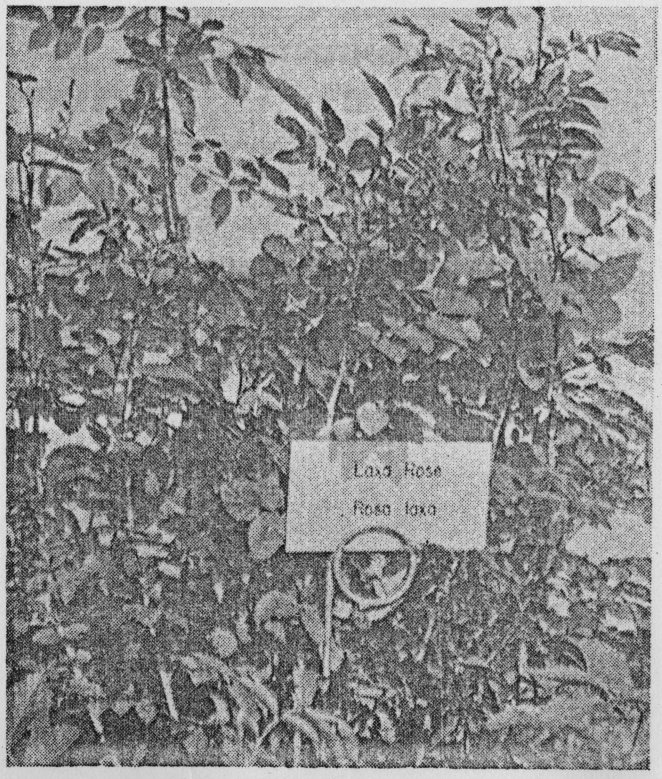
PROPAGATION OF WOODY PLANTS BY SEED

M. F. BABB

with notes on other methods of reproduction



Rose seedlings in a nursery bed at Palmer. After soaking for an hour in sulfuric acid, the seed were stratified for 90 days at 41° F and then sowed in rows. Seedlings were protected during the winter by straw and snow fencing. A rodent poison recommended by the Fish and Wildlife Service kept out mice and shrews.

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CONTENTS

The stratification table printed on the insert has been widely used in Alaska for several years. Soil conservationists, foresters, military personnel in charge of post landscaping problems, nurserymen, and amateur horticulturists have found it a convenient guide to methods of inducing quicker and better germination in seeds of woody plants. It is being published, together with supplementary material, for all who may have need for such information.

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PROPAGATION OF WOODY PLANTS BY SEED

A MAJORITY of the plants discussed in this publication are usually propagated by seed sown in the fall, or stratified in preparation for spring sowing. However, the seed of some may be planted without special treatment and still others are normally propagated by vegetative means. Table 1 indicates the general methods by which the species of each genera may be propagated.

No attempt has been made to make this table all-inclusive. Some genera are of limited usefulness in Alaska. The table actually represents materials acquired by the Alaska Agricultural Experiment Station, or sent to the Station for evaluation during the past eight years.

For each genera the Latin name and the accepted common name are given, together with general propagation methods. In some genera such methods apply with almost equal merit to all of its species. In others, individual species vary in their requirements for germination, or in the methods by which they are most satisfactorily propagated.

Some genera, such as *Acer, Betula* and *Ulmus*, include species that ripen their seed in the spring and others that are fall ripening. For best results the spring-ripened seed should be sown at once. Fall-ripened seed may be sown immediately, or it may be stored for stratification at a later date and sown in the spring.

In the genera *Alnus, Picea, Pinus* and *Rhamnus,* at least, the seed of some species appears to be non-dormant. It germinates at once without special treatment. In such cases, spring sowing is usually preferred. Seed of other species in the same genera is dormant. Dormant seed may either be sown in the fall or stored for stratification at a later date, anticipating spring sowing.

Seed of *Populus* and *Salix* remain viable only a short time under natural conditions. It must be sown as soon as collected or special storage precautions must be taken.

Andromedia, Diapensia, Kalmia, Ledum, Loiseleuria and *Rhododendron* are usually seeded in early spring in flats on peat moss, or on a compost of peat moss, leaf mold and sand. They are kept in a greenhouse until the seedlings are large enough to transplant.

VEGETATIVE PROPAGATION

Many woody plants seldom reproduce perfectly true to type from seed. For this reason, and also for the purpose of increasing stocks, horticultural varieties or select strains are often propagated by vegetative means.

In vegetative propagation a portion of the parent plant is either induced to form roots of its own and grow independently, or it is united to a related or compatible plant on whose root system it grows to form a new individual identical, in most cases, with the parent plant.

Methods of reproducing a plant on its own roots include the use of cuttings, divisions and layers, or such natural plant parts as suckers, runners, rhizomes and stolons which may already have their root systems established before separation from the parent plant.

Establishing a variety on the roots of a related or compatible species is accomplished by budding or grafting. These methods are useful for such purposes as increasing stocks of desirable plants or to take advantage of the root system of another plant to secure greater winter-hardiness, insect resistance, tolerance to adverse soil conditions or other superior characteristics and yet retain the essential characteristics of the parent plant. With fruit trees, especially, and for some ornamental plants, budding or grafting can be used to dwarf or otherwise modify top growth for special purposes.

Information on the collection, extraction and cleaning of seed, the management of nurseries, and methods of vegetative propagation may be found in the publications listed as "Reference Literature."

PROPAGATION BY SEED

Commercial seed of woody plants may be from collections made during the current year or, in the case of those species which do not produce a crop each year, it may have been held in storage for a considerable period of time.

In either case commercial seed has already been processed by the seedsman. The purchaser probably should not attempt to change its condition but should store it in a dry, cool place until it is needed. Sealed, airtight containers provide ideal storage conditions for most seeds. Temperatures between 33° and 50° F are usually recommended. Seedsmen usually furnish instructions if special storage conditions are necessary.

Fall sowing is recommended for the seed of most woody plants. When this is possible, the overwintering of the seed in cold, moist soil provides the most nearly normal conditions for breaking the dormancy of the seed embryo and stimulating germination. Where

dependence is placed on commercial sources of seed, it is often impossible to obtain it in time for fall sowing.

With certain species, too — as with some species of pine — the seeds are favored foods of mice and other predators which are difficult to control during the winter months. There is also danger of injury to the seed from alternate freezing and thawing or from excessive drying during the winter unless the seed beds are well mulched. The difficulty of weed control in the spring is another disadvantage of fall sowing.

To avoid difficulties encountered in fall planting and to provide proper conditions for breaking embryo dormancy, the seed is usually stored for a period of time after it is purchased or collected. It is later removed for stratification or other pretreatment before sowing in the spring.

STRATIFICATION

As the name suggests, stratification consists of placing alternate layers of sand, or other suitable material, and seed in a container and placing it under conditions suitable for seed germination. A No. 10 tinned food can may be used for small lots.

Clean sand, free from all organic matter, is most commonly used. Peat and chopped sphagnum moss are sometimes used, and even preferred for certain types of seed The sand or moss should be moistened. It must not contain free water as this interferes with the entrance of air and creates conditions favorable for rotting or spoilage. To avoid this latter possibility, the bottom of the container is perforated, or a false bottom is inserted to keep the seeds well above any excess water.

In practice, a layer of sand (or other medium) from 1 to 3 inches thick is placed in the bottom of the container, followed by a similar layer of seed. The process is repeated until the container is filled. Small lots of seed, or seed difficult to separate from the medium at planting time, are often enclosed in loose cheesecloth sacks and flattened out to form layers. Wire screening, folded to form a flat package or finely perforated plastic bags are also satisfactory. They have the merit of not rotting as the cheesecloth frequently does during long periods of stratification.

Sometimes — especially for larger seeds — the seeds are simply mixed with 2 to 3 times their volume of the medium and placed in containers, observing the same precautions as to moisture and drainage as are used in true stratification. In this method, or whenever the seed must be separated from the sand at planting time, pre-screening the sand to a diameter smaller than that of the seed furnishes an easy method of later separation by a combination of screening and washing.

Stratified seed is never tightly covered. A thin layer of moistened peat or sphagnum moss over the top of container reduces evaporation and helps keep the seed moist. The container is held for the required length of time in a suitable storage at the proper temperature. (See Table 1).

Storage places for stratified seed may be a refrigerator, cold room, cold storage, potato or root cellar or any such place where proper conditions of temperature and moisture can be maintained. Seed kept at the higher temperatures (68° to 86° F but usually 77° F) may be placed near a heating plant, in the living quarters, or where there is a constant source of heat for the necessary period of time. Special attention must be given to maintain proper moisture in the container.

Table 2 (hard paper insert) has been prepared with the assumption that seed will be sown on or about May 1. For a species such as *Abies amabilis,* the table shows that it is placed under stratification at a temperature of 41° F on February 15, giving a stratification period of 75 days before May 1.

Adjustments can be made for other planting times if it is known that local conditions are usually more favorable for seeding at an earlier or later date. Thus, if the desired planting date should be May 15, rather than May 1, the seed should be placed under stratification on March 1 to give the required 90 days of stratification. In this connection it should be noted that the periods recommended in the table are usually nearer the minimum, rather than the maximum, number of days given for a species or genera as listed in Table 2. This precaution seems desirable since experience has shown that it is better to sow slightly before full germination rather than after a majority of the seeds show a well developed hypocotyl.

Table 2 also indicates the temperature at which various seeds must be held during stratification. In most cases this is given as either 41° or 77° F. These two temperatures have been chosen because they represent rather well the requirements for a low and a high temperature range. Should other temperatures be used, it is best to make a corresponding change in the duration of the stratification period. Thus, it has been fairly well established that *Prunus besseyi* germinates almost equally well after 100 days at 41° F as at 120 days at 33° F. In other words, preplanting treatment is shortened by increasing the temperature at which the seed is stratified. Such adjustments should not exceed 5° or 6° because some species have a very narrow range of adjustment to temperature changes.

Some species need only a single stratification period for satisfactory germination. Other species need different treatment. For example, seed of *Crataegus, Juniperus, Rubus,*

Sambucus, Taxus and *Viburnum* require two stratification periods. Table 2 shows that *Crataegus oxyacantha* needs 60 days at 77°, followed by a period of 90 days at 41° F. Failure to provide both periods gives poor or no germination.

Species of several genera, for example, *Prunus, Sorbus* and *Symphoricarpos*, are variable in their requirements. Some seem to need two stratification periods at different temperatures, whereas others germinate well with a single treatment.

PRETREATMENT

Most seeds can be removed from storage and immediately stratified with no preliminary treatment. Some genera, such as *Amorpha, Arctostaphylos, Rhus, Rosa, Symphoricarpos* and at least one species of *Pinus* need additional pretreatment before they are placed under stratification.

In these genera certain species have either very thick or impermeable seed coats which must be made thinner or softened to permit moisture and oxygen to reach the seed embryo.

The most common treatments are (1) hot water, (2) soaking in concentrated sulfuric acid, and (3) scarifying with abrasives.

Hot water.—Seeds are placed in bags made of cheesecloth or some such porous material, and plunged into water heated 180° to 200° F, in which they are allowed to stand for about 12 hours as the water gradually cools. The volume of the water should be four to five times that of the seed.

A variation of this method is to plunge the seed into boiling water for a half to 2 or more minutes, and then into cold water, in which they are left to soak for several hours. This is more likely to injure the seed if the exact duration of the period of boiling is not carefully controlled. With some species, such as *Caragana*, good germination has been obtained by simply soaking the seed overnight in water at room temperature. Longer soaking may reduce germination.

Mechanical scarification. — This method is very commonly used by seedsmen, nurserymen and others who handle large quantities of seed, or who have frequent need of some method of treating seeds having thick or impermeable seed coats. It is not as satisfactory as the sulfuric acid treatment for small lots or for infrequent usage. This is because considerable equipment is needed if undue manual labor is to be avoided. Greater skill and experience are required to obtain uniform results.

For small lots of large-sized seed, scarification is sometimes accomplished by use of a hand file. This is a slow and costly method and the danger of injuring the seed embryo is high.

For larger quantities or for small seeds, scarification is accomplished by such means as tumbling or churning the seeds in drums lined with sandpaper. Seed may be mixed with clean, sharp sand or small gravel and rotated or churned in such containers until the seedcoats are sufficiently thin. Other devices involve passing the seed between rotating sandpaper disks, or grinding wheels, and stationary rubber pads. Several commercial machines of varying merit are available. None of these scarification methods are satisfactory for seeds containing resin or pulpy remains of fleshy seed coats. These soon destroy the cutting action of the abrasive.

Second year stand of wild apple seedlings at Palmer. This good stand was the result of stratifying for 60 days at 41° F. and spring sowing. If even one of these thousands survives, it might become the progenitor of an adapted apple variety for Alaska.

Sulfuric acid. — This is generally the most satisfactory method of pretreating seed before stratification. The seed is put into a glass, earthenware, or some nonmetallic container and covered with concentrated sulfuric acid for the desired period of time. Commercial grade acid with a specific gravity of 1.84 is satisfactory. The seed is gently stirred occasionally during the treatment.

Acid, seeds and equipment containing or covered with acid must be handled with great care. In particular, never pour water into acid, for the violent reaction may splash acid on the worker causing destruction of clothing or serious burns.

The seed is removed by pouring into a wire mesh strainer. It is then thoroughly rinsed in a large volume of water, or in running water to remove all traces of the acid. The seed is partially dried for ease in handling and either sown or placed under stratification as indicated in Table 2.

Table 1. — **GENERAL METHODS OF PROPAGATION**

TREES AND SHRUBS

ABIES Fir Fall sow, or stratify 60 to 90 days at 41° F and sow in spring. **Variable.** Also by cuttings.

ACER Maple Spring sow spring ripening seed. Fall sow fall ripening seed, or stratify from 30 to 150 days at 41° F and sow in spring. **Highly variable.** Also by softwood cuttings, layering, budding and grafting.

ALNUS Alder Spring sow non-dormant seed. Fall sow dormant seed, or stratify 60 to 90 days at 41° F, then sow in spring. **Variable.** Also by 1-foot hardwood cuttings.

AMELANCHIER Serviceberry Fall sow, or stratify 120 to 180 days at 41° and sow in spring. **Variable.** Also by grafting, cuttings, layering and division.

AMORPHA Amorpha, false indigo Fall sow, or use H_2SO_4, 5 to 8 minutes and stratify 30 days at 41° F, or by hot water treatment plus 30-day stratification. Also by hardwood cuttings, layering and suckers.

ANDROMEDIA Rosemary Spring sow in greenhouse as for rhododendron. Also by layering or division.

ARCTOSTAPHYLOS Bearberry Fall sow some species after soaking in H_2SO_4 3 to 6 hours. Stratify others 60 days at 77° F plus 60 days at 41° F. **Variable.** Also by cuttings.

BETULA Birch Spring sow spring ripening seed. Fall sow fall ripening seed, or stratify 60 to 75 days at 41° F. Also by layering, cuttings, budding and grafting.

CARAGANA Peashrub Sow in late summer, or spring sow stored seed after soaking in warm water 10 to 12 hours. Also by July cuttings, hardwood cuttings, root cuttings and layering.

CHAMAECYPARIS White Cedar Stratify 60 to 90 days at 41° F and spring sow. Also by cuttings in summer or fall.

CORNUS Dogwood Fall sow, or stratify 90 to 120 days at 41° F and spring sow. Full germination takes two years. Also by hardwood cuttings, root cuttings, layering, division, budding and grafting.

COTONEASTER Cotoneaster Fall sow, or pretreat with H_2SO_4 for 1½ hours, then stratify for 120 days at 41° F. Full germination takes two years. Also by cuttings, mound layering and grafting.

CRATAEGUS Hawthorn Early fall sow, or stratify 60 days at 77° F plus 90 days at 41° F. Full germination takes two to three years. Also by budding, grafting or layering.

DIAPENSIA Arctic diapensia Spring sow in greenhouse as for rhododendron.

ELEAGNUS Eleagnus Fall sow, or stratify 90 days at 41° F. Also by hardwood cuttings, root cuttings, layering and grafting.

EMPETRUM Crowberry Fall sow, or by hardwood cuttings in August.

EUONYMUS Euonymus Stratify 90 to 120 days at 41° F and spring sow. Also by hardwood cuttings and layering.

FRAXINUS Ash Early fall sow, or stratify 60 to 90 days at 41° F or soak in water 10 to 21 days at 70° F, changing daily.

JUNIPERUS Juniper Stratify 90 to 120 days at 77° F followed by 90 to 120 days at 41° F. **Highly variable.** Most species also from cuttings; some from layering.

KALMIA Mountain laurel Spring sow in greenhouse as for rhododendron. Also by layering.

LARIX Larch Fall sow, or stratify 30 to 60 days at 41° F and spring sow.

LEDUM Labrador tea Spring sow in greenhouse as for rhododendron. Also by layering and division.

LOISELEURIA Alpine azalea Spring sow in greenhouse as for rhododendron. Also by cuttings of half-ripened wood.

LONICERA Honeysuckle Fall sow, or stratify 60 to 75 days at 41° F. Also by hardwood and softwood cuttings.

MALUS Apple Spring sow seed stratified for 30 to 60 days at 41° F. **Variable.** Also by budding and grafting.

PHYSOCARPUS Ninebark Spring sow seed. Also by hardwood cuttings.

PICEA Spruce Spring sow non-dormant seed. Fall sow seed of species bearing dormant seed, or stratify it for 30 to 60 days at 41° F. **Highly variable.** Also by cuttings and grafting.

PINUS Pine Spring sow non-dormant seed. Fall sow dormant seed or stratify 30 to 90 days at 41° F. **Highly variable.** Also rarely by grafting and cuttings.

POPULUS Poplar Sow seed as soon as ripe. Also by stem (except aspens) and root cuttings.

POTENTILLA Cinquefoil Sow seeds as soon as ripe. Also by division.

PRUNUS Plum and cherry Fall sow or stratify. Some species 90 to 150 days at 41° F, others 60 to 90 days at 77° F, plus 60 to 90 days at 41° F. **Highly variable.** Also by budding, grafting, suckers and root cuttings.

PSEUDOTSUGA Douglas fir Fall sow, or stratify 30 to 60 days at 41° F and spring sow. Also by cuttings.

RHAMNUS Buckthorn Spring sow non-dormant seed. Fall sow seed of species bearing dormant seed, or stratify it for 60 to 90 days at 41° F and spring sow. Also by layering, hardwood cuttings or grafting.

RHODODENDRON Rhododendron Sow seed in early spring in greenhouse on peat moss-sand mixture. Keep covered and moist. Water from below. Also by cuttings, layering and grafting.

RHUS Sumac Fall sow, or treat with H_2SO_4 for 60 to 80 minutes and stratify for 30 days at 41° to 50° F. Pretreatment with H_2SO_4 for 20 minutes before fall sowing also beneficial. Also by root cuttings and suckers.

RIBES Currant, gooseberry Sow as soon as ripe, or fall sow. For spring sowing, stratify 90 to 120 days. Also by suckers and hardwood cuttings.

ROSA Rose Treat with H_2SO_4 for 1 to 2 hours plus stratification for 90 to 120 days at 41° F. Also by hardwood and root cuttings, budding, suckers, layering, and grafting.

RUBUS Raspberry, blackberry Sow as soon as ripe, or treat

with H_2SO_4 for two hours followed by stratification for 90 days at 68° to 86° F plus 90 days at 41° F. Also by layering, suckers, stem and root cuttings.

SALIX Willow Sow seeds as soon as collected. Keep moist. Hardwood cuttings best.

SAMBUCUS Elder Fall sow, or stratify 60 days at 77° F plus 90 days at 41° F. Also by hardwood cuttings and division.

SHEPHERDIA Buffaloberry Fall sow, or stratify 60 to 90 days at 41° F. Also by suckers.

SORBARIA False spirea Sow seeds as soon as ripe, or stratify 30 days and spring sow. Also by softwood cuttings, root cuttings and suckers.

SORBUS Mountain ash Fall sow, or stratify 90 days at 77° F plus 90 days at 41° F. Some stratify 90 days at 33° F. **Highly variable.** Full germination takes two to three years.

SPIRAEA Spirea Spring sow seed as soon as ripe. Also by hardwood or softwood cuttings and divisions.

SYMPHORICARPOS Snowberry Spring sow and mulch for germination the following spring, or treat with H_2SO_4 for 30 to 75 minutes, followed by stratification for 180 days at 41° F, or by stratification at 77° F for 30 days plus 180 days at 50° F. **Highly variable.** Also by softwood and hardwood cuttings and division.

SYRINGA Lilac Fall sow, or stratify 60 days at 41° F and spring sow. Also by stem cuttings, root cuttings, budding, grafting and suckers.

TAMARIX Tamarisk Spring sow seed. Also by hardwood cuttings and layering.

TAXUS Yew Fall sown seed germinates in two to three years, or stratify 60 days at 77° F, plus 60 days at 41° F and spring sow. Also by cuttings and grafting.

THUJA Thuja, arborvitae Fall sow **T. occidentalis.** Spring sow **T. plicata,** or stratify 30 to 60 days and spring sow. Also by cuttings.

TSUGA Hemlock Fall sow, or stratify 90 days at 41° F. Also by cuttings.

ULMUS Elm Spring sow spring ripening seed. Fall sow fall ripening seed, or stratify 30 to 60 days at 41° F and spring sow. Some species also by softwood cuttings.

VACCINIUM Blueberry, cranberry Fall sow, or stratify 150 days at 41° F. Divisions and cuttings preferred.

VIBURNUM Viburnum Sow in spring or early summer for good germination the following spring, or stratify 120 days at 77° F plus 60 days at 41° F and spring sow for germination the following spring. Also by greenwood or hardwood cuttings and layering.

VINES

CELASTRUS Bittersweet Fall sow, or stratify 90 days at 41° F. Also by softwood, hardwood and root cuttings, layering and suckers.

CLEMATIS Clematis Fall sow, or stratify at 41° F for 60 to 90 days and spring sow. Also by softwood cuttings and grafting.

VITIS Grape Fall sow, or stratify 60 days at 41° F. Also by layering, cuttings and grafting.

Sept Oct Nov Dec Jan 1-20 Feb 1-15 Mar Apr May

DAYS BEFORE PLANTING 240 210 180 150 120 100 90 75 60 30

Trees and Shrubs

Abies amabilis Pacific silver fir — 41°
Abies balsamea Balsam fir — 41°
Abies concolor White fir — 41°
Abies lasiocarpa Corkbark fir — 41°
Acer ginnala Amur maple — 41°
Acer glabrum var. **douglasii** Douglas maple — 41°

Acer negundo Boxelder — 41°
Acer platanoides Norway maple — 41°
Acer saccharinum Silver maple — 41°
Alnus crispa American green alder — 41°
Alnus rubra Red alder — 41°
Alnus sinuata Sitka alder — 41°

Alnus tenuifolia Thinleaf alder — 41°
Amelanchier alnifolia Saskatoon serviceberry — 41°
Amelanchier florida Pacific serviceberry — 41°
Amelanchier oblongifolia Thicket shadbush — 41°
Amelanchier ovalis Garden shadblow — 41°
Amorpha canescens Lead plant — Hot water & 41°

Amorpha fruticosa Indigobush amorpha — H_2SO_4 5-8 min. & 41°
Arctostaphylos uva-ursi Bearberry — H_2SO_4 3-5 hrs. or 77° 41°
Betula glandulosa Bog birch — 41°
Betula nana Dwarf arctic birch — 41°
Betula papyrifera
var. **commutata** Western paper birch — 41°
var. **humilis** Alaska paper birch — 41°
var. **kenaica** Kenai birch — 41°

Betula pendula European white birch — 41°
Chamaecyparis nootkatensis Alaska cedar — 41°
Cornus alba var. **sibirica** Coral dogwood — 41°
Cornus stolonifera Redosier dogwood — 41°
Cotoneaster acutifolia Peking cotoneaster — H_2SO_4 1½ hrs. & 41°
Cotoneaster apiculata — H_2SO_4 1½ hrs. & 41°

Cotoneaster foveolata — H_2SO_4 1½ hrs. & 41°
Cotoneaster integerrima European cotoneaster — H_2SO_4 1½ hrs. & 41°
Cotoneaster melanocarpa var. **laxiflora** — H_2SO_4 1½ hrs. & 41°
Cotoneaster racemiflora soongarica — H_2SO_4 1½ hrs. & 41°
Crataegus oxyacantha English hawthorn — 77° 41°
Elaeagnus commutata Silverberry — 41°

Euonymus alatus compactus Winged euonymus — 41°
Fraxinus pennsylvanica var. **lanceolata** Green ash — 41°
Juniperus communis var. **depressa** Common juniper — 77° 41°
Juniperus scopulorum Rocky mountain juniper — 77° 41°
Larix decidua European larch — 41°
Larix laricina Tamarack — 41°

Larix sibirica Siberian larch — 41°
Lonicera caerulea — 41°
Lonicera korolkovii Blue-leaf honeysuckle — 41°
Lonicera maacki var. **podocarpa** Late honeysuckle — 41°
Lonicera morrowi Morrow honeysuckle — 41°
Lonicera tatarica Tatarian honeysuckle — 41°

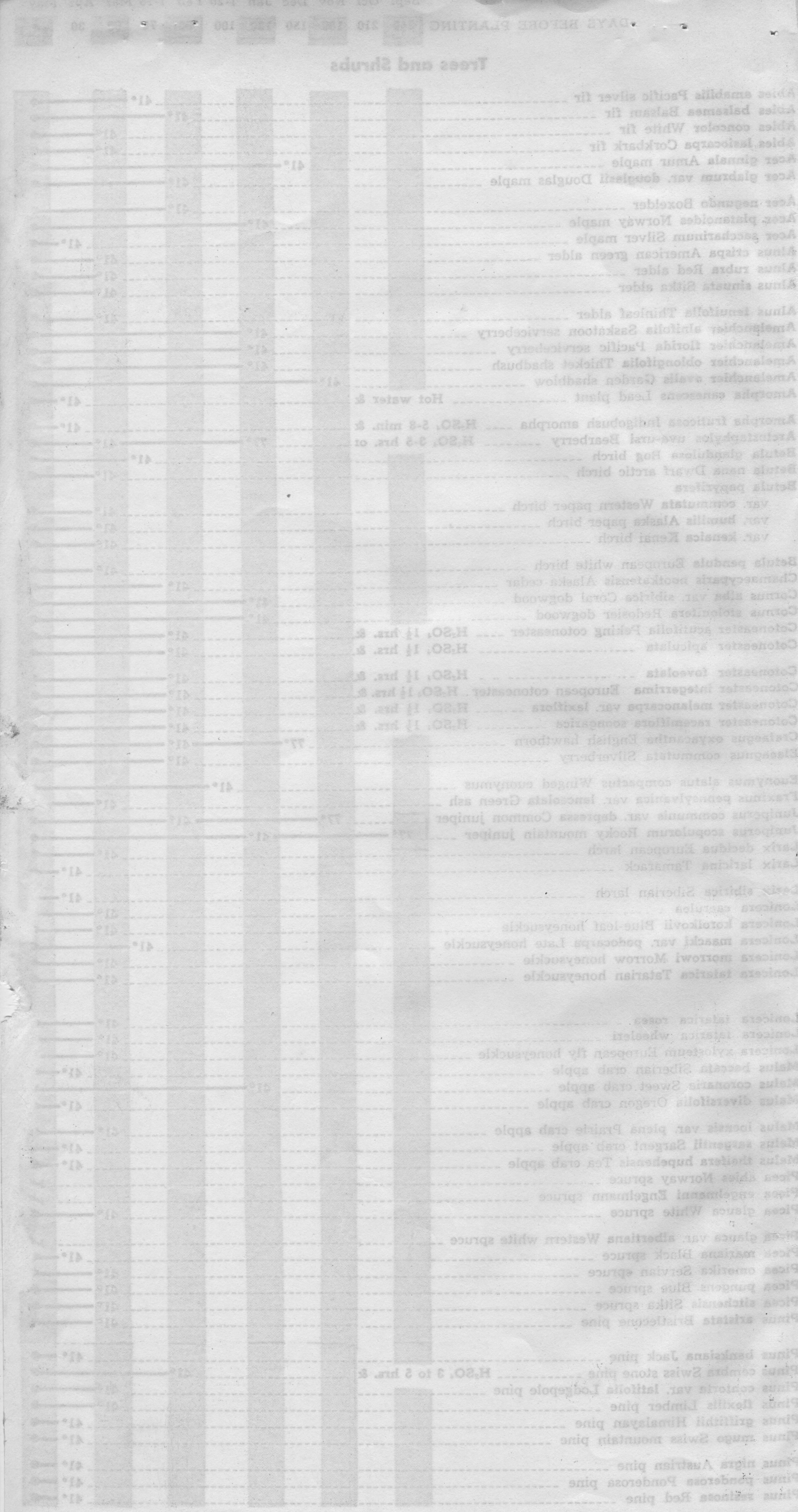
Lonicera tatarica rosea — 41°
Lonicera tatarica wheeleri — 41°
Lonicera xylosteum European fly honeysuckle — 41°
Malus baccata Siberian crab apple — 41°
Malus coronaria Sweet crab apple — 41°
Malus diversifolia Oregon crab apple — 41°

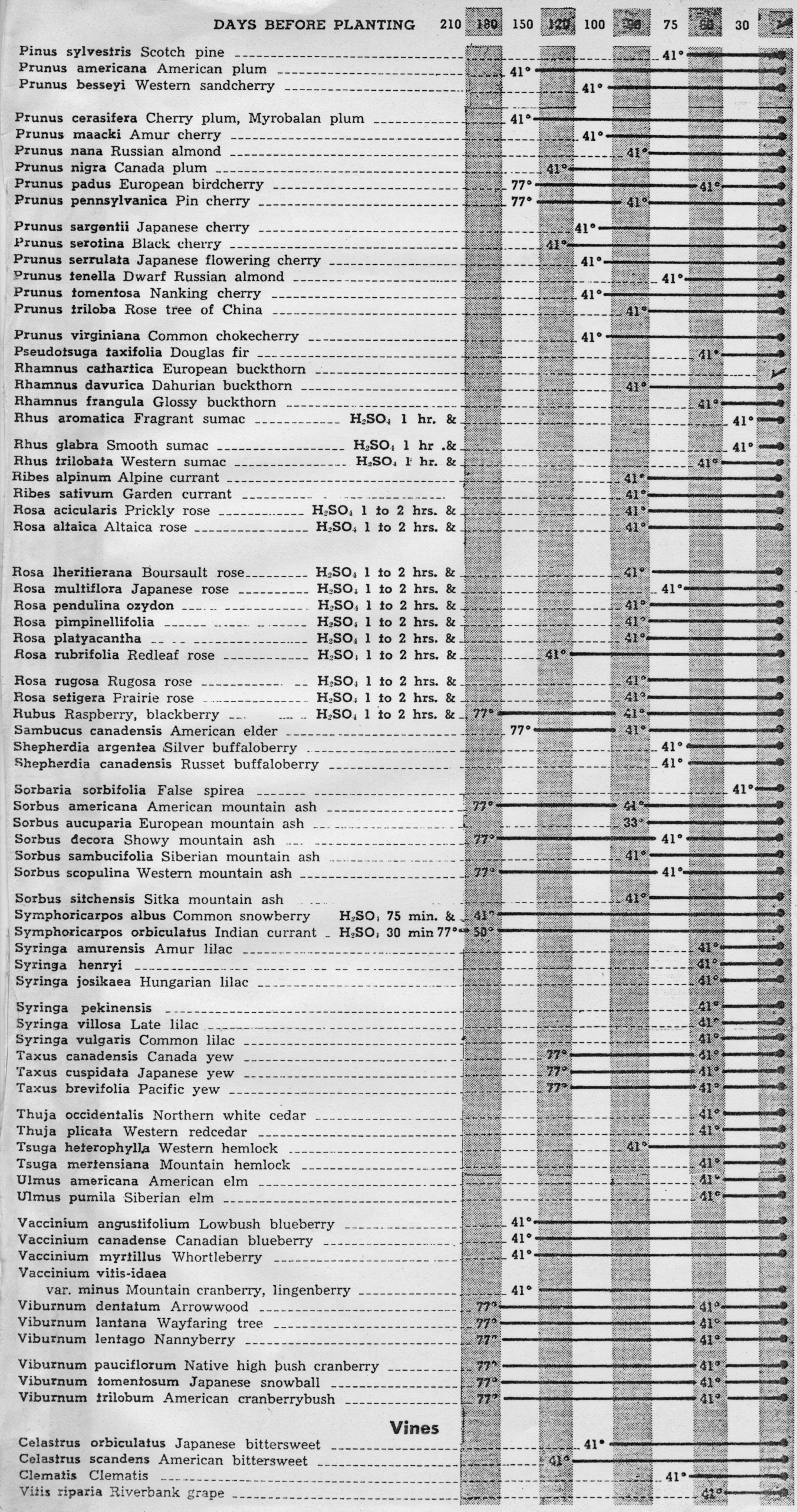
Malus ioensis var. **plena** Prairie crab apple — 41°
Malus sargentii Sargent crab apple — 41°
Malus theifera hupehensis Tea crab apple — 41°
Picea abies Norway spruce
Picea engelmanni Engelmann spruce
Picea glauca White spruce — 41°

Picea glauca var. **albertiana** Western white spruce
Picea mariana Black spruce — 41°
Picea omorika Servian spruce — 41°
Picea pungens Blue spruce — 41°
Picea sitchensis Sitka spruce — 41°
Pinus aristata Bristlecone pine — 41°

Pinus banksiana Jack pine — 41°
Pinus cembra Swiss stone pine — H_2SO_4 3 to 5 hrs. & 41°
Pinus contorta var. **latifolia** Lodgepole pine — 41°
Pinus flexilis Limber pine — 41°
Pinus griffithii Himalayan pine — 41°
Pinus mugo Swiss mountain pine — 41°

Pinus nigra Austrian pine — 41°
Pinus ponderosa Ponderosa pine — 41°
Pinus resinosa Red pine — 41°




DAYS BEFORE PLANTING
210
180
150
120
100
90
75
60
30
Pinus sylvestris Scotch pine
Prunus americana American plum
Prunus besseyi Western sandcherry
Prunus cerasifera Cherry plum, Myrobalan plum
Prunus maacki Amur cherry
Prunus nana Russian almond
Prunus nigra Canada plum
Prunus padus European birdcherry
Prunus pennsylvanica Pin cherry
Prunus sargentii Japanese cherry
Prunus serotina Black cherry
Prunus serrulata Japanese flowering cherry
Prunus tenella Dwarf Russian almond
Prunus tomentosa Nanking cherry
Prunus triloba Rose tree of China
Prunus virginiana Common chokecherry
Pseudotsuga taxifolia Douglas fir
Rhamnus cathartica European buckthorn
Rhamnus davurica Dahurian buckthorn
Rhamnus frangula Glossy buckthorn
Rhus aromatica Fragrant sumac
Rhus glabra Smooth sumac
Rhus trilobata Western sumac
Ribes alpinum Alpine currant
Ribes sativum Garden currant
Rosa acicularis Prickly rose
Rosa altaica Altaica rose
Rosa lheritierana Boursault rose
Rosa multiflora Japanese rose
Rosa pendulina ozydon
Rosa pimpinellifolia
Rosa platyacantha
Rosa rubrifolia Redleaf rose
Rosa rugosa Rugosa rose
Rosa setigera Prairie rose
Rubus Raspberry, blackberry
Sambucus canadensis American elder
Shepherdia argentea Silver buffaloberry
Shepherdia canadensis Russet buffaloberry
Sorbaria sorbifolia False spirea
Sorbus americana American mountain ash
Sorbus aucuparia European mountain ash
Sorbus decora Showy mountain ash
Sorbus sambucifolia Siberian mountain ash
Sorbus scopulina Western mountain ash
Sorbus sitchensis Sitka mountain ash
Symphoricarpos albus Common snowberry
Symphoricarpos orbiculatus Indian currant
Syringa amurensis Amur lilac
Syringa henryi
Syringa josikaea Hungarian lilac
Syringa pekinensis
Syringa villosa Late lilac
Syringa vulgaris Common lilac
Taxus canadensis Canada yew
Taxus cuspidata Japanese yew
Taxus brevifolia Pacific yew
Thuja occidentalis Northern white cedar
Thuja plicata Western redcedar
Tsuga heterophylla Western hemlock
Tsuga mertensiana Mountain hemlock
Ulmus americana American elm
Ulmus pumila Siberian elm
Vaccinium angustifolium Lowbush blueberry
Vaccinium canadense Canadian blueberry
Vaccinium myrtillus Whortleberry
Vaccinium vitis-idaea var. minus Mountain cranberry, lingenberry
Viburnum dentatum Arrowwood
Viburnum lantana Wayfaring tree
Viburnum lentago Nannyberry
Viburnum pauciflorum Native high bush cranberry
Viburnum tomentosum Japanese snowball
Viburnum trilobum American cranberrybush
Vines
Celastrus orbiculatus Japanese bittersweet
Celastrus scandens American bittersweet
Clematis Clematis
Vitis riparia Riverbank grape
H2SO4 1 hr. &
H2SO4 1 to 2 hrs. &
H2SO4 75 min. &
H2SO4 30 min
41°
77°
50°
33°