ARNOLDIA

A continuation of the
BULLETIN OF POPULAR INFORMATION
of the Arnold Arboretum, Harvard University

VOLUME 3 JUNE 25, 1943 NUMBERS 5–6

WINTER INJURY IN THE ARNOLD ARBORETUM, 1942–43

LOW temperatures during the past winter have caused considerable injury to trees and shrubs in the Arnold Arboretum, more injury than at any other time since the severe winter of 1933–34, when temperatures in Boston reached an all-time low. Last winter there were no strong winds, the soil was sufficiently moist at the time of freezing so that damage cannot be blamed on lack of moisture then. A study of the temperature records during the ten year period since 1933 demonstrates that significant winter injury can be expected every year when temperatures of below zero are recorded at the Arboretum greenhouses.

A complete listing was made of the plants suffering injury during the past winter and the lists of deciduous trees and shrubs are reproduced in this bulletin. A list of all plants suffering winter injury during the winter of 1941–42 is included since this was a very mild winter and excellent comparisons can thus be made. Not many evergreens were injured, and complete notes on them are to be found in Arnoldia **3:** 21–23, 1943. In studying these lists, another group of lists should also be studied, these being made by Arnold Arboretum staff members after the severe winter of 1933–34 and published in the Bulletin of Popular Information, Series 4, Volume II, Nos. 7, 8, 9, 11, pp. 29–47; 55–60, 1934. These combined lists thus form a rather complete picture of the kind and amount of injury to be expected in mild and severe winters at the Arnold Arboretum.

Minimum temperatures

Maximum and minimum temperature readings are taken daily at the Arboretum greenhouses. It is interesting to note that a study of these shows that temperatures of below zero have been recorded in only three winters since 1933, and each time plants suffered considerable winter injury. The minimum temperature of the 1933-34 winter was −17° F., during 1934-35 it was -8° F., and the minimum for last winter was −13° F. Winter injury may be due to any one of several factors, or to a combination of them, but from a study of the temperatures

and the reactions of the plants themselves it is safe to predict that serious injury will occur to plants when the temperatures drop below zero. By injury is meant the actual killing of flower buds, twigs, and branches. The typical "burning" of evergreen foliage can occur any winter regardless of the low temperature. If the ground is frozen and the air temperatures during the day are considerably higher than during the preceding night and high winds blow, optimum conditions for burning evergreen foliage occur. The minimum temperatures recorded at the Arboretum greenhouses are given below. These vary only a few degrees from the U.S. Weather Bureau official figures for Boston. It is interesting to note that on only seven days in 1933–34 and six days in 1942–43 did the minimum temperatures fall below zero. Only one other time did the temperature go below zero since 1933, and that was seven days in January and February, 1935.

1933		*1942*	
December	28 −4	December	17 −4
	29 −17		19 −7
	30 −14		20 −10
			21 −5
1934		*1943*	
February	7 −2	February	15 −13
	8 0		16 −11
	9 −18		
	10 −3		
	14 −4		

In comparing the amount of injury done in these two winters, it should be kept in mind that there were consistently high winds throughout the winter of 1933–34 which must have added materially to the killing of twigs and branches. There were no high winds last winter, nor was the soil too dry when it froze in the fall. However, there are 260 acres in the Arboretum grounds and temperatures are not uniform over the whole area. For instance, on December 29, 1933, when the thermometer at the greenhouse registered −17° F., one in the shrub collection a few hundred feet away (but considerably lower) registered −26° F. It is a known fact that injury is always more severe in the shrub collection on account of its low situation without sufficient air drainage.

There is a question concerning the time the damage is actually done. It will be noted that in both years the temperatures were below zero in December and February, and hence, theoretically, the damage could have occurred at either time. One instance seems to show that it may be the February cold spell which did the killing in 1942–43. Forsythia branches were taken in the greenhouse and forced after Christmas in December, 1942, and the flowers eventually came out in profusion, while branches cut again in late February failed to bloom. We also know that dormancy of many plants is a great deal more difficult to break by forcing in the greenhouse in December than it is in February. However, this

interesting problem as to the exact time injury takes place should be investigated further.

Explanation of lists

The following lists constitute a complete survey of winter injury in the Arnold Arboretum during the past two winters, one a very mild winter and one a severe winter. Many of the plants killed to the ground are sending out new buds from ground level and will grow again; a few were killed completely, although it is still too early to determine this in all cases. *Albizzia julibrissin rosea*, for instance, suffered considerable injury. It was not until after June 6 that any branches showed life at all. On the other hand, *Styrax Obassia* showed a normal growth of young shoots when examined on June 1, but after that date all new shoots suddenly withered and died, thus indicating injury to the cambium layers of the main trunk.

The plants growing in the Arboretum are divided into four groups, depending upon how seriously they were injured, i.e., plants killed to the ground, plants partially injured, flower buds only injured, and plants uninjured. It will be noted that some of the names are followed by percentages in parentheses. This is the amount of injury occurring in the winter of 1941–42, and all plants injured during that season are so designated. It may be assumed that all other plants not so designated were uninjured during that winter. Though some discrepancies in the figures are difficult to explain, in most cases the injury in 1941–42 was considerably less than in 1942-43. There was a much larger number of plants injured last winter than the previous one.

In the second list the percentage figures without the parentheses represent the approximate amount of twigs and branches killed. This naturally varies among the plants and the places where they are growing in the Arboretum, but the figures given are comparable.

In the third list, plants with flower buds killed, the percentages not in parentheses represent the approximate number of flower buds on the entire plant which were killed. It is reasonable to surmise that those plants listed as having more than fifty per cent of their branches killed would also have few, if any, flowers. Plants in this group are naturally those in which the flower buds are formed during the previous summer and are thus present all winter. It will be noted that such plants normally bloom from early spring to mid-June, including some of our most colorful ornamentals, among which are the forsythias, the oriental cherries, the magnolias, the wisterias, the azaleas, and the rhododendrons. Plants blooming later in the summer usually form their flower buds on the current year's growth.

All species at present growing in the Arboretum, not included in these lists, were uninjured by the winter cold. However, the mere listing of these would take too much space and would serve no important need; there is, of course, always the question, especially in the minds of those not familiar with the Arnold Arboretum, as to whether a certain species is actually growing there. To emphasize the fact that certain questionable plants did come through last winter unin-

jured, a fourth list has been included. Not all plants of the thousands of uninjured ones could be included in this publication, but the few in the fourth list may prove to be of interest to those who are interested in hardy trees and shrubs.

I. PLANTS KILLED TO THE GROUND DURING THE WINTER OF 1942-43

(The heights given represent the size of the plants killed. The fact that a six foot plant is killed to the ground represents a considerably greater injury than the killing of a younger plant of the same species which is only one foot high. The figures in parentheses denote the percentage in amount of winter injury during the comparatively mild winter of 1941-42.)

Abelia Engleriana 5′
Goucheri 1′
grandiflora 5′
Acanthopanax leucorrhizus 7′
Acer japonicum aconitifolium 10′
Oliverianum 4′
Actinidia chinensis 2′
melanandra 4′ (*80*)
polygama 4′
Alnus Maximowiczii 2′
Amorpha croceo-lanata
fruticosa tennessensis
glabra
Baccharis halimifolia 6′ (*20*)
Berberis aggregata Prattii 5′ (*15*)
recurvata 3′ (*30*)
"Autumn Cheer" 3′
Beaniana 5′
buxifolia nana 3′
candidula 1′
Chenaultii 3′
Fendleri
"Fireflame" 4′
Gagnepainii 3′
polyantha 3′
rubrostilla 2′
Sargentiana 5′
Wilsonae Stapfiana 6′ (*30*)
subcaulialata 5′
Berchemia racemosa 8′ (*80*)
Buddleia - all except alternifolia
Callicarpa - all species in collection 6–8′ (*25*)
Campsis grandiflora Thunbergii 2′ (*80*)
Ceanothus pallidus roseus 2′ (*40*)
Celastrus gemmata 6′ (*90*)
hypoleuca 6′ (*80*)
Celtis Tournefortii 3′
Chaenomeles lagenaria cathayensis 3′ (*90*)
Clematis species and varieties 6–8′
Clerodendron trichotomum 10′ (*80*)
Colutea - all species and varieties 6–8′ (*20-80*)
Coronilla Emerus 4′
Corylopsis platypetala 10′
spicata 6′
Veitchiana 10′
Cotoneaster affinis bacillaris 8′
amoena 2′
conspicua 4′
microphylla 1½′
rotundifolia 3′
rubens 3′
salicifolia rugosa 4′
Cytisus "Burbank hybrids" 6′ (*20*)
sessilifolius 8′
Decaisnea Fargesii 6′ (*40*)
Deutzia "Avalanche" 4′
candelabrum 5′
candida 4′ (*40*)

Deutzia carnea 3′ (*40*)
densiflora 4′ (*25*)
stellata 4′
"Contraste" 6′
elegantissima 6′
fasciculata 4′ (*60*)
glomeruliflora 5′
hypoleuca 3′ (*80*)
kalmiaeflora 2′
longifolia and vars. 4′ (*50*)
"Magicien" 3′
magnifica and vars. 3′–9′ (*60*)
mollis 4′
"Mirabilis" 5′
myriantha 8′
reflexa 3′
rosea and vars. 4′–6′ (*80*)
scabra and most vars. 4′–6′ (*30*)
Sieboldiana and var. 5′
Vilmorinae 3′
Dipelta floribunda 12′
ventricosa 5′
Fraxinus Paxiana 4′
Gaylussacia brachycera 1′
Genista cinerea 2′
Grewia biloba 10′ (*90*)
Helwingia japonica 4′
Hovenia dulcis 25′
Hydrangea arborescens and vars. 3′
cinerea and var. 3′
quercifolia 4′ (*15*)
radiata 2′
Ilex Aquifolium 3′
yunnanensis ("large leaf") 1′
("small leaf" - no injury)
Indigofera amblyantha 10′
Kerria japonica and vars. 4′ (*25-80*)
Lagerstroemia indica (Cole's "hardy" variety) 3′
Lavandula officinalis 1′
Lespedeza bicolor 4′
japonica 6′
Thunbergii 6′
Ligustrum acuminatum macrocarpum
ovalifolium aureo-marginatum (*50*)
sinense 10′ (*30*)
Lindera obtusiloba 10′
praecox 12′
Lonicera affinis pubescens 5′ (*70*)
alseuosmoides 1′
dioica 3′
etrusca 3′ (*70*)
gynochlamydea 5′ (*40*)
Henryi 2′
involucrata serotina 4′ (*20*)
Myrtillus 2′ (*60*)
obovata 3′
orientalis longifolia 10′ (*25*)
Periclymenum belgica 4′ (*50*)
quinquelocularis 9′ (*25*)
translucens 8′
saccata (*50*)
Standishii lancifolia 6′
Marsdenia erecta 3′
Meliosma Beaniana 15′
Neillia ribesioides 7′
sinensis 3′ (*30*)
Parrotiopsis Jacquemontiana 8′
Periploca laevigata 8′
Philadelphus argyrocalyx 3′
"Dame Blanche" 4′ (*30*)
Lemoinei "Coupe d'Argent" 3′
subcanus 6′ (*50*)
Photinia Beauverdiana notabilis 4′
Physocarpus capitatus 6′ (*15*)
Pleioblastus distichus 3′
Polygonum baldschuanicum 3′
Prunus Laurocerasus schipkaensis 4′
Quercus kewensis 4′
Rhamnella franguloides 4′
Rhododendron indicum laciniatum 1′
"Katie" 2′
"Nellie" 2′
Rosa Brunonii 2′
Davidi 2′
Henryi 2′

Rosa Luciae 2′
mollis 2′ (*60*)
"Morica" 3′
Noisettiana 3′ (*40*)
omeiensis chrysocarpa 2′ (*30*)
pteracantha (*70*)
sempervirens 1½′
Serafinii 1′ (*50*)
Woodsii and var. 2′
Sasa senanensis 6′ (*50*)
Sophora viciifolia 8′ (*20*)
Spiraea albiflora (*40*)
Blumei 4′ (*15*)
brachybotrys 3′ (*25*)
Bumalda Froebeli 2′ (*25*)
japonica microphylla 2′ (*50*)
ruberrima 2′
Miyabei glabrata 3′ (*30*)
mollifolia 7′
revirescens 3′ (*70*)
rubra 3′
Sargentiana 5′
Zabeliana 4′
Stephanandra incisa 5′ (*50*)
Tanakae 4′
Vaccinium Vitis-idaea 1′
Viburnum buddleifolium 6′
ovatifolium 10′
rhytidophyllum and var. 4′-9′
Vitex Negundo incisa 6′-8′
Vitis Piasezkii Pagnuccii 8′
pulchra 8′ (*90*)
Weigela hortensis 5′
japonica sinica 7′
Zanthoxylum simulans 3′ (*90*)

II. PLANTS PARTIALLY INJURED DURING THE WINTER OF 1942-43

(The figures represent percentage in amount of winter injury; the figures in parentheses denote the amount of winter injury during the comparatively mild winter of 1941-42.)

Acanthopanax setchuenensis 95
Simonii 50
ternatus 95
Albizzia julibrissin rosea 50-98?
Amorpha brachycarpa 90
canescens 50
fruticosa 75
nana 80
Artemisia sacrorum 25
Berberis aemulans 75
aggregata 80
"Barbarossa" 10
dictyophylla 50
Julianae 90
morrisoniensis 50
triacanthophora 80
verruculosa 50
vulgaris atropurpurea 25
wokingensis 50
Calluna vulgaris vars. 10–50 (*10–50*)
Calycanthus fertilis 25
floridus ovatus 50
Caragana Boisii 15
Chamlagu 50
densa 50
frutex 20
pekinensis 25
Ceanothus americanus 75 (*40*)
ovatus 25
pubescens 40
Cephalanthus occidentalis 90 (*50*)
Cercis chinensis 50
Chaenomeles lagenaria "Cardinalis" 10
"Marmorata" 40
Wilsonii 50
superba 25 (*20*)
Chionanthus virginicus 30

Clethra acuminata 5
alnifolia 10
Corema Conradii 25 (*30*)
Cornus australis Koenigii 50
Cotoneaster apiculata 50 (*30*)
Dielsiana 50
Henryana 75
horizontalis 50
perpusilla 50
Wilsonii 75
rotundifolia 50
Zabeli 50
Corylopsis pauciflora 50
Cyrilla racemiflora 50
Cytisus praecox 75
purgans 75
supinus 75
Davidia involucrata 50 ?
Deutzia candelaburm fastuosa 25
discolor 50
major 50
gracilis 75 (*30*)
hypoglauca 75 (*30*)
Lemoinei 30
compacta 30 (*30*)
parviflora ovatifolia 25
scabra "Pride of Rochester" 50
Schneideriana laxiflora 75
Diervilla rivularis 20 (*20*)
Erica carnea 90
Euptelea polyandra 25
Evodia Daniellii 30
Exochorda Korolkowi 30
racemosa 25
Fontanesia Fortunei 50
Forsythia suspensa 10
Gaylussacia baccata 10
glaucocarpa 20
dumosa 90
frondosa 10
Genista radiata 50 (*25*)
Hamamelis macrophylla 50
Helianthemum nummularium vars. 50
Hypericum densiflorum 50
frondosum 20 (*60*)
Kalmianum 20
prolificum 20
Iberis saxatilis 30
sempervirens 50
Idesia polycarpa 50
Ilex crenata 50
decidua 50 (*90*)
rugosa 75
serrata 75 (*40*)
Itea virginica 80 (*50*)
Jamesia americana 10
Laburnocytisus Adami 75
Leucothoe racemosa 10
Ligustrum acuminatum 10
ibolium 25
Ibota nana 80
insulare 25
obtusifolium 25
ovalifolium 75
Quihoui 10
pendulum 50
vulgare 30
"Lodense" 75
pyramidale 50
sempervirens 50
Lindera Benzoin 30
Liquidambar Styraciflua rotundiloba 30 (This is a small plant obtained from North Carolina)
Lonicera alpigena 10
Altmannii pilosiuscula 10
chrysantha Regeliana 10
deflexicalyx 50 (*30*)
fragrantissima 25
Heckrottii 30
heteroloba 10
Korolkovii 30
microphylla 25
Morrowii 10

Lonicera Purpusii 10
syringantha 50
thibetica 10
Vilmorinii 50 (*70*)
Webbiana 30
xylosteoides 10
Lycium chinensis 10 (*20*)
halimifolium 50 (*25*)
ruthenicum 50
Lyonia mariana 40 (*40*)
Myrica Gale 50
Paulownia tomentosa, small trees to ground, large trees only 25
Periploca graeca angustifolia 75
Pertya sinensis 75
Philadelphus "Bonje" 75
Burkwoodii 90
coronarius pumilus 50
cymosus "Conquête" 25 (*40*)
cymosus "Nuée Blanche" 25
"Rosace" 25 (*30*)
Lemoinei 50 (*20*)
"Amalthea" 50
"Avalanche" 50
"Belle Etoile" 90 (*50*)
erectus 50
"Innocence" 50 (*25*)
"Mont Blanc" 50
Lewisii 75
"Magdalenae" 50
nepalensis 25 (*20*)
"Norma" 25
"Pavillon Blanc" 50
purpureo-maculatus "Sybille"
sericanthus 50 (*30*)
"Sylvanae" 75
virginalis "Argentine" 10 (*80*)
"Glacier" 80
Physocarpus intermedius parvifolius 10
stellatus 50 (*20*)
Poncirus trifoliata 50
Potentilla fruticosa 30
micrandra 10
ochroleuca 25
parvifolia 25 (*40*)
tenuiloba 10
Veitchii 10
Prunus concinna 25
Fontanesiana 25
Persica and vars. 50
(except var. pendula which was uninjured)
pilosiuscula 60
pumila susquehanae 25
serrula 20
serrulata, no vars. had any flowers and all apparently suffered severe twig injury as evidenced by many leaf buds failing to open by June 1
"Kwanzan" 75
subhirtella 50
autumnalis, intermittent injury all along twigs
pendula 50
Pterocarya hupehensis 50
Pyracantha coccinea Lalandii, foliage only killed
Quercus Schochiana 50
Rhododendron obtusum japonicum
hybrids 25–100
Arnoldianum 10
Kaempferi 10
Rhodotypos scandens 50
Ribes diacanthum 25
futurum 50 (*30*)
petraeum Biebersteinii 50
robustum 50
Rosa arvensis 50
caudata 50
centifolia 50
foetida bicolor 25
Helenae 50

Rosa Lheritierana 75
multibracteata 50
multiflora 10
rugosa "Max Graf" 50
"Rustica" 10 (*30*)
spinosissima fulgens 50
pimpinellifolia 10
"Plato" 50
"Pythagoras" 25 (*40*)
Watsoniana 50 (*50*)
Wichuraiana 75
Rubus deliciosus 50 (*20*)
Securinega suffruticosa 50
Sorbaria arborea vars. 10–95
sorbifolia vars. 50–75
Spiraea alba 50
arcuata 50
arguta 25
betulifolia 50 (*30*)
Billiardii 50 (*50*)
cantoniensis 75 (*60*)
chamaedryfolia 30
cinerea 30 (*30*)
corymbosa 50
Douglasii 50 (*25*)
fontenaysii alba 10
rosea 25
Foxii 50
Fritschiana 30
gemmata 25
Henryi 50
hypercifolia and var. 25 (*20*)
inflexa 25 (*20*)
japonica 10
atrosanguinea 50 (*40*)
ovalifolia 25 (*50*)
laevigata 50
latifolia 25 (*30*)
lucida 10
Margaritae 50
media and var. 25
Menziesii 50
multiflora 25
nipponica 50
nudiflora 10
oxyodon 20
pachystachys 50 (*30*)
prunifolia 25
pubescens 10
pyramidata 30
Rosthornii 90
salicifolia 20
Schinabeckii 50
semperflorens 75
superba 50
trilobata 50
uratensis 25
Vanhouttei 20
Veitchii 20
virginiana serrulata 10
Staphylea colchica and vars. 75
Stewartia sinensis 50
Symphoricarpos albus laevigatus 10 (*15*)
Chenaultii 75 (*40*)
hesperius 50
orbiculatus and var. 50 (*30*)
Syringa emodi 50
Taxus chinensis 30
Ulmus carpinifolia Dampieri 10
suberosa 10
hollandica 30
major 30
Vaccinium corymbosum 10
hirsutum 25
Viburnum Burkwoodii 2
erosum 25 (20)
erubescens 90
hupehense 80
Vitex Agnus-castus alba 50 (*90*)
Doaniana 50
Weigela "André Thouin" 20 (*80*)
"E. André" 10 (*60*)
florida 10
"Congo" 25
variegata 25 (*80*)

Weigela "Marc Tellier" 10
"Pres. Duchartre" 20
"Seduction" 50
"Vanhouttei" 50 (*70*)
"Verschaffelti" 20 (*35*)
Zanthoxylum schinifolium 50
Zenobia pulverulenta 50 (*20*)
Zizyphus jujuba 10

III. PLANTS WITH FLOWER BUDS ONLY INJURED DURING THE WINTER OF 1942-1943

Figures denote percentage of injury

Abeliophyllum distichum 0–75
Amelanchier canadensis 15–50
Cornus florida 25 Flower clusters have the two bracts (outside of bud) injured and stunted in many cases.
Corylopsis glabrescens 100
Daphne Mezereum 100
Forsythia europaea 10–90
japonica saxatilis 50
ovata 75
×europaea 50–75
all others 100
Hamamelis mollis 100
Lonicera fragrantissima 75
praeflorens 100
Magnolia denudata 10
Soulangeana "Alexandrina" 30
"Candolleana" 25
"Norbertiana" 25
rubra 75
stellata 25
Pieris japonica 100
Prunus apetala 95
avium 90
canescens 90
cerasifera and vars. 95
concinna 100
cyclamina 100
Davidiana and vars. 100
incisa and vars. 75–90
insititia 99
Juddii 90
mandshurica 75
Maximowiczii 100
nipponica kurilensis 75–95
Sargenti 75–90
Schmittii 90
serrula 100
serrulata and most vars. 90-100
tomentosa and vars. 90
triloba multiplex 99
yedoensis 100
Rhododendron arbutifolium 90
catawbiense, many hybrids 25–75
"Cunningham's White" 100
dauricum 100
sempervirens 100
Fortunei hybrids 20–100
gandavense many vars. 75
indicum crispiflorum crosses 100
laetevirens 90
molle, many vars. 75
mucronulatum 99
obtusum amoenum 95
arnoldianum 95
Kaempferi 95
Schlippenbachii 100
viscosepalum 75
yedoense poukhanense 75
Viburnum fragrans 100
Wisteria sp. 100

IV. PLANTS UNINJURED DURING THE WINTER OF 1942–43

(NOTE: It is usually presupposed that all plants not recorded in "injured" lists were not injured. Such is the case with these lists. However, to be certain that some interesting plants are definitely recorded as uninjured, the following list is offered.)

Alyssum gemonense
Betula papyrifera and vars.
Campsis radicans
Castanea mollisima
Cercis canadensis
Celastrus flagellaris
orbiculata
scandens
Chaenomeles japonica "Corallina"
sanguinea
Chamaedaphne calyculata
Daphne altaica
Cneorum and vars.
"Somerset"
Deutzia coreana
glabrata
grandiflora
parviflora
staminea
Dirca palustris
Enkianthus campanulatus
Gymnocladus dioicus
Hamamelis vernalis
Hibiscus syriacus vars.
Ilex montana
yunnanensis
Kalmia latifolia
Kolkwitzia amabilis
Lespedeza kiusiana
Liquidambar Styraciflua
Macludrania hybrida
Maddenia hypoleuca
Magnolia Kobus
salicifolia
Soulangeana speciosa
verbanica
"Waterlily"
Mahonia Aquifolium
repens
Oxydendrum arboreum
Paeonia suffruticosa
Periploca sepium
Pieris floribunda
Prinsepia sp.
Prunus americana
Besseyi (heavy bloom)
cerasus austera
domestica Julianae
glandulosa
Munsoniana
"Newport"
nigra
Padus vars.
salicina
spinosa
tenella var.
Pyrus communis Pyraster
pyrifolia
ussuriensis hondoensis (very few flowers)
ovoidea
Rhododendron atlanticum
"Boule de Neige"
calendulaceum
canadense
carolinianum
× mucronulatum
catawbiense
album
Fraseri
"Fürst Camille von Rohan"
"Henrietta Sargent"

Rhododendron "Heureuse Surprise"
"Imperialis"
japonicum
narcissiflora
nudiflorum
"Pallas"
"Pucella"
roseum
Smirnowii
speciosum
Vaseyi
Rhus aromatica
Ribes aureum and vars.
odoratum and vars.
Rosa Ecae
Hugonis
Primula
rugosa and most vars.
spinosissima
Spiraea prunifolia simpliciflora
Thunbergii
Staphylea holocarpa
Stewartia koreana
Symplocos paniculata
Tripterygium Regelii
Viburnum rhytidophylloides
Vinca minor and vars.
Xanthorhiza simplicissima
Zanthoxylum americanum