Bulletin No. 87

JUNE, 1913.

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lexico College of Agriculture
And Mechanic Arts

CULTURAL EXPERIMENT STATION
STATE COLLEGE, N. M.

EES AND SHRUBS OF NEW MEXICO

By E. O. WOOTON

REPUBLICAN
Las Cruces
1913

NEW MEXICO AGRICULTURAL EXPERIMENT STATION

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INTRODUCTION

Bulletin No. 51 of this Station on Native Ornamental Plants of New Mexico has been out of print for some time, but calls for it still continue to come. The work in this line has been carried on further and it has been thought wise to get out another more extended bulletin on the same subject which is in the nature of a partial reprint of No. 51. Much of the general discussion of the subject is here reprinted verbatim; some changes have been made in places; the list of plants extended to include all trees and shrubs of our state with notes on those that are of any value; technical descriptions of the families and genera with keys for the determination of species have been included; most of the original cuts are reprinted but many news ones are added. This bulletin thus becomes the most recent information on the subject and the result of many years observation, study and experimentation.

Attention has been called to the causes tending to produce instability in our population and hence lack of decorative adornment of the homes in our State. There is not the least doubt that these conditions were in existence in the past and that the resulting bad habits still affect our population. But the necessity for semi-nomadic life no longer exists and, with new and better conditions, our population is becoming more permanently attached to our soil and the instinct of home decoration is beginning to be aroused. While the "money making" period of our development is not past the "home making" period has certainly begun.

Little need be said in argument for the increase in beauty which will accrue to our homes if surrounded by well set shrubbery. Much might be said advocating such decoration because of the increased privacy which it affords, when properly arranged, and there can be but little doubt of the value of privacy to the average dweller in town or city.

Much additional comfort in the way of shade and protec-

tion from wind, dust, and heat may be obtained for the home by the judicious use of shrubbery. Nor will anyone contradict the statement that the well shaded house, surrounded by lawns adorned with clumps of shrubs and blossoming plants and its porches festooned by vines, will command a higher price than the same house in the same location without its setting of plants.

A farm whose fields are protected by windbreaks and shelter-belts (which will also furnish fence posts and wood) is more valuable than one without these adjuncts. A family, living in a home protected and embowered and appreciating its surroundings, is sure to have better taste and better standards of living than one not so blest.

All these arguments lead to the conclusion that it is a wise thing to surround any home with protecting and beautifying plants and flowers. And then the question arises:—What plants shall we use?

A PLEA FOR THE USE OF OUR NATIVE PLANTS

The condtions necessary for the growth of plants are (1) food upon which they can subsist, both in the soil and in the air; (2) moisture in proper quantity in soil and air; (3) a certain total amount of heat during the growing season, as well as a temperature that is neither too high nor too low; and (4) a favorable amount of light. Different regions upon the earth's surface differ greatly in respect to the degree in which they supply these conditions, and, as a consequence, different localities have native floras which resemble each other in about the same degree as the growing conditions of the localities themselves approximate each other.

The degree to which the growing conditions may be artificially controlled varies considerably. The chemical content, mechanical condition or texture, and moisture content of the soil in any locality may be controlled with comparative ease, if small areas only are to be considered. But the humidity of the atmosphere, the temperature limits, and the light intensity of any region out of doors can be modified but a very small amount.

In an area so large as that of our State, almost all kinds of soils may be found, but the best natural soils occur only in the higher mountains where they have been sheltered and enriched by heavy forests. Along the foothills and on the mesas the soil is apt to be more or less coarse and rocky, thus requiring a great deal of water to produce plant growth. Here it is usually free from an excess of the salts of potassium, sodium and calcium which form the dreaded "alkali." This, however, is not always true, since the presence of these salts is in a degree dependent upon the kind of rocks of which the adjacent mountains are composed, as well as to some extent, upon the general topography of the region. In the river valleys where most of our towns are built, the soil is usually the silt of the river and is apt to be fine grained and poorly aerated, while the underlying stratum is nearly always sand.

Alkali is also very apt to be present in greater or less quantity is such soils.

These generalizations as to the soils of the State only show their variable nature and make necessary a careful consideration of the particular soil, in which we wish to grow plants.

Our State is all of it relatively high above the sea, its lowest valleys being more than 3500 feet above that level, while some of the mountains rise considerably above timber line. This elevation, when taken in connection with our geographic position, produces climatic conditions in atmospheric humidity, temperature variations and extremes, and a light intensity that are especially severe on all plant life except that which is particularly adapted to such conditions. The lack of moisture in the air is particularly hard upon plants that are accustomed to a humid atmosphere, since it increases the evaporation from their leaf surfaces to such a degree that they are able with great difficulty to get enough water from the ground to replace that lost by evaporation.

Temperature changes, both diurnal and annual, are extreme with us, because our altitude renders our atmosphere thin and the extreme dryness but accentuates this effect. Objects in direct sunlight are quickly heated to a high temperature, while as soon as the sun is down, all temperatures drop suddenly and severely. Our growing season is very long and the total quantity of heat received during a season is very great, a fact tending to produce rapid growth and relatively short life in our trees.

Light is a necessity to all self-supporting plants (i. e. not parasitic or saprophytic); they must have light in order to manufacture their food. Very few people seem to appreciate this necessary condition of plant life. But plants must have light in the proper quantity, and this quantity differs fully as much as does the proper quantity of water which they require. Some species will grow only in strong light (i. e. are

"light demanding" species) while others will endure only a small amount; still others are known as shade enduring species, they take little or much as the case may be. And among trees in particular, the young tree may be a shade enduring species while the mature tree may be light demanding. The light conditions, any place in New Mexico outside of the dense coniferous forests of the high mountains, are extremely severe, the direct sunlight is most intense and the reflected light is very strong.

When one takes all these conditions into consideration and remembers just how little they can be artificially modified in the open, the wonder is, not that so *few* of the plants commonly cultivated in the humid regions will grow here, but that so *many* of them are able to adapt themselves to such inhospitable surroundings and thrive.

Now our State has a covering of plants which are perfectly adapted to our climate and soil; scanty in places, it is true, but abundant and characteristically beautiful in others. Practically all of these plants are thoroughly adapted to those peculiarities of our climate which we can not control and which are so severe on the commonly cultivated ornamentals, viz: (1) very dry atmosphere; (2) extreme daily variation in temperature; (3) late spring frosts; (4) very high summer temperature; and (5) very intense light. Besides this some of them are inured to extreme dryness of soil and others will tolerate relatively large quantities of alkali.

It seems to me that probably the most important reason for wishing to cultivate the plants of the humid region in this State lies in the fact that we are almost all of us originally from that humid region and wish to reproduce, in the new home, conditions similar to those in the old. The desire is perfectly laudable; but does it not lead us away from our easiest method of ornamenting our homes and grounds? Does it not appear that our native plants are better adapted to the unalterable conditions of this region? Would it not be easier

to supply artificially a good soil and a little extra water to plants from our mountains than to do the same thing for eastern plants and at the same time try to protect them from our sun, our frosts, our wind, and our dry atmosphere? Which procedure is the more likely to result favorably?

Would it not be saner to recognize the fact that the conditions of a semi-arid region are fundamentally different from those of a humid one and adapt our stlyes of architecture and landscape gardening to the region instead of trying to introduce those of an entirely different one? The fundamental principle of all such effort is to make the artificial structures fit the lines and demands of the natural surroundings and arrange all vegetation so as to carry out the general natural scheme of the region whether it be formal gardening or not. Of course the native vegetation lends itself to this method and is most effective.

Then there are situations in which it is desirable to have some vegetation where only a limited supply of water is to be had at any time. In such locations some of the typical arid region plants would be thoroughly at home. While they may not be everything that is desirable, they are certainly much better than none, and no others are able to stand such a severe environment.

To me there is an appeal to "the eternal fitness of things" in our native vegetation. It seems at home, a part of the country, and as thoroughly appropriate and in place as an adobe house is in this sun-blest land of ours. This adaptation to environment is so marked in some of the trees and shrubs that, though flat-leaved and of deciduous ancestry, they are nevertheless evergreen and are thus rendered all the more valuable for ornamental purposes.

Hence I urge, as emphatically as may be, the use of our native plants; those plants which thrive in alkaline soil, which can stand six months of drouth, which do not sunscald and lose their stems and leaves on one side, which are rigid and

strong enough to resist our winter and spring winds, and canny enough to keep from getting frost bitten when spring plays fast and loose with us. Give them a fair trial, study their natural adaptations, give them slightly better conditions than they naturally have, and I feel sure they will reward the thoughtful, careful gardener by growing even better than in their native habitats. In order to obtain this end, however, it will be necessary to appreciate the particular beauty of each and study *its* possible improvements. It will be impossible to make them over according to some preconceived ideas of beauty obtained elsewhere.

CONDITIONS IN THE VALLEYS

In New Mexico there are three or four kinds of places where people make their homes. They build their houses in the open river valleys, either singly on the farms, or in groups, forming towns and cities; or they choose isolated situations near "water," on the mesas, or in the mountains, for the stockman's ranch. The mining camp is usually in some narrow canon and is apt to be lacking in permanence.

In the valleys, whether on farms or in the towns, the conditions are more or less similar. Shelter is the thing most desired; shelter from the heat and the light of our summer sun, from the wind and dust, or from the public gaze. To these comforts should be added the pleasure and benefit which come from living in beautiful surroundings and striving to make them even more beautiful.

Most of the valley farm houses and not a few of the homes in the towns are more or less protected and beautified by the use of shrubs and trees. The value of fruit trees and grape vines is fully recognized, but I doubt if the simple money value alone of a proper use of shade trees, windbreaks, shelterbelts, shrubbery, and lawns is properly appreciated. Time spent in making the home more comfortable by pro-

tecting it, is not wasted, but is well invested. The hedge and shrubbery which keeps the dust out of the house more than pays for itself in saving floors and furniture, to say nothing of muscle and nervous energy spent in cleaning out the dirt. Bodily comfort counteracts nervous irritation and makes for general sweetness of disposition; and it should be our task to make the home the most comfortable place possible. For this reason alone, if for no other, properly and tastefully arranged shrubbery is one source of comfort and pleasure for the household.

There is no reason why practically any style of horticultural decoration may not be used about our irrigated farm and town houses. Formal gardens, informal or natural planting, hedges, windbreaks, orchards and vineyards, vine covered arbors, summer houses and porches may all be had where water for irrigation is available.

Windbreaks and shelterbelts should be used much more in our cultivated valleys than is now the custom. There is little doubt that one of the worst enemies to our orchards and vineyards is our dry wind. Any means of protecting cultivated fields, orchards, vineyards, decorative shrubbery, and stock from the effect of these winds will be valuable to the valley farmer, and one of the most available forms of protection is to be found in the windbreak or shelterbelt of native trees.

THE RANCH HOUSE*

What is the average ranch house in New Mexico like? Think of those you know and judge whether each does not belong to one of the following types:

A "dobe" hut of one or two rooms, set out on a sun-blistered flat where bulls paw up clouds of pungent dust, while they bellow challenges at each other. Miles away through quivering air dance the distorted outlines of the cool timbered mountains.

A board shanty at the mouth of some canon on the edge of a boulder strewn arroyo, with everything about it as inconveniently arranged as well can be.

A one-roomed log cabin with a "lean-to," in a beautiful mountain valley, but with every vestige of the native forest cut away from around the house for fifty or a hundred yards on all sides.

These are by no means the only kinds of ranch houses, but they are by far the commonest. Are these conditions necessary? It can hardly be claimed that they are satisfactory or desirable.

In the very nature of the case the great bulk of our State must ever be devoted to stock raising. Enough water falls within its limits to properly irrigate only a relatively small proportion of it, even if all that water were caught and hoarded and applied to irrigation. Such a thing being impossible, and the above statement being true of practically all the high arid region in which New Mexico lies, we come back to our first proposition: i. e. the necessity of stock raising. It is the only kind of agricultural work possible on much of the unirrigated lands.

It is also recognized that, under the present system of handling stock, the State is losing a large part of the gain

* As used here the expression "ranch house" is intended to apply merely to the houses of stockmen which are not usually located in the irrigated valleys. The author understands that this is a restricted use of the expression which is not warranted by custom, but is here used for lack of a better term

which might be ours if our land laws were so constructed as to give a stockman control of enough land to make a living on. But the lawmakers had other conditions in view when these laws were made, and as yet nothing has been suggested which will overcome the evil resulting to arid grazing lands.

The author also appreciates how this lack of control, the uncertainty of the returns for labor, the rough character of the work itself, the exposure it entails and irregularity of habits which it engenders, all tend to render the ranch house a mere "permanent camp," where one expects conveniences only a grade better than when on the "round up."

Again comes the question: Are these conditions necessary? The author thinks they are not, and fully believes that the day is not very distant when some of them will be materially improved by legislation favorable to the stockmen, which will give them a more assured "grip" on their ranges, and at the same time render labor less arduous, rough, and irregular, and make the ranch house still more "permanent" in character and less like a camp. Many ranches now possess sufficient permanence to make greater comfort a desideratum, but until the necessity for greater comfort is felt, no attempt to gain it will be made.

Some of the comforts which may be added to the ranch house (depending somewhat upon its location) are coolness and shade, protection from wind and dust, increased privacy, and added beauty, thus raising the mental standards and appreciation of its inmates. They may all of them be had at the cost of a little time and labor expended in the judicious transplanting of native plants which grow, in every case, not far from the ranch house.

The ranch on the mesa may be protected from dust and have its privacy and beauty materially increased by the use of the *Yuccas*, sotols, ocotillo, and other shrubs of the mesa; while if a little water can be had, cottonwoods, ash, and soapberry may be induced to add their shade, and cacti and many low plants will grow and bloom in such surroundings.

In the foothills, the site of the house can usually be selected, so as to take advantage of the shade and beauty of well grown trees. It is much easier to pipe the water some distance to the house in order that the house may be protected and beautified by trees already full grown, than it is to place the house near the water and wait for trees to grow. For the ranch located in the foothills or mountains there is an ever ready source of supply of trees and vines and shrubs to be found in the mountains near by, and the average stockman has abundance of time in which to transplant them.

There are, no doubt, good reasons why the tall, shallow-rooted conifers should be removed from close about the ranch house in the mountains, but the reasons which apply to the large trees certainly do not govern the placing of smaller trees like oaks and maples, and the use of vines and shrubs. Shade may not be so desirable, but beauty and privacy both are, and the care necessary to the production of a beautiful little mountain home has its effect upon the industry, taste and neatness of the inhabitants.

It is hardly possible to say too much on the desirability of permanence in the population of the State. The ranchman who comes to stay is the desirable one. He works for the welfare of his township, his county and his State; he is interested in its schools, its churches, its laws, and whenever a man is interested in a thing he does good work for it. He may not do the best thing in every case, but the general result of his energy makes for good in his region. The man who has invested muscle and time and thought and taste in trying to improve the conditions of his home will not be ready to abandon his results for a new place, and when once attached to a place, it is doubtful if any other man would do better in that place.

METHOD OF HANDLING MATERIAL

It is not necessary to repeat here the instructions for transplanting dormant plants. Most people who have reached maturity have had some experience, and those who have not may find instructions in nearly any book on agriculture or horticulture, or even in some nurserymen's catalogues. Bulletins No. 40 and No. 47 of this Station give some details of this character which are particularly applicable to this region.

In this bulletin it has frequently been impossible to refer to a plant by anything except its Latin or scientific name because, so far as the author knows, it has no other. In speaking of the native plants that have no common names, popular descriptions have been given, so far as possible, and some illustrations have been inserted, but these methods will not always succeed in making the reader think of the plant referred to. Different common names are used for the same plants in different parts of the State, and only a part of the plants here enumerated may be found in any one locality. These conditions will, no doubt, cause some confusion in using this bulletin. Many of the plants here described in their summer condition would be recognized in their dormant state only by a very careful observer. To avoid these difficulties, it is recommended that the would-be gardener notice carefully the native plants of his region during the growing season, making particular note of the horticultural possibilities and habits of each, and at the same time examining each with sufficient care to be able to recognize it without leaves or flowers or fruit. When next they are dormant such plants as are selected may be transplanted. Such treatment is, of course, not necessary with any kind of evergreens, since they may be recognized at any time.

It must be remembered that *the roots of conifers must never be allowed to dry during the operation of transplanting.* A good way to avoid drying, is to "puddle" them at once, as nurserymen do, by dipping the roots into a thin mud or a mix-

ture containing fresh cow manure and then wrapping them in wet straw or trash which will keep them moist.

Plants which grow in shallow rocky soil are rather difficult to dig because, in such soil, the roots spread widely, and in digging it is hard to avoid cutting off the smaller rootlets with the pick or spade. The moral of this is to get all the roots of the plant that you can.

Plants just transplanted must be watered immediately and the soil compacted sufficiently to bring the wet soil into close contact with the roots. Nor must the soil be allowed to cake and sun-crack later on, else the moisture will evaporate and the plants die. Practically nothing but cacti will bear transplanting into a dry soil without being irrigated at the time of transplanting, and I would irrigate cacti even if it were necessary to carry the water in a bucket.

The Conifers or So-called Evergreens.

The Pines (*Pinus* spp.). The genus is represented in New Mexico by seven species, three of which are fairly common, the remainder being occasional or restricted to small areas within our limits.

The Pinyon (*Pinus edulis*) is common throughout the State at elevations of from 5,000 to 7,000 feet, being restricted mainly to the drier and rockier mountain slopes. It is of rela-

PINON PINE. (*Pinus edulis*)

tively small value for any purpose. Attempts to cultivate it have never been very successful, as it grows very slowly, and like all conifers is hard to transplant. Its seeds germinate readily. The wood is soft and rots easily; hence is of little

value as posts or for fencing and makes very poor firewood. On the areas in which it grows it offers some protection to stock.

The Yellow Pine (*Pinus brachyptera*) (commonly referred to in much of the literature as *P. scopulorum* or *P. ponderosa,* and sometimes called the Bull pine) is the commonest and most valuable conifer of the State. It grows in the larger mountain areas at elevations of from 6,000 to about 9,000 feet, and forms the great bulk of the timbered forests of the State. It is used more extensively for the manufacture of lumber than any other tree within our limits, and makes the best lumber. As a decorative tree it has rarely been used, though it would probably grow at elevations above 6,000 feet. Young seedling trees are common in the forests and where grown singly in the open make very beautiful young trees. If the stand is thick the trees become tall and not so good for decorative purposes. For most formal gardening where conifers can be used singly, trees of this species would be as valuable as the European Scotch Pine.

The Western White Pine or **Limber Pine** (*Pinus flexilis*) and its nearly related congener *Pinus strobiformis,* to which both of the foregoing common names are also applied, occur in the higher mountains, generally above 8,000 feet altitude, reaching almost to timber line. They are nowhere very abundant and have no great economic importance, though they are used for lumber along with the other conifers of such regions. As decorative trees they are of relatively little value, and would be restricted to the higher levels only.

The Bristle Cone Pine (*Pinus aristata*) is a species found only in the high mountains of the northern part of the State at elevations of approximately 10,000 feet or more. Locally in that region it also is called Bull pine, and is also referred to as Foxtail pine or Hickory pine in various places. It is of no economic importance in this State, because of its

distribution and scarcity, with the possible exception that locally it is used for mining timbers where it is the most convenient tree.

The two remaining species, *Pinus arizonica* and *P. chihuahuana*, occur only in the mountains of the extreme southwestern corner of the State, coming into our area from northern Mexico. It is possible that these species may prove to be of some value as decorative trees at the lower levels, since they have a more southerly natural distribution. No attempts to use them have yet been made.

Spruce (*Picea*). There are two species which should properly be called spruce growing in New Mexico. They are conical trees with short, stiff, sharp-pointed leaves which grow out in all directions from the stem but turn upwards; they have pendulous cones consisting of thin persistent scales that conceal shorter bracts. They have soft white wood that is valuable for box making. The trees are nowhere very large, rarely reaching the height of 75 feet. Both species are valuable as decorative trees for the higher levels in the State, and one of them has been introduced rather extensively into cultivation. Both occur naturally in the high mountains, often forming dense pure forests at elevations of 9,000 feet and over to timber line.

Engelmann's Spruce (*Picea engelmanni*) is dark green in color and frequently very slender in form, especially near the top of its distribution area. On the faces of cliffs and on high mountain peaks it is frequently dwarfed and straggly as the result of wind action. The cones are small and purplish until maturity, when they become dry and brown; its leaf bases are rough hairy.

The Colorado Blue Spruce (*Picea parryana*) is similar to the preceding, but the young leaves are covered with a whitish "bloom," which gives rise to the common name. Its cone is almost twice as large as that of the other species and its leaves are smooth. It makes a very beautiful decorative

COLORADO BLUE SPRUCE. *(Picea parryana)*

tree and has been introduced extensively into cultivation. It does well at Santa Fe, and could, no doubt, be used at other places of similar elevation if properly cared for.

The Balsam or **Fir** (*Abies* spp.). There are two species of this genus in New Mexico, but neither is very abundant at any place. Both grow in the high mountains at elevations of 7,000 feet and over. The leaves are apparently two-ranked, making the branches appear flat. The cones are stout and erect, borne on the uppermost branches only. The bracts

of the cones project slightly beyond the scales. The cone scales are flat, broadly obovate, reddish within when young, and fall away at maturity. One of the species is used for lumber whenever the trees are large enough.

The Balsam (*Abies concolor*) is a very large tree when mature, and forms an important part of the coniferous forests of the States north and northwest of us. In the mountains of New Mexico it is occasional only. The young trees are very beautiful and would be very decorative if brought into cultivation. Whether this can be done or not the author is unable to say.

The Cork Bark Fir (*Abies arizonica*) is a small tree resembling the spruce somewhat in size and the general conical shape. It may be readily recognized by the thin corky bark, which is very white on the young trunk and branches. As a decorative tree it would be very valuable if it can be introduced into cultivation.

The Spruce or **Douglas Spruce** (*Pseudotsuga mucronata*), often referred to as the White or Red Fir, is the largest conifer of the mountains of our State, where it grows at elevations of from 7,000 feet almost to timber line. Under favorable conditions the tree reaches a great diameter. Old trees 6 and 7 feet in diameter at the base are not uncommon in New Mexico, while in the far Northwest, where this tree is most at home, it is often very much larger. The bark is thick and very rough. The leaves are short and arranged much like those of the Balsam. It may be most easily recognized by the pendant cones, which are 1½ or 2 inches long and composed of thin persistent scales with rather slender three-parted bracts protruding ½ inch or more from beneath each scale. The lumber made from these trees is considered next in value to that of the yellow pine. In cultivation young trees of this species are very graceful and beautiful, being slender and

DOUGLAS SPRUCE OR RED FIR. *(Pseudotsuga mucronata)*

narrowly conical. The younger branches are rather light colored and the bark thin.

The Junipers and Cedars. The Junipers and Cedars and their relatives are relatively small widely-branching trees or shrubs, with short scale-like leaves and spheroidal berry-like fruits, the scales of which are thickened and somewhat pulpy, at least when young. They grow in New Mexico mostly on the lower and drier mountain slopes, associated with the pinyon and the evergreen oaks. There are representatives of three genera in the State.

The Arizona Cypress (*Cupressus arizonica*) is a tree which reaches rather large size in the mountains of Arizona.

It has been introduced into cultivation in a few places in southern New Mexico and does well, though a very slow grower. It grows native in the mountains of the southwestern corner. The scales of the mature cone are dry and woody, the cone is approximately spherical and about ½ inch in diameter. The leaves are so arranged as to make the stems appear flat, somewhat after the style of an arborvitae. The tree promises to be of value for decorative purposes at the lower levels.

The Siberian Juniper (*Juniperus siberica*) is a low shrub less than 3 feet high, with dark green leaves and dark bluish-black pulpy one-seeded "berries." It grows only on the

ALIGATOR-BARK JUNIPER. *(Sabina pachyphloea)*

high mountain peaks near timber line in the northern part of the State. It could probably be cultivated at elevations of

7,000 feet or more, if supplied with plenty of water and a small amount of shade, and would be well worth the trouble.

The Alligator Bark Juniper (*Sabina pachyphloea*) is the ommon Juniper of the low mountains of the southern half ous scale-like leaves, and rather large three- or four-seeded fruits distinguish it readily from all other species. Attempts to bring it into cultivation at the Experiment Station garden have been but partially successful, but were sufficiently so to indicate that the tree might be satisfactorily grown.

The Cedar or **Sabina** (*Sabina monosperma*) is the common low tree of the drier mountain slopes of the northern part of the State. It usually assumes a conical form, is 15 to 18 feet high in favorable conditions, widely branched and straggling, and has small one-seeded bluish fleshy berries. Another species very similar in appearance is *Sabina utahensis,* which grows mostly in the northwestern part of the State and passes

CEDAR. SABINA. *(Sabina monosperma)*

under the same names. It may be recognized by its larger fruit, which is dry and fibrous when mature. Both of these trees and the next species to be mentioned have fibrous or "stringy" bark. All three of them should prove of decorative value at elevations of 7,000 feet or over.

The Cedro *(Sabina scopulorum)* is a beautiful though small tree with dark green foliage and slender branches,

drooping near the ends. The fruit is small, blue, and succulent, usually two seeded. When growing alone it takes a fine conical shape with branches quite to the ground; an ideal shape for use on lawns. Its resemblance to the Eastern red cedar is striking. It should be quite a valuable decorative tree at the higher elevations.

Canatillo *(Ephedra* spp.*)*. The family to which these plants belongs is represented by the single genus of four species, within our limits. They are all low shrubs 6 feet high or less, with slender cylindrical striate green or yellowish-green jointed stems; the leaves are reduced to small scarious bracts occurring in whorls at the nodes. The flowers are of two sexes on different plants, and consist merely of stamens and ovules surrounded by brownish or greenish papery scales. The fruit is a hardened seed, sometimes angular, enveloped in the chaffy dry scales that surrounded the ovule. Our species grow on the sandy mesas and to some extent on the foothills of the drier mountains, associated with the mesquite, desert willow, and such plants. They are called by various names besides the Spanish one given. Another common Spanish one in usage is popotillo, and Mormon tea. A tea made by boiling the branches in water is said to be a specific for venereal diseases and kidney troubles, and is used to a certain extent by the native population. Analyses of the plant have shown that it contains a relatively large supply of tannin, though attempts to use this have never yet been made. The species are very closely alike and to be recognized by characters of the scale-like leaves and the shape and size of the fruit.

Class I. GYMNOSPERMAE.

Trees (and a few shrubby species) with resinous wood and needle-shaped evergreen leaves; fruit a cone consisting of several to many fleshy or woody scales; seeds borne at the base of the scales.	Order I. PINALES.
Low desert shrubs with terete, yellowish green stems; leaves reduced to 2 or 3 membranous scales at the nodes; fruit with 1 to 3 seeds tightly enclosed in several or numerous membranous scales, not resembling a cone.	Order II. GNETALES.

Order I. PINALES.

Buds scaly; cones oblong, dry; ovules inverted; leaves in ours about 1 inch long or more.	1. Pinaceae.
Buds not scaly; cones spherical, fleshy at least when young; ovules erect; leaves short and scalelike, mostly only a few millimeters long.	2. Juniperaceae.

1. PINACEAE. Pine Family.

Mostly evergreen monoecious resin-yielding shrubs or trees, often conic in outline. Leaves rigid, needle-like or flat, alternate, opposite, whorled or in clusters with sheathed bases, anthers 2-several-celled, in more or less elongated cones. Pollen-grains globose ellipsoidal or lobed. Pistillate cones solitary or clustered, consisting of numerous spirally disposed bracted scales. Ovules inverted usually 2 at the base of each scale. Fruit a dry cone of many scales. Seeds usually 2, winged. Cotyledons 2-16.

Leaves fascicled, enclosed by sheaths at base, at least when young; cones maturing the second year.	1. Pinus.
Leaves solitary, not sheathed; cones maturing the first year.	
Branches rough with persistent leaf-bases; leaves quadrangular, falling off when dried; cone scales thin and persistent; cones pendulous.	2. Picea.
Branches smooth; leaves flat, persistent in dried specimens.	
Cones erect, scales deciduous; leaves sessile leaving circular scars.	3. Abies.
Cones pendulous, scales persistent; bracts of the cone scales conspicuously exserted, 3-parted; leaves petioled, leaving oval scars.	4. Pseudotsuga.

1. PINUS L. Pine, Pinyon.

Rigid, large sized trees 25 to 100 feet high or more, with leaves in facicles of 2-5 surrounded at the base by scaly sheaths; staminate aments at the ends of branchlets of the preceding year; anthers 2-celled, pollen grains 3-celled the lateral 2 empty; pistillate cones globose or elongated, just back of the terminal bud or on the young twigs; scales crowded, overlapping; cones maturing the second year, scales hard and woody, mostly tipped with a short bristle or spine like appendage just below the apex; seeds winged.

Leaves in fascicles of 2, short and curved, 3 to 4 cm. long; cone small, 4 to 5 cm. long somewhat broader when mature and expanded; seeds not winged.	1. *P. edulis.*
Leaves in fascicles of 3 to 5, longer than 4 cm. (except in P. aristata); seeds with at least rudimentary wings.	
Leaves in fascicles of 5.	
Cones 10 to 16 cm. long, the scales with unarmed appendages; seeds with only rudimentary wings; leaves slender, not rigid, 4 to 8 cm. long.	
Leaves entire	2. *P. flexilis.*
Leaves serrulate	3. *P. strobiformis.*
Cones 5 to 7 cm. long, the scales with armed appendages; seeds with conspicuous wings.	
Leaves short and stout, 2 to 4 cm. long, curved, crowded on the branches; cone scales with long and weak spines; cones 6 to 7 cm. long.	4. *P. aristata.*
Leaves longer, 6 to 10 cm., not crowded; cone scales with short rigid spines; cones 5 to 6 cm. long.	5. *P. arizonica.*
Leaves in fascicles of 3 (rarely 4); appendages of cone scales short and stout.	
Sheaths of the leaves persistent and conspicuous; leaves 10 to 25 cm. long; cones 7 to 15 cm. long.	6. *P. brachyptera.*
Sheaths of the leaves deciduous; leaves 6 to 9 cm. long, rather slender; cones 3 to 5 cm. long.	7. *P. chihuahuana.*

2. PICEA Link. · Spruce.

Evergreen monoecious trees with soft wood, 30—75 feet high, of conical form, leaves not fascicled, ascending or nearly erect, short, quadrangular or nearly terete, with a prominent base which remains after the leaves fall; staminate aments from axils of leaves

of preceding year, sometimes terminal; pistillate cones terminal; scales closely overlapping; bracts membranous mostly hidden by the scales; cones maturing first year, pendant; scales thinish, persistent. Seeds winged.

Young branches and leaf bases pubescent; cones short, 1 to 2 inches long; leaves dull green, not glaucous.	1. *P. engelmanni.*
Young branches and leaf bases glabrous; cones longer, 2 to 3.5 inches, leaves on the older parts usually darker green, the younger ones very glaucous and lighter colored.	2. *P. parryana.*

3. ABIES Link. Balsam, Fir.

Medium sized and large trees 30 to 100 feet high; with very rough thick or thin corky bark, wood soft and somewhat spongy; leaves apparently 2-ranked, narrow and flatish, sometimes strongly keeled, leaving no bases when they fall away; staminate aments arising from the axils of the leaves of the preceding year.

Large trees, often over 100 feet high, 2 to 4 feet in diameter; bark dark colored, very thick, hard, and rough, on young trees and branches smooth and light colored; leaves 1½ to 2½ inches long, dark green above, glaucous beneath.	1. *A. concolor.*
Medium sized to small trees, 50 feet high or less, slender, with relatively thin, smooth, whitish, corky bark; leaves short 1 to 1½ inches long, crowded.	2. *A. arizonica.*

4. PSEUDOTSUGA L. Spruce. Douglas Spruce.. White Fir.. Red Fir.

A robust tree over 100 feet high and 3 to 6 feet in diameter, occasionally much larger, with rough thick bark; leaves flat and linear, twisted at the base so as to appear 2-ranked, ¾ to 1 inch long; cones 1½ to 2½ inches long, with thin persistent scales and elongated exserted 3-lobed bracts, ovate oblong, pendulous, maturing the first year.

A single species in the mountains, above 7,000 feet throughout the state.	1. *P. mucronata.*

2. JUNIPERACEAE. Juniper Family.

Shrubs or low spreading trees with small mostly scale-like leaves often of two forms, and dioecious rarely monoecious flowers; staminate aments small, about ⅛ of an inch long, the stamens with 2- to 6-celled anthers, the ovulate cones with few scales and no bracts, fleshy at least when young, ovules erect; fruit often pulpy, few-seeded.

Mature cones dry, woody, dehiscent, mostly spherical composed of a few peltate scales; leaves small, scale-like, appressed. — 1. Cupressus.

Cones fleshy, berry-like, indehiscent.

Leaves on mature branches not scalelike, 6 to 12 bm. long, smooth and shining above, glaucous beneath; fruit a dark blue, small "berry." — 2. Juniperus.

Leaves on mature branches short, scale-like, appressed, generally dull green with little difference in the appearance of the two sides; fruit drier though never woody; leaves of young sprouts always larger, more acute, and more glaucous than those of mature trees. — 3. Sabina.

1. CUPRESSUS. L. Cypress.

In Arizona a moderately large tree 40 to 50 feet high or even taller and a foot or two in diameter, with small scale-like leaves so arranged as to produce flat frond-like branches; flowers monoecious, the staminate cones spheroidal or ovate, about ⅛ of an inch long and exceedingly numerous in the late winter or very early spring; the ovulate cones with about 5 or 6 small fleshy scales with 2 erect ovules at the base of each: mature cone ½ to ¾ of an inch in diameter with several dry peltate scales.

A single species rare in the southern part of the state. — 1. *C. arizonica.*

2. JUNIPERUS L. Juniper.

A low widely spreading shrub 2 to 3 feet high, usually wider than it is high, with sharp pointed leaves, ½ an inch long, dark glossy green above, paler beneath, constricted at the base; fruit a dark blue pulpy berry ovate in outline, more or less glaucous, of a sweetish resinous taste, having a few seeds.

A single species on the tops of the high mountains in the Hudsonian zone. — 1. *J. sibirica.*

3. SABINA. Haller. JUNIPER. CEDAR. SABINA.

Low but sometimes widely spreading trees with "stringy" or "checked" bark; small scale-like more or less resinous leaves of two forms, those on the older stems short triangular and thickened 2 to 4 mm. long, those on young sprouts twice or three times as long, acute to spinulose tipped; and spheroidal berry-like cones with somewhat woody or fleshy scales closely pressed together and completely enclosing the 1 to 3 or 4 seeds.

Trees of the drier mountain slopes, occasionally high up on some barren peak; all over the state.

Seeds 3 or usually 4; smaller branches smooth; leaves conspicuously resinous; bark of trunk thick; broken into irregular quadrangular plates; fruit large, 10 to 12 mm. in diameter, brown and fibrous when mature. 1. *S. pachyphloea.*

Seeds 1 or sometimes 2; smaller branches mostly scaly; leaves mostly not resinous; bark of trunk shreddy or stringy.

Fruit large, about 15 mm. in diameter; seeds 1 or 2. 2. *S. megalocarpa.*

Fruit smaller, 10 mm. or usually less in diameter.

Branchlets slender, drooping; mature fruit small, 6 mm. in diameter, spherical, blue, 2-seeded; leaves 3-ranked. 3. *S. scopulorum.*

Branchlets rigid, erect, stouter; fruit mostly 1-seeded (sometimes 2-seeded in no. 3); leaves 2-ranked.

Fruit large, 7 to 10 mm. long, oblong, brown and fibrous when mature; leaves short and obtuse. 3. *S. utahensis.*

Fruit smaller, 5 to 7 mm. long, scarcely if at all longer than thick, bluish and fleshy; leaves about twice as long as in the preceding species. 4. *S. monosperma.*

Order II. GNETALES.

EPHEDRA. L. Mormon Tea. Popotillo. Canatillo.

Shrubs 5 feet high or less, much branched, with slender terete green or yellow-green striate stems bearing scale-like reduced leaves a few mm. long at the nodes and the unisexual flowers borne quite profusely on separate plants; scales of the cones brown or greenish, thin, scarious and numerous; stamens numerous in each ament, the ovulate cones with but 1 or 2 ovules in each, the mature seed enveloped in several thin scales, terete or variously angled, mostly dry.

Leaf scales in 2's; branches opposite, greenish; cone scales few.
- Scales of fruit acutish; fruit sharply 3-angled. — 1. *E. viridis.*
- Scales of fruit rounded obtuse; fruit scarcely angled. — 2. *E. antisyphilitica.*

Leaf scales and branches in 3's; cone scales numerous.
- Leaf scales 5 mm. long or less, merely acute, not spiny; fruit scabrous, smaller than in No. 4. — 3. *E. torreyana.*
- Leaf scales 8 to 10 mm. long, acerose; branches yellowish green; fruit smooth, 10 to 13 mm. long. — 4. *E. trifurca.*

THE LILY FAMILY (Liliaceae).

Among all that great group of plants to which the palms and lilies and grasses belong there are only a few species of shrubby plants found growing in New Mexico. These belong to three genera and the plants are all very similar in general form. The ordinary Spanish Dagger or Palma may be taken as a representative of the group. The plant always consists of a rather short thick stem, which may be only a few inches or several feet in length, mostly simple but sometimes branched, and crowned by a tuft of numerous radiating parallel-veined leaves. Mostly the leaves are narrow and flexible, but in a few species they are rather stiff and sharp pointed.

The yuccas are the commonest of these plants, and the different species occur under a variety of local names. They may be recognized by the fact that the leaves are always spine tipped and margined by a thread-like filament but without teeth along the margin. The flowers are always large and whitish, and contain both pistils and stamens. They vary from an inch to three inches in length, and the petals are thick and wax-like.

Most people see very little of value in these plants, but they, with others of their associates, offer a number of horticultural possibilities. The one quality of paramount importance which these plants possess is their perfect adaptation to arid conditions, which must be endured in many places where it is very desirable to have some vegetation. Attention has already been called to the appearance of many of the cattle ranches of the State, and there is no doubt that the owners of many of these ranches excuse themselves from any exertion towards adding vegetation to their surroundings by saying that nothing will grow on our mesas. These two plants (as well as some others) are living refutations of their excuses. Not only will they grow, but they will grow well, and what is better still, plants of these species of any size and age may be

transplanted with but little danger of loss. When it is remembered that a "Spanish Bayonet" or "Soapweed" eight or ten feet high, is probably as old as a cottonwood a foot in diameter, it seems strange that so few of these Yuccas die when transplanted. And they are to be had for the digging, any place in the southern part of our State.

Another advantage possessed by these plants, is that they are always in full leaf and green; and their wax-like blossoms, when they come are most beautiful. For massing, for hedges, for formal bedding plants, and for low windbreaks they are most effective. A hedge or windbreak six feet high may be had fully grown for the planting, and such a hedge will give protection to other less vigorous and yet valuable smaller plants. Without doubt there are many places where the Yuccas may be used effectively for beauty and comfort, but they will not become large shade-casting trees, though they may reach a height of eighteen or twenty feet. However, we should recognize their usefulness within their limits and utilize them in locations where practically nothing else will grow.

Spanish Bayonet. Spanish Dagger. La Palma *(Yucca macrocarpa)*. This is the broad and stiff leaved species which is common on the mesas in the southern part of the State. Ordinarily it has a straight stem six to eight inches in diameter and four to eight feet high with a head of stiff spreading leaves about four feet in diameter at the top. Under favorable conditions this plant will reach a height of eighteen or twenty feet. The stem is usually simple, but sometimes it branches either at the base or some distance from the ground. When it branches from the ground it not infrequently makes beautiful formal bedding plants, producing a mass of radiating green leaves which is almost geometrically perfect. This plant is particularly easy to transplant, because its underground stem is rarely over eighteen inches long, and its roots are small and fibrous, thus rendering the digging relatively easy. A very little water in excess of the rainfall during the

SPANISH BAYONET, LA PALMA. *(Yucca macrocarpa)*

first season after transplanting will prevent its drying and then it can take care of itself. The loss in transplanting large plants of this species will not average two per cent.

The Datil *(Yucca baccata)* is a species closely resembling the preceding, but almost stemless. Its panicle of flowers is always smaller, the flowers less numerous but considerably larger; the leaves are slightly narrower and longer; and the fruit is characteristic. The latter is often 6 or 7 inches long and 2 inches in diameter, and the numerous seeds are surrounded by a soft sweetish pulp when it is mature. These fruits are used by the Indians as food, being preserved by drying.

Soapweed, La Palmilla, Amole *(Yucca radiosa)*. This is the tall narrow-leaved species of Yucca. Its leaves are slender (half an inch wide or less), flexible, and very numerous; its flower-stalk is much taller, its blooms make a better

showing, and its stem is more often branched. For hedges and windbreaks it is better because it has thicker heads. But its tap root extends below the surface from four to six feet, and it is often necessary to cut it off in digging the plants, thus causing a greater percentage of loss. Of fifty-two plants which I have transplanted, twenty-five per cent. of them died; these plants were put in a soil where there was much more alkali than that in which they naturally grow and were generally subjected to worse treatment than they ordinarily get; hence a part of the loss may be due to these causes.

Continued experience after this the first attempt at transplanting mentioned above have confirmed the judgment then formed. The loss is usually twenty-five per cent or more up to nearly fifty per cent. depending somewhat upon the amount of water supplied at transplanting and during the first season.

In the eastern side of the State the **Bear Grass** of that region (*Yucca glauca*) is exceedingly common and on much of the land now used as dry land farms it was necessary to grub these plants out. By the residents it is considered as an undesirable weed. It resembles the preceding species very closely, but bears about the same relation to it that *Yucca baccata* does to *Yucca macrocarpa;* that is, it is almost stemless and the panicle of flowers is shorter and much less branched. Reports of the use of the leaves of this plant for making coarse brooms have come to us, but we are unable to give definite information on the subject at this time.

Another somewhat closely similar species with yellowish-green and still narrower leaves and much more numerous filaments on the leaves occurs in the extreme northern part of the State, coming in from Utah and Nevada. In the southwestern corner is to be found another tall, rather broad-leafed species *(Yucca schottii);* which would be an interesting addition to a garden collection of these plants.

Sotol *(Dasylirion wheeleri)* is a dioecious perennial with

SOTOL. *(Dasylirion wheeleri)*.

flat strap-shaped leaves having numerous recurved slender teeth along the margin. The trunk is usually 6 or 8 inches in diameter and from 1 to 4 feet tall, and covered by the dead leaf bases of older leaves. The leaves are very numerous and flexible, forming a thick crown at the head of the stem. The flowers are very small and numerous, borne in panicles on a tall stalk, often several feet high. Another species *(D. texanum)* is reported from the southeastern corner of the State.

These are near relatives of the Yuccas and are usually found more or less closely associated with them. They usually grow among the rocks and are hard to dig; young plants transplant the more readily. They are valuable for formal masses of bedding plants, or against a hedge row.

Bear Grass *(Nolina microcarpa)*. This vernacular name is applied in the southwestern part of the State to a plant somewhat closely resembling the last. The leaves, however, are stiffer and thicker (sometimes triangular in cross sections) and without the teeth, though frequently rough. The flowers are small and white, borne in a central panicle varying in height (as does the plant) with the species. They might be used effectively any place where the Sotol would grow.

YUCCA L. YUCCA.

A genus of thick-stemmed, (in two species the stem is short and mostly subterannean), stiff-leaved perennials the different species of which form a rather conspicuous part of the vegetation on the mesas and plains of the State, extending into the drier and rockier foothills and mountains. They are commonly referred to by such names as Spanish Bayonet, Soap-weed, or Bear-grass.

Leaves narrow, 10 mm. broad or less, linear lanceolate, tipped with a sharp spine; filaments slender and white; fruit dry.

Stems conspicuous (except in young plants), reaching a height of 10 to 15 feet in old plants, often several together in a cluster, simple or branched; leaves in a cluster at the top, the lower ones reflexed; old dead ones sheathing the stem almost to the base; inflorencence a tall widely spreading panicle 6 to 10 feet high; flowers numerous, usually ivory white. 3. *Y. radiosa.*

Stem short and mostly subterannean, occasionally caespitose; upper leaves spreading, the lower prostrate upon the ground; inflorencence 3 to 5 feet high usually not much branched; flowers not very numerous, greenish white or white.

Leaves bright green, rather rigidly divergent, 6 to 10 mm. broad; filaments not very abundant; flowers greenish white with enlarged style; fruit 2 to 4 inches long. 2. *Y. glauca.*

Leaves yellowish green, 2 to 5 mm. wide, almost triangular in cross section, abundantly curly filiferous below; flowers white, style not turgid; fruit about 2 inches long. 1. *Y. angustissima.*

Leaves broader, 1 to 2 inches wide, narrowly lanceolate, tipped with a very stiff rigid spine; filaments usually coarse and thick (slender or none in Y. schottii), grayish or brownish; fruit indehiscent, more or less **fleshy.**

Stem short, 6 inches high or less; perianth segments narrowly lanceolate, 2 to 3 inches long, creamy white within, reddish outside; fruit large, 5 to 6 inches long, pulpy. 4. *Y. baccata.*

Stem taller, 3 to 10 feet or even more, occasionally branched; perianth segments elliptic, hardly 2 inches long, cream-colored, usually not although sometimes reddish outside; fruit smaller, 4 inches long or less, not so pulpy.

Leaves rigid, rough like shagreen, yellowish green, not glaucous; filaments coarse and grayish. 5. *Y. macrocarpa.*

Leaves flexible, smooth, blue-green, glaucous; filaments when present fine, usually brownish. 6. *Y. schottii.*

DASYLIRION. Sotol.

Dioecious perennials with thick, short stems, numerous strap-shaped spiny-margined leaves, and numerous small, white flowers borne in a tall, narrow panicle. The bases of the leaves form a round head (when the ends have been cut off) which is used extensively in stock feeding in western Texas. These heads are roasted by the native people and used for food and for the manufacture of a drink, also called sotol, which contains from 40 to 50% of alcohol.

A single species or possibly two in New Mexico. 1. *D. wheeleri.*

NOLINA Michx. Bear Grass.

A single species mostly in the southwestern part of the state. 1. *N. microcarpa.*

THE WILLOW FAMILY (SALICACEAE).

The trees and shrubs which constitute this family are well known to all, including the cottonwoods, poplars, aspen and willows of all kinds. They are soft wooded and rapid growing trees of medium size or bushes of all sizes, from an inch or so in height to several feet. They are widely distributed at practically all levels in the State, and are more universally used in New Mexico as shade trees and for decorative purposes than any other kinds of plants.

The willows are represented in New Mexico by seventeen recognized species and it is possible that still others will be found in the mountains of the northern end of the State or in the extreme southwestern corner. Of these seventeen, most of them are of very little importance and several of them would not be recognized as willows by any one but a botanist. Of these latter several species occur only on the high mountains near or above timber line and form low brush from an inch or two to three or four feet high. In the timbered regions there are three or four species which form good sized shrubs or small trees along the banks of streams. In the lower valleys there are two important species which develop into trees, and one or two lower forms occur mainly along the ditches or in the river bottoms. The wood of the arborescent forms is used to some extent as firewood, but is so light and spongy as to be of little value.

Cottonwoods (*Populus* spp.). Three distinct species of cottonwoods are native in the State and their use as shade trees is well nigh universal. As trees they have several points in their favor, and number most men among their friends, but occasionally one meets a man who says he would rather have no trees at all than have cottonwoods. His objections are usually matters of personal taste, though he is apt to talk of the dirt due to their "cotton" or the effect of the mistletoe. The first of these objections is easily avoided by planting the

cuttings taken from the staminate* or so called "male" trees. The second difficulty necessitates the cutting out of the mistletoe about once a year; if properly watched the parasite never becomes very objectionable.

The best feature of the cottonwoods is their very rapid growth. Five years of proper treatment will generally insure a good sized shade tree, and when once established they require very little attention. As an "all around" shade tree for the streets, roads, and drives there is probably nothing better growing in the State. Their symmetrical rounded tops, their glossy leaves ever whispering to the slightest breeze, their glorious golden heads, when the first frosts come, their almost perfect adaptation to the conditions of the valleys in which we live, make them most excellent trees to have about our homes.

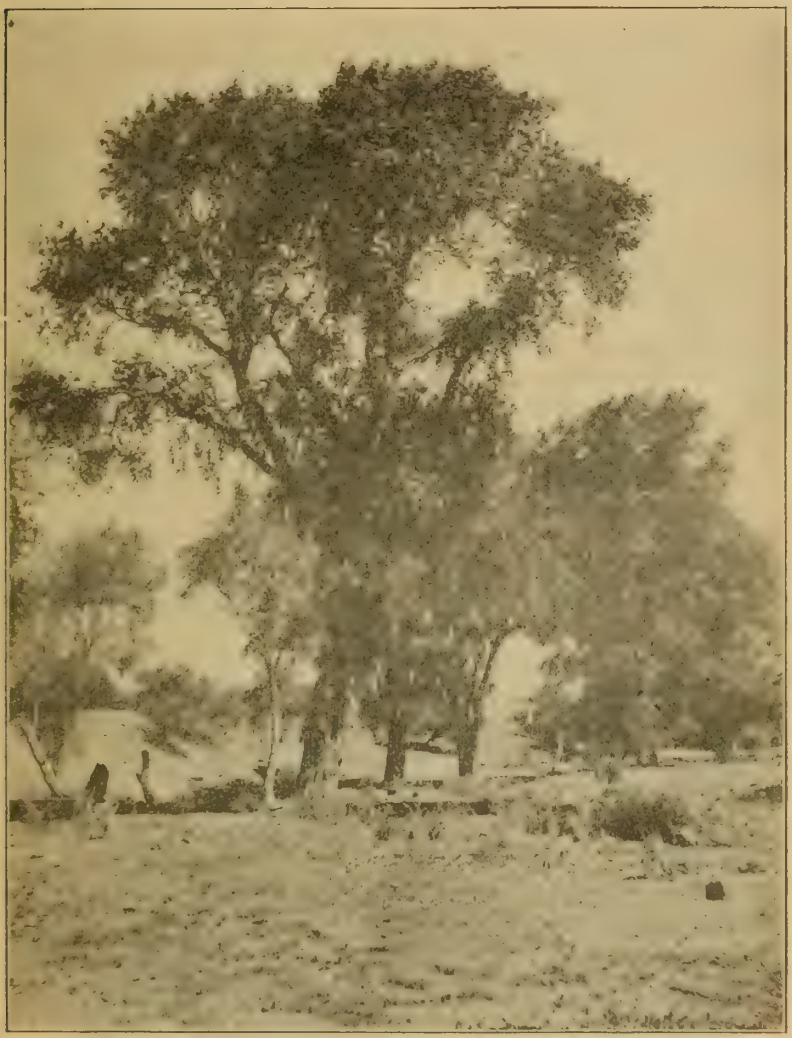
The Valley Cottonwood *(Populus wislizeni).* This is the common tree of the lower irrigable valleys of all the southwestern arid region from the Rio Grande to the Pacific, and forms much the greater part of the "bosques" of the Rio Grande, the Gila and the lower Pecos valleys. Wherever the land is under cultivation, this cottonwood is used more or less as a shade tree, or in a few cases, for windbreaks. It is a particularly rapid grower, and in the valley where the water table is but a few feet below the surface, these trees soon get their roots down to the water and do not need to be irrigated. As has already been suggested, it is necessary to protect them,

* Possibly it would be wise to explain just what is meant by the staminate trees, for the benefit of those who have not studied botany. The cottonwoods belong to that group of plants in which the two organs necessary to the production of seed (i. e. stamens and pistils) are borne upon separate trees. The stamens furnish the pollen, (or yellow fertilizing dust) and after the very simple flowers which contain the stamens cease blooming, the trees bearing them show no further evidence of being concerned in seed production. The troublesome cotton consists of numerous hairs which surround the seeds to assist in their distribution, hence is only produced by the seed bearing or "female" trees. The staminate flowers are reddish or brownish or sometimes a dull yellow, and hang in pendulous spikes which appear on the trees before the leaves. They show no sign of the green berry like balls which contain the seed. The pistillate catkins, however, are green, and each flower consists of little else than a rudimentary ball with the expanded stigma above it. There are fewer flowers on these catkins and they usually appear with the first leaves or a little later.

at least in the southern part of the State, from attacks of the mistletoe. The tree grows fifty or sixty fet high under favorable conditions, forming a symmetrical rounded head with gracefully arching branches and is effective for street use. When grown alone and frequently pollarded, as is the too common custom in the Mesilla valley, it is apt to become short and bunchy. The author has seen it used very effectively to produce a high arched open green canopy over a house which was thus rendered most pleasantly cool in the warmest weather. The tree may be recognized by its broadly triangular leaves, which are nearly as broad as they are long. This species is most effectivelly, used at Roswell and Carlsbad. Other cities and towns should follow their example.

ACUMINATE-LEAVED COTTONWOOD. Used as a Windbreak Around a Reservoir.

Another cottonwood which is fully as effective and offers a slightly denser shade is the acuminate leaved cottonwood, *(Populus acuminata)*, which has narrowly oval, taper-pointed,



MOUNTAIN COTT. ONWOOD. *(Populus angustifolia)*

and darker green leaves. This tree is used as much or more than the valley cottonwood on the streets of Deming and Silver City. It would, no doubt, grow well in any of the towns and valleys of the State where it could be given a limited amount of care and water.

The Mountain Cottonwood *(Populus angustifolia)* grows native along the streams in our mountains at elevations of from 5,500 feet to about 7,500 feet above the sea level. It is an exceedingly graceful tree with rough grayish bark and dark green, glossy, willow-like leaves and makes a very desirable shade tree, especially at the higher levels in the State. It has been grown quite successfully at Lincoln, where it is preferred to the valley cottonwood. It is certainly worthy of more general adoption.

The Quaking Aspen *(Populus tremuloides)* is really a cottonwood and should be used much more than it is. As

WILLOW. *(Salix lasiandra)*

shade trees they are not valuable because the top is small and thin, but used in clusters in connection with conifers, their white stems would be as effective as the birch of the eastern states. They probably would grow at the high levels.

Willows *(Salix*, spp.*)*. Closely related to the cottonwoods and usually associated with them are the willows. There are a number of species native in the State but most of them are but small shrubs bordering the streams and ditch banks.

Salix bebbiana and *S. scouleriana* are two small trees that occur in the timbered mountains at elevations of approximately 7,000 feet. They resemble each other pretty closely in most respects, differing only in the characters of the inflorescence. They would be of slight value for decorative purposes at middle elevations.

Salix irrorata and *S. cordata watsonii* are two shrubby forms that occur beside streams in the timbered mountains; they would be of use in forming the lower part of a background or windbreak along an irrigating ditch or stream. Their glossy green leaves, which are much lighter on the lower surface, are very attractive, and add to their value for decorative purposes.

The Black Willow *(Salix nigra)* becomes a tree twenty to thirty feet high in favorable localities and its spreading crown is often broader than it is high. This tree grows readily in sandy soil where the water is near the surface and could be used most effectively for shade and windbreaks about reservoirs or for shelter belts in the lowest of the valley lands or along ditch banks. It is the common willow tree of the river valleys, being almost as abundant in the Gila valley in New Mexico as is the cottonwood.

In the southern end of the State, particularly in the Mesilla Valley, is a medium sized tree, *Salix wrightii,* which has been used along with the cottonwoods and ash for shade trees.

BLACK WILLOW. *(Salix nigra)*

SALICACEAE. Willow Family

Trees and shrubs with simple, alternate, deciduous leaves; flowers dioecious, in catkins; bracts of the ament scale-like; perianth none; stamens 1 to several, ovary 1-celled; stigmas 2; fruit a small capsule; seeds very numerous, small comose.

Bracts incised; disk cup-shaped; stamens numerous; stigmas much expanded; winter buds with several scales. 1. Populus.

Bracts entire; disk represented by one or two small glands; stamens few, generally less than 5; stigmas much expanded; winter buds with a single scale. 2. Salix.

1. POPULUS L. Cottonwood, Aspen

Trees with rough, light-colored bark and scaly, resinous buds; leaves usually long petioled, ours somewhat coriaceous, with prominent veins; flowers in pendulous aments, appearing before the leaves; seeds with a conspicuous white coma (the "cotton").

Petioles flattened laterally; leaves broad, deltoid to rotund.

Leaves broadly ovate to rotund, abruptly short acuminate, 1 to 2 inches long and broad, paler beneath; trees of the high mountains. 1. *P. tremuloides.*

Leaves broadly deltoid, acuminate, 2 to 3 inches long and 2½ to 4 inches broad, of the same color on both surfaces; trees of the lower valleys. 2. *P. wislizeni.*

Petioles terete or channeled on the upper surface; leaves narrower, ovate to narrowly lanceolate.

Leaves ovate to ovate lanceolate, 2½ to 4 inches long, 1 to 2 inches broad, rather coarsely crenate, both surfaces of the same color. 3. *P. acuminata.*

Leaves broadly to narrowly lanceolate, 3 to 6 inches long and 1½ inches wide or less, finely serrate with blunt teeth, much paler beneath. 4. *P. angustifolia.*

2. SALIX L. Willow

Shrubs or small trees, from a few inches to several feet high; leaves from narrowly linear to short elliptic or obovate; flowers in aments appearing before or with the leaves; perianth a single scale; stamens few; pistils single, with a gland at the base of the ovary, the stigmas short; fruit a capsule containing numerous very small hairy seeds.

Leaves usually only about 3 times as long as broad, elliptic oval to obovate, never narrowly lanceolate or linear; capsule hairy (except in S. Monticola).

Styles obsolete or less than .5 mm. long.

Alpine plants less than 4 inches high. — 1. *S. saximontana.*

Small trees or shrubs, at middle elevations in the mountains; much more than 4 inches high.

Aments slender, lax; scales pale; stigmas very short; leaves elliptic lanceolate, acute. — 2. *S. bebbiana.*

Aments stout, dense; scales dark; stigmas long, slender; leaves obovate, obtuse or abruptly acute. — 3. *S. scouleriana.*

Styles elongated, 1 mm. long or more.

Leaves glabrous on both surfaces, bright green aments closely sessile. — 4. *S. chlorophylla.*

Leaves pubescent, sometimes sparingly so, at least on the upper surface; aments on leafy stem.

Capsules glabrous. — 7. *S. monticola.*

Capsules tomentose.

Plants 1 to 5 feet high. — 6. *S. glaucops.*

Plants less than 4 inches high. — 5. *S. petrophila.*

Leaves several times as long as broad, linear to long-lanceolate; capsule glabrous (or weakly villous in Nos. 10, 11, 12).

Scales not pale yellow, mostly brownish and persistent.

Leaves broadly lanceolate; young branches not glaucous; capsules distinctly pedicellate; stipules conspicuous on young branches. — 8. *S. cordata watsonii.*

Leaves narrowly oblong-lanceolate; young branches very glaucous; capsule subsessile. — 9. *S. irrorata.*

Scales pale yellow, deciduous.

Stamens 2, hairy below; leaves more or less canescent, linear, remotely denticulate or sometimes entire; capsules more or less hairy.

Capsule 3 or 4 mm. long; leaves ½ to 1½ inches long, finely pubescent. — 12. *S. taxifolia.*

Capsule 5 to 7 mm. long, glabrate; leaves 2 to 4 inches long.

Leaves bright green and glabrate, at least above, denticulate; capsules 7 mm long, on longer pedicels. 10. *S. fluviatilis.*

Leaves canescent, entire or sometimes denticulate; capsule smaller, 5 mm. long, on a short pedicel. 11. *S. exigua.*

Stamens 3 or more, hairy below; leaves bright green above, lanceolate, finely serrulate.

Petioles and leaf blades glandular; (leaves paler beneath).

Leaves long acuminate, only slightly paler beneath, thin. 13. *S. fendleriana.*

Leaves short-acuminate, glaucous beneath, somewhat coriaceous. 14. *S. lasiandra.*

Petioles and the leaf blades not glandular.

Leaves paler beneath. 17. *S. bonplandiana.*

Leaves of the same color on both surfaces.

Leaves long-lanceolate; a compact spreading tree. 16. *S. nigra.*

Leaves shorter; a straggling tree or bush. 15. *S. wrightii.*

WALNUT. NOGAL. *(Juglans major)*

The Walnut Trees *(Juglans* spp.*)*. This family contains the well known walnut or *nogal*, the English walnut of commerce, the hickory nut, and the pecan. Only a single genus occurs within our range, but the pecan is cultivated in a few localities. There are at least two species of walnut in New Mexico, and possibly a third. The two here recognized do not occur together, so far as any records show.

Juglans rupestris is a shrub which branches from the ground and attains a height of about 10 or 15 feet. It rarely shows any trunk, has narrow entire leaflets, and is to be found along the Pecos and its tributaries from southeastern New Mexico southward into Western Texas. In the latter region it is more common and generally somewhat larger, but still retains its shrubby habit. The nuts of both species are small for the genus, and the ridges are rounded and smooth. The hull is thick and the kernel small. *Juglans major* has been confused with this species, though in the original descriptions Dr. Torrey separated them very clearly and assigned this

species to subspecific rank only temporarily, for lack of sufficient data. The plant is a rather large tree when grown under the best conditions, is found only in the mountains or their foothills at an elevation of 1500 to 2,000 feet higher than the habitat of the other species. The trunk of this tree is not infrequently 18 inches or more in diameter and from 6 to 10 feet high, though it sometimes branches nearer the ground. The leaflets are considerably larger and broader and have a serrate margin. This species has also been confused with a Californian one, but we are informed by those who have seen both gowing that they are amply distinct.

Nuts of what is probably another species have been brought to us from the Mogollon region, but we are unable to determine the species from the material received, and have not seen the plant growing. The nuts in question were almost twice as large as those of either of the other species. The plant is a good sized tree. Further observation and collection will be necessary to determine this species.

The Black Walnut (*Juglans nigra*) of the Eastern States has been cultivated successfully in a few places in the State. Experience at the Experiment Station has shown that walnuts grow rather readily from seed and make good shade trees in the irrigated valleys of the southern part of the State. It is altogether probable that they will grow at almost any level, if supplied with sufficient water.

JUGLANS L. WALNUT

Strong-scented trees or shrubs; buds few scaled or naked; flowers in simple pendulous catkins from the wood of the previous year; calyx 3 to 6-cleft; stamens 12 to 40 on short filaments; styles 2, short; fruit drupaceous, the exocarp fibrous-fleshy, indehiscent; the endocarp an irregularly roughened "nut" with an edible embryo.

Large shrub 12 to 18 feet high; branching from the ground, rarely if ever with a noticeable trunk.	1. *J. rupestris.*
Tree 25 feet tall or more, with a trunk often 10 feet high and 12 to 18 inches in diameter.	2. *J. major.*

The Birch Family *(Betulaceae)* is represented in New Mexico by three species of trees. A species of the **Hop Horn Beam** *(Ostrya baileyi)* occurs sparingly in the Guadalupe Mountains (the type locality) just north of our southern boundary line. Nothing is known of its value for cultivation as yet.

Two species of **Alder** *(Alnus tenuifolia* and *A. oblongifolia)* occur in the mountains along streams almost throughout the State. One of them is found at the lower levels, reaching sometimes into the flats beside streams, and the other occurs at higher levels, associated with the pine and spruce. Both are smooth barked, graceful trees from 30 to 50 feet high, and would doubtless grow well in cultivation. They suggest the elm in several respects, and would make very beautiful ornamental trees. So far we have not seen them in use, and have been unable to get specimens for trial.

A single species of Birch *(Betula fontinalis)* is reported from New Mexico by various writers, and we have seen two specimens. It occurs, doubtless, in the extreme northwestern part of the State near the Colorado line at Aztec.

BETULACEAE. Birch Family

Monoecious or rarely dioecious trees or shrubs with alternate, simple leaves and deciduous stipules: sterile flowers in catkins; fertile flowers clustered, spicate, or in scaly catkins: fruit 1-celled and 1-seeded nut with or without a foliaceous involucre.

Ovary enclosed by a bladdery bag.	1. Ostrya.
Ovary subtended by thick, woody scales.	2. Alnus.

1. OSTRYA. Scop. Hop Hornbeam

A small tree; sterile flowers consisting of several stamens in the axil or each bract; fertile f owers a pair to each deciduous bract, enclosed in a bractlet which in fruit becomes a closed, bladdery bag, the involucres forming a kind of strobile resembling that of the hop.

1. *O. bailey.*

2. ALNUS Hill. Alder

Shrubs or smal: trees with thin, toothed leaves; sterile catkins with 4 or 5 bractlets and 3 flowers upon each scale; fertile catkins ovoid or ellipsoid. the sca'es each subtending 2 flowers and a group of 4 small scales, the latter being woody in fruit, wedge-obovate.

Leaves rounded to truncate at the base, somewhat lobed, ovate to broadly oblong; stamens 4.	1. *A. tenuifolia.*
Leaves usually cuneate or at least narrowed at the base, seldom lobed, the younger ones lanceolate, the older elliptic or oblong; stamens 1 to 3, usually 2.	2. *A. oblongifolia.*

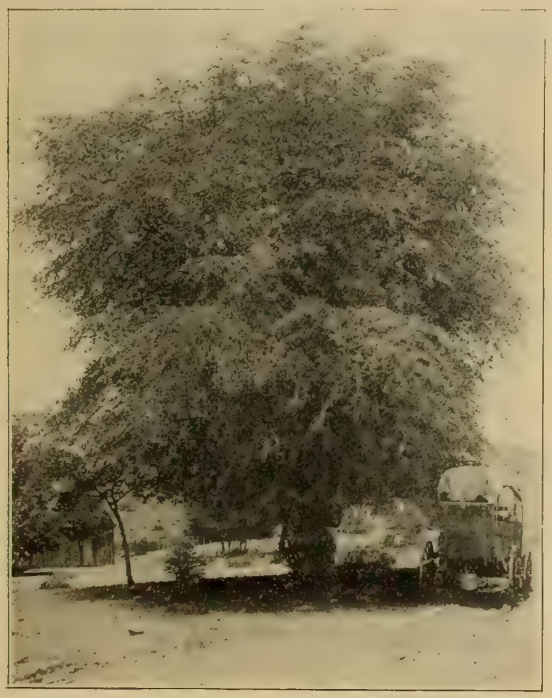
THE OAKS

The Beech Family (*Fagaceae*) is represented in New Mexico by a single genus, the oaks, of which there are 24 species or subspecies recognized. Many of these are of wide distribution in the State, and several of them are beautiful trees. There are two well marked groups of the genus, which may be recognized easily. One of them, the white oak, has large, deciduous, chrome-green leaves and the species grow in the mountains at elevations of 6,000 feet and more, reaching well into the Canadian Zone. The other group occurs mostly in the drier and rockier canyons and foothills of the mountains of the southern part of the State. They are ever-

SILVER LEAVED OAK. *(Quercus hypoleuca)*

green, since the gray-green or bluish-green leaves remain attached to the stems until the leaves of the next year are well developed. Besides the tree-like forms many shrubby species occur in the mountains throughout the State and form a very important part of the forage crop, since they are browsed extensively by cattle, sheep, and goats.

For decorative purposes perhaps the most important oak is **Silver-Leaved Oak** *(Quercus hypoleuca)* of the southwestern corner of the State. It gets to be a tree 30 feet high or more, but is frequently found as a small shrub forming clusters. The leaves are characteristic, being very thick and leathery, oblong lanceolate, mostly without teeth though occasionally with a few coarse ones near the apex; yellowish green and smooth above, densely white woolly beneath.



BLACK OAK. *(Quercus emoryi)*

The Black Oak (*Quercus emoryi*) of the same region is also a very beautiful tree. It deserves its name, since the bark is black and thick. The leaves are leathery and tough, pale yellowish-green, about the same color on both surfaces, more or less hairy, with yellowish-brown hairs along the veins, oblong, flat, not crispate, coarsely spiny toothed. The acorns are small and acute, with a shallow cup having pale yellowish-brown scales not thickened on the back. They are produced early in the season and are much appreciated by the animals of the region.

LIVE OAK. *(Quercus arizonica)*

The Live Oak (*Quercus arizonica, Q. grisea,* and *Q. oblongifolia.*) (the last of which is known only from the extreme southwestern corner of the State) are low spreading trees, with comparatively small leaves of extremely variable

LIVE OAK. *(Quercus grisea)*

scanty and uncertain. Like many of the desert shrubs and trees, if once established they will probably endure extremes of drought for long periods without dying. Two trees closely outline, that occur in the mouths of canyons and along arroyos in the foothills of the drier and hotter mountains. They are extremely slow growers and ordinarily quite scraggy in form. Occasionally under favorable conditions of water supply these trees become 30 or 40 feet high. Ordinarily they are from 10 to 20 feet, and the trunk is short, often branched from near the ground. Cattle appreciate their shade, and they generally show the effects of such use. Attempts to transplant and grow these trees at the Experiment Station have not been successful, but the author believes they can be used effectively in certain situations where shrubbery is desired and the water supply is related to this last mentioned, but which occur quite sparingly and only in the southwestern corner of the State, are *Quercus wilcoxii* and *Q. reticulata.*

WHITE OAK. *(Quercus utahensis)*

Among the **White Oaks** *Quercus utahensis*, *Q. novomexicana*, *Q. leptophylla*, and *Q. gunnisonii* are the commonest, and the first two named are most important. They both of them form medium sized trees in the timbered areas of the mountains. Attempts to transplant them to lower levels have not been successful, so far, with us; but we still believe that it can be done and that it is thoroughly desirable. *Quercus utahensis* and *Q. novomexicana* should make very good shade trees at elevations of 7,000 feet or more, and would doubtless well reward all the efforts made to grow them. Like all oaks, they would probably grow slowly, but once established, they would be very resistent and would live for a long time. These lobes. They differ among themselves in the exact outline, long and half as broad, yellowish-green and with their rounded

the depth of the lobing, the amount and character of hairiness of the leaves, and in the characters of the acorns, these characters being used to separate the species.

SCRUB OAK. *(Quercus pungens)*

There are several species of Scrub Oaks, a few of which are quite characteristic and tolerably easily recognized. All of them are important as forage plants, since they are browsed extensively wherever they grow.

The Shin-Oak or Shinry *(Quercus havardii)* is a low deciduous-leaved shrub, rarely over 3 feet high and with a very large acorn, that covers relatively large areas of sand hills in the southeastern corner of the State. As an economic plant for sandy land that is otherwise almost valueless this little oak, with its large acorn, will probably prove of considerable value. *Quercus undulata* is another shrubby species with small bluish-green leaves and small acorn, that occurs in the foothills of the higher mountains and to some extent along water courses in the higher plains. A near relative of this species, *Quercus fendleri*, is a somewhat larger shrub, often 8 to 10 feet high, that reaches slightly farther up into the mountains. Other shrubby species are *Quercus rydbergiana, Q. pungens,* and probably *Q. turbinella.*

GAMBEL'S OAK. *(Quercus gambelii)*

A single species of **Chestnut Oak** *(Quercus muhlenbergii)* has been collected at two different stations in the eastern part of the State.

In general it may be said that the oaks of the State are probably of economic importance as decorative plants, and several are certainly very important forage plants, while the wood produced is used for firewood by those people who are conveniently located to the supply.

QUERCUS L. Oak

Low shrubs or large trees with rough bark on the older stems and hard tough wood; leaves chlorophyll green and deciduous or bluish or grayish green and persistent almost or quite until the leaves of the following season appear, of various shapes, size, and texture, generally short-petioled, mostly more or less stellate pubescent at sometime; flowers monoecious, the staminate usually in slender, pendulous aments, the pistillate solitary or in few-flowered spike-like aments, appearing with the leaves; fruit (acorn) a nut varying in shape and size with the species, the cup also being of varying size and shape.

Acorns sericeous-tomentose inside, maturing the second year. — 1. *Q. hypoleuca.*

Acorns not sericeous-tomentose inside, maturing the first year.

Leaves bluish, grayish or yellowish green (never bright chlorophyll green) more or less coriaceous in texture and mostly persisting until the new leaves come, hence the plant leafy all the time.

Leaves not persisting (medium sized shrub). — 2. *Q. fendleri.*

Leaves persisting until after the appearance of the young ones.

Mature plants shrubs, never trees.

Plant about 3 feet high, with very small acorns and leaves. — 4. *Q. rydbergiana.*

Plants taller, leaves and acorns larger.

Leaves fulvous beneath; cup turbinate. — 6. *Q. turbinella.*

Leaves not fulvous beneath; cup hemispheric.

Leaves only moderately coriaceous, neither spinulose-toothed nor crisped. — 3. *Q. undulata.*

Leaves strongly coriaceous, much crisped and spinulose-toothed. — 5. *Q. pungens.*

Mature plants trees, shrubby forms immature, usually not fruiting.

Scales of the cup thin, only slightly corky-thickened on the back; mature leaves yellowish green.

Leaves of the same color on both surfaces. — 7. *Q. emoryi.*

Leaves fulvous beneath, especially when young. — 8. *Q. wilcoxii.*

Scales of the cup corky-thickened on the back; leaves fulvous beneath, glabrate above.

Acorn large; mature leaves all more or less conspicuously toothed, resembling those of *Q. fendleri*. 9. *Q. confusa.*

Acorn of medium size; only the younger leaves conspicuously toothed.

Leaves large obovate, strongly reticulate; teeth small and numerous; fruit in a long pedunculate spike. 13. *Q. reticulata.*

Leaves of medium size, oblong, only slightly reticulate, entire or with few coarse teeth.

Leaves and twigs of the year glabrous in age; leaves rarely with any teeth. 10. *Q. oblongifolia.*

Leaves permanently densely stellate-pubescent beneath, also the twigs of the year.

Cup shallow, acorn acute. 12. *Q. arizonica.*

Cup deep, covering one-third the acorn; acorn truncate or obtuse. 11. *Q. grisea.*

Leaves chlorophyll green, not coriaceous (except slightly so in No. 16) deciduous in the fall, hence the plant leafless in winter.

Leaves coarsely serrate toothed with numerous teeth from base to apex, not truly lobed. 14. *Q. muhlenbergii.*

Leaves more or less sinuately lobed.

Low shrubs, never forming trees; leaves small, 3 inches long or less.

Lobes few and shallow, appearing as a few large teeth; some of the leaves obovate in outline. 15. *Q. media.*

Lobes deeper and more numerous; leaves oblong in outline.

Acorns very large, about 1 inch long; a plant of the southeastern sandhills. 16. *Q. havardii.*

Acorns small, ½ an inch long or less, racemose; plant of the mountains of the northern part of the state. 17. *Q. venustula.*

Taller shrubs or trees with larger, deeply lobed leaves mostly 4 inches long or more.

Mature leaves soft pubescent and almost velvety beneath.

Scales of the cup thin, little thickened on the back; leaves distinctly obovate in outline. 18. *Q. submollis.*

Scales of the cup thickened on the back; leaves mostly oblong only slightly broadened upwards. 19. *Q. utahensis.*

Mature leaves not velvety beneath, usually glabrate, sometimes slightly pubescent, especially on the veins.

Cup saucer shaped, covering less than one-fourth of the acorn. 20. *Q. vreelandii.*

Cup hemispheric, covering one-third to half the acorn.

Acorns ovoid, acute; cup covering about half the acorn. 24. *Q. gambelii.*

Acorns barrel shaped, obtuse.

Mature leaves thin, large, obovate to cuneate, dark green above; acorn very short, frequently more than half in the cup. 21. *Q. leptophylla.*

Mature leaves firm, deeply lobed; acorn about one-third in the cup.

Leaves oblong, lobed half way to the midrib, dull-colored; lobes usually simple. 22. *Q. gunnisonii.*

Leaves obovate in outline, lobed more than half way to the midrib, dark green above; lobes frequently again lobed. 23. *Q. novomexicana.*

The Elm Family *(Ulmaceae)* is represented in New Mexico by a single species of **Hackberry** or CUMARO *(Celtis reticulata)* which grows in the dry foothills of the mountains. It is a low stunted tree 10 to 15 feet high, with whitish bark, generally scrubby appearance, and very rough harsh leaves. Under favorable conditions it gets much larger and very much more symmetrical, becoming a rather pretty tree, offering a dense shade.

The American Elm *(Ulmus americana)* is grown quite extensively throughout the State as a shade tree, and is a very satisfactory tree indeed.

The Wild Hop *(Humulus lupulus neomexicanus)* is a native vine that is of considerable decorative value, since it grows very rapidly and the root is perennial. In cultivation the vines grow 30 or 40 feet in a season and branch profusely, covering trellises readily and very effectively. For such purposes the plant is to be highly recommended. It grows wild in the mountains at elevations of from 6,000 to 8,000 feet.

The Mulberries *(Moraceae)* are represented in New Mexico by a single species of the genus *Morus (M. microphylla)*, which is a low branched tree 10 to 15 feet high in the drier foothills of the mountains, coming into southern New Mexico from western Texas. This shrub we have never seen in cultivation, but doubt not that it would readily respond to a little care.

The White Mulberry *(Morus alba)* is cultivated extensively as a shade tree, and very satisfactorily, throughout the lower part of the State. It is most resistant to drought, and grows well when supplied with plenty of water.

CELTIS L. Hackberry

A small tree; leaves ovate or ovate-lanceolate, taper-pointed, thick, reticulated, cordate and very unequal at the base; flowers greenish, axillary, the fertile solitary or in pairs, appearing with the leaves; calyx 5- to 6-parted, persistent; stamens 5 or 6; ovary 1-celled with a single ovule.

A single species. 1. *C. reticulate.*

HUMULUS. L. Hop Vine

A climbing perennial; flowers dioecious, the staminate in loose axillary panicles, the pistillate in short axillary spikes; bracts foliaceous, imbricated; leaves palmately 3- to 5-lobed; fruiting calyx and other parts of the plant covered with yellow resinous dots.

A single species in the timbered mountains. 1. *H. lupulus neomexicanus*

MORUS. L. Mulberry

Ours a small, scraggy tree with alternate, ovate, small about 1 to 2 inches long, serrate leaves, these usually 3- to 5-lobed, acute; flowers dioecious, small, green and inconspicuous: the fruit technically a multiple fruit, consisting of a cylindrical or oblong cluster of separate 1-seeded berries, the whole appearing to be a single fruit.

A single native species found in the drier mountains at from 5000 to 6000 feet altitude. 1. *M. microphylla.*

THE GOOSEFOOT FAMILY *(Chenopodiaceae)* is represented in our range only by several very well known shrubs, a few of which are of considerable importance as forage plants on the ranges.

The Greasewood *(Sarcobatus vermiculatus)* is a much branched succulent-leaved shrub of rather yellowish-green color, commonly only 3 or 4 feet high, but sometimes as much as 8 or 9 feet, that grows almost exclusively in tolerably wet alkaline soils. The name Greasewood is often mistakenly applied to a very different evergreen shrub, the Creosote Bush *(Covillea glutinosa)* that grows on the mesas of the southern part of the State, never occurring in alkaline soil and preferring a dry gravelly one. The proper Greasewood is not evergreen, has small, almost cylindrical leaves, and very inconspicuous flowers. The leaves are succulent and watery when crushed, never resinous, and perfectly smooth. The plant is used extensively as a forage plant, especially by sheep; though there is said to be some danger of bloat if the animals are allowed to eat it when it is growing vigorously. The fruit is dry, winged, and orbicular. The flowers are unisexual. It is often called *GREASEWOOD* bush in the northwestern part of the State.

Burro Weed *(Allenrolfea occidentalis)* is a very peculiar, almost leafless alkali-loving shrub with cylindrical jointed green succulent branches. It reaches a height of 5 or 6 feet, and is easily recognized by its smooth and bluish-green branches among the other gray and brown plants with which it is commonly associated. Its presence is certain indication of a large amount of alkali in the soil. It is sparingly eaten by burros; hence the common name.

Winter Fat *(Eurotia lanata)* is a well known small shrub, generally less than 3 feet high, that grows in the foothills of the mountains and to some extent on the high plains almost throughout the State. It will not live in the driest situations, but will endure moderate desiccation. It may be

GREASEWOOD. *(Sarcobatus vetmiculatus)*

recognized by its numerous erect stems and slender leaves, all of which are white woolly, and its profuse terminal panicle, the flowers and fruit of which are covered with white spreading hairs. The plant is considered as valuable forage by stockmen of all kinds, but sheepmen prize it especially, because it furnishes good feed at a time when other feed is scarce; hence its name. In the Northwestern states this plant is known as *WHITE SAGE.*

The Salt Bushes (*Atriplex* spp.). This genus is represented in New Mexico by five more or less shrubby species. Two of them (*A. greggii* and *A. sabulosa*) are woody at the base only, the stems and branches being herbaceous and dying down almost to the ground every year. These two plants are rarely over 2 feet high, and are of no decorative importance although of some value as forage. The other three species are shrubs of some considerable size, generally 4 to 6 feet high, or under favorable conditions even larger.

The Shad Scale (*Atriplex canescens*) is one of the commonest of the shrubs found upon the drier mesas and plains and in their arroyos practically throughout the State. It is a gray much branched shrub with narrow small leaves and dense panicles of winged one-seeded fruits. The staminate flowers appear in congested panicles on the ends of the stems about the middle of the summer and by the middle of August the plants are loaded with the conspicuous fruits, which are at first green and later turn yellowish-brown, remaining on until well into the winter. In many localities where there is no true sage brush this plant is incorrectly referred to under that name, though it is in no way related to the sage brushes. Its grayish scaly leaves and habit of growth are no doubt responsible for this misapplication of the name. Economically it is a moderately valuable forage plant, being eaten freely by stock wherever it grows.

The other two shrubby species (*Atriplex acanthocarpa* and *A. confertifolia*) may be recognized, the first by its

peculiar bluntly spiny fruit, and the second by its spinescent branches with their crowded elliptical leaves. Neither is very abundant within our limits, and both are of some slight value as forage plants.

CHENOPODIACEAE. Goosefoot Family

The family is a very important one in the arid regions where representatives are numerous both as to species and individuals. They seem particularly adapted to bright sunshine and dry soil and very tolerant of alkali. The bulk of the species are herbaceous annuals or perennials but there are several low shrubby perennials that are of importance in one way or another that are included here.

Embryo spirally coiled; leaves fleshy, linear; flowers monoecious; staminate flowers spicate without perianth, pistillate solitary, axillary; fruiting calyx winged.	1. Sacrobatus.
Embryo annular; leaves flat or scale like.	
Stems of branches jointed, younger parts terete and very succulent; leaves scale-like.	2. Allenrolfea.
Stems and branches not jointed; leaves never scale-like, mostly flat and broad.	
Pericarp and plant densely hairy.	3. Eurotia.
Pericarp and plant not densely hairy.	4. Atriplex.

1. SACROBATUS Nees. Greasewood

A divaricately branched shrub with linear leaves; staminate flowers naked in aments: pistillate flowers with a saccate calyx adherent at the 2-lipped apex to the base of the stigmas: calyx laterally margined with an erect 2-lobed border which finally becomes a broad, membranous wing.

A single species in the state.	1. *S. vermiculatus.*

2. ALLENROLFEA Kuntze. Burro Weed

An erect, much branched perennial, somewhat woody at the base: leaves scale-like, broadly triangular: flowers in dense spikes in threes in the axils of the spirally ranked bracts: whole plant succulent.

A single species in the Lower Sonoran Zone.	1. *A. occidentalis.*

3. EUROTIA Adans. Winter Fat

A low, stellately tomentose shrub: leaves alternate, entire, linear to narrowly linear lanceolate: flowers small, clustered, axillary and subspicate; calyx 4-parted; stamens 4.

Widely scattered throughout the state on plains and in the foothills in the Sonoran Zones. A single species.

1. *E. lanata.*

4. ATRIPLEX L. Salt Bushes

Monoecious or dioecious, mealy or scaly annuals or perennials, staminate flowers bractless, variously clustered; pistillate flowers subtended by two persistent bracts which become variously enlarged, thickened and united forming wings, tubercles or spine-like points on the fruit; leaves flat, alternate or opposite.

Fruiting bracts united and completely surrounding the seed; fruits large, 10 mm. in diameter or more.

Bracts winged on the back and margin forming a 4-winged fruit; the margins of the wings with small teeth or none. 1. *A. canescens.*

Bracts becoming thick and spongy, with numerous rigid blunt spine-like projections, never truly winged. 2. *A. acanthocarpa.*

Fruiting bracts united only at the base; fruit smaller, 5 to 7 mm. in diameter.

Stems woody, 3 to 6 ft. tall, widely branched and spinescent; leaves much crowded. 3. *A. confertifolia.*

Stems mostly herbaceous, woody only at the base, erect 2 ft. high or less, not spinescent, leaves not crowded.

Fruiting bracts crested on the back; leaves small, less than ½ inch long. 4. *A. greggii.*

Fruiting bracts not crested on the back, thick; not nerved; leaves larger, about an inch long or more. 5. *A. sabulosa.*

The Buttercup or Crowfoot Family *(Ranunculaceae)* displays many species of well known plants like the Columbine, the Larkspur, the Anemone, the Monkshood in New Mexico but they are all herbaceous. The only woody species within our borders are those that generally go under the name of Clematis or Virgin's bower. Recently they have been separated into three rather well marked genera.

Clematis. There are two or three native species of *Clematis* that thrive well in the State and it is likely that most

species of the genus could be grown here satisfactorily. *Clematis ligusticifolia* is the species which inhabits the ditch banks in most of our valleys, though not confined to such locations. It has large clusters of white flowers each of which is about an inch in diameter, and is followed by a head of feathery tailed seed pods. The leaves are compound and the vine climbs by twisting the small stems of the separate leaflets around the smaller parts of the support provided, whether it be a dead or living tree or the lattice work of a porch. This vine is very vigorous, and while it will endure very adverse conditions without dying, it appreciates and rewards a gardener's care. *Clematis drummondii* is a near relative of the preceding species, which lives upon the mesas and in the foothills of our drier mountains. Its flowers are small and most inconspicuous, the feathery seed pods are longer tailed and less numerous, and the leaves are smaller. Altogether it is not as attractive a plant, though it will no doubt stand greater dryness in the soil.

The Leather Flower (*Viorna bigelovii*) is a species with single flowers on long peduncles; the sepals are maroon-colored, thick and leathery, and white-hairy within. The compound leaves have oval entire leaflets mostly, though some of them are deeply lobed; all are smooth and veiny. This is a vigorous vine, well worth cultivating, which grows in the mountains at elevations of about 5,500 feet. Two other species closely resembling it also occur in the State.

The Purple Virgin's Bower (*Atragene pseudalpina*), of the northern part of the State would probably do well in cultivation while *C. orientalis* has become to a degree naturalized at Las Vegas. All of these species have perennial roots which are easily divided and transplanted. The first named species grows readily from layers and would probably do well from cuttings. They are all quite hardy, though the Leather Flower would stand less drouth than some of the others; none of them will winterkill in the State.

RANUNCULACEAE Juss. Buttercup Family

Herbs or climbing shrubs with alternate leaves, simple or compound, and regular or irregular usually complete flowers having all parts distinct and free. Sepals 3 to 15 often petaloid, mostly falling early. Petals usually the same number or wanting. Stamens mostly numerous. Pistils many or few, sometimes only 1. Fruit achenes, follicles or berries. A large family with only a few shrubby species.

Flowers small, 1 inch in diameter or less, white, numerous in panicles. — 1. Clematis.

Flowers larger, 1 to 3 inches in diameter, mostly solitary or only a few together.

Sepals usually 4 or 5, thick and leathery, dark reddish, not spreading. — 2. Viorna.

Sepals usually 5, thin and of delicate texture, purplish or paler, widely spreading. — 3. Atragene.

All these species have plumose tailed achenes.

1. CLEMATIS L. Virgin's Bower

Perennial vines, more or less woody; flowers small, numerous paniculate, dioecious or the pistillate flowers with sterile stamens; sepals petal-like, white, thin, spreading; petals wanting.

Tails of the carpels 3 to 4 inches long; panicle with few (usually less than 10) flowers; leaflets small, an inch long or less. — 1. *C. drummondii.*

Tails of the carpels 1¾ inches long or less; panicle many-flowered; leaflets 1½ to 3 inches long. — 2. *C. ligusticifolia.*

2. VIORNA Reichenb. Leather Flower

Herbaceous or woody perennials with erect or climbing stems sometimes several feet long; leaves pinnate; flowers solitary on long peduncles, usually nodding; sepals thick erect mostly dull reddish or purple; petals none; anthers linear; achenes usually few.

Leaflets strongly reticulately veined, more or less pubescent; sepals about ¾ of an inch long very thick, attenuate at the apex. — 1. *V. filifera.*

Leaflets smooth, not strongly reticulate-veined; sepals 1 to 1½ inches long, thinner, broader at the apex.

Division of the leaflets acute, lanceolate; tails of the achenes plumose. — 2. *V. bigelovii.*

Divisions of the leaflets obtuse, ovate or oblong; tails of the achenes glabrate or pubescent near the base. — 3. *V. palmeri.*

3. ATRAGENE L. Purple Virgin's Bower

Perennial vines, woody below, with compound leaves; peduncles bearing single large purplish flowers; sepals thin widely spreading; some of the outer filaments enlarged and petaloid.

A single species in the mountains of the northern part of the state. 1. *A. pseudalpina.*

The Barberry Family is represented in New Mexico by 5 species, all of which are more or less woody, though one is but a low plant, rarely over 6 inches tall.

Fendler's Barberry *(Berberis fendleri)* is a low spinescent shrub of the mountains of the northern part of the State, with simple leaves, small yellow flowers, and scarlet berries about the size of currants. It would make a very desirable little hedge plant at Santa Fe and similar elevations. It would probably grow at a lower altitude if given enough water.

The Oregon Grape *(Odostemon repens)* is a small almost prostrate plant with woody stems 5 or 6 inches long and compound leaves, the individual leaflets of which suggest a holly leaf, though of a different color. The berries are about the size of wild grapes and of much the same color. The plant is of no economic importance. There are three other species of this genus that occur in the State.

Algerita (*Odostemon haematocarpa*) is a common evergreen shrub in the lower mountains of the southern part of the State and one well worth cultivation.

It reaches a height of eight to ten feet in favorable locations and forms a bush four or five feet in diameter. The leaves are compound, having three, five and sometimes seven thick, smooth, leathery leaflets, each of which has a few stiff spiny leaves along the margin. They are suggestive of the holly leaves. The bark is stringy and brown; the wood is a bright yellow color and rather tough; the flowers are small, light yellow, and borne in clusters about three inches long, blooming in May and June; the fruits are bright red berries, a little larger than currants, and are ripe in August. In some parts of the State the berries, which are borne in abundance,

are used for making a jelly, which is quite good. This shrub should grow very well in cultivation because it grows naturally in conditions which are more severe than those supplied in any garden, and it would amply reward the gardener for his trouble. It would be necessary to transplant small bushes. *Berberis fremontii* is a shrub which closely resembles the Algerita, except that its fruit is dark blue and dry. It grows in similar situations further west and north, reaching New Mexico only along the western side.

BERBERIDACEAE. Barberry Family

Shrubs (one species low) with alternate exstipulate simple or compound leaves more or less spiny-toothed; flowers yellow, in racemes, the pedicles opposite; parts of the perianth distinct, free, opposite; anthers opening by uplifted valves; pistil simple; fruit a berry.

Stems spiny; leaves simple. 1. Berberis.
Stems not spiny; leaves compound. 2. Odostemon.

1. BERBERIS L. Barberry

Ours is a low shrub, 1 to $2\frac{1}{2}$ feet high, with simple, elliptic to oblanceolate fascicled leaves having weakly spiny-toothed margins; stems spiny; flowers crowded in short, reflexed racemes; fruit a scarlet ellipsoidal berry about the size of a currant.

A single species in the timbered mountains of the northern part of the state. 1. *B. fendleri.*

2. ODOSTEMON Raf.

Shrubs with compound leaves and stems without spines; leaflets mostly coriaceous, persistent, sinuate-dentate with few spiny teeth; flowers in rather loose racemes, the parts in sixes, except the pistil; fruit a few-seeded berry.

Low shrub 4 inches to 1 foot high with but few leaves; leaflets 1 to 2 inches long with numerous serrate teeth; fruit bluish, glaucous. 1. *O. repens.*

Tall shrubs 4 feet high or more; leaflets less than 1 inch long, with few coarse sinuate-dentate teeth.

Leaves trifoliolate; fruit red. 2. *O. trifoliolata.*

Leaves pinnate with 5 leaflets.

Fruit juicy and not inflated at maturity, blood red; terminal leaflet long-attenuate, comparatively narrow. 3. *O. haematocarpa.*

Fruit dry and inflated at maturity, dark blue; terminal leaflet acute, broad. 4. *O. fremontii.*

The Gooseberry Family (*Grossulariaceae*) is too well known to need special description. There are seven native species of WILD CURRANT (*Ribes* spp.) to be found in the mountains of New Mexico, two or three of which occur mainly about timber line. A single species (*Ribes aureum*) with sweet scented yellow flowers, is worth cultivation for its flowers alone. It is already well known in cultivation, generally going under the name of GOLDEN CURRANT or the MISSOURI CURRANT. The other species are of no economic importance, but their abundance in the mountain regions of our State strongly suggests the desirability of growing the cultivated species in such localities.

There are three native species of GOOSEBERRIES (*Grossularia* spp.) that occur in the mountains of this State. None of these are of any economic importance, but their abundance and thriftiness add to the sugestion just made. Both gooseberries and currants are grown successfully in the mountains of the State in a number of places, and if more interest were taken in the growing of small fruits for market there would be less reason for shipping in so many from other states; for they will nearly all grow in the mountains at levels of from 6,000 to 9,000 feet if given water.

GROSSULARIACEAE. GOOSEBERRY FAMILY

Shrubs with mostly erect or spreading habit and often bristly or spiny stems; leaves alternate, simple, petiolate, broadly ovate to rotund, more or less lobed and toothed; inflorescence terminal on short lateral branches; racemose or the raceme reduced to a single flower; flowers regular, perfect (rarely unisexual); hypanthium elongated, short, or obsolete; sepals, petals and stamens 5, alternate; ovary 1-celled; fruit a berry.

Stems mostly without nodal spines or bristles; pedicels jointed beneath the ovary; fruit fruit not breaking from the pedicels.	1. RIBES.
Stems with nodal spines, with or without bris--tles, pedicels not jointed beneath the ovary; breaking from the pedicel.	2. GROSSULARIA.

I. RIBES L. CURRANTS

Unarmed or bristly shrubs with palmately veined, mostly lobed leaves; flowers in several-flowered racemes; pedicels jointed; ovary not spiny, sometimes glandular; hypanthium tubular to cup-shaped, sometimes obsolete; fruit breaking from the pedicel.

Stems armed with spines. (Leaves pubescent or glandular hairy; berries bright red.) — 1. *R. montigenum.*

Stems unarmed.

Sepals slightly united at the base, the hypanthium obsolete. — 2. *R. coloradense.*

Hypanthium evident (very short in *R. wolfii*).

Anthers with a conspicuous cup-shaped gland.

Hypanthium 3 or 4 times as long as broad; fruit red. — 3. *R. inebrians.*

Hypanthium less than twice as long as broad; fruit black. — 4. *R. mescalerium.*

Anthers with at most a callus at the apex.

Hypanthium smooth, 3 or more times as long as thick; leaves involute in vernation. — 5. *R. aureum.*

Hypanthium hairy, shorter; leaves plicate in vernation.

Leaves with amber-colored glands on both surfaces; hypanthium and calyx together ½ inch long. — 6. *R. americanum.*

Leaves without glands; hypanthium and calyx together 5 mm. long or less. — 7. *R. wolfii.*

GROSSULARIA Mill. GOOSEBERRY

Spreading shrubs with numerous stems armed at the nodes with simple or 3-forked spines; leaves broadly ovate to rotund, rather deeply 3- to 5-lobed, the lobes coarsely crenate; racemes few-flowered; pedicels not jointed; ovary and fruit spiny, hairy or smooth; hypanthium evident; fruit not separating from the pedicel.

Ovary densely bristly, the bristles developing into sharp, stout spines in fruit. — 1. *G. pinetorum.*

Ovary smooth with weak, gland-tipped bristles, not spiny in fruit.

Style glabrous; leaves small, 2 mm. in diamter or less, on petioles as long or shorter, crowded; young stems densely spiny, the spines usually stout, often 1 cm. long, divergent and curved; flowers copiously ciliate and somewhat glandular outside. — 2. *G. leptantha.*

Style hairy near the base; leaves larger, mostly more than ¾ inch in diameter, on rather slender petioles longer than the blade, not so numerous as in the preceding; young stems mostly smooth, the spines short, often deflexed, ¼ inch long or less; flowers almost glabrous outside. — 3. *G. inermis.*

The Hydrangea Family (*Hydrangeaceae*). The shrubs of this species are almost without exception well worth cultivation and could, no doubt, be grown in gardens; especially at the middle levels in the State. In the lower valleys they would need some shade and protection from the wind, but could doubtless be grown and would reward the gardener well for his trouble. They all of them produce good sized flowers in considerable abundance.

Edwinia americana is a shrub generally 6 to 8 feet high common along mountain streams and to a less extent on the high peaks, frequently with its roots in the water. Apparently it will endure bright sunlight or partial shade. The leaves are simple, thin, ovate, and serrate, 3 or 4 inches long or less; bright green above and pale or fine white wooly beneath. The flowers are borne in rather dense clusters on the ends of the stems, are white, ½ inch in diameter, and the plant is a rather profuse bloomer. At elevations above 6,000 feet it would probably do very well in cultivation.

Fendlera rupicola is a shrub generally about 6 feet high with grayish bark and small simple leaves. Its pink-tinged white flowers are produced quite abundantly on plants that have sufficient water. The plant grows in the canons of the drier mountains, and will endure rather intense heat and considerable drought. Under favorable conditions it is a most beautiful shrub, its flowers resembling very much those of the mock orange.

FENDLERA RUPICOLA.

Fendlerella utahensis is a low shrub, generally less than 2 feet high, with very small leaves and small white flowers in terminal clusters an inch or so in diameter. As a low shrub comparable to some of the small cultivated varieties of spireas commonly found in our gardens it would be worth cultivation.

The Mock Orange (*Philadelphus* spp.) is represented in New Mexico by four species; all of which would seem to be worth cultivation. Two or three of them would probably stand the heat and dry atmosphere of the lower valleys, though we have not tried them.

Philadelphus argyrocalyx is a species that grows in the timbered mountains, generally among pine timber. Attempts to cultivate it on the mesas at the Experiment Station garden proved unsuccessful, because of the extreme summer heat. In partial shade of larger trees it would probably grow even at this level, where supplied with sufficient water. All of the species have rather large white flowers approximately an inch in diameter, that are borne quite profusely, and they all promise to be of value in cultivation.

HYDRANGEACEAE. Hydrangea Family.

Low or tall widely branching shrubs with opposite branches; leaves opposite, exstipulate, simple, more or less persistent, entire or toothed; flowers perfect, with mostly conspicuous white or yellowish petals, solitary or cymose; calyx of 4 or 5 sepals surmounting the hypanthium; stamens numerous, the filaments slender or sometimes stout and appendaged; ovary partly inferior; fruit a woody capsule.

Flowers in conspicuous cymes of numerous flowers; sepals and petals 5; stamens 10.	
Plants large, often 6 feet high; leaves large toothed.	1. Edwinia.
Plants small, depressed; leaves small, entire.	2. Fendlerella.
Flowers solitary or in 2- or 3-flowered clusters; sepals and petals 4 or 5, usually 4; stamens 8 or more numerous, 15 to 60.	
Filaments appendaged; flowers uniformly 4-parted; stamens 8.	3. Fendlera.
Filaments not appendaged; flowers occasionally 5-parted; stamens 15 to 60.	4. Philadelphus.

1. EDWINIA Heller.

A rather large shrub often 6 feet high, with opposite branches and brownish partly deciduous bark; leaves deciduous, thin, ovate, petiolate, serrate, ½ inch long or less, bright green above, pale or whitish tomentulose beneath; flowers in crowded cymes, white, 5-parted.

A single species of the timbered mountains of the Transition and Canadian Zones.	1. *E. americana.*

2. FENDLERELLA Heller.

A low much branched shrub 1½ to 2 feet high, with grayish young branches, small lanceolate leaves 1 cm. long or less; flowers small, about ¼ inch long, white, in cymose several-flowered clusters; hypanthium decidedly turbinate; capsule considerably exceeding the calyx.

A single species of the drier mountains. 1. *F. utahensis.*

3. FENDLERA Engelm & Gray.

A shrub 6 feet high or less, with grayish bark, rather small leaves, and beautiful pink-tinged white flowers frequently borne in great profusion; leaves entire, mostly sessile; flowers 4-parted; filaments of the 8 stamens flattened and with 2 narrow appendages at the top extending beyond the anther.

A single species of the drier mountains in the Upper Sonoran Zone. 1. *F. rupicola.*

4. PHILADELPHUS L. Mock Orange.

Freely branching shrub 8 feet high or less, mostly with conspicuous white flowers; leaves mostly small, ¾ inch long or less, elliptic-lanceolate to ovate; flowers on short pedicels, mostly solitary; sepals and petals 4, rarely 5, stamens numerous, 15 to 60; ovary about two thirds inferior.

Petals acute; ochroleucous; stamens about 15. 1. *P. mearnsii.*

Petals rounded at the apex, white; stamens 25 to 60.

Hypanthium externally glabrous to strigose. 2. *P. microphyllus.*

Hypanthium densely pubescent, silvery white.

Leaves 1 to 1¼ inches long, hirsute beneath, the pubescence loose. 3. *P. argyrocalyx.*

Leaves ¼ to ½ inch long, silky strigose beneath, the pubescence close and dense. 4. *P. argenteus.*

THE ROSE FAMILY (*Rosaceae.*)

This is a large family and is represented by many species and genera in our State; most of them, however, being herbaceous plants. Many of our cultivated plants of the utmost economic importance have been derived from wild plants of this and closely related families. Twelve genera of shrubs occur within our limits, several of which are valuable either as forage plants or for decorative purposes.

The Wild Roses (*Rosa* spp.) are represented in New Mexico by 10 species, several of which are very closely related and with difficulty separable. The best known species are *Rosa fendleri* and *Rosa suffulta,* both of which are fairly common in the mountains above 6,000 feet. *Rosa neomexicana* has grown very well with a little care in the Experiment Station garden, and bloomed very profusely. *Rosa stellata* and *Rosa mirifica* are well worth cultivation, on account of the large size and the color of their flowers. The former is known from but a single locality in the Organ Mountains, where it covers the side of one small dry hill. The latter is common in the higher mountains further east. Any of the species will repay the gardener who likes to grow wild flowers. They are, of course, not to be compared with the ordinary cultivated types for beauty.

Opulaster monogynus is a small shrub, generally 2 or 3 feet high, profusely branched and covered with small clusters of white flowers that suggest some of the garden spireas. For decorations of lawns or for massed shrubbery it should be a very satisfactory little plant. It occurs at elevations of from 6,000 to 8,000 feet.

Petrophyton caespitosum is a rather rare prostrate woody plant with stems several inches long and sometimes as large as a lead pencil but rarely over one or two inches high, with crowded small leaves and slender spikes of small white flowers. It would be valuable for use only in rockeries.

The Wild Raspberry *(Batidaea strigosus)* is a spiny shrub 3 feet high or less, with compound leaves having 5 to 7 leaflets and inconspicuous white flowers, followed by bright red juicy berries with a very pleasant taste and odor. It occurs in the timbered areas of our mountains, growing in large patches on the hillsides among the pines. The fruit is abundantly produced and is much appreciated by the people of the region, who gather it for table us.

The Thimble Berry *(Bosschia parviflora)* is a rather conspicuous plant in the higher mountains. The berries are like the red raspberry, and are very pleasant to the taste. The flowers are white and often 2 inches in diameter. The stems are woody only at the very base, the upper portion being herbaceous and rarely more than 2 feet high. The leaves are large, generally several inches in diameter and 5-lobed, suggesting some types of maple leaves. The plant is moderately common in the deep forests of the upper mountain slopes. The presence of the preceding species and this one in abundance in our mountains strongly emphasizes the desirability of growing small fruits in such locations.

Three shrubs that are closely related to the preceding belong in the genus *Oreobatus,* and occur in our mountains at elevations above 6,000 feet. The fruits of these plants are of very little importance, but they are nice looking shrubs 2 to 4 feet high, producing rather large white flowers in some abundance.

The Shrubby Cinquefoil *(Dasiphora fruticosa)* is a densely branched shrub often 3 or 4 feet high, with reddish-brown stringy bark and compound leaves having 3 to 7 leaflets. The flowers are bright yellow, about an inch in diameter, and are borne quite profusely. The plant is doubtless quite resistant to cold, but will grow at intermediate elevations. It is quite handsome and well worth cultivation.

Apache Plume *(Fallugia paradoxa)* is a widely branching shrub, often 6 or 8 feet high, with numerous white flowers

as large as apple blossoms and followed by a cluster of reddish-tinged plumose akenes that suggested the name here given by Mr. James K. Metcalfe. This shrub grows very rapidly when supplied with abundance of water, but will endure extremes of drought. It is apparently at home in the drier mountains at elevations of 6,000 or 7,000 feet, but follows down the mountain canyons and out on to the mesas in the arroyos. Besides its decorative value it is one of the most important of forage-producing shrubs of the region in which it grows. It rarely reaches its full height except where protected from animals.

Mountain Mahogany (*Cercocarpus* spp.) is represented in New Mexico by four species, all of which are more or less valuable for the forage they produce. These plants are also frequently used for firewood. They may be recognized by the single tailed akenes which protrude beyond the persistent base of the tubular calyx. The flowers are inconspicuous and lack petals. The wood is very hard and heavy, as is suggested by the common name, and of dark reddish-brown color, capable of taking a high polish. It is used occasionally for the manufacture of small articles, but is not produced in sufficient quantity to be of any particular value. It is exceedingly brittle and almost too heavy to float. The shrubs vary in height from 3 to 12 feet or even larger, and are extensively browsed by cattle, sheep and goats. They occur on the rockier and drier mountain slopes at elevations of from 5,000 to 8,000 feet.

Cowania mexicana is a very similar shrub but with resinous leaves and stems, yellowish-tinged flowers and only five akenes in each flower. It occurs at higher elevations, mainly in the mountains of the western part of the State. It also would be worth cultivating.

Sericotheca dumosa is a shrub 6 to 10 feet high with a few main spreading stems that branch profusely and gracefully. The leaves are simple, an inch or so long, with a few rounded teeth and densely white hairy beneath. The flowers

are small, less than ¼ inch in diameter, but borne in large terminal panicles. They are pale cream colored and endure for some considerable time. This is one of the most graceful native shrubs, and is a very profuse bloomer. It should do well in cultivation at middle elevations in the State.

ROSACEAE. Rose Family.

Herbs, shrubs and trees with alternate stipulate leaves (stipules often fugacious) and perfect flowers; hypanthium saucer shaped, spherical, turbinate, or tubular, often margined by a disk bearing the stamens; sepals and petals normally 5, rarely of a different number, petals wanting in one genus; stamens numerous, sometimes reduced to 5; carpels 1 to many, dry or fleshy, dehiscent in a few genera; fruit achenes, follicles or drupelets, (in some genera the receptacle is accrescent).

A large family, many of the species of economic importance, including the originals from which various horticultural varieties have been developed. These include several of the small fruits and many decorative plants that are extensively used.

Hypanthium constricted at the throat, wholly inclosing the achenes, becoming more or less fleshy in fruit; carpels numerous. — 1. Rosa.

Hypanthium not constricted at the throat, neither fleshy nor prickly, at most loosely investing the fruits.

Fruit consisting of 1 to 5 dehiscent follicles.

Follicles more or less united at the base; leaves broadly ovate and lobed, 1 to 1½ inches long. — 2. Opulaster.

Follicles distinct, usually 5; leaves very small, spatulate, less than ½ an inch long. — 3. Petrophyton.

Fruit usually consisting of numerous indehiscent carpels, becoming either achenes or drupelets.

Carpels becoming more or less fleshy drupelets.

Styles filiform; stigmas capitate; leaves compound; stems spiny. — 4. Batidaea.

Styles club-shaped; stigmas 2-lobed; leaves simple; stems unarmed.

Drupelets capped by a hard hairy cushion; stems suffrutescent, dying back leaves large; fruit pleasantly acid and pulpy — 5. Bossekia.

Drupelets without cushions; stems nearly all woody; leaves small; fruit hardly at all pulpy. 6. OREOBATUS.

Carpels becoming achenes; styles not articulated to the ovary.

Hypanthium bearing bracts; achenes several to many; more or less hairy.

Flowers yellow; leaves pinnately compound; achenes not tailed. 7. DASIOPHORA.

Flowers white; leaves deeply lobed, not compound; achenes with long plumose tails. 8. FALLUGIA.

Hypanthium bractless; achenes mostly fewer, 5 or less.

Hypanthium flat; carpels 5; flowers white, small, numerous in a small panicle. 9. SERICOTHECA.

Hypanthium funnelform or tubular; flowers mostly solitary and larger.

Petals wanting; hypanthium long-tubular; calyx deciduous from the hypanthium; carpels solitary; achenes long plumose tailed. 10. CEROCARPUS.

Petals 5; hypanthium turbinate; calyx persistent.

Carpels about 5; achenes with long plumose tails. 11. COWANIA.

Carpels 1; achenes not plumose tailed. 12. KUNZIA.

1. ROSA L. ROSE.

Low, more or less spiny shrubs 6 feet high or less, with mostly slender branches and odd pinnately compound leaves; stipules conspicuous, adnate to the petioles; leaves 3 to 9 foliate; flowers solitary or in few-flowered corymbs terminating the branches, large and showy, 1 to 2½ inches in diameter, pink or rose purple fading lighter; hypanthium spherical or ellipsoidal, not bracteolate; sepals 5, more or less foliaceous tipped; petals broadly ovate to rotund; dry or somewhat succulent by the softening of the hypanthium.

Hypanthium and fruit densely spiny; sepals all or nearly all lobed.

Young branches densely lepidote stellate; leaves usually wth 3 leaflets. 1. *R. stellata.*

Young branches with a dense covering of short, mostly gland-tipped spines, not lepidote stellate; leaves mostly with 5 leaflets. 2. *R. mirifica.*

Hypanthium not spiny; sepals not lobed.

Infrastipular spines not present.

Flowers corymbose at the ends of the branches. 3. *R. suffulta.*

Flowers solitary at the ends of the branches. 4. *R. sayi.*
Infrastipular spines present.
Sepals not bristly.
Petioles not glandular, the bracts often glandular toothed.
Spines few, stout, strongly curved; leaflets pale above, small, thick. 9. *R. neomexicana.*
Spines numerous, slender, straight or nearly so; leaflets bright green above, larger, thin. 10. *R. maximiliana.*
Petioles strongly glandular.
Leaves finely pubescent beneath, often strongly glandular. 8. *R. fendleri.*

2. OPULASTER Medic.

A low shrub, 3 feet high or less, with exfoliating bark, and white flowers in terminal corymbs; leaves simple, rounded ovate in outline, 3 to 5-lobed, glabrous or nearly so, doubly incised serrate; flowers small; hypanthium about 3 mm. broad, stellate; petals orbicular, about 3 mm. long; follicles 2 or rarely 3, united to above the middle, densely stellate, with spreading beaks.

A single species of the Transition Zone. 1. *O. monogynus.*

3. PETROPHYTON (Nutt.) Rydb.

A densely caespitose and depressed undershrub with prostrate branches; leaves spatulate, 5 to 12 mm. long, 2 to 4 mm. wide, densely silky; peduncles 1 to 4 inches high, with bract-like, subulate leaves; inflorescence a dense spike of small whitish flowers; sepals ovate-lanceolate, acute, 1.5 mm. long; petals spatulate, obtuse, about the same length; follicles 3 to 5, 2 mm. long.

A single species. 1. *P. caespitosum.*

4. BATIDAEA Greene. RASPBERRY.

Spiny shrubs 3 feet high or less, with 5- to 7-foliolate leaves, and inconspicuous white flowers; stems of the first season erect, armed with straight prickles; leaves of the flowering branches with fewer leaflets; leaflets ovate to rhombic-lanceolate, serrate, the terminal sometimes lobed, green above, densely white-tomentose beneath; fruits bright red, juicy, with pleasant taste and color.

1. *B. strigosa.*

5. **BOSSEKIA** Necker. THIMBLE-BERRY.

A low, unarmed perennial, 1 to 2 feet high, with mostly herbaceous stems arising from a woody base, and bearing a few large 3- to 5-lobed leaves often 4 or 5 inches across; flowers white, 1 to 2 inches broad; calyx densely tomentose; sepals long-acuminate; fruit large, red, pleasantly flavored.

1. *B. parviflora.*

6. **OREOBATUS** Rydb.

Unarmed branching shrubs 3 feet high or less, with 3- to 5-lobed stipulate leaves, and brownish shreddy bark; hypanthium flat, not bracteolate; sepals broadly ovate, with elongated tips, accrescent; loosely enclosing the fruit; flowers white, conspicuous; fruit fleshy or soon dry.

Petals 1 to 1½ inches long; leaves not lobed or with mostly 5 shallow lobes, the teeth very acute. 1. *O. deliciosus.*

Petals less than ¾ inch long; leaves conspicuously 3-lobed, the teeth mostly obtuse. 2. *O. rubicundus.*

7. **DASIPHORA** Raf. SHRUBBY CINQUEFOIL.

Low branching shrub with pinnately 3- to 7-foliolate silky leaves with scarious stipules; young branches silky villous, the older stems brown, with shredded bark; flowers bright yellow, axillary and solitary or in small cymes; hypanthium saucer-shaped; bractlets, sepals and petals 5; petals nearly orbicular; stamens about 25; achenes densely villous.

A single species of the timbered mountains. 1. *D. fruticosa.*

8. **FALLUGIA.** APACHE PLUME.

A much branched evergreen shrub 4 to 6 feet high, with slender white young branches, and small, fascicled, cuneate-obovate, pinnately divided, hispidulous leaves; divisions of the leaves narrowly oblong, obtuse, revolute; flowers numerous, the stems of the inflorescence somewhat corymbosely branched and the leaves reduced to bracts; hypanthium hemispheric, with several linear-lanceolate bracts alternating with the ovate, abruptly long-acuminate sepals; petals 5, broadly obovate to rotund, white; stamens numerous; achenes numerous, obovate-fusiform, long-tailed.

1. *F. paridoxa.*

9. SERICOTHECA Raf.

A shrub 6 to 10 feet high, with a few main stems and numerous spreading branches bearing simple leaves and terminal spreading panicles of small white flowers; leaves obovate or ovate, decurrent, with a few rounded teeth, densely white villous beneath; sepals 5, 1.5 mm. long, cream-colored like the hemispheric hypanthium; petals 5, elliptic or oval, about 2 mm. long; stamens about 20; pistils 5.

1. *S. dumosa.*

10. CERCOCARPUS H. B. K. Mountain Mahogany.

Shrubs 3 to 12 feet high with stout stems, rather widely branching and hard brittle wood; leaves simple, fascicled, evergreen, small; flowers solitary or fascicled with the leaves, inconspicuous; hypanthium tubular, ½ inch long or less, persistent; sepals dull whitish, small; corolla wanting; stamens numerous in 2 or 3 rows, deciduous with the calyx; fruit a terete or fusiform densely villous achene terminating in a long, slender, variously bent and curved plumose tail sometimes 2 inches long.

Leaves large, 1 to 1½ inches long, coarsely toothed.
- Pubescence of the petioles and flowers appressed, silky. — 1. *C. parviflorus.*
- Pubescence of the petioles and flowers spreadnig, not silky. — 2. *C. pallidus.*

Leaves small, ¾ inch long or less, entire or with a few inconspicuous and very small teeth near the apex.
- Pubescence of the petioles and flowers spreading, loose; upper surface of the leaves mostly soft-pubescent. — 3. *C. paucidentatus.*
- Pubescence appressed, silky; upper surface of the leaves glabrous or with a few silky, appressed hairs; leaves narrower. — 4. *C. breviflorus.*

11. COWANIA Don.

Spreading shrub 3 to 6 feet high, with small, pinnate, cuneate-obovate, very glandular, crowded leaves with oblong segments with revolute margins, and solitary flowers; leaves 10 to 15 mm. long, glabrate above to tomentose beneath; hypanthium turbinate, tomentose and glandular pubescent; sepals 5, broadly ovate, obtuse, densely tomentose, glandular on the back; petals broadly obovate, pale yellow; achenes about 5, densely villous and plumose tailed, the tail sometimes 1 to 2 inches long.

1. *C. mexicana.*

12. KUNZIA.

A low, intricately branched, prostrate shrub, with small fascicled, tomentose, cuneate, crenate leaves, and solitary flowers terminating in short branches; hypanthium turbinate; sepals ovate, obtuse; petals small, obovate, yellow; fruit fusiform, pubescent, long-tailed.

1. *K. tridentata.*

The Almond Family (*Amygdalaceae*) is represented in New Mexico by seven species of Choke Cherry, two or three of which are trees of some size; a single species of Plum; and a single small wild Cherry.

The Choke Cherries (*Padus* spp.) may be recognized by their abundant racemes of small white flowers, followed by the astringent black or reddish fruits; while the true Cherry (*Cerasus crenulata*) has its fruits in small fascicles. One species of the choke cherry is a tree 20 feet high or less, with smooth purplish-brown trunk and slender, slightly drooping branches. It occurs mostly in the canyons of the drier mountains at the southern part of the State, and has been passing under the name of a species originally described from south Central America (*Prunus capollin*). This tree is well worth cultivation as a shade tree, but we have not succeeded in getting it to grow.

The single species of **Plum** which grows in the mountains at elevations of approximately 7,000 feet is the ordinary Eastern wild plum (*Prunus americana*). We have found it only on lands that are or have been under cultivation, and it may have been introduced in these places. It is apparently thoroughly at home and entirely "wild" at present. There is a large patch of these plums near the Indian village of Taos on the Indian Reservation, and the fruits are used by the Indians.

AMYGDALACEAE. Almond Family

Trees or shrubs with alternate petiolate, simple, mostly serrate leaves and fugacious stipules; bark, leaves and seeds bitter with prussic acid; flowers perfect, solitary, fascicled, corymbose, or racemose; hypanthium mostly spheroidal, free from the simple and solitary ovary; sepals and petals 5; stamens mostly numerous; fruit a drupe.

Flowers in long racemes, on short leafy branches of the year.	1. Padus.
Flowers in corymbs or umbels on short stems of the preceding year, preceding the leaves.	
Stone of the fruit flattened, with more or less acute edges.	2. Prunus.
Stone of the fruit spheroidal, little or not at all flattened.	3. Cerasus.

1. PADUS. Choke Cherry

Large shrubs or small trees with smooth, dark-colored bark and alternate, simple, petiolate, deciduous leaves; flowers numerous, in elongated racemes terminating short leafy branches of the year; hypanthium spheroidal, sometimes campanulate; sepals 5, short, persistent or deciduous with a part of the hypanthium; petals 5, white, with the numerous stamens on the throat of the hypanthium; carpels solitary; ovary 1-celled, 2-ovuled; drupe small, usually 1 cm. in diameter or less, astringent, not glaucous.

2. PRUNUS L. Plum

A low treelike shrub 10 feet high or less, forming thickets; branches stout, rigid, divaricate, somewhat spiny; bark grayish; leaves elliptic, obovate, somewhat abruptly long acuminate, sharply serrate, glabrous; flowers white, abundantly produced before the leaves; fruit ellipsoidal, about ¾ inch long, yellowish red, with pleasant, rather tart flavor; stone flattened acute on both edges.

1. *P. americana.*

3. CERASUS. Cherry

A small slender tree 10 to 12 feet high, with smooth purplish or reddish brown bark, slender virgate branches, small leaves, and

corymbose white flowers; leaves 1 to 2 inches long, oblong elliptic, slightly attenuate to the base, acute or abruptly short-acuminate, crenulate, on petioles ½ inch long or less; corymbs about 4-flowered; hypanthium campanulate, glabrous; petals small, white; fruit ovoid, red, stone ovoid.

1. *C. crenulata.*

The Apple Family *(Malaceae)* is represented in the State by three genera containing eleven species, none of which are of any especial importance, but all of which are shrubby plants more or less worth cultivation for decorative purposes.

The Service Berries *(Amelanchier* spp.*)* occur in the mountains mostly in the pine forests, there being 7 species within our limits. These are all good sized shrubs 3 to 6 feet high, with alternate simple mostly coarsely serrate small leaves and rather delicate white flowers in clusters, terminating the branches of the year. The fruits are reddish or dark purplish-black, pulpy, and berry-like.

There are three **Hawthornes** *(Crataegus* spp.*)* in the State, all of which are large sized shrubs with stout spiny stems and simple toothed or lobed leaves. The flowers are white and borne in clusters much as apple blossoms are, but smaller. The fruits suggest small apples, about ½ inch in diameter or less. One species is known to the Mexicans as *Manzano de puna larga.*

The Mountain Ash *(Sorbus scopulina)*, described originally from Santa Fe Canon, is a shrub from 3 to 10 feet high, with compound leaves and small white flowers in large terminal clusters. The leaflets are 1 to 1½ inch long, 11 to 15 to the leaf. The fruit is a small berry-like pome. It occurs in the mountains at middle elevations.

MALACEAE. Apple Family

Trees or shrubs, with alternate simple or pinnately compound leaves having fugacious stipules; flowers regular, in racemes or cymes; hypanthium mostly spheroidal, adnate to the 1- to 5-celled ovaries; petals and sepals 5; stamens usually many, distinct; fruit a pome with papery, bony or leathery capsule.

Cavities of the ovary becoming twice as many as the styles by a false, partial or complete partition; fruit soft and berry-like; flowers racemose.	1. Amelanchier.
Cavities of the ovary not divided, as many as the styles; fruit a pome; flowers in corymbiform cymes.	
Leaves simple, lobed; ovules one in each carpel.	2. Crataegus.
Leaves pinnate; ovules 2 in each carpel.	3. Sorbus.

1. AMELANCHIER L. · Service-berry

Shrubs 3 to 6 feet high, with alternate simple, mostly rather coarsely serrate small leaves, and white flowers in racemes terminating short branches of the year; stamens numerous, all borne on the hypanthium, the latter adnate to the inferior ovary; fruit berry-like.

Leaves acutish, oblongovate.	1. *A. rubescens.*
Leaves obtuse to truncate, broader.	
Mature leaves finely pubescent, at least beneath.	
Leaves crenate, pubescent on both surfaces.	2. *A. crenulata.*
Leaves sharply serrate, pubescent beneath.	3. *A. bakeri.*
Mature leaves glabrous or loosely villous, never finely pubescent.	
Whole plant perfectly glabrous.	4. *A. poylcarpa.*
Bud scales and usually the young leaves villous.	
Mature leaves with loose pubescence beneath and often above, not cordate or but slightly so, often cuneate, usually entire below the middle.	
Petals 8 mm. long or less.	5. *A. oreophila.*
Petals 10 to 15 mm. long.	6. *A. ulmifolia.*

2. CRATEGUS L. Hawthorn

Shrubs or small trees with stout spiny stems, simple, alternate, toothed or lobed leaves, and white flowers in corymbs; hypanthium urceolate, adnate to the ovary; sepals 5, persistent; petals 5, spreading; stamens 5 to 10; fruit small, drupaceous, having 2 to 5 bony, 1-seeded carpels.

Spines short, ¾ inch or less, not very numerous; leaves mostly elliptic, not noticeably lobed, the blade about twice as long as wide. 1. *C. rivularis.*

Spines longer, 1½ inches or more, commonly numerous; leaves broader, at least some of them more or less lobed.

Leaves elliptic-ovate, rather coarsely serrate, some of them with a few larger lobe-like teeth, the smaller teeth gland-tipped; leaves cuneate at the base. 2. *C. cerronis.*

Leaves broadly ovate, with 3 to 4 pairs of broad lobes, finely serrate or doubly serrate with straight teeth, not gland-tipped; base of leaves truncate. 3. *C. wootoniana.*

3. SORBUS L. Mountain Ash

Shrub 3 to 10 feet high with pinnate leaves and white flowers in compound cymes; hypanthium urceolate or turbinate; leaflets 11 to 15, 1 to 1½ inches long, oblong-lanceolate, serrate, glabrous; sepals 5; petals 5, spreading, short-clawed; stamens 20; styles 3 to 5, distinct, wooly at the base; fruit a berry-like pome.

A single species in the Transition Zone. 1. *S. scopulina.*

The Mimosa or Acacia Family *(Mimosaceae)* contains several shrubs of considerable importance that grow mainly upon the lower, hotter, and drier mesas and in the foothills of the mountains. Five genera are represented. These plants may be recognized by their once or twice compound leaves with numerous very small leaflets; their inconspicuous regular flowers, usually clustered in circular heads or spikes and having numerous stamens; their spiny stems and bean-like fruits.

Two species of **Acacia** *(A. greggii* and *A. constricta)* are common shrubs on the mesas and in the arroyos. *Acacia greggii* is sometimes called Cat Claw, while the other species has no common name. The former is of some value as a forage plant in the region where it grows, being browsed more or less extensively by cattle. Its flowers are pale dirty white and the pod is a flattened one, ¾ inch wide and several inches long, more or less twisted and bent. *Acacia constricta* forms large patches of shrubs 3 to 5 feet high on the driest of our gravelly mesas. Its flowers are bright yellow in spherical heads about ¾ inch in diameter, and very pleasantly perfumed. The fruit is a straight cylindrical pod 3 to 4 inches long, ⅛ inch in diameter, and constricted between the seeds. This little plant is worth cultivating, though we have been but partially successful in transplanting it.

The Tornillo or Screw Bean *(Strombocarpa pubescens)* is one of the common large shrubs of the river valleys in the southern part of the State, where it is everywhere known under its Spanish name. It is economically of great importance, since the larger stems or trunks are used for fence posts and serve very well for this purpose, since they do not decay rapidly. The wood is extensively used for fuel, being the best for this purpose to be had at the lower levels. Under cultivation the plant grows with fair rapidity and produces a characteristic slender and graceful shrub which will work in well for mass planting in situations where the temperature is high and the water supply small.

Mesquite (*Prosopis glandulosa*) is one of the best known and most characteristic plants of the arid Southwest, though the common name is applied to several nearly related species. In southern New Mexico it is a plant of great economic importance. The flowers furnish the best of nectar for honey making, the leaves and pods are eaten by all kinds of grazing animals. The large roots and thickened bases of the stems furnish the best fuel of the region. As a graceful branching shrub for a dry situation it has no equal, giving an impression very similar to the pepper tree, though not assuming the tree form.

The Cat Claws or Gatunas, genus *Mimosa*, are represented by 5 species, all of which are closely alike. They are characterized by hooked triangular spines very much like the claw of a cat, and small white or pinkish flowers, usually without odor. Mostly they are widely branching low shrubs of no very great importance. One or two of them might be used in cultivation.

The Bird of Paradise Tree (*Poinciana gilliesii*) is an introduced shrub of South American origin which is used somewhat extensively for decorative purposes in the southern part of the State. It is the only shrubby representative of the Senna family (*Cassiaceae*). It is an ill smelling erect shrub, sparingly branched, with green stems 6 to 8 feet high. The leaves are quite large, twice compound and with very numerous small leaflets. The flowers are large, over an inch long, with bright yellow petals and long red stamens and pistils. The fruit is a large flat pod, which is explosive when dry.

MIMOSACEAE. Mimosa Family

Shrubs or suffruscent perennials with spiny stems and bipinnately compound leaves with usually numerous small leaflets; flowers regular, small, in axillary pedunculate heads or spikes; calyx 4- or 5-parted (sometimes wanting in Acuan); corolla of 4 or 5 distinct or united petals; stamens 5 to 10 or numerous, distinct or

united; fruit a more or less flattened dehiscent or indehiscent legume.

Stamens numerous, always more than 10; corolla polypetalous; stamens distinct.	1. ACACIA.
Stamens 5 or 10, distinct.	
Flowers 5-merous, anthers tipped with a gland; pods indehiscent, large shrubs.	
Pod spirally coiled; flowers yellow.	2. STROMBOCARPA.
Pods elongated, not coiled; flowers greenish.	3. PROSOPIS.
Flowers 4- to 5-merous; anthers not gland tipped; pods dehiscent, flatterend; leaves not sensitive or at most, tardily so; plants erect or spreading.	
Plants without spines of any kind; stems mostly herbaceous.	4. ACUAN.
Plants armed with numerous, short, recurved triangular spines; shrubs with woody stems.	5. MIMOSA.

1. ACACIA L.

Shrubs or low trees with armed or smooth stems and bipinnate leaves with numerous very small leaflets; flowers small, regular, in spikes or heads on axillary peduncles; corolla valvate, of 4 or 5 similar petals; stamens numerous, distinct, exserted; pod flattened or terete, 2-valved, dehiscent.

Flowers in elongated spikes; pods flat, ½ to ¾ inch wide; curved; spines short and hooked.	1. *A. greggii.*
Flowers in globose heads; pods terete, or if flat less than ½ inch wide, straight; spines straight and slender or none.	
Spiny shrub 3 feet high or more; flowers bright yellow, sweet-scented; pods terete, constricted between the seeds.	2. *A. constricta.*
Unarmed shrubs less than 3 feet high; flowers whitish, odorless; pods flat and thin.	
Leaflets 8 to 13 pairs, obtuse; inflorescence nearly always axillary.	3. *A. cuspidata.*
Leaflets 18 pairs or more, acute; inflorescence becoming paniculate, sometimes axillary.	4. *A. filicioides.*

2. STROMBOCARPA A. Gray. SCREWBEAN TORNILLO

A tall gracefully spreading shrub 15 feet high or less, branching from the base, with dense, dark-colored wood; leaves small, bipinnate, with 1 or 2 pairs of pinnae; leaflets 5 to 8 pairs, short-oblong; young parts pubescent; stipular spines rigid, ¾ inch long

or less, whitish; flowers yellow, in crowded spikes; pod an indehiscent spirally coiled legume. A typical plant of the Lower Sonoran Zone.

1. *S. pubescens.*

3. PROSOPIS L. MESQUITE

A much branched shrub 10 feet high or less, seldom larger, with rigid, tough stems bearing large stipular spines; leaves bipinnate with 1 or 2 pairs of pinnae and numerous oblong entire leaflets; flowers small, greenish yellow, in axillary spikes; fruit an indehiscent, slightly compressed, straight or falcate legume. Mostly in the Lower Sonoran Zone but reaching into the Upper Sonoran.

1. *P. glandulosa.*

4. ACUAN Medic.

Suffrutescent perennials with unarmed herbaceous stems and bipinnate leaves with numerous small leaflets; flowers in axillary pedunculate heads, greenish white; calyx sometimes pappiform or wanting; stamens 5 or 10, the anthers not gland bearing; fruit a flattened dehiscent legume, straight or acute.

A single species. 1. *A. jamesii.*

5. MIMOSA L. CATCLAW

Low shrubs with stems armed with hooked spines; leaves bipinnate, the leaflets small; flowers in spikes or heads, small; sepals and petals 5; stamens 10, distinct; fruit a flattened pod, armed or unarmed, sometimes constricted between the seeds.

Flowers in spikes (pink) 1. *M. dysocarpa.*
Flowers in spherical heads.
  Pinnae 4 to 7 pairs, pubescent.
    Young stems not flexous, somewhat virgate; pods usually not constricted between the seeds, straight. 2. *M. lemmoni.*
    Young stems flexous; pods more or less constricted between the seeds, conspicuously arcuate. 3. *M. biuncifera.*
  Pinnae 1 to 3 pairs, glabrous.
    Pods more or less spiny. 4. *M. borealis.*
    Pods not spiny. 5. *M. fragrans.*

The Pea Family* *(Fabaceae)* is one of the largest occuring in our range, but most of the species are herbaceous; only a few of them being shrubby and one native species of small trees. The flowers of almost all of the species of this family are constructed on the plan of a pea blossom, with a large upper petal known as a "banner," two similar side petals called the "wings," and the lower two petals united along the lower edge, forming the "keel." The family includes such well known plants as the lupines, the vetches, the clovers, alfalfa, and the loco weeds. Following is a list of the shrubby forms several of which are of great economic importance.

Coral Bean *(Broussonetia secundiflora)* is a very beautiful evergreen shrub 8 or 10 feet tall, with dark glossy green once compound leaves and violet flowers, followed by large constricted pods containing bright scarlet bean-like seeds. The latter are said to be poisonous. The plant occurs native in the Guadalupe mountains near Carlsbad and would be a very desirable plant to have in cultivation. A single attempt to grow it from the seeds was not successful.

In the extreme southwestern corner of the State there comes in a good sized shrub *(Erythrina flabelliformis)* with trifoliolate leaves and bright scarlet flowers. The stems are thick and somewhat succulent and beset with scattered hooked prickles. The corolla is large, elongated, almost 2 inches long in some specimens. It would be well worth cultivation and would no doubt endure the dry hot conditions of our lower levels.

Parryella filifolia is the name of a low, much branched shrub 2 or 3 feet high, with glandular dotted many foliolate leaves and small dull yellowish green flowers. The fruit is a one-seeded pod about 1/8 inch long, covered with minute yellowish glands. The flowers are very inconspicuous and the corolla is entirely wanting. It suggests a small dwarfed mes-

* In the older texts this and the two preceding families are usually referred to as Leguminosae.

quite bush in its general habit, but is without spines. It would endure the lower temperatures, but its decorative value is merely that of a curiosity.

Along the ditch banks and to some extent in the mountains occurs a tall shrub 6 to 10 feet high, with leaves resembling the ordinary black locust leaves, and elongated spikes of small dark purple flowers. This is *Amorpha californica*. As a decorative shrub for massing and in windbreaks it would be valuable at almost any place in the irrigated valleys, where it is now perfectly at home. It grows rapidly and readily and forms a large amount of foliage. The flowers are not conspicuous, but are peculiar for this family, having only one of the petals present (the banner). They have a characteristic somewhat acrid odor. Two other species of this genus grow in the mountains of the State, both of which would be worth cultivation. They are somewhat smaller than the one already described, usually not more than 3 or 4 feet high, and with slightly more conspicuous flowers. One of them (*Amorpha canescens*) is ashy gray in color, with small leaflets and small one-seeded pods. *Amorpha microphylla* is somewhat similar, but green and smooth.

The New Mexican Black Locust, AGARROBA, (*Robinia neomexicana*) is a large shrub or small tree growing in our mountains at elevations of 6,000 feet and more, commonly restricted to the drier and rockier slopes, where it not infrequently forms dense thickets 10 or 15 feet high. The trunk is never large, rarely over 4 inches in diameter, and the top is open and straggling. It is easily transplanted, and grows well in cultivation. The leaves resemble those of the common black locust and the flowers are similar in shape, slightly larger and of a bright rose pink color, borne on somewhat shorter peduncles. The pods are thicker than those of the black locust, and have fewer seeds. The tree is covered with spines very similar to those of the black locust. The Black Locust itself (*Robinia pseudacacia*) is a common cultivated tree throughout the State, and is a very satisfactory shade tree indeed, enduring heat,

light and drought very well. There is but one reason for not using it extensively as a shade tree, and that lies in the fact that it is attacked by a borer, which ultimately kills it and which is itself hard to kill. Its beautiful white sweet-scented flowers produced so abundantly in the early summer are certainly delightful.

The genus *Parosela* is represented by some 20 or more species in New Mexico, and most of them are fairly common, but the greater number of them are herbaceous annuals or perennials. Two or three species are low shrubs and worth cultivation, especially at the lower levels, since they are very drought resistant. One of them *(Parosela formosa)* is a low, much branched shrub 2 or 3 feet high, with very small leaves having leaflets less than ⅛ inch long and numerous small purple flowers. Another species closely resembling this, but with a white banner is *Parosela frutescens*..

On the sand hills of the lower valleys will be found a gray shrub which seems to be all slender gray stems. Its leaves are very minute and widely scattered. On the ends of the stems during the blooming season are small crowded clusters of deep blue flowers, which are borne in considerable profusion. This is *Parosela scoparia*, and it is worth cultivation in any of the warmer locations, because of its drought resistance and its somewhat bizarre appearance.

FABACEAE. Pea Family

Herbs, shrubs, vines or trees, many of them of great economic importance: leaves alternate, the blades mostly compound; flowers perfect, solitary, clustered, racemose, or capitate; calyx tubular or campanulate, with 4 or 5 teeth or lobes; corolla papilionaceous, (reduced to one petal in one genus and wanting in another); stamens normally 10, sometimes 9 or rarely 5; filaments monadelphous, diadelphous, or distinct; pistil of one carpel, becoming a legume of various forms, dehiscent or indehiscent with few to many seeds.

Stamens 10, distinct.	1. Sophora.
Stamens 10 or fewer, monadelphous or diadelphous; anthers all alike.	
Leaves trifoliolate; leaves and stems with scattering, hooked prickles; flowers bright scarlet; banner very long.	2. Erythrina.
Leaves pinnately several to many-foliolate, flowers never bright scarlet; stems and leaves without prickles, (except in Robinia)	
Corolla wanting; flowers very small, dull yellowish green.	3. Parrtella.
Corolla present; flowers various.	
Corolla of 1 petal, the stems smooth.	4. Amorpha.
Corolla papilionaceous, of 5 petals; petals hypogynous.	
Stems spiny; plant a small tree; pod many seeded.	5. Robinia.
Four petals attached to column of the stamens; stems not spiny; plants low shrubs; pods 1 or 2 seeded.	6. Parosela.

1. BROUSSONETIA. Coral Bean

A stout shrub 8 or 10 feet high or sometimes a small tree with glossy, dark green compound leaves and violet flowers; leaflets several, elliptic-oblong with entire margin, lighter colored beneath; flowers in terminal racemes; fruit a terete several seeded pod 3 to 5 inches long with thick walls constricted between the seeds; seeds bright red, larger than ordinary beans, said to be poisonous.

A single species.	1. *B. secundiflora.*

2. ERYTHRINA.

A tall, thick-stemmed shrub, with scattering hooked prickles on stems and leaves; leaves pinnately 3-foliolate, with large fan-shaped leaflets; flowers in short terminal racemes, bright scarlet; calyx campanulate, truncate, white tomentose; corolla about 4 cm. long, with an elongated banner; stamens 10, monadelphous: legume linear, torulose, long-stipitate; seeds large, bright scarlet.

A single rare species. 1. *E. flabelliformis.*

3. PARRYELLA T. & G.

Low much branched shrub with alternate, glandular-dotted, many-foliolate, odd-pinnate leaves and terminal compound spikes of very small, dull yellowish green flowers; calyx 5-toothed with very short teeth, petals wanting; fruit a short, very glandular 1-seeded pod.

1. *P. filifolia.*

4. AMORPHA L.

Shrubs or undershrubs with glandular-punctate, odd-pinnate many-foliolate leaves; flowers in terminal, more or less elongated spikes; pods small, 1-seeded; calyx teeth 5, about equal; petal 1, the banner; stamens monadelphous at the base.

Tall shrubs 6 feet high or more; pod 2-seeded. 1. *A. californica.*

Undershrubs, more or less herbaceous, less than 3 feet high; pod 1-seeded.

Plant green and glabrate. 2. *A. microphylla.*

Plant white-canescent. 3. *A. canescens.*

5. ROBINIA L. Locust

Spiny shrubs or small trees with odd-pinnate leaves, rather large pink flowers in crowded axillary short-peduncled racemes, and large flat pods 3 to 5 inches long, with prominent sutures and numerous seeds; leaflets ½ to ¾ inch long, oblong-elliptic to oval.

A single species occurring in the Upper Sonoran and Transition Zones. 1. *R. neomexicana.*

PAROSELA Car.

Annuals or perennials with herbaceous or woody stems 2 feet high or less; leaves mostly odd-pinnate, in one species palmately trifoliolate; flowers small, in crowded terminal spikes, bracteate; leaflets usually small, 1 to 20 pairs, mostly glandular punctuate; flowers perfect; calyx gamosepalous, 5-lobed; petals 5, 4 attached to the column of the monadelphous stamens, the banner free; stamens 9 or 10; pods 1 or 2-seeded, usually indehiscent, included in the persistent calyx.

Plant canescent throughout; flowers deep blue.	1. *P. scoparia.*
Plant glabrous; flowers purple.	
Calyx glabrous; lobes short; banner white.	2. *P. frutescens.*
Calyx pubescent, lobes setaceous elongated; banner yellow turning red.	3. *P. formosa.*

Closely related to the Leguminosae is a small family of plants named after the single genus which composes it. Two species of this genus *(Krameria)* occur in New Mexico. One of them *(K. glandulosa)* is a low, diffuse undershrub, rarely over 18 inches high, found on the driest and hottest of the gravelly mesas in the southern part of the State. Its leaves are very small and its stems slender, and most of the time it appears to be completely dead. In the late spring or early summer it usually blooms very profusely. The flowers are small, hardly half an inch in diameter, and of a crimson color. They are exceedingly sweet and pleasantly scented, and well worth cultivation as a low shrub for borders or in massed beds. Our experience in attempting to transplant them has not been satisfactory; probably because they were put into too tight a soil. It is likely that they can be grown from the seed, since they are very abundant in their ordinary habitat and produce seed readily, while they have no other means of distributing themselves.

KRAMERIACEAE.

Low herbaceous or woody perennials, with prostrate or widely spreading stems and small silky pubescent leaves; leaves alternate, exstipulate, entire; flowers perfect, crimson, irregular; calyx of 4 or 5 unequal petaloid sepals, deciduous; corolla or 4 or 5 petals, shorter than the sepals, irregular, the posterior one clawed, sometimes united, the anterior thick, sessile; stamens 3 or 4, the filaments united at the base; pistil simple; fruit an indehiscent spiny, globose, 1-seeded pod.

A single shrubby species. 1. *K. glandulosa.*

SYCAMORE. *(Platanus wrightii)*

The Sycamore (*Platanus wrightii*) is another native tree that might be used for decorative purposes. It grows naturally in the southwestern part of our State, so far as I have seen, only in the foothills of the mountains in the region of the Gila and its tributaries. This tree attains a height of sixty to seventy feet, is not infrequently twenty-four to thirty inches in diameter at the butt, has a wide spreading open head, smooth, flaky, whitish gray bark, and large palmate leaves whose five long acuminate lobes hang downward in a cluster with points almost touching. It may be rather difficult to get into cultivation.

PLATANUS L. SYCAMORE. ALISO.

Ours is a large tree, 30 to 50 feet high, with bark deciduous in thin, brittle plates, brownish, the young bark white or pale greenish; leaves large, 6 inches to 1 foot in diameter, deeply 5-lobed, the lobes triangular lanceolate, acuminate, densely tomentose, especially when young; flowers monoecious, in racemes of 3 to 5 spherical heads along an elongated peduncle; fruiting heads 20 to 25 mm. in diameter, on pedicels half as long; achenes glabrous, about 6 mm. long, exceeding the basal hairs.

A single species in our range. 1. *P. wrightii.*

Creosote Bush *(Covillea glutinosa)* is an evergreen much branched shrub, generally 4 or 5 feet high, with dark green resinous coated leaves and yellow flowers half an inch in diameter, that grows on the gravelly mesas of the southern end of the State. Its American name comes from its odor, and the Spanish name, *Hediondillo*—which means stinking—is also given on account of its odor, which is especially conspicuous when the plant is wet. A common mistake which is made in connection with this plant is to call it greasewood; to which it is not even remotely related, and its odor, which is distinctly like that of creosote, renders this kind of a mistake all the more inexcusable. This shrub when in cultivation and supplied with a little extra water maintains a beautiful glossy green color, and grows very rapidly if supplied with plenty of water. Under very favorable conditions of soil and moisture it sometimes reaches a height of 7 or 8 feet. It blooms profusely in the early summer. As a hedge plant or for decorative planting in masses, it is a very desirable plant. Experience has shown that it is rather difficult to transplant and requires a very large amount of water to start it growing. It grows from the seed tolerably readily, and doubtless this would be the most convenient method of starting it, since the

seeds are produced in great profusion on the mature plants. This species has been variously called *Covillea tridentata*, *Larrea tridentata*, and *Larrea mexicana* in different texts.

COVILLEA Vail.

Erect, spreading, strongly scented, evergreen, resinous shrub 2 meters high or less, with 2-foliolate leaves and numerous rather small, bright yellow flowers; leaflets small, 5 to 10 mm. long, inequilateral, thick, sessile or connate on very short petioles; appressed pubescent, at least when young; flowers solitary on short, axillary peduncles; sepals unequal, caducous, yellow; petals obovate to spatulate, twisted like the blades of a propeller; stamens inserted on the 10-lobed disk, the filaments winged below; fruit a densely hairy spheroid capsule breaking into 5 indehiscent nutlets.

A characteristic plant of the Lower Sonoran Zone. One species.

1. *C. glutinosa.*

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* See greasewood, p. 65.

The Rue Family *(Rutaceae)* is represented in New Mexico by 2 species of the Hop Tree or what is sometimes called Skunk Bush *(Ptelea)*. Our species occur in the foothills and drier canyons of the mountains *(Ptelea angustifolia)* or in the higher timber covered mountains at elevations from 6,000 to 8,000 feet *(Ptelea mollis)*. The species are closely similar, both being shrubs 6 to 10 feet high, with few stems from the base and branching rather profusely at the top. The leaves are composed of three oblong-elliptic acute leaflets, and the fruit consists of small spheriodal one-seeded pods about 1/8 inch in diameter, surrounded by a single flat wing which makes the whole fruit 3/4 inch to 1 inch in diameter. The flowers are inconspicuous, dull greenish-yellow. The leaves have a peculiar spicy odor, which is rather offensive when too intense.

In the mountains of the southern part of the State occurs a low shrub with rather thick palmately 5 to 10 foliolate leaves crowded near the ends of thick spongy branches. The leaflets are bright green, linear, an inch or more long, coarsely toothed, and glandular dotted. The flowers are large, either solitary or in few-flowered clusters. The pod is a 2-celled capsule. The plant *(Astrophyllum dumosum)* is quite rare, and known only from southern New Mexico and Arizona. It is worthy of cultivation.

RUTACEAE. Rue Family

Aromatic shrubs or low herbaceous perennials; leaves alternate, simple or compound, glandular punctuate; flowers perfect or by abortion polygamous, in cymes or short raceme-like clusters, not conspicuous; sepals 4 to 5, small; petals of the same number, dull colored and small; stamens of the same or twice the number, inserted on a hypogynous disk; pistil of 2 or 3 united carpels; fruit a capsule or samara.

Fruit a circular samara; leaves 3-foliolate.	1. Ptelea.
Fruit a 2-celled pod without wings; leaves palmately 5 to 10-foliolate.	2. Astrophyllum.

1. PTELEA. Skunk Bush

Branching shrubs 6 to 10 feet high, with smooth dark-colored bark on the old stems and greenish or yellow or reddish brown bark on the young stems; strongly scented; leaves 3-foliolate, the leaflets oblong lanceolate or rhombic, the terminal one attenuate at the base, the lateral ones inequilateral, pellucid-punctate; flowers polygamous, greenish yellow, small, in cymes, sepals, petals, and stamens 4 or 5 the last abortive in the pistillate flowers; ovary 2 or 3-celled; fruit a flattened, 2 or 3-seeded, disk-shaped, reticulated samara.

Younger branches whitish, yellow, or straw-colored; plants sweet scented; leaves turning bright yellow in autumn. 1. *P. angustfolia.*

Younger branches reddish brown; plants ill-scented; leaves green when shed. 2. *P. mollis.*

2. ASTROPHYLLUM Torr.

Low shrub with rather thick, rough stems bearing opposite, palmately 5 to 10-foliolate leaves crowded near the ends; leaflets linear, thick, bright green, coarsely dentate, conspicuously glandular punctate; flowers large, 10 to 20 mm. in diameter, either solitary or in 2 to 4-flowered clusters, axillary, white; stamens 8 to 10; ovary 5-lobed, hairy, becoming a 2-celled capsule by the abortion of some of the cells.

A rather rare shrub. 1. *A. dumosum.*

SOAPBERRY TREE. *(Sapindus drummondii)*

The Soapberry Family *(Sapindaceae)* is represented by one small tree and a shrub, both of which are well worth cultivation. **The Soapberry Tree** *(Sapindus drummondii)* is a tree 20 to 30 feet high, with erect trunk and rather smooth yellowish-gray bark and compound leaves consisting of 7 to 19 narrowly lanceolate leaflets 2 to 3 inches long. The flowers are small and white and very numerous, in large terminal panicles; while the fruit is a yellowish to black one-seeded berry-like pericarp ½ to ¾ inch in diameter, with a more or less transparent leathery portion about the large central seed. As a shade tree this should be valuable at the lower elevations in the State, and we have seen it in cultivation on one or two occasions. It is sometimes referred to as the Wild China-berry tree, though the resemblance to the China tree is very slight.

The New Mexico Buckeye *(Ungnadia speciosa)* is a shrub 4 to 6 feet high, with many smooth reddish-brown stems arising from the root. Preceding the leaves in early spring come the profuse clusters of bright pink flowers, the bushes being loaded with them. The leaves are compound, having from 3 to 9 leaflets, usually 7. The leaflets are rather large, 2 to 3 inches long, broadly lanceolate and irregularly toothed. The pod is a 3-celled capsule 1½ inches in diameter, somewhat irregularly triangular, with a long stem and containing 3 spherical smooth dark brown seeds about ½ inch in diameter and resembling the buckeye. This plant grows usually in the foothills of the drier mountains, and we have transplanted it two or three times into the garden at the Experiment Station. It seems to stand the transplanting well, and starts to grow very vigorously in the spring, but the hot weather of summer ultimately kills it. If properly shaded it will no doubt grow at the valley levels.

SAPINDACEAE. Soapberry Family

Shrubs or trees with alternate pinnate leaves; inflorescence lateral or terminal, mostly paniculate; flowers white or pink, polygamous usually conspicuous; sepals 4 or 5; petals 4 or 5; regular or irregular; stamens 7 to 12, inserted on a disk; ovary 2 to 4-celled; fruit a capsule or berrylike.

Trees with small white flowers; fruit berrylike, with a single seed.	1. Sapindus.
Shrubs with large pink flowers; fruit a 3-celled capsule with 3 seeds.	2 Ungnadia.

1. SAPINDUS L. Soapberry Tree

Tree 20 or 25 feet high or less, with erect trunk, rather smooth yellowish gray bark and thick foliage; leaves with 8 to 19 narrowly lanceolate leaflets 2 to 3 inches long, somewhat falcate, acuminate, glabrous above, soft-pubescent beneath; flowers white, small, numerous in terminal panicles; sepals and petals 4 or 5, the latter twice as long as the former and more or less lacerate, fruit a globose yellow, fleshy to leathery pericarp about ½ inch in diameter, containing a single globose seed, drying black.

1. *S. drummondii.*

2. UNGNADIA New Mexican Buckeye

Bushy branched shrubs 6 feet high or less with reddish twigs and large leaves with 3 to 9 leaflets; leaflets usually 7, broadly lanceolate acuminate, irregularly serrate; flowers rather large, bright pink, numerous, appearing before the leaves, irregular, polygamous; sepals 5; petals 4 or 5; stamens 7 to 10, exserted; capsule long stipitate, coriaceous to woody, 1 to 2 inches in diameter, 3-celled; seeds globose, brown, smooth, and shining, about 10 cm. in diameter.

A single species. 1. *U. speciosa.*

The Sumac Family *(Anacardiaceae)* is represented by two or three well known shrubs or woody vines and by two or three species of stiff spreading shrubs that occur on the mesas. All our species have been referred to the genus *Rhus* until quite recently, but the more recent treatment, which separates them into several genera, is more satisfactory, and is followed here.

The Lemitas *(Schmaltzia trilobata* and *S. emoryi)* are widely branching shrubs with trifoliolate leaves on long slender stems, and inconspcuous yellowish flowers, which appear before the leaves. These shrubs occur mainly on the drier mesas and in the arroyos, where they endure the extremes of drought. The first named species frequently occurs in the valleys, and has been cultivated in a good many places, forming dense masses of vegetation 6 to 10 feet high, with long slender vine-like branches. The stems of this species are used more or less extensively by the Mexican basket makers; and the roots, which are long and slender and of a dark red color, are used by the Mescalero Indian women in making baskets. Both species are well worth cultivation, and are relatively easily transplanted.

Another species in the family closely associated to the preceding, both in appearance and structure, as well as natural distribution, is *Rhoeidium microphyllum*. It may be recognized by its small pinnately several-foliolate leaves and inconspicuous white flowers which precede them. It is also easily transplanted and responds readily to an increased water supply.

Poison Oak *(Toxicodendron rydbergii)* is fairly common in the mountains, and of course is to be avoided on all occasions. Where the name poison oak originated we are unable to say. The Eastern equivalent, poison ivy, is very much more appropriate, since the plant is not infrequently vine-like in appearance.

Two species of **Sumac** *(Rhus glabra* and *R. lanceolata)* occur in the mountains at elevations of 5,000 to 7,000 feet,

and an unnamed species has recently been found. These may be recognized by their walnut-like leaves, hollow stems, crowded terminal clusters of small yellowish flowers, and panicles of hairy red berries. They are of little importance from the standpoint of decorative value. *Rhus virens* is an evergreen shrub 4 to 6 feet high with thick leaflets. It occurs in the dry mountains at the southern end of the State.

ANACARDIACEAE. Sumac Family

Shrubs, sometimes small, usually of large size, with acrid sap, sometimes poisonous, and polygamous or diaecious flowers; leaves pinnately 3 to many-foliolate, exstipulate; flowers small and usually inconspicuous in crowded clusters, these sometimes large, usually small; calyx 3 to 7-cleft; petals of the same number as the calyx lobes; stamens as many or twice as many, inserted at the base of a disk; ovary superior, 1-celled 1-ovuled but the styles often 3, ultimately becoming a small, dry, drupe-like fruit.

Flowers appearing before the leaves, in small crowded clusters. (Divaricately much-branched desert shrubs).	
Leaves 3-foliolate; flowers yellow tinged with red.	1. Schmaltzia.
Leaves 5 to 9-foliolate; flowers white.	2. Rhoeidium.
Flowers appearing after the leaves, in their axils or in panicles terminating the stems.	
Leaves 3-foliolate, poisonous; generally undershrubs with slender stems.	3. Toxicondendron.
Leaves pinnately several to many-foliolate; shrubby plants with thick stems, one species with hard wood.	4. Rhus.

1. SCHMALTZIA Desv.

Widely branching shrubs, the young branches often long-virgate when grown in wet soil, 6 feet high or less, with an equal or greater spread; leaves 3-foliolate, the leaflets cuneate-obovate, crenately and coarsely yellow, in crowded clusters on very short peduncles on the branches of the previous season, appearing before the leaves; fruit orange scarlet, globose, 4 to 6 mm. in diameter.

Young stems densely velvety pubescent; leaves permanently pubescent.	1. *S. emoryi.*
Young stems finely pubescent with short, often appressed hairs, never velvety; leaves glabrate in age.	2. *S. trilobata.*

2. RHOEIDIUM Greene.

Stiff, woody, widely branching desert shrub, often 6 feet high and of equal diameter with stems intricately interlaced, the short ones sometimes spinescent; leaves small, generally about ¾ inch long, with about 7 elliptic leaflets borne on a winged rachis; leaflets acute, mostly entire, the terminal slightly larger and occasionally having a few coarse teeth near the apex; flowers small, in crowded clusters on the naked branches of the previous season in the axils above the leaf scars; calyx lobes orbicular, concave, entire; petals white, finely ciliate; fruit globose, about 6 mm. in diameter; hispisdulous, viscid.

A single species common in the Lower Sonoran Zone. 1. *R. microphyllum.*

3. TOXICODENDRON Miller. Poison Oak

Low shrub, usually about 1 foot high, with 3-foliolate poisonous leaves having large, broadly ovate to rhomboid, acuminate, coarsely few-toothed or entire leaflets; flower inconspicuous, greenish yellow, in small, several-flowered axillary panicles; fruit depressed globose, glabrous, white and shining when mature.

1. *T. rydbergii.*

4. RHUS L. Sumac

Erect spreading shrubs 3 to 5 feet high or more, with pinnately 5- to many-foliolate leaves and axillary or terminal panicles of small, dull whitish or yellowish flowers; leaves persistent or deciduous, the leaflets large, 1 to 3 inches long, flowers and fruit described under the family.

Leaves evergreen, thick; flowers axillary in small clusters; stems very hard and woody. 1. *R. virens.*

Leaves deciduous, thin; flowers in dense terminal panicles; wood of stem soft, with large pith.

Rachis winged; leaflets densely pubescent beneath, of the same color on both surfaces. 2. *R. lanceolata.*

Rachis not winged; leaflets glabrous and paler beneath. 3. *R. glabra.*

The Maple Family *(Aceraceae)* is represented by two genera of trees: the Maple proper *(Acer)* and the Box Elder *(Rulac)*. **The Maples** are not common in the State, and the cultivated species do not grow well at the lower levels, and only fairly well at the higher ones, where they are somewhat sparingly used. There are 4 native species, 2 of which are relatively common. The first *(Acer neomexicanum)* is a low spreading tree with red stems and usually 3-foliolate leaves. It grows only in the higher mountains at elevations of about 7,000 feet. The other common species *(A. grandidentatum)* is usually found in the hotter mountains at lower levels and in drier situations. The bark of this tree is usually gray, with darker blotches. The leaves are simple and with 5 blunt lobes, each having a few large teeth. An undescribed species grows in the extreme southwestern corner, coming into this State from Arizona and probably from northern Mexico.

The Box Elder *(Rulac negundo)* is a good sized tree, 25 to 40 feet high, with dense spreading top and smooth greenish stems. The leaves are pinnatly 3 or 5-foliolate, and the flowers dioecious. The tree is fairly common in the mountains along small streams, and is cultivated considerably in the irrigated valleys, where it makes an excellent shade tree.

ACERACEAE. Maple Family

Small or large trees with smooth exfoliating bark; leaves opposite, simple, palmately lobed or pinnately compound; flowers polygamous or dioecious in axillary racemes or corymbs; sepals 4 or 5; petals as many or mostly wanting; stamens as many as the sepals, rarely 8, inserted on a disk or disk wanting; pistil of 2 or more united carpels becoming 2 laterally winged samaras.

Leaves simple or palmately 3-foliolate; young branches reddish or gray; flowers polygamous. 1. Acer.

Leaves pinnately 3 or 5-foliolate; young branches green; flowers dioecious. 2. Rulac.

1. ACER L. Maple

Trees with reddish, brownish, or grayish twigs, rather smooth bark, and palamately 5-lobed or 3-foliolate leaves; flowers polygamous, just preceding the leaves, inconspicuous, on slender pendant pedicels; petals sometimes present; fruit as described for the family.

Corymbs long-peduncled; teeth of the leaves acute.
- Leaves, at least most of them 3-parted. — 1. *A. neomexicanum.*
- Leaves merely 3- or 5-lobed, never parted. — 2. *A. glabrum.*

Corymbs nearly sessile; teeth of the leaves obtuse.
- Lobes of the leaves broadly oblong, with several teeth, broadest near the apex; wing of the fruit 1 inch long or more. — 3. *A. grandidentatum.*

2. RULAC Adans. Box Elder

Good sized tree with pinnate leaves; young twigs smooth and glaucous, green; leaflets 3, sometimes 5, ovate with a few coarse teeth near the apex or sometimes somewhat lobed.

1. *R. negundo.*

The Tree of Heaven *(Ailanthus glandulosus)*, belonging in the family Simarubaceae, is a Chinese plant that has been somewhat extensively introduced into the southern part of the State, where it is a valuable shade tree. It is frequently 30 feet high or more. It grows very rapidly, has smooth bark and large compound leaves resembling those of the walnut. The small, dull white, very malodorous flowers are borne in large terminal panicles. They are succeeded by the clusters of winged one-seeded reddish pods, which persist for some time upon the tree. It will endure extremes of drought, heat, and light, and will grow very rapidly when supplied with favorable conditions. It probably reproduces most readily by seed.

The Chinaberry Tree or **Umbrella Tree** PIOCHA *(Melia azederach)* is also an introduced tree that is in very common use in the southern part of the State in the irrigated valleys. Its widely branching top with dense leaf covering and abundant pale lavender sweet scented flowers make it a very desirable plant for decorative purposes. It reproduces from seed, but the seeds germinate rather poorly without special treatment.

THE STAFF-TREE FAMILY (CELASTRACEAE) is represented by three unimportant species listed below:

Janusia gracilis is a low, twining, vine-like shrub (in the family MALPHIGIACEAE) with inconspicuous leaves and small yellowish flowers that grows on the dry mountains in the southern part of the State. It is of no particular importance.

CELASTRACEAE. Staff-tree Family

Low shrubs, sometimes spiny; leaves simple, small, alternate or opposite; flowers normally cymose, small and inconspicuous, perfect; calyx and corolla 4 or 5-merous; stamens 4 to 10, inserted on a disk lining the hypanthium; fruit a capsule, drupe, or berry, the seeds often arillate.

Stamens 10; plant spiny, stem green. 1. Forsellesia.
Stamens 4 or 5; stems yellow or brown.
Flowers 4-merous; fruit a 2-ovaled capsule leaves opposite, smooth. 2. Pachystima.
Flowers 5-merous; fruit indehiscent; leaves alternate, scurfy. 3. Mortonia.

1. FORSELLESIA Greene.

A low, spiny, green-stemmed shrub 12 to 20 inches high or less, with small, obovate, acute leaves 1 cm. long or less, nearly smooth, short petioled, entire; flowers small, pentamerous, white.

1. *F. spinescens.*

2. PACHYSTIMA Raf.

A prostrate woody evergreen plant with stems a foot or less long and small opposite short petioled leaves on small inconspicuous flowers. Of no importance.

1 *P. myrsinites.*

3. MORTONIA

A rare plant from the extreme southwestern corner of the state; leaves elliptic, thick, entire, acute, contracted into a very short petiole, crowded, 1 cm. long or less; stems yellowish like the leaves; flowers in short terminal bracteate racemes; whole plant densely scurfy.

1. *M. scabrella.*

JANUSIA Juss.

Low twining perennial vine, with woody stems; leaves opposite, narrowly lanceolate, ½ to about 1 inch long, pubescent on both surfaces; sepals 5; petals 5, yellow turning reddish brown; stamens 5; styles united; fruit a samara, 9 to 12 mm. long.

A single species in the Lower Sonoran Zone. 1. *J. gracilis.*

THE BUCKTHORN FAMILY (RHAMNACEAE) contains 4 genera of shrubs, all of which are of more or less importance for decorative purposes. Two of them (*Zizyphus lycioides* and *Condalia spathulata*) are inhabitants of the most barren of the mesas in the southern part of the State. They are each spiny branching shrubs 4 to 6 feet high, sometimes assuming the form of a stunted tree with widely branching top. The leaves are small and simple; the flowers are inconspicuous; the fruits are small black berries. These plants will prove of value for cultivation in situations where the water supply is very meager and the soil poor and rocky. They may be difficult to transplant, but once established in even the driest situations, they will probably persist.

Three species of **Buck Thorn** (*Rhamnus* spp.) occur in the higher timbered mountains of this State. They are unarmed shrubs 3 feet high or more, with rather large alternate leaves and inconspicuous small flowers, followed by small 2 to 4-seeded rather dry berries. For massing they would be useful at levels above 7,000 feet.

Three species of the genus *Ceanothus* occur in the mountains between 5,000 and 8,000 feet. One of these, *Ceanothus greggii*, produces numerous small white flowers on its stiff woody stems, and is a low shrub 3 to 4 feet high, which might be used in plantations of other arid land plants. The other two species are smaller and more leafy shrubs of the higher levels.

RHAMNACEAE. BUCKTHORN FAMILY.

More or less spiny shrubs 6 feet high or less, with simple leaves having small stipules; flowers perfect or polygamo-dioecious, mostly small and inconspicuous; calyx 4 or 5 sepals, valvate, with a disk lining the hypanthium; petals 4 or 5 or wanting; stamens 4 or 5, opposite the petals on the throat of the hypanthium or the disk;

pistil of 2 or 3 united carpels; ovaries united with the disk and hypanthium, to form the berrylike fruit.

Fruit fleshy, black, with 1 to 3-celled stone.	
Petals present; young stems glaucous.	1. ZIZYPHUS.
Petals wanting; young stems not glaucous.	2. CONDALIA.
Fruit dry or somewhat berrylike, 2 or 3-seeded.	
Plants low; petals hooded or long clawed; stigmas 3.	3. CEANOTHUS.
Tall shrubs 3 feet high or more; petals not clawed or hooded; stigmas 2.	4. RHAMNUS.

1. ZIZYPHUS Juss.

Rigid spiny shrub 3 to 6 feet high, with glaucous green young branches and small glaucous leaves; leaves ¾ inch long or less ovate to oblong elliptic, acute or obtuse, flower small, in axillary corymbs; sepals 5, triangular; keeled within; petals and stamens 5, opposite each other and on the disk; ovary 2 to 3-celled; fruit a pulpy black berry green within.

1. *Z. lycoides.*

2. CONDALIA Cav.

Very similar to the preceding but the leaves spatulate and finely pubescent, and petals wanting.

1. *C. spathulata.*

3. CEANOTHUS L.

Low shrubs more or less spinescent, mostly less than 3 feet high; leaves simple, alternate, with minute caducous stipules; flowers small, in crowded terminal racemes or corymbs; sepals 5, white, petaloid; disk filling the hypanthium; petals 5, white, long-clawed, strongly hooded; stamens 5, exserted; ovary immersed in the disk; fruit at last dry, 3-celled, berrylike.

Leaf blades thin, bright green, nearly or quite glabrous 1 to 1½ inches long; inflorescence much exceeding the leaves.	1. *C. mogollonicus.*
Leaf blades thick, grayish green, densely pubescent, at least beneath, ¾ inch long or less; inflorenscence usually not exceeding the leaves.	
Plants spinescent; leaves sericeous beneath, elliptic to lanceolate, acutish.	2. *C. fendleri.*
Plants not spinescent; leaves never sericeous, hortellous to puberulent, mostly obovate, rounded or retuse at the apex.	3. *C. greggii.*

4. RHAMNUS L. Buckthorn

Unarmed shrubs with rather large, alternate leaves, over 3 feet high; flowers perfect or polygamo-dioecious, in small axillary clusters; sepal 4 or 5; disks lining the hypanthium; petals 4 or 5, sometimes wanting, clawless, on the margin of the hypanthium; stamens 4 or 5, inserted on the edge of the disk; ovary 2 to 4-celled; fruit a 2 to 4-seeded rather dry berry.

Flowers fascicled, 2 or 3 in each axil; leaves small, 1½ inches long or less, yellowish beneath; seeds 2. — 1. *R. fasciculata.*

Flowers in peduncled cymes, numerous; leaves usually more than 1½ inches long, not yellowish beneath.

Seeds 2; leaves pale beneath with a dense tomentulous pubescence. — 2. *R. ursina.*

Seeds 3; leaves green on both surfaces, sparingly pubescent beneath. — 3. *R. betulaefolia.*

WILD GRAPE. *(Vitis arizonica)*

The Grape Family *(Vitaceae)* is represented in New Mexico by a single wild grape, and the Virginia creeper; both of which are of great importance for decorative purposes.

The Wild Grape *(Vitis arizonica)* would grow with ordinary care under cultivation and it is a particularly beautiful vine for ornamental purposes. The glossy green leaves furnish a very dense shade, and the perfume of the blossoms is of that peculiar pleasant kind which seems to be a kind of evanescent nasal beverage that does not cloy. For use over arbors or trellises, over dead stumps of trees, or on unsightly buildings there is hardly a native vine which would make a more beautiful covering. Transplanting the roots would be the sure way to get them into cultivation, though it is probable that cuttings would grow readily.

The Virginia Creeper *(Psedera vitacea) is recognized* as one of our most valuable vines and used extensively throughout the State. The fact that it is such a satisfactory plant in cultivation here is rather a strong argument in sup-

port of the use of our native flora, since this species is native in our mountains. It may be simply because of the general adaptability of this widely distributed species, but at any rate, it would suggest the wisdom of trying others of our native vines and shrubs. It may be used practically any place where a vine will grow and it is especially rapid and vigorous. The more water it receives the more rapidly it grows, but absolute lack of water in the middle of the summer does not kill it; it merely stops growing vigorously and seems to wait for the water.

VITACEAE. Grape Family

Woody vines, trailing or climbing by means of tendrils; leaves large, simple or compound, petiolate, the blade flat and mostly thin; inflorescence axillary, cymose or paniculate; flowers small and inconspicuous, greenish or yellowish, sometimes delicately perfumed, perfect, polygamous, or dioecious, regular; calyx and corol'a 4 or 5-merous, a disk present or wanting; stamens of the same number as the petals and opposite them; pistil compound; fruit a berry.

Leaves simple. 1. Vitis.
Leaves compound; 5-foliolate, thin. 2. Psedra.

1.—VITIS L. Grape

Trailing or climbing vines with shreddy bark and forking tendrils; leaves simple, more or less palmately lobed or angled, with small caducous stipules; flowers in axillary panicles, dioecious, polygamo-dioecious, or rarely perfect; calyx minute; corolla caducous, the petals coherent; stamens exserted, alternate with the lobes of the disk; fruit a few-seeded globose berry, edible; seeds hard and bony, pear-shaped, relatively large.

A single species common in the mountains at levels of from 5000 to 7500 feet. 1. *V. arizonica.*

2. PSEDERA Necker. Virginia Creeper

Trailing or climbing woody vines with forking tendrils and alternate palmately 5-foliolate leaves; leaflets 2 to 4 inches long, coarsely toothed; flowers small, greenish, in axillary cymes; calyx and corolla 5-merous, disk wanting; stamens 5; fruit a depressed globose berry, blackish, not edible.

1. *P. vitacea.*

On the mesas at the southern end of the State occurs a low shrub *(Koeberlinia epinosa)* usually 2 to 4 feet high, composed entirely of branching green thorns. It is entirely leafless, the function of the leaves being performed by the bark of the stems. The flowers are small and greenish-white, borne in umbel-like clusters on short peduncles. They are followed by small berries the size of currants, which are black when mature. As a bizarre bedding plant to be associated with cacti or other arid land plants in a formal garden this plant offers much; but notwithstanding its habit of living in most unfavorable surroundings, we have so far been unable to transplant it.

Growing in alkaline soils in the southern part of the State occurs a small gray shrub 3 or 4 feet high, with minute flowers and small crowded leaves. This is *Frankenia jamesii* and the only representative of a family named after it.

Salt Cedar *(Tamarix gallica)*. One of the most satisfactory introduced plants in cultivation in this State is this shrub, which is also known by the name of tamarisk. It is a much branched shrub with minute leaves that, with its habit, give rise to the first common name. It will endure large quantities of alkali in the soil, and is exceedingly drought resistant. When supplied with plenty of water it grows rapidly and is bright green. If it receives too little water it grows slowly and is a grayish or bluish green. In the early summer it produces an abundance of small light pink flowers in terminal racemes. It is most easily propagated from cuttings, and when once established it is almost impossible to kill it. As a plant to be used upon alkaline soils where other plants do poorly or in situations where too little water is available, there is no other plant which is quite so satisfactory.

Ocotillo *(Fouquieria splendens)* is a spiny branching shrub consisting of spiny wand-like stems 6 to 10 feet long branching from the base. The stems are beset with long

spines, radiating in all directions, the hardened midribs of the leaves of the previous season. In the spring these spiny stems produce clusters of brilliant scarlet flowers at their tips. Later on in the season the smooth spatulate leaves cover the stems from one end to the other. They endure for a very short time, during which the stems grow very rapidly at the end. The plant is sometimes called COACH WHIP CACTUS, but this is a very decided misnomer, because the plant is in no way related to the cacti. It is also called CANDLEWOOD. For use as a bedding plant with cacti and other spiny shrubs it has a value all its own.

TREE CACTUS. *(Opuntia arborescens)*

The Cactaceae are a number of them shrubby and most of them are of value in several different ways. They are discussed at length in Bulletin No. 78 of this station.

The Oleaster Family *(Elaeagnaceae)* has two native representatives; while the RUSSIAN WILD OLIVE *(Elaeagnus angustifolia)* is cultivated in a number of places in the State. This tree is a very satisfactory decorative tree, with is silvery foliage, smooth brown bark, and abundant clove-scented small yellow flowers. It transplants readily and grows rapidly at the lower levels in our State.

The Buffalo Berry *(Lepargyraea argentea)* is a spiny tree-like shrub that comes into New Mexico only in the extreme northwestern corner. Its silvery leaves and bright scarlet berries made it a desirable plant for cultivation. The other species of this genus, *L. canadensis*, is a low shrub, generally less than 3 feet high, found growing in the pine forests of the northern part of the State. It is of no particular importance.

FRANKENIACEAE.

1. FRANKENIA L.

Branching shrubs four feet high or less with small, crowded leaves on numerous fascicled short branches and small white flowers; the last solitary, axillary, and sessile; sepals 5, united into a persistent tube; petals 5, white, clawed; stamens 6; fruit a few seeded capsule included in the calyx.

1. *F. jamesii.*

1. KOEBERLINIA Zucc. JUNCO

Much branched leafless shrub 3 feet high or less, (rarely 5 to 6 feet); stems of hard woord, green, the oldest blackish, each ending in a sharp thorn; leaves reduced to small scales; flowers in small lateral racemes on short peduncles and slender pedicels; sepals 4, 1 mm. long; petals 4, twice to 3 times as long, greenish white; stamens 8, shorter than the petals, the filaments enlarged in the middle; fruit a spherical black berry about 6 mm. in diameter.

1. *K. spinosa.*

1. FOUQUIERIA. Ocotillo

Spiny shrubs with several erect or ascending virgate stems 10 feet long or less, bearing leaves for but a short time in the summer, the spines formed of the indurated midribs of the leaves of the previous season; leaves oblanceolate, spatulate, entire; flowers perfect, in thrysoid panicles at the ends of the branches, bright scarlet, appearing long before the leaves; sepals 5; corolla 5-merous, gamopetalous, broadly tubular with spreading limb; stamens 10, epipetalous; fruit an ovoid capsule with many seeds.

1. *F. splendens.*

ELAEAGNACEAE. Oleaster Family

Shrubs or trees with silvery lepidote or stellate pubescence; leaves opposite or alternate, the blades entire; flowers perfect, polygamous or dioecious, usually clustered in the axils of the branches of the present or previous year; calyx of 4 or sometimes 2 sepals surmounting the hypanthium; petals wanting; stamens 4 to 8 on the tube of the hypanthium; pistil simple, becoming a drupelike fruit.

1. LEPARGYRAEA Raf. Buffalo-berry

A genus with the characters of the family as given above.

Leaves ovate or oval, green above; stems not spiny; low shrub. 1. *L. canadensis.*

Leaves oblong, silvery on both surfaces; stems spiny; tall, tree-like shrub. 2. *L. argentea.*

Palo Blanco *(Adelia spp.)* is a good sized shrub 10-15 feet high with smooth greenish or pale bark, pale green leaves and dark blue to almost black berries the size of currants. These shrubs occur not infrequently in the drier mountains and mouths of canons. They are quite symmetrical and worth cultivating.

MOUNTAIN ASH. *(Fraxinus velutina)*

The Mountain Ash Fresno *(Fraxinus velutina)* is perhaps as satisfactory a tree for general decorative and shade

purposes as grows native in the State, and its value is appreciated in the Mesilla valley where it is used quite extensively. The common name is a local one and does not refer to the shrub which ordinarily goes under that name in the eastern and central states *(Sorbus Americana)*. It is a true ash. It naturally grows in the rocky canons and dry water courses of the warmer more barren portions of the mountains, and here it attains a height of thirty to forty feet. The trunk is straight; the bark is a light brownish-gray and quite smooth even in good sized trees; the branches grow obliquely upward with rather a sharp angle and are stiff enough to bear their own weight thus giving the tree a symmetrical head. The foliage is rather pale green, not very dense, appears rather late in spring, and is rarely ever hurt by late frosts. While not as rapid a grower as the valley cottonwood, the mountain ash is a vigorous and healthy tree in cultivation. The mistletoe attacks it but slightly and the winged fruits are never sufficiently abundant to be a nuisance. Young trees may be obtained in the canons of nearly any of the mountains in southern New Mexico at altitudes below 6,500 feet are are easily transplanted any time when the leaves are off.

There are two other species to be found in the mountains of the state.

The Dogwood Family (CORNACEAE) is represented in New Mexico by a single species of Cornel, which is *Svida stolonifera riparia*, which is a reddish-stemmed shrub common in the higher mountains; and 2 species of *Garrya*. One of the latter *(Garrya wrightii)* is an evergreen shrub about 8 to 10 feet high, with numerous leathery clear green leaves and inconspicuous flowers, followed by blue-black berry-like fruits the size of currants. This shrub is a very symmetrical plant, and is quite resistant to drought when once established. Repeated efforts to bring it from the foothills of the mountains, where it is thoroughly at home, to the mesa soils near the valley have invariably resulted in failure. Attempts to grow

the plant from cuttings were also unsuccessful. If a means of getting it into cultivation can be devised, there is little doubt that this plant will be even more satisfactory than some species of euonymus.

The family ERICACEAE is represented by 2 species of Arbutus, which are tree-like shrubs in the mountains of the southern part of the State; a single MANZANITA *(Arctostaphylos pungens)*; and the little BEAR BERRY *(A. uva-ursi)*. Any of the three larger plants would be valuable additions to the cultivated shrubbery.

On the very high mountains just below the timber line is to be found one small Huckleberry *(Vaccinium orcophilum)*, which is a woody plant 6 to 8 inches high. This is the only representative of the Huckleberry family within our limits.

OLEACEAE. OLIVE FAMILY

Trees, shrubs or suffrutescent perennials with opposite (rarely alternate) simple or pinnately compound exstipulate leaves, and regular 2 to 4-parted perfect, polygamous or dioecious flowers in panicles, cymes or fascicles. Calyx usually small, (sometimes wanting) of 4 or more sepals; corolla of 2 to 6-distinct petals or gamopetalous; stamens 2 to 4 adnate to the base of the corolla; ovary superior, 2-celled; fruit a capsule, samara, berry or drupe.

Fruit fleshy, a small bluish-black drupe; flowers apetalous, polygamo-dioescious (plant a good sized shrub). 1. ADELIA.

Fruit a samara; trees with pinnately compound leaves; flowers dioecious. 2. FRAXINUS.

1. ADELIA R.Br. PALO BLANCO

Rather large shrubs with rigid branching stems bearing simple leaves and inconspicuous polygamo-dioecious flowers in lateral clusters; flowers appearing before the leaves on stems of the previ-

ous year; calyx usually present but small, tube very short, 4 to 6 lobed; corolla mostly wanting; stamens 2 to 4; fruit a blue black drupe.

Leaves glabrous.	1. *A. neomexicana.*
Leaves pubescent.	2. *A. pubescens.*

2. FRAXINUS L. Ash, Fresno

Trees of some size with opposite pinnately compound leaves and inconspicuous dioecious flowers, in clusters or panicles; calyx sometimes wanting or with short tube and four unequal lobes; stamens 2 to 3 or 4, filaments short or elongated; ovary 2-celled; styles united; stigma 2-cleft; fruit a samara with flat or terete body and a single wing partly surrounding the body.

Flowers with a 4-parted corolla; leaflets small, 1½ inches long or less.	1. *F. cuspidata.*
Flowers apetalous; leaflets 2 inches long or more.	
Leaflets sessile or nearly so.	2. *F. velutina.*
Leaflets distinctly stalked.	3. *F. toumeyi.*

BUMELIA Sw. Buckthorn

Low tree with rigid spreading branches, having hard wood, bearing alternate simple leaves and few flowered axillary fascicles of small flowers; leaves 1.5 to 3 cm. long, cuneate at the base, rounded or retuse at the apex, on short petioles, dark green and glabrous above and woody beneath; flowers perfect, 5-merous, calyx persistent; corolla white, deciduous, lobes longer than the tube, suborbicular, 2 mm. in diameter; stamens 5, epipetalous; staminoidia 5, petaliod; ovary 5-celled; fruit drupe-like.

A rare plant known only from the extreme southwestern corner of the state.

1. *B. rigida.*

CORNACEAE. Dogwood Family

Trees or (ours) shrubs with simple, entire and mainly opposite leaves without stipules and perfect or unisexual flowers in cymes or catkins; calyx lobes minute; petals and stamens 4, epigynous ovary inferior, becoming a 1 to 2-seeded drupe or berry, sometimes dry when mature.

Flowers perfect, in cymes; leaves deciduous. 1. SVIDA.
Flowers dioecious, in pendulous spikes; leaves evergreen. 2. GARRYA.

1. SVIDA Opis.

Shrub 3 to 6 feet high; branches reddish, smooth; leaves elliptic, ovate, entire, short petioled, opposite, thin, deciduous; flowers white perfect in flat topped cymes, without involucre; fruit whitish.

1. *S. stolonifera riparia*.

2. GARRYA.

Evergreen shrubs from 2 feet to over 10 feet high, with opposite elliptic to ovate, entire, short-petioled, corriaceous leaves and dioecious; inconspicuous whitish flowers in loose, axillary catkins; petals wanting; calyx 4-merous in the staminate flowers, stamens wanting; ovary 1-celled, with 2 persistent styles; fruit a blue-black berry 5 mm. in diameter or less, becoming dry. Another undescribed species occurs in the Guadalupe Mountains.

1. *G. wrightii*.

ERICACEAE. Heath Family

Shrubs and trees with scaly buds and alternate, simple, exstipulate leaves, (ours all evergreen), with perfect 4 to 5-merous flowers, in small terminal or axillary clusters; corolla urceolate or globular, 4 to 5-toothed, deciduous; stamens twice as many as the corolla lobes, included, dehiscent by terminal pores or chinks; fruit fleshy, drupaceous or berry like.

Ovary 5-celled, (rarely 4-celled) ripening into a granular coated berry, with many seeds and a firm endocarp. (Ours are good sized trees). 1. ARBUTUS.
Ovary 4 to 10-celled, with solitary ovules, in fruit becoming a drupe with as many seed like nutlets or a solid stone. (Ours are shrubs, one prostrate). 2. ARCTOSTAPHYLOS.

1. ARBUTUS.

Leaves elliptic, lanceolate, acute, glabrous.	1. *A. arizonica.*
Leaves oblong or ovate, obtuse, permanently pubescent beneath.	2. *A. texana.*

2. ARCTOSTAPHYLOS. Adans. MANZANITA

Erect shrub, 3 to 6 feet high; leaves oblong, acute or acutish; branches not glandular.	1. *A. pungens.*
Creeping shrub; leaves oblanceolate or obovate, obtuse or retuse; branches glandular.	2. *A. uva-ursi.*

VACCINIUM L. HUCKLEBERRY

Low shrubs with small alternate leaves and small solitary axillary flowers; calyx lobes nearly obsolete; corolla globular, limb 5-lobed; stamens 10; anthers prolonged upward into tubes, opening by external pores; fruit a black or blue berry.

1. *V. oreophilum.*

There are several well known families that have only a few shrubby species, which for convenience we throw together. They are as follows:

The Verbena Family *(Verbenaceae)* is represented by several species of the genus *Verbena*. The only shrubby representative in the State is *Lippia wrightii*. This is an aromatic shrub 2 or 3 feet high, with numerous small thickish leaves and terminal spikes of small white flowers. It naturally occurs on the slopes of dry rocky mountains and in the mouths of canons and when brought into cultivation responds readily to improved conditions and grows rapidly. While in no way conspicuous, it is an excellent addition to the garden where the water supply is limited.

The Mint Family *(Labiatae)* displays but three shrubby representatives in New Mexico. One of these *(Poliomintha incana)* is a gray shrub that grows on gypsum deposits in the northern part of the State. Whether it would grow in cultivation or not we are unable to say.

Two species of Sage *(Salvia)* occur in the mountains at the southern end of the State. Both of these are blue flowered, and each would make good bedding plants. The smaller *(Salvia lycioides)* is a green smooth plant a foot high or less. The other species is often 3 or 4 feet high, and has broadly triangular or heart-shaped leaves that are densely white hairy beneath.

The Potato Family *(Solanaceae)* is represented by a single shrubby genus in New Mexico. **The Garrambullo** *(Lycium torreyi)* is a shrub 3 to 5 feet high, common in the valleys of the southern end of the State. It grows readily in the arroyos or on soils that receive occasional floodings. In cultivation it responds readily to a small amount of water and produces a symmetrical green shrub bearing small scarlet berries the size of a currant. Very similar to this species, but smaller in every way, is *Lycium parviflorum;* which occurs

native on the mesas and plains at the southern end of the State. It would also probably respond to cultivation. *Lycium pallidum* is a slightly larger species of shrub, sometimes 6 or 7 feet high, with purplish-brown thorny stems and medium sized pale green leaves. It flowers are funnel form, dull green, and about an inch long. The fruit is as large as a currant and when ripe is dark red. It occurs on the drier slopes of the mountains in the southern part of the State.

Of the family *Bignoniaceae* there are two shrubby representatives probably occurring in New Mexico. **The Desert Willow** JANO *(Chilopsis linearis)* is one of the most satisfactory of native shrubs for purposes of cultivation in dry situations. It is thoroughly at home in the arroyos and foothills of the mountains at the lower elevations in our State, and is easily transplanted to the gardens. Under favorable conditions of moisture it not infrequently reaches the size of a small tree, while in most situations it is a shrub 5 to 15 feet high. It may be pruned to the tree form or allowed to branch at the base. Its long willow-like leaves give it its common name. It is a profuse bloomer, having large purplish or whitish flowers, somewhat after the type of catalpa blossoms.

Stanolobium stans is another shrub that occurs commonly in the mountains about El Paso, and probably gets into southern New Mexico, though as yet it has not been collected within our boundaries. This shrub is 3 to 5 feet high, with slender, graceful stems and large compound leaves, the leaflets of which are an inch or two long and one-fourth as broad, dark green above, paler beneath. It bears large yellow flowers in conspicuous terminal clusters, and occurs in the driest of situations on the sides of the mountains. It should respond to cultivation very readily, and would be well worth the care necessary to grow it.

The Acanthus Family *(Acanthaceae)* has 2 shrubby representatives in New Mexico. The first, *Carlowrightia linearifolia*, is a green stemmed branching shrub 3 or 4 feet high,

with very small leaves and inconspicuous pale blue flowers, that grows upon the mesas at the southern end of the State. It is of little or no economical importance. The second, *(Anisacanthus thurberi)* is a branching shrub 3 or 4 feet high with numerous stems, upon which are borne the rather large pinkish flowers in considerable abundance. This plant grows in the foothills of the southwestern part of the State, and is well worth cultivation as a decorative plant.

Bouvardia ovata is a low shrub, generally not over 3 feet high, the upper portions of the stems herbaceous and leaves 1 to 2 inches long. Its flowers are bright red and tubular, borne in terminal clusters an inch or so in diameter. This plant occurs only in the extreme southwestern corner of the State, coming in from Mexico. Several species of the genus are in cultivation, and this one would be well worth trying.

The Honeysuckle Family *(Caprifoliaceae)*. This family contains several important shrubs and trees. **The Elder** *(Sambucus)* is represented in our State by 5 well marked species, all of which are worth cultivating. The **Mexican Elder** TAPIRO *(Sambucus mexicana)* occurs only in the foothills at the southern end of the State, where it has probably been introduced. It is a low stunted tree, with round, dense top which retains its leaves almost throughout the year and produces large clusters of whitish blooms throughout the summer season. Its fruit rarely matures.

In the mountains four other species occur as shrubs, but one of them sometimes appears as a small tree with a well defined trunk. One species *(Sambucus microbotrys)* has red berries, while the fruit of the others is black.

The Snowberry *(Symphoricarpus)* displays 3 species, all of which are low shrubs from 1 to 5 feet high. The flowers are usually small, tubular, pink or white, and are succeeded by white 2-seeded berries. They are graceful plants and rather profuse bloomers, and while the flowers are small, they

are worth cultivation. One or two species of **Wild Honeysuckle** *(Lonicera)* occur in the mountains. While they are not as valuable for decorative purposes as some of the cultivated species which do well in the irrigated valleys, they will probably get along on less water and not be so easily killed. Two other shrubs belonging to this family occur in the mountains of the State.

EHRETIACEAE.

A family of low spreading or prostrate white hairy or hispid undershrubs with partly woody stems from stout woody roots. They are close relatives of the *Boraginaceae* with which they are usually combined. Three of the species have been passing as species of *Coldenia* in several of the maunals though originally described as belonging to separate genera. The fourth is not yet described.

The plants are so small and really unimportant that they are not included here although mentioned because they come within the limits of the title.

VERBENACEAE. Verbena Family.

A family consisting mostly of herbs as represented in New Mexico where the genus Verbena is common and tolerably well known. One genus of shrubs is represented by a single species that promises to be of value, as follows:

Three species of the genus *Phyla (P. lanceolata, P. cuneifolia and P. incise)* belonging to this family (sometimes included in the genus *Lippa*) should be noticed here though they are not shrubs or trees. They are low creeping vine-like plants that are valuable for use as a ground cover in place of grass. Another species is used extensively and very effectively in southern California for this purpose. Particularly in compact, somewhat alkaline soils where grass would do poorly the species *P. incisa* would be a very satisfactory substitute. They all have small heads of white flowers superficially suggesting white clover; they bloom profusely and require only a little water.

LIPPIA. L.

Branching shrub 2 to 3 ft. high, with slender stems; having the internodes 2 or 3 times longer than the short-petioled, small, ovate, crenate-serrate aromatic leaves, and terminal spikes of small white flowers; bracts ovate lanceolate, acuminate, about the length of the calyx; calyx about 2 mm. long lobes 4, acute, equal densely white-hirsute; corolla white about twice as long as the calyx, glabrous within; nutlets thin walled.

1. *L. wrightii.*

LABIATAE. MINT FAMILY.

Aromatic herbs or shrubs, annual or perennial with 4-sided stems and opposite leaves; leaves simple, entire or variously toothed or incised; inflorescence of small cymose clusters in the axils of the normal or reduced leaves or in terminal spikes or heads; flowers perfect and irregular; calyx free, persistent, tubular or campanulate, regular or irregular. Stamens 4 or by abortion 2; anthers 2-celled; ovary superior deeply 4-lobed, 4-celled; fruit 4 small nutlets in the persistent calyx.

Upper lip of the bilabiate corolla flat not concave; calyx regularly 5-toothed. 1. POLIOMINTHA.

Upper lip of the bilabiate corolla more or less concave; calyx 2-lipped, the upper lip obscurely 3-toothed or entire, the lower 2-toothed. 2. SALVIA.

1. POLIOMINTHA Gray.

Hoary canescent shrub about 3 feet high, with entire linear oblong to lanceolate nearly sessile leaves about ¾ inch long; flowers in small axillary clusters towards the ends of the stems, subtended by reduced bract-like leaves; calyx broad tubular with 5 narrow, equal teeth, densely villous with spreading white hairs; corolla pale purplish, tube surpassing the calyx, throat gaping; fertile stamens 2, and 2 rudimentary filaments.

1. *P. incana.*

2. SALVIA Linn. SAGE.

Annual or perennial herbs or shrubs, 3 feet high or less, with opposite petiolate glandular leaves and flowers in terminal paniculate or crowded verticillate clusters; calyx tubular or campanulate,

bilabiate, sometimes obscurely so, upper lip entire or trifid; lower lip bifid; throat smooth; corolla mostly conspicuously colored, blue or red; bilabiate, the upper lip erect; lower lip 3-lobed; stamens 2; stigmas 2 sometimes unequal; nutlets ovoid or 3 sided, smooth.

Leaves oblong to elliptic, acute or obtuse, entire or the lowermost obscurely dentate, nearly glabrous; calyx conspicuously veined, not accrescent; plant a foot high or less.	1. *S. lycioides.*
Leaves ovate or deltoid-ovate, acute, crenate, densely canescent beneath; calyx not conspicuously veined, accrescent in fruit; plant 3 feet high or more.	2. *S. pinguifolia.*

SOLONACEAE. Potato Family.

This is a large family containing several valuable economic genera the best known of which are those containing the potato, tomato, ground-cherry, tobacco, Petunia, etc. It is quite well represented in New Mexico but most of the species are herbaceous. A single genus of shrubs occurs within our limits as follows:

LYCIUM L.

Shrubs with divaricate branches many ending in thorns; wood hard and tough; leaves alternate or often fascicled by the reduction of the stem; thickish, entire or undulate; flowers mostly in few flowered axillary cymes; calyx of 5 sepals united at the base, persistent in fruit; corolla funnelform to almost salverform; greenish or purplish, lobes 5, obtuse; stamens 5, mostly exserted; ovary 2-celled; berry globose, fleshy bright scarlet when mature, rather pleasant to taste.

Flowers greenish, 20 mm. long; older branches dark reddish-brown.	1. *L. pallidum.*
Flowers purplish, 12 mm. long or less; branches grayish.	
Corolla 8 to 12 mm. long; leaves large and numerous.	2. *L. torreyi.*
Corolla 5 mm. long; leaves small and few.	3. *L. parviflorum.*

BIGNONIACEAE.

Shrubs or low trees with simple or pinnately compound exstiplate leaves and large perfect flowers in terminal racemes; calyx hypogynous of 2 more or less united sepals; corolla irregular, large,

funnelform; 2-lipped; deciduous; stamens 5, 1 or 3 reduced to sterile filaments or 4 and then didynamous; filaments filiform, adnate to the corolla tube, included anther sacs, divaricate; ovary 1-celled with 2 parietal placentae or 2-celled by a false partition; style 1, stigmas 2; fruit a slender, terete coriaceous capsule with numerous winged seeds.

Leaves simple; flowers purplish. 1. CHILOPSIS.
Leaves compound; flowers yellow. 2. STENOLOBIUM.

1. CHILOPSIS Don. DESERT WILLOW.

Large shrub, sometimes tree-like, 6 to 15 feet high, branched from the base, with narrow, lanceolate, thin, light green leaves and terminal racemes or thyrsoid panicles of showy, purplish flowers; calyx membranaceous splitting into 2 concave lobes; corolla about 1 inch long, funnelform, obscurely 2-lipped, the limb narrow, upper lip 2-lobed, the lower 3-lobed; anther bearing stamens 4 with a staminodium adnate to the base of the corolla tube; capsule tapering at both ends, terete, 1 dm. long or more; seeds numerous.

1. *C. linearis.*

ACANTHACEAE. ACANTHUS FAMILY.

Annual or perennial herbs or shrubs, with enlarged nodes, alternate opposite or whorled, exstipulate leaves, and perfect irregular flowers often subtended by conspicuous bract; calyx of 5 sepals, nearly distinct or often united, sometimes with bractlets subtending. Corolla of 5-partially united petals, 2-lipped or sometimes nearly regularly 5-lobed; stamens 4, didynamous, or 2; ovary superior 2-celled; style single; stigma entire or 2-lobed; fruit a capsule, 2-celled; valves elastic, seeds usually flattened.

Leaves linear; corolla 10 mm. long or less, pale blue. 1. CARLOWRIGHTIA.
Leaves lanceolate; corolla 30 mm. long, pinkish or red. 2. ANISACANTHUS.

1. CARLOWRIGHTIA A. Gray.

Much branched shrub, 3 feet high or less, with slender stems, (those of the year green), and opposite, linear to filiform leaves ¾ to 1½ inches long; flowers perfect, at first axillary, then panicu-

late toward the ends of the stems; calyx lobes 5-linear filiform, united but little at the base; corolla tube narrow, shorter than the 4-parted spreading limb, less than 1 cm. long, pale blue, (in our species), capsule ovate, short acuminate, or compressed, short stipitate; seeds very flat.

1. *C. linearifolia.*

2. ANISACANTHUS Ness.

Woody shrub 3 feet high or often more, with lanceolate, entire, short-petioled, acute or obtuse leaves, 1 to 1½ inches long, often appearing fascicled and clustered; conspicuous reddish flowers on short pedicels; calyx lobes 5, equally long attenuate, as long as the capsule; glandular pubescent, persistent; corolla reddish or pinkish white, narrowly funnelform about 1 inch long; 4 lobes similar, lanceolate, entire, the fifth rather more deeply separated; stamens and style equalling or exceeding the corolla lobes; capsule ovate, long stipitate; seeds mostly 2.

1. *A. thurberi.*

RUBIACEAE. MADDER FAMILY.

This family which contains such well known genera as Houstonia ("bluets") and Galium ("bedstraws" or "cleavers") is represented by only a single shrubby species of Bouvardia, a species well worth cultivation for its conspicuous red flowers. Several species of this genus are already in cultivation.

1. BOUVARDIA Salisb.

Low shrub, the upper parts of the stems herbaceous, with ovate-lanceolate, short petioled, leaves, 1 to 2 inches long, mostly in whorls of 4, and terminal cymes of conspicuous red heterogone and dimorphous flowers with slender tubular corollas; hypanthium turbinate or campanulate; sepals 4, persistent; corolla lobes short, valvate in the bud; style slender, more or less exserted in some of the flowers; stigmas 2, obtuse; ovary 2-celled; capsule didymous to globose, coriaceous loculicidal; seeds numerous, flat, winged all around, imbricated on the placenta.

1 *B. ovata.*

CAPRIFOLIACEAE. Honeysuckle Family.

Shrubs, trees, woody vines, or rarely low herbs, with opposite exstipulate leaves and perfect flowers variously arranged in axillary pairs or axillary or terminal cymes: hypanthium adnate to the 2 to 5-celled ovary, calyx of 4 or 5 sepals: corolla rotate, tubular or funnelform, sometimes bilabrate, lobes 4 or 5 imbricated, stamens 4 or 5, sometimes partly adnate to the corolla, alternate with the lobes; ovary 2 to 5-celled, inferior; fruit a berry or a drupe

Corolla rotate; style deeply 3- to 5-cleft, short; inflorescence compound cymose; fruit drupaceous (shrubs). — 1. Sambucus

Corolla tube long; tubular, campanulate, funnelform or salver form, sometimes two-lipped, never rotate; style slender, undivided; inflorenscence simple, few-flowered; fruit dry or berry like.

- Corolla regular, tubular,funnel form; fruit 2-seeded. — 2. Symphoricarpus.
- Corolla broadly funnelform, more or less bilabrate or nearly regular; fruit few to many seeded.
  - Upper leaves connate perfoliate; flowers mostly in terminal clusters, pseudo-verticellate or crowded; corolla not saccate at the base. — 3. Lonicera.
  - Upper leaves not connate; flowers axillary, in pairs, sessile on the end of a common peduncle, subtended by bracts; corolla conspicuously saccate at the base.
    - Bracts or bractlets very small and inconspicuous; green; not accrescent. — 4. Xylosteon.
    - Bracts foliaceous, and bractlets accrescent, reddish brown. — 5. Distegia.

1. SAMBUCUS L. Elder

Shrubs or trees with soft wood, large pith, opposite pinnately compound leaves with large leaflets, and small white or ochroleucus flowers in terminal compound cymes: hypanthium turbinate or ovoid; sepals 3 to 5, equal; corolla rotate, with 3 to 5 equal, imbricated, or rarely valvate lobes; stamens 5 adnate to the base of the corolla, anthers opening extrorsely by clefts; ovary 3 to 5-celled becoming a 1-seeded drupe like fruit.

Cyme not flat-topped, thyrsoid-paniculate, the axis continuous.

- Fruit red; cymes in flower seldom more than 4 cm. broad. — 1. *S. microbotrys.*
- Fruit black; cymes larger, 6 cm. wide or more. — 2. *S. melanocarpa.*

Cymes flat-topped, with several compound rays, the axis not continuous.
Leaflets less than 2½ inches long, ovate to oblong, short acuminate, good sized tree. 3. *S. mexicana.*
Leaflets larger, 3 to 6 inches long, lanceolate, long attenuate; branches and leaves glabrous; flowers 5 or 6 mm. broad; small tree well defined trunk. 4. *S. neomexicana.*

2. SYMPHORICARPUS L. Snowberry

Branching shrubs 5 feet high or less with opposite, simple short-petioled leaves and small mostly tubular flowers, in few-flowered axillary clusters; hypanthium cup-shaped to sub-globose; sepals 4 or 5, unequal; corolla white or reddish, tinged, sometimes campanulate, mostly tubular, funnelform; lobes 4 or 5, almost equal; stamens 4 or 5, adnate to the corolla; ovary 4-celled; berry fleshy, 2-seeded.

Corolla 5 mm. long or less, open campanulate. 1. *S. pauciflorus.*
Corolla 8 to 12 mm. long, salverform or narrowly funnelform.
Corolla 6 to 8 mm. long; leaves thick, densely pubescent; seeds rounded at both ends. 2. *S. rotundifolius.*
Corolla 8 to 12 mm. long; leaves thin, sparingly pubescent; seeds acute at one end. 3. *S. oreophilus.*

3. LONICERA L. Honeysuckle

Shrubby vines with trailing rather stiff stems and shreddy bark; leaves opposite, entire, short-petioled, the upperones connate perfoliate; flowers mostly sessile and whorled at the ends of the stems; hypanthium subglobose or ovoid; sepals 5; corolla tubular to funnelform or broader, more or less lipped; stamens 5, adnate to the corolla tube; ovary 2 to 3 celled, ovules numerous; fruit a fleshy berry, few seeded.

Limb of the corolla nearly regular; inflorenscence pedunculate; leaves campanulate ciliate. 1. *L. arizonica.*
Limb of corolla deeply bilobiate; inflorescence sessile; leaves not ciliate. 2. *L. dumosa.*

4. XYLOSTEON Juss.

Erect branching shrubs with opposite simple leaves, entire, sessile or short-petioled, not connate above; flowers sessile in pairs on the ends of solitary axillary peduncles; subtended by 2 minute bracts and bractlets; hypanthium more or less united; calyx minute or obsolete; corolla broadly funnelform, 1 cm. long or more, saccate at the base, limb 5-lobed nearly equal; ovary usually 2-celled; berries distinct or didymous, red.

1. *X. utahense.*

4. DISTEGIA. Raf.

Very simiar to the last but the flowers sometimes in threes and not coherent, the bracts leaflike and the bractlets strongly accrescent and purplish, surrounding the dark purple or black berries.

1. *D. involecrata.*

The Sunflower Family *(Compositae)* is by far the largest of all the families represented in our region, being represented by several hundred species; but most of them are herbaceous plants. There are several species of shrubs, however, in the family, some of which are of value for one purpose or another. All the shrubby species are listed below, and technical descriptions are given of the plants. Only a few need be mentioned here for purposes of calling special attention to them.

The Sage Brush *(Artemisia* spp.*)* occurs in one form or another scattered pretty well over the plains of the whole State. This name is properly applied to the shrubby species of this genus, of which there are several. *Artemisia tridentata* is perhaps the most common form, especially on the high plains at the northern end of the State. *Artemisia filifolia* is a shrub 3 to 5 feet high, with very narrow leaves, that occurs on the sandy mesas of the northern part of the State. All of the species of this genus are eaten by cattle, sheep, and goats, and several of them are considered of the greatest importance by stockmen. The commoner herbaceous forms, which are used extensively, go under the Spanish name of *Estafiata* among the Mexican herders, and they are valued highly, especially as an early spring feed. The shrubby forms to which the name Sage Brush is properly applied should not be confused with the Salt Bushes*, since they are entirely different botanically, and not as closely related as apple trees and sunflowers.

Mariola is a Spanish name for *Parthenium incanum*, a low shrub 2 or 3 feet high, with gray-green leaves and inconspicuous white flowers, that grows on the drier foothills in the southern part of the State. This little plant is a near relative of the guayule or Mexican rubber plant found in Western Texas and northern Chihuahua. It contains a small

*See *Atriplex* spp., page 68.

percentage of rubber, but not in sufficient quantity to make the extraction profitable.

Arrow Wood or **Cachinilla** *(Berthellotia borrealis)* is a common shrub, forming large patches in the valleys of the southern part of the State. It is of no economic importance, but probably receives its American name from the use of its stems by the Indians.

A small branching undershrub that occurs among the rocks in the foothills of the hotter mountains is *Carphochaete bigllovii*. This little shrub is a profuse bloomer and a free grower. While not more than 18 inches high, it would be a very satisfactory little bedding plant.

Boneset *(Eupatorium* spp.*)* is represented by one or two shrubby species which might be brought into cultivation.

The Wild Zinnia *(Crassina pumula)* is a low undershrub 8 or 10 inches high and widely branched. It produces an factory in a desert garden.
ly dry on the plant. For a border plant it would be very satis-abundance of white flowers, the ray flowers of which ultimate-more or less distinct vertical ranks, mostly destitute of herbaceous

KEY TO THE TRIBES HERE LISTED.

Anthers not caudate at the base; style-branches either truncate or tipped with an appendage.
- Heads rayless; flowers perfect; flowers white or very pale yellow. — II. EUPATORIEAE.
- Heads mostly radiate.
  - Style branches of perfect flowers flat or tipped with a distinct appendage; leaves mostly alternate. — III. ASTEREAE.
  - Style branches of perfect flowers truncate or appendaged, not flattened; leaves often opposite.
    - Involucre not scarious.
      - Pappus never capillaria.
        - Receptacle chaffy. — V. HELIANTHEAE.
        - Receptacle not chaffy. — VI. HELENIEAE.
      - Pappus capillaria. — VIII. SENECIOIDEAE.
    - Involucre scarious; pappus not capillary. — VII. ANTHEMIDEAE.

Anthers caudate at the base; style branches neither truncate nor appendaged; heads not radiate. — IV. INULEAE.

KEY TO THE GENERA HERE LISTED.

Tribe II. EUPATORIEAE.

Bracts of the involucre herbaceous neither striate nor nerved; low shrubs with small heads of large white flowers; leaves entire. — 1. CARPHOCHAETE.

Bracts of the involucre not herbaceous, striate nerved, flowers small pale yellowish white rather numerous in the head; leaves toothed. — 2. COLEOSANTHUS.

Tribe III. ASTEREAE.

Heads unisexual, dioecious, discoid, pappus of the stamenate flowers with clavate tips; flowers mostly white. — 3. BACCHARIS.

Heads of perfect flowers, at least in part, flowers yellow.
- Heads without rays. — 4. CHRYSOTHAMNUS.
- Heads radiate. — 5. CHRYSOMA.

Tribe IV. INULEAE.

A single genus with dioecious pink flowers in discoid heads. — 6. BERTHELLOTIA.

Tribe V. HELIANTHEAE.

Heads discoid.
- Heads of two kinds on the same plant; staminate heads several; pistillate usually solitary. — 7. HYMENOCLEA.

Heads all alike of numerous perfect flowers. 8. FLOURENSIA.
Heads radiate.
Rays 5, very short, heads appearing discoid; flowers all white. 9. PARTHENIUM.
Rays conspicuous, heads rather large.
Rays yellow (in our species) shrub 3 feet high or more. 10. GYMNOLOMIA.
Rays white (in our species) plant less than 1 foot high. 11. CRASSINA.

Tribe VI. HELENIEAE.

A single genus—with fleshy leaves. 12. CLAPPIA.

Tribe VII. ANTHEMIDEAE.

Receptacle naked, heads discoid:
Plants spiny; achenes and corollas cobwebby. 13. PICROTHAMNUS.
Plants not spiny; achenes not cobwebby. 14. ARTEMISIA.

Tribe VIII. SENECIOIDEAE.

A single genus: Flowers yellow; heads rayless: shrubs tomentose. 15. TETRADYMIA.

1. CARPHOCHAETE Gray.

Perennial herbs or shrubby plants with glabrous or glabrate foliage; leaves opposite; blades narrow, leathery, sessile; heads discoid; solitary or terminating branches; involucres narrowly cylindric, 4 to 6-flowered; bracts few, in few series, acuminate, successively longer; receptacle naked; corollas regular, slender; anthers often with a cleft appendage at the apex; stigmas filiform, rather obtuse; achenes elongated, 10-striate; pappus of several linear-subulate erose-denticulate scarious scales, with the mid-nerve prolonged into a barbellate awn.

1. *C. bigelovii.*

2. COLEOSANTHUS Cass.

Herbs or shrubby plants, with upright branching stems; leaves opposite or alternate; blades broadest below the middle, usually toothed, prominently nerved beneath; heads several or numerous, or rarely solitary discoid; involucres oblong to campanulate, few to many-flowered; bracts narrow, striate, in several series, the inner successively longer, receptacle naked; corollas regular; anthers ob-

tuse at the base; stigmas elongated; obtuse; achenes 10-ribbed or 10-striate; pappus of one series of scabrous barbellate or nearly smooth hair-like bristles.

Leaves small, laciniate toothed; bracts and peduncles glandular viscid; heads nearly sessile.	1. *C. laciniatus.*
Leaves longer, truncate to cordate at base, crenate dentate, not laciniate; bracts and peduncles not viscid.	2. *C. wrightii.*

Two other related species doubtfully separate from the last which they closely resemble are *C. rusbyi* and *C. reniformis.*

3. BACCHARIS L.

Perennial caulescent herbs or shrubs, usually with glabrous or resinous foliage below the inflorescence; leaves alternate; blades often leathery, entire or toothed; heads discoid dioecious, in corymbs or panicles; involucres often campanulate; bracts in several series; receptacle flat, pitted, naked; corollas various, staminate ones tubular pistillate ones filiform; anthers entire and obtuse at base; stigmas slender, those of the staminate flowers with broad appendages; achenes flattened, ribbed; pappus various, that of staminate flowers short; that of the pistillate flowers copious, of long hair-like bristles.

Leaves very small, ½ inch long or less, entire; plant 3 to 4 feet high.	1. *B. pteronioides.*
Leaves larger 1½ to 4 or 5 inches long, not fascicled, more or less toothed.	
Plant low 2 to 3 feet high, woody only at the base, leaves linear oblong, sharply and nearly evenly serrate about 1½ inches long.	2. *B. bigelovii.*
Plants much taller 6 to 10 feet high; leaves larger and irregularly toothed.	
Pappus scarcely surpassing the style in fruit; plant quite resinous; leaves 3 to 5 inches long, lanceolate, short, acuminate.	3. *B. glutinosa.*
Pappus accrescent in fruit; leaves cuneate-oblong 1 to 2 inches long with a few teeth at the apex or occasionally on the sides.	4. *B. salicina.*

4. CHRYSOTHAMNUS Nutt. RABBIT BRUSH

Shrubby or suffrutescent plants with narrow or terete entire leaves; herbage white-tomentose or glabrous, often viscidulous or resinous; inflorescence paniculate, cymose, or rarely racemose; heads homogamous; involucre narrow; the bracts well imbricated usually in more or less distinct vertical ranks, mostly destitute of herbaceous

tips; ray-flowers uniformly wanting; disk-flowers 5 to 30; style branches subulate or filiform, usually long-exserted; achenes narrow, terete or slightly angled; pubescent; pappus copious, soft, commonly dull white.

Achenes glabrous.
- Stems, leaves, and involucres more or less floccose. — 1. *C. bigelovii.*
- Plants without floccose pubescence. — 2. *C. linifolius.*

Achenes pubescent; plants tomentose at least on the young branches.
- Branches and leaves permanently white tomentose. — 3. *C. latisquamea.*
- Branches and leaves becoming glabrous.
  - Bracts glabrous; lobes of the corolla spreading in age; plants much branched. — 4. *C. graveoleus.*
  - Bracts villous-ciliate; lobes of the corolla erect; plant sparingly branched. — 5. *C. confinis.*

5. CHRYSOMA Nutt.

Shrubby caulescent herbs, with somewhat glutinous foliage; leaves alternate, blades fleshy, leathery, narrow, conspicuously pitted, mostly 1-nerved; heads radiate, numerous; involucres narrow, few-flowered, bracts in few series; receptacle pitted; ray-flowers 1 to 3, pistillate; disk-flowers mostly perfect; corollas yellow, tube scarcely dilated above; anthers obtuse at base; stigmas flattened, with lanceolate appendages; achenes pubescent; pappus of 1 to 2 series of numerous brownish hair-like bristles.

This would be well worth cultivation but our efforts to transplant it have always failed.

1. *C. laricifolia.*

6. BERTHELLOTIA DC. Arrow-wood. Cachinilla

Annual or perennial caulescent herbs, or shrubs; leaves alternate, blades usually toothed, often prominently nerved, petioled or the upper sessile or clasping; heads discoid, commonly in cluster-like cymes; involucres turbinate, hemispheric or campanulate, with pistillate and perfect flowers, bracts ovoid, in few series; receptacle flat, naked; pistillate flowers marginal, fruit-producing; perfect flowers central, mostly not fruit-producing; anthers sagittate, the auricles tailed; stigmas united or distinct; achenes 4 to 5-angled; pappus a single series of scabrous hair-like bristles.

1. *B. borealis.*

7. HYMENOCLEA Torr. & Gray.

Tall deciduous-leaved shrub, 6 to 8 feet high with yellowish-brown somewhat stringy bark and linear-filiform yellowish-green leaves, alternate, but often appearing fascicled, and terminal panicles of rather inconspicuous dull brown heads of flowers; flowers unisexual, the two kinds intermixed or the pistillate ones in the lower axils, the staminate involucre of several united bracts, saucer-shaped, the involucre of the solitary pistillate flower ovoid or fusiform, beaked at the apex and the lower part furnished with 9 to 12 dilated and silvery-scarious persistent transverse wings; achenes turgid, without pappus.

A single species. 1. *H. monogyra.*

8. FLOURENSIA DC. Blackbrush

Almost glabrous resiniferous much branched shrub, 2 to 3 feet high with alternate entire leaves, corymbous or paniculate heads of flowers on short peduncles from the axils of the upper leaves; flowers all tubular, no rays, yellow; receptacle flat, with scarious chaff conduplicate around the compressed, callous-margined very villous achenes; pappus a more or less persistent subulate awn from each angle of the truncate achene and commonly some smaller ones between. A single species in our range.

1. *F. cernua* DC.

9. PARTHENIUM L. Mariola

Perennial or sometimes annual caulescent herbs, or shrubs; leaves alternate, blades toothed, pinnatifid or dissected; heads radiate, but not conspicuous; involucres hemispheric, campanulate, or flat, pedunc'ed; bracts in 2 to 3 series, appressed, obtuse; receptacles convex or conic, chaffy; ray-flowers usually 5, pistillate, fruit-producing; ligules broad, very short, white or whitish; disk-flowers perfect, not fruit-producing, embraced by the bractlets; anthers entire at the base; achenes flattened, margined, keeled on the inner face, tipped with the persistent ray-flower.

Only one species occurs within our range. The nearly related Guayule *P. argentea* occurs just south of us, but several attempts to grow it here have failed.

1. *P. incanum.*

10. GYMNOLOMIA H. B. K.

Annual or perennial caulescent herbs or shrubby plants, with pubescent foliage; leaves alternate or opposite; blades narrow, entire or toothed; heads radiate, rather conspicuous; involucres hemispheric or campanulate; bracts narrow, in 2 to 3 series, the inner ones somewhat longer than the outer; receptacle more or less conic, chaffy; ray-flowers pistillate not fruit-producing; ligules yellow; disk-flowers perfect, fruit-producing, with yellow or brownish corollas; stigmas of disk-flowers obtuse or with acute appendages; achenes of the ray inane; those of the disk 4-angled, either somewhat flattened or turgid; truncate; pappus a denticulate crown, or wanting.

11. CRASSINA Seepin. ZINNIA

Annual or perennial caulescent herbs or shrubby plants; leaves opposite; blades commonly narrow, entire or sparingly toothed; heads radiate, often showy; involucres campanulate or somewhat cylindric; bracts in 3 to 4 series, firm, appressed, rather dry; receptacle conic or cylindric, chaffy; ray-flowers pistillate, fruit-producing; ligules red, purple or yellow, or variegated; disk-flowers perfect, fruit-producing, enveloped in bractlets; stigmas of the disk-flowers truncate or subulate; achenes various; those of the ray 3-angled; those of the disk flattened; pappus of one or several awns or teeth, or wanting.

A single woody species. 1. *C. pumila.*

12. CLAPPIA A. Gray.

Perennial shrubby, but fleshy plants; leaves alternate; blades entire or pinnately 3 to 5-parted; heads radiate; pedunculed; involucres hemispheric; bracts leathery, imbricated in 2 to 3 series, broad, obtuse; receptacle convex, bristly-fimbrillate; ray-flowers 12 to 15, pistillate, fruit producing; ligules narrow, yellow; disk-flowers perfect, fruit-producing; anthers entire at the base; stigmas of the disk with triangular appendages; achenes narrow, terete, 8 to 10-nerved, hairy on the nerves; pappus of 20 to 25 scale-like hispidulous bristles longer than the achene.

A single species in "gyp" soils only; in the Lower Sonoran Zone. 1. *C. suaedaefolia.*

13. PICROTHAMNUS.

Stems stout and densely branched, rigid, 1 to 4 cm. high, white-tomentose; leaves 4 to 8 mm. long, pedately 3 to 5-parted, the divisions 3-lobed; heads globose, racemosely glomerate on short leafy branchlets which become slender, persistent spines; bracts of the involucre 5 to 6, broadly ovate, obtuse; pistillate flowers 1 to 4, with truncate corolla; the hermaphrodite sterile flowers 4 to 8, the corollas ventricose-campanulate from a narrow base, 5-toothed; achenes oblong-obovate.

14. ARTEMISIA L. Sage Brush

Annual or perennial caulescent herbs or low shrubs; foliage usually pubescent; leaves alternate, blades entire, toothed, laciniate or dissected: heads small, discoid, often numerous, drooping or erect: involucres various in shape, bracts in several series, the inner ones successively longer: receptacle flat or hemispheric, naked or sometimes pubescent, but never chaffy; flowers various, sometimes all perfect and fruit producing sometimes the marginal pistillate and fruit-producing, the central perfect and sometimes neutral; anothers entire and obtuse at the base, usually subulate-tipped; achenes 2-ribbed, or striate, each topped by a disk.

Heads with all the flowers fertile.	
Leaves narrowly oblong to linear, entire.	1. *A. cana.*
Leaves 3-toothed at the apex.	
Bracts of the involucre nearly glabrous and resinous, infolrescence lax, race mose; plant about 1 foot high.	2. *A. nova.*
Bracts of the inflorescence tometose; inflorescence rather congested.	
Shrub tall, 3 to 6 feet; inflorescence much branched.	3. *A. tridentata.*
Shrub low a foot or so high; inflorescence rather simple and spike like.	4. *A. arbuscula.*
Heads having two kinds of flowers; central flowers sterile, the ovary abortive.	
Shrub 4 to 6 feet high, white tometose; leaves filiform.	5. *A. filifolia.*

15. TETRADYMIA DC.

Low and rigid shrubs, sometimes spinescent, canescently tomentose; with alternate and sometimes fascicled narrow and entire leaves, cymose or clustered heads of yellow flowers, and copious white pappus.

Leaves filiform 1 inch or more long; heads ½ inch long.	1. *T. filifolia.*
Leaves broader, oblong or lanceolate; ½ inch long or less; heads slightly smaller.	2. *T. canescens.*

INDEX

to the Common Names and the Genera Described in this Bulletin.