Mark Griswold Wilson, Horticulturist

ST JOHNS LANDFILL
COVER VEGETATION PLAN

SHRUB TEST PLOT REPORT

(FES Contract Amendment #3: Tasks 1, 2, & 3)

Submitted by:

Mark G. Wilson
Horticulture and Environmental Restoration
980 Southwest Broadway Drive
Portland, Oregon 97201

and

Leslie Tose
Landscape Restoration
16428 Northwest Rock Creek Road
Portland, Oregon 97231

March 1993

FES 453

ST JOHNS LANDFILL VEGETATION MANAGEMENT PLAN
SHRUB TEST PLOT ESTABLISHMENT REPORT
FES Contract Amendment #3: Tasks 1, 2, & 3)
January through March 1993

PROJECT OVERVIEW

The establishment of shrub test plots and a bioswale test plot was recommended in the St Johns Landfill Cover Vegetation Management Plan prepared for METRO by the Fishman Environmental Services Design Team in August 1992. The planting of shrubs/small trees will, if successful, increase both the structural and species diversity of proposed vegetation on the capped portion of the landfill. The shrub test plot consists of three linear transects (T-1, 2, & 3) designed to: measure the effect of landscape position on plant survival and determine the most successful and least cost method of plant propagation. The bioswale test plot (T-4) was designed to determine whether plantings of herbaceous and woody plants could provide low cost slope stabilization and treatment of surface water runoff.

During the late fall of 1992, Mark Wilson and Leslie Tose assessed the availability of six native shrub and small tree species for planting as both nursery grown containers and as propagules in the four shrub test plots [See As-Built Drawing submitted to METRO in January 1993]. The following species were ordered as nursery containers or collected as propagules and then planted within the four test plots:

Species Name - Code/Common Name

Amelanchier alnifolia -AMal (Western Serviceberry)
Rosa nutkana -ROnu (Nootka Rose)
Salix scouleriana -SAsc (Scouler's Willow)
Sambucus cerulea -SA (Blue Elderberry)
Sambucus racemosa -SA (Red Elderberry)
Symphoricarpos albus -SYal (Snowberry)

All propagule collection and planting was done by volunteers supervised by Mark Wilson (MGW), Leslie Tose (LT) and Jim Morgan (METRO).

WOODY PLANT ACQUISITION

Purchased plant materials were supplied as either one gallon size containers or 1 to 3 foot bare root nurserystock from two Oregon native plant nurseries. Stem and root cutting propagules from pre-identified wild stock were collected January 30th through February 12th, 1993. (Propagule species identification keys, collection locations, and methodology are listed in the APPENDIX.) After collection all stem cuttings were refrigerated at temperatures between 35-40 degrees (F) and plants harvested for root cuttings were divided and stored in damp peat moss until time for planting.

PLANTING

Several days prior to planting MGW & LT marked all planting locations with survey tape and flagging. One day prior to planting all ***Rosa nutkana*** **(Nootka Rose)** stem cuttings were soaked overnight in a solution of Root-tone in order to encourage root formation. On February 13, 1993 volunteers planted three shrub test plots and initiated plantings in the fourth (the bioswale test plot). On March 3, 1993 the plantings in the bioswale area were completed by MGW, LT, and Jim Morgan. A table illustrating plant species identification codes, color of identification flagging, and number of each type of propagule planted is shown in Figure #1.

PLANT PROTECTION RECOMMENDATIONS

As some or all of the woody shrub & trees could possibly be browsed on by deer or eaten by other mammals temporary plant protection is recommended. The shrub transects (T-1,2, & 3) can be easily covered with either Ree-may, a spun polyester row crop cover or 1/2" mesh bird netting. Either product should be firmly secured to the ground on the outside edge of the plantings. The bioswale test plot plantings will be more difficult to protect. Because a minimum monetary investment of a few purchased plants have been planted in this area, this area could be left unprotected to measure browsing levels or a deep mulch of cereal grain straw could be laid to provide some minimal protection at low cost. Ree-may will provide greater protection but will be difficult to secure. Both Ree-may and bird netting are available from the following wholesale nursery supply companies in the Portland metro area: Teufels, Inc./Portland/(503) 646 1111; Nurseryman's Supply/ Boring, OR/(503) 663 0307; OBC Northwest/Canby, OR/(1-800) 477 4744.

FIGURE 1

SHRUB TEST PLOTS

Transect #1 (T-1)		
Species Code	Color ID*	Total Number/Type of Propagule
ROnu	**Red flag**	**22 one gallon containers 44 Stem cuttings**
SYal	**Yellow flag**	**22 one gallon containers 44 root cuttings**
Transect #2 (T-2)		
Species Code	Color ID*	Total Number/Type of Propagule
AMal	**Red flag**	**44 bare root seedlings**
SAsc	**Blue flag**	**22 bare root seedlings 44 stem cuttings**
Transect #3 (T-3)		
Species Code	Color ID*	Total Number/Type of Propagule
ROnu	**Red flag**	**13 one gallon containers 26 stem cuttings**
SAsc	**Blue flag**	**26 stem cuttings**
SYal	**Blue flag**	**13 one gallon containers**
* Colored identification flagging is located on transect line. Two cuttings and one container or bare root plant are planted approximately two feet on either side of flag.		

BIOSWALE TEST PLOT

Transect #4 (T-4)		
Species Code	Color ID	Total Number/Type of Propagule
AMal	**Yellow tape**	**6 one gallon containers**
ROnu	**Red flag**	**15 one gallon containers 80 stem cuttings**
SA	**Pink tape**	**50 stem cuttings**
SAsc	**Blue flag or tape**	**6 bare root seedlings 20 stem cuttings**
SYal	**Green tape**	**15 one gallon containers 50 root cuttings**

APPENDIX

1. **Propagule Collection Guidelines.**

2. **Collection Sites.**

3. **Western Oregon Native Trees & Shrubs able to be Propagated by Stem Cuttings.**

4. **Winter Twigs: A Key to Deciduous Trees & Shrubs of Northwestern Oregon and Western Washington.**

5. **Key to Winter Twigs of Deciduous Trees & Shrubs at Mount Pisgah Arboretum, Eugene, Oregon.**

ST. JOHNS LANDFILL SHRUB TEST PLOTS

PROPAGULE COLLECTION GUIDELINES

Listed below are several recommendations about where to find productive sites for propagation wood collection..

1. Start at your project site and work outward in your search for suitable collection material.

2. Generally, areas on the urban/rural interface at transition zones of human activity are the most productive. Look near industrial area margins, along railroad tracks and roadsides, under powerlines and in recent clearcuts, or anyplace with recent or regular disturbance. These places are often mowed, cleared, or brushed out for maintenance purposes. Young, vigorous sucker growth is best propagation wood; with a little searching it is possible to find sites where your work has been done for you. Also beavers, cows and other browsers, in moderation, can encourage sucker growth. Check along fence line hedgerows and waterways in pastures.

3. By far the MOST productive type of site, one that would be good for providing large numbers of long cuttings, is a clearcut unit that has been brushed out annually a season or two prior.

4. Think ahead: if you find a mature stand of a suitable plant that you know would sucker well, prune or cut to stimulate growth for the next season.

5. A word on protocol. **DO CONTACT PROPERTY OWNERS PRIOR TO COLLECTING.** If there isn't a house on the property, a visit to the tax assessor's office may be in order. Timber companies will issue a collection permit. **BE DISCREET:** prune, don't ravage. **CLEAN UP:** scatter your trimmings.

COLLECTION SITES

The following contains the specific sites where the propagule materials were collected for the St. John's Landfill Shrub Test Plots. While these are exact sites, there are many potentially productive sites in the Portland Metro Area.

Species locations are keyed to map numbers in the Portland Metro Area "Thomas Guide" (1993 Edition).

Site 1: **Thomas Guide Map No. 534, square C-1**
Species:
Salix scouleriana
Sambucus racemosa and cerulea

54 acres close to intersection of NW Beck Road with NW Skyline Blvd. As of January, 1993, ownership by Longview Fibre with sale pending. Depending on development activities, this could be a good source for a couple of years.

Contact persons at Longview Fibre:
Bob Roth, (206) 425-1550 ext. 4177
Larry Hurley, (206) 397-6689, or (206) 397-6682

Site 2: **Thomas Guide Map No. 534, square H-2**
Species:
Salix scouleriana
Rosa gymnocarpa

640 acre parcel, accessible off McNamee Road. There is a turnoff with a gate on the left before the powerline. Owned by Hampton Wood Products. Cuttings area limited to approximately 1 acre adjacent to powerline on either side of the access road. In the fall of 1992, this entire unit was sprayed for brush removal; the small area identified for this project was missed. Within a couple of years, however, this entire area could be a great source of upland cuttings from a variety of species, easily accessible off of Highway 30.

Contact person at Hampton:
Dennis Creel, (503) 876-2322

Site 3: **Thomas Guide Map No. 534 and No. 535, squared J-3 and A-4**
Species:
Rosa nutkana

On the river side of Highway 30, between the Sauvie's Island Bridge and Burlington, there are patches of *Rosa nutkana*. Spot them as you drive; watch for the red blush in the twigs during the leafless season.

Oxbow

Collection Sites, continued

Site 4: **Thomas Guide Map No. 535, square G-2**
Species:
Symphoricarpos albus
Sambucus recemosa

Kelly Point Park; cuttings area is approximately 3 acres along the main access road. Plentiful understory of snowberry and red elderberry. Drive down to the end of the main access road; park and walk back. Plants visible along both sides of the road.

Contact person at East Delta Park:
Lance Wright: 823-6343

Site 5: **Thomas Guide Map No. 535, square H-7**
Species:
Salix lasiandra
Salix fluviatilis

St. Johns Landfill. Much appropriate cutting material. Also observed *Cornus stolonifera*; it would need to be cleared a season prior to be a good source of cuttings.

Site 6: **Not keyed to Thomas Guide. Cornelius Pass roadside, between the intersection of NW Skyline Blvd. and south to where Cornelius Pass crosses West Union Road. Also, 185th, between Germantown and West Union.**
Species:
Rosa nutkana
Rosa pisocarpa

This stretch of Cornelius Pass is a productive one for roses. Regular butchering by road crews and the presence of ditch water and Rock Creek make this an area with some good spots.

Site 7: **Thomas Guide Map No. 535, between H-7 and G-2**
Species:
Salix sitchensis

Lombard Avenue, Rivergate Industrial Complex. On either side of the road is a stand of *Salix sitchensis*, 1/2 acre or so in size, fairly juvenile. These could be "pruned" to become more productive.

WESTERN OREGON NATIVE TREES & SHRUBS ABLE TO BE PROPAGATED BY STEM CUTTING:

Due to the mild winters west of the Cascades the practice of direct fall or early spring planting of dormant stem cuttings is a low cost method of growing some species of deciduous plants collected from local sources. The following species indigenous to the Willamette valley are easily grown from stem cuttings collected during the winter dormant season:

OVERSTORY TREES

Populus balsamifera (Black Cottonwood)
Salix spp. (Willows)

UNDERSTORY TREES & SHRUBS

Cornus stolonifera (Red Osier Dogwood)
Lonicera involucrata (Twinberry)
Ribies spp. (Currant, Gooseberry)
Rosa spp. (Wild Roses)
Rubus spp. (Trailing Blackberry, Thimbleberry, Salmonberry)
Sambucus cerulea & S. racemosa (Elderberry)
Spiraea douglasii (Hardhack)
Symphoricarpos albus (Snowberry)

Stem cuttings, continued

Acquisition of Hardwood Cuttings:

If collecting and planting in the fall, wait until after several hard frosts or until mid December to insure that plants have been adequately chilled before collecting propagation stock. Most years the winter dormant season extends from mid December until late January. Cuttings should not be gathered if temperatures are below 32 degrees. Cutting stock gathered for same day planting should be protected from sun, wind, freezing, drying or injury before or during planting. Select propagation brush from healthy, moderately vigorous one to three year old wood on plants growing in full sunlight. Discard the tip portion (1-4 inches) of shoots as it is generally not suitable cutting wood. Cut brush into 1-2' lengths making the basal (bottom) cut straight and just below a dormant bud and the top cut on a slant 1/2 inch to 1 inch above a dormant bud. The diameter of pieces reserved for planting should not be less than 1/4" and not greater than 3/4" and each piece should contain a minimum of two dormant buds for each foot of length. If waiting until spring to plant out wrap trimmed cuttings in heavy paper or plastic with slightly damp sterile potting soil and store at 32-40 degrees (F) until planting. Stored material should be examined frequently for signs of disease and planted before dormant bud development.

Planting Hardwood Cuttings:

If placing cuttings directly in a permanent location, first remove all herbaceous vegetation in a one foot circle down to mineral soil. Then use a dibble of a diameter slightly smaller than the cutting to prepare a pilot hole in the bare soil. Insert the prepared cutting slant end (top) up into the hole deeply enough so that just one dormant bud shows above the ground. Care should be taken so as not to reverse the polarity of the cutting. Firm soil around the cutting with fingers or heel of your foot. Water as needed during the first growing season (May through September). If placing cuttings in a nursery container for planting out at a later date, hold the cutting on the bottom of a deep container such as a 1' deep tree tube while back filling with a mix of weed free native soil and well drained potting mix. Water as required until out planting. Expect a survival rate of between 50-80% at the end of the first growing season.

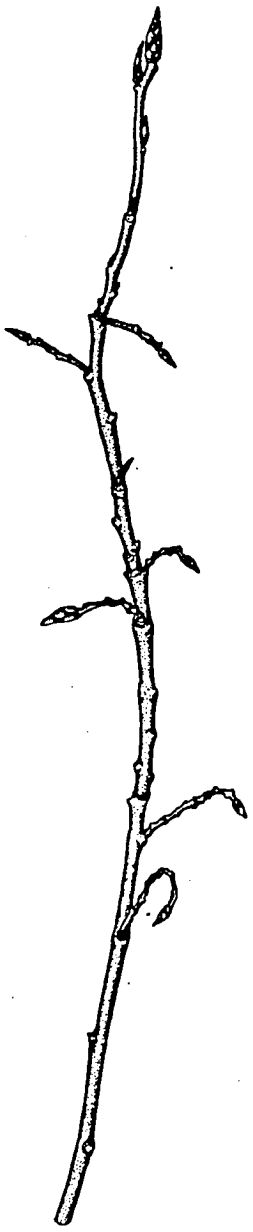
A wintertime key to deciduous trees and shrubs of northwestern Oregon and western Washington

Plates I-XIV, inclusive by
Patricia L. Packard

Other drawings by
Helen M. Gilkey

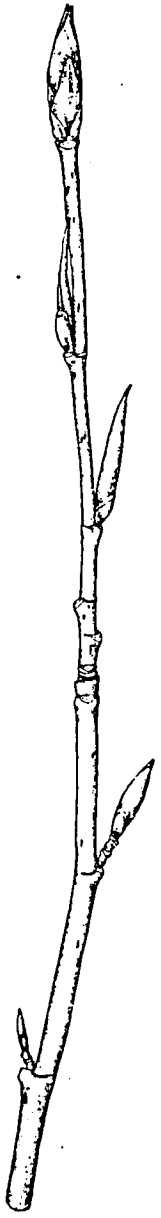
OREGON STATE UNIVERSITY PRESS
Corvallis,
Oregon

Winter Twigs



by
HELEN M. GILKEY
PATRICIA L. PACKARD

Characters Used in Identification



Twigs and Buds

A twig is a terminal portion of a main stem or a branch, and constitutes the growth of from one year to several years. Typically, at the tip, a twig bears a *terminal bud* (exceptions will be noted later); while on the sides of the twig are borne the *lateral buds*. The place on the stem where a typical lateral bud is located is called a *node*, the portion of stem between any two nodes being an *internode*.

Functionally, the buds of woody plants are of two main kinds commonly called *leaf buds* and *flower buds*. The term "leaf bud" is somewhat of a misnomer since it produces not a leaf alone, but a leafy twig (shoot) similar to the one which bore it. Thus the leaf bud contains rudiments of both leaves and stem.

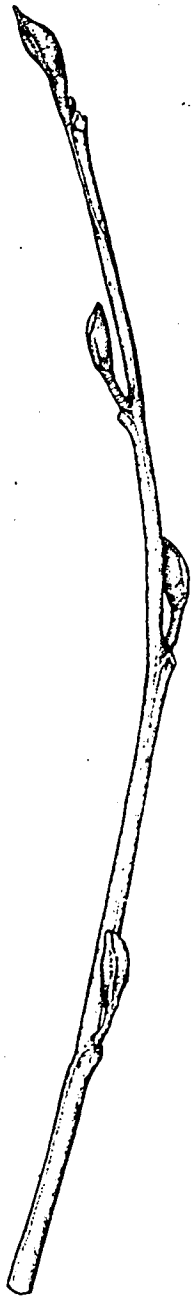
Positionally, a leaf bud may be *terminal* or *lateral* on the stem. A twig's annual increase in length normally originates with a terminal leaf bud formed at the close of the preceding growing season; while its branches develop from last year's lateral leaf buds. Thus a branch is usually a year younger than its parent shoot. In exceptional cases, however, of which Chittim (*Rhamnus purshiana*) is one, an occasional branch may grow from the axil of a rudimentary leaf *within* the terminal bud, the shoot and its branch therefore developing concurrently.

A *flower bud* contains an embryonic flower or inflorescence and, consequently, fruit; and here, too, a portion of stem is involved. Flower buds, also, may be either terminal or lateral or both.

A third kind of bud, which in reality is a composite of the other two, is sometimes found. This is the *mixed bud*, which bears rudiments of both leaves and flowers, as well as stem. An example is the large terminal bud of Big-leaf Maple (*Acer macrophyllum*) from which emerges a raceme of flowers and a short leafy continuation of the stem.

During the course of typical growth in woody plants when, by the end of a season, a terminal bud has been formed, increase in length of that twig for the current year automatically stops,—sealed off, as it were, by the presence

of the bud. This is called *determinate growth*. In certain trees and shrubs, however, notably Willow (*Salix*) and Western Huckleberry (*Vaccinium*), growth in length continues as long as conditions remain favorable. When these cease, no terminal bud is formed but the twig dies back at the tip, leaving no heir, so to speak, to carry on the following season's extension. Because of its indefiniteness, such growth is labeled *indeterminate*. Often the stem dies back to the nearest lateral bud, breaking off at that point and leaving either a recognizable stem scar or merely a withered remnant. The involved lateral bud typically assumes the function of the nonexistent terminal bud, carrying on, during the subsequent growing season, a pseudo-continuation of the twig. But the stem scar or remnant reveals what actually occurred, as does a generally obvious misalignment of the twig at this point.

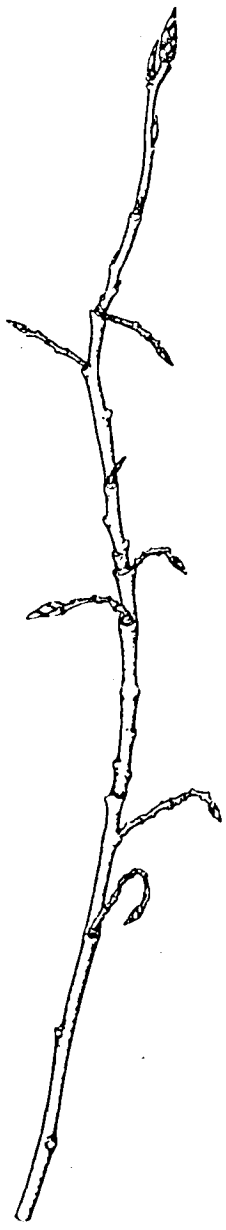


Leaf Scars and Bundle Scars

Leaf and bundle scars provide valuable data for winter identification of deciduous trees and shrubs; and it is logical, therefore, before discussing these, to consider briefly the organ which forms them.

A typical leaf consists of three component parts, namely: (1) a generally expanded portion called the *blade*; (2) a stalk known as the *petiole*; and (3) subtending the base of the petiole, a pair of usually small structures, the *stipules*. Of these, the stipules are generally the least conspicuous, though in cases—for example, certain willows and many members of the rose family—they are in evidence. Very rarely, but never in the native woody plants of our area, they predominate and take over the function of the blade. More frequently the stipules are absent or minute.

The petiole may be present or absent. If no petiole is present, the leaf is described as *sessile*. The blade in different species varies greatly in form; but whatever its shape, it is generally to some extent expanded and thus adapted to carry on its function of manufacturing food, in the most favorable exposure to sunlight. In exceptional cases the blade may be suppressed, the petiole substituting for it. Examples are the co-called simple-leaved acacias which are grown, particularly southward, as ornamentals. Again, however, this



condition is not found in native trees or shrubs of our area.

Leaf blades may be simple (undivided) or compound (divided into leaflets); but since this condition will have little to do with winter identification of twigs, it needs no further discussion here.

In winter, beneath a lateral bud at each node is found a *leaf scar.* Perhaps as good a definition as any for this structure was once written in an examination paper by a freshman: "A leaf scar is a scar that a leaf leaves when the leaf falls off in the fall." Whether this was composed innocently or by design, the instructor will never know, but at least it expresses the situation. A lateral bud is developed in the axil of a leaf. When the growing season approaches its end in late summer, a thin layer of more or less brittle cells, the *absciss layer,* is formed across the base of the leaf in the area of its attachment to the stem. Here the leaf naturally becomes detached, leaving on the stem below the bud a generally clean-cut scar shaped like the base of the petiole (or of the blade, in case of a sessile leaf). Sometimes a lesser scar can be seen at each side of the leaf scar. This pair of scars remains after falling of the stipules. In some cases, however, the stipules are merged with the petiole base, and thus leave no separate scars. Examples are found in many members of the rose family.

Within the leaf scar are usually to be seen scars of the leaf veins where they became detached from the food-and-water distributing system of the stem. These scars, called *bundle scars,* occur generally in the form of slightly raised dots or bars, and their number is often specific for a given species. The leaf scars of many species contain respectively 3, 5, or 7 bundle scars arranged in a more or less curved line. In most cases the bundle scar is simple; but in others, at least the central scar is compound; while in still others, the bundle scars may be indefinite in number and variously arranged.

Sometimes the bundle scars are obscured by the shriveling of the leaf scar, or by the presence of a ragged margin, the latter due to an incomplete formation of the absciss layer, or to complications involved in the presence of a secondary absciss layer. In such case, the scar may not be clean-cut. Examples are found in the genus *Rubus* which includes blackberry, thimbleberry, salmonberry, and related species. In these cases, a thin slice of tissue should be removed by a razor, to expose the bundle scars.

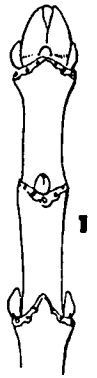
Arrangement of Buds

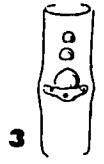
In respect to arrangement, lateral buds may be *opposite* or *alternate. Opposite buds* occur in pairs at a node, half the circumference of the stem apart, each succeeding pair occurring at right angles to the one below (1).

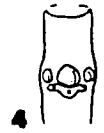
Alternate buds are arranged spirally around the stem (2), with a single primary axillary bud at the node. (The alternate arrangement is sometimes also called *spiral.*)

Since each primary lateral bud is borne above a leaf scar, it is obvious that the leaves carried the same arrangement—that is, opposite or alternate. A third arrangement, which occasionally occurs in woody plants, shows several buds forming a circle at each node. This is called the *whorled* arrangement, but since it does not occur in native trees or shrubs of our area, it will not be discussed further here.

Alternately arranged lateral buds generally occur singly at a node. But in certain species with either alternate or opposite arrangement, extra buds (*accessory* or *supernumerary*) are sometimes found at a node. These may be *superposed* (above the primary bud) (3) or *laterally multiple* (in horizontal line with it) (4). Both arrangements sometimes occur in Elder.







Bud Scales and Bud Scars

The leaf and flower rudiments in a bud may be protected by scales, in which case we find a *scaly bud*; or, if scales are absent and the young leaves or flowers are apparent from the first, the bud is termed *naked.* Naked buds are less common in temperate regions, but are present in Chittim (*Rhamnus purshiana*) and Poison Oak (*Rhus diversiloba*) in our area.

In the currants and gooseberries (*Ribes*), in most of our native woody Rosaceous plants, and in our maples (*Acer*), the bud scales are modified petioles, frequently bearing leaf-blade rudiments at their tips. Stipular scales are found in native species of *Ceanothus;* while the scales of Alder (*Alnus*) are entire leaf blades, retaining their identity in spite of extreme modification in structure. There is often successive transition from outer modified to inner unmodified leaves, as in *Acer macrophyllum.*

Obviously, due to their origin, bud scales follow the

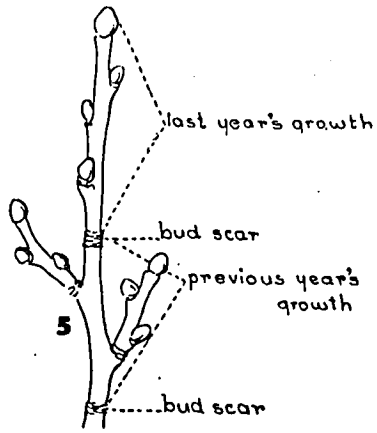
same arrangement, in any given plant, as the foliage leaves. That is, bud scales of opposite-leaved plants, such as the maples, are paired and opposite; while those of alternate-leaved Hazel, for example, are single and alternate. Extreme suppression of internodes in most buds often obscures the true arrangement, and it can be ascertained only by close examination.

Since, as we have seen, bud scales are modified leaves or parts of leaves, primitively they may bear buds in their axils. This function has been retained in some native species of *Rubus, Acer, Sambucus,* and other genera; but such buds generally remain rudimentary.

A few trees—for example, willows—appear to have a single scale covering each bud. In most trees, however, several to many scales are present, the outer often thick and stiff, sometimes gummy; the inner scales becoming progressively softer, and often hairy or woolly. The scales protect the delicate rudimentary structures primarily from loss of water by evaporation; also, perhaps, but to a lesser degree, from mechanical injury or from sudden sharp changes in temperature.

In most cases, as in our maples, the inner scales develop for a time with the shoot, often reaching an inch or more in length before finally falling. Such scales are said to be *accrescent.*

After bud scales have served their purpose, they generally become detached and drop off, leaving usually cleanly-marked scars; though, in some cases, remnants of scales may remain for several years. Since the buds of most species are protected by several scales which occur in close proximity to each other, with practically no internodal elongation between them, the scars appear grouped; and since each group represents a single bud, it is called a *bud scar.* The term is of course somewhat erroneous because merely the scales, not the bud proper, became detached. But through long usage the term has become accepted, for want of a better.



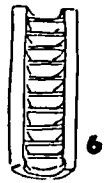
5

Since the location of each so-called bud scar indicates

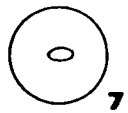
the beginning of the following season's growth, it is obvious that the age in years of most twigs can be determined by the number of growth intervals separated by bud scars (5). In those woody plants which produce no terminal bud, there is of course no terminal bud scar, and age determination by this means is impossible. An example is Willow; but here the annual *stem scar,* usually accompanied by a misalignment of the twig at the beginning of each new season's growth, is a usable substitute.

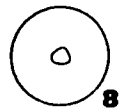
The Pith

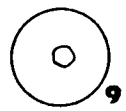
Characters of the pith are useful in identification. In Alder, for instance, the pith of the twig is very large in comparison with the wood. In Indian Peach (*Osmaronia cerasiformis*), a longitudinal section of the stem reveals a somewhat rare arrangement of the pith in parallel plates. Such a pith is designated *lamellate* or *chambered* (6). The pith of the currants and gooseberries, while not regularly lamellate, often contains noticeable spongy areas.

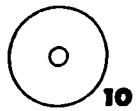

6

The shape of the pith in cross-section likewise is useful. It may be oval (7); 3-angled (8); 5-angled (9) or more; round (10); or obscure. In determining pith shape, a stem must be cut cleanly across, and examined by aid of a hand lens. A useful method is to make a thin cross-sectional slice of the stem, and to place it on a dark background for examination by the lens.


7


8


9


10

Phyllotaxy

The arrangement of leaves, and consequently of leaf scars, on the twig is known as *phyllotaxy.* It is constant for each species and usually, also, for all species of a genus. The phyllotaxy of opposite-leaved plants is uniformly *decussate,* the plane of each pair being at right angles to the plane of the pair immediately above or below, bringing the leaf scars into four vertical ranks.

Alternate leaves are arranged spirally on the twig. A line drawn from one leaf scar to those successively above or below, will spiral around the stem, any two leaf scars being separated from each other by an equal portion of the circum-

ference of the stem. This is not always obvious, since most stems twist to some degree while growing.

The two-ranked arrangement most widely distributes the leaves, the second scar being on the opposite side of the stem from the first, the third directly in line with the first. In this case, the phyllotaxy is written as $\frac{1}{2}$, expressing the arc or portion of the circumference between two successive leaf scars. Also, the numerator equals the number of turns made around the stem by one cycle of leaf scars (one turn in this case); while the denominator expresses the number of leaf scars in each cycle, which is synonymous with the number of ranks on the stem. No woody plants in our area have this natural two-ranked arrangement; but the horizontal branches of Hazel (*Corylus*), by twisting of the stem to obtain full benefit of the sun on its foliage, often assume a two-ranked position.

Alder (*Alnus*) is three-ranked, one cycle of leaf scars containing three members and making one turn around the stem, the phyllotaxy thus expressed as $\frac{1}{3}$. The most common arrangement is five-ranked, each cycle containing five members and making two complete turns around the stem, the phyllotaxy thus expressed as 2/5. In this case, the arc between any two successive leaf scars is two-fifths the circumference of the stem, and the sixth leaf scar is in line with the first.

Description of the Key

The Diagnostic Key which follows is a device used to determine the scientific name of each tree and shrub included in this manual, and is based on comparisons of characters which can be seen in winter. The scientific name of a plant is a *binomial*, i.e. it consists of two words as *Rhus diversiloba* (p. 13). The first word of each binomial is the *genus* (plural, *genera*) and always begins with a capital letter. The second word (*diversiloba*, in this case) is the *species* (this word is both singular and plural) and, as used by most authors, is never capitalized. (Note: Certain exceptions are permitted, but not required, by current international botanical rules.)

Since, unlike scientific names, common names are subject to no rules and hence may vary from one locality to another, they are disregarded in the Key; but at least one common name for each species is included in the text.

It will be noted that when more than one species in a given genus is included, a twig is keyed first to the genus which is capitalized throughout. Example, CEANOTHUS, (p. 13). Immediately following this, the Key is extended to species, with the generic name merely initialed, thus: *C. integerrimus* and *C. sanguineus*.

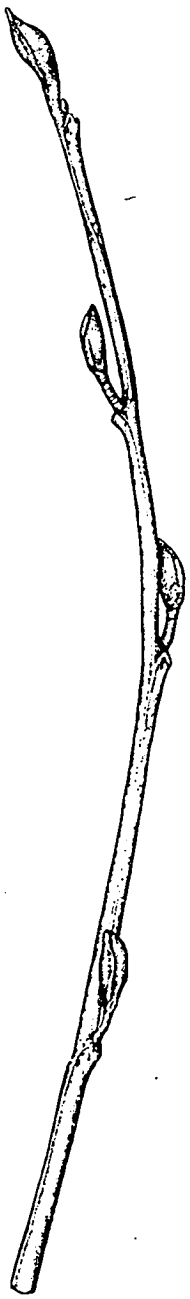
The occasional parenthetical numbers found within the body of the Key and in preceding pages of the introduction, refer to correspondingly numbered marginal illustrations.

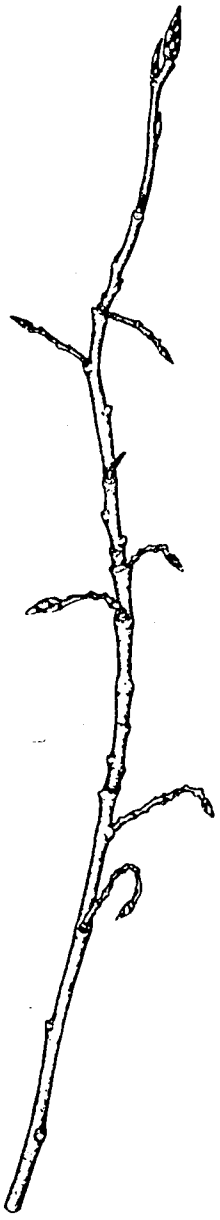
Following the Diagnostic Key, the species are catalogued under families and genera, and described in detail in winter aspect. Below the accepted name of each is cited the publication in which it first appeared, together with other names (*synonyms*) which it may have received. These synonyms, now rejected, arose through differences in interpretation of species boundaries, or as a result of different conclusions reached by various taxonomists working independently of each other.

How to Use the Key

The Diagnostic Key, for determination of the genera and species of trees and shrubs included in this manual, is based on comparisons of plant characters. As will be noted, each character used is paired with its opposing character, as *a* and *b* under, in each case, the same number, thus: 1a Leaf scars alternate, 1b Leaf scars opposite; 2a Buds naked, 2b Buds scaly; etc.

Now, with a twig before you, first note the arrangement of leaf scars. If they are alternate (check this term with its definition in the glossary), then pass to number 2. If the bud is enclosed within scales, it belongs under 2b. The first number under 2b is 4, and you must here decide whether the buds are (4a) *stalked* and with *continuous dense* pith, or (4b) *sessile* (or, if stalked, with *spongy* pith). If stalked and with dense pith, pass to 5. Granted that no errors have been made up to this point, the pith in cross-section will be either *round* (5a) or *3-armed* or *3-angled* (5b). (The determination of this character may require careful sectioning and examination.) If the pith is unmistakably round in cross-section, your tree or shrub should, according to the





Key, belong to the genus *Ceanothus*; and, by comparing 6a and 6b, you may identify it as to species.

In order to verify your conclusion, now turn to the description of *Ceanothus* and its species, and read each carefully. If an error appears to have been made and your plant does not agree with the description, go back to the beginning and retrace each step. In most choices, as between *leaves alternate* and *leaves opposite*, there is no possibility of error. But certain characters may appear somewhat obscure as, for example, in 4a and 4b. A bud may be so very short-stalked that with almost equal accuracy it may be termed sessile; or, if there is no question on this point, the texture of the pith may offer difficulties of interpretation. In a case of uncertainity such as this, it is of value to continue further in the Key, under both 4a and 4b, before drawing a conclusion.

Briefly, then, the procedure in using the Key is this: Begin at the beginning. Reconcile your plant with either 1a or 1b. Under the appropriate choice, pass to the next figure and again choose between *a* and *b*. Continue this process until the plant is satisfactorily placed. The process may very quickly lead to the correct name, as in *Rhus diversiloba;* or arrival at the name may involve the entire key, as in *Cornus occidentalis*.

It must be borne in mind that the accompanying Key includes only *native* or commonly naturalized trees and shrubs of the prescribed region. Attempted identification, by this Key, of ornamental or economic species which have not "run wild" could lead to strange and disappointing results. Also, species which have become naturalized in strictly localized areas may not be included.

It is hoped that with care in examination of the specimens to be identified, and with free use of the glossary and illustrations, even the beginner may be able to name most of the common deciduous trees and shrubs of northwestern Oregon and western Washington.

The Diagnostic Key

(Numbers in parentheses refer to marginal illustrations.)

Page

14a. Buds globose, sessile, often appearing 2-ranked on horizontal branches; scales papery, brown.....*Corylus cornuta* 27

14b. Buds not as above, and never appearing 2-ranked

15a. Bundle scars more than 7

16a. Shrub, densely spiny; bundle scars in a single series *Oplopanax horridum* 76

16b. Tree, or rarely shrubby; bundle scars obscure, grouped ..... QUERCUS 27

17a. Bud scales glabrate.....*Q. kelloggii* 28

17b. Bud scales downy.....*Q. garryana* 27

15b. Bundle scars 7 or fewer, sometimes indistinguishable on shriveled leaf scars

18a. Bundle scar 1 (See page 15 for 18b)

19a. Bark of older twigs exfoliating in long thread-like shreds

20a. Leaf scar often torn, the bundle scar projecting; twigs glabrous *Cladothamnus pyrolaeflorus* 78

20b. Leaf scar clean, bundle scar flush with surface; twigs minutely tomentose, and with scattered stalked glands.....*Menziesia ferruginea* 79

19b. Bark of older twigs not long-shreddy but, in *Spiraea*, sometimes exfoliating by thin plates

21a. Leaf scars not sharply triangular, slightly raised..... VACCINIUM 79

22a. Twigs sharply winged or angled

23a. Stems winged

24a. Buds pointed, their tips diverging (16); shrub 4 to 12 ft.; coastal, or at low altitudes in the Coast Range and Cascade Mountains *V. parvifolium* 83

24b. Buds appressed (17); shrub ½ to 1½ ft., diffusely branched; medium to high altitudes in the Cascade Mountains.....*V. scoparium* 83

23b. Stems sharply angled, at least when young, but scarcely winged

25a. Slender shrub, 3 to 10 ft. tall; at low altitudes in the Coast Range and Cascade Mountains; dead tip of stem above the uppermost bud continuing in direction of axis, thus distinctly terminal.....*V. ovalifolium* 86

25b. Spreading shrub, 1½ to 6 ft.; at medium altitudes in the Cascade Mountains; dead tip of stem above the uppermost bud diverging from the axis, thus appearing lateral *V. membranaceum* 83

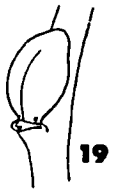
22b. Twigs angled or not, never sharply so

26a. Stems not angled; bark shreddy; shrubs of coastal and mountain bogs *V. uliginosum* 82


16


17


18


19

Page

26b. Stems more or less angled; shrubs low, rigid

27a. Buds plump, divergent (18), with several exposed scales..... *V. occidentale* 82

27b. Buds flattened, appressed (19), with only 2 exposed scales

28a. Twigs smooth; stems conspicuously, but not sharply, angled below the buds....*V. deliciosum*

28b. Twigs sometimes minutely pubescent; stems obscurely angled below the buds *V. caespitosum* 86

21b. Leaf scars sharply triangular, not raised.....SPIRAEA 40

29a. Buds, and usually twigs, puberulous.....*S. douglasii* 41

29b. Buds, and usually twigs, glabrous

30a. Stems unbranched above the ground.....*S. lucida* 40

30b. Stems freely branching.....*S. densiflora* 41

18b. Bundle scars more than 1

31a. Pith solid or lamellate, not coarsely spongy (See page 16 for 31b)

32a. Bundle scars 5

33a. Leaf scars ragged; bark shreddy *Physocarpus capitatus* 40

33b. Leaf scars not ragged; bark not shreddy SORBUS 46

34a. Shrub reaching 15 ft.; growing at medium altitudes in the Cascade Mountains....*S. sitchensis* 46

34b. Shrub typically under 7 ft.; growing at high altitudes in the Cascade Mountains *S. Occidentalis* 46

32b. Bundle scars 3, though sometimes obscure

35a. Leaf scars shriveled, on greatly raised persistent petiole bases..... RUBUS 51

36a. Stems armed with spines or prickles

37a. Shrubs with weak thickened prickles *R. spectabilis* 52

37b. Brambles and vines with well-developed, though sometimes small, prickles

38a. Stems cylindrical or nearly so

39a. Prostrate and creeping or climbing; scarcely glaucous

40a. Stems 1 to 4 ft. long; rare except in deep woods.....*R. nivalis* 60

40b. Stems reaching 12 to 18 ft.; common in open woods and thickets and along streams *R. macropetalus* 57

39b. Erect or trailing; conspicuously blue-glaucous.....*R. leucodermis* 53

38b. Stems angled or fluted

41a. Twigs fluted, maroon.....*R. procerus* 56

41b. Twigs merely angled, green or dull red.....*R. laciniatus* 57

36b. Stems unarmed with spines or prickles

42a. Stalks stout and upright.....*R. parviflorus* 52

42b. Stalks cordlike and trailing

43a. Bud scales pubescent.....*R. lasiococcus* 53

20

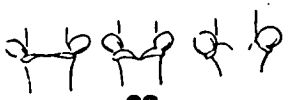
21

22

	Page
43b. Bud scales glabrous except for ciliate margins *R. pedatus*	53
35b. Leaf scars clean and visible; petiole bases deciduous, but sometimes leaving a slight ridge	
44a. Scars (from leaf) linear; bundle scars sometimes obscure ROSA	58
45a. Calyx lobes deciduous or partly so	
46a. Fruit small, pear-shaped to globose, without a neck; prickles straight, needle-like, or absent; calyx lobes completely deciduous *R. gymnocarpa*	61
46b. Fruit long urn-shaped, contracted into a neck; prickles stout, recurved; calyx lobes often only partially deciduous *R. eglanteria*	60
45b. Calyx lobes persistent	
47a. Fruit usually borne singly; not contracted into a neck *R. nutkana*	61
47b. Fruit usually borne in corymbs	
48a. Heavy prickles absent; needle-like prickles absent or present, sometimes densely so at base *R. pisocarpa*	64
48b. Heavy and needle-like prickles present *R. durandii*	64
44b. Scars (from leaf) broader than linear; bundle scars obvious	
49a. Bud scales densely pubescent	
50a. Bark shreddy *Holodiscus discolor*	44
50b. Bark not shreddy *Pyrus malus*	45
49b. Bud scales essentially glabrous	
51a. Lowermost bud scales distinctly swollen, fleshy at the base (20)	
52a. Bud scales not keeled; buds globose or nearly so *Crataegus douglasii*	51
52b. Bud scales, at least the lower, keeled; buds not globose	
53a. Stipule scars present, linear, sometimes inconspicuous PRUNUS	65
54a. Buds ovoid, ¼ to ⅜ in. long; twigs of moderate thickness *P. demissa*	65
54b. Buds narrow, conical, averaging 5/16 in. long; twigs slender *P. emarginata*	65
53b. Stipule scars absent *Pyrus fusca*	45
51b. Lowermost bud scales not swollen at the base	
55a. Pith lamellate *Osmaronia cerasiformis*	47
55b. Pith continuous *Amelanchier florida*	50
31b. Pith with sponge-like cavities, at least when dry RIBES	32
56a. Stems armed with stout or slender prickles	
57a. Nodal prickles weak and many *R. lacustre*	32
57b. Nodal prickles 1 to 3	
58a. Tip of twig glandular-pubescent; nodal prickles mostly 3-forked	
59a. Prickles at nodes slender; internodal prickles typically absent on older stems *R. lobbii*	32
59b. Prickles at nodes stout; internodal prickles usually present *R. menziesii*	33
58b. Tip of twig not glandular-pubescent; nodal prickles single, or with rudimentary laterals *R. divaricatum*	33
56b. Stems unarmed with prickles	
60a. Leaf scars large and broad, covered by a membrane *R. bracteosum*	36
60b. Leaf scars narrow	
61a. Margins of inner bud scales ciliate, not glandular *R. laxiflorum*	37
61b. Margins of inner bud scales glandular and sometimes ciliate	
62a. Buds reaching ¼ in. to ½ in.; shrubs erect, reaching 5 to 8 ft.	
63a. Growing west of the Cascade Mts. *R. sanguineum*	37
63b. Growing at medium altitudes in the Cascade Mts. *R. acerifolium*	38
62b. Buds less than ¼ in.; low shrub, widely branching, 3½ ft. or less tall *R. cereum*	38
1b. Leaf scars opposite (21)*	
64a. Vines, climbing by twining petioles and petiolules; pith somewhat obscurely 12-angled *Clematis ligusticifolia*	29
64b. Trees or shrubs; or, if vines, pith rounded, hollow	
65a. Leaf scars covered by a membrane	
66a. Bundle scars 3 *Philadelphus gordonianus*	39
66b. Bundle scars many, in a U line *Fraxinus latifolia*	87
65b. Leaf scars not covered by a membrane	
67a. Scars raised on persistent petiole bases and obscured by corky growths	
68a. Exposed bud scales 6 to 8; buds not conspicuously flattened SYMPHORICARPOS	92
69a. Erect shrub; twigs glabrous *S. albus*	92
69b. Low spreading shrub; young twigs pubescent *S. mollis*	93
68b. Exposed bud scales about 4 LONICERA	88
70a. Pith solid; erect or spreading shrubs	
71a. Erect shrub; common at the coast and on low mountains *L. involucrata*	88
71b. Spreading shrub; in our area, found only at high altitudes *L. utahensis*	88
70b. Pith hollow; vines or shrubs; buds 4-angled, divergent	
72a. Twigs glabrous *L. ciliosa*	89
72b. Twigs pubescent, at least at nodes *L. hispidula*	89
67b. Scars not greatly raised; petiole bases not persistent, though a ridge sometimes remaining	
73a. Bundle scar 1 *Euonymus occidentalis*	67
73b. Bundle scars more than 1	
74a. Pair of leaf scars meeting around stem in an ascending curve or point (22) ACER	70
75a. Exposed bud scales 2 *A. douglasii*	71
75b. Exposed bud scales more than 2	

* In Fraxinus, one bud of a pair sometimes slightly higher than the other.

		Page
76a.	Terminal bud usually absent; buds subtended by long white hairs.....*A. circinatum*	71
76b.	Terminal bud usually present; buds not subtended by hairs.....*A. macrophyllum*	70
74b.	Pair of leaf scars meeting around stem in a straight line, or a descending curve or point, or rarely not meeting (23)	
77a.	Bundle scars generally 5 or 7 (rarely 3); twigs stout, with large leaf scars.....SAMBUCUS	96
78a.	Buds diverging; upper margin of leaf scar notched *S. caerulea*	97
78b.	Buds appressed; upper margin of leaf scar entire *S. callicarpa*	97
77b.	Bundle scars 3; twigs slender; leaf scars narrow	
79a.	Scales of terminal bud more or less persistent; pubescence, when present, consisting of appressed or reflexed hairs, attached by one end.....VIBURNUM	93
80a.	Exposed bud scales 4 to 6.....*V. ellipticum*	96
80b.	Exposed bud scales 2.....*V. edule*	96
79b.	Scales of terminal bud deciduous; pubescence of twigs consisting, at least in part, of slender appressed hairs attached by their centers.....CORNUS	77
81a.	Twigs dull reddish, with predominately gray overcoating; flower buds large, button-like, naked during most of the winter.....*C. nuttallii*	77
81b.	Twigs deep lustrous red; flower buds not as described above.....*C. occidentalis*	77



Description of Plant Families, Genera, and Species

SALICACEAE

The Willows and Poplars

PLATE I-1 *Salix* L. **Willow**

Ranging from prostrate shrubs to trees, often with several trunks from the base; bark smooth at first, becoming fissured with age; twigs flexible, or fragmenting easily, slender or moderately so; bark astringent to taste, often brightly colored (red, yellow, purple, or brown, especially in late winter), often slipping off easily in an entire cylinder; cross-section round, pith 5-angled or round in older portions, white, continuous; buds appressed, sessile, solitary, with a single outer scale standing directly over the leaf scar, enclosing either floral or leaf rudiments; terminal bud absent; leaf scars alternate, narrowly C- to U-shaped, not greatly raised; bundle scars 3; stipule scars generally minute or absent; phyllotaxy 2/5.

The species of Willow are many; and the identification of individuals is rendered difficult by the wide variability within a given species, and by the apparent frequent occurrence of hybridization, with resultant intergradation. No attempt is made here, therefore, to separate species on the basis of winter characters alone. A careful observer will learn, however, to recognize a few species in the area, by noting such attributes as twig color, pubescence, degree of flexibility or ease of fragmentation, and even flower structure as revealed by dissection of the buds. These may be checked against the traditional diagnostic keys for *Salix*, in floras covering the area.

Populus L. **Poplar**

Trees; bark smooth when young, becoming fissured with age in some species; taste and odor astringent; pith 5-angled, continuous; mature buds with several pairs of exposed scales, the lowermost standing directly over the leaf scar; floral buds larger than the vegetative; terminal bud present, larger than the laterals; leaf scars alternate, raised, reniform or 3-lobed; bundle scars 3, often compound; stipule scars present.

PLATE I

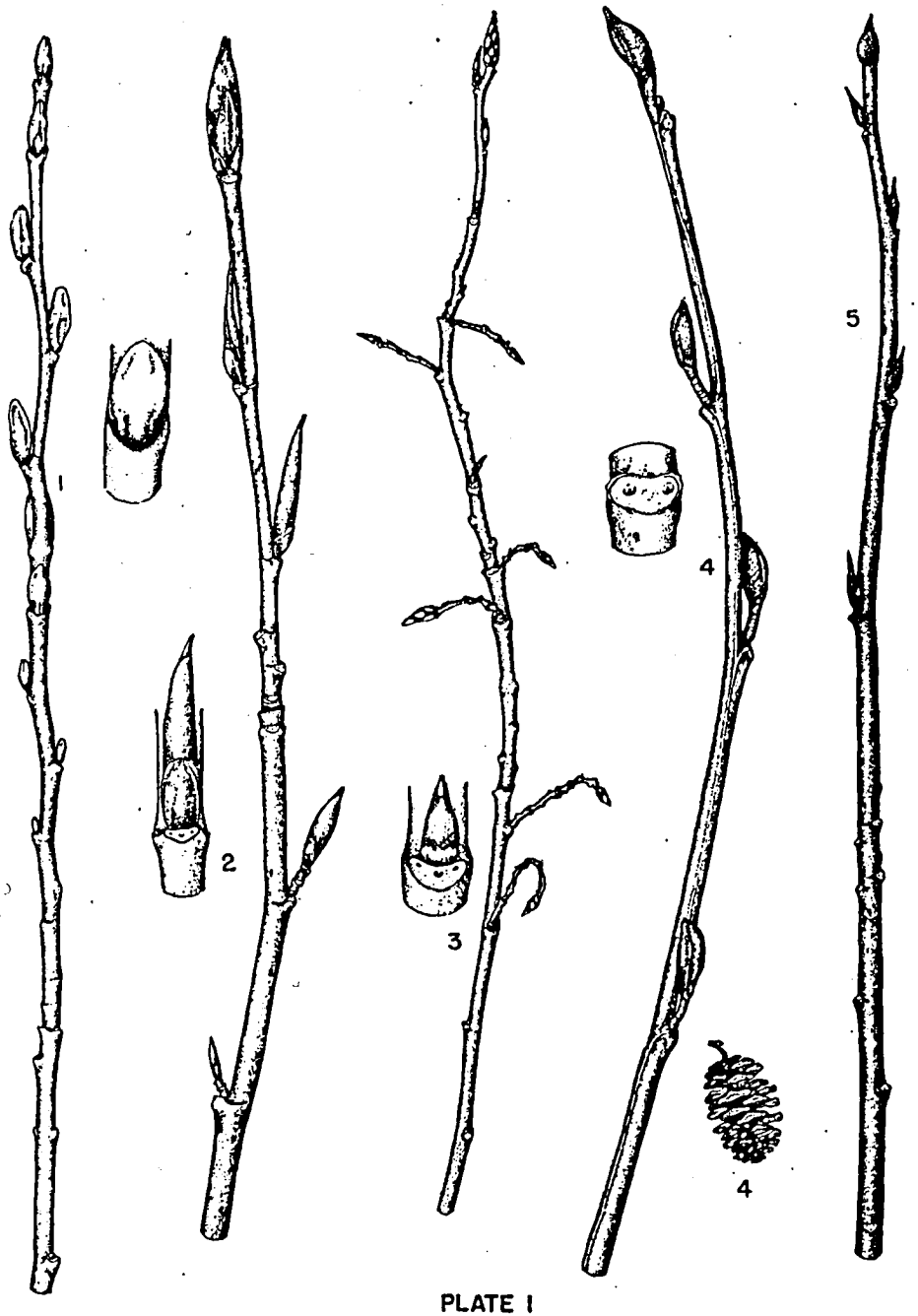


PLATE I

PLATE IV

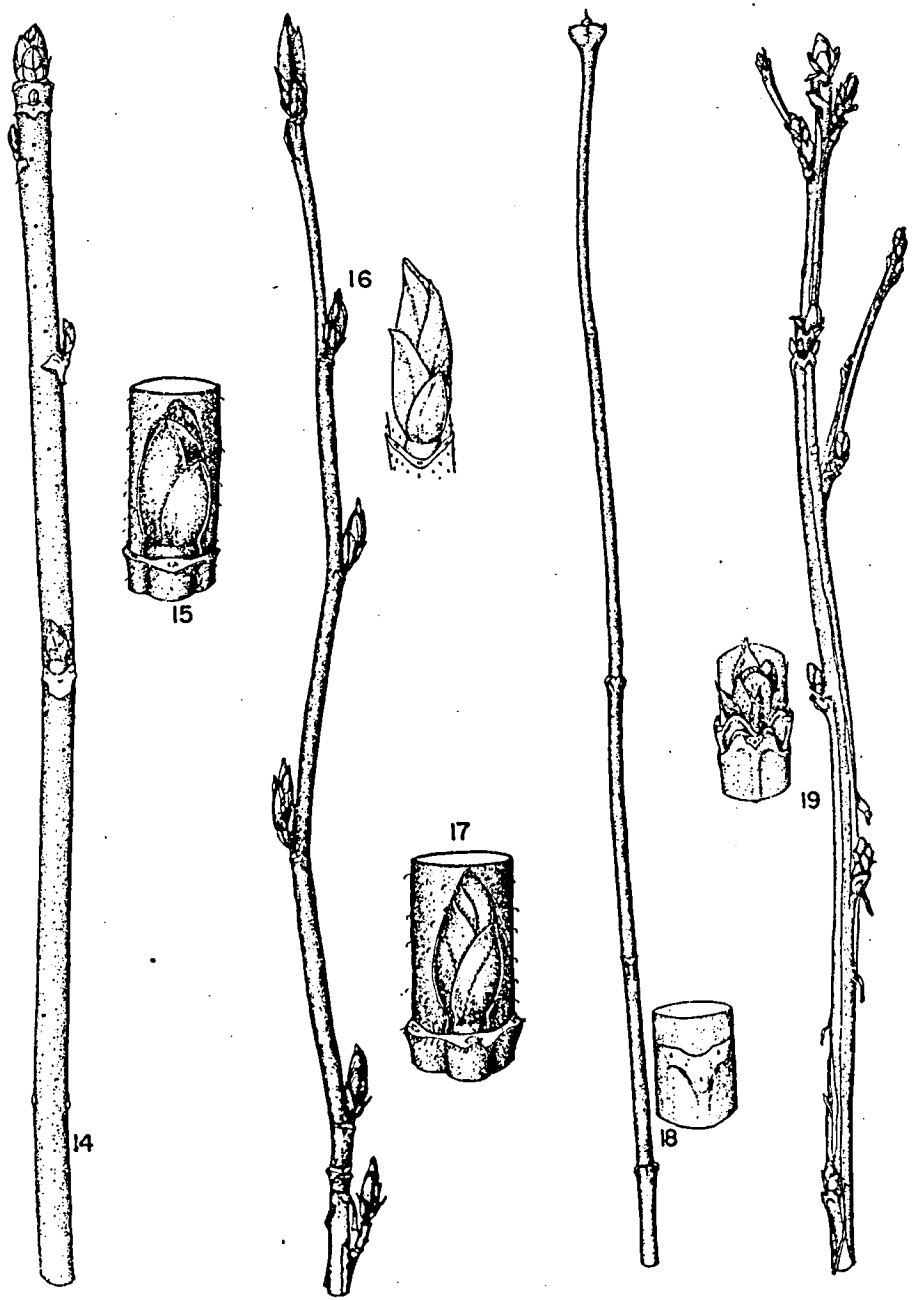


PLATE IV

PLATE VI

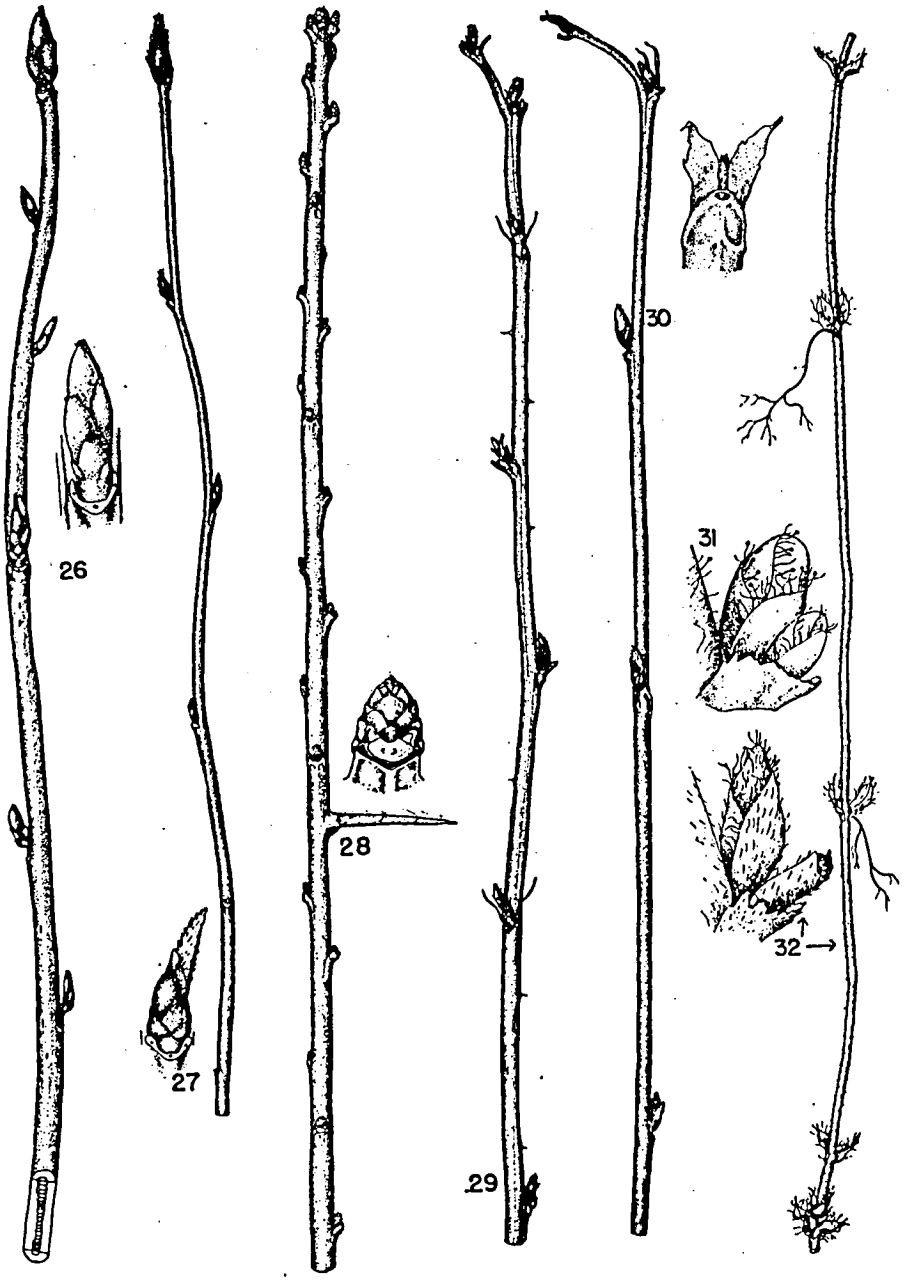


PLATE VI

PLATE V

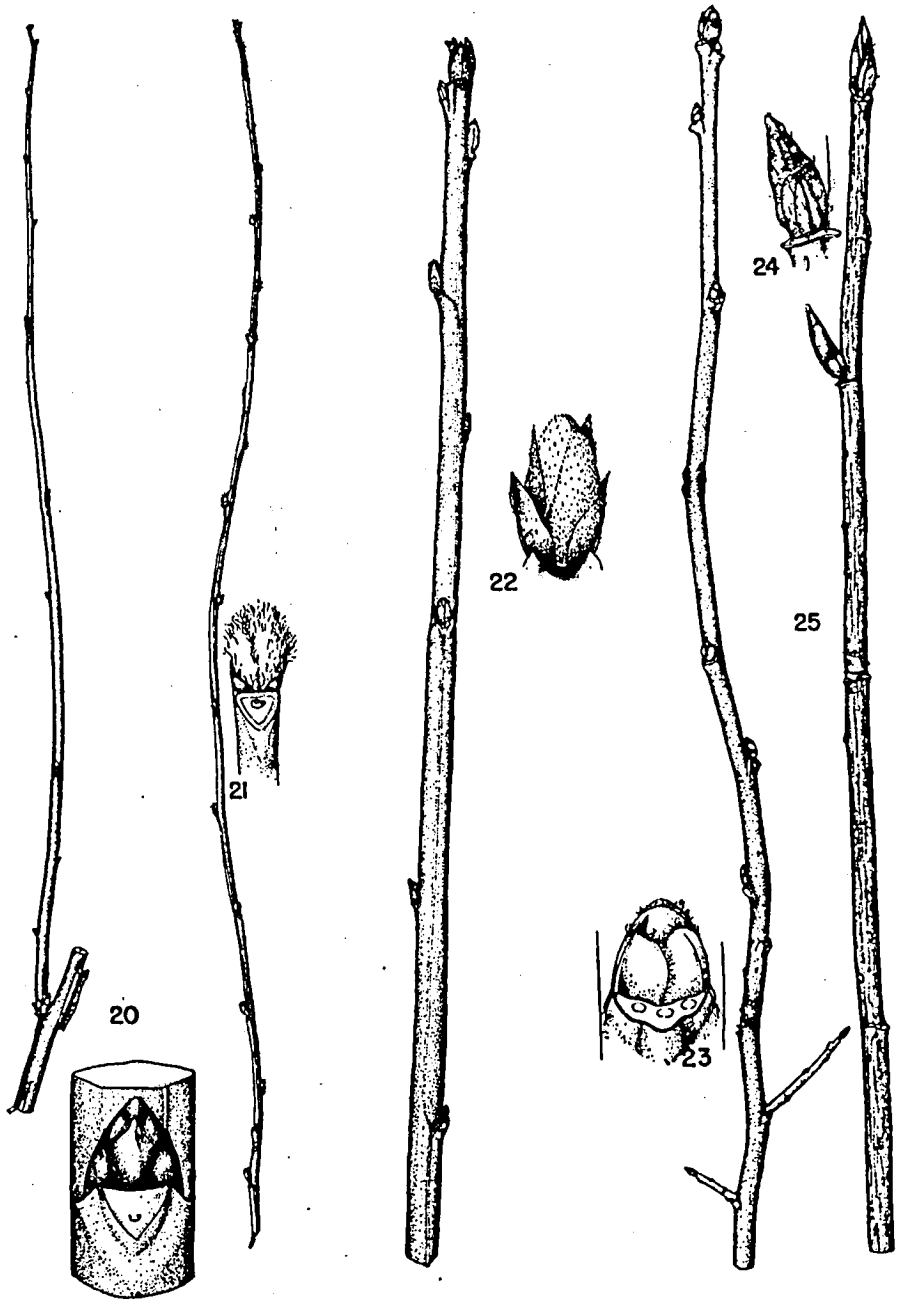


PLATE V

PLATE XIII

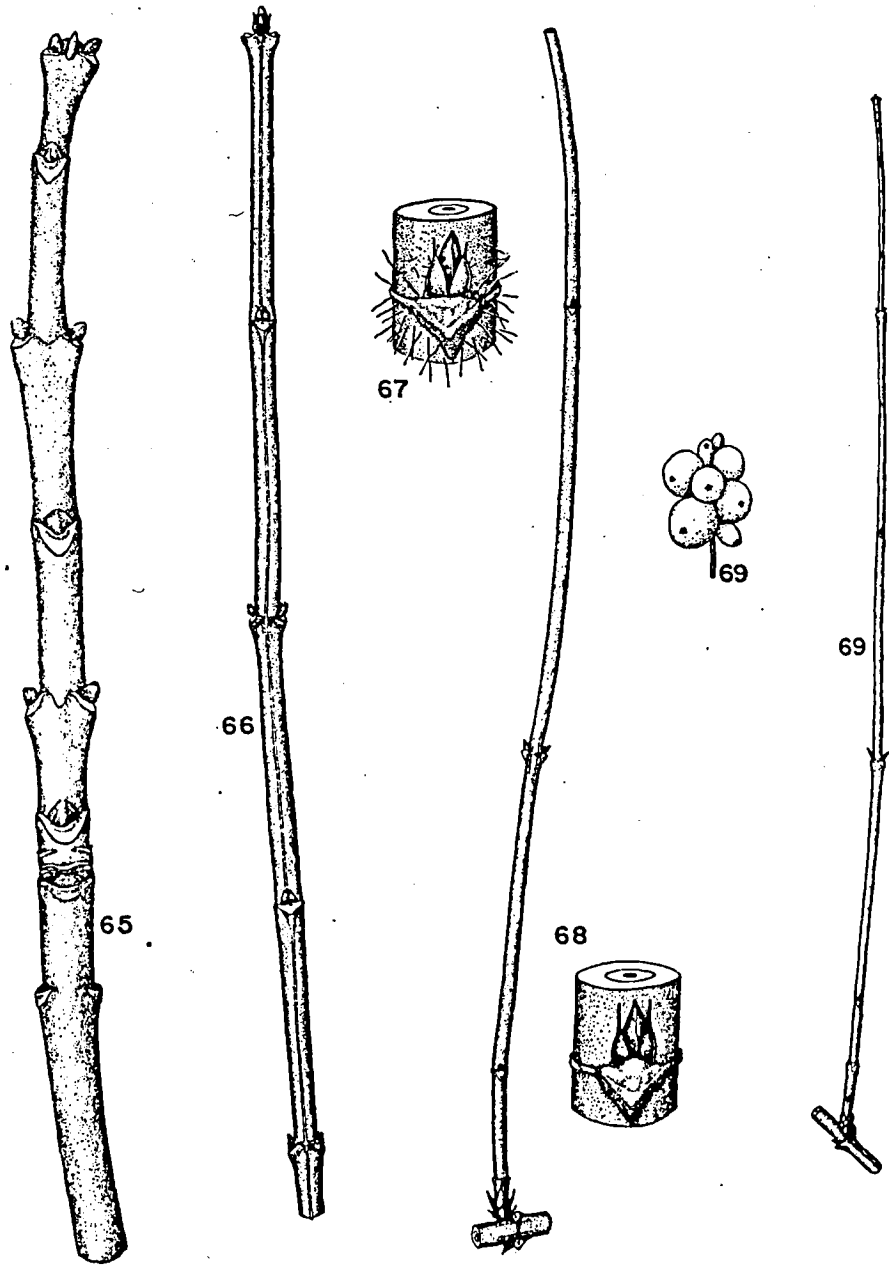


PLATE XIII

PLATE VIII

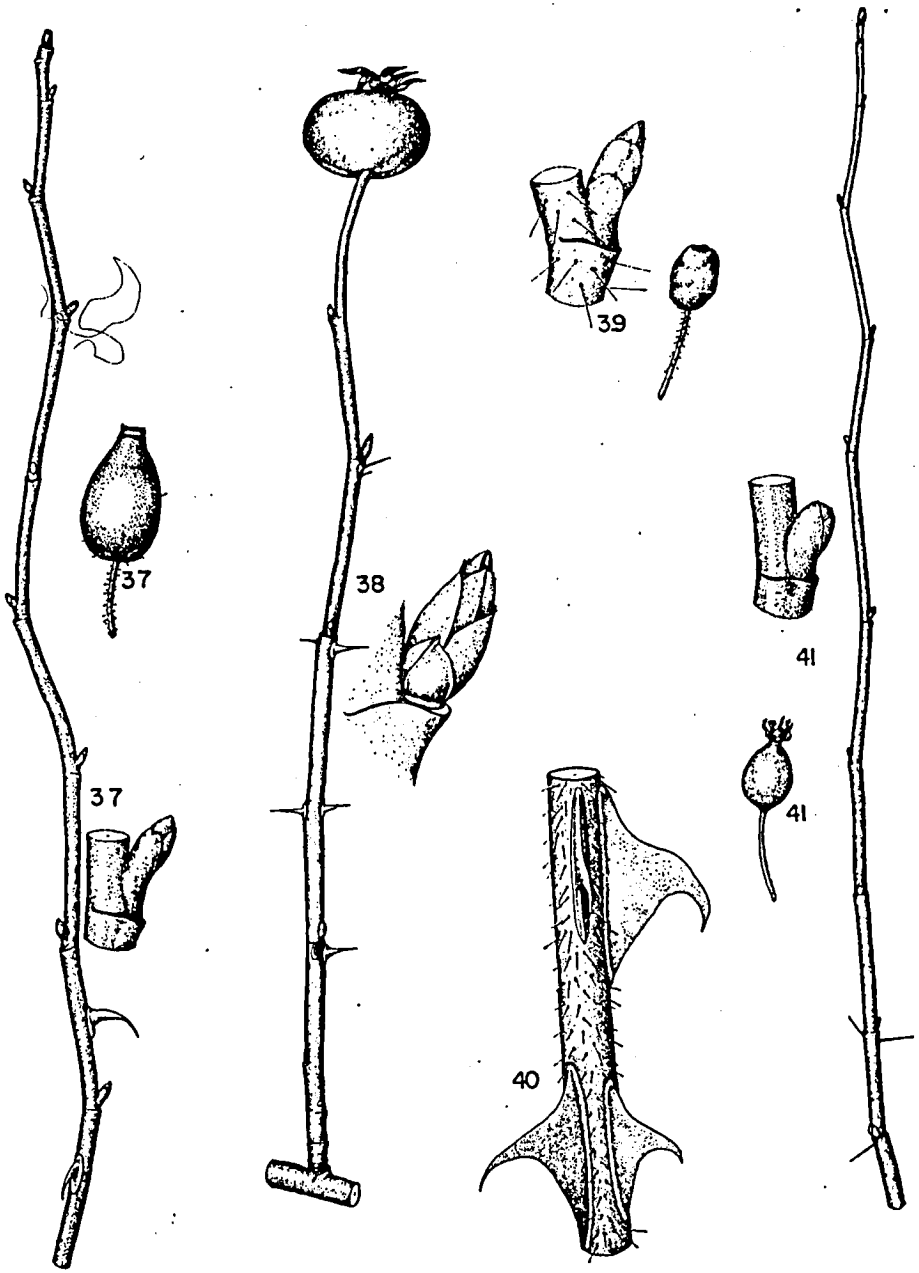


PLATE VIII

PLATE XIV

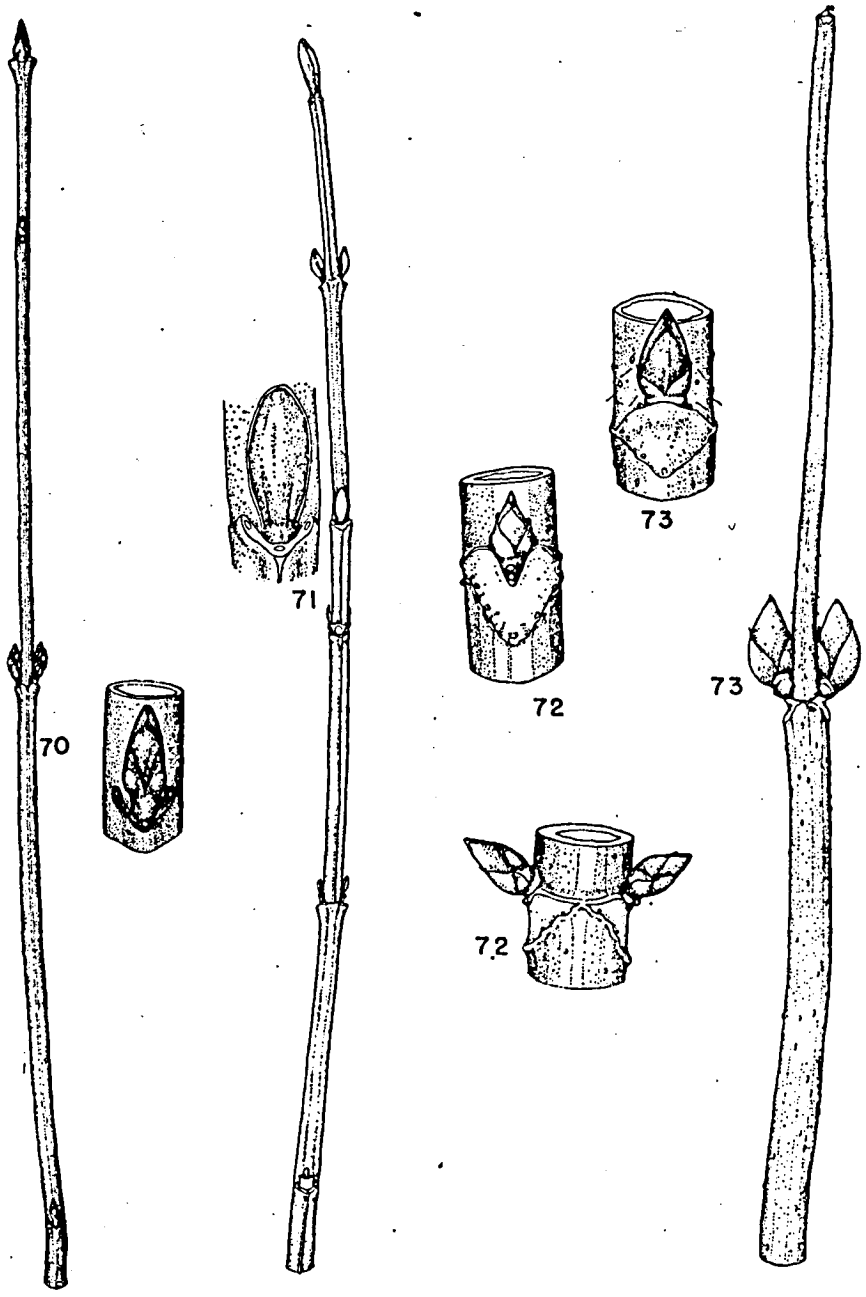


PLATE XIV

PLATE X

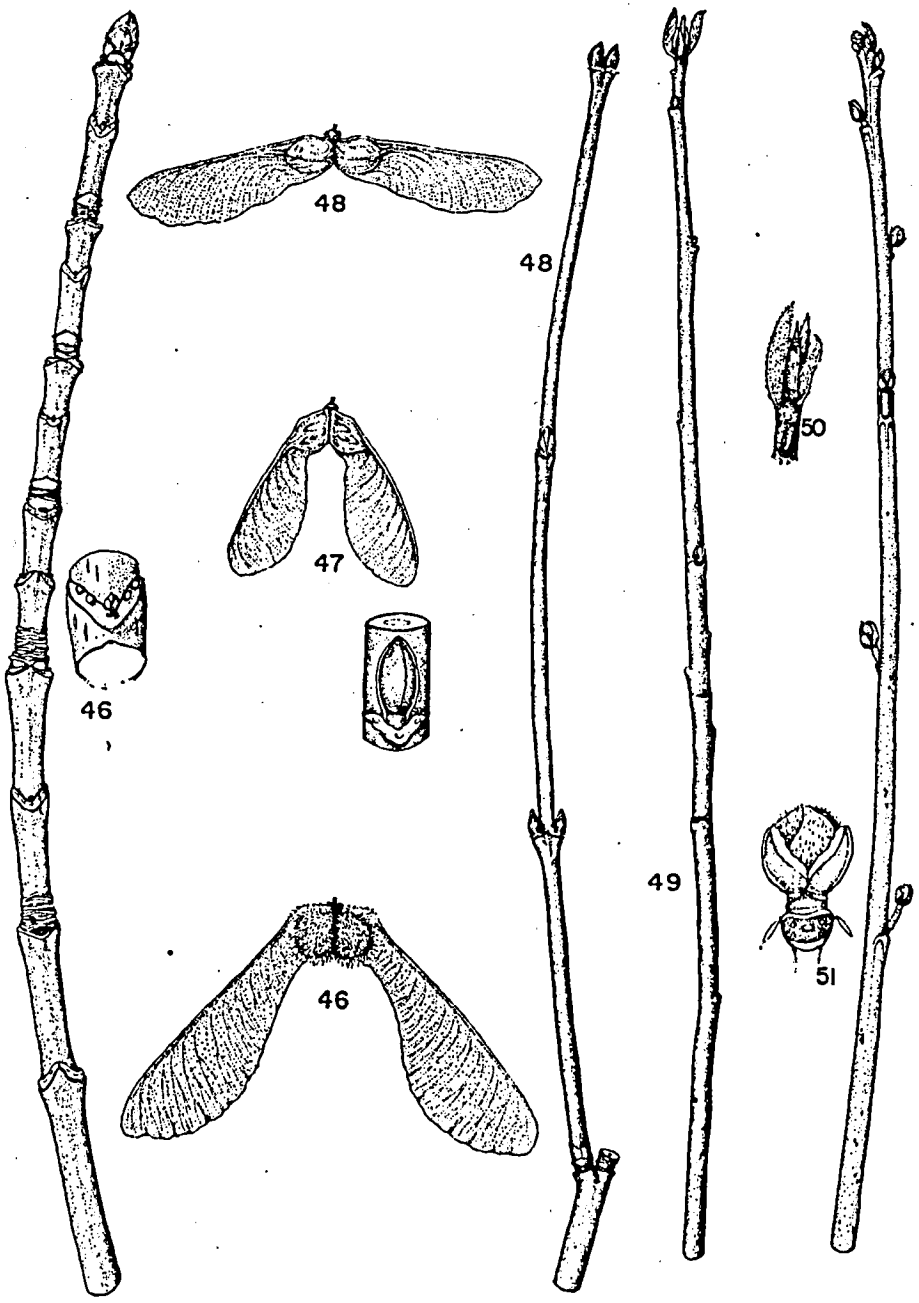
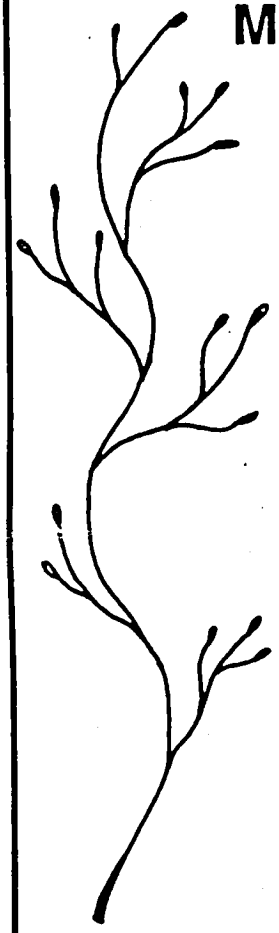
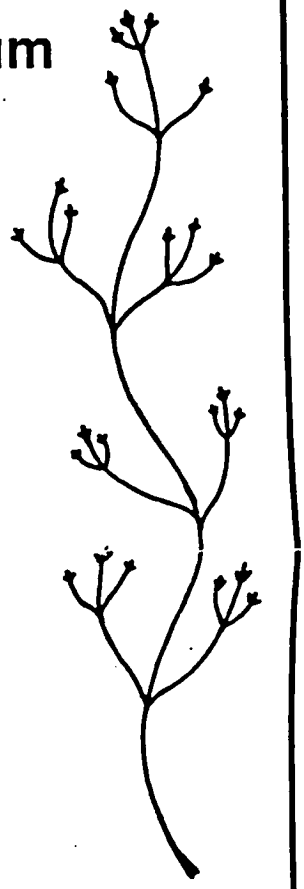


PLATE X

Key to Winter Twigs of Deciduous Trees and Shrubs at Mount Pisgah Arboretum Eugene, Oregon





by
Dr. Rhoda M. Love
Botany Instructor
Lane Community College,
Eugene, Oregon 97405

January, 1993

Published by The Mount Pisgah Arboretum
P. O. Box 5621 Eugene, Oregon 97405
(503) 747-3817

Price: $1.00

* * * * POISON OAK BEWARE * * * *

WARNING! DO NOT TOUCH ANY SHRUB OR TWIG UNTIL YOU ARE SURE IT IS NOT POISON OAK. KEEP YOUR HANDS BEHIND YOUR BACK UNTIL YOU ARE CERTAIN!

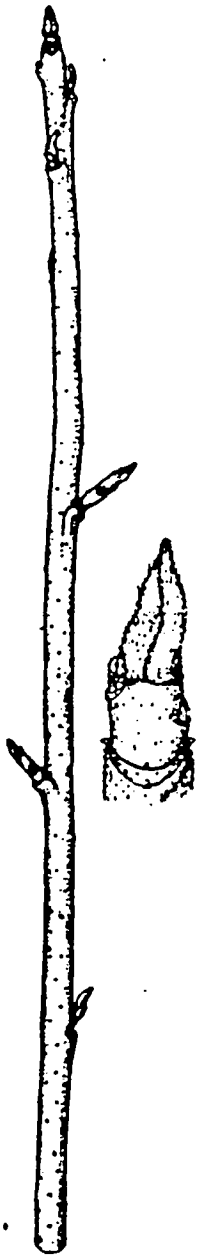
THE POISONOUS SAP OF POISON OAK IS AS IRRITATING IN WINTER AS IN SUMMER, THUS THE PLANT SHOULD NOT BE TOUCHED AT ANY TIME OF THE YEAR. Learn to recognize this plant absolutely if you do winter twig identification.

Poison oak (*Rhus diversiloba*) may grow as a shrub, a vine (climbing up a tree trunk) or as a ground cover. As a shrub, in the open, it may reach 8 feet in height. The shrubby form is much branched with the branches tending to grow up parallel to the main stem so the shrub appears broom-like. As a vine, it may climb trees for 30 feet or more.

Keeping clear of the plant, but using your hand lens, examine the stems and buds. The **stems** of poison oak are greyish or ashy brown and minutely ridged and pebbled, due to raised lenticels. (See illustration.) The youngest branches may appear red with an overcoating of grey.

The **buds** are alternate in arrangement and are small and naked, appearing as tiny fuzzy tufts. With a hand lens you can see that the tiny exposed leaves are covered with short stiff hairs. (See illustration.)

Don't touch any plant until you are sure!



Drawings from Gilkey & Packard, 1962

December, 1992

Key to Winter Twigs of Deciduous Trees & Shrubs at Mount Pisgah Arboretum, Eugene, Oregon

by Rhoda Love

(Based in part on: Winter Twigs by Gilkey and Packard, Oregon State University Press, 1962)

Additional copies of this key are available for $1.00, to cover printing and postage, from The Mount Pisgah Arboretum, PO Box 5621, Eugene, Oregon 97405, or from Rhoda Love, 393 FulVue Drive, Eugene, Oregon 97405. The key is revised regularly. Please send any comments to Rhoda Love at the above address. Thanks.

A. Arboretum Trees and Shrubs with OPPOSITE Leaf Scars:

opposite lea
scars & buc

1a. Leaf scars small, raised and covered by a membrane which also covers and hides the tiny buds; terminal bud not present; pith area large; shrub up to 12 feet; rare at the Arboretum; at least one in Water Garden area ..... *Philadelphus lewisii* (Mock orange)

1b. Scars and buds not as in 1a in all respects.

2a. Scars raised on persistent petiole bases; shrub with very slender branches; sometimes with white berries hanging on through winter; common ..... *Symphoricarpos albus* (snowberry)

2b. Scars not greatly raised; fruits not white berries

3a. Pair of leaf scars meeting around the stem in an ascending curve or point (the maples)

4a. Tree with stout branches; terminal bud usually present; buds not subtended by hairs; common throughout the Arboretum ..... *Acer macrophyllum* (big-leaf maple)

4b. Shrub with slender branches; terminal bud usually absent, thus the 2 youngest buds looking like a "cloven hoof;" most buds subtended by long white hairs; Water Garden area ..... *Acer circinatum* (vine maple)

3b. Pair of opposite leaf scars meeting around the stem in a straight line, or a descending curve or point, or not meeting

bud & leaf scar
with 3 bundle scars

5a. Leaf scars large and shaped like a "smiling mouth," with many bundle scars in a curved line; tree with stout twigs; leaf scars not meeting around the twig; common at the Arboretum, especially on moist sites ..... *Fraxinus latifolia* (Oregon ash)

5b. Leaf and bundle scars not as in 5a

buds diverging

6a. Twigs very stout with large leaf scars; very large pith; terminal bud usually absent; shrubs or small trees; scattered individuals at lower elevations in the Arboretum (the elderberries)

7a. Buds diverging; upper margin of leaf scar notched ..... *Sambucus cerulea* (blue elderberry)

buds appressed

7b. Buds appressed; upper margin of leaf scar entire ....*Sambucus racemosa* (red elderberry)

6b. Twigs slender; leaf scars narrow; shrubs or trees

8a. Hairs, if present, turned downward on the stem; buds stalked and reddish; twigs slender; leaf scars very narrow with 3 bundle scars; shrub; uncommon in the Arboretum; occasional in Water Garden area ..... *Viburnum ellipticum* (Oregon viburnum)

8b. Hairs, where present, a network of whitish, flat pubescence; shrubs or trees with slender branches and narrow leaf scars (the dogwoods)

9a. Shrub; twigs deep lustrous red; common near water ..... *Cornus stolonifera* (creek dogwood)

9b. Tree of well-drained sites; bark smooth and gray; vegetative buds narrow with 4 slender, hairy scales; twigs dull reddish, with predominately gray overcoating; flower buds large, button-like, naked during most of the winter; rare at the Arboretum ..... *Cornus nuttallii* (Western flowering dogwood)

B. Arboretum Trees and Shrubs with ALTERNATE Leaf Scars:

1a. Buds naked

2a. Leaf scars broadly V- to U-shaped; bundle scars 5; shrub, vine or ground-cover ..... ***Rhus diversiloba*** **(poison oak)** *******

2b. Leaf scars rounded; bundle scars 3; small tree with grey bark; uncommon with a few scattered individuals along the Zig-zag and McCall Trails ..... *Rhamnus purshiana* (cascara)

alternate leaf scars and buc

1b. Buds with one or more scales

3a. Buds short-stalked, dark red; pith 3-angled in X-section; tree with fruiting structures woody and cone-like; male flowers in catkins; found near the river (the alders)

4a. Fallen leaves with the edges rolled under..... *Alnus rubra* (red alder)

4b. Fallen leaves with flat edges ..... *Alnus rhombifolia* (white alder)

3b. Buds, pith and plants not as in 3a in all features

5a. Bud scale single, sac-like; shrubs or small trees; common near the river and in the Water Garden ..... *Salix* sp. (the willows)

5b. More than one bud scale present

6a. Bud scales resinous, sticky and very fragrant; tree; absent or rare in the Arboretum but common along the entrance road ..... *Populus trichocarpa* (black cottonwood)

6b. Bud scales not sticky and fragrant

7a. Buds appearing 2-ranked on horizontal branches, thus giving branches a zig-zag pattern; bud scales papery and brown, but these often shed as early as December; male flowers in catkins; tiny female flowers in scaly buds with red stigmas showing in January; shrub; common throughout Arboretum ..... *Corylus cornuta* (hazelnut)

7b. Buds not appearing 2-ranked

8a. Bundle scars more than 7; may be obscure and grouped (the oak trees)

9a. Bud scales downy or felty ..... *Quercus garryana* (Oregon white oak)

9b. Bud scales hairless or nearly so; may not be present in Arboretum ..... *Quercus kelloggii* (California black oak)

8b. Bundle scars 7 or fewer

10a. Bundle scar 1; leaf scars sharply triangular, not raised; buds with minute hairs; shrub with slender branches; at water's edge in the Water Garden ..... *Spiraea douglasii* (hardhack; steeple bush)

10b. Bundle scars more than 1, less than 7

11a. Bark peeling in long shreds; shrub, growing near the river and in the Water Garden ..... *Physocarpus capitatus* (nine bark)

11b. Bark not peeling in long shreds

12a. Leaf scars shriveled on greatly raised persistent petiole bases, stems armed with spines or prickles (the blackberries and blackcaps)

13a. Stems cylindrical; with a conspicuous blue-white "bloom"; Zig-zag Trail; not abundant ..... *Rubus leucodermis* (blackcap)

13b. Stems angled or fluted; without conspicuous "bloom;" leaves may be present through the winter (the European blackberries)

14a. Twigs merely angled, green or dull red; leaflets deeply dissected ..... *Rubus laciniatus* (evergreen blackberry)

14b. Twigs deeply grooved, maroon; leaflets merely toothed ..... *Rubus discolor* (Himalaya blackberry)

12b. Leaf scars clean and visible; petiole bases deciduous, but sometimes with a slight ridge remaining

15a. Leaf scars linear; bundle scars sometimes obscure; shrubs with thorns or prickles..... *Rosa sp.* (roses, native and introduced)

15b. Leaf scars broader than linear; bundle scars obvious; all (except hawthorn) without thorns

16a. Bud scales densely hairy, with flattened hairs; inner bud scales rosy; dried "plumes" of last year's flowers hanging on into winter; shrub ..... *Holodiscus discolor* (ocean spray)

16b. Bud scales essentially hairless

17 a. Trees; lowermost bud scales rather swollen and fleshy at the base

18a. Bud scales, at least the lower, keeled; buds not globose; bark peels horizontally ..... *Prunus sp.* (cherry)

18a. Bud scales not keeled; buds globose or nearly so; buds red; thorns usually present .....*Crataegus douglasii* (black hawthorn)

lamellate pith

17b. Shrubs; lowermost bud scales not swollen at the base

19a. Pith lamellate (only shrub in the Arboretum with this characteristic); buds rosy-red, often starting to leaf out in January ..... *Oemleria cerasiformis* (Indian plum)

19b. Pith not lamellate

20a. Buds about 1/4 inch long; bud scales usually with ciliate margins; pith usually white; several along the McCall Trail ..... *Amelanchier alnifolia* (service berry)

20b. Buds about 1/2 inch long, rosy red; bud scales without cilia; pith usually tan; in the Baker Wildflower Garden .....*Ribes sanguineum* (red flowering currant)

* * * Notes * * *