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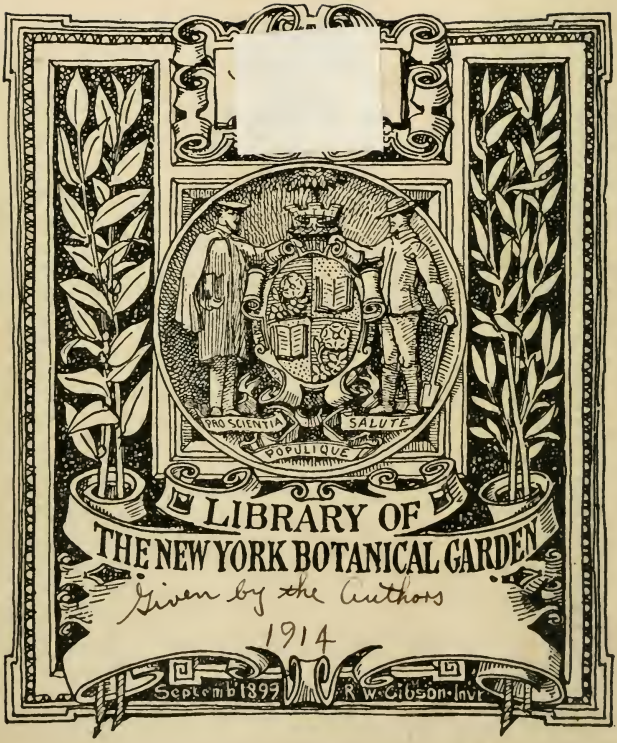
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To the Librarian,
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My dear Miss Harlow:

If I remember rightly I did not find a copy of our Yosemite Flora on your shelves when I was in New York last spring. I am therefore sending you a copy under separate cover with my compliments. Trusting that you will find a place for this, and that you will accept my best thanks for the many courtesies shown me, I am

Very truly yours,

H M Hall

WASHINGTON LILY
(*Lilium washingtonianum*)

This beautiful Lily grows amid the chaparral of exposed slopes. The white, wax-like flowers are borne on tall, erect stalks, overtopping the humbler shrubs that form their protecting thickets.

A YOSEMITE FLORA

A DESCRIPTIVE ACCOUNT
OF THE FERNS AND FLOWERING PLANTS,
INCLUDING THE TREES, OF THE YOSEMITE NATIONAL
PARK; WITH SIMPLE KEYS FOR THEIR
IDENTIFICATION; DESIGNED TO
BE USEFUL THROUGHOUT
THE SIERRA NEVADA
MOUNTAINS

BY
HARVEY MONROE HALL
ASSISTANT PROFESSOR OF BOTANY IN THE
UNIVERSITY OF CALIFORNIA
AND
CARLOTTA CASE HALL

Illustrated with Eleven Plates
and One Hundred and Seventy Figures
in the Text

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PREFACE

The Yosemite National Park is perhaps the most delightful region in all the world for the study of plant life. The wide variety of conditions here found, ranging from the hot and desiccated slopes of the brush-clad foothills to the cold, bleak summits above timber-line, the abode of glaciers and perpetual snow, gives to the flora an exceedingly diverse and interesting character. Innumerable springs, creeks, rivers, ponds, and lakes provide suitable habitats for moisture-loving plants. Rocky outcroppings, enormous cliffs, and gravelly ridges accommodate species adapted to such situations. The irregular topography yields southward facing slopes which receive the full effect of the sun's rays, as well as northward slopes where the sun's rays are little felt, where it is therefore cool, moist, and shady. The altitude ranges from two thousand five hundred feet in the foothill belt to thirteen thousand and ninety feet along the crest of the Sierra Nevada. All of these factors conspire to produce a remarkably varied and interesting vegetation.

The richness of this flora is indicated by the nine hundred and fifty-five species and varieties here described. The total number represented in the Yosemite National Park is considerably greater, since the grasses, sedges, and rushes are here omitted. Including an estimate for these, it is safe to assume that the number of species and varieties of flowering plants and ferns to be found within the one thousand one hundred and twenty-four square miles of the park is not less than about one thousand two hundred.

In preparing a pioneer flora for a district like the Yosemite, many corners of which have not yet been botanically explored, it is manifestly impossible to avoid the omission of some species. The authors have made use of every available source of information and have themselves botanized over much of the Park. It is therefore improbable that the list will be greatly extended except for the addition of foothill species, which will doubtless be found creeping up along our lower borders, especially in the vicinity of Wawona and Hetch Hetchy valleys, and for the addition of boreal species, the ranges of which will be extended southward at high altitudes. Information in regard to additions will be welcomed, particularly when accompanied by well pre-

pared specimens. Random notes and mere fragments of plants are of but little scientific value. Directions for preparing herbarium specimens and the data which should accompany them will be gladly supplied on request.

While encouragement should be given to the gathering of flowers in moderation for purposes of study or for the more convenient enjoyment of their beauty, it is hoped that all plant lovers will discourage at every opportunity the plucking of large quantities. The wasteful and thoughtless destruction of our native vegetation is deplorable. It is nothing short of vandalism that uproots entire plants or strips bushes of their beautiful flowers, which are cast aside when the ardor cools or are carried indoors where their beauty soon fades. Those who know the plants love them, and like them best in their natural surroundings. Flowers are most attractive in their native haunts and visitors to our mountains enjoy them from the trails. If the depredations continue it will soon be necessary for the authorities to enact regulations against the plucking of all flowers as they now prohibit the gathering of snow-plants.

The preparation of this Flora has been greatly facilitated by the kind assistance of many friends. Professor Willis Linn Jepson, of the University of California, placed at our disposal his collections made on excursions through the Park in 1909 and 1911. Professor Le Roy Abrams, of Leland Stanford Junior University, has likewise permitted the use of a collection made in the Yosemite in 1911. Among the members of the Sierra Club who have assisted in a similar manner may be mentioned Miss Helen D. Geis, Miss Lydia Atterbury, Miss Katherine D. Jones, and Mr. Fred M. Reed. Miss Harriet Walker and Miss Rhoda R. Reed have supplied specimens and have assisted in other ways. A portion of the information concerning Indian uses of plants was gleaned from conversations with Dr. C. Hart Merriam. Professor W. A. Setchell and Mr. and Mrs. T. S. Brandegee, of the University of California, have contributed many valuable suggestions and critical notes, and Mr. J. W. Flinn, of the same institution, has generously assisted the authors in various ways. To all of these we wish to extend our most sincere thanks.

Free use has been made of lists of Yosemite plants by Mrs. Katharine Brandegee and by Mr. J. W. Congdon, both of whom published in the biological journal, "Zoe." The writings of John Muir contain much botanical information. The forests, the meadows, and the flowers of the Sierra Nevada are described in a most delightful manner in his "Mountains of California" and "Our National Parks." The fern lists of Mrs. J. G. Lemmon, Miss Cosy Hutchings, and Mr. S. H. Burnham have been con-

sidered. The Herbarium, Library, and Botanic Gardens of the University of California have been freely consulted in the preparation of the Flora and all collections made by the authors are now preserved at this Institution.

The text figures in this Flora are original and were prepared by Miss Anna Hamilton, Miss Helen M. Gilkey, and Mrs. Carlotta C. Hall. The frontispiece and the illustrations facing pages 56 and 58 are from photographs by Mr. O. V. Langè, the plates facing pages 96, 178, and 250 are from photographs by Professor J. N. Le Conte, those facing pages 4 and 124 are from photographs by the Pillsbury Picture Company, that facing page 190 is from a photograph by Mr. Frank Adams, while those facing pages 46 and 162 are from the collection of the Southern Pacific Company and are used through the courtesy of Mr. James Horsburgh, Jr.

NOTE CONCERNING NAMES AND ACCENTS.—*No new botanical names or combinations are published for the first time in this Flora. Such as are ascribed to the authors have been previously published, either in the "Botanical Gazette," vol. 31, or in the "University of California Publications in Botany," vols. 1, 3, and 4. A name appearing in italics at the end of a botanical description is to be considered a synonym. Botanical names are usually pronounced according to the pronunciation of Latin after the English method, although exceptions are necessarily frequent. As a general guide, the names in this Flora are marked with accents. Two accents are used, the grave (`) to indicate the long English sound of the vowel, the acute (') to show the shortened or otherwise modified sound.*

INTRODUCTION

ORIGIN, DISTRIBUTION, AND CHARACTERISTICS OF THE YOSEMITE FLORA.

WERE it permitted us to view the Sierra Nevada as they appeared in past geologic times, we would see that at one period they were the workshops of mighty glaciers which, like powerful giants, were grinding down the mountains, hewing out Yosemites, polishing domes, and converting solid rock into fertile soil. As one prepares a field before the time of sowing, so, in the glacial period, these titanic forces were preparing the way for the forests, the meadows, the flowery fields yet to come. For in those early days our region was devoid of ordinary vegetation, being entirely under the influence of ice and snow. Finally, as conditions changed, the glaciers, having completed their work, retired to the slopes of the highest peaks and their places were taken by trees and shrubs, grasses and flowers, as we now find them. It may be of interest to consider briefly the origin of this flora.

The present vegetation of the Yosemite National Park has been derived from at least three sources. One element had its origin in the lowlands of California, where it still flourishes, sending representatives, like the species of Ceanothus, Manzanita, and Yerba Santa, up through the foothills to the warmer parts of our district. A second group of species reaches us from the desert borders on the east. These had their origin in the Mexican Region from which they gradually spread northward, finally crossing the Sierran passes to flourish at a few places on the westerly slope. The Sagebrush is doubtless one of these, and even the Piñon Pine of the desert ranges has been recently found on a branch of the Tuolumne. The third, and by far the most important element in our flora, is the boreal. It is a generally accepted theory that during the glacial period species belonging normally to Arctic regions were compelled to migrate southward, on account of the great reduction in temperature. At the close of the glacial period conditions were reversed, and these northern species, now finding the climate gradually growing warmer and warmer, were forced to recede to colder regions and not only migrated back to the North but also retreated to the mountains, where they found conditions somewhat similar to those of their original northern home. It is not surprising, therefore, to find many Sierran plants occurring, almost without modification, in

Washington, Canada, and Alaska, where, however, they grow at a lower altitude. Some of these species, as the White-bark Pine, the Cassiope, and the Bitter-root, are found also in the Rocky Mountains, while not a few of them, such as the Alpine Sorrel, the Sibbaldia, and the Shrubby Cinquefoil, extend quite around the world in circumpolar regions.

As implied in the foregoing, the most influential factor in the geographic distribution of plants is temperature. Now, in a mountainous district, such as ours, the temperature depends largely upon altitude, and we therefore find that species adapted only to warm temperatures are restricted to the foothill belt, that those adapted to moderate temperatures occupy the middle altitudes, while species so constituted as to be able to carry on their life functions with a relatively small amount of heat flourish on the plateaus and peaks of the highest mountains. Since each species thus comes to inhabit only those places where conditions of temperature are suitable, the result is a grouping of plants into more or less definite belts of vegetation. These have been worked out for most of North America by Dr. C. Hart Merriam, of the United States Biological Survey, who has designated them as Life Zones and developed a system of nomenclature that is generally adopted by biologists. One must not expect to find these zones always clearly defined. Often the line between two belts is as sharp as though cut by a knife; again the belts overlap and intermingle in so confusing a manner that even the expert is baffled in an attempt to distinguish them. In the Yosemite National Park four such belts are recognized, as follows:

1. **Foothill Belt** (*Upper Sonoran Life Zone*). This belt is composed chiefly of endemic Californian species. The vegetation is largely chaparral, that is, thickets of shrubs, mostly with stiff branches, small, often thick or leathery leaves, and not rarely with spines. Annuals grow in abundance between the shrubs but only during the spring and summer months. The root systems of plants in this belt are well developed and the herbage is often woolly, or densely hairy, or coated with resin. Such qualities are characteristic of plants obliged to conserve their moisture, the Foothill Belt being mostly a dry as well as a warm zone. The upper line of this belt lies normally at about 3000 feet altitude, but it reaches 5000 feet on warm southerly or westerly exposures, while on slopes facing the north it may descend to as low as 2000 feet. Characteristic plants are the Digger Pine, Wedge-leaf Ceanothus, Bladder-nut, California Buckeye, and Poison Oak.

2. **Yellow Pine Belt** (*Transition Life Zone*). In this belt we find endemic and southern species intermingling with those of northern origin. All of the more frequented portions of the Park,

including the Wawona, Yosemite, and Hetch Hetchy valleys are within its confines. There is a strong infusion of foothill species, however, in these lower districts, particularly on warm walls and gravelly slopes. As indicated by its name, this is primarily a forest belt, dominated by the Yellow Pine, one of the noblest of our coniferous trees and the most widely distributed of them all. Within this zone occur not only the largest trees and the grandest forests of which any country can boast, but also the greatest variety of cone-bearing species. Restricted to it are such well-known representatives as the Big Tree, Sugar Pine, White Fir, Douglas Fir, and Incense Cedar, each with its own peculiar attractions and all conspiring with the Yellow Pine and with each other to form open, airy, balsam-scented forests. Along the streams grow such trees as the Nuttall Dogwood, with its showy masses of pure-white bloom, the White Alder, the Black Cottonwood, and many sorts of willows, while among the flowering shrubs of this belt are the Azalea, the Deer-brush, the Chokecherry, the Thimble Berry and many others. Along its lower borders the Yellow Pine Belt meets that of the foothills at altitudes averaging 3000 feet, as along El Portal Road, but in other places it varies from 2000 to 5000 feet, as already indicated. Its upper limits occur at about 6200 feet, although the belt may be continued upward to 7000 or 8000 feet on warm slopes, or it may be depressed to as low as 4000 feet along cold streams or valleys. The upper edge of this belt is well defined where it crosses the Yosemite Falls Trail at about 5000 feet altitude. As one ascends the trail, he notes such species as Douglas Fir, Incense Cedar, California Laurel, Broad-leaf Maple, Sword-fern, Wild Ginger, and Soap Plant. All of these are plentiful until the 5200-foot contour is reached, but not one of them occurs much above this altitude.

3. **Upper Coniferous Belt** (*Canadian and Hudsonian Life Zones*). Only species of boreal origin are found in this belt. On ascending the trails from the lower valleys, it gradually dawns upon one that he is passing into a new world. One by one the familiar plants of the Yellow Pine Belt drop out, their places in the forest being taken by new forms. The Yellow and Sugar pines are here replaced by the Jeffrey, and that in turn by the Silver Pine; no longer do we see the Black Oak with its tall trunk and spreading crown, but in its place are thickets of the dwarf Huckleberry Oak; the white-plumed Deer-brush remains only as a memory, its mantle having descended to another Ceanothus, the compact, intricately branched Snow-bush, and many lesser sorts of annual and perennial herbs occur only at these higher levels. This is the Upper Coniferous Belt, characterized

by cool summers and much snow and ice in the winter time, for it extends up to timber-line, where Alpine conditions prevail.

4. **Belt Above Timber-line** (*Arctic-Alpine Life Zone*). As in the last preceding belt, the plant species here are entirely of boreal origin. For those who are not particular as to technical requirements, this is the most easy of all belts to distinguish, since its lower limits are fixed by the upper line of the forests, from which it extends to our highest summits. Here grow only those plants which, through the peculiar constitution of their protoplasm, are enabled not only to endure the rigors of winter but to make their growth and form flowers and seed with a relatively small amount of heat. In these regions spring comes on with a rush after the melting of the snow, for each plant must hasten to mature its crop of seed before it is caught by the cold storms of early autumn. All have deep, perennial roots, while low and tough stems, often much gnarled, are the fashion. The leaves are likewise tough in most cases, having a thick epidermis, and they are mostly huddled near the base or along the short stems. These characteristics are due not only to the short growing period but also to the need of conserving moisture, since, as a result of low temperature, steep slopes, porous soil, strong winds, and reduced atmospheric pressure, a lack of sufficient water is one of the plant's chief contentions. Among the more interesting of these Alpine plants may be mentioned the Arctic Willow, which creeps along the ground, rising only to a height of three or four inches; the Cassiope, with thick, overlapping leaves and dainty pendent flowers; and the Alpine Sorrel, which extends around the world in Arctic regions, ranging southward to high peaks in the Rocky Mountains and in the Alps. The Polemonium shown in the illustration facing page 190 is a typical Alpine species, having a strong, perennial root, numerous short stems with compact leaves, and showy flower-clusters.

As has been intimated in the preceding paragraphs, temperature is not the only factor to be considered in a study of distribution. Among the other environmental influences we should note the effect of soil, light, air, animals, and especially water. Let us now briefly look into a few of these factors, observing both their influence on distribution and their effect on the appearance of the vegetation.

The moisture relation often determines the kind of plant that can grow in a given place. We therefore find, within each of the great belts as already outlined, markedly different types of vegetation, known technically as plant formations. These formations often extend from one belt into another. Where the subsoil is moist and the surface soil only moderately so, as over most of

TREES OF THE STREAM BANKS

Along the water-courses is found an assemblage of plants quite different from those inhabiting drier places. White Alders, with their smooth, gray trunks, may be seen on either side of this stream. Their branches interlock above, providing a canopy of green foliage. The furrowed trunks of the Incense Cedar are also in evidence, although this tree is by no means restricted to the proximity of streams. Such entrancing views are not uncommon in our mountains. This particular one may be seen in the upper part of the Yosemite Valley.

our district, the result is a forest, with us a coniferous forest. When, however, the moisture is near the surface, as in many valleys and around springs, the result is, not a forest, but a meadow. When a group of trees occurs in a meadow, it indicates that the moisture at that spot is deeper in the soil; in fact, such forest islands are, in most cases, plainly seen to be situated on land which is slightly more elevated or better drained than the surrounding areas.

It sometimes happens, especially on warm, well-drained slopes, that the moisture-content of the soil is too small for either meadows or forest, in which case a chaparral formation may result. This consists of low shrubs, usually with deep roots and with other characters which especially adapt them to dry situations, as has been pointed out in considering the Foothill Belt. The thickets of Chinquapin, Huckleberry Oak, Manzanita, etc., at considerable altitudes, also belong to the chaparral formation and are always found where soil moisture is comparatively scarce.

Other formations which may be traced out by the interested student include that of the stream banks, known as the riparian formation. Around and especially in the quiet ponds and lakes another type of vegetation will be encountered; still another on the crests and summits; and so a dozen or more distinct formations may be recognized, each made up of forms particularly adapted to that special environment.

That external conditions exert a profound influence on the structure and appearance of plants is well known. We have already seen that those growing in dry places have special devices for acquiring and retaining moisture. As contrasted with these it will be noted that plants growing in moist situations, as along streams, around lakes or springs, and in shady places are devoid of such adaptations; the root system is often shallow, the leaves are broad and without hairy or resinous coats, the stems are taller and without spines or thorns.

Such plants as we have just described often owe their character not only to an abundance of water, which is the most influential factor affecting the shape of plants, but also to the absence of excessive light. Shady places are usually moist places, and it is sometimes difficult to determine whether certain characters are the result of the moisture or of the light relation. Often they result from both factors operating at the same time. Leaves exposed to strong sunlight not infrequently assume a vertical position, thus presenting but a small surface to the sun's rays, as may be seen in some manzanitas. On high mountains, where the light is very intense, leaves are provided with a thick epidermal layer which doubtless serves for purposes of protection. Plants in the

full glare of the sun have, almost without exception, narrow or especially protected leaves, thus guarding against excessive light, which might destroy contents of their live tissues, and at the same time protecting themselves from excessive withdrawal of moisture through their pores.

As contrasted with these light-tolerant species, it is interesting to examine the shade-loving plants. Here we find an abundance of foliage, the broad, smooth, and thin leaves being spread out in such a manner as to receive the full benefit of the diffused light sifted through the upper layers of the vegetation. Even the arrangement of the leaves so as to prevent overlapping is as though planned with the greatest of care. The Enchanter's Nightshade is a good example, the leaf-blades being broad and exceedingly thin. The Monkshood, Columbine, Twayblade, Meadow-rue, and Thimble Berry are other instances. The leaves of the Twinberry, a plant of shaded places, are decidedly thinner than those of the manzanitas of our exposed slopes.

Rock-plants have exceptionally adverse conditions with which to contend. Aside from the great exposure to light, the soil from which their nourishment is drawn is very shallow and is moistened only during rains. Many of these plants, such as the Stonecrops, have acquired a fleshy habit, the thick, juicy leaves and stems being filled with water in time of plenty to provide for their needs in time of drought. The epidermal layers are smooth and tough and with but few openings.

Such adaptations to environment as we have been considering result not only in a varied aspect of the vegetation as a whole, but often produce so great a change in the appearance of plants belonging to one species that even trained botanists are deceived. Many a supposedly "good new species" has been named and described which farther observation has shown to be only an extreme form of a well-known species, the result of an unusual environment. The common Monkey-flower is one of these plastic species. Under favorable conditions it grows to heights of two or three feet, producing many large leaves and flowers, yet it varies into forms only two or three inches high, with minute leaves and flowers "scarcely large enough to measure." This pygmy form is common around the Yosemite, especially on very shallow soil underlaid with granite, and all intermediate stages may here be observed. Other examples might be cited, where variation extends not only to shape and size but to color, amount of pubescence, lobing of leaves, and many other characters, all of which greatly affect the appearance of a plant. In searching for an explanation of these variations the investigator must consider, not one or two, but all of the possible factors.

In a district like ours, where the topography is exceedingly diverse, the number of combinations in which external factors may unite to influence the appearance of the vegetation is very great. The number of species represented is therefore large and the variation within each species is often considerable. The detailed study of such modifications and their causes is one of the most promising fields of botanical research and it would be difficult to find better opportunities for these studies than are afforded in the Yosemite National Park.

EXPLANATION OF TERMS.

The descriptions in this Flora are, in the main, couched in clear and readily intelligible language. For purposes of accuracy, however, it is often necessary to use terms which are familiar only to botanists. For the guidance of others, the following brief outline has been prepared, which, used in connection with the glossary just preceding the index, should fully equip any intelligent student for the successful and pleasurable use of this book. Special terms used entirely or mostly in a single family of plants will be explained in the family descriptions.

The Root and Root-like Organs.

The root ordinarily grows downward from the base of the stem, forks and spreads in the earth, absorbing food and water for the plant. *Fibrous roots* have slender, thread-like branches. *Taproots* are single strong roots that descend perpendicularly, with few branches. *Rootstocks* are underground, horizontal, root-like stems, usually rooting at the joints and sending up leafy stalks. The rootstocks of ferns produce fronds instead of leaves. *Bulbs* are thickened underground bodies made up chiefly of fleshy leaves, as in the Onion. They may be scaly, as in the Lilies, or with a fibrous coat, as in the Soap-root.

The Stem.

The stem grows upward from the root and bears buds which grow out into leafy branches. It finally produces flowers and fruit.

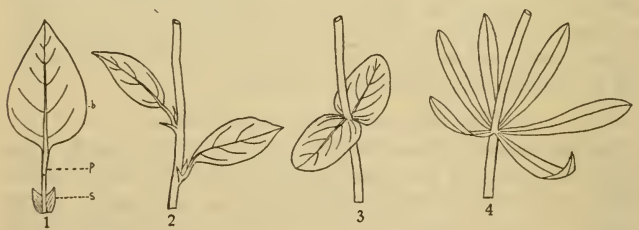
Stems are of two types. In *Endogens* the woody portion occurs in small bundles or fibers, which, in cross-section, are seen to be distributed throughout the stem. In *Exogens* the woody system grows in annual concentric layers between a central pith and an exterior bark, so that in cross-section we see a series of rings of wood, or in the first year one ring, surrounding the pith and surrounded by the separable bark. Endogenous stems produce leaves with parallel veins, while leaves on exogenous stems are nearly always net-veined.

A *node* is the place of attachment of a leaf or group of leaves. An *internode* is the portion of a stem comprised between two nodes.

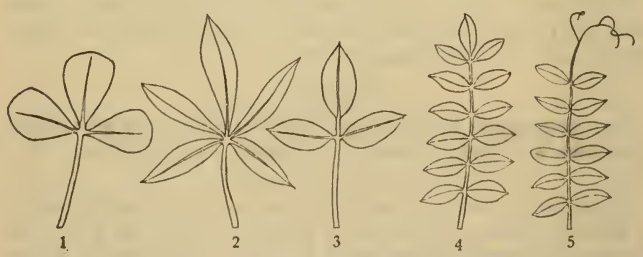
Stems and their branches may be erect, or they may be ascending, i. e., rising somewhat obliquely or curving upward. Prostrate stems may emit roots from their joints, when they are said to be *creeping*, as in the Strawberry.

The Leaves.

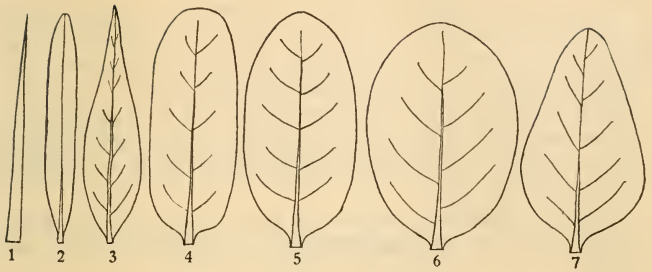
Leaves are lateral expansions and usually bear a bud in the axil, i. e., the angle formed by the leaf and the stem or branch. They are essentially digestive organs, their function being to combine materials brought by the crude sap from the roots with carbon dioxide obtained from the air, thus forming substances which may be used in building plant tissues. Only green leaves are able to perform this work.



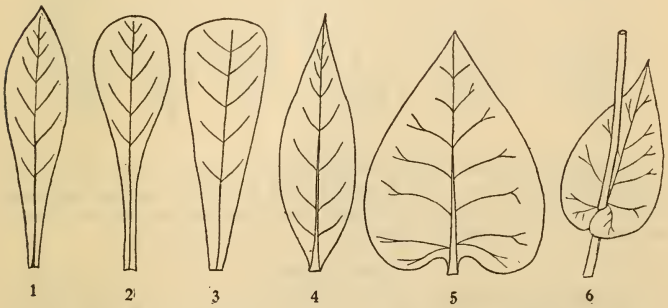
Leaves and Their Arrangement.—1. Simple leaf; *b*, blade; *p*, petiole; *s*, stipule. 2. Stem with alternate leaves. 3. Stem with opposite, sessile leaves. 4. A whorl of six leaves.



Compound Leaves.—1. A palmately compound leaf with three leaflets, as in clovers. 2. A palmately compound leaf with more than three leaflets, as in the Lupine. 3. A pinnately compound leaf with three leaflets, as in Bur Clover and some Hosackias (note the stalk of the terminal leaflet). 4. A pinnately compound leaf with more than three leaflets, as in the Loco-weed and in some Hosackias. 5. A compound leaf ending in a tendril, as in the Vetches and in the Sweet Pea.



Leaf-outlines.—1. Awl-shaped. 2. Linear. 3. Lanceolate. 4. Oblong. 5. Elliptic. 6. Oval. 7. Ovate.



Leaf-outlines and Extremities.—1. Oblanceolate, with acute apex. 2. Spatulate, with obtuse apex. 3. Wedge-shaped, or cuneate. 4. Acuminate. 5. Heart-shaped at base. 6. Clasping.

An ordinary leaf consists of a usually flat portion, the *blade,* joined to the stem by a leaf-stalk or *petiole.* When there is no petiole, the leaf is said to be *sessile* on the stem. *Stipules* are outgrowths from the base of the petiole. They may be small and scale-like, or larger and leaf-like. They are often absent.

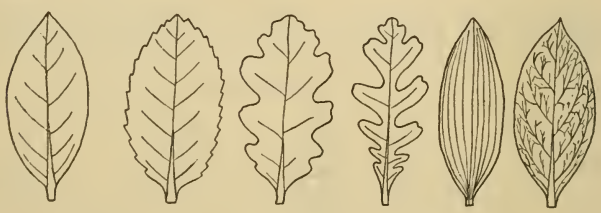
As to position, leaves are *clasping,* when the base more or less surrounds the stem horizontally; *sheathing,* when the base of the blade or petiole forms a vertical sheath around the stem; *alternate,* when not opposite to each other but arranged singly at different heights; *opposite,* when two grow from the same node at opposite sides of the stem; *whorled,* when several are arranged around the stem like the spokes of a wheel.

Simple leaves have a blade of a single piece. *Compound leaves* are divided to the midrib into separate parts, called leaflets. *Pinnately compound* leaves have the leaflets arranged along the

sides of a common stalk, or *rachis*. In *palmately* compound leaves they all spring from the summit of the common petiole, like the fingers of a hand. In a *bi-pinnate* leaf the leaflets are again divided to the base, as in the fronds of many ferns.

The terms used in describing the shapes and margins of leaves may be best understood by a study of the figures (adapted from Gray's *Structural Botany*) and of the definitions in the glossary at the end of the book.

Leaves are sometimes broader at apex than at base, in which case the prefix *ob*, meaning inversely or oppositely, is often convenient.



Leaf-margins, Lobed Leaves, and Venation.—1. An entire leaf. 2. A toothed or dentate leaf. 3. A lobed leaf, the divisions extending not more than half way to the midrib. 4. A parted leaf, the divisions reaching nearly to the midrib. 5. A parallel-veined leaf. 6. A net-veined leaf.

The Flower.

The flower comprises all of the plant parts which have to do with reproduction, that is, with the formation of fertile seeds. Some plants, however, reproduce without the aid of true flowers and do not set seed. Such are the so-called "flowerless plants" (*Cryptogams*), of which only the ferns are here described. Flowering plants, or seed plants, are known as *Phaenogams*.

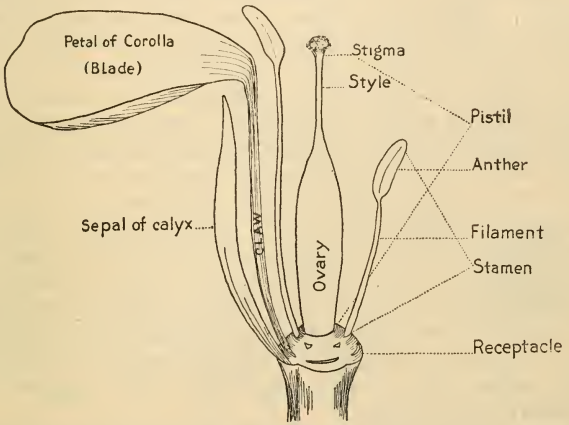
The parts of a flower (any one of which may be wanting in some cases) are as follows:

The *perianth* comprises both calyx and corolla, or only the calyx when the corolla is wanting. The showy part of most Irises, Lilies, Eriogonums, etc., is the perianth.

The *calyx* forms usually an outer circle of greenish parts, mostly for purposes of protection. It may be of distinct *sepals*, or these may be united into a cup-shaped, bell-shaped, or some other form of one-piece calyx.

The *corolla* forms an inner circle of parts usually colored for purposes of attraction, since flowers depend largely upon insects for the carrying of their pollen. It may be either choripetalous, that is, composed of separate parts (*petals*) as in the Buttercup, Mustard, Rose, etc.; or the corolla may be sympetalous, that is,

with the petals united into a one-piece corolla, as in the Morning-glory, Gilia, Pentstemon, etc. For purposes of convenience, those exogens in which the petals are distinct are spoken of as members of the *Choripetalae,* while those with united petals are the *Sympetalae.* The former have also been known as "Polypetalae," the latter as "Monopetalae" and "Gamopetalae." Flowers without a corolla are said to be *apetalous.*



A Pattern Flower.—The figure represents a choripetalous flower, with sepals, petals, and stamens all distinct (not united) and inserted on the receptacle. The single, simple pistil here figured has a superior ovary.

The *stamens* supply the pollen used by the plant in fertilizing the ovules, which then develop into seeds. This *pollen* is usually produced in the form of a yellow powder contained in a 2-celled, terminal pouch, the *anther.* At maturity the anther opens, scattering the pollen, or it may be carried by insects or by the wind, etc. The thread-like stalk of the stamen is the *filament.*

The *pistil* always occupies the center of the flower and is concerned with the bearing of seeds. It may be single, as in the Poppy and Primrose, or there may be several or many pistils to a single flower, as in the Buttercup. A complete pistil consists of three parts: (1), the *ovary,* or enlarged base, which includes one or more ovules, each of which is the forerunner of a seed; (2), *a style,* which is a usually slender continuation of the ovary and supports (3), the *stigma,* which is sometimes a mere point to the style, sometimes a flattish disk, sometimes a narrow line, sometimes a broad blade.

The function of the stigma is to catch the pollen-grains and, through the action of its secretions, cause them to send microscopic tubes through the tissues of the pistil to the ovules. Certain contents of the pollen-grain then

pass through this tube and unite with elements in the ovule, after which the latter develops into a fertile seed. The element derived from the pollen is the male element, while that in the ovule is the female element and, with few exceptions, their fusion is essential if fertile seeds are to be formed. Flowers which contain stamens but not pistils are *staminate,* or male flowers; those which bear pistils but not stamens are *pistillate,* or female flowers. Most flowers produce both stamens and pistils.

Simple pistils are those composed of a single fundamental unit (*carpel*). They always produce a one-celled fruit, and this may contain a number of seeds, as in the Pea pod, or a single seed, as in the Plum and Cherry. These simple pistils may occur singly in each flower, as in the Pea, or they may be numerous and heaped up in the middle, as in the Buttercup and Raspberry, but so long as they do not actually fuse into one body they are distinct pistils. When a simple pistil produces but one seed in a dry and hard outer covering (ovary wall) which does not open at maturity, it is called an *akene.* The seed-like bodies in the Composite Family and in the Buttercup are akenes. A *compound pistil* is formed by the fusion of several parts into one body, as may be indicated by the several cells to the ovary or by the distinct styles or stigmas. Most seed-vessels contain several cells and result from a compound pistil, as in Flax, Azalea, and Grape. One-celled ovaries with several distinct styles are less common. St. Johnswort is an example.

Superior ovaries are those which are entirely free from the calyx, i. e., the calyx is not in any way adherent to the ovary, which is attached to the receptacle. The Lily, Poppy, Mustard, Pea, Pentstemon, and in fact most flowers have superior ovaries. An *inferior ovary* is one to which the calyx is firmly united, so that it cannot be pulled away without tearing the ovary, as in the Orchid, Evening Primrose, and Godetia. The calyx in this case surrounds the ovary and is also attached to it, while the ovary itself is attached to the receptacle farther down and in this sense is "inferior." As the inferior ovary ripens, the calyx matures with it, forming an outer coat which often gives additional protection to the seeds. In some cases the calyx is attached only part way up, giving us a half-inferior ovary, as in some members of the Saxifrage Family.

The Fruit and Seed.

The *fruit* consists of the ripened ovary and whatever other parts persist until the seed is ripe. In this sense a fruit need not be fleshy or pulpy. Pods, burs, capsules, etc., are botanical fruits. The seed is the mature ovule. It contains an embryo, or young plant, and often a mealy, oily, or albuminous substance which supplies nourishment for the growing plantlet after germination.

The Arrangement of the Flowers.

By *inflorescence* is meant either the arrangement of the flowers on a plant or the flower-cluster itself. A flower is *terminal* when at the summit of a stem or branch; *axillary*, when in the axil of a leaf, as in most mints. A *peduncle*, or flower-stalk, is the stalk either of a solitary flower or of a flower-cluster. A *pedicel* is the ultimate branchlet of a cluster, supporting a single flower.

Bracts are small leaves occurring in a flower-cluster below the calyx. Sometimes they are very small and scale-like, sometimes colored. When several bracts encircle a flower or head of flowers, they are collectively called an *involucre*, as in Eriogonum and in the Sunflower. In the Nuttall Dogwood the involucre is so showy that its bracts are often mistaken for petals. Involucres are often cup-shaped and resemble calyxes. The more common types of inflorescence are explained in the figures.

Types of Inflorescence.—1. A raceme (note the stalked flowers); *b*, bract; *p*, pedicel. 2. A spike (flowers sessile). 3. A panicle (flowers scattered). 4. An umbel. 5. A head.

CLASSIFICATION AND THE USE OF KEYS.

For purposes of convenience, if for no other reason, it is well to have the multitudinous forms of plant life classified according to some established system. They are more conveniently discussed and comprehended when those individuals which are most alike are brought together under one name. This elementary unit, or group of individuals, all of which are of the same kind, is the *species* of the systematic botanist. Thus, all of the individuals of Yellow Pine are of one species, the Yellow or *ponderosa* species of Pine, while all of the individuals of the Sugar Pine belong to the Sugar or *lambertiana* species.

Again, it is convenient to have brought together those species which are most alike. This larger group, comprising several or often many similar but distinct species, is the *genus* (plural *genera*). All species of Pine, be they Yellow or Sugar or any other kind of Pine, belong to the Pine genus, written *Pinus* in the Latin form; the species of Fir belong to another genus,

Abies; both of the Redwoods to the genus *Sequoia*, etc. The botanical name consists of the generic name followed by that of the species. We therefore write as the botanical name of the Yellow Pine, *Pinus ponderosa;* of the Sugar Pine, *Pinus lambertiana;* of the One-leaf Piñon Pine, *Pinus monophylla,* etc. The generic name is frequently indicated by its initial letter only, and the species name is commonly followed by that of the botanist who first properly applied it. The name of the author is often abbreviated. *Varieties,* when they occur, are indicated by an additional name following that of the species, a variety being considered a mere form of a species, often brought about by differences in the soil, exposure, or other elements of the environment.

The next step in our system of grouping is to bring similar genera together into a larger and more comprehensive group, the *family.* The pines, the firs, the redwoods, the cedars, and many other similar genera are thus classed together as the Pine Family, or Pinaceae, since they possess certain characters in common, such as the cone-bearing habit. There are in all, 280 families of flowering plants, but only 82 of these are represented in the Yosemite National Park. Just as individuals are grouped into species, species into genera, and genera into families, so these last are collected into larger groups, some of which are used in our Analytical Key to the Species.

But the aim of botanical classification is not merely to arrive at a convenient grouping of plants. Its object is far-reaching and its methods are based upon the fundamental principles of evolution, heredity, and descent. The ultimate aim of systematic botany is to discover a natural system of classification in which all forms of plant life will be grouped according to their relationships. For there is a natural relationship—a blood-connection—existing between all plants, just as there is between all people, and the tracing of these connections is at once the most fascinating and the most important of all botanical problems. The student of organic relationships is following the steps through which the innumerable forms of life have been evolved. In his mind's eye he sees the development and modification of plant forms, the survival of the fit, the suppression of the unfit; he traces the development of an organic world.

Botanical classification, if complete and correct, would express all there is to know concerning the relationships of plants. But our knowledge is sadly deficient. The investigator is often misled into assuming that superficial resemblance indicates blood-relationship, or he is falling into other of the numerous pits of deception, and therefore the discovery of the natural system in all its details is a slow and laborious process. Until this task can be

completed, we are obliged to resort to a more or less artificial grouping of many plants, purely as a matter of convenience.

The Use of Keys.—In using keys as an aid in the determination of plants, there are certain precautions which should be observed. Perhaps the most important of these is that the key will unlock nothing unless the characters of the plant in hand are first understood. A preliminary examination of the flower and its parts is especially desirable, and care should be taken in gathering material to see that all stages from the young plant to the mature fruit are represented as far as possible. If the beginner will select plants with large flowers for his first trials, and especially if he will take the trouble to write out their characters, with the aid of our introductory lessons and glossary, he will avoid much of that confusion which results from an imperfect understanding of plant descriptions. Due allowance must always be made for a certain amount of variation in plants, especially as to size. When a number of specimens of one species are available, it is well to select an average one for study rather than either of the extremes, for descriptions are seldom drawn in such a way as to include the unusual or abnormal forms of a species.

The first step in determining the name of a plant is to decide upon the family to which it belongs. In our Analytical Key to the Families the first division separates off the Fern Group, which is the only family of the so-called flowerless plants here described. Division II (Flowering Plants) includes all plants which bear true seeds. Formerly they were called Phaenogamia and were characterized as producing true flowers. Of this great division there are two sub-divisions, as will be seen by reference to the key, (1) the Gymnosperms, which are represented with us only by our cone-bearing trees and the so-called California Nutmeg, and (2) the Angiosperms, which latter class includes the bulk of our species. The beginning student of the Yosemite Flora will probably be but little interested in that part of our key preceding the line, "Subdivision 2, Angiosperms."

The next segregation, into the class of Monocotyledons and the class of Dicotyledons, is based upon so many characters that the student seldom goes astray here. The fact that so many sets of characters run parallel in the two groups of families strengthens our belief that this segregation is a natural one. In fact, all of the divisions so far have been based on natural relationships. Leaving, now, the first class, let us take up the second, which is by far the larger and therefore the more difficult. We here find the Dicotyledons segregated into an apetalous, a choripetalous, and a sympetalous section, a classification which is

largely artificial and is used only for convenience. At this point, as in some other places, one must note that in running a plant to its family he has a choice, not of two, but of three sets of characters (in this case indicated by the Roman numerals I, II, III). Having determined the section to which a plant belongs, one follows through the successively subordinated divisions of that section, as indicated by the indentation of the lines upon the page, until he arrives at the name of the family. A key to the genera of each family will be found at its proper place in the book, and likewise keys to the species when there are more than three in a genus.

It will be noted that the arrangement of the families in the text does not follow the order of the key. This is because the key is partly artificial, being arranged with a view to ease of use, while in the body of the book families which have a natural relationship are brought next to each other as far as possible. This is also true of the arrangement of the genera within each family, and even the species are arranged according to natural relationships wherever these have been carefully worked out. The nomenclature here adopted for plant names follows the rules laid down by the International Botanical Congress, except in a few unimportant details.

ANALYTICAL KEY TO THE FAMILIES

(Carried out in some cases to genera)

Division I. FERN GROUP (Pteridophyta)

Plants without true flowers; reproduction by spores; only the Fern Family, with several or numerous fronds from a rootstock with fibrous roots is here described. .....Polypodiaceae, 25

Division II. FLOWERING PLANTS (Spermatophyta)

Plants with true flowers containing stamens or pistils or both; reproduction normally by seeds.

Subdivision 1. GYMNOSPERMS (Seeds naked)

Evergreen trees and shrubs, cone-bearing except in Taxaceae; leaves needle-like, awl-like, scale-like, or narrowly linear; stamens and pistils never borne in the same flower; ovules not in a closed ovary, maturing into naked seeds.

Fruit a woody cone bearing several to many seeds..Pinaceae, 40
Fruit berry-like or plum-like, 1-seeded.....Taxaceae, 46

Subdivision 2. ANGIOSPERMS (Seeds enclosed)

Evergreen and deciduous trees, shrubs, and herbs, not cone-bearing; leaves various; ovules in a closed sac, or ovary, which at maturity becomes the fruit and encloses the seed.

Class 1. *MONOCOTYLEDONS*

Leaves with principal veins parallel (net-veined in Erythronium, Disporum, and Trillium); flower-parts usually in 3's or 6's, never in 4's or 5's; embryo with 1 cotyledon; stems with neither pith nor ring-like layers, but with the fibers distributed through them (showing as dots in a transverse slice); ours all herbs.
(Class 2 on p. 18.)

Ovary or ovaries simple; flowers with only scale-like calyx, if any, and no corolla.

Flowers not in axils of dry chaffy bracts.

a. Immersed branching aquatics with thread-like leaves, or the floating leaves broad and flat. NAIADACEAE, 47

b. Immersed ellipsoidal or roundish free-swimming aquatics without true leaves..... LEMNACEAE, 48

c. Marsh or aquatic plants with ribbon-like leaves; stamens and pistils in separate rounded clusters. ..... SPARGANIACEAE, 47

d. Marsh plants with grass-like leaves and perfect flowers in racemes..... JUNCAGINACEAE, 47

Flowers in the axils of dry chaffy bracts.

Stems mostly cylindric and hollow; leaf-sheaths split opposite the blade; anthers attached at the middle. ..... GRAMINEAE, 48

Stems mostly 3-sided, solid; sheaths entire; anthers attached at the base..... CYPERACEAE, 48

Ovary compound; flowers with calyx or corolla or both.

Calyx and ovary wholly free from each other; stamens mostly 6. (Ovary superior.)

Plant rush-like; flowers small, greenish or brown. JUNCACEAE, 49

Plant not rush-like.

Pistils numerous, in a circle..... ALISMACEAE, 48

Pistil one, compound..... LILIACEAE, 49

Calyx adherent to the ovary. (Ovary inferior.)

Flowers regular, stamens 3; capsule 3-celled.. IRIDACEAE, 60

Flowers irregular, stamen 1 (rarely 2); capsule 1-celled ..... ORCHIDACEAE, 61

Class 2. DICOTYLEDONS

Leaves net-veined; flower-parts usually in 4's or 5's, never in 3's (exceptions occur in some members of Poppy, Buckwheat, and Spurge families); embryo with 2 cotyledons; stem with annual layers when perennial.

I. APETALOUS SECTION. Corolla none; calyx present, herbaceous or sometimes petal-like (sometimes none). (II. on p. 20.)

A. Trees, shrubs, and woody climbers. (B. on p. 19.)

Flowers in catkins, i. e., sessile in narrow scaly spikes, at least the staminate; pistillate flowers on same or different plant.

Leaves opposite; flowers in cup-like bracts..... *Garrya,* 173

Leaves alternate.
Pistillate and staminate flowers both in catkins (or cones).
Flowers 1 to each scale or bract.
Seeds hairy, many in a capsule.....SALICACEAE, 65
Seed not hairy, solitary, in waxy-coated clusters. .....MYRICACEAE, 69
Flowers 2 or 3 to each scale or bract; seeds in a woody cone. .....BETULACEAE, 70
Pistillate flowers not in catkins.
Fruit a nut in a leafy tube.....*Corylus,* 70
Fruit a nut in a scaly cup or bur (acorn or chestnut). .....FAGACEAE, 71
Flowers not in catkins.
Leaves opposite.
Ovary adherent to calyx; leaves simple; parasitic on trees. .....LORANTHACEAE, 73
Ovary free from calyx and corolla; leaves compound.
Climber; fruit of many tailed akenes.....*Clematis,* 94
Tree; fruit long-winged.....*Fraxinus,* 185
Leaves alternate, simple; erect trees and shrubs.
Stamens 4 or 5; fruit berry-like.....*Rhamnus,* 154
Stamens 9; fruit olive-like. .....LAURACEAE, 101
Stamens numerous; fruit tailed, dry, 1-seeded....
Cercocarpus, 133

B. Herbs.

Calyx free from the ovary. (Ovary superior.)
a. Pistils more than 1, distinct, becoming 1-seeded fruits; stamens many. .....RANUNCULACEAE, 94
b. Pistil 1, 3-celled; calyx and corolla both wanting; flower-clusters surrounded by a petal-like involucre; juice milky.....EUPHORBIACEAE, 150
c. Pistil 1, 4-celled; aquatic with hair-like leaves.
CALLITRICHACEAE, 151
d. Pistil 1, 1-celled; calyx present.
Stipules sheathing the stem at the nodes..POLYGONACEAE, 76
Stipules present but not sheathing.....URTICACEAE, 73
Stipules none.
Fruit a several-seeded capsule; styles 3 to 5.....
CARYOPHYLLACEAE, 88
Fruit 1-celled, 1-seeded.
Flowers in clusters surrounded by an involucre; leaves entire, in whorls or all basal, rarely alternate. .....POLYGONACEAE, 76

Flowers not involucrate; leaves alternate.
Bracts none; flowers greenish...CHENOPODIACEAE, 83
Bracts and flowers thin and dry, not green..
AMARANTHACEAE, 83
Bracts leaf-like, densely hairy.....*Eremocarpus*, 150
Calyx adherent to the ovary. (Ovary inferior.)
Leaves entire; flowers perfect.
Aquatic; leaves densely whorled.....HALORAGIDACEAE, 169
Land plants; leaves alternate or basal.
Seeds many; leaves broad-heart-shaped.....
ARISTOLOCHIACEAE, 75
Seed solitary; leaves elliptic.....SANTALACEAE, 74
Leaves deeply toothed or lobed; flowers lacking stamens or pistils.
Erect herb; seeds numerous, small.....DATISCACEAE, 162
Climbing herb; seeds several, large.....CUCURBITACEAE, 237

II. CHORIPETALOUS SECTION. Calyx and corolla both present, the latter of distinct petals. (III. on p. 22.)

A. Stamens more than double the number of petals (always more than 10). (B. on p. 21.)

Stamens free from the calyx (hypogynous).
Pistils few to many, distinct.....RANUNCULACEAE, 94
Pistil 1, compound.
Sepals falling as the corolla opens.....PAPAVERACEAE, 101
Sepals persistent; aquatics with broad floating leaves. .....NYMPHAEACEAE, 93
Sepals persistent; land plants.
Petals more numerous than the sepals (5 to 16); succulent plants. .....PORTULACACEAE, 84
Petals of the same number as the sepals (5).
Leaves alternate; flowers not yellow; stamens all united. .....MALVACEAE, 157
Leaves opposite, entire; flowers yellow; stamens united into bundles.....GUTTIFERAE, 159
Stamens borne on the calyx (perigynous).
Leaves opposite, simple.
Petals 4, white .....*Philadelphus*, 121
Petals many, red.....CALYCANTHACEAE, 101
Leaves alternate, with stipules; flowers white yellow or pinkish. .....ROSACEAE, 123
Leaves alternate, without stipules, rough; flowers yellow. .....LOASACEAE, 161

B. Stamens not more than double the number of petals.

1. CALYX FREE FROM THE OVARY OR OVARIES. (Ovary superior.) (For "2. Calyx adherent," see p. 22.)

Pistils more than one and distinct from each other.

Petals and sepals of just the same number as pistils.

Leaves simple, fleshy. ..... CRASSULACEAE, 113

Leaves pinnately compound. ..... *Floerkia*, 149

Petals and sepals not of same number as pistils.

Stipules persistent; leaves alternate..... ROSACEAE, 123

Stipules none or indistinct.

Petals and stamens 5 or 10 each.... SAXIFRAGACEAE, 115

Petals (red) and stamens numerous.....
CALYCANTHACEAE, 101

Pistil only one.

Pistil simple, as shown by the single style, stigma, and ovary-cell.

Flowers irregular; stamens united; fruit a several-seeded pod. ..... LEGUMINOSAE, 135

Flowers regular; stamens not united.

Calyx 5-lobed; fruit 1-seeded..... ROSACEAE, 123

Calyx of 2 sepals; fruit several-seeded; leaves fleshy. ..... PORTULACACEAE, 84

Pistil compound.

Ovary 1-celled.

Corolla irregular, the petals unlike.

Sepals 5; petals 5, the lower one spurred.
VIOLACEAE, 159

Sepals 2; petals 4, none spurred; corolla heart-shaped at base..... FUMARIACEAE, 102

Corolla regular, the petals all alike.

Shrubs with 1-seeded fruits..... ANACARDIACEAE, 151

Herbs; capsule several to many-seeded.

Sepals 2; herbage fleshy..... PORTULACACEAE, 84

Sepals 4 or 5; leaves scale-like, not green.
Pleuricospora, 177

Sepals or calyx-lobes 4 or 5; leaves green.

Leaves all opposite..... CARYOPHYLLACEAE, 88

Leaves all at base, roundish..... DROSERACEAE, 112

Ovary and usually the fruit 2-celled.

Fruit a capsule, rarely winged; herbs. . CRUCIFERAE, 103

Fruit winged; trees.

Leaves simple, palmately lobed..... ACERACEAE, 153

Leaves pinnately compound. ..... OLEACEAE, 184

Ovary more than 2-celled.

Anthers opening by pores at the top..... ERICACEAE, 174

Anthers opening lengthwise.
a. Herbs.
Ovules and seeds numerous.....SAXIFRAGACEAE, 115
Ovules and seeds 1 to 4 in each cell.
Leaves all entire.
Petals 5; stamens 5, on the receptacle.
LINACEAE, 149
Petals 4; stamens 4, on the calyx.
LYTHRACEAE, 162
Leaves divided or compound....GERANIACEAE, 148
b. Shrubs, trees and woody climbers.
Stamens as many as petals and opposite them.
Erect or prostrate shrubs.....RHAMNACEAE, 153
Climbing vines. .....VITACEAE, 156
Stamens alternate with the petals.
Leaves pinnately compound; fruit a bladdery pod. .....STAPHYLEACEAE, 152
Leaves palmately compound; fruit a 1-seeded pod.....SAPINDACEAE, 153

2. CALYX ADHERENT TO THE OVARY. (Ovary inferior.)
Flowers in umbels, i. e., all on nearly equal pedicels from the summit of a common stalk; all herbs.
UMBELLIFERAE, 170
Flowers not in umbels.
Styles 2 to 5, distinct or united below....SAXIFRAGACEAE, 115
Style 1, undivided (but sometimes with slender stigma-lobes).
Flowers scattered, in racemes or spikes; herbs.
ONAGRACEAE, 162
Flowers in close rounded clusters; shrubs and trees. .....CORNACEAE, 172

III. SYMPETALOUS SECTION. Calyx and corolla both present, the latter with petals united at least at base.

A. Stamens free from the corolla.

Stamens distinct from each other.
Anthers opening by pores at the top, except in one species without green herbage.....ERICACEAE, 174
Anthers opening lengthwise.....CAMPANULACEAE, 237
Stamens united into a tube around the style.....LOBELIACEAE, 238

B. Stamens on the corolla.

1. Stamens more than 5 (and ovary superior).

Petals 4, in pairs; sepals 2; stamens 6.....*Dicentra,* 102
Petals 5.
Pistils 4 or 5, distinct; stamens 10.....Crassulaceae, 113
Pistil 1.
Flowers very irregular; stamens 10; ovary 1-celled. .....Leguminosae, 135
Flowers regular; stamens many, united into a tube. .....Malvaceae, 157

2. Stamens 5 or less.

Calyx free from the ovary. (Ovary superior.)
(For "Calyx adherent," see p. 24.)
Corolla regular (i. e., the lobes all alike).
Ovaries 2, becoming a pair of pods when both mature.
Stamens lightly united or distinct, not attached to the stigmas.....Apocynaceae, 187
Stamens united, and adherent to the stigmas, the column bearing hood-like appendages.....
Asclepiadaceae, 188
Ovary 1, 4-lobed, forming 4 nutlets.
Leaves alternate, not aromatic.....Boraginaceae, 203
Leaves opposite, aromatic. .....Labiatae, 207
Ovary 1, entire.
Style 3-cleft at apex; capsule 3-celled..Polemoniaceae, 190
Styles or stigmas 2 or 1.
Stamens opposite the divisions of the corolla.
Primulaceae, 182
Stamens alternate with the divisions of the corolla.
Leaves heart-shaped at base, as broad as long, or wanting.....Convolvulaceae, 190
Leaves not heart-shaped at base.
Stemless plants; leaves (simple) all at base of a naked flower-stalk....Plantaginaceae, 230
Stems present and bearing leaves.
Herbage perfectly glabrous; leaves all opposite (or whorled) and entire; capsule 1-celled.....Gentianaceae, 185
Herbage more or less pubescent; leaves various.
Styles 2, or 1 and 2-cleft; capsule 1 or 2-celled. .....Hydrophyllaceae, 197

Style 1, entire; capsule or berry 2-celled. ..... SOLANACEAE, 213

Corolla irregular (from strongly 2-lipped to nearly regular); stamens with anthers 4 or 2; style 1.

Ovary 4-parted, forming 4 seed-like nutlets.... LABIATAE, 207

Ovary and capsule 2-celled..... SCROPHULARIACEAE, 213

Ovary and capsule 1-celled.

Parasites without green foliage..... OROBANCHACEAE, 229

Aquatics with finely cut green leaves. LENTIBULARIACEAE, 230

Calyx adherent to the ovary. (Ovary inferior.)

Stamens distinct from each other.

Leaves alternate; flowers regular; stamens 5; herbs. ..... CAMPANULACEAE, 237

Leaves opposite or whorled.

Stamens 1 to 3; flowers irregular, small. VALERIANACEAE, 236

Stamens 4 or 5, rarely 2.

Leaves either opposite and with stipules, or whorled and without stipules..... RUBIACEAE, 231

Leaves opposite or perfoliate, but neither whorled nor with true stipules.. CAPRIFOLIACEAE, 233

Stamens united into a tube around the style.

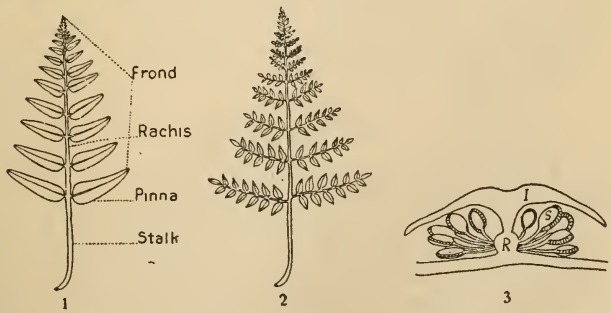
Flowers not in heads; fruit many-seeded... LOBELIACEAE, 238

Flowers in a head with a calyx-like involucre; fruit 1-seeded. ..... COMPOSITAE, 239

DESCRIPTIVE FLORA

POLYPODIACEAE. Fern Family.

Plants with stems (*rootstocks*) more or less creeping and usually underground, sending up leaves (*fronds*) singly or in groups. The stem on which the frond is borne is known as the *stalk*. Its continuation through the frond is called the *rachis* (plural, *rachises*). In ours the frond is cut almost or entirely to the midvein, never entire. When cut to the midvein the divisions are called *pinnae* (singular, *pinna*) and the frond is said to be *pinnate*. Each pinna may be again divided, in which case the frond is said to be 2-*pinnate*, or if cut again it is 3-*pinnate*, and if still again, as in some Pellaeas, the frond is 4-*pinnate*. In this Flora the ultimate division is always termed the *segment*. When the frond is simply pinnate, as in Pellaea bridgesii, each segment is a pinna. On the back of the frond are borne the fruit-masses (*sori*, singular, *sorus*), usually along the veins or margins. The sorus is composed of many stalked spore-cases (*sporangia*), each having a vertical many-jointed elastic ring which, at maturity, breaks transversely and somewhat straightens, thus discharging the *spores*. The spores correspond to seeds of flowering plants. The sporangia often rise from a common stalk (*receptacle*) to which a special covering (*indusium*) is attached when young; sometimes the indusium is formed of the altered and recurved margin of the frond. On germination, the spores produce flat, green leaf-like tissues (*prothallia*) ⅓ in. or less wide. These in their turn produce male and female bodies that unite and grow into the fern as we commonly see it. Thus all ferns pass through two generations,—one asexual, the other sexual.



Fern Characters.—1. A simply pinnate frond with its stalk; here each pinna is a segment. 2. A 2-pinnate frond; here each pinna is parted into several segments. 3. A sorus, much enlarged; I, indusium; R, receptacle; S, one of the sporangia.

A. Sori without indusia.

Backs of fronds without powder.
Fronds simply pinnate..... 1. POLYPODIUM.
Fronds at least 2-pinnate; high altitudes..... 2. PHEGOPTERIS.
Backs of fronds with whitish or yellowish powder..... 3. GYMNOGRAMMA.

B. Sori with indusia.

Sori marginal, covered by the altered reflexed margin of the frond.
Stalks light or straw-colored (except at base).
Fronds of 2 sorts, fertile and sterile, differing in appearance. ..... 8. CRYPTOGRAMMA.
Fronds all alike..... 5. PTERIS.
Stalks dark-colored.
Fronds and stalks either scaly or woolly or both; indusia separate, or if continuous the segments bead-like ..... 6. CHEILANTHES.
Fronds and stalks neither scaly nor woolly.
Indusium not continuous, bearing sporangia on its under surface; segments thin; midvein not medial, sometimes wanting; damp places..... 4. ADIANTUM.
Indusium continuous, the sporangia on the surface of the frond; segments thick (except *P. breweri*); midvein medial; dry exposed places... 7. PELLAEA.
Sori not marginal, each covered with a special indusium.
Sori round.
Indusium scale-like, attached to the vein below the sporangia ..... 13. CYSTOPTERIS.
Indusium saucer-like or fringe-like, inferior, i. e., attached centrally to the stalk beneath the sporangia ..... 14. WOODSIA.
Indusium shield-shaped, superior, i. e., attached centrally to the stalk above the sporangia.
Indusium orbicular, without a sinus..... 11. POLYSTICHUM.
Indusium kidney-shaped, or if orbicular then with a narrow sinus..... 12. ASPIDIUM.
Sori oblong; tall ferns.
Segments of frond cut-toothed; sori oblique to the midribs ..... 10. ASPLENIUM.
Segments of frond not cut-toothed; sori parallel to the midribs ..... 9. WOODWARDIA.

1. POLYPODIUM.

1. **P. vulgàre** L. COMMON POLYPODY. Stalks 2 to 8 in. long, slender, firm, erect, naked. Fronds smooth, 4 to 12 in. long, 1 to 4 in. broad at base, ovate-oblong or oblong-linear, cut to or nearly to the rachis into entire or toothed oblong-linear acute or obtuse segments. Sori large, round, usually in one row midway between the margin and midrib, without indusia. Veins free, with 3 or 4 veinlets having thickened ends, the lowest veinlet on the upper side of the vein bearing a sorus at its end.

From its name, one might expect to find the Common Polypody of frequent occurrence but we saw it only once. It grows, together with the Brittle-fern and Golden-back, in a rocky crevice which the spray of Yosemite Falls keeps constantly damp.

Polypodium vulgare

2. PHEGÓPTERIS. Beech-fern.

1. **P. alpéstris** Mett. Alpine Beech-fern. Stalks clustered, 4 to 12 in. long, straw-color, grooved, with large scattered scales when young. Fronds 12 to 24 in. long, oblong-lanceolate, acute, smooth, tapering toward the base, 2-pinnate; segments deeply cut fruiting profusely except those of the lower pinnae. Sori small, round, on the backs of veins, without indusia.

Although this fern has not yet been detected in our district, there is little doubt of its occurrence at high altitudes, since it has been found in the High Sierra Nevada of Tulare Co., to the south of us, and also on Pyramid and other high peaks to the north. The fronds, which are surprisingly large for an Alpine plant, are delicate and finely cut, closely resembling those of the Lady-fern.

3. GYMNOGRÁMMA.

1. **G. triangulàris** Kaulf. Golden-back. California Gold-fern. Stalks densely clustered, slender, brown, shiny, 1½ to 12 in. long. Fronds 1 to 6 in. long and nearly as broad at base, triangular, pinnate; pinnae sessile, generally opposite, 3 or 4 pairs, upper ones confluent into a pinnatifid apex, lowest pair much the largest and broader on the lower side and often again pinnate; segments obtuse, more or less scolloped, under surface covered with yellow or white powder. Sori oblong or linear, following the veins, often covering the whole under surface at maturity,

thus obliterating any pattern and hiding the powder; indusium wanting. (*Gymnopteris triangularis* Underw. *Ceropteris triangularis* Underw.)

The Golden-back, immediately recognized by its yellow powder (white when young), has been found growing in damp rock crevices at the foot of the lower Yosemite Fall, near the Snow Creek Trail, and in other damp or semi-damp rocky places along the walls. In dry periods the fronds of this fern roll up, thus protecting themselves until the drought is over. A variety *viscosa* Eat., is recognized. Its pinnae are more distant, less divided, the upper surface viscid, and the powder creamy white.

Adiantum pedatum

4. ADIÁNTUM. Maidenhair.

Sori borne on the inner surface of reflexed portions of the margin of the frond, the indusium thus formed being divided into varying lengths. Midrib of the ultimate segments lateral or the forking and usually free veinlets rising directly from the stalk of the segment. Stalks mostly dark reddish-brown and usually highly polished.

1. **A. pedàtum** L. Five-finger Fern. American Maidenhair. Stalks 2 to 15 in. long, dark-brown and polished, forked at summit and bearing 6 to 14 finger-like pinnae. Fronds semi-circular in outline, central finger longest (sometimes 1 ft. long and 2 in. wide); segments short-stalked, triangular-oblong, lower margin entire, upper margin lobed and finely cut and bearing a few oblong-lunate sori. Principal vein of each segment parallel and close to the lower margin, the veinlets rising to the upper margin.

Five-finger, sometimes called American Maidenhair, grows only where there is plenty of moisture. It likes best cool, damp, protected rock-crevices. A beautiful grotto of this kind may be seen from the trail as one climbs out of Tenaya Cañon above Mirror Lake. To the left of the trail about half way up is an overhanging arch of rock from which water drips and under the arch is a beautiful waving fringe of this fern. It is fervently hoped that its inaccessibility will long save it for the appreciation of true fern lovers. Those who had the privilege of visiting the Yosemite Valley twenty and thirty years ago say that the Five-finger then grew abundantly about the various falls. Today it is almost exterminated. Very careful search revealed it in only a few unfrequented places or ledges not easily reached.

2. **A. jordanii** Muell. Stalks a few inches to a foot long, continued through the frond, blackish and polished. Frond about as long as the stalk, broadly ovate or triangular, 2 to 3-pinnate below; segments long-stalked, ¼ to 1 in. wide, rounded, fan-shaped, or even kidney-shaped, lower margins entire, upper edges lobed twice or several times; the lobes in sterile fronds sharply toothed; lobes in the fertile fronds recurved, forming long indusia. Veins all radiating from the stalk of the segment. (*A. emarginatum* Hook.)

This Maidenhair, although common in the Coast Ranges, seems to be scarce in the Sierra Nevada. It grows only in moist places at low altitudes, as on Mt. Buckingham and elsewhere near El Portal. *A. capillis-veneris* L., the Venus-hair, has been reported from Yosemite Valley, but its occur-

rence is doubtful. It is known by the narrower, lanceolate frond and somewhat wedge-shaped segments.

5. PTÈRIS. Brake. Bracken.

1. **P. aquilìna** L. Common Brake. Rootstocks widely creeping. Stalks scattered, erect, rigid, straw-color or reddish brown, a foot or more high. Fronds 2 to 5 ft. long and as wide at the base (frequently attaining a greater size), triangular-ovate in outline, hairy on under surface, 2 to 4-pinnate, lowest pinnae very large, rapidly becoming smaller and less divided above, edges of the segments entire. Sori on a continuous marginal receptacle and covered by the continuous double indusium. (*Pteridium aquilinum* Kuhn.)

The Common Brake is found in many parts of the world. It is well known in the Sierra Nevada, where the creeping habit of its rootstock often causes whole hillsides and valley bottoms to be densely covered by the broad fronds, but it is absent from high altitudes. Our West American form (var. *lanuginosa* Bong.) differs from the eastern form in its greater size and in having silky hairs on the under surface of the frond. The spores do not usually develop until late July or August. Much use is made of this fern by the Indians who use the rootstocks for food and also in basketry.

6. CHEILÁNTHES. Lip-fern.

Small ferns with the fronds divided 2 to 4 times into small segments and the under surface covered with scales, wool, or powder, except in *C. californica.* Sori borne toward or at the ends of free veins, small and roundish at first, afterward forming a nearly continuous marginal line, covered by a more or less continuous indusium formed of the reflexed margin of the lobes or whole segments. Stalks dark-brown and shiny.

1. **C. gracíllima** Eat. LACE-FERN. Stalks densely clustered, 1 to 6 in. long, dark brown, white-chaffy when young, rachises with persistent delicate scales. Fronds 1 to 4 in. long, 1 in. or less wide, linear-oblong, 2-pinnate or occasionally 3-pinnate especially near the base; pinnae crowded, ¼ to ½ in. long; segments crowded, $\frac{1}{16}$ in. long, oblong, smooth above (white-hairy when young), heavily covered beneath with light reddish-brown wool but not scaly. Indusium brown, formed of the continuously recurved margin of the segment.

The Lace-fern is common in our region and northward on rocky walls and summits. It was locally noted at many places around the Yosemite Valley and up Tenaya Cañon.

2. **C. myriophýlla** Desv. ELEGANT LIP-FERN. Stalks clustered, 1½ to 6 in. long, reddish brown, covered when young with scales and hairs intermixed. Fronds 2 to 8 in. long, 1½ in. or less wide at base, oblong-lanceolate, 3 to 4-pinnate; segments crowded, bead-like, $\frac{1}{16}$ in. or less wide, smooth above, with brown ciliated scales and matted wool beneath, margin unchanged but much incurved.

This Lip-fern is abundant in rocky places, especially along the walls of our lower valleys, ranging up to 5000 ft. or more in altitude. In times of drought the fronds of this and many other ferns of arid places roll up and become dry. When the roots are again supplied with moisture, these dry and apparently dead fronds unroll and become active. Some botanists class our plant as *C. fendleri* Hook., a species distinguished by its almost entire scales, absence of wool, and slender, cord-like rootstocks. All of our specimens, however, seem to be *C. myriophylla*, or at the most only forms of it.

Three other species of Cheilanthes have been reported from the Yosemite Valley and below, but we have seen no authentic specimens from our district. They are the following: *C. californica* Mett., of the Coast Ranges, may be distinguished by the smooth delicate fronds, green on both sides and without hairs. The indusia are separate, lunate, and occur one at the end of each fertile veinlet. *C. cooperae* Eat., grows in the clefts of rocks at Hites Cove, on the South Fork of the Merced. Its fronds are densely white-hairy, the segments not bead-like, as in the two species described above. The indusia are more or less confluent, usually extending over the ends of several veinlets but not continuous all around the segments. *C. clevelandii* Eat., is very doubtfully accredited to our district. In technical characters and general

appearance it is much like our *C. myriophylla* but the fronds, although scaly beneath, are not woolly, and the rootstocks are elongated and cord-like.

7. PELLAÈA. Cliff-brake.

Usually small ferns with fronds divided 1 to 4 times, entirely without scales or wool except for a small tuft of scales at the base of the stalk. Sori near the ends of the free veins, eventually forming a marginal line which is covered by a continuous indusium formed of the altered reflexed margin of the segment. Stalks dark-brown, smooth and polished. (*Cheilanthes californica* might be sought here, but the separate lunate indusia turned back over the ends of fertile veinlets between the teeth readily distinguish it.)

Fronds simply pinnate.
- Texture thick, veins not plainly visible; pinnae mostly not parted.....1. *P. bridgesii.*
- Texture thin, veins clearly visible; pinnae mostly 2-parted .....2. *P. breweri.*

Fronds 2-pinnate; texture thick, veins not visible.
- Fronds narrowly linear in outline.....4. *P. brachyptera.*
- Fronds broader, lanceolate to ovate in outline.
  - Segments sharply pointed .....5. *P. wrightiana.*
  - Segments obtuse or notched at tip.....6. *P. andromedaefolia.*

Fronds 3-pinnate when fully developed, at least toward base of the frond.
- Segments obtuse or notched at tip.....6. *P. andromedaefolia.*
- Segments sharply tipped.
  - Fronds oblong-lanceolate, 4 to 12 in. long.....3. *P. ornithopus.*
  - Fronds triangular, 1 to 3 in. long.....7. *P. densa.*

1. **P. bridgèsii** Hook. Stalk 2 to 6 in. long, brown and glossy. Fronds blue-green, as long or longer than the stalks, ½ to 1½ in. wide, linear-oblong, simply pinnate; segments

Pellaea bridgesii

Pellaea breweri

5 to 18 pairs (usually 10 to 12), ovate, ¼ to 1 in. long (usually ½ in. long), ¼ to ½ in. wide when flat (folded lengthwise until maturity), mostly opposite. Indusium whitish, narrow, continuous.

This Cliff-brake grows in the clefts of rocks, usually above 5000 ft. alt. Quantities of it may be seen on the open, exposed summit passed over by the long trail to Nevada Falls. Specimens found here and along other trails at high points show a tendency to lobing and even parting of the segments, as in the following species.

2. **P. bréweri** Eat. Stalks 2 to 3 in. long, very fragile, reddish brown and shiny. Fronds 2 to 6 in. long, ¾ to 2 in. wide, oblong in outline, simply pinnate; segments 6 to 12 pairs, $\frac{5}{16}$ to 1¼ in. long, thin, usually parted into two lanceolate obtuse lobes of which the upper is the larger (lobes sometimes 3 or 4). Indusium broad, continuous and pale.

Professor W. H. Brewer first collected this fern, finding it, in 1863, near Sonora Pass at 7000 to 8000 ft. alt. It has been collected at Mono Pass and on Mt. Dana at high altitudes, and it also occurs in the Rocky Mts. The fronds are much thinner than in other Pellaeas, and the stalks are exceedingly fragile.

3. **P. ornithopus** Hook. Bird-foot Cliff-brake. Stalks 2 to 10 in. long, clustered, dark-brown, shiny, stout and rigid. Fronds equalling or longer than the stalks, 1 to 5 in. wide at base, rigid, broadly ovate-lanceolate or triangular in outline,

P. ornithopus *P. brachyptera* *P. wrightiana*

2 to 3-pinnate at least at the bases of the lower pinnae; pinnae spreading, often rising obliquely, each with 5 to 16 pairs of 3-foliate (sometimes 5 to 7-foliate) secondary pinnae; segments ⅛ to $\frac{3}{16}$ in. long, sharp-tipped, margins rolled back to the midrib (in the rare sterile fronds the segments are roundish).

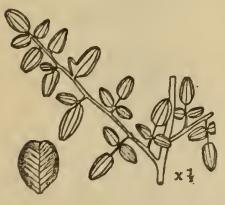
The resemblance of the segments to a bird's foot has given rise to the common name, Bird-foot Cliff-brake. This is the

most common Pellaea in our district, the rigid stalks growing in dense clumps on all of the cliffs around the Yosemite and similar valleys. The plants possess a remarkable ability to resist drought, since they grow in exceedingly dry places where often exposed to the full force of the glaring sun. It seems probable that the next two species will be eventually united with this, since intermediate forms are being constantly collected. Our text figures seem to indicate a marked difference but they represent extreme forms of these three species.

4. **P. brachýptera** Baker. Stalks 2 to 8 in. long, clustered, dark-brown, erect and wiry. Fronds about equalling the stalks, ¾ to 1¼ in. wide, narrowly oblong-linear in outline, 2-pinnate; pinnae sessile, ascending, short, often broader than long; segments ¼ to ⅜ in. long, crowded, oblong-linear, with sharp tip, the margins rolled back to the midrib, making the segment almost cylindric.—Doubtfully distinct from no. 3, differing chiefly in the narrower fronds, their pinnae closely appressed. Yosemite and Little Yosemite valleys and northward in the Sierra Nevada.

5. **P. wrightiàna** Hook. A species very closely resembling no. 4 and perhaps better accepted as a form of it, being distinguished only by the shape of the frond, which is broader in outline (broadly lanceolate or ovate) due to the widely spreading pinnae. From no. 3 it differs mainly in having 2-pinnate fronds.—Specimens referrable to this form have been gathered above the Yosemite Valley.

6. **P. andromedaefòlia** Fee. COFFEE-FERN. Stalks 2 to 12 in. long, light-brown and scattered. Fronds as long as the stalks or sometimes longer, 3 to 8 in. wide, ovate or ovate-oblong, 2 to 4-pinnate (usually 3-pinnate); pinnae distant and spreading; segments ¼ to ½ in. long, oval, obtuse, fertile ones with margins rolled back.



The Coffee-fern is a common species in the Coast Ranges, where it grows on rocky hillsides. We did not find it in the Yosemite National Park, but Mr. S. H. Burnham has reported it from near the foot of Nevada Falls and it has also been reported from Mt. Buckingham. It is a widely distributed species, ranging to South America and South Africa. The segments have edges strongly rolled backward, thus resembling coffee berries.

7. **P. dénsa** Hook. Oregon Cliff-brake. Stalks densely tufted, 2 to 9 in. long, chestnut-brown, slender and wiry. Fronds bright green, 1 to 3 in. long, 1 to 1¾ in. wide at base, triangular or ovate, 3-pinnate below; segments ¼ to ½ in. long, linear-lanceolate, sharp-tipped, margins narrowly recurved in fertile fronds and edged with distinct indusia, the rare sterile fronds sharply toothed. (*Cryptogramma densa* Diels.)

The Oregon Cliff-brake is commonly found in the clefts of rocks along the Yosemite walls and northward through the Sierra Nevada into Oregon. In altitude it extends from the foothills to at least 8000 ft. It was noted near Bridal Veil Falls, Ledge Trail, Nevada Falls, etc. It is at once recognized by its dense clusters of small, fertile, triangular fronds, the segments of which are very narrow and crowded.

8. **CRYPTOGRÁMMA.** Rock-brake.

1. **C. acrostichoìdes** R. Br. American Rock-brake. Stalks densely clustered, straw-like, 2 to 4 in. long, those bearing fertile fronds much longer. Fronds 2 to 4 in. long, 2 to 3-pinnate; sterile fronds with narrowly winged rachises, their ovate or obovate segments decurrent and toothed; segments of the fertile fronds stalked, oblong-linear, pod-like through the recurving of the margins, which thus form continuous indusia. Sori on the backs of free veins, oblong, at length running together and covering the back of the segment.

Under the edges of rocks on open summits and along cliffs this Rock-brake may be found. Its intense green and differentiated fertile fronds separate it from other ferns of this region. Magnificent specimens were collected on Sentinel Dome. It is also found on Clouds Rest and other high points.

9. WOODWÁRDIA. Chain-fern.

1. **W. radìcans** Sm. Great Chain-fern. Stalks stout, 8 to 12 in. long. Fronds 3 to 6 ft. or more long, oblong-ovate, simply pinnate; pinnae 4 to 15 in. long, broadly lanceolate in outline and cut pinnately almost to the midrib; segments slightly scolloped and minutely toothed. Sori oblong-linear, in cavities, in a chain each side of the midvein of the segments; indusium fixed by its outer margin to the fertile veinlet and covering the cavity as a lid.

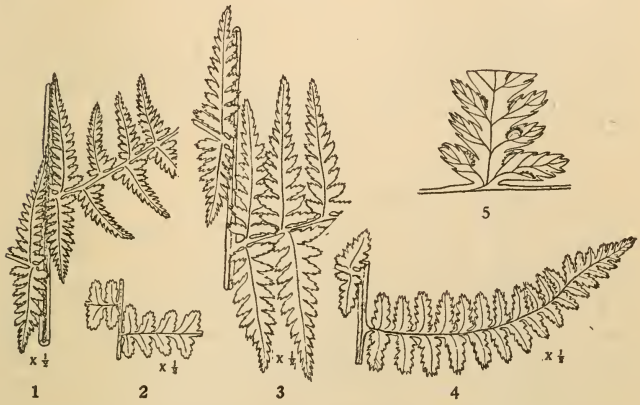
The Great Chain-fern is one of the largest and perhaps the most magnificent of our ferns. As one travels from El Portal into the Yosemite Valley he may see it at the roadside near the Cascades growing in stately groups of from 5 to 20 fronds. It may be expected along living streams at low altitudes though it is more abundant in the Coast Ranges than in the Sierra Nevada. A dwarfed form, 18 in. or less high, grows at the upper end of Yosemite Valley, about 300 ft. above the floor. Mr. S. H. Burnham reports having seen such a form on the trail to Yosemite Point. Specimens of this form collected by us are in fine fruit, nearly every pinna being rich in sori along its midvein as well as on its segments.

10. ASPLÈNIUM. Spleenwort.

1. **A. filix-fémina** Bern. Lady-fern. Stalks a few to 18 in. long, stout, sometimes reddish, dark and chaffy at base. Fronds 1 to 5 ft. long, 3 to 18 in. broad, thin and soft, oblong-lanceolate, sharply tipped, narrowed at the base, 2 to 3-pinnate; segments obtuse or sharply pointed, toothed and lobed, sometimes cut almost to the midrib. Sori oblong or linear, oblique to the midrib; indusium straight or curved, attached by one side to the fertile free veinlet. (*Athyrium filix-femina* Roth.)

The Lady-fern grows in beautiful, green, vase-like groups,

usually in shady places where a brook or spring keeps the rich, black soil continuously damp. It is luxuriant at the Iron Spring in Tenaya Cañon, also in Bridal Veil Meadows, and where Grouse Creek crosses the Wawona Road. Sometimes the indusia are so strongly curved in the spleenworts that



1. *Asplenium filix-femina.* 2. Var. *latifolium.* 3. Var. *cyclosorum.* 4. Var. *angustum.* 5. Enlarged segment.

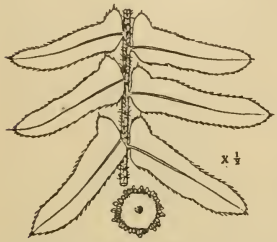
they are mistaken for the wood-ferns, especially when the sori are mature. The great variation in size, shape of frond and cutting of pinnae and segments has given rise to a number of named varieties, some of which are found in our region.

Var. *latifolium* Hook., has fronds 2 to 3 ft. high, oblong-lanceolate, 2-pinnate or nearly so; pinnae 1 to 4 in. long, oblong-linear, with narrow-winged secondary rachises; segments ovate, broad, obtuse, once or twice serrate; sori nearer the midvein than the margin. Var. *cyclosorum* Rupr., has fronds very large (sometimes 5 ft. high and 18 to 20 in. broad); segments often 1½ in. long, pinnately incised or nearly again pinnate; indusium usually strongly curved. Var. *angustum* Eat., has narrow rigid fronds, 2 to 3 ft. high, nearly 2-pinnate; pinnae curved upward or oblique; sori abundant.

11. POLÝSTICHUM.

1. **P. munìtum** Presl. SWORD-FERN. Stalks an inch or two to a foot long, chaffy with large scales at least toward the base. Fronds 1 to 4 ft. long, evergreen, lanceolate in outline, simply pinnate; segments many, 1 to 4 in. long, linear and tapering, enlarged on the upper (and sometimes lower) side of the nearly sessile base, toothed, the teeth bristle-tipped. Sori round, borne on the veinlets, abundant, forming dense rows at maturity; indusium orbicular, without a sinus, fixed by the depressed center to the middle of the sorus above the sporangia. Veins free. (*Aspidium munitum* Kaulf.)

In general habit this species closely resembles the Rigid Wood-fern, but the indusium is so characteristic that they are placed in different genera. It forms ornamental clusters on many of our talus slopes. In addition to the species, we have two of its varieties, as follows: Var. *imbricans* Maxon,



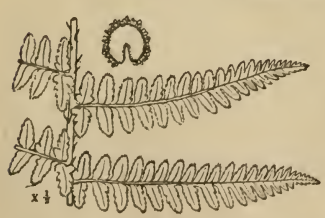
Polystichum munitum *nudatum* form Var. *imbricans*

which has been collected at Staircase Falls, etc., is smaller than the species; fronds broader at base; pinnae more crowded, ascending-imbricate and more oblique to the rachis; stalks scaly at base but otherwise mostly naked; sori near the margin and confined to the upper pinnae. The other variety (*Aspidium munitum nudatum* Eat., apparently not transferred to Polystichum) was first described from a specimen collected near Nevada Falls, and has since been found also on the Ledge Trail and along the Wawona Road. Its fronds are smaller than in the species, the stalks less chaffy; the pinnae fewer, short and broad, and farther apart; the sori confined to a few upper pinnae.

P. ACULEATUM Roth., has been reported from our district. If found, it may be known from *P. munitum* by the fronds, which are 2-pinnate, or if simply pinnate then with deeply cut pinnae. (*Aspidium aculeatum* Swartz.)

12. ASPÍDIUM. WOOD-FERN. SHIELD-FERN.

1. **A. rígidum** var. **argùtum** Eat. RIGID WOOD-FERN. Stalks 3 to 12 in. long, chaffy. Fronds dark-green and smooth above, paler and somewhat glandular beneath, 8 to 24 in. long, 3 to 10 in. broad, ovate-lanceolate in outline, 2-pinnate; lowest pinnae broadest; segments oblong, incised or doubly toothed with spine-like teeth. Sorus large, round; indusium kidney-shaped or round



with a narrow sinus, attached centrally to the receptacle above the sporangia (see enlarged sorus in figure). Veins free. (*Dryopteris rigida arguta* Underw.)

The Rigid Wood-fern, together with our Sword-fern, grows in semi-moist places throughout the State. They are especially abundant and attain their greatest size in the foggy coast mountains. Along the trails at lower and middle altitudes of the Sierra Nevada one frequently sees their fronds gracefully spread out in the lee of a protecting rock. These beautiful fronds remain green throughout the year. On this account, and also because of their hardiness, these ferns are much prized for ornamental planting.

13. CYSTÓPTERIS.

1. **C. frágilis** Bern. BRITTLE-FERN. Stalks clustered, fragile, 1¼ in. to 1 ft. long. Fronds 2 to 12 in. long, broadly lanceolate, smooth, 2-pinnate; pinnae oblong-ovate or triangular; segments ovate or ovate-oblong, obtuse, decurrent along the more or less winged rachis, toothed or lobed. Sori small, roundish, on the backs of the veins; indusium delicate, hood-like, attached by a broad base to the veinlet below the sporangia (not under them) and usually turned back by them as they ripen, or withering away. (Indusia are best studied when the sori are young.) (*Filix fragilis* Underw.)

This dainty, fragile fern is common among damp rocks by streams and in other moist, shaded places. In shape and cut of the frond it resembles our Woodsias, but it is lighter green in color, much more delicate in texture, and somewhat larger in size.

14. WOÓDSIA.

Small, dark-green ferns, fruiting freely the length of the frond. Sori round, on the backs of free veins; indusium delicate, attached to the receptacle beneath the sporangia which it partly or wholly encloses at first, often early dividing into irregular lobes, thus forming a fringe. (Indusia are best studied in young sori.)

1. **W. scopulìna** Eat. Rocky-mountain Woodsia. Stalks densely clustered, 1 to 5 in. long, straw-like, dark below, short-hairy. Fronds 1½ to 8 in. long, 1 to 1½ in. broad, oblong-lanceolate, short-hairy and glandular, pinnate or 2-pinnate, when simply pinnate the segments deeply cut and toothed, the lower pinnae shorter than the middle ones. Sori submarginal; indusium delicate, cleft into narrow divisions terminating in hairs.—On exposed rocks at Mono Pass, Ledge Trail, etc. Not common.

2. **W. oregàna** Eat. Like the preceding but the fronds and stalks quite smooth, fertile fronds taller than the sterile ones, indusium very minute and divided almost to the center into a few beaded hairs.—Reported from the Yosemite Valley.

PINACEAE. (Coniferae.) Pine Family.

Evergreen trees with resinous sap and needle-shaped, linear, or scale-like leaves. Stamen-bearing and pistil-bearing flowers in separate scaly catkins on the same tree, the pistillate catkins becoming cones. Seeds either small and bony or large, nut-like, and winged.

A. Leaves needle-like.

Needles 2 or more in a cluster enwrapped at base by a thin sheath (leaf solitary in *P. monophylla*).....1. Pinus.

B. Leaves narrowly linear or awl-like, 2 or 4-ranked.

Cones erect, the scales falling separately.....4. Abies.
Cones pendent, falling whole.
  Seeds winged; cone-scales overlapping.
    Bracts longer than the scales; leaf-scars smooth.....2. Pseudotsuga.
    Bracts shorter than the scales; branchlets roughened by the persistent leaf-bases.....3. Tsuga.
  Seeds not winged; cone-scales not overlapping.....5. Sequoia.

C. Leaves minute, scale-like, thickly clothing the branchlets.

Fruit a dry cone.
  Cone nearly globose, 2 in. or more thick.....5. Sequoia.
  Cone oval, 1 in. or less long, 2 of the scales spreading...6. Libocedrus.
Fruit a globose berry; branchlets cord-like.....7. Juniperus.

1. PÌNUS. Pine.

Trees with needle-like leaves in clusters of 2 to 5, each cluster sheathed at base by papery scales (sheath 1-leaved in *P. monophylla*). Cones maturing in the second autumn, reflexed or pendulous, their scales woody and each bearing 2 winged seeds.

a. Leaves in fives.
Cones nearly sessile, subglobose, 1 to 3 in. long.....1. *P. albicaulis.*
Cones long-stalked, long and slender.
Leaves 1 to 3 in. long; cones 6 to 8 in. long.....2. *P. monticola.*
Leaves 2 to 4 in. long; cones 13 to 18 in. long.....3. *P. lambertiana.*
b. Leaves in threes, 5 to 12 in. long.
Cones 3 to 10 in. long, the scales prickle-tipped.....4. *P. ponderosa.*
Cones 6 to 10 in. long, the scales with stout spur-like tips. 5. *P. sabiniana.*
c. Leaves in twos, 1 to 3 in. long; cones 1 to 1¾ in. long. 6. *P. murrayana.*
d. Leaves solitary; cones 2½ to 3½ in. long.....7. *P. monophylla.*

1. **P. albicaúlis** Engelm. WHITE-BARK PINE. Bark thin, whitish, smooth or somewhat grooved. Needles in 5's, 1 to 2½ in. long. Cones nearly sessile, ovoid or nearly globose, of a beautiful deep purple, becoming yellowish brown, 1 to 3 in. long.

The White-bark Pine is a small tree, sometimes erect but usually dwarfed or prostrate and broader than high, the branchlets naked save for the bush-like tuft of leaves toward the ends. It is found only near timber-line, where it forms a narrow belt on all the high mountains. On the easterly slopes of the Sierra Nevada it is replaced by the Limber Pine (*P. flexilis* James), a very similar tree but with longer, yellowish brown cones narrowly ovate in shape.

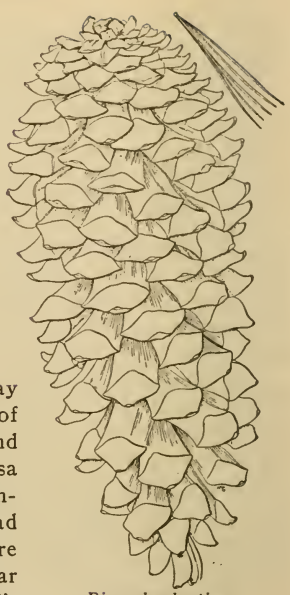
2. **P. montícola** Don. SILVER PINE. Bark reddish or whitish, thin, very smooth or checked into small plates. Needles in 5's, 1 to 3 in. long. Cones pendent on long stalks, in clusters near the ends of high branches, 6 to 8 in. long, 3 to 3½ in. thick, very slender when young, the scales somewhat spreading and flexuous.

This is a graceful tree, 50 to 120 ft. high, with mainly horizontal slender branches and blue-green foliage. It inhabits high altitudes, being common from 7000 ft. nearly to timber-line, and is sometimes found as far down as 5000 ft. alt. On Clouds Rest the Silver Pine is the dominant tree along the trail from the pinnacles to the summit, and it also grows, but in small numbers, around Sentinel Dome.

3. **P. lambertiàna** Dougl. SUGAR PINE. Bark brown or reddish, 2 to 4 in. thick, with rough ridges. Needles in 5's, 2 to 4 in. long. Cones long-stalked, pendent from the ends of the branches, 13 to 18 in. long, 4 to 6 in. thick (when open), the scales rigid and spreading at right-angles when mature and dry.

The Sugar Pine is our most handsome tree. John Muir calls it the Queen of the Sierras. It is commonly 100 to 180 ft. high, with a clear trunk, a flat-topped crown, and horizontal, arm-like branches from the ends of which depend

Pinus monticola



Pinus lambertiana

the long, slender cones. One may see exceptionally fine forests of Sugar Pine near Crockers, and near the Merced and Mariposa groves. In the Yosemite it is common only along the Wawona Road leading out of the valley, but there are several splendid individuals near Camp Curry. Its normal altitudinal range is from 4000 to 7000 ft.

4. **P. ponderòsa** Dougl. WESTERN YELLOW PINE. Bark in typical trees 2 to 4 in. thick, yellowish brown, divided into large scaly-surfaced plates; in some forms (and always when young) the bark is reddish brown and irregularly grooved and ridged, not in plates. Needles in 3's, 5 to 10 in. long. Cones breaking through near the base and falling, leaving the basal portion on the limb, usually 3 to 5 in. long, ovate or oval, each scale bearing a stout point or prickle at the thickened apex.

This pine is the most abundant tree of the Sierra Nevada, forming the "Great Yellow Pine Belt" of middle

altitudes. It is a forest tree, 60 to 225 ft. high, with massive trunk and a long, open crown, the lower branches often horizontal or drooping. The Jeffrey Pine (*P. ponderosa* var. *jeffreyi* Vasey) is a variety in which the bark is rough, even in old trees, and the cones are larger (5 to 8 or even 11¾ in. long); the foliage is very dense, dark blue-green, and fragrant. It grows mostly at higher levels than the true Yellow Pine, mixing with that form where the ranges overlap, as in Little Yosemite Valley, but extending, in some cases, to altitudes of 9000 ft.

5. **P. sabiniàna** Dougl. DIGGER PINE. GRAY PINE. Bark rough, ashen. Leaves in 3's, 6 to 12 in. long, sparse and grayish. Cones massive, breaking through near the base and falling, short-oval, 6 to 10 in. long, 4 to 6 in. thick, each scale tapering to a stout incurved beak 1 in. long.

The Digger Pine is a broad, round-topped tree, 40 to 60 ft. high, with usually several trunks from the ground. It is a foothill species ranging up to Hetch Hetchy and a few stragglers reach the Wawona Road near Alder Creek.

6. **P. murrayàna** Ore. Com. LODGEPOLE PINE. MURRAY PINE. Bark very thin, covered with small scales. Leaves in 2's, 1 to 3 in. long. Cones nearly globose when open, 1 to 1¾ in. long; the scales thin, prickle-tipped. (*P. contorta* var. *murrayana* Engelm.)

×½

The Lodgepole Pine is a slender, symmetrical tree, usually 50 to 100 ft. high (dwarfed or prostrate near timber-line), with pyramidal crown, the trunk often with branches nearly to the ground. It is confined to moist soil and therefore grows along streams or meadows or on fairly level land, occurring on hillsides only at the higher altitudes. It belongs to a higher belt than the Yellow Pine, but often grows with it, as along the Merced River in Yosemite Valley. In California it is often called "Tamarack," but the true Tamarack (*Larix*) is a deciduous tree which does not occur native in this state.

7. **P. monophýlla** Torr. ONE-LEAF PIÑON. Bark thick, rough. Leaves one in a place, cylindric, curved, 1½ to 2 in. long. Cones subglobose, 2½ to 3½ in. long; scales thick, each bearing a minute deciduous prickle.

This small, flat-crowned nut pine was found at about 5500 ft. alt. in the Piute Creek gorge above the Tuolumne River,

by Mr. H. W. Gleason, of the Sierra Club party of 1909. Its home is along the desert ranges, and it had not been previously known on the westerly slope of the Sierra Nevada except from the Kings River southward.

2. PSEUDOTSÙGA. False Hemlock.

1. **P. taxifòlia** Britt. Douglas Fir. Bark on old trees 1 to 6 in. thick, soft, dark-brown, alternately red and white inside, fissured (thin and smooth on young trees). Leaves spreading, usually on drooping branchlets, linear, ½ to 1½ in. long. Cones maturing the first autumn, pendent, oval, 1¾ to 3 in. long, 1¼ to 1¾ in. thick, the scales thin, rounded, shorter than the 2-lobed bracts which bear a spear-like point in the notch of each. (*P. mucronata* Sudw. *Tsuga douglasii* Carr.)

Next to the Sequoias, this is the most massive tree of the Pacific forests, attaining its best development in Oregon and Washington, whence the lumber is marketed under the name of Oregon Pine. In the Sierra Nevada it is restricted to middle and lower altitudes, ranging east in our district to Hetch Hetchy, head of Nevada Falls, Glacier Point, Bridal Veil Creek, and Chinquapin. Beautiful specimens may be seen scattered along the southerly side of Yosemite Valley, especially near Bridal Veil Falls.

3. TSÙGA. Hemlock.

1. **T. mertensiàna** Sarg. Alpine Hemlock. Bark brown, red inside, nearly smooth or fissured. Leaves standing out all around the branchlet, linear, ¼ to 1 in. long. Cones maturing the first autumn, solitary on ends of branchlets, pendent, nearly cylindric when open but tapering, 1½ to 3 in. long, 1 to 1¼ in. wide, the scales thin and spreading.

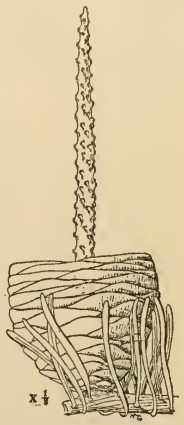
The Alpine Hemlock, the most graceful and slender of all our trees, becomes 25 to 100 ft. high, bearing branches nearly to the ground. Above, it narrows to a slender top, with drooping branchlets, the slender whip-like leader pendent. It is restricted to high altitudes near timber-line.

4. ÀBIES. Fir.

Symmetrical trees, the regularly whorled branches forming flat sprays. Leaves linear, ridged and whitened beneath, not

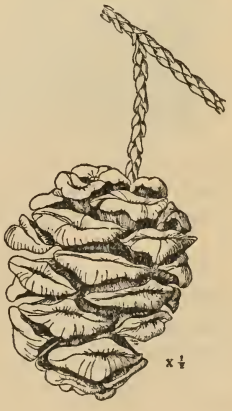
fascicled. Cones maturing the first autumn, erect, the thin scales deciduous and falling to the ground leaving the taper-like persistent axis.

1. **A. cóncolor** L. & G. White Fir. Bark smooth and whitish, becoming gray and very rough on old trunks, pale inside. Leaves spreading in 2 opposite directions or all curving upward, leaving smooth round scars when they fall, mostly ¾ to 1¾ in. long. Cones nearly cylindric, 2 to 5 in. long, 1 to 1¾ in. thick; the rounded scales incurved at apex, twice as long as their bracts.



The White Fir is a beautifully symmetrical tree, 60 to 200 ft. high, with regularly tapering crown through which the silvery shaft is visible in growing specimens. It is common at middle altitudes but requires better soil and more moisture than Yellow Pine. The text figure illustrates a cone from which all but the lower scales have fallen, exposing the persistent central axis.

2. **A. magnífica** Murr. Red Fir. General appearance and characters of White Fir but bark on old trunks reddish, in section reddish brown and purple. Cones much larger, 4 to 8 in. long, 2½ to 3½ in. thick, their bracts either shorter than the scales or (in var. *shastensis* Lemmon) much exceeding them and the tips reflexed.—Of higher altitudes; forming forests at 7000 to 10,000 ft.



5. **SEQUÒIA.** Redwood.

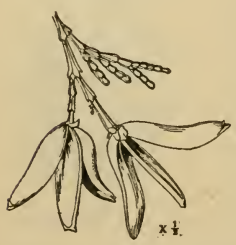
1. **S. gigantèa** Dec. Big Tree. A massive tree, 100 to 325 ft. high, with rounded crown and red furrowed bark. Leaves awl-like, ½ in. or less long, only the tips free from the branchlets. Cones maturing the second autumn, ovoid, 2 to 3¾ in. long.

The Big Tree occurs in isolated groves from Placer County south to Kern County, forming large forests toward the south, but limited in our district to the Mariposa, the Merced,

and the Tuolumne groves. It is exceeded in height only by the Coast Redwood (*S. sempervirens*, the only other living species) although some Australian species of Eucalyptus are of about the same height. It is the most massive of all trees, and perhaps the oldest. Actual ring counts place its maximum age at 2300 years, but a few individuals have doubtless reached a greater age. John Muir, after careful study of portions of a burned cavity, estimated one to be 4000 years old.

6. LIBOCÈDRUS. Incense Cedar.

1. **L. decúrrens** Torr. Incense Cedar. Bark 2 or 3 in. thick, reddish brown, fibrous, breaking in age into thick ridges. Leaves ¼ in. or less long, adherent to the stem, only the tips free. Cones brown, ¾ to 1 in. long, urn-shaped when closed, two of the scales recurving in age and only these bear seeds.



This is a beautiful, pyramidal tree, 50 to 150 ft. high, with trunk rapidly tapering from the thick base, usually bearing branches nearly to the ground. It occurs singly or in very small groves throughout the middle portions of the Yellow Pine Belt.

7. JUNÍPERUS. Juniper.

1. **J. occidentàlis** Hook. Western Juniper. Sierra Juniper. Bark brown or gray, becoming shreddy. Leaves scale-like, closely compacted about the stem in whorls of 3, ⅛ in. or less long, each with a pit on the back. Berries globose, blue-black, with a whitish bloom, less than ½ in. thick, the flesh resinous.

The Juniper is a sturdy, sub-alpine tree, 10 to 60 ft. high, often much gnarled, irregular, and stubby. It is especially common on rocky slopes and ridges from Nevada Falls and Eagle Peak to Mt. Conness and Mt. Ritter.

TAXACEAE. Yew Family.

Trees with linear leaves 2-ranked by a twist in the petiole. Stamens and ovules borne on different trees. Fruit in our single genus solitary, plum-like, 1-seeded.

BIG TREE

(*Sequoia gigantea*)

The Big Tree usually forms groves. This specimen, standing well apart from its neighbors, displays to good advantage the distinctive features of the species. The straight and massive trunk, the stocky branches, and the rounded crown are all characteristic. The White Firs to the left and the Yellow Pine at the extreme right, are themselves trees of some magnitude, but their size is scarcely appreciated when compared with this Monarch.

1. TÒRREYA.

1. **T. califórnica** Torr. CALIFORNIAN NUTMEG. Leaves rigid, linear or tapering, bristle-tipped, 1 to 2 in. long, dark green above, yellowish green beneath. Fruit elliptic, green, becoming streaked with purple, 1⅛ to 1¾ in. long, the pulp thin and resinous.

The California Nutmeg is a handsome tree 20 to 90 ft. high, with compact dark-green foliage. Along the road from El Portal one sees small, bushy specimens and a few good-sized trees, always growing well apart from each other, but a short distance up Cascade Creek there is a splendid group of six or seven shapely trees. It does not reach Yosemite Valley, but is found at Hetch Hetchy and at the Mariposa Grove.

TAXUS BREVIFOLIA Nutt., the Western Yew, has been reported from the Merced Cañon. It is a small tree with linear leaves in flat sprays and scarlet, berry-like fruits.

SPARGANIACEAE. BUR-REED FAMILY.

Marsh and aquatic herbs with cylindric stems from rootstocks. Flowers in heads near the summit, the uppermost heads containing only stamens, the lower only pistils.

1. SPARGÀNIUM. BUR-REED.

1. **S. símplex** Hudson. Stem 1 to 2 ft. high. Leaves ribbon-like, exceeding the stem, ¼ in. or less wide. Heads 2 to 4 of each kind.—Hetch Hetchy, Yosemite, Johnson Lake, Tuolumne Meadows, etc.

NAIADACEAE. PONDWEED FAMILY.

Our only representatives of this family are certain undetermined species of *Potamogeton* (Pondweeds). They are aquatics with jointed, mostly rooting stems, only the floating leaves flat and firm; flowers small, with sepals stamens and ovaries 4 each. Complete specimens with mature seeds are much desired.

JUNCAGINACEAE. ARROW GRASS FAMILY.

Marsh herbs with leaves all basal and flowers inconspicuous. Our single species has a calyx of 6 greenish sepals, no corolla, 6 stamens, and 3 to 6 simple pistils united around a central axis.

1. TRIGLÒCHIN. ARROW GRASS.

1. **T. marítima** L. Leaves densely clustered on the rootstock, very narrow, 2 to 6 in. long, fleshy, with papery

sheaths at base. Flowering stalks naked, 6 to 18 in. high, bearing a long narrow raceme of very small flowers.—Of wide distribution, especially along sea shores; occurs in saline soil at Tuolumne Meadows.

Two other members of this family may be expected in quiet ponds, such as we have in Eagle Peak Meadows and in Little Yosemite Valley: *Scheuchzeria palustris* L., with long, grass-like leaves sheathing the stem by a papery base; stem zigzag, terminated by a loose raceme of few flowers with sheathing bracts. *Lilaea subulata* H.B.K., has very thin, ribbon-like leaves, also sheathing at base, but the flowers are sessile in close, bractless spikes resembling catkins.

ALISMACEAE. Water Plantain Family.

Marsh herbs with broad sheathing leaves from the bases of naked stems. Perianth of 3 greenish sepals and 3 white petals. Stamens 6 or more. Ovaries numerous, each becoming a 1-seeded dry fruit.

1. ALÍSMA. Water Plantain.

1. **A. plantàgo-aquática** L. Leaves long-petioled; blade ovate or oblong, 2 to 8 in. long, 1½ to 4 in. broad. Flowers white, small, on pedicels ¼ to 1 in. long. Ovaries becoming flattened, 17 to 25 in the circle.

As the ponds dry up in late spring or summer, the Water Plantain sends up its hollow, smooth stem, which branches above to form a loose panicle of small, white flowers, much overtopping the broad, erect leaves. The plants, which are plentiful in the meadows of the Yosemite, Hetch Hetchy, etc., commonly grow to a height of 2 or 3 ft.

GRAMINEAE. Grass Family.

Since the grasses are seldom collected by the amateur, and since the species are difficult of determination, the family is not further considered in this book.

CYPERACEAE. Sedge Family.

The members of this family are mostly known as sedges. They resemble grasses but are easily distinguished by the characters stated in the key to the families. Because of the difficulty of their determination, especially for the amateur, they are here omitted.

LEMNACEAE. Duckweed Family.

The plants of the Duckweed Family consist of minute, stemless fronds which produce a few flowers from the edge

or upper surface and commonly hanging roots from beneath. The genus *Lemna* is doubtless represented in our district, but what species occur is not known.

JUNCACEAE. Rush Family.

This family is represented by the true rushes (*Juncus*), which have 3-celled, many-seeded capsules, and by the wood rushes (*Luzula*), which have 1-celled, 3-seeded capsules. They are grass-like plants with inconspicuous flowers and are not further described here.

LILIACEAE. Lily Family.

Perennial herbs with perfect regular flowers. Stems from bulbs, corms, or rootstocks. Perianth of 6 segments, the outer 3 often called sepals, the 3 inner called petals. Stamens 6, opposite the perianth-segments, 3 sometimes without anthers. Ovary superior, developing into a few to many-seeded 3-celled capsule or berry; styles or stigmas 3.

A. Stems nearly naked, the leaves being entirely or chiefly basal.

Styles 3, distinct down to the ovary.
- Stem glandular-pubescent, from a rootstock..... 2. Tofieldia.
- Stem glabrous, from an ovate bulb..... 3. Zygadenus.

Style 1, sometimes 3-lobed, but not down to the ovary.
- Flowers few to many, in umbels, i. e., all on pedicels arising from the summit of the stem.
  - Perianth-segments distinct to base; herbage onion-scented ..... 6. Allium.
  - Perianth-segments united below into a tube..... 7. Brodiaea.
- Flower solitary, white; leaves broad.....13. Clintonia.
- Flowers in racemes or panicles.
  - Basal leaves 4 to numerous, conspicuous.
    - Flowers blue; leaves erect.....12. Camassia.
    - Flowers yellow; leaves erect..... 1. Narthecium.
    - Flowers whitish, narrow; leaves spreading..... 5. Chlorogalum.
  - Basal leaves 1 or 2.
    - Perianth-segments similar, not hairy.....10. Erythronium.
    - Inner segments much broader than the outer, each with a hairy gland.....11. Calochortus.

B. Stems leafy.

Fruit a berry.
- Flowers white, ¼ in. long, in dense clusters.....14. Smilacina.
- Flowers greenish, ½ in. long, nodding.....15. Disporum.

Fruit a dry capsule.
- Leaves 2 in. or less wide.
  - Flowers yellow or white, 1 in. or more long..... 8. Lilium.
  - Flowers purplish, mottled, ½ to ¾ in. long..... 9. Fritillaria.
- Leaves 2 to 6 in. wide.
  - Flowers greenish, ½ in. long..... 4. Veratrum.
  - Flowers purplish, 2 in. long.....16. Trillium.

1. NARTHÈCIUM. Bog Asphodel.

1. **N. californicum** Baker. Stem 1 or 2 ft. high, nearly naked. Leaves densely tufted on a creeping rootstock, 4 to 8 in. long, not ¼ in. wide, acute. Flowers yellow, ⅜ in. long, short-pediceled in a narrow simple raceme. Perianth-segments not united, oblong-linear, acute. Stamens 6, with densely woolly filaments. Seeds with a long bristle at each end.

Although rather common in northwestern California, the Bog Asphodel is one of the rarest plants in the Sierra Nevada, having been found south of Nevada Co. only at Le Conte Falls, Tuolumne Cañon, where it was gathered by Mr. Fred M. Reed, of the Sierra Club party of 1911. It grows in marshy or moist places. The showy yellow racemes far overtop the stiffly erect clumps of grass-like leaves. A character by which it may always be known is the yellow woolliness of the apparently thickened filaments.

2. TOFIÈLDIA. False Asphodel.

1. **T. intermèdia** Rydb. Stems 6 to 12 in. high. Leaves linear, 3 to 6 in. long. Flowers in a compact terminal head about ½ in. thick, the individual flowers less than ¼ in. long. Perianth-segments not united, shorter than the 6 stamens. Styles 3. Capsule obovate, acute, 3-beaked, with numerous linear 2-tailed seeds.

The leaves of False Asphodel might easily be mistaken for grass leaves, but the compact head of greenish white flowers is unmistakable. It grows in moist places at considerable altitudes, as along the new Snow Creek Trail at 6000 ft.

3. ZYGÁDENUS.

1. **Z. venenòsus** Wats. Death Camas. Stem simple, 1 to 2 ft. high. Leaves linear, usually folded, shorter than the stem. Flowers erect, greenish white, scarcely ¼ in. long, in a simple loose terminal raceme. Stamens 6, free from the perianth and about equalling it. Capsule 3-lobed.

The leaves of the Death Camas are often mistaken for grass when the plants are young, and thousands of sheep are killed every year on the stock ranges as a result of eating them. But hogs eat the bulbs, which are often called "hog potatoes," with impunity. It grows in meadowy places, as at the Hog Ranch, Yosemite and Little Yosemite valleys, and Benson Lake, but it is nowhere very abundant.

4. VERÀTRUM.

1. **V. califórnicum** Dur. False Hellebore. Stems stout and leafy, 3 to 6 ft. high, bearing a large panicle of greenish flowers. Leaves ovate or elliptic, acute, sheathing at base, 6 to 12 in. long, 2 to 6 in. wide, the upper ones smaller. Flowers ½ in. long, nearly sessile on the branches of the panicle; stamens shorter than the segments.

The leafy clumps of False Hellebore are characteristic of wet, sub-alpine meadows and stream banks. Its large leaves have given it the name of "Skunk Cabbage," but that is a very different plant and does not grow in California. The shoots of the False Hellebore are poisonous to stock but they are seldom eaten. Veratrum is closely related to Tofieldia and Zygadenus, as is indicated by the 3 distinct styles.

5. CHLORÓGALUM.

1. **C. pomeridiànum** Kunth. Soap Plant. Stem 2 to 5 ft. high. Leaves mainly in a basal tuft, numerous, ¾ to 2 ft. long, ½ to 1½ in. broad, with wavy margins. Flowers narrow, ¾ in. long, borne along the few long branches of a spreading panicle. Perianth-segments distinct, linear, white, purple-veined. Stamens 6. Capsule top-shaped, 3-lobed.

The Soap Plant is so named because of its large, saponaceous, fibrous-coated bulb, which forms a lather with water and may be used in washing. Only the tuft of coarse, grass-like leaves are seen during the spring, but in late summer the tall, flowering stalks shoot up and unfold their delicate flowers, which, however, open only in the afternoon. It is abundant at altitudes under 5000 ft.

6. ÁLLIUM. Onion.

Odorous plants with simple stems (scapes), each stalk ending in a bracted umbel of pediceled flowers. Leaves few, grass-like, nearly basal. Perianth of 6 nearly equal distinct segments, each with a stamen attached to its base. Ovary superior, globose, developing into a 3-lobed 6-seeded capsule.

Stamens exserted from the perianth.
- Stems flattened ..... 1. *A. validum.*
- Stems round; flowers light rose-color ..... 2. *A. sanbornii.*

Stamens not exserted from the perianth.
- Flowering stems 2 to 16 in. high ..... 3. *A. campanulatum.*
- Flowering stems very short; high mountains.
  - Bracts 3; segments very acute ..... 4. *A. tribracteatum.*
  - Bracts mostly 2; segments obtuse ..... 5. *A. parvum.*

1. **A. válidum** Wats. Swamp Onion. Tall comparatively stout plant, 1 to 3 ft. high, the 2-edged stem and the leaves from an oblong bulb or a creeping rootstock. Leaves 4 to 6, often ⅓ in. wide. Flowers many, pink, in a dense terminal head-like cluster subtended by 2 to 4 thin bracts united at base and longer than the pedicels.

This onion is common in moist places of considerable altitude, the plants often growing in small beds. Although its bulbs are somewhat fibrous they are very acceptable as a flavoring ingredient for soups and stews in a region where vegetables are difficult to procure.

2. **A. sanbòrnii** Wood. Stem terete, a foot or two high, from a white ovate bulb. Leaves 2 or more, not exceeding the stem. Bracts 4; pedicels ¼ to ½ in. long. Flowers light rose-color; the ovate-lanceolate segments about ¼ in. long, shorter than the stamens and style.—A rare species, reported from the Yosemite.

3. **A. campanulàtum** Wats. Stem terete, 2 to 16 in. high, from an ovate bulb. Leaves 2 or 4, usually longer than the stem. Bracts 2, acuminate, shorter than the pedicels, these ¼ to a full inch long. Flowers light rose-color, the lanceolate segments about ¼ in. long, exceeding the stamens and style.—In open, coniferous forests. A low form with short pedicels and small flowers has been segregated as *A. bidwelliae* Wats.

4. **A. tribracteàtum** Torr. Bulb-coats with transverse reticulation. Leaves usually 2, much longer than the stem, which is only ¼ to 2 in. long. Bracts 3, acuminate. Flowers in a loose head, pale pink, with dark midveins, the narrow acute segments ¼ in. long. Capsule not crested.—Tuolumne Meadows and above.

5. **A. párvum** Kell. Bulb-coats without reticulation. Leaves 1 or 2, exceeding the very short stem. Bracts mostly 2. Flowers in a compact head, pink, with broad dark midveins, the segments rather obtuse. Capsule not crested.—Near timber-line on Mt. Lyell. *A. obtusum* Lemmon, is a related form with solitary leaf, 3 bracts, and crested capsules. *A. ambiguum* Jones, perhaps even closer to *A. parvum,* is distinguished by its bulb-coats, which are marked off into 6-sided or diamond-shaped figures. Neither of these is definitely known from our district.

7. BRODIAÈA. Brodiaea.

Flowering stem erect or twining, with few grass-like leaves

all from the roundish corm (called a bulb), bearing a bracted terminal umbel of flowers each on a jointed pedicel. Perianth withering-persistent, funnelform or tubular. Stamens 6, 3 of them sometimes merely dilated filaments without anthers.

a. *Flowers* yellow, with brown nerves; stamens 6, all with anthers.
  Stamens with broad winged filaments.....1. *B. ixioides.*
  Stamens with thread-like filaments.....2. *B. gracilis.*
b. *Flowers* white; stamens 6, all with anthers.....3. *B. hyacinthina.*
c. *Flowers* either blue, purple, or pinkish; only the 3 inner stamens anther-bearing, except in no. 6.
  Flowers blue or purple; stems usually erect.
    Pedicels 1 to 3 in. long; flowers 1¼ in. or more long.4. *B. grandiflora.*
    Pedicels 1 in. or less long; flowers under ¾ in.
      Three outer filaments broad, without anthers.....5. *B. multiflora.*
      Filaments all anther-bearing, the inner 2-winged...6. *B. capitata.*
  Flowers rose-color, ½ in. long; stems twining.....7. *B. californica.*

1. **B. ixioìdes** Wats. Golden Brodiaea. Pedicels ¾ to 2 in. long. Flowers ½ to ¾ in. long; segments longer than the tube. Stamens 6, alternately long and short, inserted in 1 row; filaments dilated, notched or rounded at the broad summit, the anther raised on a minute stalk.

The stems of the Golden Brodiaea vary in height from a few inches to over a foot and are surmounted by loose umbels of showy yellow flowers, whose segments are veined with brown. The altitudinal range extends from the foothills to at least 8500 ft., but on the higher levels it is largely replaced by the next species.

2. **B. grácilis** Wats. General habit and appearance of *B. ixioides.* Stem 9 in. or less high. Pedicels ¼ to 1 in. long. Flowers about ½ in. long, segments about equalling the tube or slightly longer. Filaments very slender, inserted in 1 row. —Common from Crane Flat and Indian Creek to Lake Tenaya, Glacier Point, Conness Creek, and other places of high altitudes.

3. **B. hyacinthìna** var. **láctea** Baker. White Brodiaea. Stem 1 to 2 ft. high, terminated by the compact umbel of white flowers, the segments with green midveins. Pedicels ¼ to ¾ in. long. Flowers about ½ in. long, cleft to below the middle. Stamens 6, in one row; filaments triangular at base, tapering above.—Moist soil in low places: Yosemite Valley, Hog Ranch, Wawona, etc.

4. **B. grandiflòra** Smith. Harvest Brodiaea. Stem stout, 6 to 18 in. high, the blue or violet flowers in a large and open terminal umbel. Pedicels 1 to 3 in. long (rarely only ¾ in.), much exceeding the membranous whitish bracts. Flowers 1¼

to 1¾ in. long, tapering to the slender base, cleft to below the middle. Outer (sterile) filaments oblong-lanceolate, about equalled by the erect anthers of the inner stamens. (*Hookera coronaria* Salisb.)

The large flowers of the Harvest Brodiaea are conspicuous sights in the half-brown grass of dry meadows in late spring and summer, but it does not reach the higher mountains. It has been found at Yosemite, Hetch Hetchy, Wawona, and similar places of moderate altitude.

5. **B. multiflòra** Benth. Pedicels ¼ in. or less long, exceeded by the ovate purple bracts. Flowers ⅝ in. long, contracted above the swollen base, the throat again enlarged, cleft one-third the way down into spreading segments. Three outer filaments broad, obtuse, entire, without anthers, about equalling the erect 2-toothed anthers of the inner stamens.—A species with the habit and blue flowers of *B. capitata,* but much less plentiful. It grows at Hog Ranch.

6. **B. capitàta** Benth. Common Brodiaea. Plant 6 to 18 in. high, with a head-like cluster of flowers subtended by several purple or metallic bracts. Pedicels ⅛ to 1 in. long. Flowers ½ in. long, cylindric, cleft one-third to one-half the way down into slightly spreading lobes. Inner filaments with thin wings which extend beyond the anthers; outer filaments dilated only toward the base, their anthers smaller than the inner ones.

This, the commonest species of the coast districts and the Sierra Nevada foothills, extends well up into the pine belt and is not rare in the Yosemite. The small bulbs, known as grass-nuts, are often eaten by children, who, like the Indians, prefer them uncooked. The plant is variously known as Wild Hyacinth, Cluster Lily, and Blue Dicks.

7. **B. califórnica** Jepson. Twining Brodiaea. Pedicels ½ to 1 in. long, either shorter or somewhat longer than the large pink bracts. Perianth pinkish or rose-color, ½ in. or less long, with inflated angled tube and narrow throat, cleft to about the middle. Outer (sterile) filaments strap-shaped, notched; inner filaments flat, continued above as two wings behind the anther. (*Stropholirion californicum* Torr. *Brodiaea volubilis* Baker.)

The weak stems of this species commonly climb on other plants around which they are disposed to twine, and in this manner carry their rose-pink flower-heads to heights of 1 to 8 ft. It belongs to the lower mountains, reaching our borders in the vicinity of Wawona, Hetch Hetchy, etc.

8. LÍLIUM. Lily.

Leafy simple stems from scaly bulbs, with showy yellow or white flowers in terminal clusters. Upper and lower leaves alternate, the middle usually in whorls, all sessile. Perianth of 6 equal lanceolate spreading or recurved segments. Stamens 6, inserted on the receptacle, shorter than the perianth. Style long, the stigma 3-lobed; capsule 3-celled, many-seeded.

Flowers white, about 3 in. long.....1. *L. washingtonianum.*
Flowers yellow.
Perianth-segments straight or recurved only from near the tip, 1 to 1½ in. long.....2. *L. parvum.*
Perianth-segments recurving from below the middle.
Flowers 2 or 3 in. long; bulbs large, matted, with jointed scales; in wet places.....3. *L. pardalinum.*
Flowers 3 or 4 in. long; bulbs ovoid, 2 to 6 in. thick, not matted; coarse plant of dry soil.4. *L. humboldtii.*
Flowers 1½ to 2 in. long; bulbs 1½ to 2 in. thick, not matted; smooth slender plant..5. *L. columbianum.*

1. **L. washingtoniànum** Kell. Washington Lily. Stems 2 to 5 ft. high, from a large bulb of thin unjointed scales 1 to 3 in. long. Leaves oblong or lanceolate, 3 to 5 in. long, ½ to 1½ in. wide. Flowers fragrant, pure white, becoming purplish, sometimes finely dotted, on erect pedicels 1 to 4 in. long. Perianth-segments 2 to 3½ in. long, the upper third spreading.

The Washington Lily is an inhabitant of the chaparral, always growing where protected by coarser plants, proudly carrying its beautiful white flowers with their soft fragrance above the more humble shrubs which compose its protective thickets. It is nowhere abundant but is well distributed up to altitudes of about 7500 ft. and ranges along the whole length of the Sierra Nevada and north to the Columbia River. In northern California it is sometimes known as Shasta Lily.

2. **L. párvum** Kell. Stems 1½ to 6 ft. high, from a small bulb of short thick jointed scales. Leaves lanceolate, 3 or 4 in. long, 1 in. or less broad. Flowers 2 to very many, on erect or ascending pedicels. Perianth-segments 1 to 1½ in. long, usually recurved from near the tip, orange-yellow spotted with purple.

Although the flowers of this lily are not so large as in other species, it is nevertheless a very striking plant when well developed, as it commonly is in moist situations. Twenty-eight flowers were counted on a single plant which grew by a rivulet in Bridal Veil Meadows, and many more have been

reported by other observers. It grows in nearly all springy places up to at least 7000 ft. alt.

3. **L. pardalìnum** Kell. LEOPARD LILY. Stem 3 to 7 ft. high, from a mat-like mass of bulbs with jointed scales. Leaves lanceolate, 3 to 7 in. long, often 1 to 2 in. broad. Flowers numerous, at maturity sharply recurved on their pedicels. Perianth-segments 2 or 3 in. long, strongly recurved from near the base, bright orange-yellow with purple spots on the lower half.

The Leopard Lily is ever associated in one's memory with pleasant places. It is especially partial to shady stream banks and to half-boggy meadows around springs, where its gorgeous yellow panicles far overtop the grasses, ferns, and other herbaceous vegetation. The species is of wide distribution in California, but in the Sierra Nevada it is restricted to cañons mostly below 3500 ft. alt. It is often known as "Tiger Lily," but that name rightfully belongs to an Asiatic species, well known as a garden plant.

4. **L. humbòldtii** R. & L. Stems stout, 4 to 8 ft. high, from a large bulb of fleshy scales 2 to 3 in. long. Leaves lanceolate, wavy, 3 to 5 in. long, ¾ to 1 in. broad. Flowers on stout spreading pedicels, recurved at maturity. Perianth-segments 3 or 4 in. long, recurved above the short narrowed base, reddish orange with purple spots.—In dry, open places, perhaps not in the Yosemite district.

5. **L. columbiànum** Hanson. Stems slender, 2 to 4 ft. or more high, from a small bulb of short fleshy scales. Leaves lanceolate, not wavy, 2 to 5 in. long, ½ to 1¼ in. broad. Flowers on slender curving pedicels. Perianth-segments 1½ to 2 in. long, strongly recurved, bright reddish orange, thickly spotted with purple.—A species of more northerly distribution, but to be looked for.

9. FRITILLÀRIA.

Stem simple, erect, from a bulb of thick scales. Leaves narrow, sessile, alternate or the lower usually in whorls. Flowers on recurved pedicels in a simple raceme, purplish brown with yellow markings, the 6 segments distinct and longer than the 6 stamens. Styles 3, united at base.

1. **F. parviflòra** Torr. SMALL-FLOWERED FRITILLARIA. Plant 1½ to 3 ft. high, light green and very smooth. Leaves 3 to 5 in. long. Flowers 3 to 20, the concave segments about ½ in. long. Capsule 6-winged.—Occasional in pine woods below 6000 ft. alt.

LEOPARD LILY
(*Lilium pardalinum*)

The Leopard Lily is ever associated in one's memory with pleasant places. It is partial to shady stream banks and to half-boggy meadows around springs, where its gorgeous yellow panicles far overtop the grasses, ferns, and other herbaceous vegetation.

2. **F. atropurpùrea** Nutt. Smaller, mostly ½ to 1½ ft. high. Flowers rarely more than 5, ½ to ¾ in. long. Capsule acutely angled.—Higher altitudes, as at north base of Mt. Lyell.

10. ERYTHRÒNIUM. Dog-tooth Violet.

1. **E. purpuráscens** Wats. Bulbs narrow, coated with a membranous sheath. Leaves 4 to 6 in. long, ½ to 2 in. wide, wavy-margined. Flowers light-yellow or tinged with purple, deep-orange at base, slender-pediceled, nodding, about ¾ in. long, the segments not united. Stamens 6. Style 3-lobed. Capsule more than 1 in. long.

The stem of this beautiful lily is about a foot long and bears, near the base, a single pair of large leaves, while above it ends in a loose raceme of 4 to 8 showy flowers. The species is very rare in our mountains, being reported only from Illilouette Cañon and from the Keltz Mine, near Sonora. It is an inhabitant of moist places.

11. CALOCHÓRTUS. Mariposa Lily.

Stems from corms often miscalled "bulbs," with few leaves and showy cup-shaped or globose flowers in open clusters. Perianth falling from the capsule at maturity; outer segments (sepals) lanceolate or oblong, greenish or colored; inner segments (petals) broad, narrowed to a claw above which is a conspicuous gland or pit. Stamens 6, on the base of the segments. Ovary 3-angled, capped by 3 sessile stigmas, maturing into a many-seeded capsule.

1. **C. nùdus** Wats. Star Tulip. Stem 10 in. or less high, much exceeded by the single flat ribbon-like leaf, bearing a terminal cluster of flowers on weak pedicels which usually become recurved (flowers rarely solitary). Petals broadly fan-shaped, ¼ to ¾ in. long, white or pale lilac, almost without hairs; gland divided transversely by a toothed scale.

The Star Tulip is a dainty inhabitant of meadowy places from the Hetch Hetchy to the Mariposa Grove and may rarely be found as high as 7500 ft. alt. Its blossoms appear in June.

C. benthamii Baker, the Yellow Star Tulip, has been found near Groveland. It has clear-yellow flowers about ½ in. long, the petals densely covered with yellow hairs.

C. maweanus Leichtl., known as Pussy's Ears, has been reported from the Yosemite. Its petals are white or purplish blue and are covered with long hairs.

2. **C. nuttállii** T. & G. Stems a few inches to 1½ ft. high, longer than the very narrow leaves, with a bulbous swelling at base and bearing usually several large flowers on erect pedicels. Petals obovate or wedge-shaped, 1 to 1½ in. long, white, tinged with greenish yellow or lilac, a brown or purplish spot or band above the yellow base, this brown eye sometimes entirely surrounded by yellow; gland broadly A-shaped, densely hairy, surrounded by long scattered hairs.

In the Yosemite meadows, where this Mariposa Lily is rather common, the plants are tall and the flowers beautifully colored, while at higher altitudes they are much dwarfed and the flowers are very pale. This high-mountain form, also known by the anthers, which are deeply notched at base, is sometimes described under the name of *C. leichtlinii* Hook.

3. **C. venùstus** Benth. MARIPOSA LILY. Similar to no. 1 but with usually larger and more open flowers, which are mostly very highly colored, the petal-gland oblong and with densely matted hairs.

This is one of the handsomest of all the Mariposa lilies and is remarkable for the range of its color forms. Along the Wawona Road, near Alder Creek, one form has deep-wine-red petals which are darker toward the middle and are crossed below by a broad yellow band, while on near-by plants the petals are nearly white, with a dark-brown eye surrounded by yellowish. *C. venustus* grows also below Crockers, but it does not invade the higher altitudes, where it is replaced by *C. nuttallii.*

12. CAMÁSSIA.

1. **C. quámash** Greene. CAMAS. Flowering stem 1 to 2½ ft. high, from a coated bulb, longer than the grass-like leaves. Flowers blue, in a loose simple terminal raceme, the pedicels ¼ to ¾ in. long and jointed at the summit. Perianth ¾ to 1 in. long; segments not united, 3-nerved. Stamens 6, on the base of the perianth. Capsule 3-lobed.

The Camas, or Quamash, inhabits boggy meadows, where its blue flowers are very conspicuous above the other plants. The bulbs of a related species were formerly much eaten by the Indians of the Northwest, who prepared them either by boiling or by roasting in pits. Much care was exercised to prevent the similar but poisonous bulbs of Death Camas from becoming mixed with the mess. In our district the true Camas has been found from Little Yosemite Valley and Eagle Peak to Crockers and Lake Eleanor.

MARIPOSA LILY
(*Calochortus venustus*)

This Lily is remarkable for the range of its color-forms. Its flowers vary from deep wine-red to nearly white and the petals are variously marked with yellow and rich reddish brown.

13. CLINTÒNIA. Clintonia.

1. **C. uniflòra** Kunth. Leaves 2 to 5, thin, 3 to 9 in. long, 1 or 2 in. broad, shortly acute, tapering to the sheathing base, sparsely hairy. Flower white, erect, ¾ to 1 in. long, pubescent, the segments distinct and exceeding the 6 stamens. Style one.

The most conspicuous part of this plant is the cluster of large leaves, which much exceeds the single-flowered, naked peduncle. It grows from a creeping rootstock and is found only in shady places along our lower borders, as in the Merced and Tuolumne groves and near Chinquapin. It is closely related to Smilacina and Disporum, as is indicated by the berry-like fruit.

14. SMILACÌNA. False Solomon's Seal.

Stems simple and leafy, from rootstocks, bearing small white flowers in close clusters. Leaves sessile and clasping, many-nerved. Perianth-segments not united, spreading. Style single, 3-lobed at summit. Fruit a globose 1 to 3-seeded berry. (*Vagnera.*)

1. **S. sessilifòlia** Nutt. Stem 1 to 2 ft. high. Leaves ovate or oblong-lanceolate, 2 to 6 in. long, acute, obscurely pubescent. Flowers in a simple raceme, the pedicels spreading. Stamens shorter than the lanceolate perianth-segments, their filaments very slender.—Rarely met with; more common in the Coast Ranges.

2. **S. amplexicaúlis** Nutt. Similar to no. 1 but often larger and coarser, the flowers in branched clusters (panicles). Stamens much longer than the perianth, their filaments broad.—Occurs only sparingly, as in Yosemite Valley and along the Wawona Road. The herbage is usually rough with short hairs, especially among the flowers, but a perfectly smooth and glabrous form (or species ?) occurs at 8500 ft. in Matterhorn Cañon and elsewhere in the Sierra Nevada.

15. DÍSPORUM. Fairy Bells.

1. **D. trachyándrum** Britt. Leaves ovate, somewhat heart-shaped at the sessile base, abruptly acute, 1 to 2½ in. long. Flowers greenish, not ½ in. long, on short drooping pedicels, solitary or in small clusters. Stamens shorter than the perianth; anthers with very short stiff hairs. Ovary and obovate scarlet berry glabrous.

The flowers of this plant are seldom seen, for they are neatly tucked away on short, pendent stalks beneath the broad and thin leaves of the spreading upper branches. The lower part of the stem, which may be a foot or two high, is nearly devoid of foliage. It is one of the rarest of Disporums, being restricted to the westerly slope of the Sierra Nevada. It grows around Bridal Veil Meadows and along the road to Chinquapin.

16. TRÍLLIUM. Wake Robin.

1. **T. séssile** L. Common Trillium. Stem simple, ¾ to 2 ft. high, naked below. Leaves 3, all borne in a whorl at the summit, round-ovate, net-veined, 3 to 5 in. long and about as broad. Flower solitary, sessile in the whorl of leaves, about 2 in. long, dull purple (rarely white). Segments and stamens 6 each. Ovary 3-celled, becoming a fleshy reddish capsule.—Rare in the Sierra Nevada; probably occurs in the Big Tree groves, in the var. *angustipetalum* Torr., with leaves narrowed at base and petals narrowly oblanceolate to linear. *T. ovatum* Pursh, with distinctly peduncled flowers, grows in the Coast Ranges and the northern Sierra Nevada.

IRIDACEAE. Iris Family.

Perennial herbs with sheathing grass-like leaves and perfect regular flowers, the 6 petal-like divisions of the perianth in 2 series. Stamens on the base of the sepals. Ovary inferior, becoming a 3-celled capsule; style 3-cleft.

Flowers 1½ in. or more long, with dissimilar segments...1. Iris.
Flowers under ½ in. long, with similar segments.....2. Sisyrinchium.

1. ÌRIS. Wild Flag.

Stems from stout creeping rootstocks. Perianth with a distinct tube above the ovary; outer segments spreading, the inner narrower and erect. Stamens distinct, with narrow anthers beneath the arching petal-like style-branches. Seeds numerous, black, flat.

1. **I. hartwégii** Baker. Stems 6 to 12 in. high, many, very

leafy up to the pair of showy terminal flowers. Leaves about ¼ in. wide, the larger ones overtopping the flowers, glabrous. Pedicels ½ to 3 in. long, partly enfolded in the long lanceolate-acuminate bracts, which are separate from each other. Petals either yellow and with lavender veins or pale lavender, with deeper-colored veins and a yellow medial portion; tube about ¼ in. long; sepals and petals 1½ to 2 in. long.

The home of this beautiful Iris is the half-dry, open, coniferous forest of middle altitudes, it being quite common from Crockers to the Mariposa Grove. The two color forms often grow together and are much admired by tourists.

2. **I. missouriénsis** Nutt. WESTERN BLUE FLAG. Stems stout, ½ to 2 ft. high, nearly naked except at base. Leaves about ¼ in. wide, mostly shorter than the stem, glabrous. Bracts usually opposite, thin and somewhat papery. Petals pale blue, 2 to 2½ in. long, the tube about ¼ in. long.

This large-flowered Iris grows in moist places on Snow Creek, in Hetch Hetchy Valley, etc., and is common east of the Sierra Nevada. A white-flowered form is reported from Mono County.

2. SISYRÍNCHIUM.

Low perennials from fibrous roots. Perianth-segments all alike. Style-branches slender. Seeds globular.

1. **S. béllum** Wats. BLUE-EYED GRASS. Stems ½ to 2 ft. high, from a cluster of fibrous roots. Leaves very narrow, shorter than the stem, glabrous. Pedicels 1 in. or less long, projecting from the pair of green sheathing bracts. Flowers blue, yellow at base, about ⅜ in. long, the six segments equal and similar. Style short, with slender stigmas. Seeds several, rounded.

The grass-like leaves and delicate, blue flowers of this plant are well known in California, where it is common on grassy hillsides and in meadows. It is plentiful in Yosemite Valley, blossoming in late spring.

2. **S. elmeri** Greene. Characters essentially those of no. 1, but flowers yellow, with purple lines, the segments acute.—Lake Eleanor (type locality), Wawona Road, etc.

ORCHIDACEAE. ORCHID FAMILY.

Perennial herbs with alternate leaves (except Listera) sometimes reduced to scales, the lower sheathing. Flowers in racemes or spikes or solitary, perfect, irregular. Sepals 3, alike. Petals 3, 2 alike, the third, or "lip," usually differing

in size and shape. Filaments united with the style to form a column which is capped by the single anther (anthers 2 in Cypripedium). Ovary inferior, developing into a 3-celled capsule with numerous minute seeds.

A. Plants without green herbage; the leaves reduced and scale-like.

Herbage pink or reddish.....7. CORALLORHIZA.
Herbage pure white.....3. CEPHALANTHERA.

B. Plants with green herbage.

Lower petal with a slender spur at base.....2. HABENARIA.
None of the petals spurred.
Leaves a single rounded pair midway of the low stem; flowers green .....6. LISTERA.
Leaves several, basal; flowers white to flesh-color.
Sepals ¼ in. or less long.
Raceme spirally twisted.....5. SPIRANTHES.
Raceme straight .....4. EPIPACTIS.
Sepals 1½ to 2½ in. long; lip an inflated sac.....1. CYPRIPEDIUM.

1. CYPRIPÈDIUM. LADY'S SLIPPER.

1. **C. montànum** Dougl. MOUNTAIN LADY'S SLIPPER. Leaves sessile, acute, broadly ovate, clasping, 4 to 6 in. long, 2 or 3 in. broad, pubescent (like the stems) with short glandular hairs. Flowers 1 to 3, short-pediceled. Sepals and wavy-twisted petals linear-lanceolate, 1½ to 2 in. long, purplish; lip an inflated sac, 1 in. long, dull white, veined with purple. Capsule nearly erect, oblong, ¾ to 1 in. long.

The Mountain Lady's Slipper is a stout, leafy plant, 1 to 2 ft. high, from a tuft of fibrous roots. It grows in moist places around Yosemite Valley, the Mariposa Grove, etc., and is often gathered because of its peculiar, showy flowers.

2. HABENÀRIA. REIN-ORCHIS.

Erect plants with simple stems from a cluster of fleshy roots, passing above into slender spikes of white or greenish flowers. Leaves closely sessile, the lower clasping or sheathing the stem. Lower petal, or lip, flat and spreading, with a slender spur at base.

1. **H. unalaschénsis** Wats. Slender plant, a foot or so high. Leaves all near the base, 3 to 5 in. long, ¼ to ¾ in. wide. Flowers small, greenish, widely separated in the open spike, much exceeding the bracts. Petals, sepals, and lip each about $^1/_{12}$ in. long, the narrow spur slightly longer; upper petals straight. Capsule oblong, sessile or nearly so, when mature ½ in. long.—In good soil of pine and fir forests, but not in wet places.

2. **H. leucóstachys** Wats. SIERRA REIN-ORCHIS. Stem robust, 1 to 4 ft. high, leafy throughout. Leaves lanceolate, 4 to 9 in. long, ½ to 1 in. wide, the upper ones smaller and narrower. Flowers larger, white, in a rather dense spike, mostly shorter than the slender bracts; lip rhombic-lanceolate; spur ⅓ to ½ in. long; upper petals inarched and overlapping at tip; capsule sessile, ½ to ¾ in. long.—In wet or boggy places of middle altitudes; the most common and showy species.

3. **H. sparsiflòra** Wats. Less robust, 1 to 3 ft. high, leafy throughout. Leaves lanceolate, the larger 3 to 9 in. long, ½ to 1 in. wide. Flowers greenish, somewhat scattered in the open spike, usually shorter than the bracts; lip narrow, linear or lanceolate; spur ⅓ in. or less long; upper petals inarched, their tips overlapping; capsule sessile, ½ in. long.—Not rare along streams at 4,000 to 8,000 ft. alt.; the only green-flowered orchis of wet places.

H. HYPERBOREA R. Br., a species with greenish flowers in a dense, thick spike, the short spur scarcely exceeding the sepals, has been reported from our district, but the plants were apparently *H. sparsiflora.*

3. CEPHALANTHÈRA.

1. **C. austínae** Heller. Leaves reduced to white sheaths an inch or two long. Flowers numerous, sessile, pure white. Sepals and petals similar, oblong-lanceolate, about ¼ in. long; lip shorter, its base concave and the limb rounded. (*C. oregana* Reich.)

In this species the whole plant is pure white, its nourishment being derived entirely from decaying vegetation. The clean stems grow from slender rootstocks to a height of 1 to 2 ft. and are very conspicuous in the dense forests, but they are by no means abundant. The species has been found near Big Meadows, near Crane Flat, in Little Yosemite Valley, and at Eight-mile Station. Its range extends northward along the Sierra Nevada and North Coast Ranges and through Oregon to Washington.

4. EPIPÁCTIS.

Erect plants from creeping rootstocks. Flowers in bracted terminal racemes which are more or less glandular. Upper sepal and petals united into a hood over the lip; lip concave at base, without callosities.

1. **E. gigantèa** Dougl. STREAM ORCHIS. Leaves sessile,

prominently veined, acute, the lower ovate, clasping, 4 to 8 in. long, an inch or two wide; upper leaves lanceolate, smaller. Flowers 3 to 12, short-pediceled, greenish or rose-pink, strongly veined with purple. Sepals ovate-lanceolate, ¾ in. long, the upper one concave. Petals slightly smaller; lip pouched at base, with narrow wing-like margins, the summit broader and entire but wavy-crested. Capsule becoming ¾ to 1 in. long, recurved or spreading.

The stout, leafy stems of the Stream Orchis are 1 to 4 ft. high, ending in a raceme of peculiar, leafy-bracted flowers. It grows only in wet places, often associated with ferns, Thimble Berry, the Sierra Rein Orchis, and other moisture loving plants. Although nowhere abundant, it has been found in the Yosemite and Hetch Hetchy valleys, etc., and is of wide distribution. Some botanists consider our species identical with *E. royleana* Lindl., an inhabitant of the Himalaya Mts.

2. **E. decípiens** Ames. RATTLESNAKE PLANTAIN. Leaves all basal, thick, spreading, broadly lanceolate, 2 to 4 in. long including the petiole. Flowers numerous, longer than their bracts. Sepals less than ¼ in. long. Lip narrowed to summit, the margins incurved. Capsules erect, ⅜ in. long. (*Goodyera menziesii.*)

This plant does not bloom until midsummer, but it may be known long before that time by its thick leaves which are marked, especially up the middle, by conspicuous white veins. The stems are 1 to 1½ ft. high and are very glandular, especially above. It is common in the Yosemite.

5. SPIRÁNTHES. LADIES' TRESSES.

1. **S. romanzoffiàna** Cham. Stem from a fascicle of thick oblong roots, 6 in. to 2 ft. high, leafy below, terminating in a twisted spike of white flowers. Leaves oblong to linear, acute, narrowed at base but sessile. Flowering spike 1 to 4 in. long; bracts large, taper-pointed. Sepals and petals all united, about ⅓ in. long; lower petal recurved, narrowed below the rounded wavy summit.

The Ladies' Tresses makes its appearance in July in meadowy places of moderate altitude and is especially common in meadows of the upper end of Yosemite Valley.

6. LISTÈRA. Twayblade.

1. **L. convallarioïdes** Torr. Simple solitary stem 3 in. to a foot high, from fibrous and creeping roots, with a pair of broad sessile opposite leaves just below the raceme. Leaves orbicular, often pointed at apex, 1 to 2½ in. across. Flowers 6 to 12, greenish. Sepals and petals linear, less than ¼ in. long; lip flat, 2-lobed, less than ½ in. long.

This peculiar plant, known at once by its single pair of rounded leaves, grows in the edges of bogs by the Mineral Spring of Yosemite Valley and may be expected elsewhere, especially at somewhat higher altitudes.

7. CORALLORHÌZA. Coral-root.

Pinkish or straw-colored plants, with coral-like rootstocks, the erect stems terminating in naked racemes of dull-colored flowers on short pedicels which become reflexed in fruit. Leaves reduced to papery sheaths. Sepals and petals about equal, the upper incurved. Pollen-masses in 2 pairs, distinct, sessile upon a short oblong gland.

1. **C. multiflòra** Nutt. Plant 1 to 2 ft. high. Sepals oblique at base and continued as a short spur, which is adnate to the ovary; sepals and petals ¼ to nearly ½ in. long; "lower" petal, or lip, concave, 3-lobed, nearly white and conspicuously spotted with purple.—Growing among pine needles or other decaying vegetation; widely distributed but nowhere common.

2. **C. bigelòvii** Wats. Much like the preceding but with the base of the sepals merely swollen over the ovary, not spurred; sepals and petals larger, about ½ in. long, strongly veined but none of them spotted; "lower" petal very concave, entire or barely toothed.—Found only in coniferous forests or elsewhere in decaying vegetation; only occasionally seen in the Yosemite district.

SALICACEAE. Willow Family.

Deciduous trees and shrubs with alternate simple leaves the stipules sometimes falling early. Flowers in narrow spikes (catkins), the staminate and pistillate on different plants. Calyx and corolla none. Stamens 1 to many. Fruit a capsule with many seeds each with a tuft of hairs at base.

Trees and shrubs; scales of the catkin entire or merely toothed. 1. SALIX.
Trees; scales deeply cut; leaves ovate or roundish..... 2. POPULUS.

1. SÀLIX. WILLOW.

Winter buds covered by a single scale. Catkins appearing with or before the leaves, their scales not deeply toothed. Stamens 1 to 10.

A. Stamens 3 to 9; filaments hairy; leaves mostly 3 to 7 in. long; slender trees.

Petioles glandular at summit; leaves ½ in. or more wide. 1. *S. lasiandra.*
Petioles not glandular; leaves narrower, mostly curved... 2. *S. nigra.*

B. Stamens 2 or 1; shrubs, rarely tree-like.

a. Creeping shrub, rooting at the joints..... 11. *S. arctica.*

b. Narrow-leaved shrub of low altitudes; leaves ⅛ to ¼ in. wide, 1½ to 5 in. long; peduncles short, leafy; filaments hairy..... 3. *S. longifolia.*

c. Narrow-leaved shrub; leaves silvery-silky beneath, mostly green above; stamen 1..... 4. *S. sitchensis.*

d. Erect shrubs and trees; leaves wider in proportion (except no. 8); stamens 2.

Peduncles short, not leafy-bracted.
Catkins nearly globose; leaves glabrous..... 12. *S. monica.*
Catkins cylindric; leaves pubescent when young.
Capsules silky; leaves obovate..... 5. *S. scouleriana.*
Capsules glabrous ..... 6. *S. lasiolepis.*
Catkins cylindric; leaves glabrous. (See no. 7.)
Peduncles evident, leafy-bracted; mostly of over 6,000 ft. alt.
Capsules and mature leaves glabrous; stigmas notched.. 7. *S. cordata.*
Capsules pubescent.
Twigs white; leaves small, narrow, silvery-pubescent ..... 8. *S. macrocarpa.*
Twigs green, brown, or yellowish.
Leaves entire. ..... 9. *S. glauca.*
Leaves glandular-toothed ..... 10. *S. californica.*

1. S. lasiándra Benth. YELLOW WILLOW. SWORD-LEAF WILLOW. Leaves lanceolate, taper-pointed, 2 to 7 in. long, ½ to 1 in. wide, glabrous, paler beneath; stipules conspicuous on vigorous shoots. Catkins 1¼ to 2¼ in. long, their peduncles leafy-bracted. Capsules slender-pediceled, glabrous.

The Yellow Willow is a slender tree, common along streams and around lakes at the lower altitudes. It is readily known by the small, wart-like glands on the petioles and the leaf-margins are also often minutely glandular.

2. S. nìgra Marsh. BLACK WILLOW. Leaves narrowly lanceolate, long-pointed, often curved, glabrous, 2 to 7 in. long, ¼ to ½ in. wide, on very short petioles; stipules falling early. Catkins ¾ to 2½ in. long. Capsules glabrous.—A tall

tree with rough, dark bark, normally belonging to river banks at low altitudes and probably not reaching the Park boundary.

3. **S. longifòlia** Muhl. LONG-LEAF WILLOW. Leaves linear-lanceolate, very acute, remotely toothed, 1 to 5 in. long, ⅛ to ¼ in. wide. Stipules very early deciduous. Catkins ½ to 1½ in. long, on short leafy peduncles. Capsules glabrous.

The many erect branches of this willow form rounded clumps 5 to 15 ft. high. The leaves are mostly glabrous, but there is a var. *argyrophylla* And., known as Coyote Willow, with a permanently silvery-pubescent foliage. Both forms grow in rocky stream beds along our lower borders. Still another form, with leaves up to 3½ in. long and ½ in. wide, and catkins 1 or 2 in. long, has been described from the Yosemite under the name of *S. bolanderiana* Rowlee.

4. **S. sitchénsis** Sans. SITKA WILLOW. Leaves narrowly oblong, acute at both ends, very prominently veined, white and velvety beneath, soon green above, 1 to 3 in. long, ¼ to ½ in. wide; stipules minute and lanceolate, or wanting. Catkins narrow, becoming 1½ to 2½ in. long, on short leafy peduncles. Capsules pubescent.

The Sitka Willow, also known as Velvet Willow and as Silky Willow, belongs typically to the north coast but occurs in a narrow-leaved form at a few places in the Sierra Nevada: Yosemite Valley (near Stoneman Bridge and Happy Isles); Nevada Falls; Merced Lake; Stubblefield Cañon; Kaweah River; Gilmore Lake, near Tahoe; etc. There are several varieties named by Jepson. The silkiness of the foliage is approached only in *S. macrocarpa,* but that has much shorter catkins and white-powdery twigs.

5. **S. scouleriàna** Barr. NUTTALL WILLOW. Leaves obovate, rounded above or very shortly acute, entire, 1 to 2 in. long, ½ to 1¼ in. wide, glabrous above, becoming so beneath; stipules semicordate, toothed. Catkins nearly sessile, ½ to 1 in. long, scaly-bracted but not leafy at base. Capsules white-silky. (*S. flavescens* Nutt. *S. nuttallii brachystachys* Sarg.) —A shrub or small tree, best known by its broad leaves; occasional in meadows and along streams at moderate altitudes.

6. **S. lasiólepis** Benth. ARROYO WILLOW. Leaves oblong or broadly lanceolate, acute, obscurely toothed, 1½ to 5 in. long, ⅜ to 1¼ in. wide, green and glabrous above, white-pubescent or pale beneath; stipules mostly wanting. Catkins nearly sessile, ¾ to 1½ in. long. Capsules glabrous or a little pubescent.

The meadows of Yosemite and other low valleys are bordered by thickets of the Arroyo Willow, which forms rounded clumps 10 to 20 ft. high. It is sometimes called White Willow.

7. **S. cordàta** var. **mackenziàna** Hook. Leaves narrowly oblong, rounded to a broad base, slenderly acute, glabrous, pale beneath, 1 to 3 or 4 in. long, ½ to 1½ in. wide; stipules conspicuous and rounded or early deciduous. Catkins 1 to 1¾ in. long, the leaves of the peduncles falling early. Style long, with short bifid stigmas. Capsules glabrous, slender-pediceled.—A rare shrub, found near Sentinel Hotel in the Yosemite and at Johnson Lake.

8. **S. macrocárpa** var. **argentèa** Bebb. SILVER WILLOW. Leaves lanceolate, entire, acute at both ends, appressed-silky beneath, becoming green above, 1 to 1½ in. long, ⅜ in. or less wide; stipules none. Catkins ¾ in. or less long. Style very short. Capsules densely short-pubescent.

The smooth, silvery-pubescent foliage and short, thick catkins best mark this beautiful willow (see also *S. sitchensis*). It is a slender, white-twigged shrub, 6 to 18 ft. high, and grows only in the higher valleys, as along the Lyell Fork of the Tuolumne, and Walker Lake, Mono Co.

9. **S. glaúca** var. **villòsa** Anders. Leaves lanceolate to oblanceolate, acute, narrowed at base, entire, 1 to 3 in. long, ¼ to ½ in. wide, soft-pubescent when young; stipules lanceolate or none. Catkins on short leafy peduncles, the pistillate 1 to 3 in. long, their scales brownish and hairy. Stigmas either entire or lobed.

This shrub (2 to 12 ft. high) forms thickets along the shores of lakes and on moist banks. It is the most common willow of upper altitudes, ranging from 7000 ft. to timberline.

10. **S. califórnica** Bebb. Doubtfully distinct from no. 9, differing chiefly in its very finely toothed leaves. It grows at Snow Flat and probably elsewhere in the range of *S. glauca villosa*.

S. LEMMONII Bebb, is a doubtful species close to *S. glauca* and reported from our higher mountains. It is described as a tall, slender shrub with nearly glabrous leaves, the scales of the catkins pitch-black.

11. **S. árctica** var. **petraèa** Anders. ALPINE WILLOW. Leaves lanceolate, tapering to each end, entire, about 1 in. long, ¼ to ½ in. wide, glabrous. Catkins erect, 1 or 2 in. long. Capsules silky.

The short, tortuous stems of this willow form a depressed body only 1 to 4 in. high and the flowering shoots rarely exceed 6 in. It is a common inhabitant of moist slopes near timber-line, often growing entangled with other alpine dwarfs and sedges.

12. **S. mònica** Bebb. Mono Willow. Leaves oblong or oblanceolate, acute at each end (or the lower obtuse), entire or nearly so, ¼ to 1¼ in. long, glabrous or lightly pubescent around apex; stipules none. Catkins small, roundish, sessile or on a very short 2-bracted peduncle. Capsules sessile, sparsely silky.—Mono Pass, Mt. Dana, Tuolumne Meadows, Rancheria Mt., etc., occurring as a low, profusely branched shrub, the lower branches reclining but not creeping. The Common Cottonwood (*P. fremontii*) replaces this species in the Sacramento and San Joaquin valleys.

2. PÓPULUS. Poplar.

Trees, similar to willows but with mostly broader leaves. Buds covered by several scales. Scales of the catkins as though torn. Stamens numerous. Stigmas long.

1. **P. trichocárpa** T. & G. Black Cottonwood. Leaves ovate or lanceolate, truncate or heart-shaped at base, acute, finely toothed, 2 to 5 in. long, on petioles ½ to 2 in. long, green above, brown or whitish beneath.

The Black Cottonwood becomes a conspicuous, broad-topped tree along the rivers in Hetch Hetchy, Yosemite, and Wawona valleys. The bark is whitish and smooth at first, but fissured on old trunks into long, narrow plates.

2. **P. tremuloìdes** Michx. Aspen. Leaves round-ovate or orbicular, abruptly tipped, faintly toothed, ¾ to 2½ in. long, on petioles ¾ to 2 in. long.

The Aspen is a slender, graceful tree with leaves constantly quivering even when there is apparently no breeze, the flat petiole being specially adapted to ease of movement. The bark is greenish white, becoming black. No other American tree has so wide a range as the Aspen, which grows from Hudson Bay and the Arctic regions south to Tennessee and Mexico. In our district it grows on moist slopes and along streams, forming thickets or small groves. It belongs to the Upper Coniferous Belt, rarely descending to 4500 ft.

MYRICACEAE. Sweet-gale Family.

Shrubs and small trees with alternate simple leaves without stipules. Flowers in short catkins, without calyx or corolla.

1. MYRÌCA. Wax Myrtle.

1. **M. hartwégii** Wats. Sweet Bay. A deciduous pubescent shrub with fragrant foliage. Leaves oblanceolate, acute, 1½ to 3 in. long, narrowed to a short petiole, toothed. Stamen-bearing flowers in catkins scarcely ½ in. long, each with 3 or 4 stamens. Pistil-bearing flowers in shorter catkins which become berry-like and waxy-coated in fruit.—Rare, but found on Big Creek, below the Mariposa Grove, and in the Merced Cañon below the Yosemite.

BETULACEAE. Birch Family.

Deciduous trees and shrubs with alternate simple petioled leaves and deciduous stipules. Flowers mostly in catkins appearing before the leaves.

Fruit nut-like, in a leafy tube.....1. Corylus.
Fruits small, many, in a woody cone.....2. Alnus.

1. CÒRYLUS. Hazel.

1. **C. rostràta** var. **californica** DC. California Hazel. Leaves thin, roundish, toothed, 1½ to 4 in. across, glandular-hairy. Nut ovoid, hard, ½ in. long, enclosed in a hairy tube ¾ to 1½ in. long.

Although more common in the Coast Ranges, the Hazel is by no means rare from the Tuolumne to the lower end of Yosemite Valley and the Mariposa Grove, ascending to 5500 ft. on Moss Creek. It is a loose, spreading shrub, 6 to 10 ft. high.

2. ÁLNUS. Alder.

1. **A. rhombifòlia** Nutt. White Alder. Leaves oblong-ovate, tapering to each end, irregularly glandular-toothed, 2 to 4 in. long. Pistillate catkins erect, becoming woody cones, ½ to ¾ in. long, bearing margined nutlets.

The Alder, which is a straight tree 30 to 80 ft. high, with smooth, pale bark, grows along all of the larger streams, but does not ascend above 5000 ft. alt. A characteristic grouping of the trees is shown in our illustration facing page 4.

A. tenuifolia Nutt., the Mountain or Narrow-leaf Alder, may reach our higher mountains from the north. It is a shrub with doubly toothed leaves.

Betula occidentalis Hook., the Western Birch, grows on the east slope of the Sierra Nevada. It is a tree with smooth, brown bark and roundish, toothed leaves 1 or 2 in. long. Birches are distinguished from alders by the solitary instead

of clustered pistillate catkins, which do not become permanent woody cones.

FAGACEAE. Oak Family.

Trees and shrubs with hard wood and alternate simple leaves. Staminate flowers in slender clusters (catkins); calyx several-lobed; stamens 4 to 12; petals none. Pistillate flowers borne on the same plant, 1 to 3 in each scaly involucre; ovary adherent to the calyx; petals none.

Fruit a smooth acorn borne in a scaly cup.....1. Quercus.
Fruit a spiny bur containing 1 to 3 nuts.....2. Castanea.

1. QUÉRCUS. Oak.

Flowers greenish or yellowish, the staminate in pendulous catkins; pistillate in young leaf-axils, the ovary with 3 to 5 styles or stigmas. Fruit an acorn in a scaly cup.

Bark gray or whitish; stigmas sessile or nearly so.
  Tree (sometimes dwarfed); acorn-cup thick, with golden fuzz .....1. *Q. chrysolepis.*
  Shrub; cup thin, without golden fuzz.....2. *Q. vaccinifolia.*
Bark dark or black; stigmas on long styles.
  Leaves entire or merely spiny-toothed.....3. *Q. wislizenii.*
  Leaves with bristle-tipped lobes.....4. *Q. kelloggii.*

1. **Q. chrysólepis** Liebm. Maul Oak. Leaves ovate or oblong-ovate, acute, entire or toothed (even on the same twig), 1 to 3 in. long, green above, golden beneath with a fine fuzz, becoming smooth and pale. Acorns ovate, globose, or cylindric, either blunt or acute, 1 to 1½ in. long, in very shallow fuzzy cups.

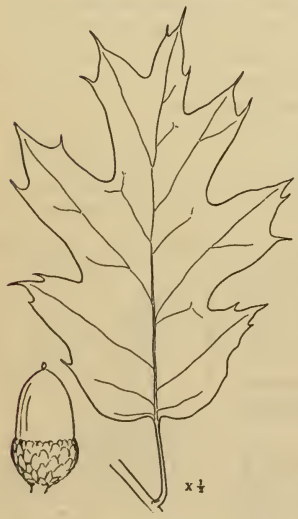
The Maul Oak is a gray-barked, evergreen tree, 20 to 60 ft. high, with roundish or spreading crown. It is one of the live oaks and belongs to the foothills and the Yellow Pine Belt, becoming dwarfed along its upper limits. It may be distinguished, even in its shrubby form, by the golden-yellow color of the backs of some of its leaves and by the golden fuzz on the thick acorn-cups.

2. **Q. vaccinifòlia** Kell. Huckleberry Oak. Leaves oval or oblong and obtuse, or ovate-lanceolate and acute, mostly entire, ¾ to 1½ in. long, ¼ to ½ in. wide, short-petioled, not golden beneath and the margins not rolled back. Acorns globose-ovate, ¼ to ½ in. long, in thin cups ¼ in. deep.

This oak forms meadowy patches of low chaparral around

the rim of Yosemite Valley and on all the higher mountains. The bark is light-colored and the twigs glabrous.

3. **Q. wislizènii** DC. Interior Live Oak. Leaves rigid, oblong to ovate, entire or spiny-toothed, 1 to 2½ in. long, green and shining above, yellowish green beneath. Acorns cylindric to conic, acute, 1¼ to 1½ in. long, in reddish-brown cups.—A small, round-headed tree with smooth, black bark becoming fissured only on large trunks. Belongs to the foothills but reaches 3400 ft. in the Merced Cañon.



4. **Q. kellóggii** Newb. California Black Oak. Leaves thin, broad, deeply parted, each of the several lobes with 1 to 3 or more coarse bristle-tipped teeth, 3 to 8 in. long, 2 to 5 in. wide, green and shining above, lighter beneath. Acorns oblong, obtuse, 1 to 1¼ in. long, deeply set in a cup ½ to 1 in. deep. (*Q. californica* Cooper.)

Our Black Oak is a graceful, deciduous tree, 30 to 80 ft. high, with broad, rounded crown and dark bark checked into small plates. It inhabits valley floors and benches of the Yellow Pine Belt, becoming dwarfed and shrubby at 7000 ft. alt. *Q. morehus* Kell., which is probably a hybrid between this and *Q. wislizenii*, occurs at El Portal. It has shallowly lobed leaves, the lobes pointing upward, and its cups are similar to those of *Q. wislizenii*.

Q. breweri Engelm., the Brewer Oak, and Q. dumosa Nutt., the Scrub Oak, have been reported from the Yosemite but without specimens. The former is a shrub with round-lobed leaves; the latter, which is a foothill shrub, has leaves either entire or spiny-toothed.

2. CASTÀNEA. Chestnut.

1. **C. sempérvirens** Kell. Bush Chinquapin. Leaves oblong or lanceolate-oblong, narrowed at base, obtuse, 1½ to 3

in. long, ½ to 1 in. wide. Catkins unbranched, 1 to 1½ in. long, in clusters.

The Bush Chinquapin is a spreading evergreen shrub 1 to 6 ft. high, with smooth bark and yellowish foliage. The large burs are unlike anything else in the mountains. It grows mostly at altitudes of over 6000 ft., often uniting with Bitter Cherry and Snow-bush to form extensive beds of chaparral.

URTICACEAE. Nettle Family.

It is probable that the common Nettle (*Urtica gracilis* var. *holosericea* Jepson) will be found in our mountains. It is an erect, unbranched herb, 4 to 10 ft. high, with ovate, toothed leaves and stinging hairs.

LORANTHACEAE. Mistletoe Family.

Evergreen shrubs, parasitic on trees. Leaves opposite, entire, often reduced to scales. Flowers greenish, small, the staminate and pistillate on separate plants. Sepals and stamens 2 to 5 each. Ovary inferior, becoming a berry.

Flowers and berries globose; stems stout, mostly over 6 in. long ..... 1. Phoradendron.
Flowers and berries compressed; stems slender, mostly under 6 in. ..... 2. Arceuthobium.

1. PHORADÉNDRON. Mistletoe.

Parasites with flat thick leaves, or these reduced to scales in our third species. Flowers globose, mostly 3-lobed, sunk in the jointed stems. Fruit a globose pulpy sessile berry, maturing the first winter.

1. **P. villòsum** Nutt. Common Mistletoe. Stems 1 to 3 ft. long, pubescent, leafy. Leaves deep green, elliptic, obtuse, 3-nerved, ¾ to 1½ in. long, ¼ to ¾ in. wide, short-petioled. Berries pinkish.—Common on oaks.

2. **P. bolleànum** Eichler. Stems ½ to 1 ft. long, leafy, becoming glabrous. Leaves greenish yellow, narrow, obtuse, nerveless, ½ to 1 in. long, ¼ in. or less wide, short-petioled. Berries pearl-white.—Common on Fir and Juniper.

3. **P. juniperìnum** Englem. Stems ½ to 1 ft. long, glabrous, yellowish. Leaves reduced to triangular obtuse scales. Berry whitish or light red.—On Juniper, the var. *libocedri* Engelm., with longer and more slender joints, on Incense Cedar.

2. ARCEUTHÒBIUM.

Glabrous parasites with square stems and scale-like leaves

united at base in pairs. Flowers crowded, compressed, the staminate 2 to 5-parted, the pistillate 2-toothed. Fruit on a recurved pedicel, maturing the second autumn. The ripe berries suddenly eject the sticky seeds to a distance of several yards. (*Razoumofskya.*)

1. **A. americànum** Nutt. Stems slender, much branched, greenish yellow. Staminate plants 3 or 4 in. long, producing terminal flowers on distinct joints of an open panicle. Fertile plants much smaller.—Known only on the Lodgepole Pine.

2. **A. douglàsii** Engelm. Similar to no. 1 but only ¼ to 1 in. high. Branches nearly erect, solitary or with accessory ones behind (never beside) the primary ones. Flowers in short (mostly 5-flowered) spikes.—On Douglas Fir. The var. *abietinum* Engelm., larger, 1 to 3 in. high, with spreading branchlets, grows on the White and Red Fir. Either form may also be expected on Yellow Pine.

3. **A. occidentàle** Engelm. Stems stout, 2 to 5 in. high, much branched. Staminate flowers in long spikes (flowers 9 to 17).—On Yellow, Jeffrey, and Digger Pine, Juniper, and Alpine Hemlock, perhaps also on Fir. Distinguished from no. 2 by the greenish-brown instead of yellowish stems and by the accessory branchlets of fruiting plants, which bear scales instead of flowers.

SANTALACEAE. Sandalwood Family.

Leaves entire. Calyx 4 or 5-cleft. Stamens 4 or 5, inserted on a fleshy disk. Style 1; ovary inferior, becoming a 1-seeded fruit.

1. COMÁNDRA.

Bastard Toad-flax.

1. **umbellàta** Nutt. Leaves alternate, oblong, thin, acute, much narrowed at base, 1 to 1½ in. long, the lower ones scale-like. Calyx-tube continued as a neck to the dry roundish fruit.

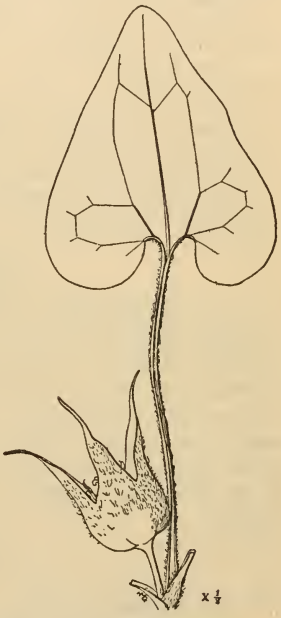
This is a very smooth, leafy perennial, ½ to 1½ ft. high, with small, greenish-white flowers in terminal clusters. The root forms parasitic attachments to the roots of trees and shrubs. It is plentiful in all our mountains.

ARISTOLOCHIACEAE. Birthwort Family.

Flowers perfect, the brownish or greenish perianth 3-lobed, the tube somewhat attached to the 6-celled ovary. Stamens 6 to 12, on the ovary.

1. ÁSARUM. Wild Ginger.

1. **A. hartwégii** Wats. Leaves alternate, entire, broadly heart-shaped, pubescent below, 3 to 5 in. broad, on petioles 3 to 6 in. long. Flowers short-peduncled, in the leaf-axils. Calyx-lobes triangular, continued into a tail ¾ to 1½ in. long. Filaments stout, continued beyond the anthers as a slender appendage. Styles 6, united at base.



This peculiar plant is apparently stemless, the fragrant, creeping rootstocks being hidden in a mass of dried leaves or other matter. The hairy, brownish flowers, with their long-tailed calyx-lobes, are nearly hidden by the clumps of broad leaves, which are often beautifully mottled with white. From its common name one might assume that the roots could be used as a substitute for ginger, but such is not the case. They are highly aromatic, however, and this has led to the suggestion that they might be used in the manufacture of sachet powders. The Wild Ginger is common in good soil in the lower part of the Yellow Pine Belt.

2. **A. lemmònii** Wats. Calyx-lobes only ½ in. or less long and not tailed, the filaments not appendaged; otherwise similar to no. 1.—A rare species, found growing near logs in the Merced Grove.

Aristolochia californica Torr., the Dutchman's Pipe, has been found at "Tissack Bridge", but it is common only in the foothills of the northern Sierra Nevada and of the Coast Ranges. Tissack Mountain is the Indian name of Half Dome. The plant is a woody vine with heart-shaped leaves and inflated flowers (1 in. or more long) which turn back on themselves so as to bring the opening near the base.

POLYGONACEAE. Buckwheat Family.

Herbs and low shrubs with simple leaves and small regular flowers without petals. Stamens 4 to 9. Calyx 3 to 6-cleft. Ovary 1-celled, mostly triangular, becoming a dry 1-seeded fruit (*akene*).

Leaves without stipules; flowers surrounded by an involucre.
  Involucre 1 or 2-flowered; annuals.
    White-woolly plant; involucres sessile.....1. Chorizanthe.
    Green plant; involucres peduncled.....2. Oxytheca.
  Involucre several-flowered; coarse perennial plants (except *E. virgatum*).....3. Eriogonum.
Leaves with papery or membranous stipules sheathing the stem, alternate; flowers without involucre.
  Calyx-lobes 6, the 3 outer reflexed in fruit, the 3 inner erect and enlarging.....4. Rumex.
  Calyx-lobes 4, the 2 outer spreading, the 2 inner erect; Alpine plant with roundish succulent leaves.....5. Oxyria.
  Calyx-lobes 5 or 6, equal and erect in fruit.....6. Polygonum.

1. CHORIZÁNTHE.

1. **C. membranàcea** Benth. Leaves linear, entire, acute, 1 or 2 in. long, the uppermost and even the bracts not much reduced. Involucres several in each sessile head, 1-flowered, papery, the 6 teeth bristle-tipped.

The erect, white-woolly stems of this annual are ½ to 2 ft. high, simple below, but branching above and bearing several or numerous bristly heads of pale flowers. It grows in dry, loose soil of the foothills, reaching 4000 ft. alt. in Yosemite Valley.

2. OXYTHÈCA.

1. **O. spergulìna** Greene. Leaves linear, entire, 2 in. or less long, somewhat hairy. Pedicels ¼ to ½ in. long. Involucre 4-cleft. Flowers rose-color; outer segments obtuse; inner segments 3-toothed. (*Eriogonum spergulinum.*)

This delicate annual (2 in. to 3 ft. high) has its leaves all in a basal tuft and bears a simple to diffusely branched panicle of small flowers on capillary pedicels. It is common in loose soil of the Yellow Pine Belt.

3. ERIÓGONUM.

Leaves alternate or in circles or basal, without stipules. Flowers on slender pedicels, several to many in each 4 to 8-toothed involucre. Calyx 6-parted, persistent. Stamens 9. Styles 3.

A. Flower-heads peduncled, in terminal umbels.

Umbel simple (its rays unbranched, bracted only at base).
Bracts at base of umbel in a leafy whorl.
Leaves rounded, ⅜ in. or more wide; stems reclining at base ..... 1. *E. lobbii.*
Leaves oblanceolate, less than ½ in. wide; stems erect ..... 2. *E. umbellatum*
Bracts inconspicuous, not leafy.
Foliage densely matted ..... 3. *E. incanum.*
Foliage loose, the stems being more diffuse at base ... 4. *E. marifolium.*
Umbel compound (its rays being forked and bracted at about the middle).
Leaves ½ in. or more wide ..... 1. *E. lobbii.*
Leaves less than ½ in. wide (usually ¼ in. or less).
Involucres deeply lobed, lobes becoming reflexed; leaves lanceolate or spatulate ..... 5. *E. stellatum.*
Involucres with short erect teeth; leaves ovate or roundish ..... 6. *E. ursinum.*

B. Flower-heads either sessile along the branches or terminal, never umbellate.

Perennials with woody base.
Leaves nearly sessile, white-woolly on both sides.
Heads terminal, mostly solitary ..... 7. *E. ovalifolium.*
Heads scattered along the branches ..... 8. *E. wrightii.*
Leaves long-petioled, green above ..... 9. *E. nudum.*
Annual, slender, heads less than ¼ in. high ..... 10. *E. virgatum.*

1. **E. lóbbii** T. & G. Flowering stems 3 to 8 in. high, from a little-branched thick base. Leaves thick, oval or roundish, very obtuse, distinctly petioled, ½ to 2 in. long and nearly as wide, white-woolly, often glabrate above. Umbels very pubescent, of 2 to 5 rays only 1½ in. or less long. Involucres nearly ½ in. long, the lobes becoming recurved. Flowers rose-color.—Tuolumne Cañon, Lundy, and northward, on gravelly slopes.

2. **E. umbellàtum** Torr. SULPHUR FLOWER. Flowering stems 3 to 12 in. high, from a much-branched woody leafy base. Leaves oblanceolate or oblong, tapering to a petiole, ¼ to 1 in. long, white-woolly, often becoming glabrous at least above. Umbels of 3 to 10 stout branches ¾ to 2 in. long. Involucre-lobes becoming reflexed. Flowers yellow.

This low but almost bush-like plant, with numerous yellow heads, is conspicuous on stony hillsides at middle altitudes, blossoming in July and August.

It is common around Yosemite Valley, often in forms indistinguishable from *E. stellatum.*

3. **E. incànum** T. & G. Flowering stems numerous, 9 in. or less high, from a dense mat of gray foliage. Leaves oblanceolate or oval, ¼ to nearly 1 in. long, densely and permanently white-woolly. Umbel of 5 to 10 slender branches 2 in. or less long, or the whole inflorescence reduced to a small head in Alpine forms. Involucres with short erect teeth. Flowers yellow, often tinged with red.—In decomposed granite at high altitudes: Sentinel Dome, Lake Tenaya, Clouds Rest, etc. The type specimens came from the Tuolumne River at 8000 to 10,000 ft. alt.

4. **E. marifòlium** T. & G. Very much like *E. incanum,* of which it is perhaps only a form. Foliage-stems less compact, the mats therefore more open. Leaves ovate or oblong, sometimes glabrous above.—High mountains, as in Tilden Cañon at 8200 ft. alt.

5. **E. stellàtum** Benth. Flowering stems 6 to 12 in. high, from a loosely branched woody base. Leaves lanceolate, ½ to 1 in. long, white-woolly at least beneath. Involucres in usually compound umbels with whorls of leaf-like bracts at the nodes.—Differs from *E. umbellatum* only in having the branches of the umbel again divided. Snow Creek, at 6600 ft., Glacier Point, and similar places.

6. **E. ursìnum** Wats. Flowering stems 6 to 15 in. high, from short and thick very leafy basal branches. Leaves oval or roundish, ¼ to ¾ in. long, nearly as broad, white-woolly beneath, greenish above. Umbel compound but very compact, whole inflorescence 1½ in. or less long, subtended by many conspicuous bracts. Flowers very pale yellow.—Tahoe district and northward, in the high mountains; to be expected within our borders.

7. **E. ovalifòlium** Nutt. Plant forming a dense white mat an inch or two high, from which arise naked simple flowering stems 1 to 9 in. long, each terminating in a dense head of flowers. Leaves oval or roundish, ¼ in. or less long, permanently white-woolly on both sides, so densely compacted as to hide the short thick foliage-stems. Flowers roseate, white, or yellow.—Gravelly slopes in the Alpine Zone, as on Mt. Dana.

8. **E. wrìghtii** Torr. Stems woody, leafy, and much branched below, the naked flowering shoots rising to 12 or 18 in. and bearing small clusters of rose-colored flowers. Leaves oblanceolate, ¼ to 1 in. long, with smaller ones densely clus-

tered in their axils, white-woolly on both sides.—Frequent in stony and gravelly places, flowering in late summer.

9. **E. nùdum** Dougl. Stems few, erect, several inches to 2 ft. high, mostly glabrous above, clustered with the leaves on a woody taproot. Leaves oblong, obtuse, usually 1 in. long except in Alpine forms, on petioles of more than twice their length, densely woolly beneath. Involucres in close heads and in the forks of the inflorescence, or terminating simple stems in Alpine plants. Bracts in 3's, short, rigid, and scale-like. Flowers dull white or pink.—Common everywhere.

10. **E. virgàtum** Benth. Stems few or solitary, erect, 3 in. to 3 ft. high, from an annual root, woolly throughout. Leaves chiefly basal, oblanceolate, usually wavy-margined, woolly. Involucres sessile, scattered along the slender branches, each subtended by 3 lanceolate scales.—A foothill species, extending up to 4200 ft. or more.

4. RÙMEX. Dock.

Perennials with small greenish or reddish flowers in terminal panicles. Leaves alternate, entire or with few lobes; stipules sheathing the stem. Calyx of 6 sepals, the outer small and spreading, the inner somewhat colored, becoming larger and appressed to the 3-angled akene. Stamens 6. Styles 3.

Plant small, slender; flowers unisexual.
- Leaves mostly lobed at base.....1. *R. acetosella.*
- Leaves never lobed.....2. *R. paucifolius.*

Plant large, coarse; flowers mostly with both stamens and pistils.
- Leaves green, strongly wavy; sepals broad-winged..3. *R. crispus.*
- Leaves green, slightly wavy; sepals narrow-winged.4. *R. conglomeratus.*
- Leaves pale, flat, willow-like.....5. *R. salicifolius.*

1. **R. acetoséllа** L. Sheep Sorrel. Stems 1 to 1½ ft. high, from slender roots with running branches, the flowers in a narrow panicle. Leaves mostly basal, oblong to oblanceolate, usually with slender basal lobes, petioled. Flowers becoming reddish, on very short pedicels jointed at the top.—An European weed with very acid leaves, naturalized in all the lower valleys.

2. **R. paucifòlius** Nutt. Stems a foot or so high, from a thick root, the flowers in a loose open panicle. Leaves chiefly basal, lanceolate or narrow, never lobed, 1 or 2 in. long, petiole usually longer. Flowers reddish, on pedicels jointed at the base.—A weed of moist places: Yosemite, Lake Tenaya, Bloody Cañon, etc.

3. **R. crispus** L. Curly Dock. Stems stout, 1½ ft. or more high. Leaves oblong-lanceolate from a broad base, the blade 4 to 10 in. long. Flowers in long very dense panicles with nearly erect branches and few leaves, the clusters compact and red-brown in fruit. Fruiting sepals with broad veiny border.—Common around weedy meadows and in moist places at moderate altitudes.

4. **R. conglomeràtus** Murr. Green Dock. Stems clustered, 2 to 4 ft. high. Leaves oblong, the lower with broad base, the blade 3 to 6 in. long. Flowers in clusters along the slender spreading leafy branches. Fruiting sepals nearly covered by the callous grain.—Low, damp ground in Yosemite Valley and probably common in all similar places.

5. **R. salicifòlius** Weinm. Willow Dock. Stems 1 to 3 ft. high. Leaves willow-like, narrowed to both ends, 2 to 5 in. long, pale. Flowers in dense clusters, on short spreading branches, only the lower of which are leafy.—To be expected at low altitudes.

5. OXÝRIA. Alpine Sorrel.

1. **O. dígyna** Camptd. Stems numerous and tufted on a thick root, 3 in. to 1 ft. high. Leaves all basal, kidney-shaped, ¾ to 2 in. across, on very long petioles. Flowers in a narrow panicle with erect branches. Calyx reddish, of 2 outer spreading sepals and 2 inner erect ones. Stamens 6. Stigmas 2, sessile on the ovary which develops into a compressed 2-winged akene.

The Alpine Sorrel is a characteristic inhabitant of moist places among rocks at high elevations, invariably indicating the Alpine Zone. It is readily known by its broad and smooth succulent leaves, which have a pleasant, acid taste, and by the reddish tint, especially of the flowers.

6. POLÝGONUM. Knotweed.

Leafy herbs, one species woody at base. Leaves alternate, entire, their stipules forming membranous sheaths around

the stem. Flowers small, on jointed pedicels; calyx of 4 to 6 nearly distinct petal-like erect segments. Stamens 4 to 9. Styles 2 or 3. Fruit a dry akene, either 3-angled or somewhat flattened.

a. *Flowers* in a loose panicle; leaves 1 in. or more wide ..... 1. *P. polymorphum.*
b. *Flowers* in dense oblong leafless racemes; leaves narrower.
Stems with few leaves; flowers white..... 2. *P. bistortoides.*
Stems leafy; flowers rose-color or pink.
Raceme solitary; leaf-sheaths not bristly..... 3. *P. amphibium.*
Racemes several; leaf-sheaths bristly-fringed..... 4. *P. persicaria.*
c. *Flowers* in the leaf-axils.
Twining herb with heart-shaped leaves.....13. *P. convolvulus.*
Prostrate woody perennial..... 5. *P. shastense.*
Slender glabrous annuals with narrow leaves.
Plants prostrate ..... 6. *P. aviculare.*
Plants erect.
Leaves obovate; stems reddish, leafy..... 7. *P. minimum.*
Leaves narrower.
Stems 6 to 24 in. high.
Flowers erect.
Leaves merely acute..... 8. *P. ramosissimum.*
Leaves with fine tips..... 9. *P. tenue.*
Flowers pendent .....10. *P. douglasii.*
Stems 4 in. or less high
Stems much branched.....11. *P. kelloggii.*
Stems simple below.....12. *P. imbricatum.*

1. **P. polymòrphum** L. Stems stout, erect, 2 to 7 ft. high, perennial. Leaves ovate or lanceolate, acute, 3 to 6 in. long, 1 to 2¼ in. wide, narrowed or rounded to a winged petiole ½ to 1 in. long. Flowers greenish white or rose-color, small but numerous in a much branched bracted terminal panicle often 1 or 2 ft. long. (*P. phytolaccaefolium* Meisn.)—In wet soil along creek banks and the margins of lakes, from the Hetch Hetchy and Yosemite valleys to Tuolumne Meadows.

2. **P. bistortòides** Pursh. Stems several from a woody root, 6 in. to usually 1 or 2 ft. high. Basal leaves oblong or lanceolate, 3 to 5 in. long, ½ to 1 in. wide, distinctly petioled; upper leaves smaller, sessile. Flowers white, in compact cylindric or roundish heads terminating the stem.

The white flower-heads of this Polygonum are conspicuous above the green herbage in nearly all of the mountain meadows, especially where the soil is wet, being of tall stature when growing at moderate altitude, but much dwarfed along its upper limits.

3. **P. amphíbium** L. Water Persicaria. Aquatic perennial with stout stems not branching above the rooting base, sel-

dom more than 1½ ft. high. Leaves usually floating, oblong to lanceolate, acute, 3 to 6 in. long, 1 to 2 in. wide, long-petioled. Flowers bright rose-color, in a dense oblong raceme which is ½ to 2 in. long.—Usually growing in water but sometimes on muddy banks where the stems become erect and more pubescent. It has been collected in the Hetch Hetchy meadows.

4. **P. persicària** L. Lady's Thumb. An introduced annual with usually erect stems, 1 to 5 ft. high, leafy throughout. Leaves lanceolate, 1 to 4 in. long, ¼ to 1 in. wide, short-petioled. Flowers pink, in dense oblong racemes (½ to 1¼ in. long) terminating short branchlets.—In moist situations but not in water; Yosemite Valley.

5. **P. shastènse** Brewer. A low spreading perennial with numerous leafy and woody twigs inclined to creep along the ground. Leaves linear, rather less than ½ in. long, acute. Flowers in the lower leaf-axils, rose-color or nearly white.—Only near timber-line on the higher peaks.

6. **P. aviculàre** L. Yard Grass. A green glabrous annual with prostrate wiry stems often several feet long. Leaves oblong, acute, ¼ to ¾ in. long. Flowers from most of the axils, erect.—An European weed, naturalized around some of the settlements.

7. **P. mínimum** Wats. Stems scurfy, reddish, ¼ to 1 ft. high, leafy to the summit. Leaves mostly obovate or broadly oblong, broad at apex but abruptly short-pointed, ¼ to ¾ in. long, nearly sessile. Flowers erect. Akenes black, shining, slightly exserted from calyx.—A high-altitude species found in moist soil on Mt. Watkins at 6900 ft. alt., also (by Miss Helen D. Geis) in Yosemite Valley, where doubtless carried down by streams.

8. **P. ramosíssimum** Michx. Stems 1 or 2 ft. high, almost woody, ridged, the few branches ascending. Leaves linear-oblong, ½ to 1½ in. long, narrowed to each end, short-petioled. Flowers several in each of the axils, on erect pedicels. Stamens 3 to 6. Akenes granular, not shining.—Yosemite Valley, etc.

9. **P. ténue** Michx. Much more slender than no. 8 and only 1 ft. or less high, the leaves mostly narrowed to a slender tip; stamens 8.—Reported from "Yosemite and above."

10. **P. douglásii** Greene. Stems slender, ½ to 1½ ft. high, with very few branches. Leaves linear-oblong, ½ to 2 in. long, sharply pointed, sessile. Flowers remote, usually only

1 or 2 in each axil, the pedicels reflexed. Akenes black, shining.—Abundant in Yosemite Valley, etc., and occurring at higher altitudes as var. *latifolium* Greene, with shorter stems, broader leaves, and more crowded flowers.

11. **P. kellóggii** Greene. Stem 2½ in. or less high, with numerous erect branches from the base. Leaves crowded, linear, under ½ in., acute, the upper not much reduced. Flowers erect, crowded.—Ostranders, and elsewhere in the higher mountains.

12. **P. imbricàtum** Nutt. Stem solitary, slender, usually simple below, 1 to 3 in. high. Leaves remote, linear, ½ to 1 in. long, acute, the upper ones short and crowded. Flowers erect, crowded. (*P. watsonii* Small.)—Moist soil at middle and upper altitudes.

13. **P. convólvulus** L. Black Bindweed. Stems 1 ft. or more long, twining. Leaves ovate, broad and "eared" at base, taper-pointed, 1 to 2 in. long, glabrous. Flowers in clusters or racemose. Akene black.—An introduced weed, abundant near settlements.

CHENOPODIACEAE. Goosefoot Family.

Weedy herbs with alternate leaves, no stipules, and minute greenish flowers. Ovary 1-celled, becoming a dry 1-seeded fruit. In our single genus the flowers are sessile in small dense bractless clusters, the persistent calyx is 5-parted, and the stamens are 5 in number.

1. CHENOPÒDIUM. Goosefoot. Pigweed.

1. **C. álbum** L. Lamb's Quarters. Pigweed. An erect simple-stemmed white-mealy annual, 1 or 2 ft. high. Leaves ovate to lanceolate, mostly angulate-toothed, the blade 1 or 2 in. long. Flower-clusters in panicled spikes.—An introduced weed of waste places. *C. murale* L., with coarsely toothed, bright-green leaves, on much-branched stems, is also to be expected.

2. **C. bòtrys** L. Jerusalem Oak. An erect very glandular greenish annual, 3 in. to 1 ft. high, simple or branched from the base. Leaves oblong, pinnatifid into oblong angular lobes, ½ to 1½ in. long. Flower-clusters in narrow leafless panicles.—Introduced weed found in Yosemite Valley; the herbage noticeably glandular and aromatic.

AMARANTHACEAE. Amaranth Family.

Weedy herbs with alternate leaves, no stipules, and minute

flowers each between 3 dry and rigid sharp-pointed bracts. In our single genus the stamens are 5 or 3 and the 1-seeded fruit is 2 or 3-beaked at apex.

1. AMARÁNTHUS. Amaranth.

1. **A. graècizans** L. Tumble Weed. A coarse diffusely branched annual, 1 or 2 ft. high, the stems smooth and whitish. Leaves obovate or spatulate, very obtuse, white-veined, 1 in. or less long, slender-petioled. Flowers crowded in the upper leaf-axils. Sepals 3. (*A. albus* L.)—A common introduced weed of the plains, reaching our lower valleys. Other species are also to be expected, especially *A. californicus* Wats., known by its nearly prostrate stems and single sepal to the fertile flowers.

PORTULACACEAE. Purslane Family.

Low herbs with succulent entire leaves and regular flowers. Ovary free from the calyx, becoming a many-seeded capsule.

Capsule breaking crosswise at maturity; stamens 5 to numerous. 1. Lewisia.
Capsule splitting longitudinally; stamens 3 or 5.
  Flowers in racemes or scattered. . . . . 2. Montia.
  Flowers in close coiled spikes; stamens long-exserted. . . . . 3. Spraguea.

1. LEWÍSIA. Bitter-root.

Herbs with thick perennial roots (slender stems from a corm in *L. triphylla*) and fleshy linear leaves. Sepals 2 to 8. Petals 3 to 16. Style-branches 3 to 8. Capsule thin, the upper part splitting off as a cap at maturity.

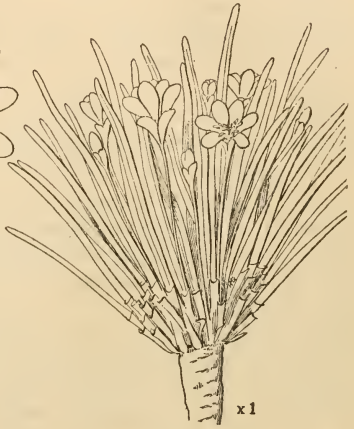
Leaves short, not exceeding the fully opened flowers. . . . . 1. *L. rediviva.*
Leaves exceeding the flowers.
  Leaves all basal, a pair of short bracts on the stem.
    Sepals entire, ¼ in. or more long. . . . . 2. *L. nevadensis.*
    Sepals glandular-toothed, less than ¼ in. long. . . . . 3. *L. pygmaea.*
  Leaves 2 to 5 in a whorl midway of the stem. . . . . 4. *L. triphylla.*

1. **L. redivìva** var. **yosemitàna** K. Brandegee. Yosemite Bitter-root. Leaves thick and fleshy, spatulate or narrowly oblong, mostly ½ to 1 in. long, crowded on the summit of a thick fleshy root. Flowers solitary and terminal on short erect stalks, overtopping the leaves when fully opened. Sepals mostly 2 to 4, oblong, acute, pinkish, glandular-margined. Petals 4 to 12, white, probably varying to rose-color, ½ to ¾ in. long. Stamens 15 to 22. Style-branches 4 or 5.

The Bitter-root, which is said to be used by the Indians for food, is of wide distribution in western North America,

but the Yosemite variety is one of our most local and rare forms. It was first collected, "somewhere about Yosemite Valley," in 1891 by Mrs. Willie F. Dodd. Then, after a period of twenty years, it was re-discovered by members of the Sierra Club party of 1911, who brought it in from the

Lewisia rediviva yosemitana



Lewisia pygmaea

summit of Mt. Watkins and from the crown of El Capitan. This material and the field notes taken by Professor Jepson, one of the collectors, indicate that our form is an exceedingly variable one. The flower-stalks are jointed only near the base and are apparently without bracts, while in the type material, as described by Mrs. Brandegee, the stalks were jointed and bracted near the summit, from which the flowers promptly fell at maturity. There is also a wide variation in the number of flower-parts, indicating that this is only a variety of *L. rediviva,* which differs chiefly in its larger size and greater number of sepals, petals, stamens, and style-branches. Aside from its botanical interest, which centers around its remarkable variability, the Bitter-root has an interesting history. Its generic name was given in honor of Captain Meriwether Lewis, of the Lewis and Clark Expedition, while its common name has more recently been used to designate an important mountain range in Montana, where it has been adopted as the State Flower. The specific name, *rediviva,* was applied because of the plant's power to revive after long periods of drought. Specimens uprooted for several days have been known to unfold their flowers when placed in water.

2. **L. nevadénsis** Rob. Leaves several from the globular or somewhat elongated thick root, linear, 2 to 5 in. long, commonly exceeding the flower-stalk. Sepals 2, not glandular. Petals 6 to 8, white, about ½ in. long. Stamens 10 to 12. Styles 4 or 5. (*Calandrinia nevadensis* Gray. *Oreobroma nevadensis* Howell.)

The thick, fleshy petals, often suffused with pink, render this plant quite conspicuous in low, moist places, notwithstanding its low stature. It grows in moist soil along meadow borders at altitudes of 5000 to at least 9000 ft., as on Ascension Mt., and in Stubblefield Cañon.

3. **L. pygmaèa** Rob. Pygmy Lewisia. Leaves numerous, from the summit of a carrot-like root, linear, ½ to 2 or 3 in. long, mostly exceeding the flower-stalks. Sepals 2, the margin with a row of purple glands. Petals 6 to 8, white or rose-red, about ¼ in. long. (*Calandrinia pygmaea* Gray. *Oreobroma pygmaea* Howell.)

This attractive little plant, usually recognized in its fresh state by the purple-fringed sepals, is encountered only near timber-line (Snow Flat, Mt. Dana, etc.), where it often grows in soil kept moist by melting banks of snow.

4. **L. triphýlla** Rob. Stems slender, 1 to several, from a globose corm. Leaves a pair or a whorl of 3 to 5 midway of the stem, linear, ½ to 2½ in. long. Flowers on slender pedicels. Sepals 2, entire. Petals ¼ in. or less long. (*Claytonia triphylla* Wats. *Oreobroma triphylla* Howell.)

The classification of this delicate plant has given botanists no end of trouble, but because of the crosswise splitting of its capsules it seems to belong in this genus. The flowers, although somewhat fleshy, are very dainty, being of a light-pink color. The species is well distributed in the mountains and grows in moist soil.

2. MÓNTIA.

Fibrous-rooted succulent herbs. Sepals 2, rounded, commonly a little unequal. Petals 5 or fewer. Stamens 3 to 5. Capsule 3-valved, opening down the sides; seeds 2 to 5. (*Claytonia,* of some authors.)

Flowering stems with a single pair of leaves united into a disk ..... 1. *M. perfoliata.*
Flowering stems with opposite leaves
Petals equal, much exceeding the sepals..... 2. *M. chamissoi.*
Petals unequal, scarcely exceeding the sepals..... 3. *M. fontana.*
Flowering stems with alternate leaves.
Stamens 5; stems simple..... 4. *M. parvifolia.*
Stamens 3; stems erect, branched..... 5. *M. linearis.*

1. **M. perfoliàta** Howell. MINER'S LETTUCE. Plant ½ to 1 ft. high, not producing runners. Basal leaves numerous, the earliest linear, the later varying to ovate or orbicular or even kidney-shaped and on petioles 2 to 8 in. long; stem-leaves a single pair united into a disk beneath the raceme of small white or pinkish flowers. Petals ⅛ in. long, twice as long as the sepals.—Abundant everywhere except at very high altitudes, passing into many peculiar forms, often much reduced and delicate.

M. SPATHULATA Howell, is similar to no. 1 but with stem-leaves distinct, or somewhat united on one side, nearly equalling the short flower-cluster.—Reported from the Yosemite.

2. **M. chamissòi** D. & J. Stems with slender runners which bury themselves and produce bulblets. Leaves opposite, in several pairs, oblong-spatulate, 1 to 3 in. long including the narrowed base (whole plant much reduced in Alpine forms, sometimes only ½ in. high). Flowers 1 to 9, on slender pedicels which spread or recurve in fruit. Petals pale rose-color or nearly white, ¼ in. long, much exceeding the sepals. (*M. chamissonis* Greene.)—Wet, meadowy or mossy places: Crane Flat; Yosemite Valley; Tuolumne Meadows.

3. **M. fontàna** L. WATER MONTIA. Stems slender, 2 to 6 in. long, often rooting from the joints. Leaves opposite, narrow, ⅛ to ¾ in. long. Flowers few, the pedicels becoming recurved. Petals minute, white, united at base.—Of wide distribution, a diminutive form occurring at Yosemite Falls.

4. **'M. parvifòlia** Greene. Stems fine and thread-like, ½ to 1 ft. long, often reclining and running. Leaves alternate; the lower obovate or oblanceolate, 2 in. or less long including the petiole; middle and upper leaves scarce, only ⅛ to ½ in. long, sessile, linear-lanceolate. Flowers few, racemose, the pedicels becoming reflexed. Petals rose-color to white, ¼ to ½ in. long, much exceeding the sepals.—On moist rocks around Yosemite Valley, etc. Bulblets are found in the leaf-axils, but drop off in drying.

5. **M. lineàris** Greene. Stems erect, usually much branched, 3 to 6 in. high, annual. Leaves alternate, linear, ½ to 2 in. long, sessile by a broad base. Flowers in racemes, the pedicels ½ in. or less long, recurving in fruit. Sepals roundish, blunt, white-margined. Petals white, unequal. Stamens 3.—Known in our district only from near Camp Curry, Yosemite Valley, where it was found in 1911 by Miss H. A. Walker.

3. SPRÀGUEA.

1. **S. umbellàta** Torr. Pussy-paws. Leaves 1 to 3 in. long, spatulate, obtuse, thick, those on the flower-stalks much reduced. Flowers in terminal clusters of coiled spikes, forming close heads or open panicles. Sepals and bracts papery, rose-tinged, equalling the 4 rose or whitish petals. Stamens 3, exserted. (*Calyptridium umbellatum* Greene.)

The chaffy flower-clusters of this plant are borne on nearly naked stalks, which rise 4 to 12 in. high from a rosette of basal leaves on a strong taproot. It is common in sandy soil throughout the mountains, becoming perennial, with a thick root, and much dwarfed at high altitudes. This pygmy form is the var. *caudicifera* Gray. Mr. Grinnell, the zoologist, tells us that the Pussy-paws is greatly appreciated by chipmunks. These little animals shell out the minute, black seeds with wonderful dexterity and after filling their cheek pouches, carry the booty to hiding places, where it is presumably stored up for winter use. As many as 750 of these seeds, perfectly clean and free from chaff, have been found in the cheek-pouches of a single chipmunk.

CARYOPHYLLACEAE. Pink Family.

Herbs with mostly thickened nodes, simple entire opposite leaves, and regular flowers. Sepals and petals 5 or 4 (or petals wanting), the stamens as many or twice as many. Ovary superior, 1-celled, with 2 to 5 styles, becoming a several or many-seeded capsule.

Sepals united; petals clawed.....1. Silene.
Sepals distinct; petals without claws.
  Styles 5; petals notched; plants 4 to 12 in. high.....2. Cerastium.
  Styles 3 or 4; petals parted nearly to base or absent; plants 4 in. or more high.....3. Stellaria.
  Styles 3; petals entire. (Styles 3 or 4 and plant very low in *A. compacta*.).....4. Arenaria.
  Styles 4 or 5; petals minute and nearly entire or absent; plants less than 4 in. high.....5. Sagina.

1. SILÈNE. Catch-fly. Campion.

Annual and perennial large-flowered herbs. Calyx tubular or inflated, 5-toothed. Petals 5, narrowed below to a claw, which usually bears near its summit an entire or cleft scale. Stamens 10. Styles 3 or 4.

Annual with pale flowers; a homely weed.....1. *S. antirrhina.*
Perennial with bright-red showy flowers.....2. *S. californica.*
Perennials with white or pale-rose flowers.

Flowers mostly nodding.
Petals cleft into 4 narrow lobes.....3. *S. lemmonii.*
Petals cleft into 2 lobes.....4. *S. bridgesii.*
Flowers strictly erect.
Leaves ovate or lanceolate.....5. *S. menziesii.*
Leaves linear, forming mats.....6. *S. watsonii.*

1. **S. antirrhìna** L. Sleepy Catchfly. Leaves oblong-lanceolate or linear, about 1 in. long. Flowers small, pink or red, erect. Petals scarcely exserted from the calyx, notched.

This erect, sparingly branched weed (1 ft. or so high) has smooth stems except that the middle of each upper internode is sticky. It grows in the Yosemite and doubtless in other of the lower valleys.

2. **S. califórnica** Dur. Indian Pink. Leaves lanceolate or broadly elliptic, narrowed to a sessile base, 1 to 3 in. long. Flowers 1 in. long, deep red, erect. Petals with 2 broad lobes flanked by 2 narrow ones. Stamens and styles exserted. Seeds covered with minute protuberances.

The stems of this plant rarely rise more than 6 to 12 in. above the ground but are sometimes much taller. They are from thick, perennial roots and, like the leaves, are finely pubescent. The strikingly handsome flowers are occasionally seen on shaded hillsides along our lower borders, as at Hodgdon Ranch, Hites Cove, Wawona Road near Eight-mile, etc.

3. **S. lemmònii** Wats. Leaves lanceolate to oblanceolate, acute, usually shorter than the internodes on flowering stems. Flowers ½ to ¾ in. long, mostly nodding, solitary or in clusters of 2 or 3 along the upper part of the stem. Petals white or pale rose, cleft into 4 linear segments, the claw with 2 narrow appendages. Styles much exceeding corolla.

This is by far the most common Catchfly at middle altitudes and is at once recognized in the field by the drooping flowers and finely fringe-cut petals. The stems are branching and leafy at base and 1 to 2 ft. high.

4. **S. bridgèsii** Wats. Habit and general characters of *S. lemmonii,* from which it may be distinguished by the petals which are cleft into only 2 segments.—Yosemite Valley is the type locality of this species, reported also from Snow Creek and Mt. Dana.

5. **S. menzièsii** Hook. Stems weak, 2 in. to 2 ft. high, very leafy throughout. Leaves mostly longer than the internodes, broadly lanceolate to ovate, acute at each end, the upper leaves scarcely smaller. Flowers ¼ to ⅜ in. long, in a leafy-

bracted panicle (solitary in dwarf specimens). Petals white, cleft into 2 segments and often with a pair of small scales on the claw, about equalled by the style.—Not common: Yosemite Valley; slopes west of Mono Lake.

6. **S. watsònii** Rob. Plant with many slender erect stems, 10 in. or less high, from a compact leafy base, finely glandular. Leaves narrowly linear, ¾ to 2 in. long. Flowers ½ to ¾ in. long, strictly erect, solitary or few, terminal. Petals white or rose-color, the short blade with 2 lobes, each lobe usually with a short lateral tooth, the claw with obtuse appendages.—Of high altitudes; known by the straight stems, each terminated by a large erect flower.

S. DOUGLASII Hook., of the Tahoe district and northward, may be known, if found, by its narrow leaves and tall, nearly glabrous stems each bearing 1 to 3 large, erect flowers.

2. CERÁSTIUM. MOUSE-EAR CHICKWEED.

Pubescent branching herbs with sessile leaves and no stipules. Sepals and petals 5 each, the latter white and notched or cleft. Stamens 10 or 5. Styles 3. Capsule becoming longer than the calyx, 10-toothed at apex.

1. **C. viscòsum** L. MOUSE-EAR CHICKWEED. Leaves ovate to elliptic, ½ to 1 in. long. Flowers white, small, on short pedicels. Petals not longer than sepals (scarcely ¼ in.). Stamens 10, 5 of them without anthers.—A homely annual weed, 4 to 12 in. high, in fields and along roadsides.

2. **C. arvénse** L. FIELD CHICKWEED. Leaves linear, narrowly lanceolate, acute, ½ to 1½ in. long. Flowers several in each terminal cluster, erect, long-pediceled. Petals white, twice as long as sepals, deeply notched.—A leafy-based perennial, often matted, 4 to 8 in. high, growing in the crevices of rocks along the Ledge Trail, at Vernal Falls, etc.

3. STELLÀRIA.

Low herbs, with numerous flat leaves and white slender-pediceled flowers. Leaves entire (crisped in one species), sessile. Sepals and petals 5 each, the latter always bifid or divided into 2 lobes, rarely wanting. Stamens 3 to 10. Styles 3 or 4. (*Alsine.*)

Petals shorter than the sepals, or wanting; stems weak.
- Leaves broad, long-petioled.....1. *S. media.*
- Leaves sessile or nearly so.
  - Flowers from the axils of very narrow bracts.....2. *S. nitens.*
  - Flowers in terminal umbels.....3. *S. umbellata.*
  - Flowers from the axils of broad leaves.....4. *S. crispa.*

Petals exceeding the sepals; stems erect.
Herbage nearly glabrous.....5. *S. longipes.*
Herbage glandular .....6. *S. jamesii.*

1. **S. mèdia** Cyr. Common Chickweed. Stems weak, often reclining, marked with a pubescent line. Leaves ovate, acute, narrowed to a slender petiole, or the upper narrower and sessile. Flowers on slender pedicels which become deflexed in fruit. Petals shorter than sepals.—A weed, introduced around the settlements.

2. **S. nìtens** Nutt. Stems very slender, 4 to 12 in. high, from an annual root, shining and nearly glabrous. Leaves mostly linear-lanceolate, acute, ¼ to ½ in. long, sessile (the very lowest smaller and petioled). Flowers on long ascending pedicels from the axils of minute whitish bracts. Sepals white-edged, tapering to sharp points, the petals much shorter or wanting.—A low-altitude plant, found at Vernal Falls.

3. **S. umbellàta** Turcz. Stems smooth, weak, ascending from a prostrate base. Leaves lanceolate or elliptic, ¼ to ¾ in. long. Flowers umbellate, *i. e.*, several from the summit of each branch, the spreading pedicels ½ to 1½ in. long and short-bracted at base. Petals minute or none. (*Alsine baicalensis* Cov.).—Soda Springs of the Tuolumne, and perhaps elsewhere at high altitudes.

4. **S. crìspa** C. & S. Stems numerous, weak, often reclining, glabrous, 1 to 3 ft. long. Leaves thin, ovate, usually crisped on the edges, acute, ½ to 2 in. long. Flowers solitary from the leaf-axils, on pedicels ¼ to 2 in. long. Petals shorter than sepals or none.—In meadows and other grassy places.

5. **S. lóngipes** Goldie. Stems numerous, slender, erect, 6 to 15 in. high, from running rootstocks, the whole plant smooth and nearly glabrous. Leaves linear-lanceolate, very acute, ½ in. to 1 in. long. Flowers solitary or loosely clustered, on pedicels of various lengths. Petals white, 2-parted to below the middle, longer than sepals.

This is perhaps our most common Stellaria. It grows throughout the Yellow Pine Belt in moist or grassy places. When shaded by other plants its stems and leaves are much longer and more slender than in the ordinary form.

6. **S. jamésii** Torr. Stems erect, strongly angled, usually 6 to 12 in. high, pubescent and viscid above. Leaves lanceolate, slenderly acute, 1 to 2½ in. long. Flowers on short pedicels (1 in. or less) in leafy panicles. Petals white, 2-cleft above the middle, equalling or longer than sepals.—Not rare in shaded places of the Yellow Pine Belt.

4. ARENÀRIA. Sandwort.

Low branching annuals and perennials with linear sessile leaves without stipules. Sepals and petals 5 each, the latter white and entire. Stamens 10. Styles 3.

Petals shorter than the rigidly sharp-pointed sepals; leafy glandular perennial ..... 1. *A. nuttallii.*
Petals longer than the sepals.
Plant perennial, with more or less woody base.
Compact Alpine plant, not 3 in. high..... 2. *A. compacta.*
Taller, more loosely branched.
Flowers on long pedicels; stems branched throughout.. 3. *A. capillaris.*
Flowers in small heads; stems simple above the leafy base ..... 4. *A. congesta.*
Plant annual; flowers showy, on naked pedicels..... 5. *A. douglasii.*

1. **A. nuttállii** Pax. Stems leafy, numerous and matted, from a thick perennial root, 2 to 6 in. high, glandular. Leaves rigid, sharply pointed, about ¼ in. long. Flowers short-pediceled, in green leafy-bracted clusters. Sepals with strong midrib, rigidly sharp-pointed. Capsule with 3 entire valves.—To be expected at more than middle altitudes. The form with leaves less rigid, scarcely spreading or pungent, and very attenuate sepals ¼ in. long is the var. *gracilis* Rob.

2. **A. compácta** Coville. Stems much branched and leafy, forming dense mats only an inch or two high, from a thick woody root. Leaves awl-like, less than ¼ in. long, minutely hairy. Flowers terminal on short naked pedicels, small. Sepals acute, green only in the middle, shorter than the petals.—Alpine plant from Mt. Danà, near Bloody Cañon, and the Mt. Whitney district.

3. **A. capillàris** Poir. Stems erect from a branching perennial base, densely leafy below, 3 to 8 in. high. Leaves rigid, sharp-pointed; the lower in dense fascicles, ½ to 1 in. or more long; upper in pairs, shorter. Pedicels glandular, mostly ¼ to ¾ in. long, the flowers therefore scattered. Sepals obtuse or barely acute. Capsule with usually 3 toothed valves.

This Arenaria grows on nearly all of the domes and gravelly summits from El Capitan and Sentinel Dome to Mt. Conness, etc. The leafy portion is often very compact, especially in plants of high altitudes, and the old branches are woody and scaly with dry leaves of previous years.

4. **A. congésta** Nutt. Perennial and branching at the densely leafy base, the simple erect stems 6 to 12 in. high. Leaves rigid, sharp; the lower fascicled, ½ to 2 in. long;

upper opposite, shorter. Pedicels glabrous, ¼ in. or less long, the flowers therefore in terminal head-like clusters. Sepals acute. Capsule normally with 3 toothed valves.

Although this Arenaria is common both north and south of the Yosemite, it has been reported but once from within the Park. It inhabits loose soil at more than middle altitudes. The var. *suffrutescens* Rob. has woody stems ¼ in. thick and long pedicels, the flowers in umbels. Var. *subcongesta* Wats. has flowers in expanded branching clusters.

5. **A. douglásii** Fenzl. A nearly glabrous much-branched annual, 2 to 8 in. high. Leaves filiform, not rigid, ¼ to 1 in. long. Flowers numerous, on spreading naked pedicels, larger than in other species (over ¼ in. across). Sepals acutish, narrowly thin-margined. Capsule with 3 entire valves.—In loose soil of open places, mostly at less than 4500 ft. alt.; our only annual species.

5. SAGÌNA. Pearlwort.

Diminutive annual and biennial herbs with narrowly linear or filiform exstipulate leaves and minute long-pediceled flowers. Petals white and shorter than the sepals, or wanting. Styles 4 or 5. Capsule 1-celled.

1. **S. apétala** Ard. Stems nearly erect, not matted. Pedicels from the leaf-axils and terminal, minutely glandular, straight. Flower-parts mostly in 4's. Petals minute or wanting.—Yosemite Valley near Stoneman Bridge.

2. **S. occidentàlis** Wats. Stems loosely branched, spreading. Pedicels axillary and terminal, glabrous, straight. Flower-parts in 5's. Petals nearly equalling the sepals.—To be expected.

3. **S. linnaèi** Presl. Stems densely matted, 3 in. or less high. Pedicels all terminal, glabrous, often becoming bent or recurved at summit. Flower-parts in 5's. Petals nearly equalling the sepals.—Yosemite Valley near Pohono Bridge and Happy Isles.

NYMPHAEACEAE. Water Lily Family.

Aquatic perennial herbs with horizontal rootstocks and large floating leaves. Represented with us by a single, large-flowered species.

1. NYMPHAÈA. Water Lily.

1. **N. polysépalum** Engelm. Indian Pond Lily. Floating leaves 8 to 12 in. long, 6 to 9 in. broad, with rounded basal

lobes and a closed sinus. Calyx cup-shaped, 2½ to 4 in. across; sepals 7 to 12, yellow and petal-like, or the outer greenish. Petals 12 to 18, ½ in. long and resembling stamens. Stamens with dark-red anthers but yellow pollen. Fruit nearly globose, with narrow neck and concave summit.

The Water Lily is a conspicuous inhabitant of quiet ponds from Lake Eleanor and Hetch Hetchy to the Yosemite, Eagle Peak Meadows, etc. The round leaves, known as lily pads, float on the surface of the water, above which the stout pedicels carry the thick-sepaled, yellow flowers. The Klamath Indians, of Oregon, roast the seeds, which they call wokas, and eat them either dry, as we do popcorn, which they much resemble in taste, or as a porridge or bread after they have been ground into a meal (Coville).

RANUNCULACEAE. Buttercup Family.

Crowfoot Family.

Herbs with alternate or basal leaves (except Clematis, a climber with opposite leaves), and without true stipules. Flower-parts all free and distinct. Sepals often petal-like. Petals sometimes wanting. Stamens mostly numerous. Pistils 1 to many, superior, 1-celled, each bearing a single style, maturing into dry fruits or berries.

A. Flowers without spurs or hoods, the sepals and petals all flat or concave.

Leaves compound.
- Flowers white, ½ in. across; leaves opposite.....1. Clematis.
- Flowers white, very small; leaves alternate.....8. Actaea.
- Flowers greenish, very small; leaves alternate.....2. Thalictrum.

Leaves simple, entire or lobed.
- Sepals 5, green or white; petals yellow or white or reduced to greenish glands.....3. Ranunculus.
- Sepals 6 to 9, white or blue; petals none.....4. Caltha.

B. Flowers either with 1 or more slender spurs or helmet-shaped.

- Petals 5, continued backward as slender spurs.....5. Aquilegia.
- Petals 4, unlike; upper sepal continued backward as a spur.6. Delphinium.
- Petals 2; upper sepal continued upward as a helmet-shaped hood .....7. Aconitum.

1. CLÉMATIS. Virgin's Bower.

1. **C. ligusticifòlia** Nutt. Leaves opposite, compound; leaflets 5 to 7, ovate, broad at base, irregularly toothed, 1 to 3 in. long. Sepals 4, petal-like, ⅜ in. long. Petals none. Stamens numerous. Akenes many, the feathery tails very conspicuous in fruit.

The stems of this Virgin's Bower clamber over bushes and

trees by the aid of their leaf-stalks, thus making more conspicuous the showy flowers, which are borne in clusters on long peduncles from the upper leaf-axils. It belongs to low altitudes but reaches Wawona and the Hetch Hetchy.

2. THALÍCTRUM. Meadow-rue.

1. **T. féndleri** Engelm. Leaves glabrous, alternate, compound to thrice compound (leaflets with rounded lobes), the 3 to 5 basal ones with long petioles dilated at insertion, the uppermost sessile. Flowers on leafy stems, staminate and pistillate on different plants. Sepals greenish, falling early. Petals none. Stamens many; filaments thread-like; anthers linear, attached at base. Akenes 5 to 15, sessile, swollen on one side, about ⅛ in. long, tapering to the slender persistent style.

The fern-like leaves of the Meadow-rue are borne on smooth, perennial stems 1 to 3 ft. high. The numerous, greenish, staminate flowers are like so many tassels suspended from the branches of a loose panicle. It grows in moist places at all altitudes below timber-line. *T. polycarpum* Wats. is a related species of the foothills, and reported from Yosemite Valley, distinguished by its very numerous akenes each about ¼ in. long.

3. RANÚNCULUS. Buttercup. Crowfoot.

Herbaceous fibrous-rooted perennials with yellow or white flowers. Sepals and petals 5 to 15 each, the latter with a small nectar-bearing pit at base or reduced to scales. Pistils numerous, developing into a globular or oblong head of akenes.

Flowers white; leaves finely dissected; aquatic.....1. *R. aquatilis.*
Flowers white; leaves roundish, lobed.....2. *R. hystriculus.*
Flowers yellow.
  Leaves entire.
    Stems creeping, rooting from the nodes.....4. *R. flammula.*
    Stems not rooting from the nodes.....5. *R. alismaefolius.*
  Leaves lobed or parted.
    Plant 9 in. or less high, glabrous.
      Flower-stalk naked .....3. *R. cymbalaria.*
      Flower-stalk leafy-bracted .....6. *R. oxynotus.*
    Plant 1 to 2 ft. high, pubescent.
      Akenes (seed-bodies) round, with short incurved beak .....7. *R. californicus.*
      Akenes ovate, with long straight beak.....8. *R. orthorhynchus.*

1. **R. aquátilis** L. Water Buttercup. Leaves roundish, the submersed ones divided into many thread-like divisions. Flowers white, with yellowish centers, short-stalked and as

though floating. Sepals 5, early falling. Petals 5, scarcely ¼ in. long. Akenes rough.—In ponds near Crockers.

2. **R. hystrículus** Gray. Leaves mostly from the base, on petioles 2 to 5 in. long; the blade nearly orbicular, ½ to 2½ in. across, with several rounded and bluntly toothed lobes. Stems 4 to 10 in. high, bearing only 1 or 2 flowers. Sepals 5, ¼ to ¾ in. long but unequal, white. Petals reduced to greenish scale-like nectaries. Styles hooked. Akenes thin, papery, loosely investing the small seed.

This flaccid, glabrous perennial grows on shaded rocks and ledges kept moist by seeping water or spray from waterfalls, and is rare except near the Yosemite, where it has been found at Vernal, Royal Arch, Staircase and Nevada falls, and in Little Yosemite Valley. It is so unlike the other buttercups, especially in its reduced petals and almost bladdery seed-bodies, that some botanists place it in a genus (*Kumlienia*) by itself.

3. **R. cymbalària** Pursh. Sea-side Crowfoot. Rarely over 6 in. high, some stems creeping and rooting, the flowers solitary on naked stalks. Leaves glabrous, succulent, roundish, coarsely few-toothed, ¼ to ¾ in. across, long-petioled. Petals 5 to 9, yellow, ¼ in. or less long. Akenes numerous, in an oblong head.—Moist or salty soil, of northern regions almost around the globe. Appears at Tuolumne Meadows in the var. *alpina* Hook., a low form with small, 3-toothed leaves.

4. **R. flámmula** var. **réptans** E. Meyer. Small glabrous creeping perennial, 2 to 4 in. high, the flower-stalks terminating in single flowers. Leaves mostly basal, with long petioles; blade ¼ to 1 in. long, linear to lanceolate. Petals obovate, less than ¼ in. long, yellow.—Wet meadows in Hetch Hetchy and Yosemite valleys, along the Pohono Trail, etc.

5. **R. alismaefòlius** Geyer. A glabrous perennial, 3 in. to 1 ft. high, the flower-stalks bearing solitary or few long-pediceled flowers. Leaves mostly near the base, long-petioled; blade lanceolate to oblong, ½ to 2 in. long; upper leaves linear, sessile. Petals obovate, from scarcely ¼ to ½ in. long, deep yellow, shining.—In moist soil at Hetch Hetchy Valley, White Wolf, Snow Flat, Vogelsang Pass, Smedberg Lake, etc. The common form with leaves mostly ovate, or even cordate, and small flowers is var. *alismellus* Gray, the original specimens of which came from Lake Tenaya and Mt. Dana.

6. **R. oxynòtus** Gray. Alpine Buttercup. Stems closely compacted at base, sheathed by brown remnants of the pre-

MEADOW BORDERS OF THE
UPPER TUOLUMNE

Between the meadow itself and the surrounding forest is found a narrow strip of loose soil sparsely covered with low shrubs and herbaceous perennials. Lavender Pentstemons, crimson Castillejas, and blue Lupines give color to the slopes. Here and there Horkelias and Eriophyllums add a dash of yellow. In the meadow, amid the grasses, rushes, and sedges, grow several species of Erigeron, their yellow disks encircled by white or purplish rays. Pink Shooting-stars and the Long-beaked Pedicularis, yellow Buttercups and Groundsels, and the beautiful Anderson Aster also inhabit these high mountain meadows. The surrounding forests are composed almost exclusively of the Lodgepole Pine. The Silver Pine and Alpine Hemlock grow on the higher slopes, as toward Unicorn and Cathedral peaks, which may be seen in the distance.

vious year, seldom more than 6 in. high, the flowers solitary on leafy-bracted stalks. Leaves glabrous; the lower long-petioled, roundish, ¼ to 1 in. across, with 5 to 9 roundish or oblong obtuse lobes or teeth; upper leaves sessile, fan-shaped, parted into narrow lobes. Sepals glabrous to shaggy-pubescent. Petals obovate, yellow, ¼ to ½ in. long.—Near snow banks above timber-line on Clouds Rest, Mt. Lyell, Vogelsang Pass, Piute Mt., etc.

7. **R. califórnicus** Benth. COMMON BUTTERCUP. Lower leaves long-petioled, divided or parted, the lobes coarsely and sharply toothed; upper leaves few, entire or with few lobes. Petals mostly 5 (5 to 15), spatulate, deep glossy yellow, ¼ to ½ in. long, short-clawed. Akenes roundish, glabrous, each with a minute curved beak.

The Common Buttercup is a pubescent, loosely branched plant, 1 to 2 ft. high, with numerous flowers in an open panicle. It is common around dry meadows at the lower altitudes, especially in the Hetch Hetchy, Yosemite, and Wawona districts.

R. TENELLUS Nutt. is to be expected at low altitudes. It may be distinguished from no. 7 by the more slender beak of the hairy akene, the petals never more than 5.

8. **R. orthorhýnchus** Hook. Lower leaves divided into 3 or 5 broad coarsely toothed leaflets; upper leaves small, merely lobed and toothed. Petals mostly 5, oblong, yellow, ½ to ¾ in. long, sessile. Akenes ovate, margined, the nearly straight beak as long as the body.

In wet meadows near Hetch Hetchy Valley, in upper Yosemite Valley, and at other low altitudes this coarse, strongly pubescent plant may be found in abundance, often growing with the Common Buttercup. It is commonly 1 to 1½ ft. high.

4. CÁLTHA. MARSH MARIGOLD.

1. **C. biflòra** DC. Smooth glabrous perennial from a fascicle of fibrous roots, the simple leaves all basal and the white or blue flowers terminating naked peduncles. Leaves fleshy, round-reniform, wavy-margined or bluntly toothed, 1 to 4 in. across, long petioled. Flower-stalks 4 to 12 in. high. Sepals 6 to 9, ½ to ⅝ in. long. Petals none.

Associated with the Shooting-star, this round-leaved herb often occupies half-boggy places at high altitudes, as along the swales just south of Glacier Point, or it may grow along moist, grassy stream banks, as at Snow Flat. It is often

called "Cowslip" but that name rightly belongs to certain European Primulas. The tender herbage is sometimes used as a salad.

5. AQUILÈGIA. Columbine.

Perennial branching herbs with compound leaves and brightly colored flowers in loose leafy-bracted panicles. Sepals 5, oblong or oval. Petals 5, produced backward into conspicuous hollow spurs. Pistil of 5 carpels developing into 5 distinct follicles.

1. **A. truncàta** F. & M. Plant 1 to 3 ft. high, glabrous, or slightly pubescent above. Basal leaves on long petioles, twice ternately compound; leaflets deeply and obtusely lobed. Flowers red, with yellow centers, usually nodding. Spurs ¾ to 1 in. long; sepals somewhat shorter.

This is the well known Columbine of the Coast Ranges where, however, it is scarcely more common than with us. Its showy flowers nod to one from nearly every moist hillside, from the foothills well up toward the Alpine Zone. The incurved tips of the spurs contain nectar, which, of course, can be reached only by animals with long tongues. Hummingbirds sometimes visit them and probably aid in cross-pollination while sipping the nectar. Bees, as though less conscientious in regard to paying for their meals, sometimes cut through the spurs with their mandibles and thus obtain the nectar, notwithstanding the handicap of their short tongues.

2. **A. pubéscens** Coville. Plant 18 in. or less high, minutely pubescent on growing parts. Leaves similar to *A. truncata* but smaller. Flowers yellow, with a tinge of pink, usually erect. Spurs 1 to 1½ in. long.

This is even more handsome than our common species and the flowers, with long downwardly pointing spurs, are much larger. But it is restricted to the neighborhood of timberline, having been collected in our district only on Mt. Dana and at Mono Pass. It ranges southward to Mineral King, Mt. Whitney, etc.

6. DELPHÍNIUM. Larkspur.

Perennial herbs with palmately divided leaves and blue or whitish flowers in terminal racemes. Sepals 5, colored, the upper one produced backward as a spur. Petals 4, the upper pair developed backward within the calyx-spur. Stamens numerous. Pistils 3, becoming many-seeded pods.

Flowers in dense racemes; stout plants with tapering roots.
  Leaves perfectly glabrous; moist places.
    Stems 3 to 6 ft. high; leaves 3 to 5 in. wide.....1. *D. glaucum.*
    Stems 1 to 2½ ft. high; leaves smaller.....2. *D. andersonii.*
  Leaves very pubescent, especially the petioles; dry places .....3. *D. hansenii.*
Flowers in very loose racemes; slender plants with roundish tuber-like roots, except no. 6.
  Flowers blue.
    Leaf-lobes oblong or obovate, obtuse.....4. *D. decorum.*
    Leaf-lobes linear, acute.....5. *D. pauciflorum.*
  Flowers red .....6. *D. nudicaule.*

1. **D. glaúcum** Wats. Tall Mountain Larkspur. Leaves glabrous, of orbicular outline, 3 to 5 in. wide, 5 to 7-parted into narrowly cleft divisions. Flowers blue, the close raceme 6 to 18 in. long; pedicels mostly ¾ in. long (the lowest 1½ in.). Sepals and spur each about ½ in. long. Pods ½ in. long, not diverging.

The very robust, leafy stem, 3 to 6 ft. high, from a cluster of thickish but not tuber-like roots readily distinguishes this, the largest of all our larkspurs. It inhabits stream banks and wet meadows but is by no means common.

2. **D. andersònii** Gray. Similar to *D. glaucum* but smaller: stems rarely 3 ft. high; leaves 3 in. or less wide, cut into broad obtuse lobes; spur ½ to ¾ in. long, much longer than the sepals.—Immature plants from Table Lake, north of the Tuolumne River, seem to be this.

3. **D. hansénii** Greene. Leaves pubescent, cleft into oblong or linear segments. Flowers pink or white, in a dense raceme, the pedicels mostly ¼ in. long. Sepals about ¼ in. long, exceeded by the spur (spur strongly curved in var. *arcuatum* Greene). Pods erect.

The stout, inconspicuously leafy stems of this species, ending in racemes of pale, pinkish flowers, are common sights in fairly dry situations of moderate altitudes, as from the Hetch Hetchy to Yosemite and Wawona. It grows 1½ to 3 ft. high, from a cluster of thick, tapering roots.

4. **D. decòrum** var. **pàtens** Gray. Leaves obscurely pubescent, 1 to 3 in. wide; the lower deeply 3 to 6-lobed; divisions obovate or oblong, obtuse, entire or slightly lobed; upper leaves with narrow segments. Flowers blue, the raceme 3 to 8 in. long. Sepals about ½ in. long, equalled by the thick spur. Pods diverging from below the middle.

This common larkspur, with slender stems (½ to 2½ ft. high) from a cluster of tuber-like roots, few leaves, and a loose cluster of deep-blue flowers, occurs almost throughout

the lower part of the Yellow Pine Belt, both in meadows and in half-open places between the trees.

5. **D. pauciflòrum** Nutt. Stem slender, 1 ft. or less high, from tuber-like roots. Leaves obscurely puberulent, ½ to 2 in. wide, all cleft into linear acute lobes. Flowers blue or pinkish purple. Sepals about ⅓ in. long, much shorter than the slender spur. Pods diverging.—Moist soil from the Yosemite and Ackerson's to Tuolumne Meadows.

6. **D. nudicaúle** T. & G. Red Larkspur. Leaves thick, fleshy, glabrous, 1 to 2½ in. wide, deeply cleft into obovate obtuse shallowly lobed divisions. Flowers scarlet and yellow, in a very loose raceme. Spur ½ to ⅔ in. long, longer than sepals.

The thick leaves, nearly naked stems (½ to 2 ft. high), and reddish flowers readily characterize this striking species. It belongs chiefly to the Coast Ranges but also occurs sparingly in the Sierra Nevada, as at Porcupine Flat, where discovered by Mr. H. M. Evans.

7. ACONÌTUM. Monkshood.

1. **A. columbiànum** Nutt. Monkshood. Leaves alternate, deeply cleft into toothed or slender-lobed divisions; lower long-petioled, uppermost sessile. Flowers blue, often mixed with white or cream. Sepals 4; the uppermost helmet-shaped, or hooded, ½ to ¾ in. long. Petals 2, hammer-shaped, nearly concealed by the hood. Stamens numerous. Pods 3 to 5.

This western Monkshood is an erect, perennial herb, 2 to 6 ft. high, with long, loose racemes of showy, irregular flowers. The blue, helmet-shaped hood at once distinguishes it. It may be looked for in moist places along any of the higher streams or meadows, but it is more common in the Tahoe district.

8. ACTAÈA. Baneberry.

1. **A. spicàta** var. **argùta** Torr. Leaves mostly basal, ½ to 2 ft. long, several times ternately compound; leaflets ovate, serrate or incised, 1½ to 3 in. long. Sepals usually 4, roundish, white, falling early. Petals small, 1 or 2, or lacking. Stamens 11 to 18. Pistil 1, developing into a red or white berry with polished surface.

This Baneberry is a perennial, glabrous herb with clustered stems (1½ to 2 ft.), ample foliage, and small, white flowers in terminal racemes. It grows in moist places in the Yosemite Valley and doubtless elsewhere at low altitudes.

CALYCANTHACEAE. Calycanthus Family.

Aromatic shrubs with opposite entire leaves, no stipules, the sepals and petals similar and numerous.

1. CALYCÁNTHUS. Carolina Allspice.

1. **C. occidentàlis** H. & A. Sweet-scented Shrub. Erect, 4 to 10 ft. high. Leaves harsh, ovate, acute, 2 to 6 in. long. Sepals and petals about 1 in. long, livid red, turning brown or tawny toward the ends. Stamens numerous. Fruit cup-like, 1 to 1¼ in. long.—Foothill cañons, extending up the Merced to 3500 ft. alt. at Cascade Creek. Variously known as Spice-bush, Spice-wood, Wine-flower, etc. The foliage and flowers are aromatic when bruised.

LAURACEAE. Laurel Family.

Trees or shrubs with simple leaves and small clustered flowers. The foliage emits a pungent odor when crushed.

1. UMBELLULÀRIA.

1. **U. califórnica** Nutt. California Laurel. Leaves alternate, oblong or broadly lanceolate, entire, 3 to 5 in. long, on short petioles. Flowers greenish, in small short-stalked clusters, regular, ⅛ in. long. Sepals 6. Petals none. Stamens 9, the anthers opening by uplifted valves. Ovary superior, 1-celled, becoming a 1-seeded olive-like fruit.

The laurel is an aromatic, evergreen tree, 20 to 60 ft. high, inhabiting cañons and hillsides at moderate altitudes. It is also known as Bay Tree and Mountain Laurel. In northern California and Oregon, where it is called Pepperwood, it becomes so large that it yields lumber of a high grade.

PAPAVERACEAE. Poppy Family.

Herbs with regular perfect flowers. Sepals 2 or 3, petals 4 or 6. Stamens numerous. Pistil 1, compound, the ovary superior.

Leaves finely cut; flowers orange-color.....1. Eschscholtzia.
Leaves entire; flowers cream-color.....2. Platystemon.

1. ESCHSCHÒLTZIA.

1. **E. califórnica** Cham. California Poppy. Leaves much dissected into linear or oblong segments, 1 to 6 in. long including the petiole. Flowers orange-color, varying to straw-color, ½ to 1½ in. long, on pedicels 2 to 4 in. long.

Sepals united into a cap, which falls off as the flower opens. Capsule 1-celled, many-seeded.

Our well-known Poppy blooms as an annual in warm sand near Bridal Veil Falls, where seed has doubtless been accidentally introduced, and also occurs, in a perennial form, at Wawona, where it is apparently native. It is the same species which is so common and beautiful at lower altitudes.

2. PLATYSTÈMON.

1. **P. califórnicus** Benth. Cream-cups. Leaves chiefly basal, elliptic to oblanceolate, ½ to 1 in. long, the upper ones narrower and smaller. Flowers cream-yellow, ¼ to nearly ½ in. long, on pedicels 3 to 5 in. long. Sepals 3. Petals 6, withering and closing about the forming fruit. Pistil breaking up at maturity into 6 to 20 separate parts.

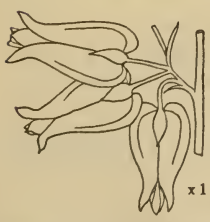
The Cream-cup is a hairy annual with many spreading branches from the base. It grows sparingly in the Yosemite with the Poppy and may be expected in warm soil along our lower borders, since it is very plentiful throughout the foothills and valleys of California.

FUMARIACEAE. Fumitory Family.

Glabrous perennial herbs with compound finely lobed leaves and irregular perfect heart-shaped flowers. Sepals 2, small. Petals 4, the inner pair narrower than the outer and united by their tips over the stamens and style. Stamens 6. Ovary superior, developing into a 1-celled capsule.

1. DICÉNTRA.

1. **D. formòsa** DC. Bleeding Heart. Leaves all from the creeping rootstock, compound and many times cut into acute lobes, 3 to 9 in. long and nearly as wide, the petiole 4 to 12 in. long. Flowering stems exceeding the leaves, naked, terminated by a narrow panicle of rose-purple flowers. Corolla flattened, ¾ in. long, cordate at base; tips of outer petals slightly spreading, ⅙ in. long.—Shaded woods at low altitudes: Merced Grove; Yosemite Valley.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2. **D. uniflòra** Kell. Leaves all from a cluster of fleshy tuber-like roots, compound, the leaflets divided into obtuse lobes, 2 in. or less long, the petiole 1 to 3 in. long. Flowering stems 1 to 4 in. high, naked, terminated by a single (rarely 2)

white or flesh-colored flower. Corolla flattened, ½ or ⅝ in. long; tips of outer petals becoming recurved, ¼ in. long or slightly more.—Yosemite Valley, Snow Creek, Mt. Lyell (10,500 ft.), Tilden Lake, Macomber Ridge; seldom seen in flower and often overlooked. *D. pauciflora* Wats. is a similar species which may occur. It has coral-like roots and nodding flowers nearly 1 in. long.

CRUCIFERAE. Mustard Family.

Herbs with alternate or basal leaves, no stipules, and the flowers in terminal bractless racemes. Sepals and petals each 4 (except Lepidium), regular and distinct. Petals narrowed below to claws, the blades spreading in the form of a cross. Stamens 6. Ovary superior, with a single style and stigma, developing into a 2-celled pod which opens from below upward, leaving the thin partition behind, or permanently closed. Herbage with mustard-like taste, never poisonous.

A. Leaves entire or merely toothed (even the lower).

Pods ½ in. or less long.
- Pedicels erect or spreading; seeds several; pods opening at maturity.
  - Pods oblong or lanceolate ..... 1. Draba.
  - Pods nearly orbicular, flat, notched at summit ..... 4. Lepidium.
  - Pods thick, pear-shaped or nearly globose; water plants ..... 5. Subularia.
  - Pods wedge-shaped, flat, notched at summit ..... 6. Capsella.
- Pedicels recurved; seeds 1 or 2 in the orbicular pod.
  - Pods not wing-margined, minutely bristly ..... 2. Athysanus.
  - Pods broadly wing-margined ..... 3. Thysanocarpus.

Pods 1 in. or more long, slender.
- Flowers orange or yellow, ¾ in. or more across ..... 10. Erysimum.
- Flowers white or purplish, smaller.
  - Upper leaves oblong or narrower ..... 14. Arabis.
  - Upper leaves nearly orbicular ..... 15. Streptanthus.

B. Leaves with several or many lobes (especially the lower).

Herbage finely pubescent (except in one introduced Brassica); plants of dry places.
- Pods 1-celled or with spongy cross-partitions ..... 7. Raphanus.
- Pods 2-celled, wedge-shaped, notched at summit ..... 6. Capsella.
- Pods 2-celled, linear, beaked at summit.
  - Leaves entire or with large lobes ..... 8. Brassica.
  - Leaves finely cut into many small lobes ..... 9. Sisymbrium.

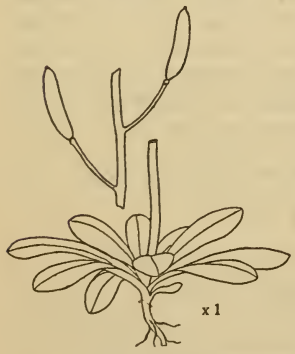
Herbage glabrous or nearly so; succulent plants of moist places.
- Pods cylindric or 4-sided.
  - Seeds in 2 rows in each cell ..... 11. Radicula.
  - Seeds in 1 row in each cell ..... 12. Barbarea.
- Pods flattened parallel to the partition ..... 13. Cardamine.

1. DRÀBA.

Depressed Alpine and sub-alpine herbs, with short racemes of small, white or yellow flowers, pubescent with short branched hairs. Leaves entire or few-toothed. Pods short, flattened parallel to the partition; seeds in 2 rows in each cell, not margined or winged.

Slender annual or biennial with a rosette of basal leaves...1. *D. stenoloba.*
Compact dwarf perennials, densely leafy at base.
Flowers yellow; pods twisted.....2. *D. lemmonii.*
Flowers yellowish; pods not twisted.....3. *D. glacialis.*
Flowers white .....4. *D. breweri.*

1. **D. stenóloba** Ledeb. Stems erect from a leafy base, annual or biennial, 1 ft. or less high, including the long raceme of yellow flowers (fading to white or pinkish). Leaves thin, obovate or oblanceolate, acutish, ¼ to ¾ in. long. Pods linear, acute, glabrous, ¼ to ½ in. long. —Moist soil, 6500 ft. alt. to timber-line.



Draba stenoloba

2. **D. lemmònii** Wats. Stems close and matted at the perennial base, ½ to 2 in. high including the raceme of bright-yellow flowers. Herbage green or yellowish. Leaves densely clustered, oblong with narrow base (spatulate), mostly very blunt, not ribbed, ⅛ to ½ in. long. Pods oblong or broadly lanceolate, more or less twisted, ¼ in. long.—"Summit of Mt. Lyell, at 13,000 ft." is given as the type locality of this species, which also grows on Mt. Gibbs, Mt. Dana, etc.

3. **D. glaciàlis** Adams. Branches very compact and leafy, forming rounded cushion-like perennial plants, the flowering stems ¼ to 3 in. high. Flowers yellowish. Herbage gray with short hairs. Leaves linear, rigid, rather acute, ribbed by the reflexed margins and prominent midnerve, mostly minute, rarely ½ in. long. Pods ovate or roundish, not twisted, ¼ in. or less long.—Above timber-line on Mt. Dana, Unicorn Ridge, etc.

4. **D. bréweri** Wats. Stems erect from a branching perennial base, 1 to 4 in. high, including the raceme of small white flowers. Herbage gray with a close pubescence. Leaves mostly in a basal tuft but also scattered along the

flowering stems, oblong or linear, obtuse, not ribbed, rarely over ¼ in. long. Pods linear-oblong, ¼ in. long.—Mt. Dana (type locality) and other high peaks; recognized by its white flowers.

D. CRASSIFOLIA Graham has been reported from Peregoy's, but an error is suspected. This species is a smooth, green annual or biennial, with only the edges of the leaves sparsely hairy, the lanceolate pods flat, acute, and smooth.

2. ATHÝSANUS.

1. **A. pusíllus** Greene. Herbage pubescent, the pods with hooked hairs. Leaves mostly basal, broadly oblong, often coarsely toothed, ¼ to ½ in. long. Flowers minute, white, the petals often wanting. Pods very small, in slender racemes, orbicular, flat, not opening at maturity.

This is a delicate annual, seldom a foot high, best known by its short, bristly pods which cling to clothing, etc. It is plentiful in the Foothill Belt and its range extends to nearly 6000 ft. alt. in the mountains.

3. THYSANOCÁRPUS.

1. **T. cúrvipes** Hook. FRINGE-POD. Leaves sessile by a clasping base, narrowly lanceolate, inch or two long, the lower usually toothed or pinnatifid and with stiff hairs (the basal petioled and forming a rosette). Flowers small, white or purplish. Pods 1-seeded, obovate or elliptic, flat on one side, curved on the other, broadly margined with a wing which is often perforated.

The Fringe-pod grows in warm, sandy soil in Yosemite Valley but belongs chiefly to lower altitudes. It is an erect annual, 1 to 2 ft. high, with few branches. The delicate pods, daintily suspended on slender, recurved pedicels of a long and loose raceme, make the plant very ornamental.

4. LEPÍDIUM. PEPPER-GRASS.

1. **L. densiflòrum** Schrad. Stem erect, ½ to 1½ ft. high, with spreading branches above. Leaves green and nearly glabrous, toothed, those of the branches narrower and entire. Fruiting racemes 1 to 6 in.

long, ⅜ in. wide. Flowers minute, the sepals whitish but petals wanting. Pods nearly flat, orbicular, notched at apex, ⅛ in. across, short-pediceled. (*L. apetalum* of authors, not of Willd.)—An annual weed, abundant in low valleys.

5. SUBULÀRIA. Awlwort.

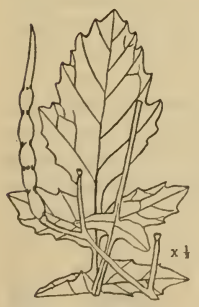
1. **S. aquática** L. A compact glabrous plant, 1 to 4 in. high, growing in water or mud. Leaves erect, entire, narrow, tapering, 1 to 3 in. long. Racemes short, few-flowered (there are also minute simplified flowers beneath the surface). Pods subglobose or pear-shaped, ⅛ in. long, on short spreading pedicels.—Reported from Crescent Lake (Congdon) and Mono Pass (Bolander).

6. CAPSÉLLA.

1. **C. búrsa-pastòris** Moen. Shepherd's Purse. Stems erect, 3 to 15 in. high, nearly glabrous. Basal leaves petioled, deeply lobed to nearly entire; upper leaves mostly entire, sessile by a lobed base. Flowers white, minute, on spreading pedicels in loose terminal racemes. Pods flat, wedge-shaped, deeply notched at the broad summit.—An introduced, annual weed of Yosemite Valley, etc.

7. RÁPHANUS. Radish.

1. **R. raphanístrum** L. Jointed Charlock. Stems 1 or 2 ft. high, with very few but stiff hairs. Leaves lyre-shaped, 3 to 6 in. long, the upper ones smaller and only toothed. Pedicels ascending, ¼ to ¾ in. long. Petals yellow or whitish, veiny (flower ½ in. across). Pods strongly constricted between the 4 to 8 seeds, long-beaked.—Introduced annual weed of lower Yosemite Valley.



8. BRÁSSICA. Mustard.

Annuals, the larger lower leaves commonly pinnatifid, with the terminal lobe the largest (lyre-shaped), the upper ones smaller and only toothed or entire, clasping at base only in no. 3. Petals with long claw and spreading yellow blade. Pods cylindric.

1. **B. nìgra** Koch. Black Mustard. Stems ¾ to 3 ft. high,

nearly glabrous. Petals about ¼ in. long. Pods beaded, on short erect pedicels, appressed, ½ to ¾ in. long, with conical seedless beak; seeds dark, very peppery.—Introduced weed in low places.

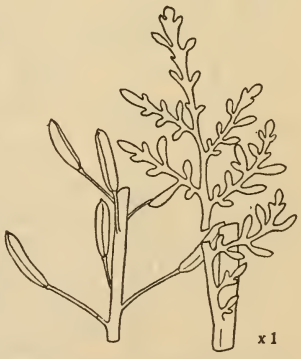
2. **B. arvénsis** B. S. P. CHARLOCK. Stems erect, 1 to 3 or even 6 ft. high, rough. Petals ¼ to ½ in. long. Pods knotty, nearly erect along the stems, 1 to 1½ in. long, with a stout 2-edged beak which often contains a seed.—An introduced weed along our lower borders, especially near dwellings.

3. **B. campéstris** L. RUTABAGA. Plant glabrous except the lower leaves, ½ to 4 ft. high. Leaves clasping the stem. Petals ⅜ in. long. Pods smooth, 1¼ to 1½ in. long, narrowed to a slender cylindric beak.—A garden plant run wild; grows at Tuolumne Meadows.

9. SISÝMBRIUM.

Erect annuals with deeply cut or finely lobed leaves not clasping at base and small yellow flowers. Pods linear, short, scarcely flattened.

1. **S. canéscens** Nutt. TANSY MUSTARD. A leafy annual, a few inches to 2 ft. high, from a taproot, grayish with a close pubescence. Leaves always finely many-lobed. Pedicels ¼ to ½ in. long, spreading. Pods slightly longer, erect or nearly so; seeds in two rows in each cell.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The gray herbage and finely cut leaves of the Tansy Mustard are commonly seen around deserted camps and in other waste places of our district. It is widely distributed in North America. The seeds were formerly used by the Indians, who added them to coarse flour, or "pinole," to give it a more piquant taste.

2. **S. incìsum** Engelm. Much like no. 1, but often nearly glabrous and the leaves less finely lobed. Seeds as wide as the pod and therefore in one row in each cell.—Widely distributed.

10. ERÝSIMUM. WALL FLOWER.

1. **E. ásperum** DC. WESTERN WALL FLOWER. Leaves rough-pubescent, 1½ to 5 in. long, ⅛ to ½ in. wide, entire to sharply

toothed. Calyx cylindric, ⅜ to ½ in. long. Corolla about ¾ in. across, the petals with slender claws and obovate blades. Pods linear, ascending or spreading, 4-sided, 3 or 4 in. long, with a stout beak.

The stout, erect, mostly simple stems of this Wall Flower bear showy terminal racemes of usually bright-orange flowers. In this form it is common from the foothills up through the pine forests to about 8000 ft. alt., but on the high mountains it is replaced by the var. *perenne* Coville, which has lemon-yellow flowers. In both forms the root may be either biennial or perennial.

11. RADÍCULA. Water Cress.

Nearly or quite glabrous plants of wet places. Pods linear or oblong, nearly cylindric, on spreading pedicels. Seeds minute, in 2 rows in each cell.

1. **R. nastúrtium-aquáticum** B. & R. Water Cress. Stems creeping and rooting at the joints but with erect flowering branches. Leaves with roundish or elliptic segments, the terminal one largest. Flowers white, less than ¼ in. across, the petals twice as long as the sepals. Pods ½ to 1 in. long, on spreading pedicels about as long. (*Nasturtium officinale* R. Br.)

The Water Cress is an excellent salad plant, the herbage being very tender and palatable and, like all other members of the Mustard Family, entirely free from poisonous properties. It grows only in wet places at middle and lower altitudes, where the succulent, leafy stems may be seen rising from the water or trailing along damp banks and bearing short racemes of white flowers. Especially good specimens were noted in the Yosemite Valley.

2. **R. curvisíliqua** Hook. Western Yellow Cress. Stems ½ to 1½ ft. long, often rooting in mud from the lower joints. Leaves pinnatifid, the segments either narrow or broad. Flowers small, yellow. Pedicels $\frac{3}{16}$ in. or less long, spreading. Pods ¼ to ¾ in. long, cylindric, erect, often curved; seeds in 2 rows in each cell. (*Nasturtium curvisiliqua* Nutt.)—Near streams and in other wet places.

12. BARBARÈA.

1. **B. vulgàris** R. Br. WINTER-CRESS. Lower leaves elliptic, ½ to 4½ in. long, sometimes with small lobes along the petiole; upper leaves pinnatifid, with a large terminal lobe. Flowers yellow, about ¼ in. long, in terminal racemes. Pod 1½ in. long; seeds in 1 row in each cell.

This is a smooth, somewhat succulent perennial with angular stem 6 to 16 in. high. It is a widely distributed plant found at Bridal Veil Meadows and is of frequent occurrence in moist places throughout our mountains. The figure represents a sub-alpine form with depressed stem and small pods.

13. CARDÁMINE.

1. **C. bréweri** Wats. Leaves mostly compound, with a large roundish terminal leaflet and 1 or 2 small lateral ones, the uppermost and the basal leaves often simple and entire or lobed. Flowers white, about ¼ in. long, in terminal racemes. Pods erect, ¾ to 1½ in. long, flattened, the seeds in one row in each cell.—A smooth, erect plant, ½ to 2 ft. high, occurring almost throughout the Sierra Nevada but not yet found in the Yosemite National Park.

14. ÁRABIS.

Erect biennial and perennial herbs with white or purplish flowers in terminal racemes. Herbage with short branched hairs or the upper parts glabrous. Leaves entire or shallowly toothed. Pods compressed parallel to the partition, long and linear. Seeds flat, more or less wing-margined.

A. Plants tall, 1 to 3 ft. high.

Pods erect; plant glabrous except at base.
- Basal leaves 2 to 4 in. long, toothed ..... 1. *A. glabra.*
- Basal leaves much smaller, entire ..... 7. *A. lyallii.*

Pods recurved or spreading.
- Lower leaves ½ to 1 in. wide, upper leaves narrowed to the base. ..... 2. *A. repanda.*
- Lower leaves ¼ in. or less wide, upper ones clasping the stem by a broad base.
  - Pods nearly straight, pendent on sharply deflexed pedicels ..... 4. *A. holboellii.*
  - Pods curved, on spreading pedicels ..... 5. *A. arcuata.*

B. Plants low, 1 ft. or less high.

Pods stout, ⅛ in. broad; leaves ½ to 1½ in. long, sparsely pubescent ..... 3. *A. platysperma.*
Pods slender, $\frac{1}{16}$ in. broad.
Stems branching and matted at base.
Sepals pubescent ..... 6. *A. lemmonii.*
Sepals glabrous ..... 7. *A. lyallii.*
Stems mostly simple below; leaves 1 to 1½ in. long.. 4. *A. holboellii.*

1. **A. glàbra** Bernh. Tower Mustard. Lower leaves oblanceolate, 2 to 4 in. long, coarsely toothed, rough hairy; stem-leaves broadly lanceolate, entire, clasping by an arrow-like base. Flowers dull white, less than ¼ in. long. Pods strictly erect, straight, 3 or 4 in. long. (*A. perfoliata* Lam.)

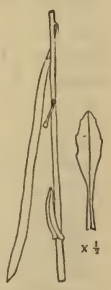
The Tower Mustard is a tall, erect biennial (2 to 4 ft.), usually without branches. It grows in Yosemite Valley but is more common in the foothills.

2. **A. repánda** Wats. Stem stout, 2 or 3 ft. high, from a biennial or perennial taproot. Lower leaves obovate or broadly oblanceolate, 1 to 3 or 4 in. long, shallowly toothed; stem-leaves narrowly oblong or lanceolate, narrowed to a broad petiole, not clasping. Flowers white, small. Pods spreading or recurved from nearly erect pedicels, 3 or 4 in. long.

Aside from the position of its pods, this Arabis is known by its leaves, which are broader than in related species. It grows sparingly in Yosemite Valley (type locality), on Rancheria Mt., and in similar places, its range extending far north and south.

Arabis repanda

A. platysperma



A. holboellii

3. **A. platyspérma** Gray. Stems several, strictly erect from the perennial root, 3 to 12 in. high. Lower leaves oblance-

olate, ½ to 1½ in. long; the upper much smaller, sessile but not clasping the stem. Petals nearly white. Pods stiffly erect, 1 to 2½ in. long, very acute. Seeds orbicular, broadly winged.—In open, gravelly places from 4000 ft. to timber-line. Mt. Dana is the type locality.

4. **A. holboéllii** Hornem. Stem usually simple below, 1 to 2½ ft. high, from a biennial taproot. Herbage finely pubescent below. Basal leaves oblanceolate, mostly entire, 1½ in. or less long; stem-leaves oblong or lanceolate, sessile by a broad clasping base. Flowers white or purplish. Pods nearly straight, 1½ to 3 in. long, pendent from sharply deflexed pedicels, the seeds in one row.

Although this species is sometimes confused with no. 2 and no. 5, it may be known from either of them by the more slender pods, which at maturity form a much narrower cluster. It is common throughout the mountains except at very high altitudes. *A. bolanderi* Wats., first described from specimens gathered in "Yosemite Valley or Mono Pass," seems to be only a form of this. Its only distinguishing characters are the short pods, ½ to 1½ in. long, and the seeds somewhat in two rows. The pods, however, are exceedingly variable as to length.

5. **A. arcuàta** Gray. Stem erect, 1 to 2 ft. high, from a biennial or perennial taproot, rough-pubescent. Lower leaves narrowly oblanceolate, 1 or 2 in. long, entire or sharply toothed; stem-leaves lanceolate, acutely angled and clasping at base. Flowers ¼ to ½ in. long, rose-color. Pods spreading, curved, 2 to 4 in. long; seeds in 2 rows in each division (in only 1 row in all our other species).

The compact, rose-purple flower-clusters of this Arabis may be seen anywhere in the lower part of the pine belt in May or early June, soon followed by the loose, dome-shaped raceme of long, recurving pods. It grows as isolated plants or in small clumps, inhabiting loose soil, especially on the slopes.

6. **A. lemmònii** Wats. Stems numerous and branching be-

low to form leafy mats, 4 to 12 in. high, from a perennial root. Herbage ashy-pubescent. Basal leaves oblanceolate or spatulate, entire, obtuse, ¾ in. or less long; stem-leaves sessile, clasping. Flowers purplish. Sepals hairy. Pods straight, 1 to 1½ in. long, erect or widely spreading, or even deflexed.—Of high altitudes, as on Mt. Dana.

7. **A. lyàllii** Wats. Similar to *A. lemmonii* but less branched, sometimes with erect stems 1 or 2 ft. high, usually much lower, the herbage green. Sepals not hairy. Pods nearly erect and straight.—Mono Co., reaching the crest of the mountains at Mt. Dana and extending to Macomber Ridge and Tuolumne Meadows.

15. STREPTÁNTHUS.

1. **S. tortuòsus** Kell. A glabrous branching annual, ½ to 3 ft. high. Lower leaves oblanceolate, petioled, entire or serrate; middle and upper leaves oblong ovate or roundish, obtuse, closely sessile and clasping the stem, ½ to 1½ in. long. Flowers racemose, pale yellow or purplish, ¼ to ½ in. long, on pedicels ¼ in. or less long. Sepals acuminate, the tip usually recurved. Pods very slender, 2 to 6 in. long, recurved.

This smooth, often purplish leaved annual usually grows ½ to 3 ft. high throughout the pine belt, where it is common. It is always freely branched, but when the central axis is very short and the lateral branches much developed, as is often the case at high altitudes, it is the form known as var. *orbiculatus* Hall. In this variety the flowers are smaller and usually of a deep-purple color.

DROSERACEAE. Sundew Family.

Bog-herbs, mostly glandular-hairy. Flower-parts withering-persistent. Petals and stamens borne on the calyx.

1. DRÓSERA. Sundew.

1. **D. rotundifòlia** L. Round-leaved Sundew. Leaves all in a tuft at base, roundish, ½ in. or less across, hairy-

margined, narrowed to hairy petioles. Flowers white, about ¼ in. broad, 1 to 25 in a terminal naked-stalked 1-sided raceme. Petals and stamens 5 each. Styles 3 or 5, deeply parted; capsule 1-celled, many-seeded.

Although the Sundew has not yet been found in the Yosemite National Park, there is little reason to doubt its occurrence, since it grows in cold bogs of Strawberry Valley, Calaveras Co., and in Huckleberry Meadow, Giant Forest. The numerous bristly hairs of the leaves exude a fluid that glistens in the sunshine like dewdrops, hence the common name of the genus. The Sundew is a partially insectivorous plant. When an insect alights upon one of the leaves, the bristles close in upon the body, holding it fast; at the same time digestive juices are excreted which gradually decompose the nitrogenous material, rendering it available for the nourishment of the plant. The California Pitcher Plant (*Darlingtonia*) is even more interesting in its method of trapping insects, but it does not grow in the Yosemite National Park, being restricted to bogs from Plumas Co. to Mt. Shasta and the North Coast Ranges. It is reported that an eastern botanist once experimented with insectivorous plants, feeding them on various sorts of food, until one day he made the mistake of supplying them with fresh cheese. As a result they all contracted dyspepsia and died, thus abruptly terminating the investigation!

CRASSULACEAE. Stonecrop Family.

Succulent perennial herbs with mostly entire leaves and no stipules. Sepals, petals, and pistils of the same number (4 or 5), the stamens twice as many. Fruit consisting of dry many-seeded pods.

Petals erect; leaves 1 to 4 in. long.....1. Cotyledon.
Petals spreading; leaves 1 in. or less long.....2. Sedum.

1. COTYLÈDON.

1. **C. nevadénsis** Wats. Leaves closely sessile, ovate to oblong, acuminate, 1 to 4 in. long, ½ to ¾ in. wide. Corolla tubular, ⅜ to ½ in. long, cleft to below the middle into lanceolate taper-pointed erect segments, yellowish, or reddish in small plants of sunny places or in poor soil. (*Dudleya nevadensis* B. & R.)

This is a stout, perennial, thick-rooted herb, with a dense, basal cluster of fleshy leaves. The scaly-bracted flowering stems are 4 to 12 in. long and branch above to form a loose, roundish inflorescence. It is common on rocks and in crevices at middle altitudes, growing where the soil is so shallow that it retains moisture for only a short time after rains. But the succulent leaves serve as reservoirs for the storing of water, this ever present supply being drawn upon as needed by the plant.

2. SÈDUM. Stonecrop.

Perennial herbs with fleshy obtuse leaves and terminally clustered flowers with spreading petals.

1. **S. rôseum** Scop. Leaves numerous up to the flowers, ¼ to ¾ in. long, obovate or oblong. Flowers usually dark purple, in a dense terminal cluster, the petals about ⅛ in. long and distinct.

The erect stems of this Alpine Sedum are closely clustered on a thick, woody, branching base and are 2 to 8 in. high. It is common in loose soil about timber-line, especially from the Tuolumne Meadows to Mt. Dana, Mt. Lyell, Clouds Rest, etc.

2. **S. obtusàtum** Gray. Plant spreading and matted, with many basal rosettes of thick leaves. Rosette-leaves spatulate, 1 in. or less long. Flowering stems 4 to 6 in. high, with few and small oblong leaves. Petals yellow, ¼ to ⅜ in. long, lanceolate, united for about one-fourth their length.

The plants from which this species was first described came from Mt. Hoffmann and Vernal Falls, but it is common throughout the Sierra Nevada, growing on rocks. A dwarf form with leaves less than ½ in. long and perhaps narrower calyx-lobes has been named *Gormania hallii* Britton. It has been collected only at Lamberts Dome, Tuolumne Meadows.

3. **S. yosemiténse** Britton. Yosemite Stonecrop. Very much like *S. obtusatum*, and perhaps not a distinct species, but the narrowly lanceolate petals are distinct to the base. It was originally collected between Vernal and Nevada Falls

but is very plentiful all around the Yosemite and Hetch Hetchy valleys. It also grows at Chilnualna Falls.

S. RADIATUM Wats., of the Coast Ranges, was once reported from the Yosemite, but doubtless in error. It has thin leaves, broadest at base, those of the stem scarcely shorter than the basal ones.

SAXIFRAGACEAE. SAXIFRAGE FAMILY.

Herbs and shrubs, usually without stipules. Stamens 5 or 10 (numerous only in Philadelphus) and, like the petals, usually inserted on the calyx. Parts of the pistil commonly fewer than the sepals, either distinct or united.

A. Annual and perennial herbs.

Stamens 10.
- Fruit of 2 cells or pods; petals entire ..... 1. SAXIFRAGA.
- Fruit 1-celled; petals entire or lobed ..... 6. TELLIMA.

Stamens 5.
- Leaves entire; flowers large, solitary ..... 7. PARNASSIA.
- Leaves toothed; flowers clustered.
  - Stems leafy.
    - Petals white; leaves 4 to 8 in. across ..... 2. BOYKINIA.
    - Petals purplish edged; leaves smaller ..... 3. BOLANDRA.
  - Stems naked except at base; flowers very small.
    - Petals entire ..... 4. HEUCHERA.
    - Petals pinnately parted, greenish ..... 5. MITELLA.

B. Shrubs with distinctly woody stems.

Leaves opposite; flowers white ..... 8. PHILADELPHUS.
Leaves alternate ..... 9. RIBES.

1. SAXÍFRAGA. SAXIFRAGE.

Herbs, with simple mostly basal leaves, the naked stems bearing terminal clusters of white or roseate flowers. Petals 5, entire. Stamens 10. Styles 2. Ovary either free from the calyx or attached to its base, maturing into a 2-celled 2-beaked capsule, or the cells forming nearly distinct pods.

Leaves nearly orbicular, as broad as long.
- Blade of leaf ½ to 2 ft. broad ..... 1. *S. peltata.*
- Blade of leaf 1 to 2½ in. broad ..... 2. *S. punctata.*

Leaves much longer than broad.
- Flowers solitary, terminating branchlets which also bear bud-like plantlets ..... 3. *S. bryophora.*
- Flowers clustered.
  - Leaves few, at the base of erect stems.
    - Stems 6 to 15 in. high; flowers scattered in an open panicle ..... 4. *S. virginiensis.*
    - Stems 3 to 8 in. high; flowers mostly in a single terminal head ..... 5. *S. nivalis.*
    - Stems 1 to 3 ft. high; flowers in small clusters terminating lateral branchlets ..... 6. *S. integrifolia.*
  - Leaves numerous along matted stems ..... 7. *S. tolmiei.*

1. **S. peltàta** Torr. INDIAN RHUBARB. A pubescent perennial with creeping rootstocks, the stems (1 to 3 ft.) bearing loose panicles of rose-color or nearly white flowers. Leaves roundish, ½ to 2 ft. broad, coarsely lobed and irregularly toothed, with a short-funnelform cavity over the insertion of the long petiole. Petals about ¼ in. long. (*Peltiphyllum peltatum* Engl.)—Along rocky margins of streams at middle and lower altitudes, the flowers appearing before the leaves. Locally noted at Little Crane, Moss, and Grouse creeks.

2. **S. punctàta** L. A glabrous or slightly pubescent plant, 1 to 2½ ft. high, from a creeping rootstock, the numerous flowers in a widely branched open panicle. Leaves orbicular, 1 to 2½ in. across, equally and deeply toothed, on petioles 1 to 8 in. long. Petals oval, obtuse, narrowed to a claw, white, with a pair of greenish-yellow dots at base.

In this Saxifrage we have one of the cleanest and most pleasing plants in the mountains. The broad, smooth leaves, round as a cart-wheel, have a wholesome appearance and the modest, white flowers are daintily clustered in the loose panicle. It grows in partial shade on moist, mossy banks, where its ample foliage is displayed without fear of the hot sun. A thrifty colony was noted in a shady glade just below Glacier Point, where it is hoped that it may long continue to cheer the passing wayfarer. Such groups are not uncommon in similar places at 6000 to perhaps 9000 ft. alt.

3. **S. bryóphora** Gray. A delicate fibrous-rooted annual, 2 to 8 in. high, the white flowers solitary and terminal on the widely spreading branchlets which also bear numerous bud-like bulblets on deflexed "pedicels." Leaves nearly sessile, spatulate-oblong, acute, entire, ½ to 1 in. long. Petals ovate, abruptly contracted to a claw, white, with a pair of yellow spots at base, $\frac{2}{16}$ in. long.

The specific name, bryophora, signifies a "moss bearer" and was applied to this species because of the bulblets which are borne along the branches and resemble small moss plants. These stem-grown bulbs, which are really modified buds, fall to the ground and give rise to new plants, thus providing the species with an unusual method of reproduction. This Saxifrage grows in open, gravelly, but moist soil of the

Upper Coniferous Belt, as along Snow Creek, and on Mt. Lyell, Mt. Dana, Macomber Ridge, etc.

4. **S. virginiénsis** var. **califórnica** Jepson. A glandular-pubescent perennial, 6 to 15 in. high, from a short rootstock, the small whitish flowers in an elongated loose panicle. Leaves few, petioled, oblong or spatulate, toothed or entire, the blade 1 to 2 in. long. Petals oblong, sessile, white or rose-tinted.—On cool, shaded slopes of middle altitudes: Eagle Peak, Little Yosemite, Wawona Road, etc.

Saxifraga virginiensis californica

Saxifraga nivalis

5. **S. nivàlis** L. An obscurely viscid-pubescent plant, 3 to 8 in. high, from a short rootstock, the small flowers in a close terminal head (inflorescence rarely branched). Leaves oblong-obovate or spatulate, with short broad petiole or nearly sessile, entire or slightly toothed, 1½ in. or less long. Petals white, oblong or spatulate, about ⅛ in. long.—Found in moist soil at high altitudes: Lake Tenaya, Glacier Point, Vogelsang Pass, Mt. Lyell.

6. **S. integrifòlia** var. **siérrae** Coville. A robust glandular perennial, 1 to 3 ft. high, with white flowers in small rounded clusters terminating the short branchlets of the panicle. Leaves oblong or oblanceolate, obtuse, ¼

to 1¼ in. wide, 2 to 6 in. long including the broad petiole, minutely few-toothed. Petals small, obovate, dull white.—In moist meadows and on stream banks, as at the base of Clouds Rest and on Mt. Dana.

7. **S. tòlmiei** T. & G. Nearly glabrous, very leafy at the matted creeping perennial base, the white flowers loosely clustered at the summit of a naked stalk 2 to 6 in. high. Leaves spatulate, leathery, nerveless, obtuse, entire, ½ in. or less long, sessile. Petals lanceolate, small. (*S. ledifolia* Greene.)—Near snow banks above timber-line; not yet found in our district but to be expected since it occurs in Tulare Co. and is common from Pyramid Peak north to Washington.

2. BOYKÍNIA.

1. **B. màjor** Gray. Leaves several, on very long petioles (upper ones sessile), the blade fan-shaped, 6 to 18 in. across, deeply palmately lobed, the lobes sharply toothed; stipules very large. Flowers numerous, small, in open terminal panicles. Petals 5. Stamens 5. Capsule 2-celled.

This is a stout perennial, 2 or 3 ft. high, the erect stem with several broad, rounded leaves and a large, loose cluster of white flowers. It grows along nearly all of the streams below 6000 ft., coming into bloom about midsummer.

3. BOLÁNDRA.

1. **B. califórnica** Gray. Lower leaves long-petioled, the uppermost sessile; stipules often conspicuous; blades roundish, ½ to 1½ in. across, irregularly cut into several broad toothed lobes. Flowers on long diverging bracted pedicels. Calyx cup-shaped, purplish, the lobes reduced to slender recurved tips. Petals 5, tapering to slender tips, dull white, the edges and tip rose-red. Stamens 5.

This slender, graceful plant, with weak stems 6 to 18 in. long, was first found in "Yosemite Valley, on the Mariposa Trail, among rocks," by H. N. Bolander, of the State Geological Survey, for whom it was named. It is not known from outside of the Yosemite National Park, where it has been collected as follows: Eagle Peak, Staircase Falls, creeks near Artist's Point, Nevada Falls, Glacier Point Trail (6900 ft.), Tenaya Falls, Stubblefield Cañon (8400 ft.), and trail above Pleasant Valley.

4. HEUCHÈRA. Alum-root.

Perennial herbs with leaves and naked flowering stems all

from a stout branching base. Leaves long-petioled, palmately veined. Flowers small, reddish or nearly white. Calyx bell-shaped, the tube adherent below to the 1-celled ovary. Petals 5, small, entire. Stamens 5. Styles 2.

1. **H. micrántha** Dougl. Leaves hairy, ovate, 1 to 3½ in. across, more or less lobed and toothed, long-petioled. Panicle very loose, of numerous small flowers, 2 to 4 in. wide and 6 to 18 in. long. Calyx pale, about ⅛ in. long including the teeth.

The long, feathery cluster of minute flowers readily distinguishes this plant. These flowering shoots are 1 to 2 ft. long and spring from a basal cluster of ample leaves. They decorate nearly every shady slope and rocky stream bank up to 6000 ft., as around the walls of Yosemite Valley, where they are exceedingly abundant and highly ornamental.

2. **H. rubéscens** Torr. Leaves rough, hairy on edges and veins, with broad almost heart-shaped base, ½ to 1½ in. broad, bluntly toothed and often slightly lobed, on petioles 1 or 2 in. long. Panicle rather compact, usually 1-sided, ½ to 1 in. wide and 2 to 6 in. long (rarely 2 in. wide and 9 in. long). Calyx rose-red, fully ⅛ in. long, with blunt green teeth. Petals narrow, white, nearly twice as long as calyx-teeth.

This Alum-root, which seldom exceeds 1 ft. in height, occurs plentifully on rocky ledges at middle and higher altitudes. It was noted at Eagle Peak, Nevada Falls, Glacier Point Short Trail (6900 ft.), and Clouds Rest. In the High Sierra Nevada the stems are shorter and the flower-clusters more compact.

3. **H. prínglei** Rydb. Leaves rough and with stiff hairs on edges and veins, ovate, the base straight (truncate) or slightly wedge-shaped, ½ to 1¼ in. across, sharply cut-toothed, on petioles 1 or 2 in. long. Panicle 1 in. or less wide, 2 to 6 in. long. Calyx dull white or reddish, ⅛ in. long exclusive of the narrow green teeth. Petals white, twice longer than calyx-teeth, almost reaching the conspicuous orange anthers.

The pale flowers of this species are found with those of *H. rubescens* at Nevada Falls and on the Glacier Point Trail. It also grows near Yosemite Falls. The characters are inconstant and suggest a hybrid origin.

5. MITÉLLA. Mitrewort.

1. **M. bréweri** Gray. Leaves all basal, roundish, the base

heart-shaped, shallowly lobed and toothed, 1 to 3 in. across, on shaggy petioles 2 to 5 in. long. Flowers greenish, small, in narrow graceful racemes 4 to 8 in. long. Petals 5. Ovary mostly inferior, short and broad, becoming a globular capsule which soon opens, exposing the numerous seeds. (*Pectiantia breweri* Rydb.)

The slenderly lobed, green petals at once distinguish this species since these characters do not recur in any other Yosemite plant. It grows in moist, shady places throughout the Sierra Nevada at altitudes of about 4000 to 8000 ft.

6. TELLÌMA.

Ours dainty perennial herbs with slender rootstocks bearing bulblets and rounded mostly basal leaves, the few flowers loosely spaced in a terminal raceme. Stipules small, fringed. Petals 5, clawed, much exceeding the sepals. Stamens 10, short. Ovary mostly inferior, 3-valved, 1-celled. (*Lithophragma.*)

1. **T. affìnis** Boland. Woodland Star. Basal leaves long-petioled, roundish, parted into lobed or toothed divisions, ½ to 1 in. across; stem-leaves 1 to 4, alternate, parted nearly to base. Flowers white or pinkish, on pedicels mostly longer than the top-shaped calyx. Petals about ⅜ in. long, irregularly cleft into several narrow lobes. Ovary half inferior.

The stems of this plant are rough with short hairs and commonly 10 to 20 in. high. The leaves are also rough-hairy and often bronze-brown beneath. It grows on moist banks in Yosemite Valley, along Moss Creek, and elsewhere at moderate altitudes. A name by which it is sometimes known is "Star-of-Bethlehem," but that belongs to a species of Ornithogalum, a member of the Lily Family often grown in gardens.

2. **T. scabrélla** Greene. Basal leaves kidney-shaped, with a broad sinus, ½ to ¾ in. across, on petioles ¼ to 2 in. long, shallowly lobed, the lobes nearly entire; stem-leaves 1 to 3, alternate, 3-cleft into narrow often toothed lobes. Flowers 3 to 6, white, nearly sessile. Petals entire, ¼ in. long, including the claw. Ovary nearly free.

The slender, minutely roughened stems of *T. scabrella* are 6 to 12 in. high. It is the Sierran representative of *T. cymbalaria,* of the Coast districts, differing in its more slender habit, smaller size, and very short pedicels. Our species grows at Bridal Veil Falls, near Nevada Falls, and on the McClure Fork of the Merced at 9500 ft. (Jepson), always in moist soil.

7. PARNÁSSIA. Grass-of-Parnassus.

1. **P. califórnica** Greene. Leaves basal, glabrous, round-ovate to elliptic, entire, the blade ¾ to 2 in. long. Flowers solitary, terminating stalks ½ to 2 ft. high and naked save for one bract. Petals 5, roundish, ½ in. long, white, green-veined. Stamens 5, and in addition 5 clusters of short gland-tipped bristles (aborted filaments).—Rare in our district, being reported only from "Ostranda's," but it also grows near Mono Lake.

8. PHILADÉLPHUS. Syringa.

1. **P. lewísii** var. **califórnicus** Gray. Leaves opposite, petioled, the blade 1½ to 3 in. long and ¾ to 2 in. wide, ovate, acute, entire or sparsely toothed. Flowers in terminal panicles. Calyx top-shaped, adherent to the ovary. Petals 4, broad and obtuse, ½ in. long. Stamens 20 to 40. Fruit a dry capsule.

During the early summer, while covered with white, fragrant bloom, this shrub, which commonly grows to a height of 4 to 12 ft., is one of the most pleasing sights in our foothill district. It is plentiful in the Merced and other cañons, ranging up to 4000 ft. alt. In Yosemite Valley, it may be seen along the south road just above the village and again near Bridal Veil Falls, where it forms fragrant, flowery thickets in June and July.

9. RÌBES. Currant. Gooseberry.

Shrubs. Leaves alternate, petioled, irregularly orbicular in outline, palmately lobed. Flowers in short racemes or solitary. Calyx-lobes, petals, and stamens 5 each. Calyx-tube adnate to the ovary and projecting beyond it. Styles 2. Fruit a smooth or prickly berry.

Plant without spines or prickles.
- Flowers white or cream-color, ⅜ in. long ..... 1. *R. cereum.*
- Flowers pink, ⅜ in. long ..... 3. *R. nevadense.*
- Flowers greenish or pinkish, ⅝ in. long ..... 2. *R. viscosissimum.*

Plant with spiny stems.
- Flowers saucer-shaped above the ovary ..... 4. *R. montigenum.*
- Flowers tubular or cylindric. (Genus Grossularia, of some.)
  - Ovary bristly; berry spiny ..... 5. *R. roezli.*
  - Ovary and berry nearly smooth ..... 6. *R. lasianthum.*

1. **R. cèreum** Dougl. Leaves ½ to 1¼ in. across, glandular and soft-pubescent, or glabrous above, nearly orbicular, obscurely lobed, the margin finely toothed or crenate. Flow-

ers white or cream, tubular above the ovary, nearly ½ in. long, pubescent. Berry bright red, becoming glabrous.

This is an intricately branched, rigid shrub, 2 to 4 ft. high, without spines or bristles. It is common in the mountains, mostly at high altitudes. *R. inebrians* Lindl., is a form differing in the bracts, which are entire or occasionally with a lateral tooth, and in the usually glabrous styles. In typical *R. cereum* the bracts are lobed or toothed and the style is usually pubescent.

2. **R. viscosíssimum** Pursh. A leafy shrub, 3 ft. or less high, without spines or bristles. Leaves 1 to 2 in. wide, glandular-pubescent on both sides, with 3 or 5 rounded lobes, the margins obtusely toothed. Flowers greenish or pinkish, ⅝ in. long including the glandular-pubescent ovary. Berry black, sometimes with a white bloom.

The abundant, fragrant foliage of this shrub is borne on short stems 1 to 3 ft. high, without spines or bristles. One first meets it at about 6000 ft., as along the Pohono Trail. In var. *hallii* Jancz., of northern California, the ovary is smooth and the sepals purplish, but in specimens from Matterhorn Cañon (Jepson, no. 4498) both kinds of flowers occur on a single branch.

3. **R. nevadénse** Kell. Sierran Currant. Leaves thin, 1 to 3 in. wide, finely pubescent or glabrous, distinctly lobed, the lobes obtuse and obtusely toothed. Flowers pink, 8 or more in a dense raceme, ⅜ in. long including the glandular ovary. Berry black but covered with a white bloom, sparsely glandular, sweet and insipid.

The clean, thrifty, unarmed shrubs of this currant, usually 3 to 6 ft. high, are often seen in the mountains at altitudes of 4000 to 8000 ft. A form from Hetch Hetchy with small, thick leaves very pubescent beneath, may be identical with *R. malvaceum* Sm., of southern California.

4. **R. montígenum** McCl. A straggling flexuous shrub, 1 to 2½ ft. high, the nodes spiny and the stems sometimes bristly. Leaves soft-pubescent, ⅜ to 1 in. across, 3 or 5-parted into toothed divisions. Flowers saucer-shaped above the glandular ovary. Berries red, glandular-bristly.—Common in the high mountains.

5. **R. roèzli** Regel. Wild Gooseberry. A stout shrub with many short rigid branchlets, 1 to 4 ft. high, the nodes spiny. Leaves ½ to 1 in. across, minutely soft-pubescent, cleft less than half way into roundish bluntly toothed lobes. Flowers dull red, ⅝ in. long including the bristly and hairy ovary.

Berry purple, ½ in. in diameter, beset with stout spines. (*R. amictum* Greene.)—Plentiful at middle altitudes.

R. AMARUM McCl. has been collected at Footman Mt. and may reach our lower borders. It has larger leaves than *R. roezli* (1 to 2 in. wide), and the numerous bristles of the ovary and berry are gland-tipped. It is also called *R. marti-posanum* Congdon.

6. **R. lasiánthum** Greene. Distinguished from no. 5 by the paler and often smaller leaves, the smaller yellowish flowers and the merely granular ovary which matures into a smooth berry.—High altitudes, as at Merced Lake.

ROSACEAE. ROSE FAMILY.

Herbs and shrubs with alternate, simple or compound leaves and usually evident stipules. Flowers regular. Calyx 5-lobed, sometimes with 5 small accessory lobes. Petals 5 or none. Stamens 5 to numerous, inserted with the petals on the calyx. Pistils 1 to many, various.

A. Leaves compound, with 3 to numerous leaflets.

Fruit fleshy or pulpy, called a berry or hip.
- Stems woody, not prickly; erect shrub ..... 3. PIRUS.
- Stems woody, prickly.
  - Flowers white ..... 5. RUBUS.
  - Flowers pink ..... 14. ROSA.
- Stems herbaceous, creeping, not prickly ..... 6. FRAGARIA.

Fruit dry, not berry-like.
- Pistil only 1; stamens 15; flowers white ..... 9. STELLARIOPSIS.
- Pistils 3 to 15 or numerous.
  - Stamens 5; leaflets 3; petals yellow ..... 10. SIBBALDIA.
  - Stamens 5 to 15, inserted near throat of calyx, distant from the receptacle; leaflets more than 3 ... 8. HORKELIA.
  - Stamens 20 or more, inserted on base of calyx near the receptacle.
    - Styles straight, falling from the mature ovary ..... 7. POTENTILLA.
    - Styles hooked (or feathery), persistent ..... 11. GEUM.

B. Leaves simple (dissected into many small lobes in Chamaebatia; all woody plants).

a. Pistils numerous; leaves large, palmately lobed .. *Rubus parviflorus*, p. 125.

b. Pistils about 5, becoming several-seeded pods; flowers rose-color ..... 1. SPIRAEA.

c. Pistils 5, becoming 1-seeded dry fruits; flowers white .. 2. HOLODISCUS.

d. Pistil 1.
- Leaves finely cut into small lobes ..... 12. CHAMAEBATIA.
- Leaves simply toothed or entire.
  - Petals none; pistil becoming a feathery-tailed akene .. 13. CERCOCARPUS.
  - Petals white.
    - Ovary superior; fruit a cherry ..... 15. PRUNUS.
    - Ovary inferior; fruit berry-like ..... 4. AMELANCHIER.

1. SPIRAÈA. Spirea.

1. **S. densiflòra** Nutt. Stems woody. Leaves simple, elliptic or short-oblong, very obtuse, sharply toothed above the entire base, ½ to 1½ in. long, narrowed to petioles less than ¼ in. long. Flowers rose-color, in a compact roundish terminal cluster ½ to 1½ in. across, the peduncle longer than the leaves. Petals 5, rounded. Stamens 20 or more. Pistils about 5, each becoming a small several-seeded pod. (*S. betulaefolia rosea* Gray.)

The leafy stems of this plant form dense clumps 2 ft. or less high, and the rounded summit is rosy with the compact flower-clusters. The species grows in rocky moist soil, as at Yosemite Falls, Lake Tenaya, Lake Merced, and Matterhorn Cañon.

2. HOLODÍSCUS.

1. **H. díscolor** var. **dumòsa** Maxim. Ocean Spray. Stems woody, intricately branched, 1 to 4 ft. high. Leaves simple, obovate, narrowed to a nearly sessile base, obtuse, coarsely toothed above the middle, about ½ in. long (⅜ to 1 in.), whitish soft-tomentose beneath. Flowers numerous, small, white, in oblong or pyramidal terminal panicles. Petals 5, rounded. Stamens 20. Pistils 5, distinct, becoming hairy akenes.

Rocky ledges and cliffs form the natural habitat of this plant, which may be tall or short, many or few-flowered, depending on the soil conditions and altitude. It ranges from Yosemite Valley and Lake Eleanor to 9000 ft. alt. and doubtless even higher.

3. PÌRUS. Mountain Ash. Rowan.

1. **P. occidentàlis** Wats. Western Mountain Ash. Stems woody, 2 to 6 ft. high. Leaves pinnately compound, 4 to 8 in. long, glabrous. Leaflets 7 to 11, oblong, obtuse, toothed above the middle, 1 to 2½ in. long. Flowers white, about ¼ in. across, in flat-topped clusters much shorter than the leaves. Stamens 20. (*P. sambucifolia,* of Bot. Calif. *Sorbus occidentalis* Greene.)

The Mountain Ash is a rare, deciduous shrub, beautiful in foliage and in flower, but especially striking in late summer and autumn when the large clusters of berry-like fruits turn to coral-red. It grows on stream banks or in other moist places from Tuolumne Cañon, Snow Creek, and Crescent Lake to Mt. Lyell and the Sierran crest. The common name

THICKETS OF SERVICE BERRY

A flowery slope near Lake Tahoe.
The white bloom of this shrub is frequently encountered in Coniferous Forests throughout the whole length of the Sierra Nevada.

was not well chosen, for the term *ash* properly belongs only to species of Fraxinus, but "Mountain Ash" as applied to Pirus, is now too firmly established to be dislodged.

4. AMELÁNCHIER.

Service Berry. June Berry. Shad Bush.

1. **A. alnifòlia** Nutt. Stems woody, divaricately branched, 2 to 10 ft. high. Leaves simple, short-petioled, ½ to 1 in. long, oval or short oblong, toothed around the very obtuse summit, pubescent beneath. Flowers white, in short leafy-bracted lateral racemes. Petals 5, spatulate, ⅜ to ½ in. long, much exceeding the calyx and the 20 very short stamens. Ovary inferior.

Our species of Service Berry is a common, red-twigged shrub which produces pulpy, black, roundish fruits ¼ in. in diameter. The edible pulp is an article of food among the Indians, but its sickly-sweetish taste is not pleasant to epicurean palates. The abundant white bloom often covers whole thickets, as is shown in our illustration. A dwarf form of the shrub has been found at high altitudes.

5. RÙBUS.

Bushes with erect or trailing stems. Stamens numerous. Pistils many, crowded on an elevated receptacle, becoming fleshy and fusing to form a so-called berry.

1. **R. parviflòrus** Nutt. Thimble Berry. A woody-stemmed perennial, 2 to 3 ft. high, without prickles. Leaves simple, palmately 5-lobed (lobes toothed), circular in outline, heart-shaped at base, 3 to 7 in. across, on petioles 1 to 3 in. long. Petals white, ¾ in. long. Fruit large, with luscious but thin pulp. (*R. nutkanus* Moc.)

The broad, horizontally spreading leaves mark this species as a shade-lover. It is especially common along streams in partial shade of pine and oak trees and is plentiful from our lower borders up to at least 7000 ft. alt. Only the birds seem to find the picking of the berries a profitable occupation. In the eastern states this plant is known as Salmon Berry, while certain members of the raspberry group are there called thimble berries.

2. **R. leucodérmis** Dougl. Wild Raspberry. Stems woody, prickly. Leaflets 3 to 7, ovate, acute, doubly toothed, 1 to 2½ in. long, green above, white beneath. Petals white, about ⅜ in. long. Fruit either black or red, edible.

The Wild Raspberry forms thickets at a few places in

Hetch Hetchy and Yosemite valleys and elsewhere along our lower borders. Its berries are as highly flavored as those of any cultivated species and are eagerly sought by campers, who usually find, however, that the birds have preceded them.

6. FRAGÀRIA. Strawberry.

Perennials with running stems which root at the joints, the white flowers in small clusters. Leaves basal, each with 3 obovate or wedge-shaped toothed leaflets and with a pair of stipules at base of petiole. Sepals 5, alternating with as many sepal-like bractlets. Petals 5, obtuse, never notched. Stamens about 20. Receptacle hemispheric or conic, becoming enlarged and juicy, bearing the minute dry akenes scattered over its surface.

1. **F. califórnica** C. & S. California Wild Strawberry. Leaflets sessile, ¾ to 2 in. long, silky-pubescent beneath. Flowers white, ½ to 1 in. across, in irregular clusters, the branches being very unequal. Seed-like akenes set in shallow pits of the juicy fruit.

The California Strawberry is most abundant in the Coast Ranges, but it occurs also in the foothills of the Sierra Nevada, as from Crockers to Big Meadows and the Mariposa Grove, and has been found as high as 6200 ft. alt. in Little Yosemite Valley. The Sierran plants are almost entirely of the var. *crinita* Hall, distinguished by their thicker leaves and by the long, white, almost shaggy hairs of the petioles and flower-stalks. The berries, though small, are of delicious flavor.

2. **F. virginiàna** Duch. Leaflets mostly short-stalked, 1 to 3 in. long (shorter in one var.), silky-pubescent beneath, nearly glabrous above. Flowers white, ½ to 1 in. across, on nearly equal branches of a few-flowered umbel. Seed-like akenes set in deep pits of the juicy fruit.

Visitors to the Yosemite are not long in locating the strawberry beds and filling their baskets with the luscious fruit. These patches, like those to be found at the Hog Ranch, near Hetch Hetchy, are doubtless the result of plantings of roots brought from the East by the early settlers, since the plants have all of the characters of the eastern form. The native wild strawberries of this species, which grows throughout the Sierra Nevada from about 4000 ft. alt. to timber-line, belong to the following varieties: Var. *platypetala* Hall, distinguished by its smoother and greener appearance, the leaves being practically glabrous above and with

a slight bloom; petals mostly larger than in the species, often nearly twice as long as the calyx. Var. *platypetala* f. *sibbaldifolia* Hall is a sub-alpine form of small size, the leaflets ½ to 1 in. long, toothed only around the summit, the lateral ones nearly sessile. It grows on Mt. Dana and elsewhere toward timber-line, but as one descends he finds the plants becoming larger and larger, gradually taking on the characters of var. *platypetala*.

7. POTENTÍLLA.

Annual and perennial herbs, one species a low shrub, with compound leaves. Flowers yellow or whitish, in terminal clusters or solitary, never sessile. Calyx nearly flat to cup-shaped, with 5 main teeth alternating with 5 tooth-like bractlets. Petals 5, broad, obtuse, often notched. Stamens at least 20, inserted on a thickened ring near base of calyx; filaments thread-like. Pistils 10 to 80, on a conical receptacle which does not become fleshy or juicy, each pistil maturing into a dry seed-like akene.

Stems erect and woody; low shrub of high altitudes..... 1. *P. fruticosa.*
Stems creeping and rooting in wet places.....2. *P. anserina.*
Stems erect or reclining, neither woody nor rooting from the joints.
Leaflets 3.
All 3 leaflets sessile or short-stalked.....3. *P. flabellifolia*
Terminal leaflet long-stalked.....4. *P. grayi.*
Leaflets 5 or more, all from summit of petiole.
Stems mostly 1 ft. or more high.....5. *P. gracilis.*
Stems ½ to 1 ft. high.....6. *P. dissecta.*
Leaflets 5 or more, scattered along the petiole.
Herbage white with soft cottony hairs.....7. *P. breweri.*
Herbage green, more or less viscid-pubescent.
Flowers yellow .....8. *P. glandulosa.*
Flowers white or cream-color when fresh.....9. *P. lactea.*

1. **P. fruticòsa** L. Shrubby Cinquefoil. Leaves ½ to ¾ in. long, on petioles of ½ in. or less, much crowded, white silky-pubescent beneath; leaflets 3 to 7, pinnately arranged but very crowded, oblong, entire, ¾ in. or less long. Flowers yellow, ½ to 1 in. across, the petals orbicular. (*Dasiphora fruticosa* Rydb.)

As indicated by its name, this is a true shrub. The very leafy branches, with a shreddy, reddish bark, and the large, yellow flowers render it an attractive object at about timber-line on the higher mountains. It is plentiful on Mt. Dana, Mt. Lyell, etc., its range extending thence northward to Alaska and around the world in sub-arctic regions.

2. **P. anserìna** L. Silver-weed. Leaves 6 to 18 in. long including the petiole, green above, white-silky beneath; leaflets 7 to 21, ½ to 1 in. long, with smaller ones interposed, oblong, sharply toothed. Flowers yellow, solitary on very long pedicels. (*Argentina anserina* Rydb.)

The Silver-weed inhabits marshy or springy places where the stems creep along the ground, rooting at the joints and sending up tufts of leaves and long, naked flowering stems. It is widely distributed in the Northern Hemisphere.

3. **P. flabellifòlia** Hook. Leaves few, on petioles ½ to 4 in. long, chiefly basal, thin, obscurely pubescent; leaflets 3, all sessile or nearly so, ½ to 1 in. long, fan-shaped, deeply and obtusely few-toothed, the lateral ones oblique. Flowers yellow, in a loose cyme. (*P. gelida* Wats., not Meyer.)

The broad, green leaves of only 3 leaflets, the long petioles, and the flowers of a very bright, cheerful yellow best mark this species. It grows abundantly in moist soil at Lake Tenaya, Snow Flat, Clouds Rest, and other places at high altitudes.

4. **P. gràyi** Wats. Leaves on petioles ¾ in. or less long (except a few bract-like ones), nearly or quite glabrous; leaflets 3, the terminal one distinctly stalked, ¼ to ¾ in. long, obovate, coarsely and deeply 5 to 7-toothed, the teeth mostly acute. Flowers yellow, in a loose cluster or solitary.

This is a rather dwarf plant with the leaves all huddled at the base and the flowering stalks 6 in. or less high. It is found sparingly at high altitudes.

5. **P. grácilis** Dougl. Leaves mostly in tufts from the base, on petioles 2 to 8 in. long, soft-pubescent above, densely silky or white-tomentose beneath; stem-leaves smaller and shorter-petioled; leaflets 5 to 7, all sessile on the end of the petiole, 1 to 2 in. long, oblanceolate, divided into lanceolate acute teeth. Flowers yellow, numerous in the loose terminal cluster.

This robust plant is commonly 12 to 18 in. high. Its numerous forms have given rise to many named varieties. Var. *rigida* Wats. (*P. nuttallii* Lehm.) has leaves long-hairy beneath but not woolly. Var. *fastigiata* Wats., is stout

and low, with broad greenish leaflets. Var. *hallii* Wolff, is a low form with very green leaves and short petals scarcely exceeding the calyx. *P. blaschkeana* Turcz., is a large form with leaflets cleft into narrowly ovate or oblong teeth, silky and green above, white and tomentose beneath.—All of these are common throughout the middle Sierra Nevada.

6. **P. dissécta** Pursh. Similar to *P. gracilis* but smaller. Petioles 2 in. or less long. Leaves somewhat silky but green on both sides, the leaflets sharply cut-toothed.—Eastern slope of the Sierra Nevada, reaching Mt. Lyell.

7. **P. bréweri** Wats. Leaves mostly in a basal tuft, on petioles ¼ to 2 in. long, densely white silky-pubescent on both sides; leaflets 5 to 11, crowded along the common rachis, ¼ to ¾ in. long, broadly wedge-shaped and deeply cut-toothed. Flowers yellow, rather few.

In typical *P. breweri* the stems are nearly erect and the flowers quite compact. In var. *expansa* Wats., the widely spreading stems are upwardly curved and the flower-clusters loosely expanded. The white, almost cotton-like covering of the leaves contrasts well with the bright-yellow flowers. The stems are 6 to 18 in. high. The variety is common from Snow Flat and Clouds Rest to the crest of the Sierra Nevada. The type locality of the species is Mono Pass.

8. **P. glandulòsa** var. **nevadénsis** Wats. Leaves 3 to 10 in. long, on petioles 1 to 4 in. long, those toward the top gradually smaller, soft-pubescent and somewhat glandular, not tomentose or cottony; leaflets 5 to 9, not crowded, from less than ½ to 1½ in. long, obovate, regularly sharp-toothed. Flowers yellow, in an open cluster. (*Drymocallis glandulosa monticola* Rydb.)

The stems of this plant are usually erect, ½ to 2 ft. high, and bear several leaves in addition to the basal cluster. It is common up to 11,000 ft., where, however, it becomes much dwarfed. Various forms have been named but only the var. *reflexa* Greene, with reflexed petals and calyx-lobes, can be satisfactorily separated.

9. **P. láctea** Greene. The white or cream-colored flowers constitute the only character by which this may be certainly distinguished from no. 8, and even these often turn yellow in drying. The stems are slender and erect and the petals do not much exceed the calyx. It grows in open places in the pine forests from about 4000 to 9000 ft. alt. In the lower part

of its range and in protected places the stems are tall, the leaves broad, and the petals are often much longer than the calyx. This form, which grows at Hog Ranch and in Fresno County, has been called *Drymocallis gracilis* Rydb.

8. HORKÉLIA.

Perennial herbs with pinnately compound leaves and yellow or white flowers in close terminal clusters (sessile, or pedicels shorter than calyx). Calyx cup-shaped, with 5 main teeth alternating with 5 tooth-like bractlets. Petals 5, wedge-shaped to linear. Stamens 5 to 15, inserted on the calyx-throat and therefore well separated from the receptacle; filaments either filiform or dilated. Pistils 2 to numerous, on a permanently dry conical receptacle, becoming akenes.—Aside from the technical characters, our species differ from Potentilla in having smaller flowers in more compact clusters.

Flowers white.
- Stamens 10; filaments broad.
  - Leaflets 11 to 17 ..... 1. *H. fusca.*
  - Leaflets 5 to 9 ..... 2. *H. tridentata.*
- Stamens about 15; filaments thread-like ..... 3. *H. unguiculata.*

Flowers yellow; stamens 5 or 10.
- Leaves green ..... 4. *H. gordonii.*
- Leaves densely white-silky, worm-like ..... 5. *H. muirii.*

1. **H. fúsca** Lindl. Stems mostly 1 to 1½ ft. high, purplish or green. Leaves 3 to 5 in. long, including petiole, somewhat glandular, either green or whitish pubescent; leaflets 11 to 17, wedge-shaped, ¼ to ½ in. long, the upper portion deeply toothed or cut into acute divisions. Flowers white, the calyx purplish. (*Potentilla douglasii* Greene.) Var. *tenella* Wats., is the more slender form, 6 in. to 1 ft. high, the flowers smaller (*Horkelia tenella* Rydb., *H. parviflora* Nutt., and *Potentilla andersonii* Greene).

This plant has numerous leaves at base but passing up the stem they become fewer and smaller. In the Yosemite and at Hog Ranch the foliage is green and glandular; at Lake Tenaya, where it covers exposed slopes, the foliage is almost white with soft hairs.

2. **H. tridentàta** Torr. Stems 9 to 18 in. high. Leaves 1 to 3 in. long including petiole, always white or gray with silky hairs; leaflets 5 to 9, linear to obovate, ⅜ to ½ in. long, entire or three-toothed at apex (rarely 4 or 5-toothed). Petals oblanceolate, white, slightly exceeding the sepals. (*Potentilla tilingii* Greene.)

The silky pubescence and few teeth of the leaflets best mark

this species. It grows in the pine forests at middle altitudes, as at Yosemite Valley and Hog Ranch.

3. **H. unguiculàta** Rydb. Stems numerous, 6 to 15 in. high, leafy to the top. Leaves 2 to 5 in. long, grayish with scattered hairs; leaflets numerous and crowded (30 or more), ¼ in. or less long, divided to the base into linear segments. Flowers white, the calyx commonly purplish. (*Ivesia unguiculata* Gray.)—Remarkable for its leafy stem and soft, crowded leaflets. First described from specimens gathered at Westfalls Meadows by H. N. Bolander (alt. 8000 ft.) but now known to range south to Fresno Co.

4. **H. gordònii** Hook. Flowering stems 2 to 8 in. high, nearly leafless. Leaves basal, ¾ to 3 in. long, scarcely petioled, green or yellowish green, obscurely hairy; leaflets numerous, about ⅛ to ¼ in. long, cleft nearly to base into narrow divisions, closely placed but not entirely masking the leaf-stalk. Flowers yellow, in slightly branched or more head-like terminal clusters. (*Ivesia gordonii* T. & G.)

The narrow leaves of this plant form dense tufts resembling clumps of certain mosses. It grows only near timberline and many forms occur. One, with conspicuous petals exceeding the calyx, is the var. *megalopetala* Rydb. Another, with very dwarf habit and bristle-tipped leaves, has been called *H. pygmaea* Rydb. A third form, likewise dwarfed, with leaves only 1 in. long, the minute segments densely crowded (not bristle-tipped) is *H. lycopodioides* Rydb.; it comes from Mt. Hoffmann and Mt. Dana. Such forms, however, do not serve well for species.

5. **H. mùirii** Rydb. Stems erect, slender, 1 to 5 in. high. Leaves 1 to 1½ in. long, terete, white or pale and silky with a dense soft hairiness; leaflets very numerous, minute, completely covering the central stalk nearly to the base. Flowers in white-hairy heads, the minute yellow petals linear. (*Potentilla muirii* Greene.)

This is a most peculiar Alpine plant, with its dense, basal tuft of worm-like leaves, and short, nearly naked flowering stalks each capped by a round head of minute flowers. It inhabits gravelly slopes high up on Mt. Hoffmann, where it was first found by John Muir, in whose honor it was named.

9. STELLARIÓPSIS.

1. **S. santolinoìdes** Greene. Stems slender, erect, ½ to 1 ft. high, nearly naked, widely branched above. Leaves cylindric, 1 to 3 or 4 in. long, gray and silky with a dense pu-

bescence; leaflets minute, scale-like, imbricated. Petals white, exceeding the short sepals. Stamens 15. Pistil only 1. (*Ivesia santolinoides* Gray.)

The peculiar, worm-like leaves form the most striking feature of this plant, which may also be known by its very diffuse panicle of numerous flowers. It always grows in sandy, open places and is especially plentiful on the gravelly domes around the Yosemite. It was first discovered by H. N. Bolander, of the State Geological Survey, along the Merced River at 9000 ft. alt.

10. SIBBÁLDIA.

1. **S. procúmbens** L. Leaves softly hairy, compound, with 3 terminal leaflets, the lower petioles ½ to 3 in. long; leaflets broadly wedge-shaped, 3 to 5-toothed at apex, ¼ to ¾ in. long, short-stalked. Flowers few, distinctly pediceled. Petals 5, yellow, spatulate, shorter than the calyx. Stamens 5. Pistils 5 to 20, the fruit dry.

The general appearance of Sibbaldia suggests strawberry plants, but the numerous flowering stems, 2 to 6 in. high, all spring from a mat of basal leaves on a strong, perennial taproot, there being no creeping stems. It grows only on the higher mountains and is much dwarfed above timber-line.

11. GÈUM.

1. **G. macrophýllum** Willd. Stems erect, 1 to 2 ft. high, stiff-hairy. Leaves mostly basal, 4 to 18 in. long including the petiole; the terminal leaflet nearly orbicular, lobed and coarsely toothed, 2 to 6 in. wide; other leaflets smaller, some minute. Flowers yellow, ½ to ¾ in. across, calyx-lobes reflexed. Stamens numerous. Pistils numerous.

This perennial herb is at once recognized by the bur-like fruits and odd leaves, the large, terminal leaflet being out of all proportion to the others. It grows in shaded places from the foothills and Yosemite Valley to Tuolumne Meadows. In *G. triflorum* Pursh., of Tahoe and northward, the leaves are cut into many narrow segments, the flowers are purplish, and the akenes have straight, feathery tails.

12. CHAMAEBÀTIA.

1. **C. foliolòsa** Benth. KIT-KIT-DIZZE. A low intricately branched fragrant shrub. Leaves obovate-oblong, ½ to 3 in.

long, several times pinnately dissected into minute crowded lobes. Flowers white, ½ in. across, pediceled in loose terminal clusters. Petals 5, obovate. Stamens many. Pistil 1, simple.

Kit-kit-dizze, the Indian name of this charming, fern-like, little plant has been adopted at the suggestion of Dr. C. Hart Merriam. Although sometimes called "Bear Clover," bears will have nothing to do with it, and "Mountain Misery," another of its names, is wholly inappropriate. It is often known as "Tarweed," but the true tarweeds are all Compositae. The finely cut foliage forms fragrant carpets in open pine forests of middle and lower altitudes. On warm days the odors distilled from the resinous leaves are very suggestive of healing properties. The plant has been collected in large quantities for medicinal purposes.

13. CERCOCÁRPUS. Mountain Mahogany.

1. **C. parvifòlius** Nutt. Mountain Mahogany. Hard Tack. Stems woody, 6 to 12 ft. high, with a thin gray bark. Leaves simple, obovate, coarsely toothed above the middle, veiny, glabrous above, ½ to 2½ in. long. Flowers in clusters of 2 or 3. Calyx with a slender stem-like tube and salverform limb. Petals none. Stamens numerous. Pistil 1, becoming a 1-celled akene with a twisted feathery tail 2 in. long.

The exceedingly hard and beautiful wood of this loosely spreading shrub has given its common name. It grows in Hetch Hetchy Valley and the lower foothills, where whole slopes are sometimes made gray by its peculiar, feathery-tailed seed-bodies. On the easterly slope of the Sierra Nevada, as near Mono Pass, and in some parts of southern California, it is replaced by a species with narrow, entire leaves (*C. ledifolius* Nutt.).

14. ROSA. Rose.

1. **R. califórnica** C. & S. California Wild Rose. Stems erect, 1 to 6 ft. high, with stout recurved prickles. Leaves pinnate, hairy; leaflets 5 or 7, ovate to elliptic, sharply toothed, ¾ to 1½ in. long. Flowers pink, ½ to 1 in. across. Petals 5 to 8, rounded. Stamens numerous. Ovaries many, hard at maturity and enclosed in the globose fleshy calyx-tube, which is called a "hip."

This common rose grows around all the meadows of Yosemite, Hetch Hetchy, and other low valleys, but reaches 6000 ft. alt. in a dwarfed form. The flowers are both abundant and fragrant.

15. PRÙNUS. Cherry. Plum.

Shrubs or small trees with reddish astringent bark, simple leaves, and showy white flowers. Petals 5. Stamens 15 to 30. Pistil 1. Fruit globose, without bloom, the pulp covering a bony stone.

1. **P. emarginàta** Walp. Bitter Cherry. Leaves oblong-obovate, obtuse, finely toothed, ¾ to 1¾ in. long, on petioles ¼ in. or less long; blade with 1 or 2 glands on the narrowed base. Flowers white, 3 to 10 in each lateral cluster. Cherry oval, bright red, bitter.

Many a thicket in the mountains is formed of this shrub, especially where the soil is fairly moist and at more than middle altitudes. The cherries have a slight tonic effect and are used medicinally by mountaineers, who allow them to stand in whiskey or brandy and then drink the extract.

2. **P. demíssa** Walp. Western Choke-cherry. Leaves oblong or broad-elliptic, acute, finely toothed, 1½ to 3 in. long; petiole ¼ to ½ in. long, with 1 or 2 glands just below its summit. Racemes 2 to 4 in. long, each with 20 to 50 white flowers. Cherry dark purple, bitter.

The Choke-cherry is a graceful shrub, often 6 to 15 or even 50 ft. high. The beautiful fruits are very attractive during the summer months but their strongly astringent qualities are not pleasing to the taste. The plant grows in moist places up to 6000 ft. and is often met with in the Yosemite.

3. **P. subcordàta** Benth. Sierra Plum. Leaves elliptic or almost round, ¾ to 1½ in. long; petiole about ¼ in. long. Flowers 2 to 4 in a cluster, white. Fruit a red plum, ¾ to 1 in. long, either with dry pulp or juicy and edible.

The stiff, crooked stems of the wild plum are usually 3 to 6 ft. high and much branched. The plant, which is seldom seen in bloom, grows in the lower part of Yosemite Valley, in Hetch Hetchy Valley, etc. With us the fruit usually remains small and dry but in the northern Sierra Nevada it becomes large and is gathered in quantity, both for eating fresh and for preserving. The plums are exceptionally fine in Plumas and Modoc counties, where, in addition to the red-fruited form, there is one with yellow fruits.

LEGUMINOSAE. Pea Family.

Herbs and shrubs, ours with alternate compound leaves with stipules. Calyx 5-toothed or in Lupinus 2-lipped. Corolla of 5 petals, irregular and butterfly-like; the upper petal is the banner, the lateral petals are the wings, the 2 lowest petals unite by their edges to form the keel. Stamens 10, united into a sheath around the ovary, or 1 of them free. Pistil 1, maturing into a 1-celled several-seeded pod.

A. Flowers in racemes.

Leaflets 3; flowers small, yellow.....2. Medicago.
Leaflets more than 3.
  Leaves palmate, the leaflets all from the summit of the petiole .....1. Lupinus.
  Leaves pinnate, the leaflets arranged along the sides of the common axis.
    Leaves not tendril-bearing.....5. Astragalus.
    Leaves ending in slender tendrils.
      Style hairy all around the summit.....6. Vicia.
      Style hairy on the upper side only.....7. Lathyrus.

B. Flowers in heads or in umbels or solitary.

Leaves palmately compound, the 3 leaflets all from the summit of the petiole.....3. Trifolium.
Leaves pinnately compound.....4. Hosackia.

Cercis occidentalis Torr., the Western Red-bud or Judas Tree, grows in the foothill cañons below our borders. It is a shrub with reddish flowers appearing in spring before the simple, rounded leaves.

1. LUPÌNUS. Lupine.

Herbs and low shrubs with palmately compound leaves of more than 3 leaflets. Flowers showy, in terminal racemes or spikes. Calyx 2-lipped. Pod oblong, flattened, 2 to 12-seeded.

A. Annuals.

Flowers ⅜ in. or less long, purplish and white..... 1. *L. micranthus.*
Flowers over ½ in. long, pink and yellow..... 2. *L. stiversii.*

B. Perennials.

Leaflets mostly 1½ in. or more long.
  Leaves green and nearly glabrous..... 3. *L. longipes.*
  Leaves pale, long-hairy..... 4. *L. covillei.*
Leaflets under 1½ in. or rarely 2 in. long.
  Flowers ½ in. or more long.
    Keel hairy on the inner edge.
      Banner glabrous; pubescence slightly spreading.. 5. *L. grayi.*
      Banner hairy on back; foliage silvery-pubescent.. 6. *L. ornatus.*
    Keel entirely without hairs..... 7. *L. formosus.*

Flowers less than ½ in. long.
Petioles longer than the leaflets.
Stems 1½ to 3 ft. high..... 8. *L. albicaulis.*
Stems rarely over 1 ft. high.
Leaflets acute.
Flowers blue or pink..... 9. *L. confertus.*
Flowers nearly white; dwarf.....10. *L. danaus.*
Leaflets obtuse, silky; matted plant.....11. *L. breweri.*
Petioles mostly shorter than leaflets; erect white-hairy plant; flowers not ¼ in. long.....12. *L. meionanthus.*

1. **L. micránthus** Dougl. SMALL-FLOWERED LUPINE. Stems several from the base, leafy, 5 to 15 in. high, gray-pubescent. Leaflets linear or linear-oblanceolate, ½ to 1 in. long, densely gray-pubescent on both sides. Flowers scarcely ¼ in. long, mostly in 3 to 6 whorls, blue or purplish, the banner with a central white spot which changes to purple.

Throughout the length of California, especially on the plains and in the foothills, we find this to be the most abundant lupine. In our district it ranges up to 4000 ft. alt., as in Yosemite Valley. A common form, or perhaps a distinct species, is the var. *bicolor* Wats., known by its larger flowers (¼ to ⅜ in. long); this is plentiful on the flats around Wawona and along the Tuolumne River below 4500 ft. alt. The root-tubercles are usually well formed in these annual species, indicating their ability to fix atmospheric nitrogen through the aid of bacteria, and in this way they enrich the soil in which they grow, especially if plowed under at maturity.

2. **L. stivérsii** Kell. Stem much branched, leafy, 6 to 18 in. high, finely pubescent. Leaflets obovate or wedge-shaped, obtuse, ½ to 1½ in. long, green and succulent, sparsely hairy. Flowers fully ½ in. long, scattered in the raceme; banner yellow, fading to salmon-color; wings rose-pink.

In point of color, this is the most striking of all our lupines, the large flowers being yellow in the center and with a bright-pink or rose-color border. It always grows in warm, sandy or gravelly places and is restricted to the western slopes of the middle Sierra Nevada and a few localities in the Coast Ranges. In our district it has been found sparingly from the foot of El Capitan to El Portal, on several slopes near Wawona, on Sawmill Mt., and near Hog Ranch. *L. citrinus* Kell., with pure-yellow flowers, may be expected in similar situations.

3. **L. lóngipes** Greene. A leafy bushy plant, 2 to 6 ft. high. Leaflets 7 to 11, lanceolate, acute, 2 to 4 in. long, green and little if at all hairy. Flowers about ½ in. long, in elongated racemes, blue or lavender, the banner with white center,

the keel hairy on inner edge. Pods about 7-seeded, the seeds flattened.

The green, leafy clumps of this lupine, plumed with numerous racemes of blue flowers, may be seen in springy places and around nearly any of our meadows from the altitude of Wawona well up toward timber-line. Plants growing in wet meadows are usually more succulent and larger-flowered than those which inhabit the half-dry borders a short distance away.

4. **L. covíllei** Greene. Stems in rounded clumps, 1½ to 2½ ft. high, leafy up to the flowers. Leaflets 7 to 9, very narrowly lanceolate, 1½ to 4 in. long, shaggy with long hairs. Flowers about ½ in. long, in dense racemes, equalled by the persistent bracts, purple. Pods shaggy, about 1 in. long, 5 or 6-seeded.—Mt. Hoffmann, Lake Tenaya, Seavey Pass, Tilden Lake, and elsewhere at high altitudes.

5. **L. gràyi** Wats. Stems scarcely woody at base, growing in rounded clumps about 1 ft. high, naked near the flowers. Leaflets 7 to 9, oblanceolate, ¾ to 1¼ in. long, gray with a somewhat spreading dense pubescence, not shining. Flowers ½ in. long, blue or purple, the banner yellow in the middle and entirely glabrous on the back, even in bud; keel hairy along the upper edge.

This beautiful and fragrant plant, which was named in honor of Dr. Asa Gray, and so might be called Gray's Lupine, often covers whole hillsides in the open pine forest. Its range extends from about 4000 ft. alt., as in Yosemite Valley and near Wawona (the type locality), to at least 6500 ft., as in Little Yosemite and Aspen valleys. Excellent specimens may be seen on the pine flats above Mirror Lake.

6. **L. ornàtus** Dougl. Similar to *L. grayi*, but the stems woody, often forming distinct trunks, and the plant bushy; foliage shining and silvery with closely appressed hairs; banner hairy on the back, especially in bud.—Of low altitudes, as along the slopes of Merced Cañon below Yosemite Valley; even more handsome than no. 5, because of its bush-like habit and silvery foliage.

7. **L. formòsus** Greene. Stems weak, often curved at base, usually many in a rounded clump, 1½ to 3 ft. high, leafy nearly to the flowers. Leaflets 7 to 9, linear-lanceolate, ¾ to 1½ in. long, silky-hairy. Flowers ½ in. long, "rich violet," the keel glabrous.—Plentiful around Wawona and elsewhere at low altitudes; a beautiful and showy species.

8. **L. albicaúlis** Dougl. Habit and appearance of *L. for-*

mosus but the pubescence sparse and appressed, the flowers smaller and less brightly colored, tawny to dull blue, the keel much exposed.—Scattered throughout the lower part of the Yellow Pine Belt, in a mostly blue-flowered form. Flowers sometimes nearly as large as in *L. formosus,* which may be only a variety of this. In the Botany of California, *L. parviflorus* is reported from the Yosemite, but the specimens the authors had in mind were apparently *L. albicaulis.*

9. **L. confértus** Kell. Stems erect, 6 to 15 in. high, each ending in a naked-peduncled raceme. Leaflets 5 to 8, narrowly oblanceolate, acute, ½ to 1½ in. long, gray with loose spreading hairs. Flowers crowded, about ⅜ in. long, blue or pinkish, the banner oblong and keel hairy along the upper edge.

Under this species we are obliged to retain a large number of forms until the group is more thoroughly worked out by specialists. Genuine *L. confertus* is an erect plant with conspicuous bracts and is common in many of our drier meadows. A smaller plant of the dry hillsides, with leaves only ¼ to ¾ in. long, has passed as *L. minimus,* which is perhaps a different species of Oregon and northward.

10. **L. danàus** Gray. An Alpine dwarf, the stems often prostrate, 1 to 4 in. high. Leaflets 4 to 6, acute, ⅛ to ½ in. long, gray-hairy. Flowers few, crowded, about ¼ in. long, pale pink or nearly white, the keel tipped with purple and hairy along its upper edge.—Only above or near timber-line, the original specimens from Mt. Dana at about 12,500 ft. alt.

11. **L. bréweri** Gray. Stems woody, spreading, 9 in. or less long, very leafy. Leaflets 6 to 10, obovate, obtuse, ¼ to ¾ in. long, soft and nearly white with appressed silky hairs. Flowers crowded, ¼ in. long, blue, the banner roundish, the keel hairy along upper edge.

This plant grows in gray, leafy mats studded with the compact, blue, flower-clusters which are only 2 in. or less long. It inhabits gravelly ridges and slopes above 5000 ft. alt., being very common on El Capitan, Sentinel Dome, and similar summits. The original specimens came from the "Yosemite trail, alt. 6000 ft."

12. **L. meionánthus** Gray. Stems erect, from a woody root, 1 to 2 ft. high, very leafy up to the flowers. Leaflets 5 to 7, narrowly lanceolate, acute, ¾ to 1 in. long, mostly longer than the petioles, silvery with soft hairs. Flowers pale blue, scarcely ¼ in. long.—From the Minarets and Rancheria Mt. to Tahoe and Nevada.

2. MEDICÀGO.

Herbs with pinnately compound leaves (leaflets only 3) and small usually yellow flowers in short racemes. Introduced plants of some forage value, now running wild. The ordinary Alfalfa, with blue flowers, is a member of this genus.

1. **M. híspida** Gaertn. Bur Clover. Herbage nearly glabrous. Leaflets obovate, about ½ in. long, rigidly toothed. Peduncles 3 to 5-flowered. Pod twisted into 3 to 5 coils, the thin edge with hooked or curved prickles. (*M. denticulata* Willd.)—Sparingly introduced; the stems, which are a few inches to 2 ft. long, lie flat on the ground and bear numerous burs.

2. **M. lupulìna** L. Nonesuch. Black Medick. Much like Bur Clover but with more flowers and kidney-shaped 1-seeded pods which are not at all bur-like.—Grows at Crockers and perhaps elsewhere near settlements.

M. apiculata Willd., if found, may be distinguished by its several-seeded, spirally coiled, unarmed pods. Otherwise it is exactly like *M. hispida.*

3. TRIFÒLIUM. Clover.

Herbs with palmately compound leaves (leaflets 3 in our species) and white, red or purple flowers in head-like clusters. Pod oblong, 1 to 8-seeded.

A. Flower-heads subtended by an involucre of distinct or united bracts.

Bracts minute (rarely $\frac{1}{16}$ in. long) ..... 1. *T. monanthum.*
Bracts conspicuous, at least half as long as calyx.
  Herbage plainly pubescent.
    Involucre flat; flowers over ½ in. long ..... 2. *T. obtusiflorum.*
    Involucre cup-shaped; flowers much smaller ..... 6. *T. microcephalum.*
  Herbage glabrous.
    Heads over ½ in. broad; leaflets mostly ¾ in. long.
      Leaflets linear or linear-lanceolate, not veiny ... 3. *T. tridentatum.*
      Leaflets broader, veiny ..... 4. *T. spinulosum.*
    Heads less than ½ in. broad; leaflets mostly ¼ in. long ..... 5. *T. variegatum.*

B. Flower-heads naked.

Plant conspicuously pubescent.
  Leaflets acute ..... 7. *T. longipes.*
  Leaflets obtuse.
    Heads dense, conic, rose-red ..... 8. *T. pratense.*
    Heads dense, gray; calyx-teeth long-hairy ..... 13. *T. macraei.*
    Heads loose, pale ..... 9. *T. breweri.*

Plant glabrous.
Root perennial.
Flowers white; introduced species.....10. *T. repens.*
Flowers purplish; native species.....11. *T. bolanderi.*
Root annual; native species.....12. *T. gracilentum.*

1. **T. monánthum** Gray. Stems numerous, mostly spreading from a thick root, inch or two to a foot long. Leaves obovate, ⅜ in. or less long, nearly entire. Heads on peduncles rarely ½ in. long; involucre of 4 to 9 distinct bracts not ⅛ in. long. Flowers white (often pink-veined) with dark-purple centers. Pod 1 to 3-seeded.

This clover, which ranges from middle altitudes to above timber-line, was first described from specimens collected at the Soda Springs of the Tuolumne. These were of the subalpine form, in which the plants are nearly glabrous and the heads only 1 to 3-flowered. At lower elevations the stems are longer and more spreading, the herbage more hairy, and the heads 3 to 8-flowered. This latter form is the var. *parvum* McDer. (*T. multicaule* Jones). None of our other species resemble this one, except no. 5, and that has larger, toothed bracts.

2. **T. obtusiflòrum** Hook. Stems stout, erect, 1 to 2 ft. high. Leaflets narrow-elliptic or oblanceolate, about 1 in. long, ¼ in. wide, with many spine-like teeth; stipules large, cut-toothed. Heads purplish, 1 in. or more across, on peduncles 1 to 3 in. long; involucre irregularly cut into many spine-like lobes.

The remarkable clamminess readily distinguishes this species in the field, the robust plants being wet, as though with dew, even on dry days. The heads are larger than in any of our other clovers. It grows above Mirror Lake, near the El Capitan Bridge, near Alder Creek, at El Portal, etc., and is probably not rare in the mountains although nowhere abundant.

3. **T. tridentàtum** Lindl. Stems erect from a curved base, very slender, ½ to 1½ ft. high. Leaflets slenderly lanceolate or linear, ¾ to 1¼ in. long, sharply toothed, the tip awl-like; stipules toothed. Heads purplish, ¾ in. across, on peduncles 1 or 2 in. long; involucre with slender lobes.—Shady places in the foothills, but reaching 6200 ft. alt. in Little Yosemite Valley.

4. **T. spinulòsum** Dougl. Stems decumbent to erect, stout, 6 to 12 in. high, the whole plant glabrous. Leaflets broad-elliptic or oblong, mostly ¾ in. long and ¼ to ⅜ in. wide, short-tipped, minutely sharp-toothed, the midrib and cross-

veinlets prominent; stipules large, toothed. Heads white and purple, ¾ in. across, on peduncles 1 or 2 in. long; involucre deeply cut into awl-shaped lobes.—Grassy places at moderate altitudes; considered by some botanists to be a form of *T. involucratum* Willd.

5. **T. variegàtum** var. **pauciflòrum** McDer. Stems very slender, 9 in. or less high. Leaflets obovate, obtuse, ⅜ in. or less long, minutely toothed. Heads purplish, 1 to 7-flowered, ¼ in. or less broad, on peduncles rarely exceeding ½ in.; involucre irregularly cleft. Pod 2-seeded. (*T. geminiflorum* Greene. *T. pusillum* Greene.)

The weak stems of this clover, which is widely distributed except in the high mountains, are commonly reclining or supported by other plants. It is best distinguished by the involucre which, although evident, is smaller than in any other species except no. 1 and subtends but few flowers.

6. **T. microcéphalum** Pursh. Small-headed Clover. Stems weak, spreading, 3 to 15 in. long, the herbage loosely hairy. Leaflets spatulate and obcordate, ½ in. or less long, ¼ in. or less wide, toothed toward the apex; stipules ovate, tapering to a slender tip, mostly entire. Flower-heads rose-color to white, usually ⅓ in. across, on peduncles ½ to 1¼ in. long; involucre cup-shaped, with 7 to 10 nearly entire lobes.—Common, especially in the lower parts of our district.

7. **T. lóngipes** Nutt. Stems stout, 3 to 12 in. high, the dense foliage often forming a sod, the herbage pubescent. Leaflets linear-oblong (early ones roundish), acute, ¾ to 1¼ in. long, sharply toothed. Heads purplish, becoming brown, dense, ¾ to 1 in. across; flowers nearly sessile, permanently erect. Peduncles stout, 2 or 3 in. long.—In meadows from 4600 ft., as at Lake Eleanor, nearly to timber-line.

8. **T. praténse** L. Red Clover. Stems stout, erect, ½ to 2 ft. high, the herbage glabrous. Leaflets large, ovate to elliptic, nearly or quite entire. Heads large, conic.—Introduced and running wild near the settlements.

9. **T. bréweri** Wats. Stems weak but usually ascending, 6 to 18 in. long, leafy throughout, the herbage sparsely pubescent. Leaflets oblanceolate to roundish, ¼ to ¾ in. long, toothed. Flowers whitish or purplish, few and loose in the head, slender-pediceled, becoming reflexed. Peduncles ½ to 2 in. long, spreading.

"Clark's, Yosemite Valley" is the locality where this species was first discovered. It is now known to be fairly common

in the middle Sierra Nevada, growing in rather dry soil of open pine forests.

10. **T. rèpens** L. White Clover. Stems short, numerous, forming a sod. Leaflets broadly reverse-heart-shaped or roundish. Heads medium-sized, roundish, the flowers white. —Escaped from some of the meadows where introduced for agricultural purposes.

11. **T. bolánderi** Gray. Stems 1 ft. or less high, nearly naked save at the leafy branching base, the herbage glabrous throughout. Leaflets narrowly obovate, obtuse, nearly entire, ¼ to ½ in. long. Heads purplish, ½ in. wide, on peduncles 2 to 6 in. long. Flowers pediceled, at length reflexed in the head.

This rare clover is peculiar in having very long peduncles terminated by umbrella-like heads of reflexed flowers. It is known only from above the Yosemite Valley, where it has been found at Westfall's and Peregoy's meadows. The former is the type locality.

12. **T. graciléntum** T. & G. Pin-point Clover. Stems erect, slender, ½ to 1 ft. high, the herbage glabrous. Leaflets broadly wedge-shaped, notched at the broad summit, toothed, about ½ in. long. Peduncles ¾ to 5 in. long. Flowers pale or purplish, becoming reflexed, thus exposing the pin-like central stalk.—Of the lowlands, but reaching Wawona.

13. **T. macraèi** H. & A. Stems stout, often wiry, much branched at base, the herbage grayish hairy. Leaflets wedge-shaped, obtuse, toothed above the middle, ½ to 1 in. long. Heads sessile or on short peduncles, rendered gray by the long hairs of the calyx-teeth. Flowers purplish, permanently erect.—A foothill species reaching Wawona.

4. HOSÁCKIA.

Herbs with pinnately compound leaves and whitish yellowish or purplish flowers borne solitary or in small clusters on bracted peduncles. Calyx-teeth 5, nearly equal. Pod flat or nearly cylindric, several-seeded, never inflated.

Annuals; peduncles 1 or 2-flowered.
  Leaflets mostly 3; stems erect.....1. *H. americana.*
  Leaflets mostly 4 (3 to 7).
    Pods glabrous; flowers minute.....2. *H. parviflora.*
    Pods pubescent; flowers ¼ in. or more long.....3. *H. strigosa.*
Perennials; several flowers terminal on each peduncle.
  Stipules large; pods nearly straight, opening at maturity.
    Corolla purplish .....4. *H. crassifolia.*
    Corolla yellow and white.....5. *H. torreyi.*

Stipules gland-like; pods incurved, not opening.
Stems prostrate, hairy; leaflets obovate.....6. *H. decumbens.*
Stems nearly erect; leaflets oblong.....7. *H. glabra.*

1. **H. americàna** Piper. Spanish Clover. Dakota Vetch. Stem erect, ½ to 2 ft. high, leafy and hairy throughout. Leaflets 1 to 3, ovate or oblong, ½ to 1 in. long. Flowers $\frac{5}{16}$ in. long, salmon-colored; the peduncle exceeding the leaves. Pod ¾ to 1 in. long; seeds oblong, smooth. (*Lotus americanus* Bisch.)

The Spanish Clover is an abundant species throughout the arid foothill belt, where it is an important forage plant for late summer feed. It rarely occurs above 5000 ft. alt., but is very common on the floor of Yosemite Valley, where it grows in a small form and exhibits a wide range of variation, especially as to the amount of pubescence of the herbage.

2. **H. parviflòra** Benth. Stems 3 to 8 in. long, prostrate or with ascending branches. Leaflets 3 to 5, nearly glabrous, obovate to oblong, obtuse, less than ½ in. long. Flowers pale pink, turning red, about ⅛ in. long, on bracted peduncles shorter than the leaves. Pod glabrous, the edges thickened; seeds roundish, smooth. (*Lotus micranthus* Benth.)—Moist soil at the foot of Yosemite Falls and elsewhere at moderate altitudes; best distinguished by the green herbage and small flowers.

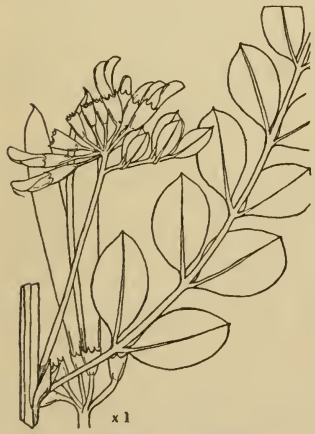
3. **H. strigòsa** var. **hirtélla** Hall. Stems 4 to 12 in. long, nearly prostrate, with short spreading hairs. Leaflets 4 to 7, very hairy, oblong, obtuse, ¼ to ½ in. long. Flowers yellow, about ⅜ in. long; the peduncles either shorter or longer than the leaves, each usually with a bract at summit. Pod hairy, with thin edges; seeds square, rough, notched on one side. (*Lotus hirtellus* Greene.)

This variety is found in the lower part of the pine belt from near the lower end of Yosemite Valley to ridges above Hetch Hetchy. In true *H. strigosa* the leaflets are usually acute and the hairs closely appressed to the stems and leaves, while in our variety the leaflets are obtuse and the hairs spreading. This form occurs wherever the conditions are semi-arid, as along the Sierra Nevada foothills and near the southern deserts.

4. **H. crassifòlia** Benth. Stems stout, 2 to 3 ft. high, the

herbage dull green and nearly glabrous. Leaflets 9 to 15, thick, obovate or oblong, obtuse, ½ in. or more long. Flowers numerous, in a compact umbel, ¼ to ½ in. long, the peduncle shorter than the leaves. Pod thick, 2 to 2½ in. long. (*Lotus crassifolius* Greene.)

Under favorable conditions the sturdy plants of this species appear in abundance, forming miniature thickets. Whether growing thus together or as scattered individuals, they have a clean, wholesome appearance, perhaps due to their smooth herbage and upright habit of growth. Even the pods are full and fat, as though they might yield peas fit for the table. There is reason to suspect, however, that the seeds are poisonous. This is a rather common species throughout the Yellow Pine Belt, extending to altitudes of at least 6500 ft.



Hosackia crassifolia

Hosackia torreyi

5. **H. tòrreyi** Gray. Meadow Hosackia. Stems often 1 to 2 ft. high, mostly glabrous. Leaflets 5 to 11, softly pubescent, narrowly oblong, mostly acute, ½ to ¾ in. long. Flowers ½ in. long, yellow, with white keel and wings, on peduncles which eventually exceed the leaves. Pod flat. (*Lotus torreyi* Greene.)

The stems of the Meadow Hosackia are weak and slender but always erect. It grows in moist, grassy places, especially around springs, the parti-colored flowers often forming yellow-and-white patches of considerable extent. Although confined to altitudes of less than about 7000 ft. the species occurs throughout the whole length of the Sierra Nevada and also in the North Coast Ranges.

6. **H. decúmbens** var. **nevadénsis** Wats. Stems wiry, often 1 or 2 ft. long, the herbage conspicuously hairy. Leaflets 3 to 5, obovate, acute, ¼ to ½ in. long. Flowers numerous, yellowish, ¼ to nearly ½ in. long, the peduncle very short. Pod strongly curved, ¼ in. long, with slender curved beak longer than the body. (*Lotus nevadensis* Greene.)

x 1

The numerous stems of this plant diverge from the perennial root like the spokes of a wheel, forming loose, leafy mats in half-shady and dry places of open pine forests. It is a perennial but sometimes flowers as an annual.

7. **H. glàbra** Torr. Deer-weed. Stems woody at base, 2 to 4 ft. high, sparsely leafy, the herbage nearly glabrous. Leaflets 3 to 6, oblong, ¼ to ½ in. long. Flowers many, yellow, turning red, ¼ in. long, the umbels sessile. Pod with incurved beak. (*Syrmatium glabrum* Vog.)—A foothill species, common at El Portal and elsewhere near our lower borders.

5. ASTRÁGALUS. Loco-weed. Rattle-weed.

Perennial herbs with pinnately compound leaves, true stipules, and pale flowers in terminal racemes. Calyx 5-toothed. Pod 2 to many-seeded, 1-celled or incompletely 2-celled.

Leaflets not prickly-pointed.
  Pod sessile in the calyx.
    Pod bladdery, not woolly.....1. *A. lentiginosus*
    Pod not bladdery, woolly.....2. *A. purshii.*
  Pod narrowed below to a stalk.
    Walls of the bladdery pod thin.....3. *A. whitneyi.*
    Walls of the firm pod thick.....4. *A. bolanderi.*
Leaflets prickly-pointed and rigid.....5. *A. kentrophyta.*

1. **A. lentiginòsus** Dougl. Leaflets 9 to 21, oblong or obovate, entire, about ½ in. long. Flowers white or purple. Pod ½ to ¾ in. long, bladdery-inflated, ovate, stoutly beaked, curved, sessile in the calyx.

The numerous leafy stems give this plant a bush-like appearance, though only 6 to 15 in. high. The typical form is green but there is a var. *fremontii* Wats., with silvery pubescence and larger, nearly straight pods. *A. lentiginosus* grows at Mono Pass, where it inhabits warm, gravelly ridges. It is probably one of the species responsible for the loco disease mentioned under no. 4.

2. **A. púrshii** Dougl. Leaflets 9 to 19, narrowly oblong, ½ in. or less long, crowded, woolly. Flowers dull white, purple-

tipped. Pod 1 in. or less long, ovate, incurved, thick-walled, densely long-hairy, sessile in the calyx.—Eastern ranges of the Sierra Nevada and therefore to be expected along our borders. A compact, gray plant, instantly recognized by its woolly pods.

3. **A. whítneyi** Gray. Leaflets 11 to 19, linear, ¼ to ½ in. long. Flowers violet. Pod 1 to 1½ in. long, balloon-like, with thin walls, glabrous, narrowed at base to a stalk longer than the calyx.—Mt. Warren and other high peaks near the desert; doubtless occurs along our eastern borders.

4. **A. bolánderi** Gray. Leaflets 17 to 27, linear-oblong, entire, ¼ to 1 in. long. Flowers nearly white. Pod 1 in. or less long, slightly inflated, thick-walled, incurved, on a stalk longer than the calyx.

This plant resembles no. 1 but may be distinguished by the narrow leaflets and stalked pods. It varies from green to silvery pubescent. "Yosemite Valley" is given as the type locality, but we did not find it there, although it grows near Eagle Peak, Snow Flat, Peregoy Meadows, and elsewhere in open, gravelly places.

The name "Loco-weed" has been applied to this genus of plants because of their tendency to produce symptoms of insanity in animals when eaten, *loco* being the Spanish for "crack-brained." While most animals will not touch the weeds, some of them, especially young or underfed ones, will occasionally nibble the herbage, then eat more freely, and finally acquire the "loco habit," which is likely to be transmitted to other members of the flock or herd. It has recently been discovered that the poisonous effect is not due to the weed itself but to the metal barium, which the plant takes up from the soil. Since the amount taken up and the form in which it occurs varies with local conditions, a species may be poisonous in one locality and harmless in another, hence the wide difference of opinion among stockmen as to the danger from loco-weeds.

5. **A. kentróphyta** Gray. Leaflets 5 to 7, narrow, rigid and spine-like, not ½ in. long. Flowers only 1 to 5 on each peduncle, whitish. Pod ovate, pointed, ¼ in. long, sessile in the calyx. —A matted plant, 6 in. or less high, found near the summits of Mt. Warren and Mt. Dana and also in the Rocky Mts.

A. CONGDONII Wats. comes from Hites Cove, below the Yosemite Valley and may be known by its linear reflexed pods.

6. VÍCIA. Vetch.

1. **V. americàna** Muhl. Stems 1 to 3 ft. long, from a perennial root, trailing, or climbing by tendrils. Leaflets 4 to 11, much varied in shape and size. Flowers purplish or bluish, ¾ in. long, 4 to 8 in each raceme on peduncles shorter than the leaves. Pod flat, several-seeded. (*V. durbrowi* Eastw.)

Throughout the lower part of the pine belt we find this vetch to be rather common, usually occurring as var. *truncata* Brewer, with leaflets as though cut across at apex and 3-toothed. Vicia is always known by the tuft of hairs completely surrounding the apex of the style, but, aside from this technical character, the plants are much like those of the wild sweet pea.

7. LÁTHYRUS. Sweet Pea.

Perennial herbs with pinnately compound leaves ending in tendrils. Upper teeth of calyx shorter than the lower. Style flattish, hairy only along one side. Pod flat, several-seeded.

1. **L. nuttállii** Wats. Herbage finely pubescent. Leaflets 3 to 6 pairs, elliptic, acute, 1 or 2 in. long, much longer than the sharp arrow-shaped stipules; tendrils commonly short and unbranched. Peduncle 3 to 5-flowered. Corolla reddish purple, drying to blue, ½ to ¾ in. long, the keel abruptly curved upward.

The rather stiff stems of this plant are 9 to 18 in. high and nearly erect. Its range extends from near Eightmile, on the Wawona Road, northward along the lower slopes of the Sierra Nevada. *L. nevadensis* Wats., a related species also to be looked for, has yellowish-white flowers and very much reduced tendrils.

2. **L. sulphùreus** Brewer. Herbage glabrous. Leaflets 6 to 10, not paired, ¾ to 2 in. long, ovate or elliptic, acute or obtuse but with a short needle-like tip; stipules large, often toothed; tendrils branched. Peduncle with 10 to 25 flowers on recurved pedicels. Upper calyx-teeth short, sharp, incurved. Corolla dull white (banner purple-veined), soon turning to a yellowish brown, ½ in. long, very obtuse.

This species has leafy stems, 1½ to 3 ft. long. The numerous whitish or brown flowers, borne in crowded racemes, distinguish it from the others. It is not rare in the lower part of the pine belt, growing in small patches and isolated clumps.

3. **L. graminifòlius** White. Herbage glabrous or nearly so. Leaflets 2 or 3 pairs, linear, pointed, 1½ to 3 in. long; stipules

small, narrow; tendrils simple or branched. Peduncle with mostly 3 (2 to 10) spreading flowers. Corolla ⅜ in. long, nearly white but variable as to color. (*L. paluster graminifolius* Wats.)

The numerous, grass-like leaves are much narrower in this species than in the others and the stems are rarely over 1 ft. long. It grows in open pine forests near Crockers and at Big Meadows. Although apparently rather rare in California, it has a wider range than our other species, extending southward to Mexico.

GERANIACEAE. Geranium Family.

Herbs with lobed dissected or compound leaves and regular flowers. Sepals and petals 5 each, the stamens twice as many (5 in Erodium) and distinct. Ovary 5-lobed, each lobe becoming a 1-seeded nutlet.

Leaves palmately lobed.....1. Geranium.
Leaves pinnately dissected or compound.
  Flowers ¼ in. long, purple; stems prostrate.....2. Erodium.
  Flowers ½ in. long, whitish; stems erect.....3. Floerkia.

1. GERÀNIUM. Geranium.

Herbs with forking stems, swollen joints, and alternate stipulate palmately parted leaves. Petals deciduous. Styles united around an elongated axis, becoming coiled tails of the seed-bodies.

1. **G. carolinià̀num** L. Carolina Geranium. Stems slender, weak, ½ to 1½ ft. long. Herbage pubescent. Leaves roundish, 1 to 2 in. across, parted into 5 to 7 wedge-shaped toothed obtuse segments. Petals pink, about ¼ in. long.

This is a naturalized annual from the Eastern United States, now found as far into the mountains as the Hetch Hetchy and Yosemite valleys. *G. dissectum* L., differing in its purple flowers and acute leaf-lobes, is also to be expected.

2. **G. incìsum** Nutt. Stems erect, 1 to 2 ft. high; herbage pubescent with rather short dingy hairs, glandular. Leaves 2 to 4 in. broad, roundish, palmately parted into 3 to 5 lobes which are again cleft or toothed. Petals pinkish, with deeper-red veins, hairy within, ½ to ¾ in. long.

This pink-flowered geranium, which grows from thick, perennial roots, is a pleasing and not uncommon inhabitant of the Yellow Pine Belt. In exposed places the plants are small and very hairy, in the shade they become taller and smoother. Occasionally they produce albino flowers and can then scarcely be distinguished from the next species.

3. **G. richardsònii** F. & M. Distinguished from *G. incisum* by its white but roseate-veined petals and by its longer white hairs mostly tipped with purple glands.—Indian Creek at 7300 ft. and elsewhere in the higher mountains.

2. ERÒDIUM. Storksbill.

1. **E. cicutàrium** L'Her. Red-stem Filaree. Herbage with scattered spreading hairs. Leaves opposite, 1 to 4 in. long, compound; leaflets ovate or oblong, sharply cut and irregularly toothed. Flowers small, rose-purple, on long pedicels. Sepals with 1 or 2 bristle-like hairs. Filaments not toothed (as in related species).

This, the common Filaree, or Alfilerilla, is a prostrate annual which has made its appearance at a few places along our lower borders. It is very abundant in the foothills and on the plains, where it is considered to be one of the most important of the introduced forage plants.

3. FLOÉRKIA. Meadow Foam.

1. **F. álba** Greene. Stems weak, 6 to 12 in. long, the young parts and buds with long hairs. Leaves alternate, cut into linear-lanceolate acute segments ¼ to ½ in. long, without stipules. Petals persistent, yellowish white, often roseate at top, about ½ in. long. Seed-bodies very rough.

The very flaccid stems and finely cut leaves best mark this pretty annual, which has been found in Hetch Hetchy Valley and along the Hog Ranch Road, where it forms white, billowy patches. It also grows at an altitude of 7000 ft. on Piute Creek. Although the buds are characteristically hairy, or even woolly, the calyx becomes nearly glabrous at maturity. In this adult stage our plant is scarcely distinguishable from *F. douglasii*, the common Meadow Foam of middle California and the Sierra Nevada foothills. But that species is entirely glabrous, even when young.

LINACEAE. Flax Family.

Smooth plants, the leaves either opposite or alternate. Flowers loosely clustered, regular, the petals falling early. Represented with us by only one genus.

1. LÌNUM. Flax.

Glabrous herbs with sessile, narrow leaves without stipules. Sepals and petals 5 each. Stamens 10. Styles 2 to 5, distinct. Ovary superior, becoming a several-celled, many-seeded capsule.

1. **L. lewísii** Pursh. Blue Flax. Perennial plant with several stems from a woody base, 1 to 2½ ft. high. Leaves alternate, linear, acute, entire, ½ to 1 in. long. Corolla blue, ½ to 1 in. across, pediceled.

The conspicuous blue flowers of this flax, borne on stiffly erect leafy stems, may be seen in open places at nearly all altitudes, but the species is nowhere abundant. While resembling the cultivated flax from which linen fiber and linseed oil are made, it grows from a perennial instead of an annual root. The fiber, although strong, is not present in sufficient quantity for commercial purposes.

2. **L. dígynum** Gray. Annual plant with erect stem simple below, ½ to 1 ft. high. Leaves opposite, elliptic, ½ in. or less long, the upper sometimes toothed. Corolla yellow, less than ¼ in. across, short-pediceled.—A small-flowered annual, found in rather dry meadows of moderate altitudes, as at the Hog Ranch and near the Yosemite.

3. **L. micránthum** Gray. Stem solitary, from an annual root, freely branched above, ½ to 1½ ft. high. Leaves linear, obtuse, ¼ to ¾ in. long. Flowers white or pinkish, numerous, less than ¼ in. across, slender-pediceled.—Reported from near Yosemite Valley.

EUPHORBIACEAE. Spurge Family.

Represented with us by only two genera of homely herbs with simple leaves and inconspicuous flowers without petals. Ovary superior, 3 or 1-celled.

Capsule 1-celled; herbage densely pubescent.....1. Eremocarpus.
Capsule 3-celled; herbage glabrous.....2. Euphorbia.

1. EREMOCÁRPUS.

1. **E. setígerus** Benth. Turkey Mullein. A low branched annual, forming leafy mats 1 or 2 ft. wide, densely stiff-hairy throughout. Leaves alternate, or the upper opposite, thick, ovate, ¼ to 1½ in. long. Flowers minute; the pistillate in the lower axils, without calyx; the staminate in terminal clusters, with calyx.—Dry places in the foothills, reaching El Portal and Hetch Hetchy Valley.

2. EUPHÒRBIA. Spurge.

Ours glabrous herbs with staminate and pistillate flowers on the same plant, each flower surrounded by a calyx-like involucre. Capsule slender-pediceled, 3-celled, each cell 1-seeded.

1. **E. serpyllifòlia** Pers. THYME-LEAF SPURGE. Stems often reddish, repeatedly branched, forming leafy prostrate mats 3 in. to 1 ft. across, rarely ascending. Leaves oblong, narrowed to the oblique base, minutely toothed around the blunt apex, about ¼ in. long.

All species of spurge are poisonous when taken in quantity and several of them are used medicinally. The present species, which grows in loose soil at altitudes of less than 5000 ft., is one of the sorts known as Golondrina, under which name it is often used by Indians and others as an antidote for the bite of the rattlesnake. The plant, either fresh or dried, is bruised, steeped in wine, and applied to the wound. But the permanganate and other modern treatments are doubtless more efficacious.

2. **E. leptócera** Engelm. Stems erect, leafy, 6 to 12 in. high. Leaves obovate or oblanceolate, obtuse, entire, ¼ to 1 in. long; floral leaves opposite or in 3's, roundish, often united at base. Glands of the involucre greenish yellow, crescent-shaped.—A foothill species, occasionally seen in the pine belt, even as high as Mono Pass.

CALLITRICHACEAE. WATER STARWORT FAMILY.

This family is represented only by an undetermined species of the single genus, *Callitriche*, the Water Starwort. It is a low, slender, aquatic herb, the submersed leaves linear and entire, the floating ones roundish (about ⅛ in. across). The staminate flowers bear each a single stamen; the pistillate flowers have each a single 4-celled ovary becoming a nut-like fruit. It grows in pools along the Tuolumne River at 10,000 ft. alt.

ANACARDIACEAE. SUMACH FAMILY.

A family represented with us by only two species, the first of which is sometimes classified under the genus *Toxicodendron* and the second under the genus *Schmaltzia*.

1. RHÚS. SUMACH.

Deciduous shrubs with alternate leaves and very small flowers. Parts of the calyx, petals, and stamens 5 each. Ovary superior, becoming a 1-seeded berry-like fruit.

1. **R. diversilòba** T. & G. POISON OAK. Leaves roundish to ovate or oblong, 1 to 4 in. long, entire or variously toothed or lobed or more often compound, and the 3 leaflets are also variable. Flowers greenish, in somewhat pendulous short-

peduncled panicles, appearing with the leaves. Fruit whitish, ¼ in. broad.

The Poison Oak may be either a low shrub or a high, climbing vine. It readily adapts itself to local conditions, but very fortunately it has not learned to endure the rigors of the higher altitudes and is therefore confined to the lower end of Yosemite Valley, and to the Hetch Hetchy and the lower foothills. Recent investigations have shown that the poisonous properties of the Poison Ivy, a closely related eastern species of Rhus, are due to a glucoside, which is carried by a fixed oil, and there is no reason to suppose but that our western plant is poisonous because of the same substance. Since glucosides are easily decomposed by permanganate of potassium, this chemical is coming into use as an antidote. A two or three per cent solution, mixed with a little sodium carbonate, is used as a wash with very beneficial results. Care must of course be taken that the solution does not reach the eyes.

2. **R. trilobàta** Nutt. SQUAW BUSH. Leaves compound; leaflets 3, ovate or elliptic, narrowed to the base, toothed or divided, ½ to 1½ in. long. Flowers yellowish, in close spikes about ½ in. long, appearing before the leaves. Fruit scarlet, sticky.

Far from being poisonous, as is our other species of Rhus, the Squaw Bush is of great service to the Indians, who utilize the split stems in basketry and who prepare a refreshing beverage by soaking the berries in water. It is a low shrub, never climbing, and is mostly restricted to the foothills, but also grows on warm slopes in Yosemite Valley and near the Mariposa Grove.

STAPHYLEACEAE. BLADDER-NUT FAMILY.

Shrubs with opposite pinnately compound leaves with stipules. Stamens as many as the petals (5 in ours) and alternate with them, borne outside a large disk.

1. STAPHYLÈA. BLADDER-NUT.

1. **S. bolánderi** Gray. CALIFORNIA BLADDER-NUT. A loosely branched glabrous shrub. Leaflets 3, ovate or roundish, 1 to 2½ in. long, finely toothed. Flowers whitish, in loose drooping clusters, the stamens and styles ½ to ¾ in. long, exceeding the sepals and petals. Pods 1 or 2 in. long, bladdery-inflated, each of the 3 cells with 1 to 4 globose seeds.—Dry hillsides of the foothills, especially near El Portal; also reported from Snow Creek.

ACERACEAE. Maple Family.

Deciduous trees and shrubs with opposite simple leaves palmately lobed in our species, and no stipules.

1. ÀCER. Maple.

Flowers small, regular, in drooping racemes or short clusters. Calyx 5-cleft. Petals five, or none. Stamens 3 to 10. Ovary superior, 2-celled, becoming 2-winged in fruit.

1. **A. macrophýllum** Pursh. Big-leaf Maple. Leaves roundish, 4 to 12 in. across, on petioles 2 to 10 in. long, palmately parted into 5 broad divisions which are again lobed or toothed. Wings of the dry bristly fruit 1 to 1½ in. long.

The Big-leaf or Oregon Maple is a large, spreading tree with smooth, green bark when young, becoming gray and furrowed in age. It grows in moist places of the Yellow Pine Belt, reaching an altitude of 5500 ft. near Nevada Falls, but it is nowhere abundant.

2. **A. glàbrum** Torr. Sierra Maple. Leaves roundish, 1 to 3 in. across, on petioles 1 to 2½ in. long, parted less than midway into 3 or 5 sharply toothed lobes. Wings of the glabrous fruit ½ to 1 in. long.

The Sierra Maple, also known as Dwarf Maple, is a slender, graceful tree or shrub, 6 to 15 or rarely even 30 ft. high. It grows on hillsides, often forming thickets, throughout the pine belt of the Sierra Nevada, reaching 6800 ft. alt. on the Glacier Point short trail.

SAPINDACEAE. Buckeye Family.

Deciduous trees with opposite compound leaves and no stipules, ovary superior, 3-celled, 6-ovuled, commonly only 1 ovule maturing.

1. AÉSCULUS. Horse Chestnut.

1. **A. califórnica** Nutt. California Buckeye. A small spreading tree with gray bark. Leaflets 5 to 7, all from the summit of the petiole, oblong, acute, 3 to 5 in. long. Flowers ½ in. long, white, showy, in clusters 4 to 6 in. long. Seed 1 or 2 in. across.—A well-known tree of western California, extending up our cañons as far as El Portal and probably to Hetch Hetchy.

RHAMNACEAE. Buckthorn Family.

Shrubs with simple leaves and small but often showy flowers. Calyx-lobes, petals, and stamens 4 or 5 each.

Fruit fleshy, berry-like; calyx free from ovary.....1. Rhamnus.
Fruit a dry capsule; calyx adnate to base of ovary.....2. Ceanothus.

1. RHÁMNUS. Buckthorn.

Leaves alternate, short-petioled. Flowers small, greenish, in small lateral clusters. Petals small, without claws.

1. **R. califórnica** Esch. Coffee-berry. Leaves oblong, acute, minutely toothed, 1¼ to 3 in. long, glabrous or slightly hairy (densely hairy or even silvery beneath in var. *tomentella* B. & W.). Flowers less than ¼ in. broad, the notched petals minute. Berry black, globose or oval, ¼ in. thick, 2-seeded.

The Coffee-berry is an erect shrub 4 to 8 ft. high and may always be known by the astringent taste of its bark, which has the same medicinal properties as cascara sagrada (*Rhamnus purshiana*). Var. *rubra* Trel., is a form with slender, glabrous, red twigs; small, deciduous leaves (2 in. or less long), and obovoid fruit. The species is common in the foothills and up to about 4500 ft., while the var. occurs at higher altitudes, even to 7000 ft.

2. **R. crócea** var. **ilicifólia** Greene. Red-berry. Leaves elliptic or roundish, sharply toothed, ¼ to 1 in. long, glabrous, often golden beneath. Berry bright red, ovoid, scarcely ¼ in. long, 2-seeded.—A low, loose shrub which occurs sparingly around Hetch Hetchy and Yosemite.

2. CEANÓTHUS. Ceanothus.

Shrubs with small but showy flowers in loose oblong clusters. Petals 5, hooded by the inflexion of the tip, long-clawed. Stamens 5, long-exserted. Ovary subglobose (style 3-cleft), becoming dry and separating into 3 seed-bodies.—"Mountain Lilac" is a name applied indiscriminately to the species of Ceanothus, but since the true Lilac belongs to another family, this name is not appropriate. "Buckbrush" is a name often used for any of the more rigidly branched species. The flowers of Ceanothus yield a copious, soapy lather when rubbed in water.

Leaves opposite.
- Erect shrub; flowers white; leaves entire.....1. *C. cuneatus.*
- Prostrate shrub; flowers blue; leaves toothed.....2. *C. prostratus.*

Leaves alternate.
- Stems low and trailing; flowers deep blue.....3. *C. diversifolius.*
- Stems erect, 2 to 8 ft. high; flowers blue or white.
  - Leaves ¼ to 1 in. long, very obtuse, pale.
    - Flowers white; somewhat spiny shrub.....4. *C. cordulatus.*
    - Flowers blue; not spiny.....5. *C. parvifolius.*
  - Leaves 1 to 3 in. long, green.
    - Leaves thin, entire.....6. *C. integerrimus.*
    - Leaves thick, toothed.....7. *C. velutinus.*

1. **C. cuneàtus** Nutt. WEDGE-LEAF CEANOTHUS. Leaves thick, pale, obovate or oblanceolate, wedge-shaped at base, entire, ⅜ to ¾ in. long, whitish hairy beneath. Flowers white. Capsule short-oblong, with 3 roundish knobs near summit.

This rigidly branched shrub, with its pale, brittle foliage, is a chief component of the chaparral of the foothill districts, ranging up into Hetch Hetchy Valley and even reaching the Yosemite, where it grows on warm slopes near Indian Cañon.

2. **C. prostràtus** Benth. SQUAW CARPET. MAHALA MATS. Leaves thick, obovate, narrowed at base, rigidly toothed around the blunt summit, ½ to ¾ in. long, mostly glabrous. Flowers blue. Capsule globose, prominently horned.

The green, leafy mats of this Ceanothus often cover slopes of considerable size and are very decorative. It reaches its upper limits at Chinquapin and on the ridges back of Hazel Green (6000 ft.), where it grows with the next species. The Indians and stockmen of Butte and Plumas counties prepare a tea from the roots and bruised foliage which they use as a remedy for kidney troubles and as a blood purifier.

3. **C. diversifòlius** Kell. Leaves thin, ovate to elliptic or obovate, finely glandular-toothed all around, ½ to 1½ in. long, softly hairy. Flowers blue. Capsule globose, each lobe sharply ridged on the back.

The leafy stems of this species creep along the ground, forming loose mats which are especially beautiful in May and June when partially hidden by the blue flowers. The foliage is much softer than that of the Squaw Carpet. It is abundant in the lower part of the pine belt, especially from Hetch Hetchy to the Merced Grove, Yosemite, and the Mariposa Grove, but it is not common outside of our district.

4. **C. cordulàtus** Kell. SNOW-BUSH. Leaves rather thin, pale, ovate, obtuse, minutely toothed or entire, ½ to 1 in. long, ¼ to ¾ in. wide, 3-nerved from the base, soft-hairy at least beneath. Flowers white. Capsule evidently lobed at top, slightly 3-crested.

The Snow-bush is a low, flat-topped shrub with olive or grayish branches, the rigid twigs often spine-like. Its low stature and compact growth are the result of the heavy burden of snow which the shrubs are obliged to carry for several months in the year, but whether it is because of this that the species has been called Snow-bush, or because of the snow-like appearance when in full bloom, we are unable to say. It forms almost impenetrable thickets at altitudes of

6500 to 9000 ft., rarely descending to 4000 ft., as near Mirror Lake, where a large-leaved form occurs.

5. **C. parvifòlius** Trel. Leaves pale beneath, elliptic, obtuse, 3-nerved from a narrowed base, entire, ¼ to ¾ in. long, glabrous. Flowers blue, in a loose cluster 1 to 3 in. long. Capsule nearly crestless.

This is a low shrub, rarely over 4 ft. high, with ascending branches and pleasing light-blue flowers. It grows from the Yosemite to Wawona and elsewhere at similar altitudes.

6. **C. integérrimus** H. & A. DEER-BRUSH. Leaves thin, green, oblong or long-ovate, obtuse, mostly 3-nerved from the rounded base, entire, 1 to 3 in. long, lightly pubescent or becoming glabrous. Flowers white, in a feathery cluster 2 to 6 in. long. Capsule inconspicuously crested.

The Deer-brush, when in bloom, is one of the most graceful and charming shrubs of middle altitudes. It often forms thickets covering a considerable area. The airy, plume-like flower-clusters are borne in abundance on slender branches 6 to 12 ft. high. A remarkable form, perhaps of hybrid origin, grows near the mouth of Indian Cañon, Yosemite Valley, distinguished by its very rigid habit, pale twigs, and broad, prominently veined leaves. It blossoms early, being in seed when neighboring plants of true *C. integerrimus* are only in bloom.

7. **C. velùtinus** Dougl. Leaves thick, green and as though varnished above, pale and velvety beneath, ovate or broadly elliptic, very obtuse at both ends, closely and finely toothed, 1 to 3 in. long, ½ to 2½ in. broad, strongly 3-nerved from the base; petioles stout, ¼ to ½ in. long. Flowers white, in short clusters. Capsule deeply lobed at top, nearly crestless.

The broad, shiny leaves readily distinguish this species from all others. It is a large, loosely branched shrub which ranges from Kern Co. to Mt. Shasta and is therefore to be expected in our district.

VITACEAE. VINE FAMILY.

Woody plants with simple commonly lobed leaves. Calyx minute, its limb often obscure.

1. VÌTIS. GRAPE.

1. **V. califórnica** Benth. CALIFORNIA WILD GRAPE. Leaves alternate, heart-shaped at base, roundish, toothed and often lobed, 2 to 6 in. broad, densely soft-hairy at least beneath. Flowers small, regular, greenish, in compound clusters. Petals

and stamens 5 each. Fruit a 2-celled purple berry, edible but with large seeds.

The Wild Grape climbs by means of its tendrils to considerable heights on the trees of Hetch Hetchy Valley and our lower cañons, where the odor of its foliage fills the air with a delightful fragrance on warm days. In the Yosemite Valley it occurs sparingly along the base of the north wall, this being its uppermost limit.

MALVACEAE. Mallow Family.

Herbs, pubescent with branching hairs. Leaves alternate, simple, palmately veined and lobed or toothed, with slender stipules at base of petiole. Flowers regular. Calyx-lobes and petals 5 each. Stamens numerous, united into a tube around the pistil. Capsule breaking at maturity into several 1-seeded parts.

Annual weeds with pale flowers.....1. Malva.
Perennials with showy flowers.....2. Sidalcea.

1. MÁLVA. Mallow.

Leaves rounded, long-petioled. Calyx with 3 bractlets near base. Flowers small, whitish or rose-color. All of the 3 species to be expected are annual weeds. *M. rotundifolia* L., is known by its nearly prostrate habit. *M. parviflora* L., is erect, robust, the calyx-lobes widely spreading under the fruits (often called "cheeses"). *M. pusilla* Sm., is similar but with calyx-lobes closed over the fruits.

2. SIDÁLCEA.

Perennial herbs with rounded toothed leaves and showy pinkish flowers in terminal racemes or spikes. Calyx usually without bractlets.

Flowers in an open raceme.
  Stems and petioles rough with very short hairs.....1. *S. asprella.*
  Stems and petioles smooth .....2. *S. glaucescens.*
  Stems and petioles long-hairy .....3. *S. reptans.*
Flowers in a dense spike; petioles long-hairy.....4. *S. spicata.*

1. **S. asprélla** Greene. Stems 1 to 3 ft. high, rough with short hairs. Leaves ½ to 4 in. across, the lower obtusely toothed or lobed, the upper parted into entire or toothed lobes. Flowers purplish, ½ to 1 in. long, distinctly pediceled, in an open raceme. (*S. montana* Congdon.)

This plant with its numerous, long-petioled leaves and several stems from a perennial root may be expected anywhere in the Yellow Pine Belt, where it grows with the next

species. Many plants bear noticeably smaller flowers than others. These smaller flowers do not produce pollen, and therefore, if they set seed, must necessarily be cross-pollinated. Indeed, this seems to be essential even in the perfect flowers, for here the anthers shed their pollen before the

Sidalcea asprella

Sidalcea spicata

stigmas are receptive, and self-pollination is further checked by the position of the anthers, which is at a lower level than that of the mature stigmas. The pollen is probably transferred through the agency of bees.

2. **S. glaucéscens** Greene. A species very closely related to *S. asprella* and distinguished from it only by the smooth stems and by the leaves, which are nearly or quite glabrous.

3. **S. réptans** Greene. Stems 1 to 3 ft. high, with long spreading hairs as also the petioles. Leaves only ¾ to 2 in. across, the lower toothed or lobed, the upper more deeply parted. Flowers deep rose-purple, about ½ in. long. Seed-bodies honey-combed on the back. (*S. favosa* Congdon.)

The stems of *S. reptans* are reclining at base and often strike root from the lower joints. It has been collected at the Mariposa Grove and reported as not rare in high meadows, but it is seldom collected.

4. **S. spicàta** Greene. This species resembles *S. asprella* but is very distinct in technical characters. It may best be known by its dense spike of smaller flowers (¼ to ¾ in. long)

and by the long spreading hairs on the petioles of the lower leaves. It grows in meadowy places at 5000 to 9000 ft. alt.

GUTTIFERAE. St. John's-wort Family.

Herbs and shrubs with opposite entire mostly sessile leaves and no stipules. Flowers regular, the sepals and petals 4 or 5 each. Ovary free from the calyx, becoming a 1 to 7-celled capsule.

1. HYPÉRICUM. St. John's-wort.

Mostly smooth plants with dotted leaves. Stamens 15 to numerous, frequently united into several clusters. Styles in ours 3.

1. **H. formòsum** HBK. Stems nearly simple, erect, ½ to 3 ft. high. Leaves sessile, ovate or oblong, obtuse, ½ to 1 in. long, the margins black-dotted. Flowers large, yellow, the petals ½ in. long.

The loose, terminal, yellow flower-clusters of this plant are a common sight in weedy meadows and along streams at moderate altitudes. It is widely distributed in western North America. The flowers do not yield honey but they are nevertheless visited by many insects for pollen. Aside from that intentionally carried away, the insect gets his breast well dusted with the powder and incidentally effects cross-pollination by rubbing it against the rigidly protruding stigmas of the next flower he visits.

2. **H. anagalloìdes** C. & S. Stems weak, leafy, seldom 6 in. high. Leaves lanceolate to nearly orbicular, obtuse, ⅛ to ½ in. long. Flowers few, about ⅛ in. long, yellow.

This plant forms dense, leafy mats brightly ornamented with the small, yellow flowers. It grows in moist soil in the Yosemite and Hetch Hetchy valleys, etc., and up to nearly 9000 ft. alt.

H. CONCINNUM Benth., of the foothills, has flowers as large as no. 1, but may be known by its wiry stems and woody base.

VIOLACEAE. Violet Family.

Herbs with irregular nodding flowers.

1. VÌOLA. Violet.

Perennial herbs with alternate stipulate leaves and solitary flowers on long pedicels. Sepals 5, unequal. Petals 5, unequal, the lowest continued backward as a spur. Stamens 5. Ovary

free from the calyx, maturing into a 1-celled many-seeded capsule.

Flowers white ..... 1. *V. blanda.*
Flowers blue ..... 2. *V. oxyceras.*
Flowers yellow.
  Leaves ¼ to 1 in. wide, narrowed to the petiole..... 3. *V. purpurea.*
  Leaves 1 to 3 in. wide, broad or heart-shaped at base.
    Leaves mostly cleft or parted..... 4. *V. lobata.*
    Leaves merely toothed, heart-shaped..... 5. *V. glabella.*

1. **V. blánda** Willd. Sweet White Violet. Plant low and tufted, nearly glabrous, the leaves and peduncles all from an underground rootstock. Leaves roundish, heart-shaped at base, ½ to 1½ in. long. Flower-stalks 1 to 3 in. high, exceeding the leaves. Petals about ¼ in. long, hairy, white, the lower one dark-veined; spur short.

The White Violet, which can never be mistaken, is a modest inhabitant of cool, moist places from Hetch Hetchy, Yosemite, and Crescent Lake to timber-line, often growing where it is nearly hidden by grass or other plants. It is especially fond of boggy meadows in high valleys.

2. **V. oxýceras** Greene. Sierran Dog Violet. Plant low and compact or 6 in. high and spreading, glabrous or nearly so. Leaves round-ovate, ¾ to 2 in. long. Petals blue or violet, ⅜ to ½ in. long, nearly equalled by the slender acute spur.

This blue violet always grows in moist places and is most frequently found on low, damp ground where the grass is short or sparse. It is well distributed in the Sierra Nevada, occurring with us at such localities as the Yosemite Valley, along the Hog Ranch Road, White Wolf, and Tuolumne Meadows. The true Dog Violet, of which this was formerly considered a variety, is a well known species of northern Europe. The so-called dog violets of eastern North America have, like ours, been shown to be distinct from the Old World species.

3. **V. purpùrea** Kell. Stems densely clustered, 3 to 9 in. high, from a stout vertical root, the herbage grayish pubescent. Leaves lanceolate to oblong, coarsely toothed, 1 to 2 in. long, often purplish veined. Petals yellow, brownish on the outside, ⅜ in. long, the spur short and round. Ovary and capsule globular, pubescent.

The home of this violet is the open pine forest, where its pale foliage and light-yellow flowers may be seen forcing their way through the thin layer of pine needles. The small-flowered form growing in dry or exposed situations, is var. *pinetorum* Greene; its peduncles are longer, its leaves nar-

rowly lanceolate, and the pubescence more dense, these changes doubtless being due to its more arid habitat. *V. nuttallii* Pursh., has been reported. If found, it may be distinguished from the above species by its ample foliage and glabrous, oval capsule.

4. **V. lobàta** Benth. Stems 3 to 12 in. high, from branching rootstocks. Herbage grayish, glabrous or minutely pubescent. Leaves very various, heart-shaped, triangular, or fan-shaped, deeply parted (nearly entire in var. *integrifolia* Wats.), 1 to 5 in. wide. Petals yellow, the upper often brownish or purplish, ½ in. or less long, the spur short and round.

The peculiarly lobed leaves, bright green above but pale beneath, distinguish this species from all others. It inhabits open forests of the Yellow Pine Belt, always growing in fairly dry soil. One finds it especially common along the Wawona and Hog Ranch roads.

5. **V. glabélla** Nutt. Smooth Yellow Violet. Stems 6 to 18 in. high, from rootstocks. Herbage green, usually glabrous. Leaves heart-shaped, shallowly toothed, 1 to 4 in. broad. Petals yellow, veined with brown, ½ in. long, the spur short and rounded.

The thin, green foliage, devoid of hairy or other covering, marks this violet as a shade-loving plant. It grows along streams and in similarly moist places, nearly always in partial shade, where its broad leaves are spread out in such a manner as to receive the full benefit of the subdued light. Although of wide general distribution it is rather rare in our district but it has been found at Chinquapin, at Peregoys, and in the Mariposa Grove.

LOASACEAE. Loasa Family.

Rough-hairy herbs with alternate leaves and no stipules. Flowers regular. Petals 5. Stamens numerous, inserted with the petals on the throat of the calyx. Capsule 1-celled, many seeded, crowned with the persisting calyx-lobes.

1. MENTZÈLIA.

1. **M. dispérsa** Wats. Stems erect, usually 12 to 18 in. high, from an annual root. Leaves lanceolate, oblong, or the upper ovate, toothed or entire, 1 to 3 in. long, very rough. Flowers yellow, sessile in the axils of leaf-like bracts. Petals less than ¼ in. long. Capsule linear, ½ to ¾ in. long.

The brittle, white-barked stems and clinging leaves best mark this plant. It is very plentiful in warm, sandy soil but

does not grow in the higher mountains. As to beauty, it is in no wise comparable to *M. aurea* Baill., a large species of the foothills, with numerous showy flowers, the golden-yellow petals an inch or more long and vermilion at base.

DATISCACEAE. Datisca Family.

Calyx of united sepals. Corolla none. Flowers of two sorts borne on different plants, the staminate with 8 to 12 stamens, the pistillate with a 1-celled inferior ovary and 3 cleft styles.

1. DATÍSCA.

1. **D. glomeràta** B. & W. Durango Root. Stems clustered, erect, 2 to 4 ft. high, the whole plant glabrous. Leaves 3 to 6 in. long, nearly as broad, much divided and toothed, fern-like. Staminate flowers in loose clusters in the leaf-axils. Pistillate flowers in small nearly sessile clusters or scattered along the leafy branches; capsule angular, opening at the top, many-seeded.—Stream beds along the foothills, extending up to 5000 ft. near Wawona (and Hetch Hetchy ?).

LYTHRACEAE. Loosestrife Family.

Herbs with entire leaves and no stipules. Petals and stamens borne on the throat of the calyx. Ovary and capsule 1 to 4-celled, free from the calyx.—Represented in the foothill and coast districts by a common Loosestrife (*Lythrum californicum* T. & G.) with cylindric calyx and purple petals, but the only member of the family known to inhabit our region is the following.

1. ROTÀLA.

1. **R. ramòsior** Koehne. A glabrous annual, 2 to 8 in. high, leafy to the top. Leaves tapering to the base, ¾ in. or less long. Flowers small, 1 to 3 in each leaf-axil. Calyx globose in fruit, 8-ribbed. Petals 4, purplish. (*Ammania humilis* Michx.)—Reported as having been collected in Yosemite Valley by Mr. J. G. Lemmon.

ONAGRACEAE. Evening Primrose Family.

Herbs with simple leaves and complete regular flowers in spikes or racemes or solitary. Calyx-tube adnate to the ovary, the 4 petals and 8 stamens inserted at its summit (flower-parts in 2's in Circaea). Ovary inferior, becoming a 2 or 4-celled capsule (1-celled and indehiscent in Circaea); style single.

EVENING PRIMROSES IN
YOSEMITE VALLEY .

In favorable seasons the tall, stately Evening Primrose appropriates to itself certain fields in Yosemite Valley, converting them into masses of yellow bloom. The flowers open in the early evening, displaying great yellow disks which fairly startle one as he comes upon them in the quiet of the twilight hours. Before the following day has far advanced the petals fold together and droop until evening again comes on. The field here shown is in the upper part of Yosemite Valley. The prominent tree to the left is a California Black Oak. To the right, near the foot of Glacier Point, a vigorous Yellow Pine is outstripping its neighbors. Between these trees one looks straight up the Merced Cañon to the Panorama Cliff, somewhat more than a mile away.

Petals 2; fruit a small 1-seeded bur..... 1. Circaea.
Petals 4; fruit nearly globose, nut-like..... 2. Heterogaura.
Petals 4; fruit a linear or oblong capsule.
Seeds with a tuft of long hairs at apex.
Flowers white, purple, or pink..... 3. Epilobium.
Flowers (including calyx) scarlet, large..... 4. Zauschneria.
Seeds naked at apex.
Flowers white or pinkish, ⅛ in. or less long..... 5. Gayophytum.
Flowers yellow ..... 6. Oenothera.
Flowers purple.
Calyx-lobes reflexed or the tips united and turned to one side.
Petals sessile ..... 7. Godetia.
Petals distinctly clawed ..... 8. Clarkia.
Calyx-lobes erect; petals lobed..... 9. Boisduvalia.

1. CIRCAÈA. Enchanter's Nightshade.

1. **C. pacífica** A. & M. Leaves very thin, ovate, obtuse or heart-shaped at base, acute, wavy-toothed to nearly entire, 1 to 3 in. long, on petioles ½ to 1½ in. long. Flowers minute, white, in bractless racemes. Calyx white. Petals 2. Stamens 2. Fruit a one-seeded minute bur.

This delicate, erect plant is an inhabitant of moist, shady dells and is so attractive that anyone who finds it may consider himself fortunate. It grows in the Merced Grove, in bogs near the Happy Isles, at the Iron Spring in Yosemite, and may be expected in similar places where the altitude is not too great.

2. HETEROGAÙRA.

1. **H. califórnica** Rothr. Leaves thin, ovate-lanceolate, nearly or quite entire, 1 or 2 in. long, on petioles ¼ to ½ in. long. Flowers small, purple, short-pediceled in loose terminal racemes. Petals with claws. Ovary 4-celled, maturing into a nearly globose nut-like fruit not ⅛ in. thick.—Shady banks in Hetch Hetchy and other low valleys.

3. EPILÒBIUM. Willow-herb.

Herbs with nearly sessile leaves and purple pink or white flowers in racemes. Calyx-tube little prolonged beyond the ovary, the 4 spreading lobes deciduous. Capsule linear, 4-sided, 4-celled. Seeds numerous.

A. Flowers large, showy; petals ½ in. or more long.

Petals entire; stems 1 to 3 ft. high..... 1. *E. angustifolium.*
Petals deeply lobed; stems short..... 2. *E. obcordatum.*

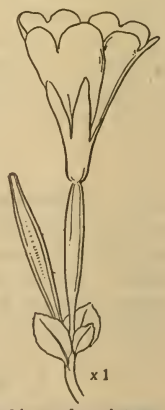
B. Flowers small; petals less than ¼ in. long.

Slender annuals.
  Leaves 1 in. or less long..... 3. *E. minutum.*
  Leaves 1 or 2 in. long..... 4. *E. paniculatum.*
Perennials.
  Leaves small, mostly ¾ in. or less long.
    Herbage nearly glabrous .....10. *E. oregonense.*
    Herbage crisp-hairy ..... 7. *E. ursinum.*
  Leaves larger, mostly ¾ to 2 or 3 in. long.
    Glabrous throughout; leaves narrowly lanceolate.. 8. *E. glaberrimum.*
    Glabrous below; minutely hairy above.
      Leaves all strictly sessile ..... 6. *E. brevistylum.*
      Leaves short-petioled.
        Leaves thickish, 2 or 3 in. long..... 5. *E. adenocaulon.*
        Leaves very thin, ¾ to 2 in. long..... 9. *E. alpinum.*

1. **E. angustifòlium** L. FIRE-WEED. Herbage finely ashy-pubescent above, otherwise glabrous. Leaves alternate, lanceolate, nearly entire, 3 to 6 in. long. Flowers many, large, purplish lilac, in long racemes. Petals about ½ in. long, entire. (*E. spicatum* Lam.—*Chamaenerion angustifolium* Scop.)

The tall, leafy stems of the Fire-weed are terminated by the long, brilliant spikes of purple flowers. It is a highly decorative plant of meadows and stream banks and has a wide distribution.

Epilobium angustifolium



Epilobium obcordatum

2. **E. obcordàtum** Gray. ROCK-FRINGE. Herbage glabrous and pale except the glandular-pubescent upper parts. Leaves all opposite, broadly ovate, nearly entire, ¼ to ¾ in. long,

rounded to very short petioles. Petals bright rose-color, ½ to 1 in. long, deeply lobed.

Rocky slopes and ledges at the base of Mt. Hoffmann are often brilliant with the flowers of this little plant, which creeps along the surface, forming loose mats or streamers. Further exploration will doubtless discover it on other of our high peaks.

3. **E. minùtum** Lindl. Stem scarcely branched, 6 to 18 in. high, annual, minutely crisp-pubescent or nearly glabrous. Leaves lanceolate, acute, obscurely few-toothed, 1 in. or less long, mostly with smaller ones clustered in the axils. Petals violet or pale, small, deeply cleft.—Vernal Falls and elsewhere on moist banks.

4. **E. paniculàtum** Nutt. Stem freely branched, 1 or 2 ft. high, glabrous or glandular, from an annual root. Leaves linear-lanceolate, acute, nearly entire, 1 or 2 in. long, often with smaller ones in the axils. Petals violet.—Common in middle California, extending into the mountains as far as Nevada Falls. The flowers are twice as long as in no. 3 and the seeds are also much larger.

x1

5. **E. adenocaúlon** Haussk. Stems stout and erect, 1½ to 4 ft. high. Herbage glabrous below, the buds, capsules, etc., glandular-pubescent. Leaves elliptic to ovate-lanceolate, rounded to short petioles, slightly toothed, obtuse, 2 or 3 in. long. Petals ⅛ to ¼ in. long, rose-pink, notched at summit. (*E. concinnum* Congdon.)

x1

In the var. *occidentale* Trel., of this species, the leaves are more triangular-lanceolate, mostly 2 in. long, those of the inflorescence acute at each end. Both forms are common in the mountains, where they inhabit moist meadows and stream banks, becoming 2 to 4 ft. high. Related species which may be found are *E. watsonii* Barb., marked by its softly crisp-downy pubescence and large petals (about ½ in. long) and *E. californicum* Haussk., known by its long, thin leaves and the spreading, non-glandular hairs on the flower-buds.

6. **E. brevístylum** Barb. Stems slender, erect, 6 to 18 in. high. Herbage crisp-hairy above, mostly glabrous below. Leaves sessile, ovate-lanceolate, slightly toothed, ¾ to 2 in. long. Petals purplish.—Rare, found along the Tioga Road; dwarf forms look like the next.

7. **E. ursìnum** var. **subfalcàtum** Trel. Plant very slender, 6 to 18 in. high, crisp-hairy throughout. Leaves sessile, narrowly ovate, somewhat toothed, mostly obtuse, ½ to ¾ in. long. Petals white or lavender, about ⅛ in. long.—A rare species: Hog Ranch, to Yosemite and Little Yosemite valleys. Slightly hairy forms approach no. 6 but are smaller and more slender.

8. **E. glabérrimum** Barb. Stems 1 to 2 ft. high. Herbage glabrous throughout, covered with a bloom. Leaves narrowly lanceolate, rather obtuse, entire or very obscurely few-toothed, 1 to 2 in. long, narrowed at base but scarcely petioled. Petals nearly white, over ⅛ in. long, notched at summit.—A common species of moist places, first described from specimens collected in the Yosemite Valley.

9. **E. alpìnum** L. Plant 9 to 18 in. high, minutely crisp-hairy among the flowers. Leaves thin, light green, broadly elliptic, mostly obtuse, nearly entire, ¾ to 2 in. long. Petals white or rosy-tipped, ⅛ in. long, deeply notched.—Moist banks at Glacier Point and probably at other high altitudes.

E. HORNEMANNI Reich., of the northern Sierra Nevada, may be expected; like *E. alpinum* but more pubescent, the petals twice as large and violet or lilac, the leaves dark green or purplish.

10. **E. oregonénse** Haussk. A delicate plant, 6 to 18 in. high, glabrous below, obscurely pubescent above. Leaves lanceolate, almost entire, very obtuse, ¼ to ¾ in. long. Flowers few, strictly erect. Petals about ¼ in. long, deep violet. Var. *gracillimum* Trel. has white flowers less strictly erect (*E. pringleanum* Haussk.).—Moist places, as in Yosemite meadows and along the upper Tuolumne.

4. ZAUSCHNÈRIA.

1. **Z. califórnica** Presl. CALIFORNIA FUCHSIA. BALSAMEA. Herbage gray-pubescent. Leaves lanceolate, acute, ½ to 1½ in. long. Flowers 1 to 1½ in. long (above the ovary), the funnelform calyx as well as the 2-cleft petals scarlet. Stamens exserted.

In late summer and autumn many a rocky slope is ablaze with this scarlet-flowered, gray-foliaged perennial, the range of which extends from the foothills to about 6500 ft. alt. The ease with which it is grown and its high ornamental value make it a suitable garden plant where masses of late bloom are desired. As yet, however, it is but little known among garden people.

5. GAYOPHÝTUM.

Very slender erect annuals, differing from Epilobium chiefly in having seeds naked at apex and a 2-celled capsule.

Seeds covered with short appressed hairs.
- Flowers minute ..... 1. *G. lasiospermum* Greene.
- Flowers larger, about ⅛ in. long..... 2. *G. eriospermum* Coville.

Seeds glabrous, either smooth or minutely roughened.
- Stems much forked above, not very leafy; pedicels elongated; capsule irregularly bulging at intervals.
  - Flowers minute ..... 3. *G. ramosissimum* T. & G.
  - Flowers larger, about ⅛ in. long..... 4. *G. diffusum* T. & G.
- Stems nearly simple or branched especially toward the base, densely leafy; pedicels short; capsule nearly smooth.
  - Capsule narrowly linear, with suberect seeds. 5. *G. caesium* T. & G.
  - Capsule broadly oblong, flattened, with very oblique seeds ..... 6. *G. pumilum* Wats.

The above species may be found in the Yosemite district, but they are difficult to distinguish specifically, largely because of the minuteness of their flowers. They are not here described further than in the above synopsis, which is adapted from a report of the Missouri Botanical Garden.

6. OENOTHÈRA. Evening Primrose.

Erect herbs with alternate leaves and yellow flowers. Calyx-tube prolonged beyond the ovary, its 4 lobes reflexed. Capsule 4-celled, sessile.

1. **O. hoókeri** T. & G. Evening Primrose. Herbage conspicuously pubescent. Leaves lanceolate, mostly sessile, acute, toothed (upper often entire), 4 to 10 in. long. Calyx-tube 1 to 2 in. long. Petals 1 to 1¼ in. long, obcordate, yellow fading to rose. Stigma with 4 slender lobes. Capsule about 1 in. long, 4-sided.

The open, dryish meadows of Hetch Hetchy, Yosemite, Wawona, and other low valleys are rendered brilliant in places by the gorgeous yellow bloom of the Evening Primrose. It is a stout biennial 3 to 6 ft. high. The flowers ap-

pear in July and open only in the evening, remaining open until the middle of the next forenoon.

2. **O. strigulòsa** T. & G. Herbage minutely pubescent and glandular. Leaves sessile, linear, obscurely toothed, ½ to 1 in. long. Petals ⅛ in. long, yellow turning red. Stigma globose. Capsule linear, about ¾ in. long.

This slender annual, rarely over 18 in. high, grows in warm, sandy soil as far up as Little Yosemite Valley and even Merced Lake, where it is only 4 in. high, but it normally belongs to much lower altitudes.

7. GODÈTIA.

Erect annuals with alternate leaves and showy purplish flowers in leafy racemes. Calyx with funnelform tube beyond the ovary, its lobes united and turned to one side. Capsule 4-celled, sessile or nearly so.

1. **G. dudleyàna** Abrams. Leaves linear to oblong, mostly entire, inch or two long including the petiole-like base. Buds nodding. Petals ½ to 1 in. long, pinkish lavender with darker dots toward the paler base.

This Godetia is a slender annual, 8 to 18 in. high, belonging to the lower slopes but reaching Yosemite Valley. Its delicate coloring and dainty habit make attractive patches along the Wawona Road, where it grows in abundance on warm, southerly exposures.

2. **G. vimínea** Spach. Leaves linear to lanceolate, entire, mostly ½ to 1½ in. long, sessile or short-petioled. Buds erect. Petals ½ to 1¼ in. long, purplish or crimson, with a large purple blotch in center or at apex, the base yellowish. (*G. williamsonii* Wats.)

The strikingly handsome flowers of this slender, erect annual (a few inches to 2 ft. high) may be seen in half-meadowy places, often forming dark-purple areas. A very leafy form with deep-crimson petals ½ to ¾ in. long and

abundant 8-ribbed capsules is the var. *incerta* Jepson, described from the Yosemite Valley. Hetch Hetchy Valley yields the var. *congdonii* Jepson, a rather tall form with loosely hairy buds, and very distinct, slender calyx-tips.

8. CLÁRKIA.

1. **C. rhomboídea** Dougl. Leaves alternate (or the lower opposite), oblong to ovate, entire, ½ to 1½ in. long, ¼ to ¾ in. wide, on petioles ¼ to ¾ in. long. Flowers distant in terminal racemes. Buds nodding. Calyx-tube obconic above the ovary, short. Petals purple, ¼ to ½ in. long, narrowed below to a broad toothed claw. Capsule nearly sessile, 4-angled, slightly curved, 1 in. long. (*Phaeostoma rhomboidea* Nels.)

The Clarkia is a slender, erect annual with pretty purplish flowers. Although nowhere abundant, it is widely distributed throughout the lower part of the Yellow Pine Belt.

9. BOISDUVÀLIA.

Erect rigid annuals, with alternate sessile leaves and small flowers in leafy-bracted spikes. Petals purple, obovate, 2-lobed. Calyx-lobes erect, deciduous. Capsule 4-celled, sessile.

1. **B. densiflòra** Wats. Plant 1 to 2 ft. high, soft-pubescent. Leaves lanceolate, 1 to 2 in. long. Flowers in a dense spike, each in the axil of an ovate acute bract ½ in. or so long. Partitions of the capsule persisting on the central axis.—On low ground of Yosemite Valley, Hetch Hetchy, etc.

2. **B. strícta** Greene. Similar, but leaves and bracts linear and the flowers not crowded. Partitions of the capsule permanently attached to the walls.—Hetch Hetchy Valley; perhaps common at low altitudes.

HALORAGIDACEAE. Water Milfoil Family.

Aquatic or marsh plants with inconspicuous flowers sessile in the axils of leaves or bracts. Ovary inferior, the fruit 1 to 4-celled, with 1 seed in each cell.

1. HIPPÙRIS. Mare's Tail.

1. **H. vulgàris** L. A simple-stemmed erect herb, ½ to 2 ft. high. Leaves in whorls of 6 to 12, linear, entire, acute, ¼

to ¾ in. long. Flowers minute, without petals. Stamen and style 1 each.—In pools at the Soda Springs of the Tuolumne. Widely distributed in the Northern Hemisphere.

UMBELLIFERAE. Parsley Family.

Herbs with usually hollow stems and alternate mostly compound leaves, the petioles expanded at base. Flowers small, in umbels or heads. Calyx entire or 5-toothed, the tube wholly adherent to the 2-celled ovary, the 5 petals and 5 stamens inserted on the disk that crowns the ovary and surrounds the base of the 2 styles. Fruit of 2 seed-like bodies, when ripe separating from each other and usually suspended from the summit of a slender axis; each body marked with ribs and between the ribs are commonly oil-tubes (best seen in slices made across the fruit).

This is a large and difficult family. Since mature fruits are needed for determining most of the species, and since these are seldom collected by the amateur, only the more showy or otherwise interesting ones are here described.

Flowers yellow; fruit bur-like.....1. Sanicula.
Flowers white or pinkish; fruit not bur-like.
  Fruit not at all winged.
    Plant tall and slender.
      Roots fragrant, not tuber-like; flowers inconspicuous.2. Osmorhiza.
      Roots tuber-like; flowers showy.....3. Eulophus.
    Plant 2 in. or less high; Alpine dwarf.....4. Podistera.
  Fruit winged on the margins.
    Flowers sessile in dense heads.....5. Selinum.
    Flowers pediceled in simple or compound umbels.
      Fruit oblong; leaflets linear or lanceolate.....6. Angelica.
      Fruit nearly orbicular; leaflets ovate.....7. Heracleum.

1. SANÍCULA. Snake-root.

1. **S. nevadénsis** Wats. A glabrous perennial, 3 to 12 in. high, with long taproot. Leaves 1 or 2 in. long, palmately divided, with lobed segments. Flowers yellow, in compact clusters terminating naked peduncles from near the base. Fruit small, bristly all over, with many oil-tubes.—Middle altitudes; not common. *S. nemoralis* Greene, was described from "Big Trees" and "Yosemite Valley." It is a coarser plant with pinnately divided leaves. Among other species to be expected, especially toward the foothills, is *S. tuberosa* Torr., with pinnately divided and finely cut leaves, the stem from a small, globose tuber.

2. OSMORHÍZA. Sweet Cicely.

1. **O. nùda** Torr. Common Sweet Cicely. Stems glabrous

above, 1 to 3 ft. high, from a perennial aromatic root. Leaves mostly basal, pubescent, palmately twice compound, each of the main divisions with 3 leaflets; leaflets ovate, wedge-shaped at base, lobed and toothed, ¾ to 2 in. long. Flowers white, in loose compound umbels, the pedicels without bracts at base. Fruit linear, nearly ¾ in. long, bristly on the ribs, the oil-tubes obscure. (*Washingtonia brevipes* C. & R.)—Common in shady woods. *O. brachypoda* Torr. is a similar plant and with similarly bristly-ribbed fruits, but with conspicuous bractlets at base of pedicels. It is also common, especially in the Yosemite Valley and near Hetch Hetchy. *O. occidentalis* Torr., our third species, is a larger plant, with mostly larger leaves and fruits, the latter entirely glabrous.

3. EÙLOPHUS.

1. **E. bolánderi** C. & R. Glabrous perennial, 1 to 2 ft. high, from a cluster of tuber-like roots, the nearly naked stems bearing usually several long-peduncled compound umbels of small white flowers. Leaves 3 to 6 in. long, pinnately compound (except the uppermost bract-like ones), the numerous segments linear-filiform; petioles enlarged toward the base. Bracts pale, lanceolate, slenderly acute. Fruit flattened laterally, glabrous, ⅛ in. long. (*Podosciadium bolanderi* Gray.)—First described from specimens collected by Bolander on the State Geological Survey, 1873, on the "Mariposa Trail, Yosemite"; common in our district. *E. parishii* C. & R., which also occurs, has the same habit and general appearance, but the leaves are with only 3 or 4 segments, these lanceolate or broadly linear, the very slender petioles enlarged only at the insertion on the stem, and the bracts few or none.

4. PODÍSTERA.

1. **P. nevadénsis** Wats. A dwarf stemless perennial, 1 or 2 in. high, minutely pubescent throughout. Leaves about ¼ in. long, pinnately parted. Flowers white or pinkish, in close umbels. Fruit flattened laterally, elliptic-ovate, glabrous, the ribs slender.—Known only from above timber-line on Mt. Dana (type locality) and Mt. Warren.

5. SELÌNUM.

1. **S. capitellàtum** Wats. A stout perennial, 1 to 5 ft. high, glabrous up to the flower-cluster. Leaves 1 or 2 ft. long, pinnately compound, the numerous toothed leaflets oblong or lanceolate and 1 to 3 in. long. Flowers white, in dense heads,

each head about ½ in. across and terminating the white-woolly branch of a simple umbel. Fruit flattened, ribbed at base, winged above. (*S. validum* Congdon.)—Occasional on wet ground from Wawona and Yosemite to timber-line.

6. ANGÉLICA.

1. **A. linearíloba** Gray. Stems stout, clustered, 2 to 6 ft. high, from a perennial base, the whole herbage glabrous. Leaves twice compound; leaflets numerous, linear, 1 to 4 in. long, entire, or the lower parted into 3 linear lobes. Flowers white, in loose compound umbels destitute of bracts. Fruit oblong, glabrous, nearly ½ in. long, with winged margins and intermediate ribs, the oil-tubes conspicuous.—A rare plant, first described from specimens gathered at Ostrander's Meadows. *A. breweri* Gray, our only other Angelica, has much wider (lanceolate) leaflets, which are regularly toothed and commonly pubescent. It grows at Hetch Hetchy, Chilnualna Falls, etc.

LIGUSTICUM GRAYI C. & R., resembles a species of Angelica, but its fruit is flattened from the sides instead of from the back and front; the stems are tall and the large leaves (chiefly basal) have many cut-toothed leaflets. Its type locality is Ostrander's Meadows.

7. HERÁCLEUM.

1. **H. lanàtum** Michx. COW PARSNIP. A coarse perennial, commonly 4 to 6 ft. high, almost woolly with white hairs. Leaves with broad sheathing petioles, palmately compound; leaflets 3, lobed and toothed, 3 to 12 in. across. Flowers white, in large and loose compound umbels with linear bractlets. Fruit flat, nearly orbicular, ⅜ in. across, thin-winged and with intermediate ribs.—Common in moist places of moderate altitude.

CORNACEAE. DOGWOOD FAMILY.

Trees and shrubs with opposite entire exstipulate leaves. Calyx-tube adherent to the ovary, 4-lobed or entire. Petals 4, or wanting. Stamens 4. Ovary developing into a globose 1 or 2-seeded fruit (drupe).

Flowers white, in roundish clusters or heads, perfect.....1. CORNUS.
Flowers in narrow spikes (aments), the staminate and pistillate on separate plants.....2. GARRYA.

1. CÒRNUS. DOGWOOD.

Deciduous shrubs and trees with perfect white flowers in terminal heads or round-topped clusters.

1. **C. tòrreyi** Wats. Leaves obovate or oblanceolate, acute, on long slender petioles, lower surface pale and loosely silky-pubescent. Flowers in a loose spreading cluster. Fruit white; stone obovoid, ¼ in. long, acute at base, rough at summit, ridged on the edges.—Only once collected and the locality not known, but supposed by some to be the Yosemite Valley.

2. **C. pubéscens** Nutt. Creek Dogwood. Leaves ovate, acute, pale and pubescent beneath, 2 to 5 in. long, on petioles ¼ to 1 in. long. Flowers in a loose cluster 1 or 2 in. broad. Fruit white, subglobose; stone mostly oblique, with furrowed edges, the sides ridged.

This red-stemmed dogwood, which becomes 6 to 15 ft. high, grows along streams and in other moist places to at least 6700 ft. alt., often forming small thickets.

3. **C. nuttállii** Aud. Nuttall Dogwood. Leaves obovate, acute, pubescent, 3 to 5 in. long, short-petioled. Flowers in a compact head surrounded by a circle of white petal-like bracts 1½ in. or more long. Fruit scarlet. (*Cynoxylon nuttallii* Shafer.)

The Nuttall Dogwood (also called Western, Mountain, and Pacific Dogwood), which is a small tree with smooth bark, is one of the most showy and attractive plants in the mountains when in full bloom. The circle of white bracts is 3 to 5 in. across making the resemblance of the flower-cluster to a single flower very deceptive. It may be seen along the road to Wawona, in the Yosemite, Hetch Hetchy, and other low valleys, coming into bloom the latter part of May.

2. GÁRRYA. Silk Tassel Bush.

1. **G. fremóntii** Torr. Bear Brush. Leaves light-green,

thick, rigid, ovate or oblong, entire, 1½ to 2 in. long, on petioles ¼ to ¾ in. long. Staminate flowers in cup-like bracts of slender clustered spikes (aments), these becoming pendent and tassel-like. Pistillate flowers on separate plants, the globose black and glabrous ovaries sessile in the bracts of recurving spikes.

The Bear Brush, an evergreen, nearly glabrous shrub 5 to 10 ft. high, is common around Yosemite Valley and forms thickets near the head of Nevada Falls. It also occurs at other places of moderate altitude. *G. congdonii* Eastw. grows along the new Coulterville road, but probably below our limits. Its wavy-margined leaves are silky-pubescent beneath.

ERICACEAE. Heath Family.

Trees, shrubs, and perennial herbs. Leaves simple, mostly evergreen and stiff, sometimes fleshy or scale-like. Flowers mostly regular, the parts in 5's or 4's. Stamens free from the corolla, as many or twice as many as its parts. Anthers mostly opening by terminal holes, often with 2 horns. Ovary 1 to 10-celled, becoming a capsule or berry.

A. Petals distinct to base (corolla choripetalous).

Flowers in terminal globose or flat-topped clusters.
- Leaves toothed; stems scarcely woody..... 1. Chimaphila.
- Leaves entire; stems woody; shrub..... 7. Ledum.

Flowers in cylindric spikes or racemes.
- Ovary 5-celled ..... 2. Pyrola.
- Ovary 1-celled; no green foliage..... 3. Pleuricospora.

B. Petals united (corolla sympetalous).

Plants reddish, without green leaves.
- Flowers over ½ in. long..... 4. Sarcodes.
- Flowers not ¼ in. long..... 5. Pterospora.

Plants with ordinary green leaves.
- Stamens much exceeding corolla.
  - Tall shrub; flowers 1½ to 2 in. long..... 6. Rhododendron.
  - Low shrub; flowers not ¼ in. long..... 9. Bryanthus.
- Stamens shorter than corolla.
  - Ovary free from calyx.
    - Flowers open bowl-shaped; low shrubs.
      - Leaves ¼ to 1 in. long, opposite..... 8. Kalmia.
      - Leaves ⅛ in. long, scale-like, 4-ranked.....10. Cassiope.
    - Flowers cylindric, in racemes; tall shrub.....11. Leucothoe.
    - Flowers jug-shaped, narrowed at orifice; stems red .....12. Arctostaphylos.
  - Ovary adherent to calyx.....13. Vaccinium.

1. CHIMÁPHILA. Pipsissewa.

Low evergreen perennials, scarcely woody, with thick shining leaves scattered along the short stems. Flowers

flesh-color, waxy, few, on terminal peduncles longer than the leaves. Stamens 10, their filaments thick and hairy in the middle. Capsule 5-lobed, splitting downward.

1. **C. umbellàta** Nutt. PRINCE'S PINE. Four to 12 in. high. Leaves oblong or oblanceolate, narrowed to the base, sharply toothed, 1½ to 2½ in. long.—Big Oak Flat Road; rare.

2. **C. menzièsii** Spreng. MENZIES PIPSISSEWA. Mostly smaller, 3 to 8 in. high. Leaves ovate or broadly lanceolate, 1¼ in. or less long, less deeply toothed.—Occurs sparingly both north and south of us.

2. PÝROLA. WINTERGREEN. SHIN-LEAF.

Low perennial herbs, the leaves either evergreen and all basal or white and scale-like (somewhat scattered in *P. secunda*). Flowers in a raceme on a naked or scaly stalk. Stamens 10. Fruit a 5-celled 5-lobed capsule, splitting upward.

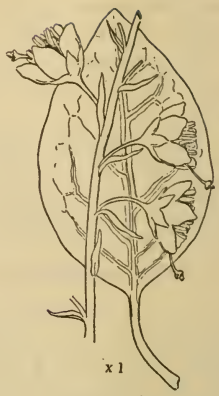
Plants with ordinary green leaves at base.
  Style straight, capped by a broad stigma.
    Corolla longer than style.....1. *P. minor.*
    Corolla shorter than style.....2. *P. secunda.*
  Style much curved, with narrow stigma.
    Leaves orbicular, green, not white-veined.....3. *P. asarifolia.*
    Leaves ovate or elliptic, white-veined.....4. *P. picta.*
    Leaves obovate or spatulate, whole surface pale.....5. *P. pallida.*
Plants reddish, with small scale-like leaves.....6. *P. aphylla.*

1. **P. mìnor** L. Leaves roundish, very minutely toothed, ½ to 1 in. long, on mostly shorter petioles. Flowers crowded, nodding, the stalk 4 to 8 in. high. Corolla nearly globose, about ¼ in. across, white or rose-color. Style straight, short and included.—Branching and leafy at base. Rare, being known with us only from Little Yosemite Valley, but extending to Arctic regions.

2. **P. secúnda** L. Leaves scattered, ovate, minutely toothed, the blade 1 to 1½ in. long and exceeding the petiole. Flowers all turned to one side, scarcely nodding, the stalk 2 to 10 in. high. Corolla barely ¼ in. across, greenish white, the petals oval. Style straight, long-exserted.

This little Pyrola with its somewhat scattered, bright-green leaves is an inhabitant of damp places as along lake borders and streams, where it forms small colonies. It grows in damp meadows near Glacier Point, in the Tuolumne Cañon, and elsewhere in our region. Perhaps the best example of its colonies may be seen on the shores of Gilmore Lake, in the Tahoe country, where for a number of yards it has taken possession of the shore.

Pyrola secunda



Pyrola picta

3. **P. asarifòlia** var. **incarnàta** Fernald. Leaves orbicular or nearly so, thick, shining, entire, 1½ to 3 in. across, rounded to a winged petiole 1½ to 3 in. long. Flowering stalk 6 to 18 in. high, the many flowers pendent and scaly-bracted. Corolla ½ in. across, rose-color, the petals obovate, obtuse. Style much curved, exserted. (*P. rotundifolia bracteata* Gray.)

The large, roundish leaves of this species often cover the ground in shaded and moist places. It grows near Upper Chilnualna Falls, near Mirror Lake, at Rosaco's, etc., but it is more plentiful around Tahoe.

4. **P. pícta** Sm. White-veined Shin-leaf. Leaves thick, firm, ovate to elliptic, mostly entire, 1 to 2½ in. long (petiole much shorter), pale beneath, dark green above but veined with white. Flowers nodding, the whole stalk 6 to 15 in. high. Corolla nearly ½ in. across, greenish, exceeded by the much curved style.

The basal cluster of shining green leaves veined or marbled with white, best mark this shin-leaf. It grows here and there in Yellow Pine forests, usually forcing its way through a carpet of pine needles.

5. **P. pállida** Greene. Pale Shin-leaf. Leaves tough, very pale on both sides, usually broadest above the middle. Otherwise like *P. picta*, with which it grows.

6. **P. aphýlla** Sm. Leaves all reduced to a few colorless or reddish scales. Flower-stalk reddish, 6 to 12 in. high, bearing a dense raceme of nodding flowers each ½ in. across. Petals thick, obovate, very obtuse, dull white or reddish. Style nearly straight, exserted, pointing downward.

The naked, reddish stalks of this species usually grow up through a bed of pine needles, each stem supporting a cylindric cluster of thickish flowers. They may be expected anywhere in the Yellow Pine Belt but the species is nowhere abundant.

3. PLEURICÓSPORA.

1. **P. fimbriolàta** Gray. Stalks erect, simple, stout and fleshy, 3 to 8 in. high. Scales (reduced leaves) ovate, acute, overlapping, white or brownish. Flowers in a dense raceme (about 1 in. thick), each in the axil of a lanceolate fringed bract. Petals 4 or 5, whitish, not united, barely ½ in. long, fringed. Stamens 8 or 10. Ovary 1-celled.

This peculiar, thick-set saprophyte was found pushing itself up through the carpet of decaying pine and Sequoia leaves in the Mariposa Grove and near Wawona. It is reported from the Pohono Trail.

4. SARCÒDES.

1. **S. sanguínea** Torr. Snow Plant. Stem erect, simple, stout and fleshy, 9 to 18 in. high, often 1 in. or more thick at base, bearing reddish scales instead of leaves and a thick raceme of fleshy red flowers. Lower scales ovate, the upper strap-shaped, all glandular and with rough edges. Corolla red, ½ to ¾ in. long, deeply 5-cleft into pointed lobes. Stamens 10. Ovary 5-lobed, becoming a 5-celled many-seeded capsule surrounded by the persistent calyx.

The Snow Plant is one of the most popular plants in the mountains, where it occurs rather sparingly in the Yellow Pine Belt. It sends its thick, bright-red stalks up through carpets of pine needles after the snow has melted, but not through the snow, as many suppose. The Park authorities have forbidden the destruction of this plant and have imposed a severe penalty for the non-observance of the regulation.

5. PTERÓSPORA.

1. **P. andromedèa** Nutt. Pine-drops. Stem erect, simple, fleshy but rather slender, 1 to 4 ft. high, ¼ to ½ in. thick at base, very sticky, the leaves reduced to reddish-brown scales. Flowers pendent in a narrow raceme, dense at first. Corolla white, scarcely ¼ in. long, shortly 5-toothed. Stamens 10. Ovary 5-lobed, many-seeded.

As indicated by its name, this highly interesting plant is an inhabitant of the pine woods, where its reddish-brown stalks shoot up straight as an arrow, or are only rarely curved

to one side to avoid some obstruction. It is much more slender than the Snow Plant, the herbage is not of so bright a color, and the stalks are usually taller.

ALLOTROPA VIRGATA T. & G., is similar in appearance to Pterospora but smaller; calyx of 5 roundish sepals; corolla lacking.—Tahoe, Kings River.

6. RHODODÉNDRON. AZALEA.

1. **R. occidentàle** Gray. AZALEA. Shrub 2 to 10 ft. high, loosely branched. Leaves alternate, entire, mostly clustered near the ends of the twigs, narrowly obovate, tipped with a sharp gland, 1 to 3 in. long, somewhat pubescent. Flowers clustered. Corolla 1½ to 3 in. long, with funnelform tube and recurved acute oblong lobes, either white or shading into rose-color, with a yellow stripe on upper lobe, much exceeded by the long stamens and style.

In June and July the sweet fragrance of the Azalea adds another pleasure to the trails where they follow a river bank or lead through swampy places. The bushes, white with bloom, may frequently be seen leaning out over a stream, now and again dipping their beautiful clusters into the water. The range extends from our lower limits to altitudes of 7500 ft., as near Glacier Point and on Clouds Rest. The true azaleas, of which this is one, differ from the true rhododendrons in having deciduous leaves, but no good botanical distinction can be made between them.

7. LÈDUM. LABRADOR TEA.

1. **L. glandulòsum** Nutt. Shrub rigid, 2 to 6 ft. high. Leaves alternate, densely clustered, entire, oblong to narrow-oval, flat, ¾ to 1½ in. long, glabrous, pale beneath. Flowers crowded, in a rounded terminal cluster. Corolla white, nearly ½ in. across, the oval petals distinct or nearly so and widely spreading, shorter than the stamens.

This is an evergreen shrub of moist places and is not uncommon in the higher mountains. It was locally noted as follows: Eagle Peak Meadows, Clouds Rest Trail, Snow Flat, Lake Tenaya, Vogelsang Pass, Mt. Lyell. The bruised foliage imparts a pleasing fragrance due to a resin which it contains. The plant is said to be poisonous.

8. KÁLMIA. AMERICAN LAUREL.

1. **K. polifòlia** var. **microphylla** Hall. PALE LAUREL. Shrub spreading, 2 to 6 in. high. Leaves opposite (rarely in 3's),

AZALEAS ALONG THE MERCED

Azaleas always grow amid pleasant surroundings, as though appreciative of the beautiful. The large, white and orange-colored flowers are most delightfully fragrant. The bushes, often five or ten feet high and white with bloom, may be frequently seen leaning out over the stream, now and again dipping their beautiful flower-clusters into the water.

nearly sessile, oblong or nearly linear, the edges strongly rolled backward, ¼ to ¾ in. long, glabrous, pale beneath. Flowers in a simple terminal cluster, on pedicels longer than the leaves. Corolla bowl-shaped, ⅜ to ½ in. across, lilac-purple, longer than the stamens. (*K. glauca microphylla* Hook.)

The smooth foliage and the bright showy flowers of the Pale Laurel are very attractive along creeks and moist meadows near timber-line, but it is one of our most poisonous plants. In the Rocky Mts., where it is more plentiful, many sheep and cattle are lost each year by eating it.

9. BRYÁNTHUS.

1. **B. bréweri** Gray. Leafy stems 6 to 12 in. high, erect from a prostrate branching base. Leaves alternate but much crowded, linear, entire, with thickened or recurved margins, obtuse, ¼ to ½ in. long, glabrous. Flowers in head-like terminal clusters, the glandular pedicels slightly exceeding the leaves. Corolla rose-purple, cup-shaped, deeply lobed, ⅜ in. across, the stamens and style conspicuously protruding. (*Phyllodoce breweri* Heller.)

The Bryanthus, often called "Heather," because of its similarity to the true heather of Europe, grows on gravelly slopes, moist banks, and grassy places at high altitudes. There are patches of it on Clouds Rest, among the summit rocks. The narrow, thickly set leaves standing out all around the stem like the bristles of a bottle-brush, and the showy clusters of red flowers with their conspicuously protruding stamens, are characters which at once distinguish this interesting plant.

Bryanthus

Cassiope

10. CASSÌOPE.

1. **C. mertensiàna** Don. Stems rigid and ascending, 1 ft. or less high, densely leafy. Leaves closely overlapping in 4

rows, thick, boat-shaped, only about ⅛ in. long, glabrous. Flowers nodding on erect naked pedicels from the upper leaf-axils. Corolla white or rose-color, cup-shaped, about ¼ in. across.

It is always a pleasure to come across the bell-like flowers of the Cassiope, or White Heather, as it is sometimes called, for aside from its own charm, it is ever a good omen of charming places. It grows only along ridges and rocky ledges near timber-line where everything is clean and inviting. The peculiar, thick leaves, closely set and overlapping each other, completely clothe the tough, perennial stems, which freely branch below to form tangled beds, often of considerable extent.

11. LEUCÓTHOE.

1. **L. davísiae** Torr. Evergreen leafy shrub, 3 to 5 ft. high, nearly glabrous. Leaves alternate, short-petioled, oblong, minutely toothed, 1½ to 3 in. long, ½ to 1 in. wide. Flowers pendulous, in clustered terminal racemes 2 to 6 in. long. Corolla cylindric, 5-toothed, slightly oval, ¼ in. long, dull white, completely enclosing the stamens.—Moist places above 5000 ft. alt., not common: Merced Grove, Signal Peak, and near Chinquapin.

12. ARCTOSTÁPHYLOS. MANZANITA.

Evergreen shrubs with crooked branches, the red bark very smooth. Leaves alternate, entire or toothed. Corolla pinkish, urn-shaped, 5-toothed. Stamens 10, included. Fruit of several-stony nutlets surrounded by a soft pulp, called a berry. (*Uva-ursi.*)

Stems prostrate ..... 1. *A. nevadensis*
Stems erect.
  Whole plant glabrous; leaves green ..... 2. *A. patula.*
  Plant pubescent, at least the petioles and inflorescence.
    Leaves pale, rigid ..... 3. *A. mariposa.*
    Leaves green ..... 4. *A. tomentosa.*

1. **A. nevadénsis** Gray. DWARF MANZANITA. Leaves glabrous, oval or oblanceolate, sharply tipped, 1¼ in. or less long, ¼ to ¾ in. broad, mostly erect. Flowers few, in small clusters. Berry smooth, reddish.

The trailing or creeping stems of the Dwarf Manzanita are found covering banks and forming loose mats in the high mountains. It ranges from Gin Flat (7000 ft.) and Glacier Point to timber-line on Clouds Rest and the High Sierra Nevada.

2. **A. pátula** Greene. Green Manzanita. Leaves green and glabrous, oval to orbicular, obtuse, broad at base, 1 to 2 in. long, ¾ to 2 in. broad, spreading or pendulous. Flowers deep pink, ¼ in. long, in rounded terminal clusters. Berry smooth, fleshy, over ¼ in. across. (*A. pungens platyphylla* Gray.)

The stems of this Manzanita are commonly 4 to 6 ft. high and branched to make spreading shrubs. It forms much of the chaparral on slopes around the Yosemite Valley, ranging from about 4500 to at least 9000 ft. alt. and is widely distributed in the Sierra Nevada. The ripening berries are pleasingly acid, the taste being similar to that of green apples. It is said that they are much sought by bears, and chipmunks are very fond of the seeds.

3. **A. maripòsa** Dudley. Leaves pale gray, rough-pubescent (petioles and twigs stiff-hairy), ovate to broadly oblong, obtuse but with a short point, 1 to 1½ in. long, ¾ to 1¼ in. broad, mostly erect. Flowers in flat-topped clusters. Berry scarcely ¼ in. broad, soon dry and mealy.

The desiccated foothill slopes form the natural habitat of this species, but it also ranges well up into the Yellow Pine Belt on warm exposures, reaching Yosemite Valley and extending up southward slopes to about 6000 ft. alt. The shrubs are erect, commonly 3 to 5 ft. high, and with spreading branches.

4. **A. tomentòsa** Dougl. Hairy Manzanita. Similar to *A. mariposa* but leaves green and nearly smooth, either erect or loosely spreading. Berry larger, ⅜ in. across.—Hetch Hetchy and the lower foothills.

13. **VACCÍNIUM.** Blueberry. Cranberry. Bilberry.

Shrubs, ours all small and confined to high altitudes. Calyx-tube adherent to the ovary, which becomes a 4 to 5-celled many-seeded berry crowned with the short calyx-teeth. Corolla in our species rose-color, ovate or globose. Stamens 8 or 10, included in the corolla-tube.

1. **V. occidentàle** Gray. Sierra Bilberry. Stems 1 or 2 ft. high, the twigs densely leafy. Leaves glabrous, oval or oblanceolate, entire, ¼ to ¾ in. long. Flowers 2 to 4 or solitary in the leaf-axils, from distinct scaly buds. Calyx-limb deeply

4 or 5-parted. Corolla mostly 4-lobed. Berry scarcely ¼ in. across, blackish blue, with a bloom.—Mostly at 5000 to 8000 ft., not so common as in the Tahoe district.

2. **V. caespitòsum** var. **cuneifòlium** Nutt. DWARF BILBERRY. Stems a few in. to 1 ft. high. Leaves broad above, somewhat wedge-shaped, with rounded apex, mostly finely toothed, ¼ to 1 in. long. Flowers solitary. Calyx-limb only slightly lobed. Corollas mostly 5-lobed. Berry blue, with a bloom, sweet.—Dark Hole and Crescent Lake to the summits; common in subalpine meadows.

V. MYRTILLUS var. MICROPHYLLUM Hook., is a low plant which may be known, if found, by its sharply angled green branches and very small toothed leaves. *V. ovalifolium* Sm., has similarly angled branches but it is a large shrub (4 to 8 ft.) with leaves 1 or 2 in. long. It may occur at moderate altitudes.

PRIMULACEAE. PRIMROSE FAMILY.

Herbs with simple undivided leaves. Flowers regular, the parts usually in 5's. Stamens on tube or base of corolla opposite the lobes. Ovary free from calyx (in ours), 1-celled, with a single style, becoming a capsule.

Leaves all crowded near the base.
  Stamens short, included in the corolla-tube.
    Corolla ½ in. long, open at throat.....1. PRIMULA.
    Corolla minute, narrowed at throat.....2. ANDROSACE.
  Stamens much exserted.....3. DODECATHEON
Leaves all in a terminal cluster.....4. TRIENTALIS.

1. PRÍMULA. PRIMROSE.

1. **P. suffrutéscens** Gray. SIERRA PRIMROSE. Leaves crowded on creeping stems, thick, narrowly wedge-shaped, toothed at apex, ¾ to 1½ in. long. Flowers in a loose umbel terminating a naked stalk 1 to 4 in. high. Corolla ½ to ¾ in. long, red-purple, the 5 spreading lobes deeply notched.

The Sierra Primrose inhabits gravelly mountain-tops and ridges, where its bright flowers form pleasing groups, often in the shelter of granite rocks. It grows on Clouds Rest, Mt. Hoffmann, Mt. Dana, and other high peaks.

2. ANDRÓSACE.

1. **A. septentrionàlis** var. **subulífera** Gray. A dwarf annual

with lanceolate nearly entire leaves (½ in. or less long) all huddled at base. Stems several, erect, ¼ to 2 in. high, each bearing 1 to several minute terminal flowers. Calyx sharply 5-toothed to the middle, ⅛ in. long, equalling the white corolla.—Common only in the Rocky Mts. and the far north. Discovered in 1909 between Mt. Dana and Mt. Gibbs by Professor W. L. Jepson.

3. DODECÀTHEON. Shooting-star.

Perennial herbs with naked stalks bearing at summit an umbel of several showy flowers. Corolla 4 or 5-parted, the long and narrow divisions turned back over the short tube and thick throat. Stamens as many as corolla-lobes, pointing straight forward, inserted on the throat, the short flat filaments united, or entirely wanting in our species. Style long. Related to the cultivated Cyclamen.

1. **D. jéffreyi** Van Houtte. Leaves oblanceolate, acutish, entire or slightly toothed, narrowed to a sheathing base, 2 to 15 in. long. Stem naked, 5 to 18 in. high, finely pubescent above where it bears a bracted cluster of 5 to 15 nodding flowers, each on a pedicel ½ to 3 in. long. Corolla-segments mostly 4, ¾ to 1 in. long, rose-pink, pale or yellowish toward base, closely reflexed and exposing a purple ring of the throat. Stamens 4, anthers reddish purple.

Dodecatheon jeffreyi

Dodecatheon jeffreyi redolens

The Shooting-stars are most attractive as one comes upon them in the wet mountain meadows, standing straight like pink soldiers. There is a fine meadow back from Glacier Point, just off the Chinquapin Road, that has been entirely taken over by Shooting-stars and the white Marsh Marigold. It also grows at Hog Ranch, Snow Flat, Eagle Peak

Meadows, Yosemite Valley, and thence nearly to timber-line. At high altitudes one may expect the large var. *redolens* Hall, characterized by a stronger fragrance of the herbage, the 5 corolla-segments less closely reflexed, thus including the lower part of stamens and capsule in the cup-like corolla-tube and not exposing the purple ring of the corolla. The two forms are well distinguished in the accompanying figures. A decidedly different plant as to general appearance also grows at high altitudes (technically known as *D. jeffreyi* forma *pygmaeum* Hall). This is only 4 to 8 in. high, with thicker leaves only 1 to 1½ in. long. Its whole appearance is that of a starved plant, or one which has only a short growing period. At Snow Flat, where it grades into the usual form, the smallest plants always grow in poor soil, either sandy or where decaying vegetation has made the soil acid.

2. **D. alpìnum** Greene. Similar to no. 1 but smaller in all its parts and perfectly glabrous throughout. Leaves strap-shaped, acutish, 1 to 5 in. long. Corolla-segments ⅜ to ⅝ in. long.

Notwithstanding its specific name, this shooting-star is not strictly Alpine, for it grows most plentifully in moist meadows throughout the Upper Coniferous Belt. At high altitudes the plants are smaller and resemble the pygmy form of no. 1, but are always distinguished by the entire absence of glands or hairs on the branches of the flower-cluster. When timber-line is reached an extremely small form is encountered, the stalks only 2 to 6 in. high and the leaves only ½ to 1½ in. long. This is technically known as forma *nanum* Hall, and was first described from specimens gathered on Mt. Dana at 11,000 ft. alt.

4. TRIENTÀLIS.

1. **T. europaèa** var. **latifòlia** Torr. STAR-FLOWER. Stems 3 to 6 in. high, with only a terminal whorl of 4 to 6 leaves which subtend a cluster of dainty slender-pediceled roseate flowers. Leaves obovate, 1 to 3 in. long, ¾ to 2 in. broad. Corolla wheel-shaped, deeply 5 to 7-parted, ¼ to ½ in. across. —Shaded places, chiefly of the Coast Ranges, but also found in the vicinity of Crockers.

OLEACEAE. OLIVE FAMILY.

Trees and shrubs, ours with opposite pinnately compound leaves. Flowers small, each with a 4-cleft calyx, the corolla sometimes wanting. Stamens mostly 2. Ovary 2-celled,

becoming a mostly 1-celled 1-seeded fruit with a long wing from the end.

1. FRÁXINUS. Ash.

Two species of Ash grow at El Portal and elsewhere so near the Park boundary that they should perhaps be included. The Oregon Ash (*F. oregona* Nutt.) is a fair-sized tree, with leaves 6 to 12 in. long, each with 5 to 7 oblong or oval leaflets 2 to 5 in. long, the flowers without corollas. The Flowering Ash (*F. dipetala* H. & A.) is a large, rounded shrub, 5 to 15 ft. high, with leaves 3 to 6 in. long, each with 3 to 9 leaflets 1 or 2 in. long, each flower with 2 white petals.

GENTIANACEAE. Gentian Family.

Glabrous herbs with opposite entire sessile leaves and no stipules. Flowers regular, conspicuous. Stamens inserted on the tube of the corolla, as many as its lobes and alternate with them. Ovary 1-celled, with a single style, the seeds numerous.

Leaves simple, entire, sessile.
  Flowers pink; slender annual.....1. Erythraea.
  Flowers bluish or greenish.
    Stems not 2 ft. high.....2. Gentiana.
    Stems 3 to 5 ft. high; petals with fringed glands.....3. Frasera.
Leaves compound, long-stalked; marsh plant.....4. Menyanthes.

1. ERYTHRAÈA. Canchalagua.

1. **E. venùsta** Gray. Leaves ovate or lanceolate, acute, ¾ in. or less long. Calyx-lobes slenderly linear, parted nearly to base. Corolla with very short narrow tube, the spreading oval deep-pink lobes ⅜ or ½ in. long. Anthers exserted from the tube, becoming spirally twisted.

The Canchalagua is a slender annual, 3 to 12 in. high, the single stem branching only above, where it bears a loose, showy cluster of bright-pink flowers with yellow centers. It is common in the foothills, extending into the mountains as far as Wawona, Yosemite, and Hetch Hetchy valleys and Rancheria Mt. (5500 ft.). Settlers use it in the treatment of malaria and other fevers.

2. GENTIÀNA. Gentian.

Erect herbs with showy flowers. Corolla funnelform. Style very short or none; stigma of two spreading lobes.

Calyx naked; slender annuals.
  Flower solitary, 1 in. long.
    Seeds rough .....1. *G. detonsa.*
    Seeds smooth .....2. *G. simplex.*
  Flowers many, ½ in. long.....3. *G. amarella.*

Calyx surrounded by leaf-like bracts; perennials.
Plant dwarf, 1 to 5 in. high.....4. *G. newberryi.*
Plant robust, 5 to 15 in. high.....5. *G. calycosa.*

1. **G. detónsa** Rottb. Plant 3 to 15 in. high, the stem simple, or branched below, with 2 to 6 pairs of lanceolate leaves (¼ to 1 in. long) and terminated by a single erect flower. Pedicel much exceeding the leaves. Corolla sky-blue, 1 to 2 in. long, deeply 4 or 5-lobed; lobes rounded, often minutely toothed. Seeds oval, rough with minute projecting scales. (*G. serrata holopetala* Gray.)

The famous Fringed Gentian of the Eastern United States is a close relative of this plant, differing mainly in having the corolla-lobes strongly fringed around the summit. Our species occurs throughout the Sierra Nevada in meadowy and grassy places, ranging from the altitude of the Yosemite to Tuolumne Meadows. Except by its seeds, it can scarcely be distinguished from the next.

2. **G. símplex** Gray. Like no. 1, but the stem always simple, the flowers ¾ to 1¼ in. long, and the seeds smooth but longitudinally lined.—In similar places, and the two species often mistaken for each other in the absence of seeds.

3. **G. amarélla** var. **acùta** Hook. Plant 6 to 18 in. high, erect, leafy up through the flower-clusters. Leaves lanceolate or oblong, ½ to 1½ in. long. Corolla mostly blue, about ½ in. long, with 5 oblong lobes.—A widely distributed species, found at Tuolumne Meadows (and Tahoe).

4. **G. newbérryi** Gray. Plant 1 to 3 in. high (rarely 5 in.). Stems several, decumbent at base, with crowded spatulate or oblong leaves and a single terminal flower. Peduncle very short or none. Corolla pale blue, white within, greenish dotted, about 1½ in. long; lobes ovate, sharply pointed, connected by a transparent 2 or 3-cleft membrane.—Near Glacier Point and perhaps elsewhere at high altitudes.

5. **G. calycòsa** Griseb. Stems simple, 5 to 15 in. high, leafy to summit, with one or several erect terminal flowers. Leaves ovate or roundish, ¾ to 1½ in. long. Pedicels much shorter than leaves. Corolla blue, green-dotted, about 1½ in. long, its ovate lobes connected by a bluish membrane with several slender teeth.—Reported from near Sentinel Dome; more common around Lake Tahoe.

3. FRÀSERA.

1. **F. speciòsa** Dougl. Leaves opposite or in whorls of 4 or 6, ovate or oblong, the upper narrower, acute, 5 to 10 in.

long, nerved. Calyx of 4 narrow acute sepals. Corolla-lobes 4, spreading, greenish white and dark-dotted, oval, acute, ½ in. long, each with a pair of large long-fringed glands. Stamens 4, shorter than the lobes. (*Sweertia radiata* O. Ktze.)

This is a straight, robust, perennial herb, 3 to 5 ft. high, the unbranched leafy stalk bearing a long cluster of numerous greenish flowers on pedicels 1 or 2 in. long. It grows at Glacier Point, in Little Yosemite Valley, at Tuolumne Meadows, etc., but it is nowhere common.

4. MENYÁNTHES. Buckbean.

1. **M. trifoliàta** L. Leaves long-petioled, with 3 oval or oblong leaflets each 1½ to 3½ in. long. Corolla short-funnelform, 5-cleft, white or rosy, the upper surface white-bearded, nearly ½ in. long.

The muddy bottom of Lost Lake, in Little Yosemite Valley, is full of the creeping rootstocks of the Buckbean, which lifts its leaves above the surface of the shallow water in great abundance. It has been reported also from Crescent Lake and doubtless occurs elsewhere in our district.

APOCYNACEAE. Dogbane Family.

Ours perennial herbs with milky juice and entire opposite leaves. Flowers regular, the parts in 5's except the pistils, which are 2. Stamens on the corolla, alternate with its lobes, anthers grouped around the stigma. Pods 2, the seeds with a tuft of silky hairs at one end.

1. APÓCYNUM. Indian Hemp.

1. **A. androsemaefòlium** var. **pùmilum** Gray. Small Dogbane. Plant low (6 to 15 in.), the many branches widely spreading. Leaves dark green, ovate or roundish, with broad base, ¾ to 1½ in. long, short-petioled. Flowers solitary in the upper leaf-axils and in short terminal clusters. Corolla pinkish white, nearly ¼ in. long, the lobes somewhat spreading. Pods 2 to 7 in. long, slender-cylindric, pointed.—Widely scattered in open pine forests, occurring in a variety of forms.

2. **A. cannábinum** L. Indian Hemp. Plant taller (2 to 4 ft.), with fewer and less spreading branches. Leaves pale green, narrowly ovate to lanceolate, 1½ to 3 in. long, sessile or short-petioled. Corolla greenish white, ⅛ in. long, the lobes ascending. (*A. breweri* Greene, a broad-leaved form from the Yosemite.)

Mr. Charles R. Dodge, of the U. S. Department of Agriculture, reports that the fiber prepared from the stems of

this plant by the Indians is fine, long, and tenacious, and when well treated is creamy white and remarkably soft. It is used in making twine, fish lines, small baskets, and similar articles, especially by the Pai Utes of Nevada. The plant grows in moist places at moderate altitudes and is very common in the lower part of Yosemite Valley.

CYCLADENIA HUMILIS Benth., is to be expected on gravelly ridges. It is a broad-leaved dwarf with showy, rose-purple flowers ¾ in. long.

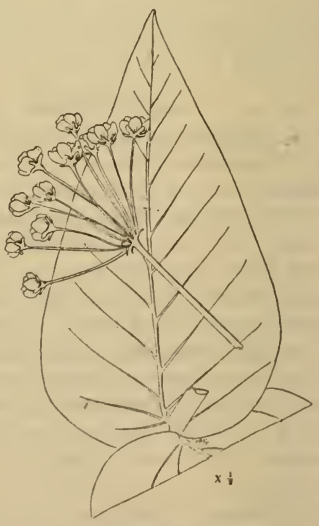
ASCLEPIADACEAE. MILKWEED FAMILY.

Herbs, with milky juice, the leaves opposite or in whorls. Calyx and corolla 5-parted (divisions reflexed in ours). In our single genus the 5 stamens are on the base of corolla, the filaments united into a tube fused above with the styles and bearing on the back a circle of 5 hoods each often with an incurved horn. Fruit 1 or 2 large pods with numerous seeds, each seed with a silky tuft of hairs at apex.

1. ASCLÈPIAS. MILKWEED.

Erect perennial herbs, branched only at base, leafy to the top. Flowers pediceled, in simple stalked clusters (umbels) from between the upper leaves.

Asclepias speciosa



Asclepias cordifolia

1. **A. speciòsa** Torr. SHOWY MILKWEED. Stem stout, 1½ to 5 ft. high, stiffly erect, woolly-pubescent except when old. Leaves oval to ovate or oblong, 3 to 8 in. long, petioled. Petals pink or reddish purple. Hoods with conspicuous horns (¼ in. long) much exceeding the central disk. Pod woolly, soft-spiny toward the apex.

The stems of this milkweed, which is plentiful in the Yosemite and other of our valleys, yield a strong, white fiber, much used by the Indians, who call it Hook-ken. The Hupas prize also the milky juice, which they boil down and use as a chewing-gum. The herbage is very poisonous to animals. It does not cause so much trouble to stockmen, however, as *A. eriocarpa* Benth., a species of lower altitudes which may be known by its more oblong leaves and white flowers.

2. **A. cordifòlia** Jepson. PURPLE MILKWEED. Stems 1½ to 3 ft. high, the whole plant entirely glabrous and more or less purplish. Leaves ovate, acute, 2½ to 6 in. long, 1½ to 4 in. wide, sessile by a heart-shaped base. Petals dark reddish purple. Hoods purplish, without horns. Pod glabrous, smooth, long-pointed. (*Gomphocarpus cordifolius* Benth.)

The smooth and clean-looking foliage of this plant is a common sight on the gravelly and rocky slopes around Yosemite Valley. It doubtless grows throughout the lower part of the Yellow Pine Belt. Although we have no direct evidence, it is probable that this species is poisonous to live-stock in the same manner as the next.

3. **A. mexicàna** Cav. NARROW-LEAF MILKWEED. Stems usually 2 or 3 ft. high, the plant entirely glabrous and green. Leaves 3 or more in a whorl, narrowly lanceolate, acute, 2½ to 6 in. long, ¼ to ¾ in. wide, narrow at base. Flowers

Asclepias mexicana

small, greenish white or purplish. Horns slender, exserted from the hoods. Pod smooth, glabrous.

The Narrow-leaf Milkweed is a foothill species, but has been found as far up as Mirror Lake. It is much dreaded by sheepmen on hot days when they are obliged to drive their flocks over dry districts where there is little other vegetation and no water. Under these conditions the sheep are tempted to eat the milkweed, which contains an active poison and causes many deaths. This is sometimes prevented by cutting the plants down a few days before the sheep are driven through, the object being to dry the herbage and so render it less tempting.

CONVOLVULACEAE. Morning-glory Family.

Chiefly trailing or twining herbs, with alternate leaves or leafless. Flowers regular. Stamens 5, on the corolla-tube and alternating with its 5 lobes. Ovary 2-celled, becoming a globose 2 to 6-seeded capsule.

Leafy plants with conspicuous flowers.....1. Convolvulus.
Leafless twining herb with small flowers.....2. Cuscuta.

1. CONVÓLVULUS. Morning-glory.

1. **C. villòsus** Gray. Leaves petioled, triangular or heart-shaped, 1 to 2½ in. across, velvety with a dense white pubescence. Flowers pediceled, from the leaf-axils, the calyx with a pair of broad bracts at base. Corolla creamy white, funnel form, 1 to 1½ in. long, not lobed. (*C. malacophyllus* Greene.)

The trailing, leafy stems of this plant are commonly ½ to 2 ft. long, and may be seen in open pine forests at middle altitudes.

2. CÚSCUTA. Dodder. Love-vine.

1. **C. californica** Choisy. Stems twining, pale, leafless. Flowers in loose clusters, very small. Corolla nearly globose, with 5 slender acute lobes.

The thread-like, orange-colored stems of this dodder entwine themselves about grasses and other low plants, upon which they are parasitic, although the seeds germinate in the ground. It is abundant in low valleys. Other species are doubtless present but not yet detected.

POLEMONIACEAE. Gilia Family.

Herbs and low shrubs with mostly regular flowers. Calyx and corolla 5-lobed. Stamens 5, inserted on the tube or throat.

POLEMONIUMS AMONG SUMMIT ROCKS

The Polemonium is at home among granite rocks of the highest peaks. It is a sturdy perennial with dense clusters of funnel-form, blue flowers. This species is *Polemonium eximium.*

Capsule 3-celled and style 3-parted, or cells and style-branches only 2 in some Navarretias.

Leaves pinnately compound, the leaflets entire; corolla bluish, bell-shaped or short-funnelform.....1. POLEMONIUM.
Leaves simple, often finely cut or deeply lobed.
Tube of corolla constricted below the spreading lobes; two stamens regularly inserted lower down than the other three; perennials with opposite entire leaves.....2. PHLOX.
Tube of corolla not constricted below the lobes; stamens often unequally inserted but not in two sets.
Calyx-lobes equal; flowers pediceled (pedicels very short in some species).....3. GILIA.
Calyx-lobes unequal; flowers strictly sessile in heads with spinose bracts.....4. NAVARRETIA.

1. POLEMÒNIUM. GREEK VALERIAN.

Perennials with alternate pinnately compound leaves, the leaflets entire. Corolla bell-shaped or short-funnelform, with very short tube. Stamens equally inserted near summit of tube, but often of unequal length.

Corolla-lobes about equalling the tube.
Stem solitary, 2 to 4 ft. tall.....1. *P. occidentale.*
Stems numerous, 9 in. or less high.....2. *P. pulcherrimum.*
Corolla-lobes much shorter than tube.....3. *P. eximium.*

1. **P. occidentàle** Greene. Leaves 3 to 12 in. long; leaflets 9 to 25, narrowly lanceolate to ovate, ¾ to 1½ in. long. Corolla blue, ½ in. long, much exceeded by the style. (*P. coeruleum* of Bot. Calif.)

The stem of this species is strictly erect from a perennial root, the upper portion bearing numerous deep-blue flowers in small clusters. It grows in wet places but is known in our district only from Yosemite Valley and Mono Pass.

2. **P. pulchérrimum** Hook. Leaves 2 to 5 in. long; leaflets 7 to 19, oval or elliptic, ¼ to ¾ in. long. Corolla blue or violet, about ⅜ in. long, the style slightly exserted. (*P. humile pulchellum* Gray.)

In this Polemonium the bright flowers are borne on the branching summits of leafy stems only 4 to 8 in. high, which rise from a creeping, perennial base. It is found in moist or shaded places at 6000 to 10,000 ft. alt., and is especially common along Snow Creek and at Lake Tenaya.

3. **P. exímium** Greene. Leaves 1 to 4 in. long; leaflets 15 to numerous, crowded, elliptic, about ⅛ in. long. Corolla deep blue, ½ to ¾ in. long, the roundish lobes nearly ¼ in. across, exceeding the style. (*P. confertum*, of Bot. Calif.)

The peculiar worm-like leaves with numerous small, divided

leaflets, at once mark this interesting Alpine plant. The leaves are crowded toward the thick, perennial base, the flowering stalks (2 to 8 in. high) being comparatively naked. The flowers are in terminal, head-like clusters. The species grows only among granite rocks above timber-line but here it is common, from one end of the Sierra Nevada to the other, amid surroundings such as shown in the illustration.

2. PHLÓX.

Low perennials with opposite and sessile entire leaves. Corolla with a long slender tube and abruptly spreading limb (salverform). Stamens included, very unequally inserted in the tube of the corolla in two sets. Capsule with but 1 seed in each cell.

Leaves 1 or 2 in. long; corolla-lobes usually notched.....1. *P. speciosa.*
Leaves ½ in. or less long; corolla-lobes entire.
  Leaves ¼ to ½ in. long.....2. *P. douglasii.*
  Leaves not ¼ in. long; calyx glandular.....3. *P. caespitosa.*

1. **P. speciòsa** Pursh. Leaves not crowded, 1 to 2½ in. long, linear-lanceolate, acute. Flowers in loose clusters, the naked calyx (and stems) glandular-hairy. Corolla rose-pink, ½ in. across, the lobes deeply notched or sometimes entire, the tube ½ in. long.

This is one of the most showy and pleasing plants of the lower part of the pine belt. The loosely branched, woody stems are 6 to 18 in. high and bear a great profusion of dainty, pinkish flowers. The species is not common except in the neighborhood of Crockers and in Tuolumne Co. Our form, marked by the glandular calyx with teeth shorter than the tube, was once called *P. occidentalis* Dur.

2. **P. douglásii** Hook. Leaves densely crowded, ¼ to ½ in. long, nearly awl-shaped, sharply pointed. Flowers terminal on short branches, the calyx crisp-hairy and nearly hidden by the upper leaves. Corolla bluish purple, lilac, or nearly white, ⅜ to ¾ in. across, the tube (½ in. long) exceeding the calyx, the lobes entire.

The very leafy stems of this Phlox creep along the ground, forming dense, green mats, thickly dotted with beautiful flowers on erect branchlets. It grows on gravelly slopes and summits above 6000 ft. alt. The comparatively loose form with longer leaves is the var. *diffusa* Gray.

3. **P. caespitòsa** subsp. **muscoìdes** Brand. Moss-PHLOX. Somewhat like *P. douglasii* but still more compact and moss-like, the stems only 1 or 2 in. high and completely hidden by the dense foliage. Leaves not ¼ in. long. Calyx glandular. Corolla more exserted.—Alpine Zone only, as at Mono Pass and Mt. Dana.

3. GÍLIA.

Annuals and perennials (some low shrubs). Corolla tubular-funnelform or salverform (i. e., with cylindric tube and spreading lobes). Stamens equally or unequally inserted (this best seen by holding a flower up to the light).

A. Leaves all, or at least the upper, alternate.

Flowers salmon-color, mostly in terminal bracted heads.
- Corolla 3 or 4 times as long as calyx..... 1. *G. grandiflora.*
- Corolla not twice as long as calyx..... 2. *G. linearis.*

Flowers not salmon-color.
- Corolla inconspicuous; seeds 1 to 3 in each capsule.
  - Leaves all sessile and entire..... 3. *G. gracilis.*
  - Lower leaves petioled, often lobed..... 4. *G. gilioides.*
- Corolla showy; seeds 6 to numerous.
  - Leaves entire, or palmately parted into entire leaf-like lobes.
    - Flowers on slender naked pedicels..... 5. *G. leptalea.*
    - Flowers sessile among rigid needle-like leaves; woody perennial ..... 8. *G. pungens.*
  - Leaves pinnately lobed.
    - Flowers pale, in dense heads..... 6. *G. achilleaefolia.*
    - Flowers red, scattered..... 7. *G. aggregata.*

B. Leaves all opposite or apparently whorled.
(Delicate erect annuals, except no. 15.)

Corolla less than ¼ in. long, broadly funnelform, the tube not exserted from the calyx.
- Stem pubescent ..... 9. *G. filipes.*
- Stem glabrous ..... 10. *G. harknessii.*

Corolla ½ in. or more long, salverform with narrow tube long-exserted except in no. 14.
- Stamens exserted from the corolla-tube; flowers in bracted clusters.
  - Flowers a little longer than the bracts.
    - Corolla purple; annual ..... 11. *G. ciliata.*
    - Corolla white; perennial ..... 15. *G. nuttallii.*
  - Flowers twice as long as the bracts.
    - Corolla nearly glabrous, not 1 in. long..... 12. *G. bicolor.*
    - Corolla pubescent, 1 in. or more long..... 13. *G. androsacea.*
- Stamens included; flowers white, large, in pairs or scattered ..... 14. *G. dichotoma.*

1. **G. grandiflòra** Gray. COLLOMIA. Stem simple, 1 or 2 ft. high, leafy to the top. Leaves sessile, linear or lanceolate, entire. Flowers mostly in a terminal head surrounded by

broad bracts. Corolla buff or salmon-color, narrow-funnelform, 1 in. long. Stamens unequally inserted. Seeds 1 to 3 in the capsule. (*Collomia grandiflora* Dougl.)

The erect, leafy stems of this annual, each bearing a terminal head of showy flowers, is a familiar sight around Yosemite Valley and from Wawona to Hetch Hetchy. The species grows in warm situations, blossoming in summer. In Germany, where it is cultivated, the stems are often much branched.

2. **G. lineàris** Nutt. Similar to no. 1 but smaller, the corolla only about ½ in. long and not twice as long as the calyx.—Mariposa Grove.

G. TINCTORIA Kell., is a similar but branching plant with purplish corolla and stamens equally inserted. It occurs north of our limits.

3. **G. grácilis** Hook. Stem simple, or branched above, annual, 3 to 9 in. high. Leaves oblong or lanceolate, entire (the lower opposite, upper alternate). Flowers scattered. Corolla purple, with yellow throat, salverform, ¼ to ⅜ in. long, scarcely exceeding the calyx. Stamens unequally inserted.—Widely distributed at middle altitudes, occurring in a variety of forms.

4. **G. gilioìdes** Greene. Stem loosely branched, annual, 6 to 18 in. high, pubescent. Leaves lanceolate, partly entire but some toothed or even parted into broad lobes. Corolla blue-purple, salverform, ¼ to ½ in. long, twice as long as calyx but very narrow and not showy. Stamens equally inserted or nearly so.—Very common. Var. *benthamiana* Brand, has leaves mostly with linear or lanceolate segments. Var. *greeneana* Brand, has oval or oblong leaf-segments. Var. *integrifolia* Brand, has entire leaves.

5. **G. leptàlea** Greene. A slender erect annual, 2 to 20 in. high, with many fine ascending branchlets, nearly glabrous. Leaves linear, entire, ½ to 2 in. long. Flowers numerous, scattered, on naked pedicels. Corolla magenta, the dull-white throat with blue markings, the tube yellow, funnelform, ½ in. long, much exceeding calyx. Capsule 9 to 15-seeded.—Abundant at middle altitudes and in a small form to 9000 ft. alt., but not conspicuous until midsummer.

G. CAPILLARIS Kell., may occur. It resembles a low form of *G. leptalea* but the pale or nearly white corolla is more tubular and inconspicuous, scarcely ¼

in. long. *G. subalpina* Greene, is a diminutive form of high altitudes, with never more than 6 ovules.

6. **G. achilleaefòlia** Benth. BLUE GILIA. An erect annual, 9 to 18 in. high, with few branches, nearly glabrous. Leaves pinnately divided into linear mostly toothed lobes. Flowers in dense terminal heads without bracts. Corolla pale blue or white, ⅜ in. long, much exceeding calyx, the lobes broadly oblong.—From the foothills to Wawona, Yosemite, etc. *G. capitata* Dougl., a similar species but with linear-lanceolate corolla-lobes, may be found.

7. **G. aggregàta** Spreng. SCARLET GILIA. Stems numerous, 1½ to 4 ft. high, from a branched biennial base, pubescent. Leaves pinnately parted into narrowly linear divisions. Corolla reddish or scarlet, 1 to 1½ in. long, the lanceolate lobes (red-dotted on a yellowish ground) recurved. Stamens protruding, inserted in the notches between the lobes. Var. *bridgesii* Gray., has broader calyx-teeth and leaf-lobes and stamens sometimes included.

This is the most showy of all our gilias. The brilliant flowers are borne in loose panicles 1 ft. long and when occupying an area to the exclusion of other species the mass effect is very striking. It inhabits loose or gravelly soil at 6000 to 9000 ft. alt., as in Illilouette Valley, along the Pohono trail, near Snow Creek (6600 ft.), Crane Flat, and Rancheria Mt. extending to Washington, Nebraska and Mexico.

Gilia aggregata

Gilia pungens

8. **G. púngens** Hook. Stems many, from a woody base, 1 ft. or less high, very leafy to the top. Leaves parted to the base into rigid and needle-like sharp-pointed lobes ½ in. or so long, each lobe resembling an entire leaf, with shorter ones

in the axils. Corolla white (or tinged with rose), about 1 in. long, the flaring lobes roundish and obtuse. Stamens not protruding.

This Gilia forms loose mats on summits and along ledges at more than middle altitudes. It resembles Phlox, but the corolla gradually expands from a narrow tube to the spreading limb (funnelform), while in Phlox the limb is abruptly spreading (salverform). Var. *hookeri* Gray, is a form with fewer but more rigid leaves.

9. **G. fílipes** Benth. Stems 2 to 6 in. high, pubescent, often branched, the few flowers on thread-like pedicels from the upper axils. Leaves ¼ in. or less long, parted into 3 to 7 narrow pointed lobes. Corolla $\frac{3}{16}$ in. long, flaring from base to the rounded lobes (broad-funnelform, without tube), lilac, with yellow throat, much exceeding the calyx. (*G. pusilla californica* Gray. *Linanthus filipes* Greene.)—Along the lower part of the pine belt.

10. **G. harknéssii** Curran. Stems 3 to 12 in. high, glabrous, simple below, the flowers on naked thread-like pedicels. Leaves ⅛ to ½ in. long, palmately parted into 3 to 5 very narrow lobes, thus appearing whorled. Corolla minute, white or purplish. Capsule only 3-seeded. (*Linanthus harknessii* Greene.)—Yosemite Valley; Tuolumne Meadows.

11. **G. ciliàta** Benth. Stem 3 to 12 in. high, short-hairy, the flowers nearly sessile in terminal heads surrounded by leaf-like bracts parted into linear sharp-pointed lobes. Leaves ¼ to 1 in. long, parted into 5 to 7 narrow rigid lobes. Bracts larger, with stiff white hairs. Corolla ½ to ¾ in. long, tubular, with small round lobes, rose-purple with yellow throat. (*Linanthus ciliatus* Greene.)—Not rare up to about 7500 ft. alt. and in a depauperate form to 9000 ft. Our specimens seem all to belong to var. *neglecta* Brand, distinguished by its simple stem 6 in. or less high and by the variegated corolla-lobes.

12. **G. bìcolor** Brand. Similar to small forms of *G. ciliata* but known by the very slender corolla-tube two or three times as long as the bracts (which are less hairy). (*Linanthus bicolor* Greene.)—Found at Crockers and at 7500 ft. alt. on Indian Creek; perhaps not rare.

13. **G. androsàcea** var. **montàna** Brand. Also similar to *G. ciliata* but often tall and the flowers much more showy, 1 to 1½ in. long, the tube purplish and pubescent, the throat yellowish, the large lobes white tinged with violet. (*Linanthus montanus* Greene.)—At 4500 ft. alt. near Crockers and at 6500 ft. near the Middle Fork of the Tuolumne.

14. **G. dichótoma** Benth. EVENING SNOW. Stems branching, 6 to 18 in. high, glabrous, some flowers nearly sessile in the upper axils, some long-pediceled, all leafy-bracted. Leaves entire or parted into thread-like lobes, ¼ to 1 in. long. Corolla about 1 in. long, white, the large rounded lobes often brownish near margin and as long as the tube. (*Linanthus dichotomus* Benth.)—A foothill species found as far up as Wawona.

15. **G. nuttállii** Gray. Stems numerous, 6 to 12 in. high, from a woody perennial base, leafy up through the flower-clusters. Leaves opposite, ¼ to 1 in. long, parted to the base into 3 to 7 linear lobes. Corolla about ½ in. long, white, the stamens scarcely exceeding its throat.—Whole length of the Sierra Nevada but not yet found in the Yosemite National Park.

4. NAVARRÉTIA.

1. **N. divaricàta** Greene. A slender rigid branching annual, 5 in. or less high and about as broad. Leaves few, 1 in. or less long, mostly entire. Flowers in small heads, surrounded by rigid spiny bracts. Corolla minute, shorter than the calyx, purplish, longer than the stamens and style. (*Gilia divaricata* Torr.)—Widely distributed up to 8200 ft. alt.

Other Navarretias may be expected in clay soil at low altitudes, especially *N. intertexta* Hook., known by its pinnately parted leaves with spine-like lobes, and its pearly-white flowers in dense heads surrounded by woolly, spiny-lobed bracts. *N. leucocephala* Benth., is similar but with soft, green leaves and yellowish flowers.

HYDROPHYLLACEAE. PHACELIA FAMILY.

Herbs and shrubs with regular flowers. Stamens 5, inserted near base of corolla, alternate with its 5 lobes. Styles 1 or 2. Fruit a 1 or nearly 2-celled capsule with several to numerous seeds.

Style 2-cleft at apex; herbs, some slightly woody at base.
  Leaves (including petiole) 6 to 12 in. long; flower-clusters head-like, not coiled.....1. HYDROPHYLLUM.
  Leaves smaller.
    Flowers solitary or clustered on leaf-bearing stems.
      Calyx with 5 reflexed tooth-like appendages from between the lobes; ovary and capsule 1-celled.2. NEMOPHILA.
      Calyx without appendages; ovary and capsule apparently 2-celled.
        Leaves all opposite and ¼ to 1 in. wide; perennial .....3. DRAPERIA.

Leaves mostly alternate, the only opposite-leaved species being delicate annuals with leaves not ¼ in. wide.....4. PHACELIA.
Flowers solitary on naked stems, the leaves being all basal (and entire).....5. HESPEROCHIRON.
Styles 2, distinct to base; shrubby plants.....6. ERIODICTYON.

1. HYDROPHÝLLUM. WATERLEAF.

1. **H. occidentàle** Gray. Stems 1 or 2 ft. high, from a perennial base, rough-hairy. Leaves alternate, 6 to 12 in. long including petiole, with 7 to 15 oblong and mostly cleft lobes. Flowers in head-like clusters on peduncles mostly longer than the leaves. Corolla bluish, bell-shaped, nearly ½ in. long. Stamens and style long-exserted. Ovary 1-celled, 1 to 4-seeded.

This Waterleaf has been found near Wawona and at Crockers but is common only farther north. It scarcely differs from some Phacelias, save in the ovary, but may usually be known by the larger, apparently compound leaves. *H. capitatum* Dougl., of the northern Sierra Nevada, is a smaller plant with peduncles much shorter than the leaves.

2. NEMÓPHILA.

Low annuals with at least the lower leaves opposite. Flowers in racemes (not coiled) or solitary. Calyx with a reflexed appendage from between each pair of teeth. Stamens not exserted. Style 2-cleft. Capsule 1-celled.

Flowers large, ⅜ to 1½ in. across.
Corolla white, each lobe with a purple spot at tip.....1. *N. maculata.*
Corolla bluish .....2. *N. menziesii.*
Flowers small, ⅜ in. or less across.
Leaves all opposite, wedge-shaped, shallowly lobed or entire .....3. *N. humilis.*
Leaves often alternate above, the lower ones deeply lobed.4. *N. exilis.*

1. **N. maculàta** Benth. SPOTTED NEMOPHILA. Stems spreading, 3 to 12 in. long. Leaves all opposite, ¾ to 2 in. long, deeply and often doubly lobed or the upper ones entire, tapering to the base. Pedicels slightly surpassing the leaves. Corolla ⅜ to 1½ in. across, white, purple-dotted and usually with a purple spot at tip of each lobe.—Common in meadows along the Hog Ranch Road and in the foothills. In the var. *concolor* Brand, the corolla-lobes lack the purple spot.

2. **N. menzièsii** H. & A. BABY-BLUE-EYES. Stems 4 to 12 in. long. Leaves mostly opposite, ½ to 3 in. long, deeply divided into 5 to 9 ovate or roundish often lobed divisions. Pedicels much surpassing the leaves. Corolla ½ to 1 in. across, blue,

veined with deeper blue or purple, lighter and often dotted toward the center.—A foothill and valley species, reaching Wawona and Yosemite Valley.

3. **N. hùmilis** Eastw. Stems spreading, 2 to 8 in. long. Leaves all opposite, ½ to 1½ in. long, entire or with few entire lobes, tapering to the base. Pedicels about as long as the leaves. Corolla scarcely ⅜ in. across, white, often purple-dotted but without a purple spot at tip of each lobe.—Hog Ranch Road and Hazel Green to 8000 ft. alt., but not common.

4. **N. éxilis** Eastw. Stems slender and weak, 3 in. to 2 ft. long. Leaves ½ to 2 in. long, the lower deeply lobed, the upper less lobed or entire, mostly petioled. Pedicels mostly much longer than the leaves. Corolla ⅛ to ⅜ in. across, white.—Our most common Nemophila, abundant in the Yosemite and throughout the lower part of the Yellow Pine Belt.

N. SEPULTA Parish, may be found. It has pinnately lobed leaves, the upper longer than the pedicels, and very small white flowers (often bluish without).

3. DRAPÈRIA.

1. **D. sýstyla** Torr. DRAPERIA. Stems 1½ ft. or less high, from a spreading perennial base. Leaves all opposite, silky-hairy, ovate, entire, 1 to 2 in. long, petioled. Flowers crowded on the coiled branches of a naked peduncle. Corolla purplish, about ½ in. long, funnelform. Stamens unequal, not exserted.

We here adopt the generic name, Draperia, to also serve as a common name for this plant, since no other has been proposed. The genus was named in honor of Professor John William Draper, of New York, a chemist and historian. *D. systyla* is the only species, but it occurs in two forms. The first is broad-leaved and grows plentifully on banks throughout the Yellow Pine Belt of the Sierra Nevada. The second (var. *minor* Brand) has leaves only ¼ to ½ in. wide and more wedge-shaped at the base. It has been collected in Yosemite Valley.

4. PHACÈLIA.

Herbs with bluish or white flowers in coiled spikes or racemes. Calyx 5-lobed nearly to the base. Style 2-cleft. Capsule with 2 seed-bearing portions which nearly meet in the middle. Seed-coats pitted or netted. The species are here arranged according to habit, as a matter of convenience. It is doubtful if the usual classification based on the number of seeds is a natural one.

A. Stamens scarcely if at all exceeding the corolla; low annuals.

Seeds 4 or fewer in each capsule.
- Leaves mostly near summit, opposite.....1. *P. racemosa.*
- Leaves basal and scattered, some alternate.....2. *P. humilis.*

Seeds 8 to 20 in each capsule.
- Flowers not ¼ in. long; pedicels evident.....3. *P. curvipes.*
- Flowers over ¼ in. long; pedicels very short.....4. *P. menziesii.*

B. Stamens much longer than the corolla.

Leaves gray-hairy, the upper ones entire or merely toothed.
- Stems sparsely leafy; ovules 4.....5. *P. magellanica.*
- Stems leafy to the top; ovules 6 to 12.....6. *P. hydrophylloides.*
- Stems leafy; ovules 12 to 16; leaves mostly entire.4. *P. menziesii.*

Leaves bright green, all deeply lobed.
- Perennial, with spreading stems.....7. *P. ramosissima.*
- Annual, with erect stem.....8. *P. tanacetifolia.*

1. **P. racemòsa** Brandegee. A delicate erect annual, nearly naked up to the branching flower-cluster, 2 to 9 in. high, glandular-pubescent only above. Leaves linear-lanceolate, entire, ½ to 2 in. long. Flowers blue, ⅛ in. long, pedicels shorter than calyx. Seeds 4. (*P. namatoides* Gray.)—A rare species, found at Glacier Point.

2. **P. hùmilis** T. & G. Stems simple or branched, leafy, 3 to 9 in. high, whole plant with short spreading hairs. Leaves alternate (lower rarely opposite), narrowly lanceolate, entire, 1½ in. or less long. Pedicels all shorter than calyx, the latter with linear lobes. Corolla indigo-blue, scarcely ¼ in. long, the stamens a little longer. Seeds only 4 in each capsule.—Yosemite Valley (summit of El Capitan, Nevada Falls), Alder Cr., Stubblefield Cañon, etc.; probably throughout our district.

P. EISENII Brandegee, may occur. It is like *P. humilis,* but with slender pedicels longer than the calyx and 2 distinct styles. P. PURPUSII Brandegee, is also similar, but known by its broad, almost obovate calyx-lobes. It grows in the foothills, perhaps reaching Yosemite Valley.

3. **P. cúrvipes** var. **yosemitàna** Brand. Stems simple or commonly much branched, 3 to 12 in. high, rough-pubescent, usually purplish. Leaves oval or oblanceolate, entire, the blade ¼ to 1 in. long, often equalled by the slender petiole. Lower pedicels as long as calyx. Corolla violet or blue, under ¼ in. long, the stamens usually shorter. Seeds about 16 to 20, 3-angled, the capsule shorter than the enlarged spatulate calyx-lobes.

This Phacelia has doubtless come to us from the south, since the species is common in the drier parts of the southern Sierra Nevada. These southern plants are scarcely if at all

glandular, while our Yosemite variety, which has been named and described only within the present year, is densely glandular above, especially on the pedicels, etc. Its type locality is at 5300 ft. alt. along the new Tenaya Trail, but it also grows elsewhere around the Yosemite Valley in warm, gravelly soil.

P. VALLICOLA Congdon, which grows at Hites Cove and El Portal, is similar to no. 3 and with similarly small flowers but these are nearly sessile and the leaves are broader (elliptic to obovate). It also resembles *P. purpusii,* mentioned under no. 2, but the capsules bear many more seeds and the filaments are perfectly smooth.

4. **P. menzièsii** Torr. Stems simple below, leafy, 3 to 12 in. high, pubescent. Leaves linear or lanceolate, entire or some deeply lobed, 1 to 3 in. long. Pedicels very short, the flower-clusters therefore dense. Corolla bright violet or white, more than ¼ in. long, about equalling the stamens. Calyx-lobes linear. Seeds 12 to 16 (or fewer by abortion).—Yosemite Valley; common in northern California.

5. **P. magellánica** Coville. Stems ½ to 2 ft. high, strictly erect from a branching woody base, stiff-hairy. Leaves mostly at base, rough-hairy, 1 to 6 in. long, lanceolate or ovate, entire, or often lobed or the lower even with distinct leaflets. Flowers in lateral and terminal coiled clusters. Corolla whitish or pale blue, about ¼ in. long. Capsule 4-seeded. (*P. circinnata* Jacq. f.)

In this Phacelia we have one of the most common and at the same time one of the most variable species that occurs within our limits. It ranges from the foothills to regions above timber-line. Many of the forms have been described as distinct species, but these have been recently reduced to forms by Dr. A. Brand, a German botanist. According to his views, the genuine *P. magellanica* is restricted to South America, while all of our forms come under the subspecies *barbata,* and although they grade insensibly into each other they may usually be segregated according to the following synopsis, in which f. is the abbreviation for "form." Not all of these have been found in the Yosemite National Park, but they all occur in the Sierra Nevada and so are to be expected.

Plant very low, forming mats..... 1. f. *compacta.*
Plant taller, not forming mats.
  Leaves all entire (with very few exceptions).
    Stems low, 4 to 8 in. high; root perennial.
      Foliage silvery, shining ..... 2. f. *alpina.*

Foliage gray with stiff hairs (an Alpine form)... 3. f. *frigida.*
Stems tall, mostly 1 or 2 ft. high; root often biennial. 4. f. *griseophylla.*
Leaves all or at least some of them deeply lobed.
Lower leaves with a single pair of lobes at base, or some entire, the upper leaves mostly entire.
Leaves 4-nerved ..... 5. f. *egena.*
Leaves 8-nerved ..... 6. f. *heterophylla.*
Lower leaves deeply parted into several or many lobes.
Basal leaves long-petioled.
Segments shortly acute ..... 7. f. *californica.*
Segments long-acuminate; plant mostly white-hairy ..... 8. f. *bernardina.*
Basal leaves short-petioled.
Flower-cluster short, loose ..... 9. f. *patula.*
Flower-cluster long (1 ft. or more), dense.....10. f. *virgata.*

P. IMBRICATA var. CONDENSATA Brand, has been accredited to the Yosemite. It is like large forms of *P. magellanica* with lower leaves lobed at base, but the calyces are much enlarged in fruit and closely overlapping, the broadly ovate outer segment larger than the others, the margins all stiffly hairy.

6. **P. hydrophylloìdes** Torr. Stems a foot or two long, ascending from creeping woody rootstocks, short-hairy, leafy to the top. Leaves silky-hairy, ovate, 1 or 2 in. long (exclusive of the long petiole), cut-toothed or the lower deeply lobed. Flowers in dense terminal clusters. Corolla violet or whitish, ¼ in. long. Capsule 6 to 8-seeded.—Glacier Point, Matterhorn Cañon, and elsewhere, especially in fir forests.

7. **P. ramosíssima** Dougl. Stems spreading, 1 to 3 ft. high, from a woody base, minutely pubescent, leafy. Leaves obscurely hairy, 1½ to 4 in. long, parted into 5 to 9 oblong deeply toothed divisions or the upper simply lobed. Flowers in dense coiled clusters. Corolla dull white, about ¼ in. long. Capsule 4-seeded.—Widely distributed but nowhere common: Little Yosemite, Ledge Trail, Crane Flat, etc. Our form, marked by its spreading or almost reclining habit, is technically distinguished as forma *decumbens* Brand (*Phacelia decumbens* Greene).

8. **P. tanacetifòlia** Benth. Stems ½ to 2 ft. high, erect, from an annual taproot, sparsely stiff-hairy or glabrous, leafy to the top. Leaves green, obscurely pubescent, finely dissected into lobed divisions. Flowers in dense coiled clusters. Corolla light blue or violet, ⅜ in. long. Capsule 4-seeded.—Foothills, also warm, sandy soil near Bridal Veil Falls. *P. distans* Benth., is a related species with internal appendages of corolla free at tip, instead of attached all the way up, as in *P. tanacetifolia.* It may reach our lower borders.

5. HESPEROCHÌRON.

Dwarf stemless perennials, 3 in. or less high, with leaves all in a basal tuft. Flowers on simple naked stalks shorter than the leaves. Stamens not exserted. Capsule 1-celled, 15 to 20-seeded.

1. **H. califórnicus** Wats. Leaves entire, elliptic, obtuse, narrowed to a petiole, the whole 1 to 3 in. long. Corolla nearly white, about ½ in. long, cup-shaped, with distinct tube equalling the lobes.—A rare plant, found in the Yosemite Valley. Ours is the var. *benthamianus* Brand, distinguished by its glabrous peduncles.

2. **H. pùmilus** Porter. Similar but with very shallow corolla-tube much shorter than the spreading lobes.—Moist soil at Glacier Point and near Vernal Falls; occurs in the Sierra Nevada at higher altitudes than no. 1. Our form has been recently classified as var. *vestitus* f. *hirtella* Brand, because of the pubescent upper surface of the leaves and the spreading hairs of the peduncles.

6. ERIODÍCTYON.

1. **E. califórnicum** Greene. YERBA SANTA. Leaves alternate, thick, oblong or lánceolate, tapering to a short petiole, toothed or wavy-margined, 2 to 6 in. long. Flowers borne on coiled branches of a terminal panicle. Corolla white or pale blue, narrow-funnelform, about ½ in. long, longer than the stamens. Ovary nearly 2-celled, 4-valved, the two styles distinct. (*E. glutinosum* Benth.)

Yerba Santa is a branched shrub, 2 to 6 ft. high, with glutinous leaves which emit a pleasant odor when crushed. They are often chewed and smoked like tobacco or made into a thick syrup which is used as a remedy for colds and sore throat. The shrub is abundant in the foothills and grows on warm slopes to at least 5000 ft. alt.

E. LOBBII Greene, has been reported from near Yosemite. It is a creeping, woolly shrub with narrow, entire leaves 2½ in. or less long.

BORAGINACEAE. BORAGE FAMILY.

Herbs with entire alternate leaves, or a few rarely opposite, the flowers regular and mostly borne in 1-sided coiled spikes or racemes. Stamens 5, inserted on the tube of the 5-lobed corolla. Ovary superior, deeply 4-lobed (as in Labiatae), each lobe becoming a seed-like nutlet, the single style rising from

the center between them, sometimes only 1 or 2 of the nutlets maturing.

A. Flowers pink, blue, or violet.

Surface of nutlets prickly.
Nutlets spreading, prickly all over; below 6000 ft. alt...1. CYNOGLOSSUM.
Nutlets erect .....2. LAPPULA.
Surface of nutlets not prickly.....7. MERTENSIA.

B. Flowers white.

Annuals of moderate altitudes.
Nutlets attached to a low-conical central base.
Flowers nearly naked .....3. ALLOCARYA.
Flowers leafy-bracted .....4. PLAGIOBOTHRYS.
Nutlets attached to a slender columnar central axis....5. CRYPTANTHE.
Perennial of high summits.....6. OREOCARYA.

C. Flowers yellow.

Perennial of high summits.....6. OREOCARYA.
Annual of low altitudes.....8. AMSINCKIA.

1. CYNOGLÓSSUM. HOUND'S TONGUE.

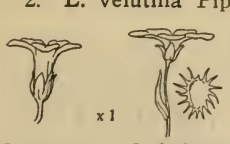
1. **C. occidentàle** Gray. Stems several, leafy, 9 to 18 in. high, from a perennial base, rough-hairy. Leaves lanceolate to ovate, 3 to 6 in. long, the upper closely sessile. Corolla violet or blue, the tube longer than the calyx, with rounded lobes. Nutlets nearly globular, ¼ in. long, prickly.—Occasional in pine woods at moderate altitudes.

2. LÁPPULA.

Ours leafy-stemmed perennials with bluish or rarely white flowers. Corolla with closed throat. Nutlets armed with prickles, forming burs.

1. **L. nervòsa** Greene. Stems erect, 1 or 2 ft. high, smooth and usually glabrous above. Leaves oblong, the upper closely sessile, 1 to 6 in. long, green but rough-hairy. Flowers loosely panicled. Corolla blue with a white ring in throat, becoming purplish, ⅜ in. across, the tube surpassing the calyx. Nutlets prickly all over the back as well as on the margins. (*Echinospermum nervosum* Kell.)—High altitudes: Rancheria Mt., Glacier Point, Clouds Rest, etc.

2. **L. velutìna** Piper. Similar to no. 1, but the herbage smooth and velvety with a close pubescence and the flowers much larger, the corolla about ½ in. across; nutlets prickly on backs and margins.—Rather common in the Sierra Nevada at moderate altitudes.



L. nervosa *L. floribunda*

3. **L. floribùnda** Greene. Herbage gray, the stems as well

as leaves closely pubescent. Corolla almost wheel-shaped, its tube being shorter than the calyx, often pink. Nutlets prickly on the margins, but their backs without prickles. Otherwise as no. 1.—Clouds Rest at 8700 ft. alt., Merced Lake, etc.

L. CALIFORNICA Piper, of the northern Sierra Nevada, has small, wheel-shaped, white corollas and nutlets prickly all over the backs and margins. It may be expected in our district.

3. ALLOCÁRYA.

1. **A. stipitàta** Greene. A low annual, branching from the base. Leaves nearly linear, 1 to 2 in. long. Corolla white, with yellow throat, not ¼ in. across, the flowers nearly sessile in racemes. Nutlets with flat back, rough.—Moist ground in Yosemite Valley, etc.

Allocarya *Plagiobothrys* x1

4. PLAGIOBÒTHRYS.

POP-CORN FLOWER.

1. **P. tòrreyi** Gray. Annual, with many branches from the base, 1 to 6 in. high, soft-hairy. Basal leaves clustered, oblanceolate, about ½ in. long; upper leaves oblong, extending into the flower-clusters. Corolla white, very small. Nutlets smooth and shining but ridged crosswise, broadly ovate, attached by the middle of the hollowed ventral face.—Common, even up to 7500 ft. alt. The herbage of this plant imparts a violet stain to paper.

5. CRYPTÁNTHE.

Erect annuals. Flowers mostly sessile, small, white, with closed yellow throat. Nutlets 1 to 4, never wrinkled, the inner face with a groove from apex to the scar near the base and often continued beyond as a fork; nutlet attached to the slender central column from the scar half-way or wholly to the apex along the groove. (*Eritrichium. Krynitzkia.*)—A difficult genus, the species distinguished chiefly by the nutlets. "Forget-me-not" is a name commonly applied to Cryptanthe and also to several kinds of Lappula, but the true forget-me-nots are all European species of Myosotis, much cultivated as ornamental plants. It would seem that the generic name, Cryptanthe, were euphonious enough to be adopted also as the common name for these dainty West American flowers.

Surface of nutlets smooth and shining.
Nutlets 1 or 2, narrow, slenderly pointed.....1. *C. flaccida.*
Nutlets 4, ovate, merely acute.
Groove near edge of nutlet.....2. *C. affinis.*
Groove in middle of nutlet.....3. *C. torreyana.*
Surface of nutlets rough.
Calyx much longer than the nutlets.....4. *C. ambigua.*
Calyx little longer than the nutlets.....5. *C. muriculata.*

1. **C. fláccida** Greene. Stems ½ to 2 ft. high, grayish pubescent. Leaves linear, 1 in. or less long. Flowers about ⅛ in. across, in coiled spikes. Calyx bearded at base. Nutlets smooth, ovate-lanceolate, nearly cylindric, with beak-like summit, the groove enlarged at base but not forked. (*Krynitzkia oxycarya* Gray.)—Mariposa Grove, Wawona Meadows, Yosemite Valley, thence to the foothills.

2. **C. affínis** Greene. Similar, but the leaves wider (oblong) and often 2 in. long. Nutlets attached in pairs, smooth, ovate, merely acute, the slender groove nearer one edge than the other, not enlarged or forked at base. (*C. geminata* Greene.)—A common species in the Yellow Pine Belt.

3. **C. torreyàna** Greene. Similar to no. 1 and with similarly narrow leaves. Calyx bristly. Nutlets ovate, smooth and shining, merely acute, the groove in the middle and forked at base.—Common at moderate altitudes.

4. **C. ambígua** Greene. Habit, foliage, and flowers as in no. 1. Nutlets gray, rough with minute scattered knobs, ovate, pointed, the edges rounded, the groove narrowly forked at base, about one-third the length of the calyx.—Plentiful in the Yosemite Valley, etc.

5. **C. muriculàta** Gray. A coarse rough-hairy annual, 1 or 2 ft. high. Leaves numerous, linear, 1 or 2 in. long. Nutlets very rough, ovate, with sharp edges, the groove and its fork mostly closed, becoming nearly as long as the bristly calyx.—This, the most robust and bristly of all our species, grows on warm hillsides up to 5500 ft. alt.

6. OREOCÀRYA.

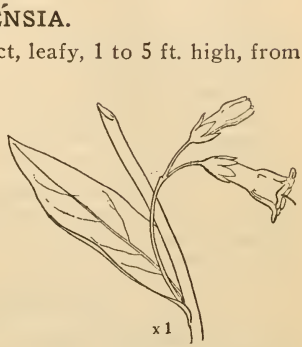
1. **O. nubígena** Greene. Stems numerous, erect, 1 ft. or less high, from a perennial base, the whole plant bristly. Leaves oblanceolate, 1 in. or so long. Flowers in dense clusters. Corolla tubular, with spreading lobes (salverform), ¼ in. across. Nutlets ovate, smooth or slightly wrinkled.

The type locality of this rare plant is the summit of Clouds Rest, where it was collected in 1889 by V. K. Chesnut and E. R. Drew. It has been found also on a few of the other

high peaks. The flowers are yellow, or perhaps white with a yellow center. Further specimens, especially in fruit, are much desired.

7. MERTÉNSIA.

1. **M. sibírica** Don. Stems erect, leafy, 1 to 5 ft. high, from a perennial base. Stem-leaves oblong or ovate, acute, 2½ to 6 in. long, ¾ to 1½ in. wide; the lower long-petioled, larger. Flowers light blue, tubular, with distinct white crests in the opening, about ½ in. long. Nutlets dull, wrinkled or roughish when dry.



This Mertensia is one of the handsomest blue-flowered plants to be found in the high mountains, where it grows along brooks and in other moist places. It is remarkably smooth for a Borage, being almost devoid of pubescence. The flowers, which are pink in bud, are borne in showy, terminal clusters, some nodding, some erect, often with conspicuously protruding styles. It is sometimes called "Mountain Bluebell," but the true bluebells are all campanulas.

8. AMSÍNCKIA.

1. **A. spectábilis** F. & M. An erect annual, simple below, ½ to 2 ft. high, bristly-hairy. Leaves lanceolate, 1 to 3 in. long. Flowers showy, yellow, in coiled spikes. Corolla about ½ in. long, funnelform. Nutlets ovate, rough.

The species of Amsinckia all have rather showy, yellow or orange-colored flowers, very different from those of other members of this family. Although the herbage is very harsh to the touch, it is much relished by browsing animals. Our single species was found in warm soil near El Capitan Bridge, where it was doubtless introduced, since it normally belongs to lower altitudes.

LABIATAE. Mint Family.

Aromatic herbs or low shrubs with square stems and opposite leaves. Corolla 2-lipped. Stamens 4, or the upper pair sometimes wanting or without anthers, inserted on the corolla-tube. Ovary superior, 4-lobed around the central 2-cleft style, each lobe becoming a seed-like nutlet (as in Boraginaceae).

A. Calyx regular and its teeth nearly equal.

Corolla nearly regular, the lobes being alike.
Flower-clusters in the leaf-axils.
Stamens long-exserted, much curved..... 1. TRICHOSTEMA.
Stamens straight .....10. MENTHA.
Flowers in terminal heads..... 8. MONARDELLA.
Corolla decidedly 2-lipped.
Flowers in whorls, pale.
Corolla with upper lip concave, hood-like..... 6. STACHYS.
Corolla-lobes all flattish..... 9. KOELLIA.
Flowers in a dense spike, lavender; herb..... 3. AGASTACHE.
Flowers in a leafy raceme, white; shrub..... 7. SPHACELE.

B. Calyx 2-lipped or its teeth very unequal.

Flowers in a dense spike; perennial; leaves nearly entire. 4. PRUNELLA.
Flowers in whorls; annual; leaves lobed..... 5. SALVIA.
Flowers solitary in the leaf-axils..... 2. SCUTELLARIA.

1. TRICHOSTÈMA. BLUE-CURLS.

1. **T. oblóngum** Gray. A leafy annual, 18 in. or less high, soft-pubescent. Leaves oblong, obtuse, entire, ½ to 1½ in. long. Flowers blue, in small lateral clusters. Corolla exserted, curved, the lobes nearly alike. Stamens 4, long-exserted and curved.—Half-grassy places in the foothills and up to at least 4500 ft. Immediately known by the turpentine-like odor of its herbage.

2. SCUTELLÀRIA. SKULL-CAP.

Ours perennial herbs with flowers solitary or in pairs in the upper leaf-axils. Calyx with 2 short entire lips, the upper with a hood-like projection. Corolla with long-exserted tube and beak-like upper lip, the lower lip seemingly 1-lobed. Stamens 4, all perfect and parallel.

1. **S. angustifòlia** Pursh. Plant 4 to 12 in. high, nearly glabrous. Leaves narrowly oblong, narrowed to the base (except the lower), entire, ½ to 1¼ in. long, the upper ones smaller. Flowers bluish violet, ¾ to 1 in. long, in the axils of shorter leaves.

This skull-cap is of frequent occurrence at middle altitudes throughout the Sierra Nevada, often growing in small beds modestly ornamented by the many blue flowers. Mrs. Alice Merritt Davidson, who observed this plant in southern California, reports

that the flowers are assiduously visited by bees. According to this writer, the head of the bee must be thrust well down into the throat of the corolla, and "the bee's back is dusted with pollen from the anthers, which are included in the fold of the upper lip. The stigmas are similarly situated. Since the clusters have only from one to three flowers expanded at one time, much of the pollination is of one plant with another." Two related species which may also be found are the following: *S. antirrhinoides* Benth., of the foothills, is very similar, but with broader leaves obtuse at base, the corolla shorter and broader. *S. californica* Gray, is also similar but with whitish flowers longer than their leaves, which are acute at base.

2. **S. bolánderi** Gray. Plant 9 to 18 in. high, pubescent. Leaves numerous, ovate-oblong, very obtuse, sessile by a broad base, ¾ to 1¾ in. long, only the upper ones entire. Flowers whitish, ½ to ¾ in. long, shorter than their subtending leaves.

This species was first collected by H. N. Bolander, of the State Geological Survey, at "Clark's Meadows, Mariposa Co., in patches." These meadows occupy the Wawona Valley, where we found the plant growing in moist soil. It occurs mostly at lower altitudes from Plumas Co. to southern California.

3. **S. tuberòsa** Benth. Plant only 6 in. or less high, soft-hairy, the roots producing tuber-like thickenings. Leaves ovate or roundish, few-toothed to entire, ¼ to ¾ in. long. Flowers violet or blue, ½ to ¾ in. long.—Little Crane Creek and lower altitudes.

3. AGÁSTACHE. Giant Hyssop.

1. **A. urticifòlia** O. Ktz. Stems 3 to 5 ft. high, glabrous or pubescent. Leaves ovate, toothed, 1 to 3 in. long, petioled. Flowers crowded in terminal spikes 2 to 6 in. long. Calyx-tube green, teeth lavender. Corolla white, the upper lip 2-lobed, nearly erect, the lower spreading. Stamens 4, the exserted anthers lavender, the filaments white. (*Lophanthus urticifolius* Benth.)

Many a meadow border is gaily adorned with the showy, lavender-and-white flowers of this tall perennial. The

dense, cylindric clusters are borne on widely spreading branches several feet from the ground. The species is restricted to moderate altitudes and is especially abundant in Yosemite and Hetch Hetchy valleys.

4. PRUNÉLLA. Self-heal. Heal-all.

1. **P. vulgàris** L. Stems 4 to 12 in. high, from a perennial base, often pubescent, terminated by a series of leafy-bracted whorls of 6 flowers each. Leaves oblong or ovate, obscurely toothed, 1 to 3 in. long, tapering to a petiole. Corolla pinkish, the tube slightly exserted from the purplish calyx; upper lip erect, beak-like, entire; middle lobe of lower lip pendent. Stamens 4.—Common in low, meadowy places.

5. SÁLVIA. Sage.

1. **S. columbàriae** Benth. Chia. Annual, 4 to 18 in. high, the flowers in 1 or 2 dense prickly whorls subtended by roundish sharp-tipped bracts. Leaves mostly basal, petioled, much lobed, rough. Corolla blue, little exceeding the prickly-tipped calyx, very irregular.

×½

Chia is the Spanish name of this plant, which grows on a few warm slopes along our lower limits, reaching the borders of Yosemite Valley. In the foothills and in southern California, where it is much more plentiful, the Indians still gather its seeds by knocking the old flower-heads with a stick and catching the seeds in a flat basket as they are thrown out. After they have been parched and ground the seeds are added to wheat flour and the whole mass is pounded up together. This dark-looking meal, or "pinole," is baked into small cakes or loaves, which have a pleasant, nutty flavor. Chia is one of the most important and famous of the Indian plants.

6. STÀCHYS. Hedge Nettle.

Flowers in close whorls of an interrupted spike. Calyx equally 5-toothed. Corolla with cylindric tube; upper lip erect; lower lip spreading, its middle lobe largest.

1. **S. álbens** Gray. White Hedge Nettle. A perennial herb, 1 to 4 ft. high, leafy and white-woolly to the top. Leaves broadly oblong or ovate, obtuse or heart-shaped at base, toothed, 1½ to 4 in. long beyond the petiole, the

upper ones sessile. Flowers white, reddish veined, ⅜ to ½ in. long. Stamens protruding.—Common along streams and in boggy places; known by its rank, leafy growth and abundance of soft, white wool.

2. **S. ajugoìdes** Benth. Similar to no. 1, but only 1½ ft. or less high, the woolly hairs less abundant and the herbage therefore greener. Leaves 1 to 2½ in. long, acute or obtuse at base. Flowers less crowded.—Yosemite Valley to the foothills.

Marrubium vulgare L., the common Hoarhound, may be introduced around settlements. It is a perennial herb, the stems coated with matted white hairs. Its flowers are small and white, in dense whorls, the calyx with hooked teeth.

7. SPHÀCELE. Pitcher Sage.

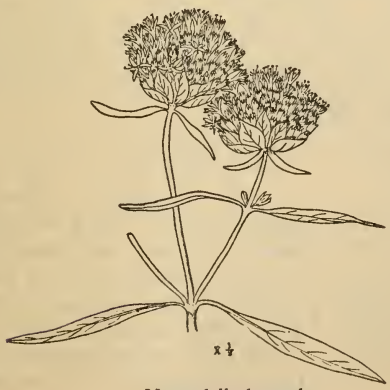
1. **S. calycìna** Benth. A low shrub with ovate toothed leaves 2 to 4 in. long. Flowers white, over 1 in. long, in leafy racemes. Calyx becoming inflated in age.—Near El Portal and in the lower cañons.

8. MONARDÉLLA.

Fragrant herbs with flowers in bracted heads terminating long peduncles. Calyx tubular, with 5 nearly equal teeth. Corolla with upper lip erect, 2-cleft, the lower lip 3-parted. Stamens 4, unequal, protruding. (*Madronella.*)

1. **M. lanceolàta** Gray. Western Pennyroyal. Erect annual, ½ to 2 ft. high. Leaves few, linear-oblong, entire, 1 to 2½ in. long. Heads 1 in. across, reddish violet.

One is attracted to this annual mint by the beautiful, red-



Monardella lanceolata

Monardella odoratissima

dish flower-heads, which stand out on nearly naked branches. The fragrance being likewise delightful, it seems a pity to designate this altogether charming plant by the opprobrious name of "Mustang Mint," by which it is sometimes known. It grows in abundance in loose, warm soil, but not at high altitudes.

M. CANDICANS Benth., is a foothill annual with nearly white flowers, the bracts white-edged.

2. **M. odoratíssima** Benth. MOUNTAIN PENNYROYAL. Stems many, tough, 9 to 18 in. high, from a creeping perennial base. Leaves ovate, entire, ¾ to 1½ in. long, on petioles ½ in. or less long, grayish hairy. Heads 1 in. across, surrounded by thin purplish bracts. Flowers dull white.

The leafy, perennial stems of the Mountain Pennyroyal grow in low or depressed clumps on many of our dry slopes in the pine forests, but the flower-heads terminate erect shoots. The aromatic leaves, gathered preferably from old plants, are sometimes used as a substitute for tea. This beverage is seemingly of some value as a remedy for colic and as a blood purifier.

3. **M. sheltònii** Torr. Stems woody at base, as in *M. odoratissima*, of which this is perhaps only a form. Leaves oblong. Bracts green and leaf-like in texture.—Also of the open pine forests.

9. KOÈLLIA. MOUNTAIN MINT.

1. **K. califórnica** O. Ktze. Stem erect, 2 to 4 ft. high, perennial. Leaves stiff, broadly lanceolate, toothed (rounded base and slender apex entire), 2 to 3½ in. long, sessile. Flowers white, in dense leafy-bracted whorls. Calyx-teeth woolly. Corolla with notched flattish upper lip and 3-lobed lower lip. Stamens 4, exserted, unequal. (*Pycnanthemum californicum* Torr.)—A stiff, gray herb of weedy meadows in the Yosemite and similar valleys.

10. MÉNTHA. MINT.

1. **M. canadénsis** L. Stems mostly simple, 1 to 3 ft. long, from a perennial base, leafy to the top. Leaves broadly lanceolate, sharply toothed, 1½ to 2 in. long, petioled. Flowers small, pink, in dense whorls in the leaf-axils, the corolla nearly

regular, shorter than the 4 stamens.—Common in meadows; the herbage pleasingly odorous.

M. SPICATA L., the well-known Spearmint, has escaped from gardens at Crockers and other resorts. Its flower-clusters are in terminal spikes and the small flowers are nearly regular.

SOLANACEAE. NIGHTSHADE FAMILY.

Herbs (rarely shrubs) with alternate leaves and regular flowers. Corolla 5-lobed. Stamens 5, on the corolla. Fruit a 2-celled many-seeded capsule or berry.

Corolla wheel-shaped; fruit a berry.....1. SOLANUM.
Corolla tubular; fruit a capsule.....2. NICOTIANA.

1. SOLÀNUM. NIGHTSHADE.

1. **S. xánti** Gray. Stems several, 1 to 3 ft. high, spreading, from a perennial root, sticky-pubescent. Leaves ovate or oblong, ½ to 1½ in. long, entire. Flowers in loose clusters. Corolla blue, saucer-shaped, ½ to ¾ in. across. Berry light green, the size of a cherry.

This nightshade occurs sparingly up to 6500 ft. or more. It is easily recognized by the yellow anthers standing together in the center of the blue, angularly lobed corolla, which has a circle of green spots at base. The Black Nightshade (*S. nigrum* L.), with small, white flowers and black berries may occur in our district. The herbage and unripe berries of both species are poisonous.

2. NICOTIÀNA. TOBACCO.

1. **N. attenuàta** Torr. Stems erect, 1 to 3 ft. high, from an annual root, sticky-pubescent. Leaves lanceolate or nearly linear, the lower ovate, tapering to a slender apex, narrowed to the petiole, entire, 2 to 4 in. long. Flowers in loose clusters. Corolla dull white, tubular, with narrow spreading limb, 1 to 1½ in. long. Stamens included.—To be expected in warm, sandy soil.

SCROPHULARIACEAE. FIGWORT FAMILY.

Herbs or low shrubs. Corolla irregular, sometimes obscurely so, 2 lobes constituting the upper lip, which is sometimes beak-like, 3 lobes the lower lip (corolla with only 4 lobes in Veronica). Stamens 4 or 5 (2 in Veronica), the fifth, when present, devoid of anther or much reduced. Ovary 2-celled; style 1, undivided.

A. Leaves opposite, or the upper sometimes alternate.

Stamens with anthers 4; corolla tubular to funnelform or two-lipped.
Plant annual; stamens 4.
Corolla 2-lipped, the middle lobe of lower lip folded lengthwise and enclosing the stamens and style. 1. COLLINSIA.
Corolla 2-lipped or nearly regular, the lower lip not folded.
Flowers not blue; all 4 stamens with anthers.... 4. MIMULUS.
Flowers pale blue; 2 stamens without anthers... 5. ILYSANTHES.
Plant perennial; stamens 5, but only 4 with anthers.
Corolla globose; 4 lobes erect, 1 reflexed; sterile stamen adhering to upper side of corolla..... 2. SCROPHULARIA.
Corolla tubular or bell-shaped or funnelform, often 2-lipped; sterile stamen free from corolla except at base..... 3. PENTSTEMON.
Stamens 2; corolla nearly wheel-shaped..... 6. VERONICA.

B. Leaves alternate; stamens 4, all with anthers; corolla 2-lipped, the upper lip enclosing the stamens and style.

Leaves either entire or with narrow entire sharp-pointed lobes.
a. Corolla with upper lip much longer than the minutely 3-toothed lower-lip; stems 1 foot or more high; perennials; bracts and calyx-lobes reddish. 7. CASTILLEJA.
b. Corolla with upper lip much longer than the broad inflated 3-saccate lower lip; stems 1 ft. or less high (annuals except *O. pilosus*)..... 8. ORTHOCARPUS.
c. Corolla-lips about equal; stems 1 ft. or more high; annuals; bracts and calyx green..... 9. CORDYLANTHUS.
Leaves much dissected into short lobes, feather-like; perennials; calyx green.....10. PEDICULARIS.

VERBASCUM THAPSUS L., the Common Mullein, will probably be found in low valleys. It is a coarse, woolly herb, 3 to 6 ft. high, with yellow, nearly regular flowers in a dense spike 1 ft. or more long.

1. COLLÍNSIA.

Annuals with opposite simple leaves and blue purplish or lilac flowers which are mostly borne in successive whorls. Corolla irregular somewhat as in the Pea Family. Fifth stamen reduced to a minute gland at base of corolla-tube. Seeds 4 to 12.

Flowers almost sessile, in dense whorls; calyx glandular...1. *C. tinctoria.*
Flowers slender-pediceled.
Plant glabrous .....2. *C. parviflora.*
Plant glandular above.
Flowers ¼ in. long.....3. *C. torreyi.*
Flowers smaller .....4. *C. wrightii.*

1. **C. tinctòria** Hartweg. Erect, ½ to 2 ft. high, very glandular above, imparting a brown stain, the flowers nearly sessile in successive dense whorls. Leaves broadly lanceolate, sessile by a broad base, 1½ to 2½ in. long, ¼ to 1 in.

broad, coarsely toothed. Corolla ½ to ¾ in. long, lilac or nearly white, with broad pale-yellow throat and purple markings.—Warm places from Wawona to Yosemite and Hetch Hetchy. *C. stricta* Greene, found at Wawona and in Calaveras Co., is perhaps a var. of this, or a diseased form. It has smaller leaves and flowers, the upper lip of the corolla with short segments which are reflexed and laid one against the other.

2. **C. parviflòra** Dougl. SMALL-FLOWERED COLLINSIA. Stem slender and weak, a few inches to 2 ft. long, glabrous; the flowers in pairs or whorls of 3, or solitary, on spreading pedicels ¼ to 1 in. long. Leaves spatulate to narrowly lanceolate, 1¼ in. or less long, about ¼ in. wide, entire or nearly so. Calyx-lobes sharp-pointed. Corolla white and blue, scarcely exceeding the calyx.—In moist soil of Yosemite and other low valleys.

3. **C. tòrreyi** Gray. Stem 6 in. or less high, with spreading branches above the erect simple base, viscid-glandular above, the slender-pediceled flowers in successive whorls of 3 to 6. Leaves linear-lanceolate, narrow at base, entire, seldom over 2 in. long. Calyx-lobes short, obtuse. Corolla deep blue, fully ¼ in. long, much exceeding the calyx.—Common in the pine belt; the type locality given as "Mariposa Big Tree Grove and near Donner Lake."

4. **C. wrìghtii** Wats. Similar but smaller. Calyx-lobes acute. Corolla blue, the upper lip yellowish.—Glacier Point and Tuolumne Meadows.

2. SCROPHULÀRIA. FIGWORT.

1. **S. califórnica** Cham. A perennial herb, 3 to 6 ft. high, the flowers in a long loose panicle. Leaves petioled, opposite, ovate, toothed, the blade 2 to 5 in. long. Corolla dull red, nearly globose, ¼ in. across.—Cañon sides at low altitudes.

3. PENTSTÈMON.

Leafy perennials with showy flowers in terminal panicles. Leaves opposite. Corolla tubular or funnelform or bell-shaped. Anther-bearing stamens 4, the fifth sterile but conspicuous.

A. Flowers red or crimson.

Leaves broad, mostly toothed; anthers woolly.....1. *P. menziesii.*
Leaves narrow, entire; anthers not woolly.....2. *P. bridgesii.*

B. Flowers bluish, purple, or yellowish, never red.

Anthers densely woolly; dwarf Alpine plant: var. *davidsonii* of .....1. *P. menziesii.*

Anthers not woolly.
Corolla pale, pink-striped ..... 3. *P. breviflorus.*
Corolla blue or purplish.
Flowers in dense whorls or heads; sterile filament hairy. 4. *P. confertus.*
Flowers more scattered, in open racemes or panicles; sterile filament glabrous.
Inflorescence and calyx glandular.
Corolla 1 in. long ..... 5. *P. laetus.*
Corolla ½ to ⅔ in. long ..... 6. *P. roezli.*
Inflorescence and calyx glabrous ..... 7. *P. azureus.*

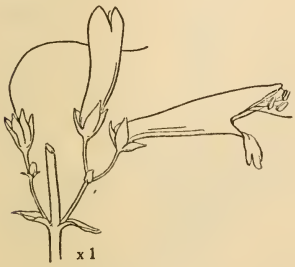
1. **P. menziesii** Hook. PRIDE OF THE MOUNTAINS. Stems numerous, woody below, 1 ft. or less high. Leaves ovate, finely toothed or entire, ½ to 1 in. long, ¼ to ½ in. wide, the upper ones smaller. Corolla 1 in. long, slightly 2-lipped; upper lip 2-cleft; lower lip 3-lobed. Anthers densely woolly.

In the Yosemite National Park are found two seemingly distinct forms of this variable species. The first is a bushy plant with bright-red flowers and is very common on rocky ledges up to altitudes of 9000 to 10,000 ft. It is known as var. *newberryi* Gray. The second form is found only above timber-line, where it is recognized by its small size, commonly 4 in. or less high, the small and rounded entire leaves, and the large, purple corolla, often 1 to 1¼ in. long. This is the var. *davidsonii* Piper. It was first named *Pentstemon davidsonii* Greene, in honor of the late Professor George Davidson, who gathered the original specimens on Mt. Conness, at an altitude of 12,300 ft., in 1890. More recent collections, especially in Washington, have shown it to be only an Alpine form of *P. menziesii*, which, in its typical condition, is a bushy plant with bluish flowers and does not occur in our district.

2. **P. bridgesii** Gray. Stems many, woody below, slender, 2 ft. or more high, blooming from about the middle. Leaves lanceolate, 1 to 2 in. long, less than ½ in. wide, the upper much smaller. Corolla scarlet, 1 in. long, narrowly funnelform; upper lip straight, 2-lobed; lower lip 3-parted and recurved. Sterile filament glabrous.

Hummingbirds are frequently seen hovering over the patches of this Pentstemon, attracted by the red flowers which stand out in loose, airy clusters. While gathering nec-

tar, these birds unconsciously transfer pollen from one plant to another, thus insuring a cross-pollination of the flowers. The nectar is secreted at the bottom of a long and narrow corolla-tube and is therefore inaccessible to most or perhaps to all insects, while the hummingbird has no difficulty in reaching it with his long beak, which soon becomes so covered with pollen as to appear gilded. The species occurs at such places as Yosemite Valley (Union Point and Ledge Trail), Rancheria Mt., and Matterhorn Cañon.



Pentstemon bridgesii

Pentstemon breviflorus

3. **P. breviflòrus** Lindl. Stems often 3 to 6 ft. high, with numerous slender branches, each terminating in a loose oblong panicle of yellowish flowers. Leaves lanceolate to linear, 1 in. or more long, ¼ in. wide, minutely toothed. Corolla ½ to ¾ in. long, flesh-color, pink-striped within; upper lip arched, hairy; lower lip recurved. Sterile filament glabrous.

This species forms loose, rounded clumps on talus slopes and in other rocky places below about 6000 ft. alt. The Indians utilize the tough, flexuous stems by weaving them into large baskets used for the storing of food.

4. **P. confértus** Dougl. Stems simple and erect, 3 in. to 2 ft. high, from leafy tufts, terminating in a series of dense floral whorls, or these reduced to a single head-like cluster. Leaves lanceolate or oblong, entire, 1 to 4 in. long, about ¼ to ¾ in. wide, the lower petioled, upper sessile. Corolla blue, ½ in. or less long, tubular, slightly 2-lipped; lower lip bearded within. Sterile filament hairy along one side.

The extent to which this Pentstemon responds to changes in environment is remarkable. The original form, from Oregon and the Rocky Mts., is yellow-flowered. In our form the flowers are always bluish, a character which induced Dr. Gray to give it the unwieldy but expressive varietal name of *caeruleo-purpureus.* In good soil at low altitudes, as

on the floor of Yosemite Valley, the stems are tall, often 2 ft. or more high, and with 3 to 5 dense, floral whorls well

Pentstemon confertus.—The inflorescence of the common form and an entire plant of the Alpine form. Both figures are natural size.

separated on the central shaft. At higher altitudes, as on Mt. Hoffmann, at 8500 ft., the plants are 7 or 8 in. high and the flower-clusters are reduced to 2 or 3. Exceedingly dwarf plants, only 2 or 3 in. high, and with flowers all in a single terminal cluster, is encountered above timber-line on Mt. Dana and Mt. Lyell, where it grows in moist soil close up to banks of perpetual snow. In this Alpine form, sometimes known as *P. geniculatus* Greene, the root-system is longer than all of the rest of the plant. Near Mt. Whitney we found a form 1 ft. high and with 3 whorls of flowers neighboring with plants only 3 in. high and with a single whorl. This variation, all within a small area, was apparently due to the light relation, the tall ones growing in the shade, the shortest ones only in the open meadow, while all intermediate forms were found in partial shade.

5. **P. laètus** Gray. Plant a foot or two high, with slender

erect branches ending in elongated loose panicles. Lower leaves spatulate; upper leaves sessile, narrowly lanceolate, entire, ¾ to 1½ in. long, ¼ in. wide. Corolla bluish purple, with 2 oblong white patches on throat, 1 in. long, inflated above a narrow tube, lips nearly equal. Sterile filament glabrous. — The most common species at middle altitudes, giving brilliant color to dry, rocky slopes; often mistaken for *P. heterophyllus* Lindl., a species of the Coast Ranges.

6. **P. roèzli** Regl. Much like no. 5 but seldom more than 1 ft. high, the shorter panicles more densely flowered, and light-blue or violet corolla only ½ to ⅔ in. long.—Yosemite Valley. Rare.

7. **P. azùreus** Benth. AZURE PENTSTEMON. Plant 9 in. to 2 ft. high, with many stiffly erect branches from a creeping woody base. Leaves linear or linear-lanceolate, ½ to 1¼ in. long, entire, acute. Corolla azure-blue, about 1 in. long, dilating above the short tube to a broad throat, the lips about equal. Sterile filament glabrous.—Rare: White Wolf; Yosemite Valley in a narrow-leaved form (var. *angustissimus* Gray); the opposite extreme is var. *jaffrayanus* Gray, a form with broader leaves, the lower spatulate, the upper ovate or oblong, ¼ to ½ in. wide, obtuse or almost heart-shaped at the broad base.

4. MÍMULUS. MONKEY-FLOWER.

Annual or perennial herbs with showy yellow red or purplish flowers. Calyx prismatic, 5-angled and 5-toothed (in one species deeply 5-parted). Corolla 2-lipped, obscurely so in some species. Stamens 4, with no rudiment of a fifth.

A. Flowers yellow (upper lip purple in M. angustatus).

Leaves basal; flowers nearly sessile, half yellow, half purple ..... 18. *M. angustatus.*
Leaves all near the base; flowers solitary, terminating the naked erect pedicel ..... 1. *M. primuloides.*
Leaves scattered; flowers in bracted racemes, panicles, or whorls.
  Plant glabrous or nearly so.
    Leaves ovate, merely toothed ..... 2. *M. luteus.*
    Leaves lanceolate, pinnately parted into small lobes. 3. *M. laciniatus.*

Plant plainly pubescent.
Leaves ¼ to 1 in. wide, mostly toothed.
Flowers ¾ to 1 in. long (at least over ½ in.)
Herbage slimy ..... 4. *M. moschatus.*
Herbage not slimy ..... 5. *M. moniliformis.*
Flowers ½ in. or less long.
Pedicels erect; herbage slimy..... 6. *M. floribundus.*
Pedicels reflexed in fruit; not slimy..... 7. *M. geniculatus.*
Leaves not ¼ in. wide, entire (faintly toothed in no. 8).
Calyx deeply parted; flowers about ¼ in. long, slender-pediceled ..... 19. *M. exilis.*
Calyx merely toothed; flowers about ¾ in. long.
Flowers long-pediceled ..... 8. *M. bicolor.*
Flowers nearly sessile ..... 14. *M. mephiticus.*

B. Flowers red, pink, crimson, or scarlet.

Corolla about ¼ in. long, inconspicuous..... 13. *M. breweri.*
Corolla mostly over ½ in. long, much longer than calyx.
Pedicels much longer than calyx (except sometimes the upper).
Plant robust, 1 to 3 ft. high; flowers 1½ to 2 in. long.
Stamens exserted from the corolla-tube; flowers scarlet ..... 9. *M. cardinalis.*
Stamens included; flowers pink..... 10. *M. lewisii.*
Plant slender, 1 in. to 1 ft. high; flowers ½ to ¾ in. long. (See also no. 12.)..... 11. *M. palmeri.*
Pedicels shorter than calyx or almost none.
Plant low (3 to 12 in.); flowers ¼ to ¾ in. long.
Herbage perfectly glabrous ..... 12. *M. acutidens.*
Herbage pubescent.
Calyx scarcely oblique at orifice, i. e., the teeth nearly equal ..... 15. *M. nanus.*
Calyx more oblique at orifice..... 16. *M. torreyi.*
Plant tall (6 to 24 in.); flowers ¾ to 1 in. long; calyx very oblique..... 17. *M. bolanderi.*

1. **M. primuloides** Benth. Perennial by stolons, 1 to 6 in. high, the showy solitary flowers borne on slender erect pedicels emerging from a basal cluster of leaves. Leaves elliptic, wedge-shaped, or obovate, usually toothed, either clothed with glistening white hairs or nearly glabrous. Corolla bright yellow, ½ to 1 in. long, the lobes alike.

In moist situations at moderate altitude this Mimulus is quite tall and bears leaves for a distance of several inches up the stem. More commonly, however, the leaves are all in a basal rosette. In the Tuolumne and other high meadows one meets with a very depressed, moss-like form, the leaves only ¼ to ½ in. long and densely covered on the upper surface with long, white hairs. This has been named *M. pilosellus* Greene. The two forms sometimes grow near each other and intermediates occur, but it is not known whether these

are due to variation or whether they are hybrids between distinct species. A third but unnamed form, with very narrow, sharply toothed leaves scattered along the lower part of tall stems, has been found in shady, grassy places in the Yosemite Valley.

2. **M. lùteus** L. COMMON MONKEY-FLOWER. Leaves ovate or roundish, sharply toothed, ¾ to 1½ in. long, only the lower ones petioled. Corolla bright yellow, often dotted in the hairy throat with cinnamon, ¾ in. or more long, strongly 2-lipped, the throat nearly closed. (*M. langsdorfii* Don.)

This is an annual, or perennial from slender, creeping stems, with erect, leafy stalks bearing usually several long-pediceled showy flowers. It is often tall and robust, sometimes very short, passing into several named varieties. *M. implexus* Greene, is a form (or distinct species ?) with short stems from many slender rootstocks, broad, rounded, thin leaves, and flowers large for the size of the plant. It grows in moist soil at high altitudes. *M. nasutus* Greene, is a variety in which the lateral calyx-teeth turn toward the upper one, which in fruit is twice the length of the others and beak-like. It grows at low altitudes and the flowers vary from small to large.

3. **M. laciniàtus** Gray. CUT-LEAF MONKEY-FLOWER. Plant apparently annual, much branched, especially near the base, the slender stems 6 to 18 in. high, including the loosely flowered racemes. Leaves 1 to 2½ in. long, petioled, lanceolate in outline, irregularly cleft or pinnately parted into small lobes. Corolla pale yellow, ¼ to ¾ in. long, 2-lipped, the lower lip hairy and often with a brown dot at throat.

The deeply lobed or parted leaves, which may always be found on well developed plants of this monkey-flower, make it very easy of determination. But dwarfs with merely toothed leaves, such as are likely to occur when the soil is very shallow, resemble small specimens of no. 2. It is a rare species and is restricted to moist places, especially near the spray of waterfalls, as in Yosemite Valley and Tenaya Cañon. The original description was drawn from specimens gathered "on the South Fork of the Merced at Clark's Ranch," by Dr. Asa Gray. This ranch is the present site of Wawona.

4. **M. moschàtus** var. **longiflòrus** Gray. MUSK PLANT. Stems erect, 4 to 18 in. high, leafy throughout with basal leaves crowded. Leaves more or less petioled, ovate or elliptic, sparingly toothed, ¾ to 2 in. long, ¼ to 1¼ in. wide. Flowers conspicuous, usually borne in pairs on long slen-

der pedicels from only the upper axils. Calyx-teeth long. Corolla bright yellow, with brown tints on throat, about 1 in. long, much exceeding the calyx.

Although apparently an annual, this plant grows from slender, perennial rootstocks. It is white-hairy and often quite slimy, these characters seeming to be associated with its habit of growing only in moist, shady places. It is a common inhabitant of the Yellow Pine Belt.

5. **M. monilifòrmis** Greene. Like *M. moschatus*, but not slimy, the leaves often purplish, the rootstocks ending in small tubers.—Exposed rocky or gravelly slopes; not rare around the Yosemite.

6. **M. floribùndus** Dougl. Stem weak, 4 to 12 in. long, leafy to the top, white-hairy and slimy. Leaves broadly ovate, toothed, ½ to 1½ in. long. Flowers not showy, the pedicels (short at first) from nearly all the leaf-axils. Calyx-teeth very short. Corolla narrow, light yellow, ⅜ in. long.—An annual of the foothills, reaching Yosemite Valley, etc.

7. **M. geniculàtus** Greene. Annual, with weak stems 3 in. to 2 ft. long, hairy but not slimy. Leaves very thin, ovate, ½ to 1 in. long, toothed. Pedicels longer than the flowers, deflexed in fruit. Corolla yellow, the throat brownish, ½ in. long.—Yosemite Valley, in the shade of large rocks; Hog Ranch; Hetch Hetchy.

8. **M. bìcolor** Benth. Annual, 3 to 10 in. high, with erect flowers on pedicels longer than calyx. Leaves linear-lanceolate, nearly entire. Calyx with 5 sharp equal teeth, the tube often reddish dotted. Corolla ¾ in. long, golden yellow, the upper lip usually white.—Lower slopes of the Sierra Nevada; found at Wawona.

9. **M. cardinàlis** Dougl. Scarlet Monkey-flower. Leaves sessile, ovate or oblanceolate, all sharply toothed, 2 to 4 in. long. Corolla scarlet, 1½ to 2 in. long, decidedly 2-lipped; upper lip erect and the lobes turned back; lower lip reflexed. Stamens long-protruding, nearly equalling the upper lip.

In brilliancy of coloring the scarlet Mimulus has no rival. The rich, green foliage, soft with hairs, makes a wonderful setting for the large, velvety flowers. In swamps or by running water at our lowest altitudes this stout, much branching perennial may be found sometimes 4 feet high. It grows in several places in Yosemite Valley and at Wawona.

10. **M. lewísii** Pursh. Pink Monkey-flower. Leaves sessile, lanceolate or nearly ovate, sometimes slightly toothed,

1 to 3 in. long, ½ to 1¼ in. wide. Flowers showy, on long pedicels much exceeding the leaves. Corolla pink, plainly 2-lipped, but the lips similar (1½ to 2 in. long, throat ½ to ¾ in. wide). Stamens shorter than corolla-tube.

Along streams and in wet places of our high mountains this pink Mimulus replaces the scarlet species of the foothills and low valleys. It is a robust perennial, sometimes 3 ft. high and covered throughout with short hairs. It grows on the slopes of Clouds Rest, at Snow Flat, at Glacier Point, etc.

11. **M. pálmeri** Gray. Slender annual, 3 to 12 in. high, minutely pubescent and glandular throughout. Leaves lanceolate to oblanceolate, sometimes toothed, ½ to 1 in. long, usually less than ¼ in. wide. Lower pedicels long, spreading or even deflexed. Corolla nearly ¾ in. long, scarcely 2-lipped, lobes spreading, red, with yellow marks near the throat.

The delicate, bright-red flowers, each on a slender pedicel, best mark this species, which has been found from Hetch Hetchy to Crockers and Moss Creek. Our form, differing from typical specimens in its lanceolate, acute calyx-teeth, is sometimes known as *M. biolettii* Eastw. Another form, which has been described as *M. filicaulis* Wats., is very much dwarfed, being only 1 to 4 in. high. Its calyx-teeth are very acute and the corolla is marked with purple as well as yellow in the throat and tube. It was described from specimens collected on Snow Creek by J. W. Congdon, and has not since been found.

12. **M. acùtidens** Greene. Slender branching annual. Leaves ovate, mostly toothed, ¼ to ¾ in. long. Pedicels erect, the lower becoming longer than the calyx. Corolla ½ in. long, rose-color (or yellow).—Alder Creek trail, 5500 ft. alt., to the foothills. Known by its smooth, glabrous herbage and broad calyx appearing as though cut off at the top.

13. **M. bréweri** Coville. A delicate annual, seldom 6 in. high, with usually simple stem, decidedly glandular. Leaves linear or lanceolate, entire or nearly so, ¼ to ¾ in. long. Pedicels ascending. Calyx truncate at summit, with short sharp teeth. Corolla rose-color, slightly exserted, ¼ in. long. Capsule with seed-bearing walls (placentae) united below the middle.—Rather common throughout the Sierra Nevada. *M. rubellus* Gray, may be distinguished, if found, by its scarcely glandular herbage, blunt calyx-teeth, and placentae separate to base.

14. **M. mephíticus** Greene. Plant 2 to 6 in. high, annual, with nearly sessile flowers in most of the leaf-axils and in

small terminal clusters. Herbage viscid-pubescent and strongly scented. Leaves broadly oblong to nearly linear, entire or obscurely toothed, tapering to the base. Calyx papery between the green ribs, with 5 broadly lanceolate acutish teeth. Corolla well exserted, ⅔ to ¾ in. long, with very narrow tube and widely spreading limb, which is somewhat 2-lipped, yellow, the throat often with reddish lines and dots.

It was in 1884 that Mrs. Brandegee and Mr. Hutchings collected the plants which first made this species known. Their specimens were gathered on the southward slopes of Clouds Rest. It is now known to grow, in a dwarf form, on the very summit of that peak, while sandy flats in Little Yosemite Valley are covered with its yellow bloom. It also occurs on Sentinel Dome, El Capitan, Tamarack Flat, Snow Creek, etc., extending down the Sierra Nevada as far as Tulare Co.

15. **M. nànus** H. & A. Differs from *M. mephiticus* in its rose-purple corolla, ⅔ to ¾ in. long, and in the calyx-teeth, which are one-fourth or one-third as long as the tube. As compared with *M. torreyi* this is a stouter plant, with more branched and leafier stems, the leaves broader.—Mt. Dana and southward at high altitudes.

16. **M. tòrreyi** Gray. Stems 3 in. to 1 ft. high, viscid throughout. Lower leaves rhomboid or oblanceolate, narrowed to a short petiole; upper leaves narrower, ½ to 1 in. long, all entire. Calyx oblique, the two lower teeth being shorter than the upper. Corolla pink-purple, ½ to ¾ in. long, broadly funnelform, 2-lipped.

This is a slender annual, usually with divergent branches and numerous showy flowers in nearly sessile pairs. It is frequently found in open places at moderate altitudes, ranging up to Little Yosemite Valley where it forms red carpets on the valley floor.

M. LEPTALEUS Gray, is to be expected. It is a small species with small flowers nearly sessile in the axils of spatulate leaves; calyx oblique; corolla crimson, ¼ to ½ in. long, the tube narrow.

17. **M. bolánderi** Gray. Leaves oblong, narrowed to both ends, ¾ to 2 in. long, entire or toothed. Calyx ⅜ to ½ in. long, very oblique. Corolla reddish purple, an oblong area on lower lip white and reddish dotted, ¾ to 1 in. long, cylindric, evidently 2-lipped.

The erect, leafy, very viscid stems are characteristic of this

striking annual, which grows on warm, gravelly slopes in Yosemite Valley (Indian Cañon), at Wawona, and elsewhere at moderate altitudes. It is more common in the foothills.

18. **M. angustàtus** Gray. Leaves densely clustered at base, linear, 1 in. or less long, entire, hairy, hiding the calyx of the nearly sessile flowers. Corolla 1¼ to 1½ in. long, with slender tube and funnelform throat; upper lip purple, lower lip golden yellow and purple-dotted. (*Eunanus pulchellus* Drew.)

The pygmy plants which represent this species are only 2 or 3 in. high, and most of this height is due to the slender flowers, which grow even from the lowest leaf-axils. They are found in meadows from Lake Eleanor and the Hog Ranch Road to Yosemite.

19. **M. éxilis** Durand. Annual leafy plant with small flowers on long pedicels from all but the lower leaf-axils, softly villous throughout, 3 in. to 1 ft. high. Leaves oblong or lanceolate, entire, sessile, the larger 1 to 1½ in. long. Calyx deeply cleft into 5 unequal lanceolate lobes. Corolla small, its lobes nearly equal, yellow, each of the lower lobes often with a brown spot.—Gravelly soil in Yosemite Valley and below.

5. ILYSÁNTHES. False Pimpernel.

1. **I. anagallídea** Rob. A smooth erect annual, 3 to 9 in. high. Leaves sessile, ovate or oblong, ¼ to ¾ in. long. Pedicels spreading, longer than the leaves. Corolla pale blue or "purplish," scarcely ¼ in. long.—Wet places in Bridal Veil Meadows; of wide distribution.

6. VERÓNICA. Speedwell.

Annual and perennial herbs of meadows and moist places, with white, pale-blue, or purplish small flowers. Leaves mostly opposite, the upper sometimes alternate. Corolla rotate, with very short tube and 4 lobes, one of them smaller than the others. Stamens only 2.

Flowers in loose racemes which spring from the axils of opposite leaves; perennials.
  Leaves short-petioled, ovate or oblong, obtuse at each end. 1. *V. americana.*
  Leaves sessile, narrowly lanceolate, tapering to each end. 2. *V. scutellata.*
Flowers in simple terminal racemes, each flower from the axil of a bract.
  Stems several, from perennial rootstocks; leaves ovate or roundish.
    Capsule obscurely notched at summit..... 3. *V. alpina.*

Capsule plainly notched (obcordate), broader at summit ..... 4. *V. serpyllifolia.*
Stem solitary, annual; leaves narrow, oblong or linear. 5. *V. peregrina.*

1. **V. americàna** Schw. American Brooklime. Stems creeping at base and rooting from the lower joints, usually branching and 1 to 3 ft. long, the whole plant glabrous. Leaves ovate or broadly oblong, often toothed, ¾ to 2 in. long, from nearly ½ to ¾ in. broad. Flowers bluish, in loose spreading racemes. Capsule orbicular, many-seeded.—Grows in shallow water.

2. **V. scutellàta** L. Marsh Speedwell. Stems slender, mostly erect, connected by creeping stolons, 3 in. to 1 ft. high, the whole plant glabrous. Leaves numerous, lanceolate or narrower, nearly entire, ¾ to 2 in. long (much exceeding the internodes), less than ¼ in. wide. Flowers pale blue, in slender flexuous racemes. Capsule pendulous on a slender pedicel, flat, deeply notched at apex, several-seeded.—Yosemite Valley and northward.

3. **V. alpìna** L. Alpine Speedwell. Stems usually erect, from slender creeping rootstocks, 6 to 12 in. high, simple, hairy. Leaves sessile, ovate to oblong, shallowly toothed or entire, ½ to 1½ in. long. Raceme dense when young, the pedicels then shorter than calyx. Corolla blue or violet.—A common species. Yosemite and Little Yosemite valleys, Lake Tenaya, etc.

4. **V. serpyllifòlia** L. Thyme-leaf Speedwell. Stems creeping and branching at base, becoming 3 to 9 in. high, glabrous or obscurely pubescent. Lower leaves short-petioled, upper sessile, roundish, nearly or quite entire, ¾ in. or less long. Pedicels longer than calyx. Corolla bluish, or pale with blue stripes.—Widely distributed.

5. **V. peregrìna** L. Neckweed. Stem simple or nearly so, 3 to 12 in. high, glabrous or somewhat glandular. Leaves thick, the lowest pair petioled and broad; the others sessile, oblong to linear or spatulate, mostly alternate and entire, about ½ in. long. Pedicels shorter than the calyx which is exceeded by the leaf-like bracts. Capsule orbicular, obscurely notched.—Yosemite Valley, Hog Ranch, etc.

7. CASTILLÈJA. Painted Cup.

Perennial herbs with alternate sessile leaves passing above into reddish bracts of the showy terminal spike. Calyx tubular, flattened, cleft before and behind, the lobes either entire or again cleft. Corolla tubular; upper lip much elongated

and beak-like, enclosing the 4 stamens and single style; lower lip short and very small, not inflated, with 3 small teeth.

Plant tall (1 to 4 ft.); beak of corolla equaling or longer than the tube.
  Herbage very pubescent throughout; leaves mostly lobed. 1. *C. parviflora.*
  Herbage nearly glabrous; leaves mostly entire..... 2. *C. miniata.*
Plant low (9 in. or less); beak of corolla much shorter than the tube.
  Leaves lanceolate or broader, the upper divided into spreading lobes, distinctly 3-nerved; flowers dull red ..... 3. *C. breweri.*
  Leaves linear-lanceolate, attenuate, mostly entire, all but the lowest 1-nerved; flowers crimson..... 4. *C. culbertsonii.*

1. **C. parviflòra** Bong. INDIAN PAINT BRUSH. Stems erect or ascending, 1 to 2 ft. high, the whole plant rough-pubescent. Leaves linear to oblong, entire to pinnately parted into narrow lobes, 1 to 2½ in. long. Corolla about 1 in. long, the lower lip not protruding from the calyx, the beak about equalling the tube.—An inhabitant of dry places, especially on hillsides in the open forest. A common form with entire leaves is *C. pinetorum* Fernald; another, with leaves parted into 3 lobes, is *C. trifidum* Greene, but all forms of leaves may be found on a single plant.

2. **C. miniàta** Dougl. Stems erect, 2 to 4 ft. high, or less at high altitudes, with large red terminal spikes; the stem and leaves glabrous or minutely pubescent, the inflorescence with longer hairs. Leaves lanceolate or linear-lanceolate, acuminate, entire, 1 to 3 in. long. Corolla 1 to 1½ in. long, curved, the lower lip protruding from the calyx, the beak longer than the tube. (*C. montana* Congdon.)

While admiring the brilliant, red flower-clusters of Castilleja, borne proudly erect on leafy stems, one little suspects the robbery that is being perpetrated by the plant through the sucking organs developed on its roots. These attach themselves to the underground parts of other plants, which are thus brought under tribute. But the Castilleja is not entirely a robber, for it has a well developed root system of its own and also a good supply of green foliage capable of assimilating carbon dioxide for itself. Apparently all species of the genus are partially parasitic. *C. miniata* is the most showy of all and also the most common in our district, where it grows in meadows and other moist places, from the foothills nearly to timber-line.

3. **C. brèweri** Fernald. Stems clustered on a thick woody root, whole plant conspicuously soft-hairy and glandular. Leaves coarse; the lower lanceolate and entire; the upper

broad, plainly 3-nerved, many with 3 lobes. Spike dull red, 2½ in. or less long, the corolla ½ to 1 in. long.—In rather dry soil, from Clouds Rest to our eastern borders, the original specimens from Mt. Dana at 10,000 to 11,000 ft. alt.

4. **C. culbertsònii** Greene. Stems several, very slender, attached by a delicate curved or horizontal base to the common deep-seated taproot, whole plant minutely hairy and viscid. Leaves thin, erect, mostly entire, the lower lanceolate, 1-nerved or obscurely 3-nerved; upper leaves linear, tapering to a fine point, 1-nerved, rarely with a sharp tooth; the bracts broader and 3-cleft. Spike crimson, 2½ in. or less long, the corolla ½ to ¾ in. long.—In moist meadows and along streams: meadows near summit of Clouds Rest; Lake Tenaya; Tuolumne Meadows; etc.

8. ORTHOCÁRPUS. Owl's Clover.

Low herbs with entire or slenderly parted leaves passing above into bracts of the dense brush-like spike. Calyx 2-cleft, the divisions again cleft or parted. Corolla with slender tube; upper lip beak-like, a little longer and much narrower than the inflated and 3-lobed lower one.

1. **O. pilòsus** Wats. Plant 1 ft. or so high, with many leafy stems from a strong perennial root, soft-villous or pilose throughout. Leaves parted into many linear lobes. Bracts and calyx yellowish.—Gravelly ridges and summits above 6000 ft. alt.

2. **O. lácerus** Benth. Plant 3 to 10 in. high, usually with one simple erect stem, short-hirsute, viscid above. Leaves or their lobes narrowly linear, ½ to 1½ in. long. Bracts pale, deeply cut into narrow lobes. Corolla bright yellow, about ½ in. long.—Common in grassy places, especially at low altitudes.

3. **O. linearílobus** Benth. Much like *O. lacerus* but often larger, the leaves sometimes 2½ in. long. Corolla nearly ¾ in. long, white or purplish.—Restricted to moderate altitudes.

4. **O. imbricàtus** Benth. Stem simple, erect, 6 to 15 in. high, minutely pubescent. Leaves linear, entire or lobed, ¾ to 2 in. long. Bracts broad, obtuse, entire, partly purple, closely overlapping. Corolla purplish, ½ in. long.—Rancheria Mt. and above.

5. **O. purpuráscens** Benth. Owl's Clover. Annual, erect, 6 to 12 in. high, very pubescent. Leaves parted into many thread-like segments. Bracts broad at base, cleft into nar-

rowly linear lobes, the upper with crimson or purple tips. Corolla crimson, 1 to 1¼ in. long, the upper lip densely hairy on the back.—Abundant in the foothills, reaching Wawona.

9. CORDYLÁNTHUS. Bird's Beak.

1. **C. ténuis** Gray. Herbage somewhat pubescent and often glandular. Leaves linear, entire, ½ to 1 in. long. Corolla about ⅝ in. long, short-hairy, almost equally 2-lipped, the end of lower lip and the tube greenish yellow, intermediate parts reddish striped, back of upper lip suffused with dull red.

This is a slender, erect, branching annual, 1 to 2 ft. high, with dull-colored corollas nearly concealed by the green, 2-parted calyx. It is a late bloomer and is common throughout the drier parts of the Yellow Pine Belt.

10. PEDICULÀRIS. Lousewort.

Perennial herbs with simple stems, finely cut leaves and dense terminal spikes of irregular flowers. Leaves alternate. Corolla with cylindric tube, conspicuously 2-lipped.

1. **P. groenlándica** Retz. Long-beaked Pedicularis. Stems 12 to 18 in. high, leafy below. Leaves lanceolate in outline, finely divided and feather-like. Flowering spike cylindric, dense, 2 to 6 in. long, ¾ to 1 in. wide, glabrous. Corolla rose-red; upper lip hooded, continued into a conspicuous curved slender beak ¼ in. or more long.—Moist and grassy places at considerable altitudes.

2. **P. attòllens** Gray. Elephant Heads. Similar to no. 1 but often smaller, more slender. Flowering spike ½ in. or less wide, densely clothed with white hairs. Beak of corolla short, abruptly upturned.

Meadows and other moist places form the natural home of this peculiar plant. It is common throughout the mountains in such situations, but does not range so high as no. 1, from which it may be distinguished by the dense, white-woolly spike. The leaves are chiefly basal, spreading out as a rosette from the center of which rises the nearly naked flowering stalk.

3. **P. semibarbàta** Gray. Plant short, mostly 4 to 6 in. high, much branched from the base. Leaves in a rosette, surrounding the short sessile spikes, these 1 to 2 in. wide. Corolla yellowish, upper lip hooded but not continued into a beak.—Restricted to the drier parts of fir and other forests.

OROBANCHACEAE. Broom-rape Family.

Root-parasitic herbs with yellowish alternate scales in place

of leaves. Flowers in the axils of scales or on long peduncles. Corolla tubular, 2-lipped, withering-persistent. Stamens 4. Ovary 2-celled, the capsule many-seeded.

1. OROBÁNCHE. Broom-rape.

Brownish or whitish plants, our species often described under *Aphyllon*.

1. **O. unifl̀ora** L. One-flowered Cancer-root. Stem scaly, short, mostly subterranean, bearing few erect peduncles 3 in. to 1 ft. or so high, each terminated by a solitary dull-yellow but violet-tinged flower. Calyx-lobes mostly longer than tube, attenuate. Corolla ¾ to 1 in. long, somewhat curved, its lobes obovate.—Grows attached to the roots of shrubs, etc., but not common.

2. **O. fasciculàta** Nutt. Stem usually more exserted from the ground, bearing numerous fascicled peduncles, the flower-clusters therefore more compact. Calyx-lobes not longer than the tube. Corolla dull yellow, rarely purplish, its lobes oblong.—Rare; found in Yosemite Valley.

LENTIBULARIACEAE.
Bladderwort Family.

Small herbs with a 2-lipped calyx and a 2-lipped corolla spurred at base. Stamens 2. Ovary free from the calyx, becoming a 1-celled several-seeded capsule.

1. UTRICULÀRIA. Bladderwort.

1. **U. vulgàris** L. A slender aquatic, the leaves with hair-like divisions and bearing many small bladders which float the plant at time of flowering. Flowers borne on long naked stalks which rise above the water. Corolla yellow, ½ to ¾ in. across, closed.—In quiet ponds at Eagle Peak Meadows, Little Yosemite Valley, and Tuolumne Meadows. Widely distributed in the Northern Hemisphere.

PLANTAGINACEAE. Plantain Family.

Chiefly stemless herbs with regular flowers in spikes. Corolla membranous, 4-lobed.

1. PLANTÀGO. Plantain. Ribwort.

Leaves ribbed. Calyx of 4 dry sepals. Stamens 4 or 2, some with weak exserted filaments. Capsule 2-celled, with 1 to several ovules in each cell, the top falling off like a lid.

1. **P. màjor** L. Common Plantain. A glabrous perennial with leaves all at base of an erect flower-stalk. Leaf-blades roundish or ovate, entire or toothed, 2 to 6 in. long, abruptly narrowed to broad petioles nearly as long. Spike narrow, 5 to 6 in. long, on a stalk 6 to 18 in. high.—Low ground at Yosemite Valley, Crockers, etc. The var. *asiatica* Dcne., has upright leaves tapering to slender petioles, and erect flower-stalks.

2. **P. lanceolàta** L. English Plantain. Ribwort. A somewhat pubescent perennial, with leaves all at base. Leaf-blades lanceolate, acute, 2 to 8 in. long, entire or slightly toothed, tapering to a petiole. Spike dense, thick, ½ to 2 in. long, on a stalk 4 to 12 in. high.—A naturalized European weed; common in low valleys.

3. **P. patagònica** Jacq. A silky-pubescent annual, 3 to 6 in. high. Leaves basal, linear to oblanceolate, 1½ to 5 in. long including the narrowed petiole-like base, less than ¼ in. wide. Spike thick, almost head-like, ¼ to ¾ in. long.—A common species of wide distribution which probably occurs on dry hillsides along our lower borders.

RUBIACEAE. Madder Family.

Herbaceous or slightly woody plants with simple entire sessile leaves and small regular flowers with both stamens and pistil. Calyx adherent to the ovary, its teeth minute or none. Stamens 3 to 5, alternating with the lobes of the corolla, inserted on its tube or throat. Ovary inferior.

Leaves opposite; corolla funnelform or salverform.....1. Kelloggia.
Leaves in whorls of 3 to 8; corolla rotate.....2. Galium.

1. KELLÓGGIA.

1. **K. galioìdes** Torr. Slender erect perennial from creeping rootstocks, a foot or so high, often profusely branching at base. Leaves lanceolate, entire, usually 1 in. long. Flowers in panicles terminating the branches, the spreading pedicels ¾ to 1¼ in. long in fruit. Corolla pinkish, ⅛ to ¼ in. long, funnelform, with spreading lobes. Fruit dry, covered with hooked bristles, separating at maturity into two parts.

Kelloggia is a smooth, leafy perennial, frequently encountered in the pine forests. It is often mistaken for a species

of Galium but the larger, funnelform corollas readily distinguish it. The genus, which contains but the single species, was named in honor of Dr. Albert Kellogg, a botanist and early member of the California Academy of Sciences.

2. GÀLIUM. Bedstraw. Cleavers.

Branching plants, often with rough stems which are encircled at the joints by whorls of narrow leaves. Corolla rotate,. its lobes sharply pointed. Style 2-cleft. Ovary 2-celled, 2-lobed, developing into a dry or fleshy fruit, sometimes bur-like.

A. Fruit dry.

Leaves without bristle-like tips, mostly 4 in each circle (varying to 6 in G. trifidum and to 3 or 2 in G. bifolium).
- Fruit short-hairy; leaves about ½ in. long; smooth slender annual under 6 in. ..... 1. *G. bifolium.*
- Fruit smooth, glabrous; pedicels shorter than leaves; smooth slender matted perennial under 6 in. ..... 2. *G. brandegei.*
- Fruit smooth, glabrous; pedicels longer than leaves; rough slender perennial, 6 in. to 2 ft. long ..... 3. *G. trifidum.*

Leaves with short bristle-like tips, 6 to 8 in each circle; stems 1 ft. or more long.
- Fruit rough with short hairs or merely granular ..... 4. *G. asperrimum.*
- Fruit bristly with long hooked hairs.
  - Perennial; leaves mostly 6 in each circle ..... 5. *G. triflorum.*
  - Coarse annual; leaves mostly 7 or 8 to each circle .. 6. *G. aparine.*

B. Fruit fleshy, berry-like; leaves 4 in each circle; perennials.

Stems and leaves grayish with short stiff hairs ..... 7. *G. pubens.*

Stems and leaves rough, especially on edges, but green.
- Leaves ¼ in. or less wide ..... 8. *G. bolanderi.*
- Leaves ¼ to ½ in. wide ..... 9. *G. subscabridum.*

1. **G. bifòlium** Wats. A very slender annual, 2 to 6 in. high, smooth and glabrous. Leaves narrow, the upper ones apparently only opposite, the larger fully ½ in. long. Fruits rough with short hairs, recurved on the slender scattered pedicels.—Snow Creek at 6500 ft. alt.; common in the Sierra Nevada.

2. **G. brandegèi** Gray. A delicate perennial, 2 to 6 in. high, growing in dense mats, smooth and glabrous or nearly so. Leaves many, small, seldom over ¼ in. long. Fruits smooth, on scattered pedicels which are shorter than the leaves.—A rare Rocky Mt. species, to which specimens from Ostranders, near Yosemite, have been referred.

3. **G. trífidum** var. **pacíficum** Wiegand. Perennial from slender rootstocks; the weak stems usually 1 ft. or more

long and intertangled, rough on the angles. Leaves linear, ¼ to ¾ in. long. Fruits smooth, on recurved pedicels which mostly exceed the leaves.—Yosemite, Hetch Hetchy, etc.

4. **G. aspérrimum** Gray. Stems long and weak, very rough. Leaves linear to elliptic, ¾ to 1¼ in. long. Flowers numerous, in repeatedly forked clusters. Fruits rough with short hairs.—Perhaps common: Mariposa Grove, Snow Creek, Yosemite Valley, Mt. Dana.

5. **G. triflòrum** Michx. SWEET-SCENTED BEDSTRAW. Stem weak, a foot or two long, moderately rough. Leaves broadly elliptic or oblong, ¾ to 1½ in. long. Flowers on long 3-forked peduncles. Fruits bristly, the hairs nearly as long as the body of the fruit.—Damp, shady places in the Yosemite Valley, etc.

6. **G. aparìne** L. CLEAVERS. GOOSE GRASS. Weak reclining annual, 1 to 4 ft. long, hispid on the angles of the stems and on the edges and midribs of the leaves. Leaves linear to oblong, ½ to 2 in. long. Fruit dry and covered with stiff hooked hairs.—Common at low altitudes.

7. **G. pùbens** Gray. Stems herbaceous or woody, stiff, 1 or 2 ft. long, the whole herbage grayish with a short stiff pubescence. Leaves oblong or oval, acute, ¼ to ½ in. long. Berry short-hairy, juicy, probably purple or black.—Plentiful in rocky places at middle altitudes.

8. **G. bolánderi** Gray. Stems somewhat woody and stiff, 1 or 2 ft. long, roughish. Leaves linear or narrowly lanceolate, acute, seldom over ½ in. long, ¼ in. or less wide. Berry glabrous, juicy, white when fresh, drying black.—Very common on rocky ledges and talus slopes.

9. **G. subscàbridum** Wight. Like *G. bolanderi* except that the leaves are broadly lanceolate to oval, the main ones ½ to ¾ in. long, ¼ to ½ in. or more wide.—Known only from Wawona and from Fresno Co.

CAPRIFOLIACEAE. HONEYSUCKLE FAMILY.

Shrubby plants with opposite leaves and no stipules. Stamens as many as the lobes of the corolla (4 or 5) and alternate with them, inserted on the tube or base. Ovary inferior, ripening into a fleshy berry-like fruit; style 1.

Leaves pinnately compound; corolla nearly rotate.....1. SAMBUCUS.
Leaves simple; corolla tubular to bell-shaped.
  Corolla regular .....2. SYMPHORICARPOS.
  Corolla more or less irregular, swollen at base on one side .....3. LONICERA.

1. SAMBÙCUS. Elder.

Shrubs and trees with rank odor when bruised, pinnately compound leaves, and numerous small flowers in compound clusters. Calyx-lobes minute or obsolete. Corolla open, regular, the limb 5-cleft. Stamens 5. Stigmas 3. Fruit juicy, berry-like, containing 3 seed-like nutlets.

1. **S. racemòsa** L. Red Elderberry. Herbage green and nearly glabrous. Leaflets 5 (or 7), lanceolate, narrowed above to slender tips, sharply toothed, 2½ to 5 in. long, the two sides nearly even at base. Flowers fragrant, pale yellow, in pyramidal or dome-shaped clusters 1½ to 3 in. wide. Fruit bright red.

With us the Red Elderberry is a low shrub, the numerous stems being only 2 to 4 ft. high. It is plentiful around Lake Tenaya and in other moist situations from about 7000 ft. alt. to timber-line.

2. **S. canadénsis** var. **mexicàna** Sarg. Herbage soft with a short pale pubescence. Leaflets 5 to 9, lanceolate, acute, evenly toothed, 2 to 4 in. long, one side continued farther down the stalk than the other. Flowers fragrant, pale yellow, in flat-topped clusters 3 in. to a foot wide. Fruit unknown. (*S. velutina* D. & H.)

This elderberry is almost a tree, commonly growing to a height of 10 to 15 ft. and with a distinct trunk. Its distinguishing marks are its broad, flat-topped flower-clusters, its very pubescent herbage, and the white pith (brown in no. 1). It grows in Yosemite Valley and is perhaps rather common in the warmer parts of our district.

S. glauca Nutt., the common Blue Elderberry of the foothills, may reach our borders. It is known by its perfectly glabrous herbage. The flower-clusters are flat-topped.

2. SYMPHORICÁRPOS. Snowberry.

Low shrubs with oval or roundish short-petioled simple leaves. Flowers white, tinged with rose-color, in small clusters. Calyx-teeth short. Corolla bell-shaped, 4 or 5-lobed, with 4 or 5 stamens inserted in the throat. Fruit a 4-celled, 2-seeded berry.

Short-flowered, the corolla as broad as long.
- Leaves nearly glabrous ..... 1. *S. racemosus.*
- Leaves densely soft-pubescent ..... 2. *S. mollis.*

Long-flowered, the cylindric corolla much longer than broad.
- Nutlets of fruit round at base ..... 3. *S. rotundifolius.*
- Nutlets pointed at base ..... 4. *S. oreophilus.*

1. **S. racemòsus** Michx. A much-branched shrub, 3 or 4 ft. high. Leaves roundish, ¾ to 1½ in. long, entire or toothed or lobed, glabrous, or barely pubescent beneath. Corolla cup-shaped, not ¼ in. long.—Low altitudes; reported from Yosemite Valley.

2. **S. móllis** Nutt. A low shrub, rarely 2 ft. high. Leaves oval or round, ½ to ¾ in. long, entire or with few teeth, velvety-pubescent. Corolla shallowly cup-shaped, ⅛ to nearly ¼ in. long, lobed nearly to the middle.—Foothills up to at least 8400 ft. alt. (above Muir Gorge); a common species.

3. **S. rotundifòlius** Gray. Shrub, commonly 3 or 4 ft. high. Leaves orbicular to elliptic, ½ to 1 in. long, entire or lobed, minutely pubescent or becoming glabrous. Corolla nearly tubular, over ¼ in. long, the lobes one-half or one-third the length of the tube. Nutlets of fruit obtuse at both ends.—Sierra Nevada north and south of us; hence to be expected within the Park boundaries.

4. **S. oreóphilus** Gray. A twiggy shrub, 3 to 5 ft. high. Leaves thinner than in no. 3, elliptic or rarely ovate, ½ to 1 in. long, commonly glabrous. Corolla narrow, the lobes only one-fourth the length of the tube. Nutlets of fruit pointed at base.—The common species in the high mountains.

3. LONÍCERA. Honeysuckle.

Shrubs and twining woody vines with normally entire leaves. Calyx-tube ovoid or globose, with 5 short teeth or truncate. Stamens 5. Style slender.

Leaves all distinct; flowers 2 or 3 on each peduncle.
- Flowers yellow, with narrowly linear bracts.....1. *L. coerulea.*
- Flowers yellow, with ovate leaf-like bracts.....2. *L. involucrata.*
- Flowers nearly black, naked.....3. *L. conjugialis.*

Upper leaves united in pairs; flowers sessile, yellow.....4. *L. interrupta.*

1. **L. coerùlea** L. Stems 1 or 2 ft. high, erect. Leaves thick, veiny beneath, oblong-elliptic, ¾ to 1½ in. long. Peduncles much shorter than the cluster of 2 or 3 flowers which is subtended by linear or narrower bracts. Corolla ⅓ in. long, pale yellow, nearly regular. Berry black, with a blue bloom.—Reported from Crescent Lake.

2. **L. involucràta** Banks. Twinberry. A leafy shrub, 2 to 10 ft. high. Leaves ovate or oblong, acute or more abruptly contracted to apex, 1½ to 5 in. long, short-petioled. Peduncle ½ to 2 in. long, with a pair of leafy bracts beneath the cluster

of 2 or 3 flowers. Corolla yellowish, ½ to ¾ in. long, with short erect nearly equal lobes. Berries dark purple, shorter than the enlarged bracts.

This yellow-flowered twinberry occurs both in the Sierra Nevada and Coast Range mountains, ascending the former to 8000 ft. alt. It grows at the following places: Pohono Trail, Yosemite Valley, Clouds Rest, Conness Creek, Tuolumne Meadows, Vogelsang Pass, and Rodgers Lake.

3. **L. conjugiàlis** Kell. DWARF TWINBERRY. A slender leafy shrub, a foot or two high. Leaves thin, ovate or oval, acute, short-petioled, 1½ to 3 in. long, ¾ to 2 in. wide. Peduncles ½ to 1 in. long, bearing usually 2 flowers with united ovaries, the bracts not evident. Corolla about ⅓ in. long, dull purple, strongly 2-lipped, the throat very hairy. Stamens protruding. Berry red.

The nearly black flowers, borne mostly in pairs on the summit of a naked stalk, mark this twinberry as distinct from all other plants. It inhabits moist banks from the Mariposa Grove and Yosemite Valley to Mt. Lyell Meadows and Smedberg Lake, being most common above 7000 ft. alt.

4. **L. interrúpta** Benth. CHAPARRAL HONEYSUCKLE. Leaves roundish or broadly oblong, pale beneath, obtuse but with a short sharp tip, ¾ to 1 in. long, one or two uppermost pairs united into disks around the stem. Flowers yellow, nearly ½ in. long, sessile in whorls of a terminal glabrous spike. Corolla strongly 2-lipped, glabrous.

The flexuous stems of this shrub, or vine, for it is often inclined to climb and twine, are 3 to 6 ft. long. It grows in warm places of the Yellow Pine Belt. In Yosemite Valley is found a very pubescent form which seems to connect the species with *L. hispidula* Dougl., the common honeysuckle of the north.

VALERIANACEAE. VALERIAN FAMILY.

Herbs with opposite leaves and no stipules. Calyx-tube adherent to the ovary. Corolla tubular, 5-lobed. Stamens 1 to 3, distinct. Fruit not opening, 1 or 3-celled, always 1-seeded.

Upper leaves lobed or parted; perennial.....1. VALERIANA.
Leaves all entire.....2. VALERIANELLA.

1. VALERIÀNA. VALERIAN.

1. **V. sylvática** Banks. Stems erect, from perennial rootstocks, 1 or 2 ft. high, with a flat terminal cluster of white or roseate flowers. Lower leaves oblanceolate, entire or

toothed, 1 to 3 in. long; upper leaves deeply parted into several lanceolate or oblong lobes. Flowers nearly ¼ in. long. Calyx-lobes becoming feathery in fruit. Stamens 3, exceeding the corolla. Fruit seed-like, flattish. (*V. californica* Heller.)—Occasional in meadows above 5000 ft. alt.: Glacier Point, Snow Flat, Benson Pass, etc.

2. VALERIANÉLLA.

1. **V. congésta** Lindl. Stem erect, from an annual root, 6 to 18 in. high, with a terminal cylindric cluster of rose-colored flowers. Leaves sessile, oblong, obtuse, entire, 1 or 2 in. long. Flowers irregular, spurred, scarcely ¼ in. long. Calyx without lobes above the ovary. Stamens 3, shorter than corolla. Fruit seed-like, boat-shaped, rough-hairy.—Yosemite Valley, in a form with fruit appendaged on the inner side, as in *Plectritis davyana* Jepson.

CUCURBITACEAE. Gourd Family.

Our only representatives of the Gourd Family are one or two species of *Echinocystis* and these reach only our lower borders. They are succulent herbs with simple, palmately lobed leaves and small, greenish-white flowers. The fruit is a large, dry bur containing several smooth seeds. The large, often branching perennial root has given these plants the names of "Big Root" and "Man Root," while the Spanish-Californians know them as "Chilicothe."

CAMPANULACEAE. Bluebell Family.

Herbs with alternate leaves, no stipules, and regular 5-lobed corollas. Calyx persistent, divided down to the ovary, to which it is adherent. Stamens distinct from each other. Style 1, provided with pollen-collecting hairs below the 2 to 5 stigmas. Ovary inferior, 2 to 5-celled, the capsule many-seeded.

a. *Capsule* opening by 1 or more small window-like valves on the side; stems stiffly erect, 1 ft. or more high.
Flowers mostly pediceled; bracts linear or inconspicuous (except the lower) ..... 1. Campanula.
Flowers closely sessile in the axils of ovate or roundish bracts ..... 2. Specularia.

b. *Capsule* opening by irregular fissures along the sides; calyx-lobes round, toothed ..... 3. Heterocodon.

c. *Capsule* opening at apex, within the calyx; calyx-lobes linear, entire ..... 4. Githopsis.

1. CAMPÁNULA. Bellflower.

1. **C. prenanthoìdes** Dur. California Harebell. Perennial plant with erect stems, leafy below but nearly naked among the flowers, nearly glabrous. Leaves ovate to lanceolate, sharply toothed, tapering to the base, ¾ to 1¼ in. long. Corolla blue, cylindric in bud, nearly ½ in. long, parted into 5 narrow lobes. Style becoming longer than corolla. Capsule nearly globose.—Coniferous woods along our lower borders.

2. SPECULÀRIA.

Venus Looking-glass.

1. **S. biflòra** Gray. Annual plant, either branched from the base or simple, the flowers scattered along the upper part of the erect stem, which is rough on the edges. Leaves sessile, ovate, somewhat wavy-margined, ¾ in. or less long. Lower flowers (self-pollinated) inconspicuous, the upper (cross-pollinated) with showy blue or purple corollas longer than the styles. Capsule cylindric.—Hetch Hetchy Valley.

3. HETEROCÒDON.

1. **H. rariflòrum** Nutt. A delicate sparsely pubescent annual, seldom 1 ft. high, the sessile flowers mostly concealed by the broad bracts. Leaves roundish, the broad sessile base partly clasping, ¼ in. across. Lower flowers (self-pollinated) inconspicuous, the upper (cross-pollinated by insects) larger, with pale-blue open bell-shaped corollas. Calyx-lobes ovate, leaf-like.—Plentiful below 5000 ft. alt.

4. GITHÓPSIS.

1. **G. specularioìdes** Nutt. A small annual (2 to 10 in.), glabrous or nearly so, with rigid branches and showy blue strictly erect flowers. Leaves linear, toothed, sessile, about ¼ in. long. Calyx-lobes rigid, linear, over 1¼ in. long. Corolla bell-shaped, 5-lobed, ½ to ¾ in. long.—Foothills, perhaps not in our district.

LOBELIACEAE. Lobelia Family.

Low herbs with alternate leaves, no stipules, and irregular flowers. Calyx with 5 distinct lobes or teeth, its tube adherent to the ovary. Corolla with 2 lobes in the upper lip and 3

in the lower. Stamens 5, united either by their filaments or anthers. Ovary 2-celled, with a single style, the stigma globose and girt with a ring of hairs.

Anthers distinct but their filaments united above the middle; flowers showy .....1. DOWNINGIA.
Anthers united into a curved tube; flowers small.....2. NEMACLADUS.

1. DOWNÍNGIA.

1. **D. montàna** Greene. A low branching plant of muddy places, 6 in. or so high, leafy and glabrous throughout. Leaves linear, ¼ to ½ in. long, the upper ones much exceeded by the pedicel-like calyx. Calyx-lobes linear, as long as corolla. Upper lip of corolla of 2 minute lavender lobes; lower lip of 3 broad spreading lobes, white, with a broad lavender or blue border.—Hog Ranch Road.

2. NEMÁCLADUS.

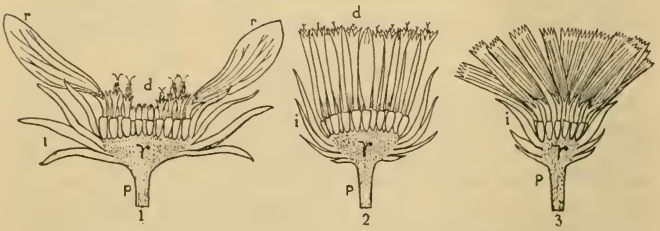
1. **N. ramosíssimus** var. **montànus** Gray. A delicate diffusely branched annual with numerous minute flowers on long spreading pedicels. Basal leaves oblanceolate, toothed, those of the branches minute (rarely ¼ in. long) and entire. Flowers about ⅛ in. long; corolla-lobes unequal, white, with a reddish-brown blotch near the base of each and a tint of yellow below each blotch.—Wawona to Hetch Hetchy Valley, not common.

COMPOSITAE. COMPOSITE, OR SUNFLOWER FAMILY.

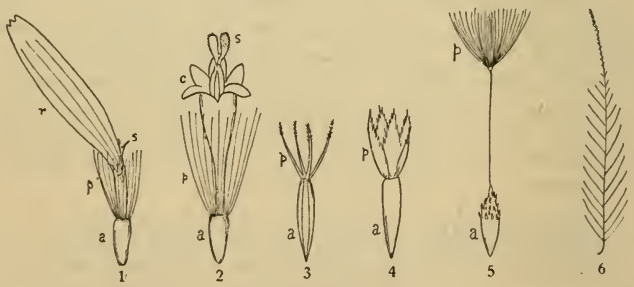
(Including Asteraceae, Ambrosiaceae, Carduaceae, and Cichoriaceae.)

Herbs and shrubs, or trees in some foreign genera, ours all with flowers in heads, each head borne on the enlarged summit of the common peduncle (*receptacle*) and surrounded by a common *involucre* of separate bracts, the receptacle sometimes also bearing scale-like or bristle-like bracts among the flowers. Corollas either *tubular* and 5-toothed (or 5-lobed) or the limb strap-shaped and toothed at apex. When both kinds are present (e. g., the true sunflowers), the flowers with the strap-shaped corollas occupy the margin of the head and are called *ray-flowers;* the flowers with tubular corollas occupy the center and are called *disk-flowers;* such heads are said to be *radiate.* Heads without strap-shaped corollas are *discoid* (e. g., Everlasting). All of the flowers have strap-shaped corollas in the Chicory Tribe. Calyx-tube united with the ovary and often continued above it in the form of a *pappus,* which may consist of awns, hairs, bristles, or scales, or it may be reduced to a mere ring.

Stamens 5, on the corolla-tube, usually themselves united into an inner tube. Style divided into 2 branches. Ovary 1-celled, 1-ovuled, maturing into an *akene,* which resembles a seed and is crowned by the pappus when that is present.



Types of Heads in Compositae.—1. Head of Sunflower, cut vertically (radiate). 2. Head of Cudweed, cut vertically (discoid). 3. Head as in the Chicory Tribe (flowers all strap-shaped).—r, ray; d, disk; i, involucre of bracts; **r**, receptacle; p, peduncle.



Details of Flowers in Compositae.—1. Ray-flower of an Aster, with pappus of bristles. 2. Disk-flower from the same head. 3. Akene of Rigiopappus, with pappus of flattened awns. 4. Akene of Chaenactis, with pappus of scales. 5. Akene of Dandelion, with beak and pappus of bristles. 6. A single feathery pappus-bristle of Thistle.—a, akene; c, corolla; p, pappus; r, ray; s, stigma.

Artificial Key to the Genera of Compositae.

To use this key, first determine the series (I., II., or III.) to which the plant belongs. Then turn to the key for that series and run the plant through in the ordinary manner. A synopsis of the tribes will be found at end of key.

I. Flowers of two sorts, the outer series with rays, the central ones tubular and toothed. Series I. Radiate Compositae, key on p. 241.

II. Flowers all alike, tubular and toothed; none with rays. Series II. Discoid Compositae, key on p. 242.

III. Flowers all with strap-shaped corolla, therefore all resembling ray-flowers, there being no tubular and regularly toothed corollas. Series III. Chicory Tribe, key on p. 243.

I. Radiate Compositae.

(Heads with rays.)

A. Rays blue, purple, or white.

Leaves finely cut into many small lobes; rays white.
  Heads solitary; annual ..... 33. Anthemis, p. 261
  Heads clustered; perennial ..... 34. Achillaea, p. 261
Leaves entire or merely toothed or with very few lobes, rays variously colored.
  Pappus of 3 to 12 scales or awns.
    Bracts very acute.
      Heads small; rays white..... 29. Rigiopappus, p. 259
      Heads ¾ in. high; rays saffron-color.... *Hulsea heterochroma*, p. 260
    Bracts obtuse, enfolding the outer akenes... *Hemizonia douglasii*, p. 258
  Pappus of numerous bristles.
    Plant white-woolly ..... 10. Corethrogyne, p. 247
    Plant glabrous or hairy, not woolly.
      Disk-flowers and ray-flowers both white... 11. Sericocarpus, p. 248
      Disk-flowers yellow.
        Bracts of the involucre in 2 or more series, mostly unequal; style-appendages acute ..... 12. Aster, p. 248
        Bracts in 1 or 2 series, mostly equal; style-appendages obtuse ..... 13. Erigeron, p. 250

B. Rays yellow or orange-color.

Pappus of numerous slender bristles.
  Bracts of the involucre unequal, in 2 or more rows, the outer often shorter; pappus rigid.
    Heads many, small (scarcely ⅜ in. high, including rays) ..... 4. Solidago, p. 245
    Heads few, larger.
      Involucre-bracts very unequal, of 4 or more lengths, the outer regularly shorter.
        Akenes very pubescent..... 3. Chrysopis, p. 245
        Akenes glabrous ..... 8. Hazardia, p. 247
      Involucre-bracts of nearly equal length... 5. Haplopappus, p. 246
  Bracts of the involucre equal (often a few minute outer ones at base); pappus soft, hair-like.
    Leaves opposite ..... 38. Arnica, p. 263
    Leaves alternate ..... 39. Senecio, p. 264
Pappus of 2 to 12 scales or awns, or wanting.
  Bracts of the involucre each enveloping or wrapped about an outer akene, so that on pulling off a bract the akene comes away with it.
    Outer akenes and their bracts with narrow backs ..... 24. Madia, p. 257
    Outer akenes and their bracts with broad rounded backs.
      Plant not 6 in. high..... 25. Hemizonella, p. 258
      Plant 1 ft. or more high..... 26. Hemizonia, p. 258

Bracts of the involucre not enfolding the outer akenes but merely standing next to them.
Disk-flowers intermingled with conspicuous scales or bracts.
Rays yellow, disk purplish or black.
Disk conical, 1 or 2 in. high.....19. RUDBECKIA, p. 255
Disk flat .....22. HELIANTHUS, p. 256
Rays and disk both yellow.
Pappus present, of awns or scales (usually falling away from ripe akenes)...21. WYETHIA, p. 256
Pappus none or very obscure.
Leaves broad; akenes 4-sided.....20. BALSAMORHIZA, p. 255
Leaves narrow; akenes flat.....23. HELIANTHELLA, p. 257
Disk-flowers without intervening scales or bracts (i. e., receptacle naked).
Pappus none; leaves all opposite.....27. WHITNEYA, p. 259
Pappus present; upper leaves alternate.
Leaves very woolly, 1½ in. or less long..28. ERIOPHYLLUM, p. 259
Leaves scarcely woolly, usually much longer.
Glandular; leaves toothed.....31. HULSEA, p. 260
Not glandular; leaves entire.....32. HELENIUM, p. 260

II. DISCOID COMPOSITAE.

(Heads without rays.)

A. Flower-heads yellow.

Plant shrubby, the stems being decidedly woody.
Pappus none .....36. ARTEMISIA, p. 261
Pappus present, of numerous bristles.
Leaves (roundish) and stems green, resinous. 6. ERICAMERIA, p. 246
Leaves white, very narrow; tall shrub..... 7. CHRYSOTHAMNUS, p. 247
Leaves green; stems white-woolly; low shrub. *Haplopappus discoideus,* p. 246

Plant not shrubby, the stems herbaceous.
Pappus none .....36. ARTEMISIA, p. 261
Pappus of 4 or 5 flat scales.....*Chaenactis glabriuscula,* p. 260
Pappus of numerous slender bristles.
Bracts of the involucre unequal.
Leaves broadly lanceolate..... 3. CHRYSOPSIS, p. 245
Leaves linear .....*Erigeron inornatus,* p. 251
Bracts of the involucre equal.
Pappus-bristles feathery .....37. RAILLARDELLA, p. 263
Pappus-bristles simple, not feathery.
Leaves opposite, heart-shaped.....*Arnica discoidea,* p. 263
Leaves alternate.
Pappus soft and white.....39. SENECIO, p. 264
Pappus rigid .....13. ERIGERON, p. 250

B. Flower-heads not yellow.

Plant not woolly in any part.
Leaves merely toothed; perennials.
Involucre not ¼ in. high; akenes 5-angled.. 1. EUPATORIUM, p. 244
Involucre exceeding ¼ in.; akenes 10-nerved. 2. BRICKELLIA, p. 245
Leaves finely lobed; annual.....35. MATRICARIA, p. 261

Plant in some part very woolly, at least when young.
Leaves spiny-toothed; thistles .....40. CARDUUS, p. 267
Leaves not spiny-toothed.
Pappus of numerous slender bristles.
Central flowers lacking either stamens or pistils.
No leaves over ⅛ in. wide.....15. ANTENNARIA, p. 253
Lower leaves ¼ in. or more wide.....16. ANAPHALIS, p. 254
Central flowers with both stamens and pistils.
Heads white or greenish yellow, nearly sessile .....17. GNAPHALIUM, p. 254
Heads lilac, on slender peduncles..... 9. LESSINGIA, p. 247
Pappus of flat white scales (leaves lobed)...30. CHAENACTIS, p. 260
Pappus none.
Leaves triangular, 2 to 5 in. broad.....18. ADENOCAULON, p. 255
Leaves narrower.
Depressed annual, 1 in. high.....14. PSILOCARPHUS, p. 253
Tall perennials .....36. ARTEMISIA, p. 261

III. CHICORY TRIBE.

(Rays all strap-shaped.)

a. Pappus none or very obscure.....41. PHALACROSERIS, p. 267
b. Pappus of scales or feathery from a scale-like base; flowers yellow.....42. MICROSERIS, p. 267
c. Pappus feathery (the bristles branched); flowers not yellow .....43. STEPHANOMERIA, p. 268
d. Pappus of simple bristles or hairs.
Akenes not flattened.
Heads solitary on unbranched stalks from a leafy base.
Akenes sharp-toothed .....45. TARAXACUM, p. 269
Akenes not toothed .....48. TROXIMON, p. 269
Heads several to numerous; stems branched above.
Annual; white or pink-flowered; pappus falling away .....44. MALACOTHRIX, p. 268
Perennials (except one yellow-flowered annual); pappus persistent.
Akenes narrowed above; leaves deeply lobed .....49. CREPIS, p. 270
Akenes broad at summit; leaves entire or toothed .....50. HIERACEUM, p. 271
Akenes flat; leafy-stemmed plants.
Flowers yellow; akenes not narrowed above to a beak.....46. SONCHUS, p. 269
Flowers bluish; akenes short-beaked.....47. LACTUCA, p. 269

NATURAL TRIBES OF THE COMPOSITAE.

The members of this large family may be grouped, so far as our species are concerned, into ten natural divisions, or tribes. This grouping, however, is based upon technical characters often too minute for the use of the amateur and is here inserted only as a guide for the professional botanist. Others will find the foregoing artificial key more useful.

1. Eupatory Tribe (*Eupatorieae*). Heads discoid; the flowers all alike, perfect, never yellow. Anthers without tails at base. Style-branches club-shaped, obtuse. Includes our genera nos. 1 and 2.

2. Aster Tribe (*Astereae*). Heads either discoid or radiate. Disk-flowers commonly yellow, the rays when present either the same or different color. Anthers without tails at base. Style-branches flattened and with a distinct terminal appendage. Leaves alternate. Receptacle naked in our species. Includes our genera nos. 3 to 13.

3. Everlasting Tribe (*Inuleae*). Heads discoid and small (in ours). Anthers notched at base, the lobes continued into tails. Style-branches obtuse, without appendages. Pappus hair-like or none. Includes our genera nos. 14, 15, 16, 17, and 18.

4. Sunflower Tribe (*Heliantheae*). Heads either discoid or radiate. Bracts of the involucre merely subtending the outer akenes, not enfolding them; bracts of the disk present as scales or bristles among the flowers. Anthers not tailed. Style-branches truncate or hairy-appendaged. Pappus never hair-like nor of bristles, sometimes none. Leaves mostly opposite or basal. Includes our genera nos. 19, 20, 21, 22, and 23.

5. Tarweed Tribe (*Madieae*). Heads nearly always radiate. Bracts of the involucre each embracing or enfolding an akene; bracts of the disk often in a single circle between the ray and disk-flowers. Leaves opposite or alternate. Otherwise as in Tribe 4. Includes our genera nos. 24, 25, and 26.

6. Sneezeweed Tribe (*Helenieae*). Characters nearly as in Tribe 4, but the disk without bracts among its flowers and leaves often alternate. Includes our genera nos. 27 to 32.

7. Mayweed Tribe (*Anthemideae*). Distinguished from tribes 4, 5, and 6 by the more or less dry and papery or scaly bracts of the involucre, which are imbricated. Akenes small, with pappus short and crown-like or none. Herbage usually aromatic. Includes our genera nos. 33, 34, 35, and 36.

8. Groundsel Tribe (*Senecioneae*). Heads discoid or radiate, all the flowers usually yellow. Bracts of the involucre nearly equal, not dry or scale-like. Disk without bracts. Anthers without tails. Style-branches truncate. Pappus of soft or rigid bristles. Includes our genera nos. 37, 38, and 39.

9. Thistle Tribe (*Cynareae*). Heads discoid. Involucre imbricated. Disk bristly. Anthers long-tailed at base. Style-branches obtuse. Pappus mostly of fine bristles. Leaves alternate. Includes our genus no. 40.

10. Chicory Tribe (*Cichorieae*). Corollas all strap-shaped. Anthers not tailed. Herbage with milky juice. Leaves alternate or basal. Includes our genera nos. 41 to 50. Key on p. 243.

1. EUPATÒRIUM.

1. **E. occidentàle** Hook. Stems somewhat woody, 1 to 3 ft. long. Leaves partly alternate, ovate, few-toothed, 1 to 2 in. long, short-petioled. Heads pinkish, in small clusters on leafy branchlets, the involucre very short. Akenes 5-angled; pappus of many rough hair-like bristles.—Yosemite Valley to timber-line. There are some splendid clumps of this plant at the foot of the upper Yosemite Fall.

2. BRICKÉLLIA.

Herbs and shrubs with veiny leaves. Involucre narrow, its bracts thin, the outer successively shorter, all with parallel nerves. Flowers whitish. Akenes with 10 longitudinal lines. (*Coleosanthus.*)

1. **B. califórnica** Gray. A woody-stemmed bush, 2 to 4 ft. high. Leaves alternate, ovate, toothed, ¾ to 1½ in. long, short-petioled. Heads 10 to 20-flowered, whitish, in a leafy panicle. Pappus of rough hair-like bristles, becoming brown. —In stony soil at low altitudes.

2. **B. grandiflòra** Nutt. Stems simple below, scarcely woody, 1 to 3 ft. high. Leaves mostly opposite, ovate, toothed, 1½ to 3 in. long, petioled. Heads whitish, about 40-flowered, ½ in. high, in leafless panicles. Pappus-bristles white.—Of wide distribution; found at Mirror Lake and at Lake Tahoe.

B. LINIFOLIA Eat., a low, brittle-stemmed desert shrub, with narrow and entire, sessile leaves, has been reported from Yosemite Valley, but this was undoubtedly an error, perhaps due to the mixing of labels.

3. CHRYSÓPSIS.

Perennial herbs with alternate entire leaves and medium-sized heads of yellow flowers. Involucre of thin narrow regularly imbricated bracts. Akenes narrowed below, very hairy; pappus of numerous brownish bristles (and also some short outer scales in the first species).

1. **C. villòsa** Nutt. A leafy perennial, gray with a dense pubescence, ½ to 1½ ft. high. Leaves lanceolate, entire, ¾ to 1½ in. long, sessile. Heads ½ in. high, including the showy yellow rays.—A widely distributed species found above Pleasant Valley by Mr. Fred M. Reed.

2. **C. bréweri** Gray. A leafy rough-pubescent perennial herb, 2 to 4 ft. high. Leaves ovate-lanceolate, acute, entire, 1 to 1¾ in. long, sessile. Heads without rays, ½ in. high, the linear-acute bracts much shorter.—In pine forests and on rocky ledges at 4000 to 9000 ft. alt.

4. SOLIDÀGO. GOLDENROD.

Perennial herbs with alternate leaves and many small heads of yellow flowers. Involucral bracts imbricated, thin, narrow, without green tips. Akenes cylindric, 5 to 12-nerved; pappus of numerous slender bristles.

1. **S. multiràdiata** var. **scopulòrum** Gray. Stems ¼ to 1 ft. high, the terminal flower-cluster (of 5 to 20 heads) ½ to 2 in. long. Leaves oblanceolate to lanceolate, mostly entire. Heads ⅜ in. high, including the yellow rays.—Common in high meadows.

2. **S. elongàta** Nutt. Stems 1 to 4 ft. high, very leafy to the top, the dense pyramidal panicle (of very many heads) 3 to 7 in. long. Leaves lanceolate, acute, sharply toothed. Heads (including the yellow rays) scarcely ¼ in. long.—Common in the Yosemite and other meadows.

S. CALIFORNICA var. NEVADENSIS Gray, if found, may be known by its very harsh, obtuse leaves. It grows in dry soil north and east of us.

5. HAPLOPÁPPUS.

Herbs and low shrubs. Heads hemispheric, in terminal clusters or solitary, the involucre in ours scarcely imbricated, the outer bracts leaf-like. Disk yellow. Pappus of numerous dull-white or reddish bristles. (*Aplopappus. Hoorebekia.*)

1. **H. apargioìdes** Gray. A pale thick-rooted perennial herb, 1 ft. or less high, the numerous reddish leafy stems bearing few terminal heads, loosely woolly or nearly glabrous. Leaves narrow, acute, sharply toothed, 1 to 3 in. long, the lower petioled, upper ones sessile. Heads ½ in. high, with about 20 yellow rays. Akenes glabrous.—In meadows at high altitudes.

2. **H. suffruticòsus** Gray. A low shrub with glandular but not woolly stems. Leaves glandular, nearly linear, entire, ½ to 1 in. long. Heads over ½ in. high, with showy yellow rays. Akenes pubescent. (*Macronema suffruticosa* Nutt.)—Gravelly soil along the Sierran crest.

3. **H. discoídeus** Gray. A low shrub, the branches white with matted wool. Leaves green and glandular, spatulate, entire, ½ to 1 in. long. Heads fully ½ in. high, without rays. Akenes pubescent. (*H. macronema* Gray. *Macronema discoidea* Nutt.)—High ridges in loose soil; summit of Clouds Rest. Often confused with *Chrysothamnus bolanderi,* but with broader heads.

6. ERICAMÈRIA.

1. **E. cuneàta** McCl. A low leafy shrub, glabrous but resinous. Leaves thick, alternate, obovate, obtuse, entire, only ⅛ to ½ in. long. Heads small, mostly in compact clusters, without rays. Akenes silky; pappus-bristles copious, brown.—In cracks of rocks, blossoming in autumn.

7. CHRYSOTHÁMNUS.

1. **C. nauseòsus** var. **gravèolens** Piper. RABBIT-BRUSH. A white-woolly shrub, 2 to 5 ft. high. Leaves alternate, linear, 1-nerved, entire, ¾ to 2 in. long, sessile. Heads numerous, small, without rays, the narrow involucre of yellowish imbricated bracts. Akenes cylindric, pubescent; pappus of soft hairs, sordid.—A shrub of the desert borders, extending to Yosemite Valley, Crane Creek, etc., in warm, sandy soil.

C. VISCIDIFLORUS var TORTIFOLIUS Hall, may reach our eastern borders. It is a low, rounded shrub, not woolly, the heads in rounded, terminal clusters, the numerous green leaves wavy-twisted.

C. BOLANDERI Greene, is a low, narrow-leaved shrub of the eastern slope. Its stems are densely white-woolly, the narrow, discoid heads in short, leafy racemes, and the involucral bracts drawn to very slender tips.

8. HAZÁRDIA.

1. **H. whítneyi** Greene. A perennial herb, 1 or 2 ft. high, leafy to the top. Leaves harsh, alternate, oblong, rigidly toothed, 1 or 2 in. long, closely sessile. Heads few, fully ½ in. high, the involucre of acute overlapping bracts, the short yellow rays and yellow disk both turning purplish. Akenes glabrous; pappus reddish.—Almost throughout our district but nowhere common.

9. LESSÍNGIA.

1. **L. leptóclada** Gray. A slender erect annual, 6 to 24 in. high. Leaves woolly, alternate, narrowly oblong, the lower ones tapering to the base, entire or few-toothed, 1½ in. or less long. Heads lilac, scarcely ½ in. long, mostly solitary on nearly naked peduncles, the green-tipped bracts closely imbricated. Flowers nearly alike. Pappus of rough bristles, becoming reddish.—Abundant in low valleys. The small form with only 3 to 5 flowers in a head is var. *microcephala* Gray.

10. CORETHRÓGYNE.

1. **C. filaginifòlia** Nutt. Stems several, white-woolly, 1½ to 3 ft. high, from a perennial base. Leaves densely woolly, alternate, oblanceolate, obtuse, mostly entire, 1 to 2½ in. long. Heads ½ in. high, few, in a loose panicle, the erect bracts closely imbricated. Rays purple; disk yellow. Akenes pubescent; disk-pappus of rigid reddish bristles.—Rocky ledges and walls below 5000 ft. alt., blooming late.

11. SERICOCÁRPUS.

1. **S. rígidus** Lindl. Stems erect, 2 or 3 ft. high, perennial, leafy throughout. Leaves rough, alternate, oblong, entire (often wavy), 1 or 2 in. long. Heads ⅜ in. high, in close terminal clusters, the bracts closely imbricated and with broad green tips. Rays white, few, short. Akenes hairy; pappus white.—A species of the Tahoe and more northern districts but also found near Hetch Hetchy and reported from Yosemite Valley.

12. ÁSTER. Aster.

Ours all perennial herbs with alternate or basal leaves and showy flowers. Involucre top-shaped to hemispheric, the bracts imbricated in several ranks. Rays in 1 row, never yellow; disk-flowers yellow. Style-branches flattened, with acute appendages. Akenes flattened; pappus copious, of hair-like bristles.—A genus not well separated from Erigeron.

Leaves all basal, entire, the nearly naked stem bearing but 1 head ..... 1. *A. andersonii.*

Leaves scattered, the lower toothed; outer bracts recurved at tip ..... 6. *A. canescens.*

Leaves scattered, entire; heads several to numerous; bracts nearly straight.
- Herbage glandular; leaves ½ to 2 in. wide..... 2. *A. integrifolius.*
- Herbage not glandular; leaves narrower.
  - Bracts of the involucre all loose and similar.
    - Plants slender, mostly 1 to 2 ft. high..... 3. *A. yosemitanus.*
    - Plants rigid, mostly under 14 in. high..... 4. *A. fremontii.*
  - Bracts closely imbricated, the outer successively shorter ..... 5. *A. occidentalis.*

1. **A. andersònii** Gray. Anderson Aster. Stem 6 to 18 in. high, bearing a few reduced leaves. Basal leaves linear, entire, 2 to 7 in. long. Head solitary, terminal, 1 in. across; bracts nearly equal, acute, reddish-margined. Rays purple.

In the Eagle Peak Meadows and in similar places above the Yellow Pine Belt we find this Aster raising its beautiful, purple heads above the grasses and other low plants. Its own leaves imitate those of grass in appearance but are all borne near the ground, the solitary head being on a nearly naked stalk.

2. **A. integrifòlius** Nutt. A coarse rigid plant, the reddish leafy stems bearing racemes or panicles of large heads. Leaves entire, large (2 to 10 in. long, ½ to 2 in. wide), the lower petioled, upper sessile and clasping. Heads nearly 1 in. across; bracts green, linear. Rays 15 to 25, bluish purple.

—Chilnualna Creek, Yosemite Valley (and Hetch Hetchy ?) to Tuolumne Meadows.

3. **A. yosemitànus** Greene. YOSEMITE ASTER. Stems very slender and leafy up to the numerous heads, 1 to 2 ft. high (sometimes dwarfed). Leaves ascending, entire, linear, acute, 2 to 4 in. long, closely sessile. Heads in leafy panicles, ½ to ¾ in. wide; bracts nearly equal, with flat green slender-pointed tips. Rays violet.

"Summit to Yosemite Valley" was the range first given for this Aster, and the phrase still nearly expresses our knowledge of its distribution. The summit referred to is above Donner Lake. It is also rather common around the south end of Lake Tahoe. In the Yosemite Valley we find it growing in the drier meadows, where it is not rare in half-shady places. The stems are leafy, especially toward the top, the soft leaves standing nearly erect.

A. adscendens Lindl., from which our species was segregated, is a comparatively stiff, rigid plant, with thick leaves and firmer bracts decidedly imbricated. It belongs to more northern and eastern districts, probably not occurring in the Yosemite National Park.

4. **A. fremóntii** Gray. Stems less slender than in no. 3, rigid and stiffly erect, seldom over 14 in. high. Leaves entire, the lower oblong or oblanceolate, 1 to 3 in. long, sessile. Heads in small panicles with reduced leaves; bracts loose, nearly equal, acute but not drawn to fine tips. Rays violet.—Occurs with *A. yosemitanus* but also ranges to higher altitudes. First collected in the Rocky Mts.

5. **A. occidentàlis** Nutt. Like no. 4 and with similarly stiff erect and usually short stems but the leaves narrower, even the lower only narrowly oblong; bracts plainly imbricated, of 2 or 3 lengths, merely acute.—Yosemite Valley to Lake Tahoe and Washington.

6. **A. canéscens** Pursh. Stems 1 or 2 ft. high, erect, finely pubescent, also glandular above. Leaves linear or oblanceolate, the lower toothed and 1 or 2 in. long. Heads ½ to ¾ in. wide, in panicles with linear leaves; bracts very unequal, the outer ones shorter and with spreading or recurved tips. Rays few, bluish purple.—A widely distributed Aster, found on Rancheria Mt.

A. FRONDOSUS T. & G., is a small species with obtuse, leaf-like involucral bracts, very short rays, and an abundant, soft pappus. It may be expected along our eastern borders and toward Lake Tahoe.

13. ERÍGERON. Fleabane.

Technically distinguished from Aster only by the triangular obtuse style-appendages, but usually also differs as follows: involucral bracts narrow, little imbricated, without green tips; rays very narrow, more numerous, in several rows; pappus more scanty and fragile.

Leaves clustered at base; heads solitary on nearly naked peduncles.
  Stems 6 in. or less high (rarely 9 in.); leaves short-hairy.
    Leaves parted ..... 1. *E. compositus.*
    Leaves entire.
      Leaves spatulate ..... 2. *E. ursinus.*
      Leaves linear ..... 3. *E. nevadensis.*
  Stems 9 to 24 in. high; leaves nearly glabrous..... 4. *E. salsuginosus.*
Leaves numerous along the flowering stems.
  Rays blue or violet (rarely whitish in no. 10), showy.
    Pappus a single series of bristles.
      Leaves smooth, long..... 4. *E. salsuginosus.*
      Leaves rough, short.
        Plant tall; leaves ½ to 1¼ in. long..... 5. *E. breweri.*
        Plant low, weak; leaves shorter..... 6. *E. elmeri.*
    Pappus double, the outer series very short.
      Perennial ..... 9. *E. concinnus.*
      Annual .....10. *E. divergens.*
  Rays white or pink or entirely wanting.
    Heads entirely rayless.
      Stems low, gray-hairy..... 7. *E. miser.*
      Stems tall, nearly glabrous..... 8. *E. inornatus.*
    Heads with many showy white rays.
      Heads 1 to 4, large.....11. *E. coulteri.*
      Heads many, small .....12. *E. ramosus.*
    Heads with many small rays.
      Low plant; heads ½ in. across.....13. *E. armeriaefolius.*
      Tall plant; heads not ¼ in. across.....14. *E. canadensis.*

1. **E. compósitus** Pursh. Leaves crowded on the short thick perennial stalks, forming dense mats, the blade short, mostly with 1 to 3 lobes at the enlarged summit. Heads ½ to 1 in. across, solitary on the nearly naked erect peduncles which spring from the leafy mat and are only ½ to 6 in. high. Rays 40 to 60, light-purple or violet (entirely wanting in the otherwise identical var. *discoidea* Gray).

This compact little perennial, immediately known by its peculiar leaves cut only at summit, is at home among the granite peaks of our highest mountains, often growing near banks of perpetual snow. It is not found until one has ascended nearly to timber-line, when its purplish flowers may be looked for in the crevices of rocks and in decomposed granite. Such situations are plentiful in our Alpine Zone, a

TIMBER-LINE IN THE HIGH SIERRA NEVADA

Near the summits of our higher mountains the trees are stunted, often much gnarled, and the branches tough and cord-like. Above timber-line only low, deep-rooted shrubs, and perennial herbs may be found. This treeless belt is technically known as the Arctic-Alpine Zone. Here grow true willows, producing the usual catkins, yet with stems rising only two or three inches above the ground. The little Alpine Phlox, with its compactly arranged leaves, nestles among the rocks. Here and there are spread dark-green mats of Cassiope, enlivened by dainty, bell-like flowers, which are a delight to every mountaineer.

region of great attraction for the botanist and mountain climber, as is indicated by the illustration. The closely huddled leaves and low stature of this species are doubtless the result of insufficient heat during the growing period, and especially at night, when plants ordinarily make their greatest growth. This condensed habit protects many an Alpine plant from the sudden changes in temperature to which it is subjected.

2. **E. ursìnus** Eat. Stems several from the stout rootstocks, 9 in. or less high, with a few reduced leaves and a solitary terminal head. Leaves clustered at base, spatulate, pubescent. Head naked, 1 in. across; involucre glandular and long-hairy. Rays about 50, purple.—Near and above timberline on Clouds Rest, Mt. Dana, Mt. Lyell, Mt. Conness, etc.

3. **E. nevadénsis** var. **pygmaèus** Gray. Similar to *E. ursinus* but leaves gray-pubescent and very narrow (linear), often much crowded, the smaller head on a stem only ½ to 3 in. high.—Crest of the Sierra Nevada from Mt. Whitney to Tahoe. Occurs in Bloody Cañon and at 12,200 ft. on Mt. Dana. Specimens from Rancheria Mt., 5 in. high, the leaves 2 in. long, approach typical *E. nevadensis*.

4. **E. salsuginòsus** Gray. Stems 9 in. to 2 ft. high, the leaves much smaller toward the solitary or few long-peduncled heads. Lower leaves oblanceolate, obtuse, 3 to 8 in. long, glabrous except the margins. Heads 1¼ in. or more across. Rays violet, ½ in. long, about 50 to 70.

This is the most showy and abundant Erigeron in the higher mountains, where it grows in moist places along streams and around lakes and meadows. A small form with very narrow leaves is the var. *angustifolius* Gray.

5. **E. bréweri** Gray. Stems brittle, erect, 6 to 18 in. high, from creeping rootstocks, bearing solitary or few heads on curved peduncles. Leaves linear, or narrowly oblanceolate, ½ to 1¼ in. long, rough with short stiff spreading hairs. Heads scarcely 1 in. across; involucre nearly glabrous, outer bracts successively shorter. Rays only 10 to 25, violet.—Yosemite Valley, Cherry Creek, etc., to Tuolumne Meadows; common.

6. **E. élmeri** Greene. Stems many, weak and spreading, 3 to 9 in. long, leafy, bearing solitary or few heads. Leaves linear, ¾ in. or less long, green, rough-hairy. Heads ¾ in. across, the bracts unequal. Rays 10 to 30, violet. Pappus indistinctly if at all double.

This beautiful and graceful Erigeron was first described

from specimens gathered in the "Grand Cañon of the Tuolumne River, California, in the summer of 1890, by Messrs. Victor Chesnut and Elmer Drew" and was named in honor of the latter. It is now found to be rather common on rocky ledges around Yosemite Valley and occurs as far southward as Mineral King, Tulare Co.

7. **E. mìser** Gray. Stems loose, spreading, 3 to 9 in. high. Leaves spatulate, ¾ in. or less long, densely gray-pubescent. Heads ½ in. across, without rays, the involucre minutely glandular.—Donner Lake, perhaps extending to our northern borders.

8. **E. inornàtus** Gray. Stems stiffly erect, 12 to 24 in. high, bearing 5 to 30 peduncled heads in a terminal cluster. Leaves broadly linear, 1 or 2 in. long, green, nearly glabrous. Heads ½ in. across, with unequal bracts and no rays.—Tioga Road and elsewhere in the Yellow Pine Belt.

9. **E. concínnus** T. & G. Stems numerous, erect, 12 in. or less high. Leaves linear-spatulate, acute, ¾ to 1½ in. long, gray with long spreading hairs. Heads ¾ in. across. Rays very numerous, violet or blue. Pappus of the usual bristles and an additional outer series of short narrow scales.—Desert borders, reaching Bloody Cañon. There is a var. *aphanactis* Gray, without rays.

10. **E. divérgens** T. & G. Stems many, from an annual taproot, 6 to 18 in. high, bearing numerous heads. Leaves linear or spatulate, ½ to 1 in. long, pale, rough-hairy. Heads about ¾ in. across; involucre white-hairy. Rays very numerous, narrow, violet or whitish. Outer pappus of short slender scales.—Hetch Hetchy Valley.

11. **E. coùlteri** Porter. Stems few, erect, 9 to 18 in. high, from perennial rootstocks, bearing 1 to 4 heads. Lower leaves oblanceolate, 2 to 4 in. long, often toothed; middle ones oblong or lanceolate, with clasping base; all thin, green, and obscurely pubescent. Heads 1¼ in. across. Rays 50 to 80, white, ½ in. long. (*E. frondosus* Greene.)

The pure-white rays of this Erigeron, surrounding the yellow disk, add a cheerful tone to many a shaded stream bank and sub-alpine meadow. The bright-green foliage is softer and more pleasing than in most other species. It ranges throughout the Sierra Nevada from about 6000 to 10,000 ft. alt.

12. **E. ramòsus** B.S.P. Daisy Fleabane. Stems erect, 1½ to 3 ft. high, from an annual root, bearing usually numerous heads. Leaves spatulate or oblong, mostly entire, rough-hairy; the lower 2 to 4 in. long (including the petiole); upper

lanceolate, sessile. Heads ¾ to 1 in. across. Rays over 100, white, scarcely ¼ in. long. Pappus double.—Occurs on low, moist ground, but more common in the eastern states. *E. philadelphicus* L., is a similar species of the foothills; flowers larger, pink; pappus simple.

13. **E. armeriaefòlius** Turcz. Stems erect, 3 to 15 in. high, from a biennial root. Leaves elongated, linear, 1 to 5 in. long, pale, glabrous or with a few long loose hairs. Heads ½ in. across; bracts mostly equal. Rays whitish, abundant but very short and thread-like.—Tuolumne and other high meadows. Perhaps also in Yosemite Valley.

14. **E. canadénsis** L. Horseweed. Stem simple, erect, 2 to 6 ft. high, from an annual root. Leaves linear to lanceolate, 2 to 3 in. long, green, glabrous or with a few hairs. Heads scarcely ¼ in. across, with unequal bracts and many minute white rays but apparently discoid.—A common weed in California, rarely reaching 4000 ft. alt. in the mountains.

14. PSILOCÁRPHUS.

1. **P. tenéllus** Nutt. A small forked woolly annual, only 1 in. or less high. Leaves opposite, narrow, ¼ to ½ in. long, the upper ones exceeding the sessile heads. Outer flowers enclosed each in a loose sac-like bract; inner flowers without bracts. Pappus none.—Yosemite Falls to the foothills.

Filago californica Nutt., may appear along our lower borders. It is a slender, erect, woolly annual, only the inner flowers of each head pappus-bearing.

15. ANTENNÁRIA.

Perennial woolly herbs with alternate sessile entire leaves (chiefly basal). Heads small, without rays, the bracts papery and imbricated. Pistil-bearing and stamen-bearing flowers borne on separate plants, the former with pappus-bristles united at base, the latter with pappus-bristles thickened at tip.

1. **A. argentèa** Benth. A leafy-stemmed perennial, 9 to 18 in. high. Lower leaves spatulate, 1 or 2 in. long, ¼ to ½ in. wide, upper ones narrower. Heads ¼ in. high, numerous, in rounded terminal clusters, the bracts greenish white.—In open forests at low altitudes; common from Wawona to Hetch Hetchy Valley.

2. **A. mèdia** Greene. A matted perennial, 2 or 3 in. high. Leaves spatulate, acute, ¼ to ½ in. long. Heads in small dense terminal clusters, the bracts green but with lighter tips. —Abundant near timber-line and above.

3. **A. rósea** Greene. Larger than no. 2, the flowering stems 4 to 12 in. high, the leaves ½ to 1½ in. long, less than ⅛ in. wide. Bracts white, or more commonly bright rose.—Forms white mats at many places up to about 9000 ft. alt. Var. *angustifolia* Nels., described from "Yosemite Valley," is a low plant with small leaves and close heads. Var. *imbricata* Nels., is a meadow form with broad, obtuse leaves and more imbricated bracts.

16. ANÁPHALIS. Everlasting.

1. **A. margaritàcea** B. & H. Perennial, 1 or 2 ft. high, upper surface of leaves becoming green, otherwise permanently woolly. Leaves alternate, numerous, lanceolate, 2 to 2½ in. long. Heads in rounded terminal clusters, the bracts pearly white. Pappus of bristles.—Common in pine forests. Leaves broader and firmer than in our Gnaphaliums and the bracts whiter; technically distinguished from that genus only by the sterility of the few central flowers in the female plant.

17. GNAPHÀLIUM. Cudweed. Everlasting.

Woolly herbs with alternate sessile entire leaves. Heads small, pale, without rays, their bracts papery and imbricated. Outer flowers pistillate, central flowers perfect. Pappus of bristles.

1. **G. palústre** Nutt. Lowland Cudweed. Annual, 1 to 6 in. high, loosely woolly. Leaves mostly spatulate, ½ to 1 in. long. Heads in small dense terminal clusters, nearly hidden by the wool, the thin bracts greenish at base.—On low ground.

2. **G. decúrrens** var. **californicum** Gray. California Everlasting. Biennial, stout, 1 to 2 ft. high, soon becoming green and glandular and then balsamic-scented. Leaves lanceolate, 2 to 4 in. long. Heads in close terminal clusters, woolly only at base, the bracts white.—Moist places at moderate altitudes.

3. **G. microcéphalum** Nutt Small-headed Everlasting. Annual or biennial, slender, 9 to 18 in. high, permanently white-woolly. Leaves linear, 1 or 2 in. long. Heads very small, in small clusters of an open panicle, not woolly, the bracts pure white.—Common in dry soil; foothills to Yosemite Valley, etc.

4. **G. chilénse** var. **confertifòlium** Greene. Annual or biennial, stout, erect, mostly unbranched, 1 or 2 ft. high, permanently white-woolly. Leaves linear, 1 or 2 in. long, numerous up to the compact rounded terminal cluster of heads. Bracts

greenish yellow, woolly only at base.—Common at some places, as near the Hog Ranch.

18. ADENOCAÚLON.

1. **A. bìcolor** Hook. Perennial, 1 to 3 ft. high, with a few large leaves, above which the glandular naked stems are freely branched. Leaves alternate, triangular, coarsely lobed, 2 to 5 in. across, green above, white beneath with matted hairs. Heads very small, dull white, the mature akenes much exceeding the involucre.—Shady, moist places throughout the pine belt.

19. RUDBÉCKIA. Coneflower.

Tall herbs with alternate leaves. Heads large, sunflower-like, the disk conical and brown or purplish, the rays yellow. Akenes 4-angled or flattish.

1. **R. califórnica** Gray. California Coneflower. Erect and leafy, 2 to 4 ft. high, with a single terminal head on a long smooth peduncle. Leaves entire or toothed, 4 to 12 in. long, 1 to 5 in. wide, rough-hairy. Rays yellow; disk becoming elevated, conical, and 1 or 2 in. high. Akenes flattish; pappus a 4-cleft crown.—Occasional in the Sierra Nevada. Found in the Mariposa Grove and at Crane Flat.

2. **R. hírta** L. Black-eyed Susan. Yellow Daisy. An erect leafy plant, 1½ to 4 ft. high, with usually several heads on very rough peduncles. Leaves nearly entire, 2 to 4 in. long, less than 1 in. wide, rough-hairy, the upper ones oblong or lanceolate. Rays orange-yellow; disk becoming conical but not over ¾ in. high. Akenes angled; pappus none.—Native of the Mississippi Valley but becoming common in the meadows of Yosemite Valley, where introduced; very ornamental in July and August.

20. BALSAMORHÌZA. Balsam Root.

Low perennials with thick roots and a tuft of basal leaves. Heads few, on nearly naked peduncles from the base, the bracts nearly equal. Rays yellow. Akenes without pappus, those of the disk 4-sided.

1. **B. sagittàta** Nutt. Leaves gray, silvery-pubescent, oblong or narrowly ovate, the base heart-shaped, mostly entire, 4 to 9 in. long, 2 to 5 in. broad, long-petioled. Flowering stems 1 or 2 ft. high, bearing a few small and narrow leaves and usually a solitary head. Involucre white-woolly. Rays 1 or 2 in. long, yellow.—Common in dry places.

2. **B. deltoídea** Nutt. Like no. 1 but leaves green and rough and the involucre only slightly woolly. Stem-leaves (1 or 2 in. long) lanceolate.—With no. 1 but less common.

3. **B. hoókeri** Nutt. Leaf-blades 5 to 10 in. long, pinnately parted into many narrow lobes, gray-pubescent. Heads solitary on naked peduncles from the root.—In the lower part of the pine belt, as at Big Meadows.

21. WYÉTHIA.

Perènnial herbs with thick roots and large entire alternate leaves. Heads few, large, on leafy stems. Rays and disk yellow. Akenes 4-sided, with persistent pappus of unequal scales or awns.

1. **W. móllis** Gray. Plant white with soft wool, 1 to 3 ft. high. Leaves oblong and ovate, 6 to 15 in. long, 2 to 9 in. wide, petioled. Involucre about 1 in. high, soft-woolly. Rays yellow, 1 in. or more long.—Dry places almost throughout our district.

2. **W. angustifòlia** var. **foliòsa** Hall. Plant green, rough-hairy, 1 or 2 ft. high. Leaves lanceolate, 4 to 12 in. long, ½ to 2 in. wide. Involucre about ¾ in. high, stiff-hairy. Rays yellow, about 1 in. long. (*W. foliosa* Congdon.)—Common in the Yellow Pine Belt.

3. **W. elàta** Hall. Plant gray with soft hairs but not woolly, 2 to 4 ft. high, from rootstocks. Leaves ovate, acute, the base broad, 4 to 7 in. long, 1½ to 4 in. wide, all petioled. Involucre soft-pubescent; bracts ovate, the outer leaf-like. Rays yellow, 20 or more, 1 or 2 in. long. Pappus a scaly toothed crown. (*W. ovata* Gray. Not *W. ovata* T. & G.)

This rare species was first collected on "dry hillsides at Clark's, Mariposa Co." by H. N. Bolander. It also grows along the Pohono trail and at Darrah.

22. HELIÁNTHUS. Sunflower.

Coarse rough herbs with leafy stems, the leaves alternate (or the lower opposite). Rays yellow; disk purplish, flat. Akenes thick, 4-sided, bearing pappus-scales at the angles.

1. **H. ánnuus** L. Common Sunflower. An erect annual, 2 to 10 ft. high, the stems rough. Leaves petioled, 4 to 10 in. long, broad-ovate, toothed, or the uppermost narrow and entire. Heads 2½ to 5 in. across (including rays); bracts ovate, slenderly tipped, hairy on the edges.—In fields near the settlements.

2. **H. éxilis** Gray. Annual, erect, 1 or 2 ft. high. Leaves 1 to 3 in. long, lanceolate, sparingly toothed, tapering to the petioles. Heads 1 to 2½ in. across, the bracts hairy on back and edges. Bracts of disk each with an awn longer than the flowers.—Yosemite Valley, Hog Ranch, etc.

3. **H. califórnicus** var. **mariposiànus** Gray. Perennial, 3 to 8 ft. high, the stems very smooth. Leaves ovate or lanceolate, entire, 4 to 10 in. long, 3 in. or less wide. Bracts of the involucre linear-lanceolate. Rays, etc., similar to no. 1.—Yosemite Valley, Wawona.

23. HELIANTHÉLLA.

1. **H. califórnica** Gray. Root perennial, crowned with tufts of leaves and several slender few-leaved stems each terminated by a solitary head (heads rarely 2 or 3). Leaves lanceolate, entire, tapering to each end, 4 to 10 in. long, ½ to 1½ in. broad, nearly glabrous. Heads about 1½ in. across including the many yellow rays, the disk also yellow; outer bracts leaflike. Akenes flat, glabrous, the pappus obscure.—Abundant around Wawona and along the foothills.

24. MÀDIA. Tarweed.

Erect herbs with alternate entire leaves and yellow flowers. Involucre angled by the sharply folded bracts, each of which completely enfolds its ray-akene, the tip free. Ray-akenes laterally compressed, with narrow backs, fertile; disk-akenes sterile.

1. **M. yosemitàna** Parry. Yosemite Madia. A delicate annual, 3 to 12 in. high, hairy and glandular. Leaves linear, ½ to 1 in. long. Heads very small, on long peduncles. Rays 5 to 10, minute, yellow. Pappus of ray-flowers a minute crown; pappus of disk-flowers of about 5 long bristles.—Common in moist places around Yosemite and Hetch Hetchy valleys, extending to 6500 ft. alt. The type specimens were gathered by Dr. C. C. Parry in June, 1881, "in damp moss at the foot of the Upper Yosemite Fall."

2. **M. bolánderi** Gray. Stout, 1½ to 4 ft. high, hairy and very glandular. Leaves linear, 5 to 10 in. long, grass-like. Heads large, ½ in. across exclusive of the 12 to 18 yellow rays. Pappus of conspicuous scales (in disk-flowers).—Little Yosemite Valley and the Mariposa Grove.

3. **M. élegans** Don. Common Madia. Plant 6 to 18 in. high, glandular above and white-hairy. Leaves linear, 1 to 4

in. long. Heads scattered, on distinct peduncles. Rays 12 to 15, about ½ in. long, yellow, or with a red spot at base. Pappus none.—Abundant at moderate altitudes. The yellow heads with a central dark eye are very ornamental.

4. **M. glomeràta** Hook. Erect, usually simple, 4 to 18 in. high, soft-hairy. Leaves linear, erect. Heads clustered, on very short peduncles, yellowish green and glandular. Rays greenish, few or entirely wanting. Pappus none.—Found near Snow Creek at 6600 ft. alt.

5. **M. exígua** Greene. Slender, 4 to 8 in. high, glandular and sweet-scented. Leaves linear, 1 in. or less long. Heads scattered, on naked peduncles, small. Rays minute, yellow; disk-flower solitary, without pappus.—Plentiful throughout the Sierra Nevada.

M. DISSITIFLORA T. & G., is a foothill weed with scattered heads on short peduncles, small yellowish rays, 5 to 20 disk-flowers, and no pappus.

25. HEMIZONÉLLA.

1. **H. mínima** Gray. Only 2 or 3 in. high, branched, stiff-hairy. Leaves linear, entire, not ½ in. long. Heads nearly sessile, in small dense clusters, scarcely ⅛ in. high; bracts folded for their whole length. Rays minute, yellow. Pappus none. In var. *parvula* Hall, the earliest heads are slender-peduncled, the stems sometimes 6 in. high, and the ray-akenes tipped with a short incurved beak.—Both forms occur with us.

26. HEMIZÒNIA. TARWEED.

Differs from Madia in the obcompressed ray-akenes, which are therefore thick and with broad backs and are not completely enclosed in their bracts, the upper portion of which is flat.

1. **H. wrìghtii** Gray. Commonly 1 ft. high, widely branched above, glandular and sweet-scented. Lower leaves toothed. Heads numerous, on bracted peduncles. Rays mostly 5, yellow, showy. Ray-akenes rough, beaked; disk-akenes with pappus of torn scales.—Plains and foothills, reaching the lower end of Yosemite Valley.

2. **H. douglásii** Gray. Stems 1 or 2 ft. high, rarely branched, soft-pubescent. Leaves narrowly linear, entire. Heads sessile, clustered in all the upper leaf-axils, the bracts marked with peculiar tack-shaped glands. Rays few, white purplish or yellow, deeply 3-lobed. Pappus of disk-flowers of 10 or 12 linear-lanceolate scales as long as corolla.—A foot-

hill species, reaching Crockers, Wawona, and the west end of the Pohono trail. *H. mollis* Gray, a similar species but soft-hairy and the heads in peduncled clusters, has been reported from Yosemite Valley. It is common in the foothills.

27. WHÍTNEYA.

1. **W. dealbàta** Gray. A white-leaved perennial, 9 to 18 in. high. Leaves opposite, oblanceolate to obovate, entire, 1½ to 3 in. long, soft with silvery hairs. Heads long-peduncled, showy, the yellow rays ¾ to 1 in. long and becoming papery. Pappus none.—A rare plant, found on Cherry Creek, near the Yosemite Valley, and at the Mariposa Grove.

28. ERIOPHÝLLUM.

Our species white-woolly plants with yellow radiate heads. Involucre with rigid, erect bracts. Akenes linear.

1. **E. confertiflòrum** DC. A bushy perennial, woody below, 9 to 18 in. high, the small heads in compact clusters terminating erect stems. Leaves ½ to 1 in. long, with 3 to 7 narrow lobes. Rays ⅛ in. long. Pappus of 8 to 10 short scales.—Occasional below 6500 ft., on warm, rocky slopes.

2. **E. lanàtum** Forbes. A low spreading perennial herb (under 12 in.) with many solitary naked heads on long erect peduncles. Leaves narrowly spatulate to obovate, 1 in. or less long, entire or lobed. Rays about ⅜ in. long. Pappus of short scales.—Crockers and Sentinel Dome to the crest of the Sierra Nevada, occurring in a variety of forms which have not yet been properly named by the botanist (*E. caespitosum* var. *leucocephalum* Gray, and var. *integrifolium* Gray).

3. **E. nubígenum** Greene. A low annual, 2 to 6 in. high, with erect short-peduncled heads among the upper leaves. Leaves lanceolate-spatulate, ½ to ¾ in. long, entire. Rays scarcely ¼ in. long, yellow. Pappus of about 10 narrow scales one-third the length of the akene.—Known only from Clouds Rest, at about 9000 ft. alt., where first collected by Mrs. Katharine Brandegee.

29. RIGIOPÁPPUS.

1. **R. leptócladus** Gray. A slender erect annual, 1 ft. or less high, with scattered heads (⅜ in. high). Leaves alternate, linear. Rays very short. Akenes linear, with a pappus of 3 to 5 sharp rigid awns.—Foothills, reaching 4000 ft. alt. on the South Fork of the Tuolumne.

30. CHAENÁCTIS.

Our species have alternate lobed leaves and erect heads without rays, the bracts erect and equal. Pappus of thin white scales.

1. **C. glabriúscula** DC. Annual, 1 or 2 ft. high, at first woolly but soon smooth and green. Heads fully ½ in. high, solitary on the long naked peduncles. Flowers yellow, the outer ones enlarged. Pappus-scales acute.—Foothills up to 4000 ft. (Yosemite Valley).

2. **C. douglásii** H. & A. Annual or biennial, 1 or 2 ft. high, rather permanently white-woolly. Leaves with numerous small lobes. Heads many, short-peduncled. Flowers flesh-color, the outer corollas not enlarged. Pappus-scales obtuse. —Dry forests almost throughout the mountains.

3. **C. nevadénsis** Gray. Prostrate, woolly, 6 in. or less high. Heads few, solitary. Flowers flesh-color. Pappus-scales obtuse.—Mono Pass, Pyramid Peak, etc.

31. HÚLSEA.

Biennial and perennial herbs with alternate sessile leaves. Heads yellow or purple, not small. Bracts narrow, acute, nearly equal. Akenes flattish, soft-hairy, with 4 short pappus-scales.

1. **H. heterochròma** Gray. Robust, 1½ to 5 ft. high, very sticky and of disagreeable odor. Leaves oblong, coarsely toothed. Heads ¾ in. high, the 40 to 60 rays saffron-color and scarcely exceeding the bracts.—On gravelly slopes above Mirror Lake. Yosemite Valley is the type locality of this species. It ranges to southern California.

2. **H. brevifòlia** Gray. Stems ½ to 2 ft. high, glandular. Leaves narrowly oblong, toothed, 1 or 2 in. long. Heads nearly 1 in. high, including the 10 to 20 showy yellow rays.—Mariposa Grove (type locality) to Clouds Rest, Mt. Watkins, and Indian Creek; also on slopes above Mirror Lake.

3. **H. álgida** Gray. Perennial, stout, 1 ft. or less high, glandular and the heads very woolly. Leaves narrowly oblong, toothed, 2 to 4 in. long. Heads solitary, terminating the stems, 1 in. high, including the many yellow rays.—Above timber-line on Mt. Dana (type locality) and other high peaks throughout the Sierra Nevada.

32. HELÈNIUM. Sneezeweed.

Erect herbs, ours perennial with alternate entire leaves, the

upper sessile. Heads showy. Akenes top-shaped, ribbed, with 5 to 12 thin pappus-scales.

1. **H. bigelòvii** Gray. Bigelow Sneezeweed. Nearly glabrous, branching and sparsely leafy above. Leaves green, lanceolate, 4 to 10 in. long, ½ in. or less wide, continued down the stem as wings. Rays yellow, drooping over the reflexed bracts, ½ to ¾ in. long; disk brown, globose, ½ to ¾ in. across. Akenes hairy.—In meadows and along streams at moderate altitudes.

2. **H. hoopésii** Gray. White-woolly when young, branching and leafy to the top. Leaves pale, oblong, the lower tapering to the base, entire, 2 to 6 or 10 in. long. Rays yellow, about 1 in. long, spreading; disk yellow, globose, ¾ to 1 in. across. Akenes silky.—Near timber-line only.

33. ÁNTHEMIS. Camomile.

1. **A. cótula** L. Mayweed. A leafy annual, 6 in. to 2 ft. high, nearly glabrous. Leaves alternate, dissected into numerous linear lobes. Heads ½ in. across, long-peduncled, the yellow disk and white rays showy. Akenes glabrous but rough, without pappus.—An introduced weed in waste places.

34. ACHILLAÈA. Yarrow. Milfoil.

1. **A. millefòlium** var. **lanulòsa** Piper. Perennial from rootstocks, not woody, the simple leafy stems 1 to 3 ft. high, loosely gray-pubescent. Leaves alternate, finely cut into many small lobes. Heads ¼ in. high, in flat-topped terminal clusters, with 4 to 6 white or pink rays; involucre of closely overlapping scales. Akenes linear, without pappus.—Abundant throughout the mountains.

35. MATRICÀRIA.

1. **M. suavèolens** Buch. A glabrous leafy annual, 4 to 12 in. high. Leaves alternate, finely dissected. Heads short-peduncled, with greenish disk and no rays. (*M. discoidea* DC.)—May be expected as an introduced weed.

36. ARTEMÍSIA. Wormwood.

Herbs and shrubs, mostly bitter and aromatic, with alternate leaves. Heads small, without rays, the tubular flowers yellow or purplish, not showy. Akenes glabrous, without pappus.

Plant herbaceous, or hardly woody at the base.
  Leaves green and glabrous, linear, entire.....1. *A. dracunculoides.*
  Leaves soft-hairy, parted into many narrow lobes...2. *A. norvegica.*

Leaves white-woolly beneath.
Upper surface of leaves also woolly.....3. *A. ludoviciana.*
Upper surface green .....4. *A. heterophylla.*
Plant shrubby, the stems woody.
Leaves mostly 3-lobed at summit.....5. *A. tridentata.*
Leaves mostly entire .....6. *A. rothrockii.*

1. **A. dracunculoìdes** Pursh. A green and glabrous perennial herb (not woody), 2 to 5 ft. high, with many erect leafy stems. Leaves linear, 1 to 4 in. long, mostly entire. Heads many, in panicles.—Widely distributed in North America; common in all of our valleys.

2. **A. norvégica** Fries. A soft-hairy herbaceous perennial with a thick root and numerous erect leafy stalks ½ to 2 ft. high. Leaves 2 to 6 in. long, including the petiole, parted into many linear or lanceolate lobes. Heads (over ¼ in. across) many-flowered, long-peduncled, numerous, in a loose terminal cluster 6 to 12 in. long, the bracts with broad brown margins. —Grows only at high altitudes, as near the head of Indian Cañon, but ranges from Tulare Co. to Pyramid Peak and the far north, extending even to northern Europe.

3. **A. ludoviciàna** Nutt. A white-pubescent perennial, slightly woody at base, the leafy stems 1 to 4 ft. high, from rootstocks. Leaves lanceolate or oblanceolate, coarsely toothed or parted into acute lobes (the upper ones narrow and entire), 1½ to 4 in. long, permanently white-woolly on both sides. Heads in panicles.—Widely distributed at moderate altitudes.

4. **A. heterophýlla** Nutt. Like no. 2 but leaves mostly broader, less toothed, and green above.—Found in similar localities.

5. **A. tridentàta** Nutt. SAGEBRUSH. An erect much-branched shrub with distinct trunk and shreddy bark, the leaves and twigs gray-woolly throughout. Leaves wedge-shaped, the broad summit with 3 or 4 teeth (the uppermost ones linear and entire), ½ to 1½ in. long. Heads in loose panicles, 5 to 8-flowered.—The dominant shrub of the Great Basin, occurring with us in dry, rocky places from the lower slopes up to at least 9500 ft. alt.

6. **A. rothróckii** Gray. A low shrub, resembling the common Sagebrush but the leaves mostly entire, the others 3-lobed at summit; heads larger, more globose, 9 to 14-flowered, the yellowish-green bracts ovate or oval.—High Sierra Nevada, chiefly on the desert side; occurs at Mono Pass and Mt. Dana; also reported from Crescent Lake.

37. RAILLARDÉLLA.

Perennial herbs with narrow entire leaves chiefly basal. Heads solitary, yellow. Akenes linear, pubescent, with 12 to 25 white feathery pappus-bristles.

1. **R. argentèa** Gray. A compact Alpine plant with narrow silvery-hairy leaves ½ to 2 in. long. Heads ½ or ¾ in. high, without rays, on simple naked stalks 4 in. or less long.—Plentiful above timber-line.

2. **R. scapòsa** Gray. A matted plant, hairy when young but not silvery. Leaves green, linear, 1 to 4 in. long. Heads ½ to 1 in. high, rarely with 1 to 3 rays, on simple naked stalks 4 to 10 in. high.—Occasional from 6000 to 10,000 ft. alt.

38. ÁRNICA. Arnica.

Erect perennial herbs with large yellow heads, these mostly long-peduncled. Involucre of equal broadish bracts. Pappus of many white or brownish rough bristles.

Lower leaves with broad mostly heart-shaped base.
- Rays none ..... 1. *A. discoidea.*
- Rays large
  - Stems nearly naked above ..... 2. *A. cordifolia.*
  - Stems leafy above ..... 3. *A. latifolia.*

Lower leaves narrowed to the base.
- Stems leafy to the top.
  - Plant not woolly; leaves 1-nerved from the base.
    - Leaves oblong-lanceolate to ovate, not taper-pointed.
      - Leaves sharply toothed ..... 4. *A. amplexicaulis.*
      - Leaves entire or nearly so ..... 5. *A. chamissonis.*
    - Leaves narrowly lanceolate, taper-pointed ..... 6. *A. longifolia.*
  - Plant woolly; leaves 3-nerved from base ..... 7. *A. foliosa.*
- Stems less leafy; heads 1 to 3, large ..... 8. *A. nevadensis.*

1. **A. discoídea** Benth. Leafy only toward the base, 1 or 2 ft. high, glandular and hairy. Leaves ovate, base usually heart-shaped, toothed, 2 to 4 in. long, 1½ to 2½ in. broad, on petioles 1 in. or more long, upper leaves very small. Heads several, without rays, about ¾ in. high.—Moderate altitudes; rather common around Yosemite Valley.

2. **A. cordifòlia** Hook. More leafy but upper leaves small, almost woolly above, the solitary or few heads with showy, yellow rays.—Rare in the Sierra Nevada: Yosemite cliffs; McClure Fork at 9500 ft. alt.

3. **A. latifòlia** var. **viscídula** Gray. Leafy almost throughout, 1 or 2 ft. high, the stems rough with short hairs or becoming glabrous, glandular above. Leaves ovate, the lower

with broad base and winged petiole, the upper ones sessile, toothed, 2 to 4 in. long. Heads several, with showy yellow rays. Akenes pubescent.—Middle altitudes, as near Vernal Falls.

4. **A. amplexicaúlis** Nutt. Plant 1 or 2 ft. high, nearly glabrous. Leaves oblong-lanceolate, acute, all but the lowest sessile by a clasping base, sharply and deeply toothed, 2 to 4 in. long, ¾ to 1½ in. broad. Heads few, with rays. Akenes hairy.—Moist places from Tulare Co. north but not yet found in the Yosemite National Park.

5. **A. chamissònis** Less. Similar to no. 4 but more pubescent; leaves often ovate and obtuse, only the uppermost sessile, less deeply toothed, or entire.—Tenaya Trail, rare; common from Tahoe north. True *A. chamissonis* is a narrow-leaved plant of the far North. Our form, which may be a distinct species, has been named *A. mollis* Hook.

6. **A. longifòlia** Eat. Leafy to the top, the many stems 1½ to 3 ft. high, minutely pubescent. Leaves narrowly lanceolate, acute, tapering to base, entire or toothed, 3 to 6 in. long, ¾ in. or less wide (rarely 1 in.). Heads 3 to 12, with showy rays. Akenes only glandular.—Rare in the Sierra Nevada but to be expected along streams.

7. **A. foliòsa** var. **incàna** Gray. Plant ½ to 1½ ft. high, gray or white with loose wool. Leaves lanceolate, clasping by a narrowed base, the lower sheathing the stem, acute, mostly entire, 2 to 6 in. long. Rays present. Akenes hairy or smooth.—Hog Ranch, Lake Tenaya, etc.

8. **A. nevadénsis** Gray. Stems 18 in. or less high, hairy and glandular. Leaves oval to oblong, tapering at base, obscurely toothed or entire, 2 or 3 in. long. Heads several, with showy yellow rays.—Common from about 6000 to 10,000 ft. *A. alpina* Olin, is a more northern species with narrower, lanceolate, 3-nerved leaves.

39. SENÈCIO. Groundsel.

Herbs and shrubs with alternate leaves. Heads cylindric, many-flowered, often with small bracts at base of involucre. Akenes cylindric, with a copious pappus of soft white bristles.

A. Stems leafy only toward the base.

Leaves partly with narrow lobes except in dwarfed plants with solitary heads ..... 1. *S. aureus.*
Leaves all entire or merely toothed.
Leaf-blades 1½ in. or less long; low plants.
Plant glabrous except when young..... 2. *S. petrocallis.*
Plant permanently woolly ..... 3. *S. canus.*

Leaf-blades longer; plants usually over 1 ft. high.
Stem from fibrous roots ..... 4. *S. lugens.*
Stem from rootstocks ..... 5. *S. scorzonella.*

B. Stems leafy to the top.

Herbs; glabrous at maturity.
Stems 2 ft. or more high.
Leaves toothed or entire.
Base of leaf broad ..... 6. *S. triangularis.*
Base of leaf narrowed ..... 7. *S. serra.*
Leaves deeply lobed ..... 8. *S. clarkianus.*
Stems 1 ft. or less high ..... 9. *S. fremontii.*
Shrub; densely white-woolly ..... 10. *S. douglasii.*

1. **S. aúreus** L. A green and glabrous perennial, 4 to 20 in. high (rarely with a little wool when young). Lower leaves oval or roundish, toothed, petioled; upper leaves lanceolate, entire to toothed or deeply lobed.—Moist places, in a variety of forms. One form has stems 12 to 18 in. high, large leaves, and yellow rays (*S. laetiflorus* Greene). With this is sometimes found a similar form but without rays (*S. lembertii* Greene). A medium-sized form with saffron-colored flowers is often found in high meadows (*S. aureus* var. *croceus* Gray). There is a dwarf form (of high altitudes) with nearly naked stem and a solitary head with yellow rays (*S. aureus* var. *subnudus* Gray). A similar form but with stem-leaves more developed and the rays sometimes lacking is *S. aureus* var. *borealis* T. & G.

2. **S. petrocállis** Greene. An Alpine dwarf, forming dense leafy tufts from which protrude the naked flower-stalks, the whole plant only 2 to 4 in. high. Leaves soon glabrous, thick, oval or oblong, with narrow base, entire or few-toothed. Heads 1 to 7, the yellow rays ¼ in. long. (*S. petraeus* Klatt.) —Above timber-line on Mt. Dana.

3. **S. cànus** Hook. A tufted perennial, 6 to 15 in. high, white with matted wool. Leaves oblong or oval, entire (rarely a few lobes), ½ to 1½ in. long. Heads several or numerous, short-peduncled, the yellow rays over ¼ in. long.—High altitudes, as at Merced Lake and near Mt. Lyell.

S. WERNERIAEFOLIUS Gray, of the Rocky Mts., was once reported from Mt. Conness. It is like *S. canus* but dwarf, the leaves linear-spatulate and 2 or 3 in. long by ¼ in. wide, or some only 1 in. long by ½ in. wide.

4. **S. lùgens** var. **exaltàtus** Gray. Stout, 1 to 3 ft. high, from a cluster of fibrous roots, lightly woolly when young. Leaves basal and scattered; the lower long-petioled, spatulate to obovate or roundish, the blade 2 to 8 in. long; upper ones narrower and often toothed. Heads terminally clustered,

with or without rays.—The most common species in loose soil of open pine forests.

5. **S. scorzonélla** Greene. Like *S. lugens* but the stems from horizontal rootstocks and the leaves more clustered at base, these oblanceolate or narrower and sharply toothed, woolly.—Meadow borders near Eagle Peak and Lake Tenaya. Also (in a rayless form) on the Chilnualna Trail and in Tuolumne Meadows. *S. covillei* Greene, is a form nearly glabrous from the beginning. *S. whippleanus* Gray, if found may be known by its large size (3 or 4 ft. high, heads ¾ in. high) and deeply toothed leaves.

6. **S. triangulàris** Hook. A leafy glabrous perennial, 2 to 6 ft. high. Leaves thin, triangular-lanceolate, acute, the base broad (except upper leaves), 2 to 8 in. long, ¾ to 3 in. broad, mostly toothed, on short petioles. Heads many, small, with yellow rays about ¼ in. long.—Common along streams and in bogs.

7. **S. sérra** var. **integriúsculus** Coville. Similar to no. 6 but leaves less than ¾ in. wide and all tapering to the base; heads smaller.—Tulare Co. to Oregon but not yet found in our district.

8. **S. clarkiànus** Gray. Erect, leafy to the top, 3 or 4 ft. high, glabrous. Stem-leaves lanceolate, sessile, 4 to 7 in. long, sharply lobed. Heads many, short-peduncled, the yellow rays nearly ½ in. long.

This rare Senecio has been found only along the Glacier Point Road and near Wawona in what was once called Clark's meadow. It was first described by Dr. Asa Gray, who adds the following to his description: "In Clark's meadow, below the Mariposa Big-tree Grove, Bolander. This striking, tall species may well bear the name of the valued guide and mountaineer, Galen Clark, in whose meadow it grows, and who has done so much to make the Mariposa Grove of *Sequoia gigantea* accessible."

9. **S. fremóntii** var. **occidentàlis** Gray. A glabrous perennial with many leafy stems 1 ft. or less long. Leaves oblong to roundish, with narrow base, obtuse, toothed, ½ to 1½ in. long. Heads numerous, ½ in. high, with showy rays.—Rocky places near timber-line.

10. **S. douglásii** DC. A white-woolly leafy shrub, 3 to 5 ft. high. Leaves with 3 to 9 linear lobes or the uppermost entire. Heads large, with about 13 rays ½ in. or so long.—Foothills and warm slopes to 5000 ft. alt.

40. CÁRDUUS. THISTLE.

Spiny herbs with mostly lobed alternate or basal leaves. Heads large, the outer bracts spine-tipped. Flowers all tubular and alike. Pappus of numerous bristles. (Includes *Cirsium.*)

1. **C. drummòndii** Coville. Stem simple, 15 in. or less high, glabrous and leafy up to the heads. Leaves woolly. Heads about 2 in. high, sessile, white or purple-flowered; inner bracts with weak tips, the outer gradually shorter and ovate, short-spined.—Probably occurs only in the following variety.

Var. **acauléscens** Coville. Heads smaller, few or several, sessile in a tuft of basal leaves, the plant therefore stemless.—Dry meadows above 5000 ft. alt. *Cnicus tioganus* Congdon, is a form with more strongly lobed leaves of the same color on both sides and white flowers; its type locality is, "Mt. Dana region from the Tioga Mine to Mono Pass."

2. **C. andersònii** Greene. Stem 1 to 3 or 4 ft. high, lightly woolly. Leaves woolly beneath, usually green above. Heads 1½ to 2 in. high, long-peduncled, bright pink-red; bracts all straight and erect, the outer gradually shorter, each tipped with a weak prickle.—Occasional at middle altitudes.

3. **C. califórnicus** Greene. Stem 2 to 5 ft. high, white with matted wool. Leaves white-woolly. Heads 1 to 1½ in. high, long-peduncled, cream-color white or purplish; outer bracts spreading, each ending in an upward-curved prickle.—Common on warm slopes below 6000 ft. alt.

CENTAUREA MELITENSIS L., or Tocalote, one of the yellow star thistles, may appear as a weed. It is known by its small, roundish, yellow-spined heads and obliquely inserted akenes.

41. PHALACRÓSERIS.

1. **P. bolánderi** Gray. A glabrous perennial, the leaves and naked flower-stalks (5 to 15 in. high) all from the thick root. Leaves lanceolate, entire, 4 to 8 in. long. Head solitary, yellow. Akenes short-oblong, not narrowed at either end, without pappus.—First described from specimens gathered at "Westfalls Meadows, above Yosemite Valley, alt. 8000 feet." Sometimes the akenes have a pappus of a short crown with divided margin (var. *coronata* Hall). This form has been found from near Cathedral Peak and Chilnualna Creek to Fresno Co., but it is very rare.

42. MICRÓSERIS.

Glabrous or obscurely hairy herbs with yellow-flowered

heads on long peduncles. Leaves entire to deeply lobed, even in the same species. Akenes ribbed, bearing 5 to 10 pappus-scales each continued as a slender awn.

1. **M. nùtans** Gray. Stem slender, 6 to 15 in. high, from a thickened root, branching and somewhat leafy. Heads showy, nodding in bud. Pappus of 15 to 20 soft feathery bristles from a short scale-like base.—Common in moist soil of forests and meadow borders.

2. **M. linearifòlia** Sch. Bip. Stems 4 to 12 in. high, from a slender tap-root, thickened and hollow beneath the solitary erect head. Akenes narrowed above; pappus-scales white, becoming ½ in. long, each with a slender awn from the notched summit.—Foothills and warm slopes up to 7000 ft. alt.

43. STEPHANOMÈRIA.

Herbs and shrubs with purplish or white heads in panicles. Akenes oblong, or narrowed below, strongly angled, glabrous. Pappus-bristles feathery.

1. **S. lactucìna** Gray. Perennial, not woody, leafy to the top, 4 to 12 in. high. Leaves broadly linear, entire or few-toothed, 1 to 4 in. long, the uppermost ones scarcely smaller. Heads ½ in. high, on spreading peduncles. Pappus-bristles sordid, feathery except at base.—Rare, but found at Lake Eleanor, Rancheria Mt., Yosemite Valley, Mariposa Grove, etc.

2. **S. virgàta** Benth. Annual or biennial, not woody, sparsely leafy, 1 to 10 ft. high. Leaves oblong to linear, entire or toothed. Heads nearly sessile all along the branches, ¼ in. high. Pappus white, feathery almost to base.—Dry slopes up to 5000 ft. alt.

3. **S. myrióclada** Eat. Woody at base, much branched and bushy, 1 or 2 ft. high. Leaves of the branches reduced to scales. Heads short-peduncled, small, the bracts and flowers only 3 or 4 each.—Reported from the "Yosemite"; more common in Nevada.

S. TENUIFOLIA Hall, is similar to no. 3, but the stems are not woody and the leaves are mostly slender and grass-like. It may reach our borders from the desert side.

44. MALACÒTHRIX.

1. **M. obtùsa** Benth. Annual, 5 to 15 in. high, with many slender branches, but the leaves nearly all in a basal tuft, often with traces of wool, otherwise smooth. Leaves lobed, ½ to 2½ in. long. Heads small, white or pinkish. Akenes

slightly narrowed above, 5-ribbed; pappus of soft deciduous bristles.—Warm, gravelly soil; occasional around Yosemite Valley and at Moss Creek, Cherry Creek, etc.

45. TARÁXACUM. Dandelion.

1. **T. officinàle** Weber. A thick-rooted perennial with lobed leaves all in a basal tuft and large yellow heads on naked hollow stems. Akenes spiny-toothed above and tapering to a slender beak.—Occurs in low meadows.

46. SÓNCHUS. Sow-thistle.

1. **S. ásper** Hill. Prickly Sow-thistle. A leafy succulent annual, 1 to 3 ft. high, smooth below, pubescent above with gland-tipped hairs. Leaves coarsely lobed and sharp-toothed, the upper sessile and clasping. Flowers yellow. Akenes flat, ribbed, smooth between the ribs; pappus white, cottony.—An introduced weed of wet places. *S. oleraceus* L., the Common Sow-thistle, may also appear. It is known by the akenes, which are ridged crosswise between the longitudinal ribs.

47. LACTÙCA. Lettuce.

1. **L. pulchélla** DC. An erect leafy-stemmed glabrous perennial, 1 or 2 ft. high, bearing numerous bluish or violet heads. Leaves lanceolate, entire or backwardly toothed. Akenes very short, flat, tapering to a short beak with abundant soft pappus. —Hetch Hetchy and Yosemite valleys, etc.

48. TRÓXIMON.

Herbs with nearly naked stems, each bearing a single terminal head, the leaves all basal or nearly so. Flowers yellow, orange, or purplish. Akenes 10-nerved, tapering to a beak; pappus of numerous soft bristles.

1. **T. glaúcum** Nutt. Perennial. Leaves 4 to 12 in. long, very variable, entire to deeply lobed. Heads usually purplish or saffron, ½ to 1 in. long, on stalks 6 to 15 in. high. Akenes narrowed to a thick nerved beak shorter than the body, the pappus rigid.—Meadows above 6000 ft. On high summits the plants are only 2 to 4 in. high (*Agoseris monticola* Greene).

2. **T. aurantìacum** Hook. Like *T. glaucum* and equally variable, but the akenes tapering into a slender thread-like beak nearly as long as the body, the pappus very soft; flowers orange or purplish.—Moist soil above 5000 ft. alt. *T. nuttallii* Gray, with similar akenes but yellow flowers, has been reported from Yosemite Valley.

3. **T. grandiflòrum** Gray. Perennial. Leaves 4 to 9 in. long, narrow and tapering, entire or with narrow acute lobes. Heads yellow-flowered, 1 to 1½ in. high, on stalks 6 to 18 in. high. Akenes narrowed into a thread-like beak three times as long as the body.—Hetch Hetchy, Yosemite, and the lower slopes.

4. **T. retròrsum** Gray. Perennial. Leaves 4 to 8 in. long, parted into linear acute lobes which point backward. Heads yellow-flowered, 1½ to 2½ in. high, on stalks 6 to 15 in. high. Akenes with broad summit abruptly contracted to a thread-like beak about three times as long as the body.—Common on dry hillsides up to about 9000 ft. alt.

5. **T. heterophýllum** Greene. Annual. Leaves 1 to 4 in. long, entire or bluntly lobed. Heads yellow-flowered, ¾ in. or less high, on stalks 2 to 12 in. high. Akenes with slender beak nearly twice as long as the body.—In low places around meadows at Wawona, Yosemite Valley, etc.

Other species of Troximon doubtless occur, but specimens with ripe akenes are needed for their identification and these are not at hand.

49. CRÈPIS. Hawksbeard.

Annual and perennial herbs. Involucre narrow, the bracts with thickened midribs. Akenes narrowed above, 10 to 30-ribbed; pappus copious, white and soft.

1. **C. acuminàta** Nutt. Perennial, 1 to 3 ft. high, the sparsely leafy stems bearing a loose panicle of yellow-flowered heads. Lower leaves lanceolate, parted into narrow sharp lobes, narrowed below to a petiole and above to a tail-like tip, the whole leaf 5 to 10 in. long, finely pubescent. Involucre (of 5 to 8 main bracts) bright green and smooth, enclosing 5 to 10 flowers.—Occasional at middle altitudes.

2. **C. intermèdia** Gray. Very similar but often more ashy-pubescent, the involucres especially being ashy with short hairs.—Of wide distribution but not common. *C. occidentalis* Nutt., with 8 to 24 bracts and 10 to 30 flowers in a head, is another perennial which may occur.

3. **C. vìrens** L. Smooth Hawksbeard. Annual, 1 to 2 ft. high, the few-leaved stems bearing loose panicles of yellow-flowered heads. Leaves oblanceolate, deeply lobed, the terminal lobe broadest, the whole leaf 2 to 6 in. long, green and nearly glabrous. Involucre hairy and glandular, many-flowered. Akenes smooth, 10-nerved.—Introduced weed in Hetch Hetchy Valley.

C. NANA Rich., may occur near timber-line. It is a dwarf with obovate, entire, glabrous leaves.

50. HIERÀCEUM. HAWKWEED.

Ours perennial herbs with simple and narrow involucres. Akenes not narrowed above, with a single row of fragile bristles.

1. **H. albiflòrum** Hook. Stems 1 to 3 ft. high, leafy only at base, ending in panicles of white-flowered heads. Leaves broadly oblanceolate or oblong, entire or shallowly toothed, 3 to 6 in. long, the lower ones (and base of stem) bristly with long hairs. Pappus dull white.—Open pine forests, common.

2. **H. hòrridum** Fries. Stems 4 to 12 in. high, leafy up to the panicle of yellow heads. Leaves oblanceolate or oblong, obtuse, entire, 1 to 4 in. long, shaggy with long hairs. Pappus reddish.—Among rocks from 4000 ft. alt. to timber-line.

3. **H. grácile** var. **detónsum** Gray. Stems 6 to 18 in. high, nearly naked except at the leafy base, the few heads yellow (involucre black-hairy). Leaves obovate or oblong-spatulate, 1 to 4 in. long, entire or shallowly toothed, glabrous and green. Pappus dull white.—Moist, shaded soil, 8000 ft. alt. to timber-line.

GLOSSARY

Numbers refer to more extended explanations or illustrations in the first part of the book. Many of the definitions are taken from Gray's New Manual of Botany, by Robinson & Fernald.

Acuminate. Ending in a tapering point.
Acute. Ending with a sharp angle; p. 9.
Adherent. Grown fast to.
Adnate. United; grown fast to.
Akene. A small dry 1-seeded fruit which does not open; p. 12.
Alpine. A high-mountain belt, above timber-line.
Alternate. Arranged singly at different heights; p. 8.
Ament. A spike in which the flowers are subtended by scales.
Angiosperm. A plant bearing seeds in a covering of some sort.
Annual. Living but a single year.
Anther. The pollen-bearing part of a stamen; p. 11.
Apetalous. Without petals.
Aquatic. Living in the water.
Ascending. Rising somewhat obliquely.
Attenuate. Becoming very narrow.
Awl-shaped. Tapering upward from the base to a slender point.
Awn. A bristle-shaped organ or appendage.
Axil. The angle formed by a leaf or branch with the stem.
Axillary. Situated in an axil.
Axis. The central support of a group of organs, as a stem.

Banner. Upper petal in Leguminosae; p. 135.
Beak. A prolonged tip.
Berry. A fleshy or pulpy fruit.
Biennial. Living two years.
Bilabiate. Two-lipped.
Bipinnate. Twice pinnate. Also written 2-pinnate.
Blade. The flat expanded portion of a leaf; p. 8.
Bloom. A fine powder or dust, easily rubbed off.
Bract. A modified leaf among the flowers; p. 13.
Bulb. An underground leaf-bud with fleshy scales or coats.
Bur. Any rough or prickly fruit.

Calyx. The outer usually green circle of a flower; p. 10.
Capsule. A dry seed-vessel composed of more than one part.
Catkin. A spike in which the flowers are subtended by scales.
Cell. Any structure containing a cavity, as the cells of ovary, capsule, etc.
Chaff. A small thin scale.
Chaparral. Colonies of shrubs; literally the "little chaps" as distinguished from trees.
Choripetalous. Petals not united to each other, even at base; p. 10.
Ciliate. Hairy along the margin.
Compound. Composed of 2 or more similar parts; pp. 9, 12.
Compressed. Flattened.
Conical. Cone-shaped; round and tapering to a point.
Corolla. The circle of petals in a flower; p. 10.
Cotyledons. The first leaves of the embryo as found in the seed.

Deciduous. Not persistent; not evergreen.
Decurrent. Continued down the stem below the insertion.
Deflexed. Bent abruptly downward.
Dicotyledons. Plants with 2 cotyledons in each seed.
Discoid. Like a disk; pp. 239, 240.
Dissected. Many times cut or divided.
Distinct. Separate; not united; evident.
Divided. Lobed nearly to the base.

Ecological. Concerning the relation of plants or animals to their environment.
Entire. Smooth-margined, without teeth or lobes.
Equalling. Of the same length as.
Exceeding. Longer than.
Exserted. Projecting beyond, as stamens from a corolla.
Exstipulate. Without stipules.

Feathery. With fine hairs on each side; p. 240.
Fertile. Productive, as a flower having a pistil, a seed with an embryo, or an anther with pollen.

Filament. The stalk supporting an anther; p. 11.
Flaccid. Weak; not rigid.
Free. Not attached to other organs.
Frond. The "leaf" of a fern.
Fruit. The seed-bearing part of a plant; p. 12.

Genus (pl. *Genera*). See p. 13.
Glabrous. Smooth; not hairy.
Gland. A protuberance, usually a secreting structure.
Glandular. Bearing glands or exuding a sticky liquid.
Globose. Somewhat spherical.
Gymnosperm. A plant bearing naked seeds.

Habit. The general appearance of a plant; mode of growth.
Head. A dense rounded cluster, p. 13.
Heart-shaped. Ovate with 2 rounded lobes at base.
Herb. A plant with no persistent woody stem above ground.
Herbaceous. Like an herb.
Herbage. Stems and leaves of the season.
Hirsute. With coarse or stiff hairs.
Hypogynous. Attached to the receptacle below the ovary and free from it and from the calyx; having the stamens and petals so attached.

Imbricate. Overlapping, like the shingles of a roof.
Incised. Sharply and irregularly cut.
Included. Not at all protruded.
Indusium. The proper covering of the fruit-dot in Ferns; p. 25.
Inferior. Lower. An inferior ovary is attached to the calyx; p. 12.
Inflated. Distended; bladdery.
Inflorescence. The arrangement of the flowers in a cluster; p. 13.
Inserted. Attached to.
Introduced. Brought by man from another place.
Involucre. A circle or collection of bracts surrounding a flower-cluster or a single flower. (In Compositae, see p. 239.)
Irregular. The parts not of the same size or shape, as a corolla with some petals or lobes larger than the others.

Keel. A central ridge along the back. (In Leguminosae, see p. 135.)

Lanceolate. Broadest above the base and narrowed to the apex; p. 9.
Leaflet. A single part of a compound leaf.
Linear. Long and narrow, with parallel margins; p. 9.
Lip. One of the two divisions of a 2-lipped corolla or calyx.
Lobe. Any segment of an organ, especially if rounded.
Lobed. Divided into lobes.
Lunate. Shape of a half-moon or crescent.

Membranous. Thin and somewhat papery.
Monocotyledons. Plants with only 1 cotyledon in each seed.

Naked. Without covering or appendages; without bracts or leaves.
Nerve. A simple vein or slender rib.
Node. The place on a stem where a leaf is normally borne.
Nut. A hard 1-seeded fruit which does not open at maturity.
Nutlet. A small nut.

Oblanceolate. Inverted lanceolate.
Oblong. Longer than broad and with nearly parallel sides; p. 9.
Obovate. Inverted ovate.
Obtuse. Blunt or rounded at the end; p. 9.
Opposite leaves. Two from each node, attached to opposite sides of a stem but at the same level; p. 8. A stamen is opposite a petal when set before it.
Orbicular. Circular.
Ovary. The part of the pistil that contains the ovules; p. 12.
Ovate. With outline like that of an egg; p. 9.
Ovule. The body in the ovary which becomes a seed.

Palmate (leaf). With the divisions pointing to the petiole. Palmately compound, with the leaflets all borne on the summit of the petiole; p. 8.
Panicle. A loose irregular cluster of flowers; p. 13.
Pappus. The modified calyx-limb in Compositae; p. 240.
Parasitic. Deriving nourishment from another plant.
Parted. Cleft to below the middle.
Pedicel. The stalk of a single flower in a cluster.
Peduncle. The stalk of a solitary flower or of a flower-cluster.
Pendulous. More or less hanging.
Perennial. Lasting year after year.
Perfect (flower). With both pistil and stamens.

Perianth. The floral envelope; p. 10.
Perigynous. Attached to the perianth, and therefore around the ovary and not at its base.
Persistent. Lasting a long time.
Petal. A division of the corolla; p. 10.
Petiole. The footstalk of a leaf; p. 9.
Phaenogam. A plant species having flowers with stamens and pistils and producing seeds.
Pinna (pl. *Pinnae*). One of the primary divisions of a pinnate or compoundly pinnate frond or leaf; p. 25.
Pinnate. Compound, with the leaflets arranged on each side of a common petiole; p. 9.
Pinnatifid. Pinnately cleft.
Pinnule. A secondary pinna; one of the pinnately disposed divisions of a pinna.
Pistil. The seed-bearing organ; p. 11.
Pistillate. With pistils but without stamens.
Placenta (pl. *Placentae*). The ovule-bearing tissues of an ovary.
Pod. Any dry fruit, opening at maturity.
Pollen. The fecundating grains in the anther; p. 11.
Pubescent. With hairs.

Raceme. A cluster in which the flowers are borne along the central axis on pedicels of nearly equal length; p. 13.
Rachis. The axis of a flower-cluster or compound leaf.
Radiate. Spreading like the spokes of a wheel; bearing ray-flowers; p. 239.
Ray. The branch of an umbel; the marginal flowers in a head when the corolla is strap-shaped; p. 239.
Receptacle. The end of a pedicel which bears the organs of a flower; pp. 11, 239.
Reflexed. Bent or turned abruptly downward.
Regular. Uniform in shape and structure.
Reniform. Kidney-shaped.
Root. See p. 7.
Rootstock. An underground stem; p. 7.
Rotate. Somewhat flat and circular in outline; wheel-shaped.

Saprophyte. A plant which derives nourishment from decaying vegetation.
Scale. A small thin body.
Seed. The ripened ovule; p. 12.
Segment. One of the parts of an organ that is cleft or divided. (In ferns, see p. 25.)
Sepal. A division of the calyx; p. 10.
Serrate. With sharp teeth.
Sessile. Without a footstalk of any kind.
Sheath. A tubular envelope.
Shrub. A woody perennial smaller than a tree.
Silky. Clothed with closely pressed soft straight hairs.
Simple. Of one piece; not compound.
Smooth, Not rough or hairy.
Spatulate. Narrowed downward from a rounded summit; p. 9.
Spike. A cluster in which the flowers are sessile along the central axis; p. 13.
Spine. A sharp-pointed hard woody organ.
Spore. The fruit of ferns and other Cryptogams.
Spur. A hollow extension.
Stamen. A pollen-bearing organ; p. 11.
Staminate. Bearing stamens but not pistils.
Stem. See p. 7.
Sterile. Not productive; barren.
Stigma. A part of the pistil; p. 11.
Stipulate. Having stipules.
Stipule. An appendage at base of petiole; p. 9.
Stolon. Any basal branch that is disposed to root.
Strict. Straight and upright.
Style. A part of the pistil; p. 11.
Submerged. Growing under water.
Succulent. Juicy; fleshy.
Superior (ovary). Free from calyx; p. 12.
Sympetalous. Petals united, at least at base, so that they cannot be separated without tearing; p. 11.

Taproot. A single perpendicular root; p. 7.
Terete. Cylindric and slightly tapering.
Throat. The orifice of a calyx or corolla.
Timber-line. The upper limit of tree growth on mountains; p. 4.
Tri-pinnate. Thrice pinnate. Also written 3-pinnate.
Truncate. Cut off squarely at the end.
Tuber. A short thick underground branch or root.

Tubular. Shaped like a tube or hollow cylinder.

Tufted (stems). Short and set close together.

Type. The specimen on which the first description of a species is based.

Type locality. The exact station at which a type was collected.

Umbel. A flower-cluster in which the pedicels all spring from the end of a common peduncle; p. 13.

Unisexual. Either staminate or pistillate only.

Valve. One of the pieces into which a capsule splits.

Veins. Branched threads of tissues.

Viscid. Glutinous; sticky.

Whorl. An arrangement (of leaves, etc.) in a circle around the stem; p. 8.

Wing. Any thin border; the lateral petals in Leguminosae.

Woolly. Clothed with long matted hairs.

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