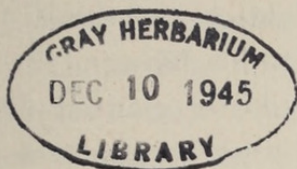


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THE GLENMORE ARBORETUM AT BUFFALO CREEK, COLORADO

THE Glenmore Arboretum is at Buffalo Creek, Colorado in the Colorado foothills. It was started twelve years ago when its owner decided to landscape his summer residence with native plants. A number of native plants which were available at local nurseries were purchased and a few trees and shrubs were collected from nearby locations.

The next spring it was decided to add, to the collection of native plants, as many different types of evergreens as could be obtained, whether native or not. All types that were offered by local nurseries were trucked to Buffalo Creek and numerous exotics were ordered by mail. Little attention was paid to soil or location and the following spring it was discovered that even though the Colorado mountains were covered with evergreens, not all evergreens were hardy there, and that even the natives required different treatment from that which had been accorded.

Information relative to the proper planting practices was readily obtained, but curiously enough it seemed that no one had ever made any systematic endeavor to ascertain just what evergreens are hardy in Colorado. It was decided to conduct experiments along this line.

During the fall and winter a library on evergreens was started, a good deal of studying was done. Buffalo Creek is but twenty miles from the Continental Divide where the eternal winds distort the limber pines into grotesque shapes and the protracted low temperatures furnish but the briefest of growing seasons. Even at Buffalo Creek, with an elevation of only 7000 feet, high winds are invariably present in the spring and annual minimum temperatures range from -25° to -35° F. Often there is little snow in the winter and in the spring alternate freezes and thaws kill all but the most sturdy of plants. The soil is a disintegrated granite

with very little humus. Lacking adequate browse, the deer pruned most of the junipers and disbudded all exotic pines. Never having been told that pruning should not extend into old wood, a great deal of damage was done.

Peter Rabbit also found buds and tender shoots to his liking.

To improve the soil, an area was manured, plowed and planted in soy beans, and these were turned under while green. At the suggestion of the Supervisor of the U.S. Forest Service Nursery at Monument, Colorado, this area was fenced with a fine mesh wire (one-third inch) eighteen inches high and buried six inches beneath the surface. Above this was stretched two feet of rabbit wire, and above that, a couple of strands of barbed wire. Subsequent experience has indicated that this is the only feasible method of excluding rabbits and mice. "Repellants" have proved but appetizers. The deer, of course, hop over this fence when so inclined. The extra effort required, however, has thus far proved a decided deterrent.

The following spring, permission was secured from the Denver City Nursery to use a few frames and the more doubtful items which were purchased at that time were planted in these more favorable surroundings. (Denver's annual minimum temperature is a good ten degrees above that of Buffalo Creek and soil and wind conditions are better, too.) Lath shading was kept on these Denver frames for a year and the same protection was furnished the new trees that were planted at Glenmore. They were regularly watered at both places.

Some years later a frame for propagation by seed was added at Buffalo Creek and the Denver City Greenhouse lent a bench for experiments in vegetative propagation. Out of all these faltering experiments and subsequent additional ventures, three main purposes have finally evolved:

1. To establish at Buffalo Creek an arboretum composed of native plants and such evergreens (native or foreign) as will live there.
2. To ascertain what evergreens are hardy under normal Colorado conditions.
3. To perpetuate, through vegetative propagation, evergreens that are noteworthy because of their appearance or their hardiness.

Although cuttings are placed in sand at the City Greenhouse each December, the vegetative propagation is carried out for the most part through the medium of commercial nurseries that handle custom grafts and cuttings. Each December scions are taken from noteworthy trees that have been observed during the preceding year. A false cypress that has no business even staying alive in Denver has, for some reason, actually flourished for ten years. Its tips are sent away for grafting. The aphid that travel from Douglas fir to spruce for some reason leave a given tree entirely alone. Possibly grafts from it may have the same immunity. Fastigate junipers and pines are sometimes found in the hills, and perhaps, their useful ornamental form may propagate true. Grafts from a "weeping" spruce may themselves weep. The Glenmore Arboretum has a golden Colorado spruce, which was noted among several hundred thousand normal seedlings at a local

nursery a few years ago. A cynical wife insists it is but a "peroxide blonde" because this same nurseryman sold some "dwarf ponderosa pines" a few years ago that turned out to have knots tied in their seedling trunks, just below the surface of the soil of the pots in which they were planted. Two of these "dwarfs" were even proudly sent to the Arnold Arboretum! However, the "peroxide blonde" has kept her amazing color in her new surroundings for almost three years now. Its scions will be grafted this winter.

The functions that were first named are the ones most stressed, however. Exotic evergreens that can "take" Denver's occasional winters of -20° Fahrenheit, its alternate freezes and thaws each spring, with little snow protection, and its burning sun and high winds—such evergreens are probably pretty hardy everywhere. If, in addition, they can survive the additional rigors always present at Buffalo Creek, then a very worthwhile test has been given.

Although originally all of the experimenting was done at Buffalo Creek, now it constitutes the secondary stage. Each year there are purchased and placed in the Denver frames evergreen transplants from various locations, the annual minimum temperature of which runs at least as low as -5° to -10° (Rehder's Zone V). These trees are kept in the Denver frames for two years, the first year being under lath screens. Half of those that survive are taken to Glenmore and are there put in nursery frames for two years, again having lath protection the first year. The other half of these specimens are planted in open nursery rows in Denver, where they will get cultivation and water. At the end of another two years further transplanting is done. Those that have lived for two years in the Buffalo Creek nursery frames are put in open nursery rows at Buffalo Creek and half of those that have lived in the open nursery rows in Denver are then taken to the open nursery at Buffalo Creek. After two years in the open nursery at Buffalo Creek they are transplanted to permanent locations and if they survive a couple of reasonably rigorous winters in their final location, it is felt that they are "good prospects."

Of course, no decisive test can be made in a time as short as this. The winter of 1944 and the spring of 1945 were the most trying that have been experienced at Buffalo Creek. A virtual drought from August to December, and practically no snow between December and April created a condition that even the native trees found little to their liking. Colorado spruces and limber pines that had been transplanted to their permanent locations as much as six years ago died. Mountain common juniper growing naturally died in great quantities. Japanese larch killed almost to the ground after three successful years in the open nursery. (If larch sap could be used as a rodent repellant it might be successful. Not one larch bud has ever been eaten, even during the years of worst famine.)

During these twelve years a card index record was kept on every evergreen that was planted. This record will, perhaps, be the most valuable contribution

to horticulture of the Glenmore Arboretum. For the statistically inclined, a summary of the Buffalo Creek burials is appended.

Growth is incredibly slow at "Glenmore." Once a tree leaves the nursery, life is harsh. The earth ball has good soil in it and native grasses discover this almost immediately. Probably the additional moisture that is given after transplanting attracts these hungry marauders. Whatever it is, by the end of the first season any tree that has been planted even near sod has all it can do to stay alive. If it does stay alive two or three years it still may not be able to subsist on the native diet, once its roots have gone beyond the earth ball.

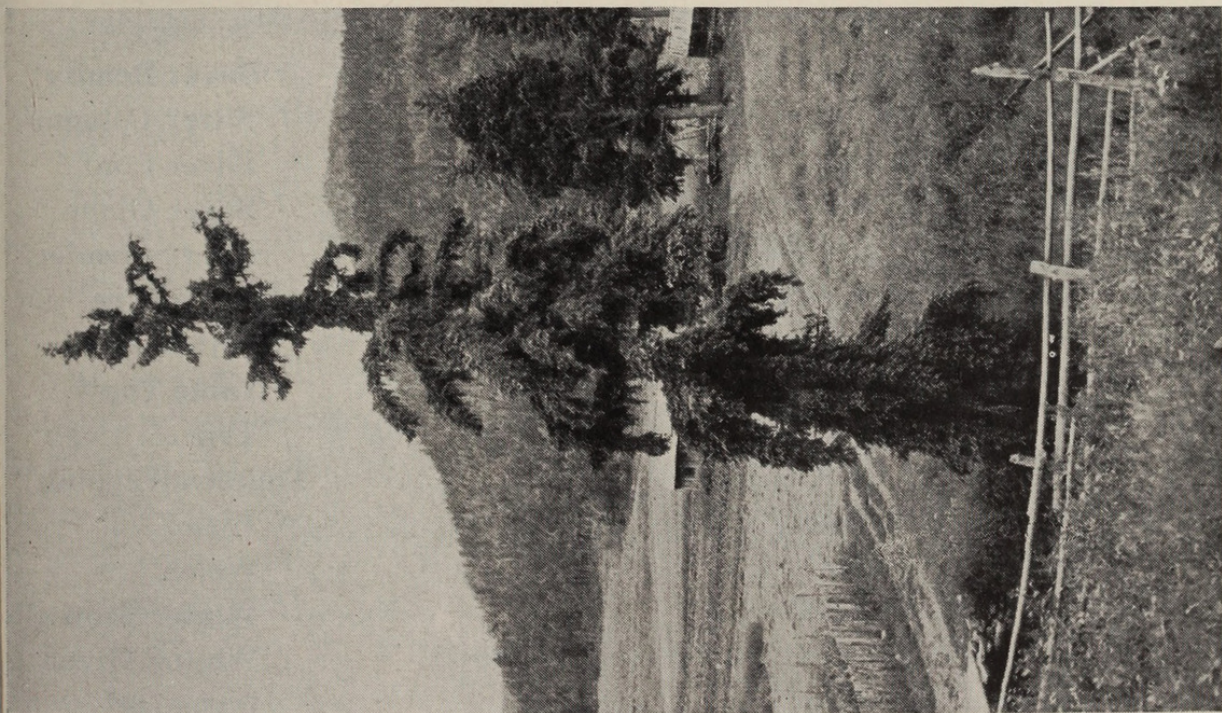
There are high spots, however. Juniper blight is never known in this dry atmosphere. Red spiders are infrequent and scale is seldom present. Spruce gall aphids are always present, but are not too bad. The pine tip moth comes every now and then, but seems to prefer conditions along the roadsides.

From the lists appended it will be noted that the great majority of varieties attempted at "Glenmore" are clons. The number of species that are happy in Colorado—particularly at Buffalo Creek—are relatively small. Even the sturdy eastern red cedar has a much harder time than its western cousin, the Rocky Mountain juniper.

The Rocky Mountain juniper is truly a splendid tree in Colorado. As it is very variable, at least in youth, forty-five distinctive clons have been secured. It will be interesting, long after the present owner is dead, to see if these variants in color, form and texture eventually arrive at the somewhat typical pattern shown in the cut below.

The Colorado native evergreens have made great contributions to ornamental horticulture. The bristlecone pine, bizarre in youth and picturesque at maturity, has few, if any, rivals for naturalistic planting. (Unfortunately this tree has not thus far proved successful in eastern locations.) The common Douglas fir of Colorado is highly prized everywhere. It is one of the "common" trees at "Glenmore." The Colorado spruce in its striking blue and silver shades is becoming almost ubiquitous, while the white fir of Colorado has no rival in its genus for general landscaping purposes and should be used even more than it is.

The deciduous trees and shrubs at "Glenmore" are, as has been stated, restricted to natives, for the most part, because that group has not been explored by local nurserymen as much as the deciduous exotics have been. These deciduous natives, when put upon their own, grow with incredible slowness. And that constitutes the one great drawback to a Colorado Arboretum—life is seldom more than threescore years and ten.



The weeping variety of the Colorado spruce,
Picea pungens.



A Rocky Mountain Juniper, *Juniperus scopulorum*.

EVERGREENS TRIED AT GLENMORE ARBORETUM

Two hundred and fifty two species, botanical varieties and clons of evergreens have been tried at Glenmore. These have been divided into the following eight tentative groups.

I. Hardy in Denver and Buffalo Creek

<i>Abies concolor</i> (difficult to get started)	<i>Juniperus scopulorum</i> "Emerald"
" " <i>brevifolia</i>	" " "Fastigiata"
" " <i>conica</i>	" " "Funalis"
<i>Juniperus chinensis</i> "Compact Pfitzer"	" " "Gareei Spreading"
" " "Hetz"	" " "Glenmore Globe"
" " Pfitzeriana	" " "Glenmore Queen"
" " "Pfitzeriana aurea"	" " "Gray Gleam"
" " Sargenti	" " "Green King"
" " "Silver Sargent"	" " "Green Queen"
" <i>communis saxatilis</i>	" " "Hall"
" " " "Compact"	" " "Hilborn Globe"
" " " "Dense"	" " "Marshall"
" " " "Erect"	" " "Marshall spreading"
" " " "Lewis"	" " "McCoy"
" " " "Prostrate"	" " "Moffett"
" <i>horizontalis</i> "Wyoming"	" " "Montana"
" <i>monosperma</i>	" " "Morrisson"
" " "Silver"	" " "Northern Beauty"
" <i>Sabina</i>	" " "Pathfinder"
" " "Russian"	" " "Raleigh"
" " "Russian No. 4"	" " "Scraggy"
" " <i>tamaricifolia</i>	" " "Silver Beauty"
" " "tamaricifolia erecta"	" " "Silver Column"
" " "Von Ehron"	" " "Silver Cord"
" <i>scopulorum</i> - (clons of this	" " "Silver Globe"
have all proved hardy, those in	" " "Silver Spreader"
bold face type being especially	" " "Stove Pipe"
fine)	" " "Sutherland"
" <i>scopulorum argentea</i>	" " "Table Top"
" " "Blue Heaven"	" " "Tepee"
" " "Chandler Blue"	" " "Tolleson Weeping"
" " "Cologreen"	" " "Weir"
" " "Column"	" " "Welch"
" " "Communis type"	" " "Winter Brown"
" " "Cone"	" " "Winter Green"
" " "Dewdrop"	" " "Wyoming"

Juniperus utahensis (not as sturdy as
J. scopulorum)
Larix Gmelini
Picea Engelmanni
 “ “ *argentea*
 “ *glauca densata* (sometimes
 scorches a little)
 “ *pungens*
 “ “ “Buffalo”
 “ “ *compacta*
 “ “ “Fan”
 “ “ *glauca*
 “ “ “Glenmore Golden”
 “ “ “Hill Golden”
 “ “ “Hudson”
 “ “ *kosteriana*
 “ “ “Moerheim”
 “ “ “Redskin”
 “ “ “Turkey Creek”
 “ “ “Weeping”
 “ “ “Weeping Silver”

Picea pungens “Wellington”
Pinus aristata
 “ *Banksiana* (difficult to start)
 “ *cembroides edulis* (this occasion-
 ally burns particularly the first
 winter after transplanting)
 “ *contorta latifolia*
 “ *flexilis*
 “ “ “Fastigate”
 “ “ “Long Leaf”
 “ “ “Short Leaf”
 “ “ “Silver”
 “ “ “Twisted Leaf”
 “ *Heldreichii leucodermis*
Pseudotsuga taxifolia
 “ “ *compacta*
 “ “ *fastigiata*
 “ “ *glauca*
 “ “ *pendula*
 “ “ *viridis*

II. Hardy in Denver but Questionable or Unsatisfactory in Buffalo Creek

Juniperus chinensis Keteleeri

“ *communis aurea*

“ *virginiana*

“ “ “Burk”

“ “ *Canaertii*

“ “ “Cypress”

“ “ *glauca*

“ “ *globosa*

“ “ “Goldtip”

“ “ “Hill Dundee”

Juniperus virginiana Kosteri

“ “ *Schottii*

“ “ *tripartita*

Larix laricina

Pinus nigra

“ *resinosa*

“ *Strobus* (occasionally burns on
west side)

“ *sylvestris*

III. Hardy in Denver and Buffalo Creek if protected

Abies lasiocarpa arizonica

“ “ “Blue”

Juniperus excelsa stricta

Pinus Cembra

Taxus cuspidata nana



PLATE XIV

Limber pine, *Pinus flexilis*, at timber line.

IV. Hardy in Denver if protected, but Questionable or Unsatisfactory in Buffalo Creek

<i>Juniperus horizontalis plumosa</i>	established in Denver, it does well,
<i>Picea glauca conica</i>	but often is difficult to start)
<i>Pinus densiflora umbraculifera</i>	<i>Pinus Mugo Mughus</i>
<i>Pinus Mugo compacta</i> (when once es-	

V. Possibilities in both Denver and Buffalo Creek - trees that have done well during a very brief trial

<i>Abies homolepis</i>	<i>Larix decidua</i>
<i>Chamaecyparis pisifera filifera</i>	“ <i>sibirica</i>
“ “ “Forest”	<i>Libocedrus decurrens</i>
“ “ “Glenmore”	<i>Picea glauca albertiana</i>
<i>Juniperus chinensis</i> “Armstrong”	“ <i>mariana</i>
“ “ <i>columnaris</i>	“ <i>obovata</i>
“ “ <i>japonica</i>	“ <i>orientalis</i>
“ “ “Dwarf”	<i>Pinus densiflora</i>
“ “ <i>tortulosa</i>	“ <i>monticola</i>
“ <i>communis</i> “nana compacta”	“ <i>nigra pygmaea</i>
“ “ <i>saxatilis</i>	“ <i>ponderosa</i> (from the west side
“ <i>horizontalis</i> “Admirabilis”	of the Rocky Mountains)
“ “ “Black Hills”	“ <i>sylvestris fastigiata</i>
“ “ <i>Douglasii</i>	<i>Taxus media Hicksii</i>
“ “ “Filicinus”	<i>Thuja occidentalis robusta</i>
“ “ “Pulchiness”	“ “ <i>Woodwardii</i>
(These clons of <i>J. horizontalis</i>	“ <i>orientalis</i> “Dark Green”
should be transplanted only	“ “ “Fairfax”
when they are very small. They	“ “ “Fastigate”
should probably not be exposed	“ “ “Glenmore”
to the west sun and wind)	“ “ “Krameria”
“ <i>squamata</i>	“ “ <i>stricta</i>
“ “ <i>prostrata</i>	

VI. Questionable Trees - trees that have lived thus far but give indications that they are not hardy

<i>Abies lasiocarpa</i> (hardy in Buffalo	<i>Pinus Griffithii</i>
Creek, however)	“ <i>rigida</i>
“ <i>Veitchii</i>	<i>Sequoiadendron giganteum</i> (has lived
<i>Chamaecyparis obtusa</i>	under lath in Denver for three
<i>Juniperus conferta</i>	years, but dies quickly at Buffalo

Creek)
Taxus media Brownii
 “ “ *Hatfieldii*

Taxus media “Wellesley”
Thuja plicata

VII. Unsatisfactory Trees - trees that have stayed alive but in such a manner that they have no horticultural value

<i>Abies balsamea</i>	covered in winter to live)
“ <i>holophylla</i>	<i>Juniperus horizontalis</i> “Bar Harbor”
<i>Chamaecyparis obtusa gracilis</i>	“ <i>squamata</i> Meyer (holds
“ “ <i>nana</i>	dead foliage and gets “leggy”)
“ <i>pisifera</i>	<i>Picea Abies</i>
<i>Juniperus chinensis</i> (this retains its	“ “ <i>borealis</i>
dead foliage and gets very un-	<i>Thuja occidentalis</i> (as previously
sightly)	stated, a few trees have been suc-
“ <i>chinensis</i> “Dwarf”	cessful and clons from these give
“ <i>communis</i> <i>Jackii</i> (must be	promise)

VIII. Trees that have died

<i>Abies alba</i>	<i>Picea Abies argentea</i>
“ <i>cephalonica</i>	“ “ <i>Gregoryana</i>
“ <i>cilicica</i>	“ “ <i>Maxwellii</i>
“ <i>firma</i>	“ “ <i>nana</i>
“ <i>Fraseri</i>	“ “ <i>pygmaea</i>
“ <i>grandis</i>	“ <i>Engelmanni</i> “Dwarf”
“ <i>Nordmanniana</i>	“ <i>glauca</i>
<i>Chamaecyparis nootkatensis</i>	“ <i>jezoensis hondoensis</i>
“ <i>obtusa</i> <i>Crippsii</i>	“ <i>Omorika</i>
“ <i>thyoides</i> (poor condi-	“ <i>polita</i>
tions, however, will be tried	“ <i>rubens</i>
again)	<i>Pinus albicaulis</i> (should be hardy, will
<i>Cryptomeria japonica</i>	try again)
<i>Cupressus arizonica</i>	“ <i>attenuata</i>
“ <i>Macnabiana</i>	“ <i>cembroides monophylla</i>
<i>Ginkgo biloba</i> (will be tried again)	“ <i>Sabiniana</i>
<i>Juniperus californica</i>	“ <i>Strobus nana</i>
“ <i>chinensis mas</i>	“ “ <i>fastigiata</i> (both these
“ <i>communis</i>	varieties should be hardy in
“ “ <i>depressa</i> (will be	Denver)
tried again)	“ <i>Taeda</i>
<i>Larix occidentalis</i>	“ <i>Thunbergii</i>

Pseudotsuga macrocarpa
Taxodium distichum
Taxus brevifolia
Taxus canadensis
 “ “ *stricta*

Taxus cuspidata (will be tried again)
Tsuga canadensis (this has lived under
 lath at the Denver City Nursery)
 “ *canadensis* “Kelsey Weeping”
 “ *caroliniana*

Deciduous Trees and Shrubs - mostly natives of Colorado,
all growing very well

Acer glabrum
 “ *Negundo*
Aesculus octandra
Alnus tenuifolia
Amelanchier alnifolia
Amorpha canescens
 “ *fruticosa*
 “ “ *angustifolia*
 “ *nana*
Apocynum androsaemifolium
Artemisia frigida
 “ *tridentata*
Berberis Fendleri
 “ *koreana*
Betula fontinalis
 “ *glandulosa*
 “ *papyrifera*
Ceanothus Fendleri
 “ *velutinus*
Celtis occidentalis
Cercocarpus montanus
Clematis ligusticifolia
Cornus stolonifera coloradensis
Corylus cornuta
Cowania Stansburiana
Crataegus species (4)
Eleagnus argentea
Fallugia paradoxa
Forestiera neo-mexicana
Fraxinus pennsylvanica lanceolata
Holodiscus dumosus
Humulus lupulus neomexicanus

Ipomoea leptophylla
Jamesia americana
Lonicera involucrata
Lycium pallidum
Mahonia Aquifolium
 “ *repens*
Pachistima Myrsinites
Parthenocissus quinquefolia
Philadelphus microphyllus
Phyllodoce empetrifolmis
Physocarpus species (3)
Pieris floribunda
Populus acuminata
 “ *Andrewsii*
 “ *angustifolia*
 “ *deltoides*
 “ *Sargentii*
 “ *tremuloides*
Potentilla fruticosa
Prunus americana
 “ *Besseyi*
 “ *pennsylvanica*
 “ *virginiana melanocarpa*
Ptelea trifoliata
Purshia tridentata
Quercus macrocarpa
Rhus glabra cismontana
 “ “ *flavescens*
 “ *trilobata*
Ribes americanum
 “ *aureum*
 “ *cereum*

Ribes species (3)	Shepherdia canadensis
Robinia luxurians	Sorbus scopulina
Rosa species (4)	Symphoricarpos species (4)
Rubus deliciosus	Viburnum pauciflorum
“ “ “Andrews Double”	Vitis Longii
“ idaeus strigosus	Yucca angustissima
Salix species (11)	“ baccata
Sambucus microbotrys	“ glauca
Sapindus Drummondii	“ “ rosea
Shepherdia argentea	“ neomexicana

ROBERT E. MORE

Editor's Note:

Mr. Robert E. More, owner of “Glenmore” at Buffalo Creek, Colorado, is an enthusiastic plantsman who for many years has been experimenting with the growing of evergreens. We do not receive much information concerning the growing of ornamental trees in the Rocky Mountain region and that is why we welcome this frank discussion of what Mr. More is doing at “Glenmore.” His letters have proved to be so interesting over a period of years that he was asked to record his experiences so that other *Arnoldia* readers will understand some of the problems in reference to the growing of ornamental evergreens in his area.

Indian Artifacts

An exhibit of special interest has just been installed in the display cases at the right in the vestibule of the Administration Building of the Arnold Arboretum. This consists of about one hundred stone artifacts found by Mr. E. J. Palmer in the Arboretum grounds. The display includes arrow and spear points, scrapers or knives, digging tools, etc., as well as a number of stone flakes or spalls. The presence of the latter indicates that the Indians who inhabited the area actually manufactured their stone implements at their permanent or temporary camp sites, the latter, for the most part, having been situated near one or the other of the small streams that flow through the grounds. Several of these have also been found near the spring across the road from the Rockery. For further information concerning Indian relics found in the Arnold Arboretum, see the bulletin on the subject written by Mr. Palmer. (*Arnold Arboretum Bull. of Pop. Inf.*, Series 4, Vol. II, No. 12, Dec. 28, 1934.)



Moore, Robert E. 1945. "The Glenmore Arboretum at Buffalo Creek, Colorado." *Arnoldia* 5(10-11), 65-76.

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