grow in more or less abundance on this zone, but the Atriplex is often stunted while the Mesquite seems to prefer the adjacent mesas.

The Atriplex Zone

On the first bench, or lowest level of the mesas, the Atriplex zone is a continuous belt extending almost from one end of the valley to the other. Its characteristic plant is Atriplex canescens, but in place

mesquite grows even in excess of the Atriplex. The zone is a striking one; its ashy grey color showing well in the sharp tension line between it and the smokey green of the Larrea zone on its east. With the Atriplex, so characteristic of this zone, are to be found numerous other plants such as mesquite, an occasional yucca, cacti, and numerous weeds, which are more or less common to the several zones of the mesas.

Recent experiments made by Prof. J. D. Tinsley and his soil physics class have shown that the light sandy loam of this zone carries from 15 per cent of soluble salts at its western edge, to less than 0.1 per cent. in samples taken near its eastern edge.

The Larrea Zone

Crossing the sharp tension line which separates this zone from the Atriplex and Mesquite, we pass within 25 yards from a more or less thick growth of the two latter shrubs into a similar growth of Larrea tridentata, locally known as creosote bush. This zone generally follows the second level of the mesas and Larrea, its most characteristic plant, seems to grow most vigorously and plentifully on this bench, but in places the tension line does not follow the bench very closely but runs out for a short distance upon the same level with the Atriplex and Mesquite. In many places where this is the case there seems to be little or no difference in the soil to all external appearance, but experiments have shown the percentage of soluble salts to gradually diminish as we approach this line from the west, and in many places a slight difference in the amount of fine parts carried by the soil may be noted even at the tension line, while the typical soil of the Larrea zone is a reddish loam instead of the light colored sandy loam found on the Atriplex zone.

The Yucca Zone

A third and very irregular level of the Mesilla Valley mesas is occupied along its western and more eroded parts by a rather scanty and local growth of Black Gramma, (Bouteloua eriopoda), and the so-called six weeks Gramma, (Bouteloua aristadoides)and (B. polystachya) . There seems also to be more Yucca on this strip than any other and for this reason it has been called the Yucca zone, but the Yuccas are very scattering and there seems to be no more reason for naming it after the Yuccas than the grass which gives ti it its characteristic color. One thing is certain, however, and that is that the strip belongs neither to the Larrea zone west of it, nor to the Acacia zone east of it, and for want of a strikingly characteristic plant to name it after, I shall term it the Middle Grass or Yucca zone.

The soil of this zone is a light sandy loam in which the sand is much finer than that of the Atriplex and Mesquite zone, and has the same general appearance as the river bottom sands. Its relative proportion of soluble salts is even less than that of either of the two adjacent zones, the resistance shown by the electrolitic bridge for the three being as follows: Larrea, 1250, Yucca, 2557.5, Acacia, 1736.2.

The Acacia Zone

Grading more or less sharply into the Middle Grass or Yucca zone, lies a broad area on which grows Acacia constricta; this strip varies in width from two to five miles, and its only typical plant is this Acacia and it is very characteristic. In fact, there are many places where it is almost the only plant that grows at all, even the many weeds

common to the other mesa zones being very scarce. The Acacia grows from four to six feet high, has rather scanty, inconspicuous leaves and dark red stems, the latter imparting to the area a distinctive dark color.

The soil is reddish loam carrying slightly more fine particles than that of the Larrea zone, and also a little more of soluble salts than either of its adjacent zones, but not enough to determine with the electrolitic bridge.

GRASS ZONE
of the
ORGAN FOOTHILLS

A more or less broken strip of country bordering on the Organ mountains might well be called the Grass zone, since it is fairly well covered by black gramma and other grasses. On the west it shades rather gradually into the Acacia zone and on the east it extends up the Organ mountains far enough to meet the scrub oaks, which begin irregularly at the about 5,000 ft. contour.

The soil is mostly a light sandy loam, but not as sandy as the Middle Grass or Yucca zone and the sand is much coarser. Like all the other zones east of it to the top of the Organ mountains, it has an almost inappreciably small percentage of soluble salts.

ZONES
of the
ORGAN MOUNTAINS

Because of the limited opportunities for observation, in a locality where tension lines are so indefinite and where characteristic

zonal plants occur in such scanty numbers, it was almost impossible to draw any definite conclusions as to the number and limits of these zones. On ascending Organ peak from the northwest side, several well known zonal plants were observed, which appear to occupy about their customary altitudinal sequence of position. Their absolute altitudinal positions are somewhat high on account of the small amount of precipitation which occurs in the mountains.

Passing from the grass zones of the Organ foothills, we enter the scrub, or live oak zone. On the western, southwestern, sothern, and southeastern exposures of the range this zone extends from about the 5,000 ft. conture up to that of about 8,400 ft. Ascending the northwest slope of the peak, we pass from the scrub oak near the 7,000 ft. conture, and come to an occasional juniper and piñon along with a few small oaks of the Quercus Gambelli group. The junipers and piñons extend considerably below 7,000 ft. They junipers begin near the Cueva. A few pines also make their appearance at about the same level, becoming more numerour from there almost to the top. Just a little above the first pines, Douglas spruce is found, but neither pine nor spruce is represented at any level by more than an occasional tree, so the question of separating them into zones is a difficult one and still, at about the 8,000 ft. conture the spruce seems to grow more numerous than the pine, while juniper and piñon entirely disappear. It might be well to state that the pines go higher on the drier, warmer hillsides, while the Douglas spruce follow the cooler, more moist cañons downward, thus causing the apparent overlapping of zones. This is rendered particularly pronounced in a region where neither tree is thoroughly at home. Just on, or a little above the 8,000 ft. conture, a small low form of oak, (Q. venustula) 3 to 4 ft. in height begins to grow in thick patches, and finally near the 8,400 ft.

level it becomes the characteristic shrub. Here even the spruce ceases to grow.

Probably some of the above noted changes are at least partly due to the slope of the mountain, for nowhere is a continuous slope offered on which to study zonal distribution.

The soil of the Organ mountain zones is, beginning at the top, a black loam, very rich in humus, but as we descen it becomes less rich in humus, more gravelly and lighter in color, until it finally merges into the sandy loam of the Scrub Oak zone. The percentage of soluble salts is, as I have stated, almost inappreciably small.

ECOLOGY

A more interesting and instructive field for the study of Ecology than the Mesilla Valley, as here considered, is seldom found, and it is to be regretted that the time of the author should have been too limited for a thorough investigation of this subject. He offers the following ideas tentatively in partial explanation of some of the more striking phenomena of distribution. Attention has here been given only to the factors of soils, water supply and elevation.

The Baccharis Zone

Nothing seems more easy of explanation than the fact that Baccharis glutinosa is practically the only plant found on the first level of the Rio Grande flood plains. The surface of this plain is only one or two feet above the water table, and is often flooded by from one to several feet of swiftly flowing water during the spring months. These sand bars are not permanent long enough for a shrub to establish itself,

unless it be of relatively rapid growth. This is characteristic, however, of Baccharis glutinosa, and whether almost covered up or nearly washed out, it seems ever ready to grow with vigor.

Salix and Populus Zone

The Salix and Populus zone is occasionally overflowed by the highest flood waters but the water which overflows it, does not run deep nor swiftly enough to wash down such small plants as young willows or cottonwoods during their first year's growth. While the author does not offer this as an explanation of the growth of Salix and Populus, he would call attention to it, in contrast to the Baccharis zone, simply as permitting their growth. Probably the one feature of the zone most conducive to the germination and development of Salix and Populus is the almost constant surface moisture. The very sandy and salty soil makes up in the matter of moisture, by absorption below, what the atmosphere fails to supply by precipitation, and while Salix and Populus do not naturally prefer alkali soils, their first and principal need is a moist surface upon which the tiny, slow-growing seedlings can subsist until their roots have reached the water below. That their growth upon this zone is due mainly to the presence of constant surface moisture, is shown by the fact that they will grow equally well on any of the other zones above it when planted and well watered, or when by accident they have got rooted under favorable moisture conditions.

The Tornillo Zone

In taking up the consideration of this zone, the author would call attention first to the fact that Prosopis pubescens, its character-

istic plant, grows more or less abundantly on the wet, alkali soil of the Salix and Populus zone and in fact it seems to grow as readily there as it does in its own particular, drier, and less alkaline soil. This would seem, at first thought, to indicate that moisture played no part in the separation of these zones. But in reality it is the one thing which gives rise to the two zones, since, while it happens that Tornillo seems adapted to the soil conditions of either, it is not able to hold its own with the willows and cottonwoods in the struggle for existence in the wet soil of the Salix and Populus zone. Hence it is forced to take as its own private zone, the more dry and less alkaline soil of the old river beds and deserted flood plains, which is too dry to support a growth of young willow and cottonwoods.

The Cachanilla Zone

Soluble salts have thus far played little or no part in the conditions governing zonal distribution, other than their possible influence upon the absorbent capacity of the soils, but in the Cachanilla zone the almost entire absence of alkali would seem to be one of the requisites for the growth of that plant. Another explanation of its growth upon this level only, is the fact that it prefers an almost pure sand to grow in, Besides these two conditions which are apparently most instrumental of all in setting aside this level for the growth of Cachanilla, the zone is, on the whole, somewhat drier than any of the others so far described. It is never flooded while the others are; two of them by the river at times, and one, the Tornillo zone, by local flood water and escaped irrigation water.

These remarks are, as I have given in all cases, simple cita-

tions of the environmental conditions, and no doubt an anatomical study of these plants will show many interesting things in the way of adaptation to these naturally existing conditions.

The Dondia Zone

That the Dondia strip carries more alkali than any other zone of the valley, and the fact that Dondia sufrutescens seems to grow better there than in any other zone, would at once indicate that it prefers an alkaline soil. And so it does, for when found at all in other river bottom zones, it is most abundant on alkaline spots. The strip upon which it grows shows about the same mpisture content as the Cachanilla zone or any of the mesa zones east of it. Observations of this character as well as the fact that it occasionally grows well on wet alkaline spots, would at once seem to indicate that its separation from adjacent zones is not a question of moisture. It appears, then, that its growth upon the Dondia zone is due partly to two environmental factors, the first of which is that it has more or less undisputed growing room there because the alkali prevents a vigorous growth of other plants, and secondly it seems to have a natural affinity for an alkaline soil.

The Mesa Zones

To give a detailed discussion of the mesa zones would be, for the present author at least, a case of saying a great deal to tell very little. However, a few facts concerning the environmental conditions they offer to plants have been noted and may serve as a guide for further study of the subject.

The mesa plants are easily separated from the river bottom p

plants by their zerophytic characters; a general characteristic due entirely to their adaptation to dry soil and dry atmosphere.

The causes which produce a separation of these plants into the striking and sharply marked zones or belts that extend almost or quite unbroken from one end of the valley to the other, it is not so easy of explanation. One thing is plainly seen; water supply plays little part in this zonal distribution, since all these zones are exposed to the same dry sweeping west winds, have a practically common slope, and receive about the same amount of annual rainfall. In the matter of elevation, there is some difference, but certain observations, such as the growth of Larrea on top of Little Mountain, 400 ft. above its natural zone, the fact that Atriplex canescens may be seen extending up the sandy draws to a level somewhat higher than the zone on which it grows best, and, further the fact that now and then a bush of Acacia constricta may be found growing vigorously on the first level of the mesas,; all such facts would seem to indicate that the assignment of these characteristic zonal plants to their respective zones, is not dependent upon elevation at least not to any great extent.

The one environmental condition which would seem to explain zonal distribution of plant life on these mesas, is that of soil conditions. Beginning with the Atriplex zone, just east of the Dondia zone, the soil is a sandy loam in which the sand is rather coarse. The typical soil of the adjacent Larrea zone is a reddish loam, and even where the Larrea extends out upon the first mesa level, the soil seems to contain a larger percentage of fine particles, and generally have the reddish tinge. Passing on from the light, loamy soil of the Larrea zone we come to a very light sandy loam in the Yucca zone. The sand here is not like

that of the Atriplex zone, but resembles river sand very much. Bordering the Yucca zone on the east, we meet wi th another red loam in the Acacia zone, even redder and apparently containing a higher percentage of fine particles than that of the Larrea zone. East of the Acacia zone we pass into the Grass zone, and again find a sandy loam, but the sand is not so fine not is there as large a percentage of it as is found in the soil of the Yucca zone. Hence we have an alternation of sandy loam and loamy soils in these zones.

Another interesting thing to note in connection with these soils is their relative proportion of soluble salts. The Atriplex zone has the highest percentage of them all and varies within itself from west to east, carrying from .15 per cent to too small a percentage for determination by the electrolitic bridge. This fact, together with the physical differences in their soils, would seem to offer a plausible explanation of the sharp tension line between this zone and tat of the Larrea zone along its eastern side. From the western edge of the second level to the top of the Organ mountains, the percentage of soluble salts is too small for determination by the electrolitic bridge, but the relative percentages may be determined by the use of that instrument and they show some interesting facts. It will be remembered that the physical conditions of the soil in the Larrea zone very much resemble those of the Acacia zone soil, while the soil ofthe Yucca zone between them, bears about the same relation to that of the Grass zone. And it is now interesting to note that the percentage of soluble salts in the Larrea zone approaches very closely to that of the Acacia zone, while that of the Yucca zone is somewhat less tan either of the zones between which it lies and very nearly the same as that of the Grass zone.

From the foregoing facts it seems, to the author, clearly shown that a careful study of the soluble salts in these soils as well as their physical properties is of the utmost importance, if we would understand the conditions producing the very marked zonal distribution of plants on the mesas.

The Zones of the Organ Mountains

In leaving the river bottom we noted a change from hydrophytic and mesophytic plants to the zerophytic plants of the mesas, a change which applied to the whole mesa flora irrespective of zone. Upon entering the Organ mountains we immediately notice that the reverse change has occurred. This change, although due in a slight degree to the more abundant rainfall on the mountains, is due mostly to the slope and to the fact that some areas receive extra water supply in the form of drainage waters. The steep northeastern, northern, and northwestern slopes are not subjedt to conditions producing as rapid evaporation as the surrounding mesas, nor as the southeastern, southern, and southwestern slopes of equal altitude. This fact, which is due of course to the direction from which they receive the sun's rays, gives rise to differences in flora not only between these northern slopes and the surrounding mesas, but also between the northern and southern slopes of the same level as the mountains themselves. In some of the deeper and longer cañons of the range, running water is permanent enough to maintain a growth of hydrophytes, while many of these deep, narrow cañons offer favorable conditions for the growth of mesophytes. These conditions immediately suggest the question as to whether some of the valley plants are not to be found in these wet places of the Organ mountains. The answer is that a few of

them are so found*, but a difference of fifteen hundred feet in altitude as well as the differene between a non-alkaline soil rich in humus, and a snady alkaline soil are sufficiently potent in giving to each place its characteristic flora.

Although the life zones of the Organ mountains are hard to distinguish, they are not difficult of explanation. The combination of slope and altitude, obviously plays the most important part in zonal distribution upon them. On the hprthern slopes, the mountains offer an altitude low enough fpr the growth of Quercus Arizonica and Q. grisea, and extend to a high enough altitude for the Douglas spruce to grow well, while between are found junipers, piñons, then a few pines associated with the Quercus Novo-Mexicana , and finally the Douglas spruce, which extends almost to the top and no doubt would do so if the slopes were favorable. On the southern slopes, the scrub oaks are almost the only characteristic plants and are only replaced at the very top by a small capping of the bushy Quercus venustula. Hence we see that on the northern slopes are to be found such plants as prefer a cool, moist location, while on the somewhat drier and hotter southern slopes the two oaks above mentioned are about the only characteristic plants.

The Flora of Little Mountain and the Pyramid Peak Hills

Before closing the discussion of plant distribution, the author would call attention to one thing not mentioned in the description of

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* See list of plants common to Organ mountains and river bottom.

zones, that is the striking similarity of flora on the Little mountain situated near the middle of the mesas, and that of Pyramid Peak hills at the southeast end of the valley. It will be remembered that they are both limestone formations, and no doubt this fact explains their common flora*. With but one or two exceptions, every plant which is characteristic of the Little Mountain flora is to be found on the Pyramid Peak hills, but insufficient collections from the latter region make it uncertain as to whether its particular flora contains many characteristic plants which are not to be found on the Little Mountain. One trip made by Professor E. O. Wooton and myself to these hills, has resulted in two or three species which had not been collected elsewhere in the valley.

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* For plants common to the two places, see list of plants peculiar to Pyramid Peak and Little Mountain.

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The published literature of an ecological character which has been at the disposal of the author has been freely used whenever possible.

A List of the Plants of the Area Studied.

Plants of the river bottom.

Equisetumlaevigatum; A.Br.
Equisetum robustum; A.Br.
Eriochloa punctata; (L.) W.Hamilt.
Echinochloa Cruss-galli; (L.) Beauv.
Syntherisma sanguinalis; L.
Cenchrus tribuloides; L.
Aristida fasciculata; Torr.
Lycurus phleoides; H.B.K.
Sporobolus airoides; Torr.
Sporobolus asperifolius; (Ness&Meyen) Thurb.
Arrhenatherum elatius; (L.) Beuv. (Introduced).
Phragmites phragmites(L.) Karts.
Pappophorum Wrightii; Wats.
Bulbilis dactyloides; (Nutt) Raf.
Leptochloa mucronata; Kunth.
Bromus unioloides; (Willd.) H.B.K. (Introduced).
Acanthochiton Wrightii; Torr.
Allionia linearis; Pursh.
Abronia carnea; Greene.
Abronia turbinata; Torr.
Mirabilis multiflora; A.Gray.
Lepidium alyssoides; A.Gray.
Lepidium Virginicum; L.
Sinapis alba; L. (Introduced).
Brassica arvensio;(L.) B.C.P. (Introduced).
Brassica juncea; (L.) Cosson. (Introduced).
Lesquerella Gordoni; (A.Gray.) Wats.
Sophia ochroleuca; Wooton.
Acuan Illinoensis; (Mich.) Kuntze.
Prosopis pubescens; Benth.
Hoffmanseggia stricta; Benth.
Medicago lupulina; L. (Introduced)??
Medicago sativa; L. (Introduced).
Mellilotus alba; Desv. (Introduced).
Melilotus indica; (L.) All.
Trifolium pratense; L. (Introduced).
Amorpha fruticosa; L.
Parosela dalea; (L.) Brit.
Lolium perenne; L. (Introduced).
Elymus Canidensis; L.
Arundo donax; L.
Cyperus esculentus; L.
Scirpus lacustris; L.
Eleocharis palustyis ; (L.) R.& S.
Juncus nodosus; L.
Populus Fremontii Wislizeni; Wats.
Phorodendron macrophyllum; (Engl.) Ckll.

Plants of the river bottom.

Rumex sôlicifolius; Weinm.
Polygonum emersum; (Michx.) Brit. (Introduced).
Polygonum lapathifolium; L.
Polygonum ramosissimum; Michx.
Chenopodium leptophyllum; (Moq.) Nutt.
Chenopodium album; L.
Atriplex elegans; Dietr.
Atriplex expansa; Wats.
Coriospermum villosum; Rydb.
Dondia suffrutescens; (Wats.) Heller.
Amaranthus blitoides; Wats.
Amaranthus retroflexus; L.
Parosela lanata; (Spreng.) Brit.
Astragalus Wootoni; Cheldon.
Glycyrrhiza lepidota; Nutt.
Erodium cicutarium; (L.)L.Her.
Tribulus terrestris; L. (Introduced).
Kallstroemia brachystylus; Vail.
Kallstroemia maxima; (L.) Vail.
Sphaeralcia lobata; Wooton.
Sphaeralcia lobata perpallida; Cockerell.
Sida lepidota; A.Gray.
Anoda lavateroides; Medic.
Cevallia sinuata; Lag.
Onagra biennis grandiflora; (L.) Scop.
Onagra albicaulis; (Pursh.) Brit.
Gaura parviflora; Dougl.
Coriandrum sativum; L. (Introduced).
Apocynum androsaemifolium?; L.
Asclepias galioides; H.B.K.
Cressa Truxilensis; H.B.K.
Convolvulus sepium; L. (Introduced).
Phacelia integrifolia; Torr.
Helitropium xerophyllum; Crockerell.
Echium vulgare; L. (Introduced).
Solanum elaeagnifolium; Cav.
Datura discolor; Benth.
Petunia parviflora; Juss.
Plantago Rugelii; Den.
Sambucus Mexicana; Presl.
Cucurbita foetidissima; H.B.K.
Solidago Canidensis; L.
Aster hebecladus; DC.
Isocoma heterophylla; (A.Gray) Greene.
Psilactis asteroides; A.Gray.
Aster Boltoniae; Greene.
Aster hesperius; A.Gray.
Leucosyris spinosa; (Benth.) Greene.
Machaeranthera tanacetifolia; (H.B.K.)Nees.
Baccharis glutinosa; Pers.
Pluchea sericea; (Nutt.) Coville.
Gaertneria acanthicarpa; (HOOK.) Benth.
Xanthium Canadense; Nell.
Rudbeckia amplexicaulis; Vahl. (Probably introduced).
Ratibida Tagetes; (James) Barnhart).

Plants of the river bottom.

Helianthus annuus; L.
Helianthus ciliaris; DC.
Bidens bipinnata; L. (Introduced).
Flaveria repanda; Lag.
Picradenia multiflora; (Buckley) Greene.
Artemesia filifolia; Torr.
Senicio sparticides; T. & G.
Lactuca scariola; L. (Introduced).
Euphorbia sp.
Sophora sericea; Nutt.
Parosela scoparia; (A.Gray) Heller.
Phylla cuneifolia; (Torr.) Greene.
Erigeron arenarius; Greene.
Marrubium vulgare; L.
Lycium Torreyi; A.Gray.

Plants of the Organ mountains.

Filix fragilis; (L.) Underwood.
Dryopteris filix-mass; Swartz.
Phanerophlebia auriculata; Underw.
Asplenium trichomes; L.
Asplenium parvulum; Mart.&.Gob.
Gymnopteris hispida; (Nutt.) Under.
Pellaea atropurpurea; Hooker.
Pellaea ternufolia; Link.
Pellaea Wrightiana; Hooker.
Notholaena Hookeri; D.C.Eaton.
Notholaena ferruginea; Hook.
Notholaena sinuata; Kaulf.
Cheilanthes Feei; Moore.
Cheilanthes Fendleri; Hook.
Cheilanthes Lindheimeri; Hook.
Cheilanthes tomentosa; Link.
Selaginella rupestris Fendleri; Underw.
Selaginella rupincola; Underw.
Pinus edulis; Engelm.
Pinus ponderosa; Dougl.
Juniperus fachyphloea; Torr;
Nazia racemosa; (L.) Kuntz.
Panicum bulbosum; H.B.K.
Stipa flexuosa; Vasey.
Muhlenbergia distichophylla; (Presl) Munro.
Muhlenbergia Neo-Mexicana; Vasey.
Muhlenbergia Pringlei; Scribn.
Sporobolus confusa; Vasey.
Agrostris verticillata; Vill.
Bouteloua oligostachya;(Nutt) Torr.
Bouteloua hirsuta; Lag.
Poa Bigelovii; Vasey & Scribn.
Poa Fendleriana; (Steud) Vasey. (And also on foot of Little Mt.).
Festuca octoflora; Walt.
Sitanion brevifolium; G.J.Smith.

Cyperus meyenianus; (Nees) Kunth.
Cyperus Fendlerianus; Boeckl.
Cyperus inflexus; Muhl.
Cyperus Rusbyi; Britton.
Cyperus Schweinitzii; Torr.
Cyperus sphacelatus; Rottb.
Cyperus uniflorus; Torr. & Hook.
Stenophyllus capillaris; (L.) Brit.
Commelina crispa; Wooton. (Arroyos also).
Commelina dianthifolia; DC.
Tradescanthia scopulorum; Rose.
Allium Neo-Mexicana; Rydb.
Allium reticulatum; Don.
Nolina erumpens; Wats.
Dasylirion Wheeleri; Wats. (Little Mt. also).
Wagnera amplexicaulis; (Nutt.) Greene.
Agave applanata; Lemoire. (Little Mt. also).
Populus angustifolia; James. (Very rare).
Celtis reticulata; Torr.
Morus microphylla; Buckley.
Parietaria debilis; Forst.
Parietaria pennsylvanica; Muhl.
Phoradendron flavescens; (Pursh) Nutt.
Eriogonum hieracifolium; Benth.
Eriogonum Jamesii; Benth.
Eriogonum polycladon; Benth.
Chenopodium cornutum; (Torr.) B.& H.
Chenopodium Fremontii; Wats.
Amaranthus Bigelovii; U.& B.
Amaranthus Pringlei; Wats.
Gomphrena caespitosa; Torr.
Gomphrena nitida; Rothroc.
Froelichia Floridana; (Nutt) Moq. (Little Mt. also).
Froelichia gracilis; Moq. (Little Mt. also).
Allioniella oxybaphoides; A.Gray.
Allionia nyctaginea; Mich.
Boerharvia erecta; L. (Mesas also).
Boerharvia gibbosa; M.& G.
Boerharvia faciculata; Rich.
Mollugo Cervina; Siringe.
Talinum confertifolium; Greene.
Talinopsis frutescens; A.Gray. (Little Mt. also).
Silene antirrhina; L.
Silene laciniata Greggii; (Gray) Wats.
Cerastium arvense maximum; Britton&Holl.
Cerastium longipedunculatum; L.
Arenaria Fendleri diffusa; Porter & Colt.
Paronychia Jamesii; T.& G.
Aquilegia chrysantha; A.Gray.
Delphinium Wootoni; Rydb. (Foothills).
Thlaspi Fendleri; Englem.
Thalictrum Fendleri; Engelm.
Berberis haematocarpa; Wooton.
Thelypodium linearifolium; (A.Gray) Wats.

Thelypodium micranthum; (A.Gray) Wats.
Thelypodium Wrightii; A.Gray.
Lepidium Eastwoodiae; Wooton.
Lepidium lasiocarpum; Nutt.
Lepidium medium; Greene.
Sisymbrium diffusum; A.Gray.
Drylopetalon runcinatum; A.Gray.
Lesquerella purpurea; (A.Gray) Wats. (Little Mt. also).
Draba cuneifolia; Nutt. (Little Mt. also).
Parrasia camporum; (A.Gray) Greene. (Little Mt).
Cheiranthus Arkansanus; (Nutt) Greene.
Polonisia uniglandulosa? DC. (Arroyos).
Dedum Wootonii; Britton.
Sedum Wrightii; A.Gray.
Heuchera parvifolia; Nutt.
Heuchera rubescens; Torr.
Fendlera Wrightii; (Eng.& Gray) Heller.
Fendlerella Utahensis (Wats) Heller.
Holodiscus australis; Heller.
Rubus Neo-Mexicana; A.Gray.
Cercocarpus parvifolius; Nutt.
Cercocarpus paucidentatus; (Wats) Brit.
Rosa Fendleri; Crepin (Introduced from Mts. of N.M. to valley).
Rosa stellata; Wooton.
Prunus Capollin; DC.
Acuan Jamesii; (T.& G.) Kuntze.
Cassia Lindheimeriana; Scheele.
Cassia calycioides; DC.
Hoffmanseggia drepanocarpa; A.Gray.
Lupinus concinnus; A.Gray.
Lotus puberulus; (Benth) Greene.
Parosela pogonathera (A.Gray) Vail.
Petalostemon oligophyllus; (Torr) Rydb.
Robinia Neo-Mexicana; A.Gray.(Cultivated in valley).
Astragalus Bigelovii ; A.Gray. (Foothills).
Astragalus Fendleri; A.Gray. (Foothills).
Astragalus humistratus; A.Gray.
Astragalus Nuttallianus: DC.
Astragalus tephrodes; A.Gray.
Meibomia Neo-Mexicana; (A.Gray) Kuntze.
Vicia Hassei; Wats.
Vicia linearis; (Nutt) Greene.
Lathyrus Arizonica; Britton.
Sphaeralcea hastulata; A.Gray.
Sphaeralcea pedatifida; A.Gray. (Little Mt. also).
Sida diffusa; H.B.K.
Sida Neo-Mexicana; A.Gray.
Calcoelaria verticillata; (Ortega) Kuntze.
Mentzelia albicaulis; (Hook) Dougl.
Mentzelia asper; L.
Mentzelia oligosperma Nutt.
Lythrum lanceolatum; Ell.
Cactus gummifera; (Englm.) Kuntze.
Cereus Fendleri; Engelem?
Cereus viridiflorus; Engelm.

Echinocactus intertextus; Engelm.
Cactus tuberculosus; (Engelm) Colt. (Little Mt. also).
Sapindus marginatus; Wild.
Onagra Jamesii; (T.& G.) Small.
Anogra Neo- Mexicana; Small.
Galpinsia Hartwegia; (Benth.) Britt.
Gaura Nealleyi; Coult.
Spermolepis echinatus; (Nutt) Heller.
Pseudocymopterus montanus tenuifolius; (A.Gray) C.& R.
Peucedanum nudicaules; (Pursh) Nutt.
Garrya Wrightii; A.Gray.
Androsace diffusa; Small.
Cologania pulchella; H.B.K.
Dolicholus Texana; (T.& G.) Vail.
Phaseolus acutifolius; A.Gray.
Phaseolus macropoides; A.Gray.
Erodium Texanum; A.Gray. (Little Mt.).
Oxalis violaceae; L.
Linum Lewisii; Pursh.
Janusia Gracilis; (A.Gray. (Little Mt.).
Ptelea Mollis; M.A.Curtis.
Polygala puberula; A.Gray.
Croton fruticulosus; Torr.
Acalypha Neo-Mexicana; Muell Arg.
Tragia ramosa; Torr.
Rhus virens; Lindhimer.
Acer grandidentum; Nutt.?
Vitis Arizonica; Engelm.
Parthenocissus quinquefolia; (L.) Planch.
Abutilon parvulum; A.Gray.
Sphaeralcea Fendleri A.Gray.
Fraxinus velutina; Torr.
Apocynum laurinum; Greene.
Philibertella crispa; (Benth) Vail.
Asclepias brachystephans; Engelm. (Foothills only).
Asclepias alata; Benth.
Asclepiodora decumbens; (Nutt) A.Gray.
Vincetoxicum productum; (Torr) Vail.
Dichondra argentea; Willd.
Evolvulus Nuttallianus; R.& S.
Evolvulus sericeus; S.W.
Quamoclit coccinea hederaefolia; (L.)A.Gray.
Impomoea cardiophylla.
Impomoea costellata; Torr.
Phlox Stansguryi; (Torr.) Heller.
Phlox triovulata; Thurber.
Gilia multiflora; Nutt.
Phocelia congesta; Hook.
Lappula ursina; Greene.
Cryptanthe pterocarpa; (Torr.) Greene.
Lithospermum multiflorum; Torr.
Lithospermum oblongum; Greene.
Verbena Wrightii; A.Gray.
Brittonastrum pallidum; (Lindi) Brique.

Stachys coccinea; Jacq.
Salvia subincisa; Benth.
Hedeoma Dentata; Torr.
Lycium pallidum; Meirs.
Margaranthus solanaceus; Schlecht.
Physalis hederaefolia; A.Gray.
Physalis Neo-Mexicana; Rydb.
Necotiana trigonophylla; Dunal.
Pentstemon acuminata; Dougl.
Pentstemon barbatus;(Cav.) Nutt.
Pentstemon linarioides; A.Gray.
Pentstemon spectabilis; Thurber.
Mimulus Langsdorfii; Sims.
Mimulus rubellus; A.Gray.
Veronica arvensis; L.
Conofolis Americana;(L.F.) Wall.
Thalesia fasciculata;(Nutt) Brit.
Galium aparine; L.
Galium microphyllum; A.Gray.
Galium Wrightii; A.Gray.
Symphoricarpos oreophilus; A.Gray.
Lonicera albiflora; T.& G.
Sicyos glaber; Wooton.
Legouzia perfoliata; (L.) Britton.
Carminatia tenuiflora; DC.
Gutierrezia sp.
Gutierrezia longiflora; Greene.
Carphochaete Bigelovii; A.Gray.
Eupatorium Pendleri; A.Gray.
Coleosanthus petiolaris; (A.Gray) Greene.
Coleosanthus Rusbyi; (A.Gray) Kuntze.
Coleosanthus Wrightii;(A.Gray.) Brit.
Coleosanthus Wootoni; Greene.
Gymnosperma corymbosa; DC.
Grindelia squarosa nana; Nutt.
Chrysopsis fulcrata; Greene.
Solidago Bigelovii; A.Gray.
Solidago radula; Nutt.
Solidago trinervata; Greene.
Eriocarpum Gracilis; (Nutt) Greene.
Leucelene arenosa; Heller.
Leucelene ericoides; (Torr.) Greene.
Erigeron flagellaris; A.Gray.
Conyza Coulteri; A.Gray. Gnaphalium Wrightii; A.Gray.
Berlandiera lyrata; Benth. (Foothills).
Engelmannia pinnatifida; T.& G.
Iva ambrosiaefolia; A.Gray.
Sanvitalia Aberti;A.Gray.
Gymnolomia annua; (Jones) Rob.& Greene.
Hymenothrix Wrightii; A.Gray.
Viguiera cordifolia A.Gray.
Heterospermum pinnatum. Cav.
Bidens Bigelovii; A.Gray.

Cosmos parviflorus;H.B.K.
Perityle coronopifolia; A.Gray.
Laphamia cernua; Greene.
Picradenia Vaseyi;(A.Gray) Greene.
Gaillardia pinnatifida; Torr.
Gaillardia pulchella; Foug.
Artemisia microcephala; Wooton. (Little Mt. also).
Senicio Neo-Mexicana; A.Gray.
Carduus Neo-Mexicana; A.Gray.
Perezia Wrightii; A.Gray.
Trixis angustifolia; DC.
Euphorbia serpyllifolia; Pers. (Mesas also).
Euphorbia Preslii; Guss.
Euphorbia heteriphylla graminifolia; Engelm.
Dysodia papposa; (Vent) A.S.Hitch.
Centaurea Americana; Nutt.
Lactuca pulchella; (Pursh) DC.
Heteropogon glaber; Pers. (Little Mt. also).
Yucca baccata?; Torr.
Ephilobium sp. (Little Mt. also).
Chrysopsis mollis; Nutt.
Fouquiera splendens; Engelm. (Little Mt also).
Lippia Wrightii; A.Gray. (Little Mt.also.).
Salvia Henryi; A.Gray. (Little Mt. also.).
Castillega integra; A.gray.
Maurandia antirrhiniflora; (Poir.) Willd. (Little Mt. also).
Panicum saccharatum; Buckley.
Bouteloua hirsuta ; Lag.
Pectis prostrata; Cav. (Foothills only).

Mesa Plants.

Ephedra trifurca; Torr.
Hilaria mutica; Benth. (Base of little Mt).
Panicum Hallii; Vasey.
Aristida purpurea; Nutt.
Aristida reverchoni; Vasey. (Near Little Mt.).
Muhlenbergia Porteri; Scribn.
Lycurus phalaroides; H.B.K.
Sporobolus cryptandrus flexuosus; Thurb.
Sporobolus cryptandrus strictus;
Tricuspis Nealleyi; Vasey.
Tricuspis pulchella; (H.B.K.) Torr.
Bouteloua polystachya;(Benth) Torr.
Scleropogon Karwinskianus; (Fourn) Benth.
Yucca macrocarpa; (Torr) Coville.
Yucca radiosa; (Engelm) Treales.
Atamosco longifolia; Hemsl.
Eriogonum abertianum; Torr.
Atriplex canescens; (Pursh) James. (Rare in valley).
Allionia linearifolia; Wats.
Boerharvia Wrightii; A.Gray.
Wedelia incarnata; (L.) Kunteze.
Abronia fragrans; Nutt.

Talinum parviflorum; Nutt.
Talinum aurantiacum; Engelm.
Clematis Drumondii; T.& G.
Clematis ligusticifolia; Nutt.
Streptanthus carinatus; Wright.
Lesquerella Fendleri; (A.Gray) Wats.
Polanisia trachysperma; T.& G.
Acacia constricta; Benth. (Organ Foothills also).
Acacia cuspidata; Schlect.
Cassia bauhinioides; A.Gray.
Krameria parvifolia; Benth.
Hoffmanseggia Jamesii; T.& G.
Linum aristatum; Engelm.
Linum Vernale; Wooton.
Larrea tridentata; (DC.) Vail. (Also on Little Mt).
Croton corymbulosa; Engelm.
Croton Neo-Mexicana; Muell.
Rhus microphylla; Engelm. (Rare in valley proper.)
Sphaeralcia Emoryi?: Torr. (Foothills west of River only).
Hibiscus denudatus; Benth.
Koeberlinia spinosa; Zucc.
Mentzelia multiflora; (Nutt) A.Gray. (Also to be found in Mts.).
Cactus macromeris; (Engelm.) Kuntze.
Opuntia Comanchica; Engelm.
Opuntica leptocaulis; DC.
Opuntia macrocentra; Engelm.
Opuntia phaeacantha; Engelm.
Podostemma Lindheimeri; (Engelm.) A.Gray.
Evolvulus alsinoides; L.
Gilia filifolia; Nutt.
Heliotropium convolvulacum; (Nutt).
Creocarya multicaulis; (Torr) Greene.
Cryptanthe pusilla; (T&G.) Greene.
Verbena bipinnatifida; Nutt.
Verbena rudis; Greene.
Tetracelea Coulteri; A.Gray.
Monarda punctata; L.
Solanum rostratum; Dunal.
Chilopsis linearis; (Cav.) Sweet.(Introduced into valley).
Carlowrightia linearifolia; A.Gray.
Apodanthera undulata; A.Gray.
Ibervillea tripartita; (Cong). Greene.
Gutierrezia spherocephalla; A.Gray.
Melampodium leucanthum; T.& G.
Hymenoclea monogyna; T.& G.
Crassina grandiflora;(Nutt.) Kuntze.
Crassina pumila; (A.Gray) Kuntze.
Gymnolomia tenuisecta;(A.Gray) B.& H.
Florensia cernua; DC.
Hymenothryx Wislizeni; A.Gray.
Chaenactis stevioides; H.& A.
Bahia biternata; A.Gray.
Pectis angustifolia; Torr.

Pectis filipes; A.Gray.
Ptiloria Parryi; (A.Gray) Caville.
Nemoseris Neo-mexicana; (A.Gray) Greene.
Calycoseris Wrightii; A.Gray.
Euphorbia serpens; H.B.K.
Ptiloria pauciflora; (Torr). Raf.
Echinocactus Wislizeni; Engelm.(Mesas & Little Mt.).
Menodora scabra; A.Gray.
Perezia Nana; A.Gray.
Rumex hymenosepalus; Torr.
Sophia andrensarum;Chl.
Aristida scheidiana; Trin & Ruprus.
Mollugo verticillata; L.
Zizyphus lycioides; A.Gray.
Ptiloria paucifl ra; (Torr). Raf.

Plants Common to River Bottom
and
Organ mountains.

Comandra pallida; DC. (Arroyos also).
Rhus Trilobata; Nutt.
Ipomoea Mexicana; A.Gray.
Solanum nigrum; L.
Orobanche multiflora; Nutt.
Leptilon Canadense; (L.) Brit.
Artemisia dracunculordes; Pursh. (Little Mt. also).
Salix interior; Rowlee.
Phacelia intermedia; Wooton. (Mesas also).
Sonchus asper:L.All.
Eragrostis major; Hart. (Mesas also).
Amaranthus blitoides; Wats. (Mesas also).
Eragrostis Neo-Mexicana; Vasey. (Arroyos also).
Panicum capillare; L.

Plants common to Little Mt.
And
Bishop's Cap.

Anemone sphenophylla; Poeppe.
Parosela nana;(Torr) Heller. (Little Mt. only).
Parosela Wrightii;(A.Gray) Vail. (Little Mt. Only).
Fouquiera splendens; Engelm. (Organs and Little Mt only).
Cereus chloranthus; Engelm.
Cereus stramineus; Engelm.
Echinocactus horizonthalonis; Lemaire. (Little Mt. Only).
Cactus meiacanthus; Engelm.
Cactus grahami; (Engelm.) Kuntze.(Little hill east of Dona Ana).
Opuntia Lindheimeri; Engelm. (Valley also).
Gaura coccinea; Pursh. (Little Mt. only).
Macrocalyx micranthus; (Torr.) Corville.
Coldenia canescens; DC.
Oreocarya humilis ; Greene.
Coldenia hispidissima; A.Gray.
Lippia Wrightii; A.Gray. Little Mt. & Organs Only).

Hedeoma nana; (Torr.) Greene.
Thelesperma longipes; A.Gray. (Little Mt. only).
Hymenatherum Thurberi; A.Gray. (Lava Flow also).
Abutilon malacum; Wats. (Little Mt. only).
Euphorbia revoluta; Engelm. (Little Mt. only) (Mesas?).
Euphorbia exstipulota; Engelm. (Little Mt only).
Talinum parviflorum; Nutt. (Little Mt only(.
Eurotia lanata; (Pursh) Moq.
Aristida reverchoni; Vasey. (Little Mt Only).
Panicum Halli; Vasey. (Little Mt. only.).
Panicum saccharatum; Buckley. (Little Mt. and Organs only.).
Notholaena dealbata; Kuntze. (Little Mt.only).
Hilaria mutica; Brunth.(Little Mt.,Mesas & Mts.).
Ephedra antysphilitica; Meyer. (Rare on Mesas).

Plants Common to Mesas
and
Organ Mountains.

Bouteloua curtipendula; (Michx). Torr.
Diplachne dubia; (Kess) Benth.
Eriogonum Wrightii; Torr.
Guilleminea illecebroides; H.B.K.
Selinocarpus chenopodioides; A.Gray.
Eschscholtzia Mexican; Greene. (Foothills only).
Argemone intermedia; Sweet. (Foothills only).
Falugia paradoxa; (Don) Endl.(Arroyos only).
Mimosa biuncifera; Benth. (Organs and Foothills only).
Parosela farmosa; (A.Gray) Vail.
Cereus polyacanthus; Engelm.
Cactus radiosus Neo-Mexicana; Engelm.
Lavauxia privimeris; (A.Gray) Small. (Mesas & Organ foothills)
Gilia longiflora; (Torr) Don.
Lappula Texana; Scheele) Brit.
Chamaesaracha conoides; (Moricand) Britt.
Plantago Purshii; R.& S.
Parthenium incanum; H.B.K.
Hymenatherum aserosum; (DC.)A.Gray.
Hymenatherum Pentachaetum; DC.
Artemisia ludoviciana; Nutt.
Malocothrix Fendleri; A.Gray. (Organ Foothills mainly).
Euphorbia Fendleri; T.& G.
Carduus ochrocentrus; (A.Gray). Greene.
Opuntia arborescens; Engelm.
Gilia inconspicua; (J.E.Smith) Sweet.

Plants Common to the Mesas and River Bottom.

Sporobolus cryptandrus stricta; Scribn.
Bouteloua aristidoides; (Kunth) Grisel.
Bouteloua eriopoda; Torr. ?
Cladothrix lanuginosa; Nutt.
Mirabilis Multiflora; A.Gray. (Arroyos?).
Besuvium sessile; Pers. (Perhaps a valley plant).
Trianthema Monogyna; L.
Talinum lineare; H.B.K.
Portulaca oleracea; L. (Occasionaly in Organs).
Portulaca lanceolata; Engelm. (Occasionally in Organs).
Dithyrea Wislizeni; Engelm.
Prosopis glandulosa; Torr.
Vicia exigua; Nutt.
Cuscuta Californica; Choisy.
Cuscuta squamata; Engelm.
Gutierrezia glomerella; Greene.
Hymenopappus flavescens; Greene.
Thelesperma gracile; (Torr) A.Gray.
Polypteris Hookeriana; (T.& G.) A.Gray.
Ptiolria Neo-Mexicana; Greene.
Bitilias multicaulis; (DC.) Greene. (Probably a River Bottom plant).
Chloris elegans; H.B.K.
Rhus trilobata; Ait.
Aristida purpurea ; Nutt. .
Eriogonum annuum; Nutt.
Martynia althaeafolia; Benth.
Martynia parviflora; Wooton.
Eriocarpum australe; Greene.
Aphonostephus humilis; (Benth) A.Gray.
Psilostrophe tagetina; (Nutt) Greene.
Baileya pleniradiata; Harv. & Gray.
Bahia absinthifolia; Benth.
Pectis papposa; Harv.& Gray.

Plants Cosmopoliten in the Mesilla Valley.

Andropogon saccharoides; SW.
Amaranthus hybridus; L.
Campoides curvisiliqum; (Eng) Kuntz.
Sophia halictorum; Ckl.
Cryptanthe crassisepala; (T&G.) Greene.
Verbesina encelioides; Cav.) A.Gray.
Senicio filifolius; Nutt.
Boerharvia viscosa; Lag.
Euphorbia adenoptera; Benth.
Datura meteloides; DC.
Townsendia Fendleri; A.Gray.
Euphorbia albomarginata; T.& G.