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*Eastern Redcedar:
an annotated bibliography*

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EASTERN REDCEDAR: AN ANNOTATED BIBLIOGRAPHY

E. R. Ferguson

The purpose of this bibliography is to provide a convenient summary of the literature on eastern redcedar (*Juniperus virginiana* L.).

Redcedar has considerable potential for forest management, especially on sites where shallow soil limits the growth of other species. Though stands are now depleted, the trees have a variety of commercial uses and also provide food for wildlife.

Redcedar is widely distributed in the Eastern U. S., and many writers have documented its historical significance, its dendrological and silvical characteristics, and its insect and disease enemies. On other topics pertinent information is in short supply, and it is only when the literature is brought together under some classification scheme that the magnitude of the voids can be appreciated. Thus, of about 330 entries in this bibliography, 128 fall under the general heading of silviculture and almost 100 come under injuries and protection. There is a single entry in the harvesting section, mensuration is represented by eight items, and the entire body of knowledge about forest economics and management is contained in five publications, three of which are from a single location. The literature is most ample on aspects that lend themselves to observation or short-term study, and scanty on subjects that require advanced research techniques or collection of data over significant periods in the lifetime of stands.

The entries include popular as well as scientific articles, and are intended to be complete through 1969. Initial sources of reference were the author's files, the *Journal of Forestry*, and

the Oxford Catalogue of World Forestry Literature on Microfilm, as issued by the Commonwealth Agricultural Bureaux, Farnham Royal, England. Citations in specific publications provided additional titles. Though considerable care has been taken, there probably are omissions; notification of these will be appreciated.

Citations are arranged by the Oxford Decimal System. The table of contents provides a key to the classification, and further information is available in the *Oxford System of Decimal Classification for Forestry*, published by the Commonwealth Agricultural Bureaux. Publications have been cross-referenced under such subject-matter heads as seemed appropriate, except that comprehensive or general treatments are listed only once, under classification O.

Entries are for the most part accompanied by brief abstracts. When two or more publications contain virtually the same information, the abstract follows the more complete one, which generally will also be the one most readily available. The complete citation and abstract are printed on the page where the publication is first listed. Later references are abbreviated, for example:

Arend. 1950. (114)

In this cross-reference, the number in parentheses indicates the subject head (Soil) under which the abstract appears. Most abstracts were written by the author after a reading of the original, but some are from summaries or briefs contained in the publications themselves.

O. FOREST, FORESTRY, AND UTILIZATION OF FOREST PRODUCTS

Bailey, L. H. 1933. THE CULTIVATED CONIFERS IN NORTH AMERICA, COMPRISING THE PINE FAMILY AND THE TAXADS. 404 p. N.Y.: Macmillan.

Detailed botanical description of redcedar, with very general information on cultivation and propagation and on insects, diseases, and injuries.

Betts, H. S. 1945. EASTERN RED CEDAR. USDA Forest Serv. Amer. Woods Ser., 4 p.

Distribution, growth, supply, and principal uses.

Collingwood, G. H. 1938. EASTERN RED CEDAR. Amer. Forests 44: 30-31.

Occurrence, growth characteristics, botanical characteristics, wood features, utilization, and common pests.

Ferguson, E. R., Lawson, E. R., Maple, W. R., and Mesavage, C. 1968. MANAGING EASTERN REDCEDAR. USDA Forest Serv. Res. Pap. SO-37, 14 p. S. Forest Exp. Sta., New Orleans, La.

Previous research and recent studies in Arkansas indicate that redcedar should be favored on many areas where trees of other species grow poorly. Planting is feasible, and redcedar responds well to release and thinning.

Mohr, C. 1901. NOTES ON REDCEDAR. USDA Bur. Forest. Bull. 31, 37 p.

Sections on distribution, associated species, products, growth and development, enemies, natural reproduction, forest management, nomenclature and classification, botanical description, and morphology.

Muenschler, W. C. 1949. THE RED CEDAR. Cornell Plant. 5: 47.

Occurrence, range, wood qualities, and tree form.

USDA Forest Service. 1907. RED CEDAR (JUNIPERUS VIRGINIANA). USDA Forest Serv. Circ. 73, 4 p. Also as USDA Plant. Leaflet. 20, 4 p.

Form and size, range, habits and growth, uses, planting techniques, cultivation, and care.

USDA Forest Service. 1955. EASTERN REDCEDAR (JUNIPERUS VIRGINIANA). USDA Useful Trees of the U.S. 13, 4 p.

Distribution in the United States, resources, growth habits and size, tree and wood characteristics, uses, and enemies.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11 SITE FACTORS: SOIL, HYDROLOGY (WATER CONSERVATION, ETC.)

114 SOIL

Arend, J. L. 1948. INFLUENCES ON REDCEDAR DISTRIBUTION IN THE OZARKS. USDA Forest Serv. S. Forest Exp. Sta. S. Forest. Notes 58.

See entry below.

Arend, J. L. 1950. INFLUENCE OF FIRE AND SOIL ON DISTRIBUTION OF EASTERN REDCEDAR IN THE OZARKS. J. Forest. 48: 129-130.

In the Ozarks redcedar characteristically occurs on shallow limestone soils and rough topography, since fire and competition keep it off better sites. Contrary to common belief, soil acidity appears to have little effect on occurrence and distribution of redcedar in the Ozarks. The neutral to alkaline soils found under many stands may be a result rather than a cause of the species' occurrence.

Arend, J. L., and Collins, R. F. 1949. A SITE CLASSIFICATION FOR EASTERN RED CEDAR IN THE OZARKS. Soil Sci. Soc. Amer. Proc. 13:510-511.

Evaluates and describes important site factors. Proposes four site classes: Site I, alluvial soils, deep and well drained, site index 55-60. Site II, upland soils, 24 inches and over in depth, site index 45-50. Site III, upland soils, 12-24 inches in depth, site index 35-40. Site IV, upland soils, less than 12 inches in depth, site index 25-30.

Broadfoot, W. M. 1951. REDCEDAR LITTER IMPROVES SURFACE SOIL. USDA Forest Serv. S. Forest Exp. Sta. S. Forest. Notes 71.

See entry below.

Broadfoot, W. M. 1951. SOIL REHABILITATION UNDER EASTERN REDCEDAR AND LOBLOLLY PINE. J. Forest. 49: 780-781.

In north-central Mississippi, litter and surface soil under even-aged redcedar, loblolly pine, and adjacent herbaceous cover varied chemically, physically, and biologically. Soil rehabilitation proceeds faster under redcedar than under herbaceous or loblolly pine cover.

Chandler, R. F., Jr. 1939. THE CALCIUM CONTENT OF THE FOLIAGE OF FOREST TREES. Cornell Univ. Agr. Exp. Sta. Mem. 228, 15 p.

The calcium content of evergreen foliage increased throughout the growing season but remained fairly constant during winter. The older the foliage the higher was its calcium content. Redcedar litter has a marked effect on the pH and structure of the soil.

Coile, T. S. 1933. SOIL REACTION AND FOREST TYPES IN THE DUKE FOREST. Ecology 14: 323-333.

Redcedar occurs in very small pure stands within other forest types, but seldom is found in the overstory on extensive areas. It tends to raise the pH of normally acid soils.

Fletcher, P. W., and Ochrymowych, J. 1955. MINERAL NUTRITION AND GROWTH OF EASTERN REDCEDAR IN MISSOURI. Mo. Agr. Exp. Sta. Res. Bull. 577, 16 p.

Mineral composition of twigs and foliage was compared with mineral composition of soil on which the plants grew. Conclusions: (1) Rich, calcareous soils produced maximum growth but least ash per unit of oven-dry matter. (2) The percentages of total seedling weight in root, stem, and foliage remain almost constant regardless of plant size or soil. (3) Soluble phosphorus and exchangeable calcium in silt-loam soils were directly related to seedling growth. (4) Phosphorus concentration in the foliage of seedlings and mature trees was related directly to phosphorus concentration in the silt-loam soils studied. (5) The foliage contained greater concentrations of potassium, magnesium, and phosphorus than did the twigs, about the same silica and total ash, and less calcium. (6) As the growing season advanced, concentration of phosphorus in the foliage increased.

Lorio, P. L., Jr. 1963. TREE SURVIVAL AND GROWTH ON IOWA COAL-SPOIL MATERIALS. Diss. Abstr. 23: 3583-3584. *Redcedar proved best adapted to calcareous sites.*

Lorio, P. L., Jr., and Gatherum, G. E. 1965. RELATIONSHIP OF TREE SURVIVAL AND YIELD TO COAL-SPOIL CHARACTERISTICS. Ia. Agr. Exp. Sta. Res. Bull. 535, p. 394-403. *See entry above.*

Read, R. A. 1950. ROCKS MAKE THE TREES. S. Lumberman 181(2273): 217-219. *Where St. Joe limestone is exposed in north Arkansas, redcedar predominates regardless of the direction of the slope. Hardwoods are of poor quality on these sites, and shortleaf pine seldom occurs.*

Read, R. A. 1952. TREE SPECIES OCCURRENCE AS INFLUENCED BY GEOLOGY AND SOIL ON AN OZARK NORTH SLOPE. Ecology 33: 239-246. *Natural relationships between tree species occurrence and types of soil, as derived from surface geologic formations in the northern Arkansas Ozarks. Redcedar, northern red oak, winged elm, chinquapin oak, and shagbark hickory predominated on St. Joe limestone.*

Read, R. A., and Walker, L. C. 1950. INFLUENCE OF EASTERN REDCEDAR ON SOIL IN CONNECTICUT PINE PLANTATIONS. J. Forest. 48: 337-339. *Physical and chemical properties of surface soil beneath redcedar trees are different from those beneath adjacent pines. Properties of the surface soil beneath redcedars are apparently influenced by the specific chemical nature of the leaf litter and its decomposition products.*

Spurr, S. H. 1940. THE INFLUENCE OF TWO JUNIPERUS SPECIES ON SOIL REACTION. Soil Sci. 50: 289-294. *Both Juniperus virginiana and communis alter the pH of soils on abandoned fields near New Haven. The first species raises pH in the upper part of the mineral soil and lowers it at a depth of 6 inches. Communis, on the other hand, lowers pH at both depths.*

Voigt, G. K. 1965. NITROGEN RECOVERY FROM DECOMPOSING TREE LEAF TISSUE AND FOREST HUMUS. Soil Sci. Soc. Amer. Proc. 29: 756-759. *In laboratory and greenhouse studies, weight loss and N deficits were more marked in hardwoods than in redcedar and other conifers.*

Wherry, E. T. 1922. SOIL ACIDITY PREFERENCES OF SOME EASTERN CONIFERS. J. Forest. 20: 488-496. *Redcedar reaches maximum development in the limestone barrens of Tennessee, where the surface soil is minimalkaline, and the habitat typically circumneutral. It is also abundant in many other limestone regions where conditions are similar. It becomes prominent on basic igneous rocks, calcareous clays, and various other substrata in which lime is available near the surface.*

Wilde, S. A. 1946. SOIL-FERTILITY STANDARDS FOR GAME FOOD PLANTS. J. Wildl. Manage. 10: 77-81. *Characteristics of Wisconsin soils supporting redcedar, standards of soil fertility for nurseries, and site requirements.*

116 HYDROLOGY

Broadfoot. 1951. (114)

Freeman, C. P. 1933. ECOLOGY OF THE CEDAR GLADE VEGETATION NEAR NASHVILLE, TENN. Tenn. Acad. Sci. 8: 143-228.

Study of a subclimax redcedar forest on a shallow soil overlying horizontal limestone. Includes information on soil temperature, weekly course of soil water, hydrogen-ion concentrations, and surface evaporation.

Hahn, H. C., Jr. 1945. CEDAR IMPORTANT TO WILDLIFE. Tex. Game and Fish 3(12): 27-28.

Spread of redcedar on grassland due to absence of fire and excessive grazing. Although it is not important as a food for domestic livestock, it is very valuable in the prevention of erosion, and as habitat and winter food for wildlife.

Van Dersal, W. R. 1938. NATIVE WOODY PLANTS OF THE UNITED STATES. USDA Misc. Publ. 303, 362 p.

Junipers are suitable for dry sites, are desirable in erosion control, and make food and cover for wildlife.

13 GENERAL ZOOLOGY

George, E. J. 1939. TREE-PLANTING ON THE DRIER SECTIONS OF THE NORTHERN GREAT PLAINS. J. Forest. 37: 695-698.

Redcedar often reproduces from seed carried by birds.

Parker, J. 1951. NATURAL REPRODUCTION FROM REDCEDAR. J. Forest. 49: 285.

The seed is largely distributed by animals. Excellent reproduction is sometimes found under hardwood stands adjacent to open-grown cedars, because birds feed on the cedar berries and perch in the hardwoods. Recommends removal of some of the hardwoods after establishment of redcedar.

Phillips, F. J. 1910. THE DISSEMINATION OF JUNIPERS BY BIRDS. Forest. Quart. 8: 60-73.

Birds are responsible for most of the dissemination of the junipers. Lists birds that eat juniper berries.

Van Dersal, W. R. 1938. UTILIZATION OF WOODY PLANTS AS FOOD BY WILDLIFE. Third N. Amer. Wildl. Conf. Trans. 1938: 768-775.

Seventy wildlife species were reported using redcedar—the widest use of any woody plant in North America.

16 GENERAL BOTANY

160 PLANT CHEMISTRY

Arend. 1948. (114)

Arend. 1950. (114)

Chandler. 1939. (114)

Voigt. 1965. (114)

161 PHYSIOLOGY

Bifoss, C. G. 1947. THE WATER CONDUCTING CAPACITY AND GROWTH HABITS OF JUNIPERUS HORIZONTALIS MOENCH AND JUNIPERUS VIRGINIANA L. Ecology 28: 281-289.

Measurements on stem tracheids of the two species revealed that (1) conductivity did not vary between species, (2) values for

both species were low, and (3) under favorable conditions *J. virginiana* grows much faster than *J. horizontalis*.

Pack, D. A. 1925. DISPERSION OF LIPOIDS. *Bot. Gaz.* 79: 334-338.

As the tissues in redcedar's seeds grew active the lipoids became dispersed.

164 MORPHOLOGY

Agramont, F., Busking, R., Mitchell, J., and Enzinger, E. 1948. THE RED CEDAR. *Mo. Bot. Gard. Bull.* 36, p. 86-92.

Redcedar distribution in St. Louis (Mo.) area, wood color, and leaf variation.

Blake, S. F. 1910. NOTE ON JUNIPERUS HORIZONTALIS AND *J. VIRGINIANA*. *Rhodora* 12: 218.

New England redcedar fruit had one well-developed seed per berry and occasionally two seeds.

Jack, J. G. 1893. THE FRUCTIFICATION OF JUNIPERUS. *Bot. Gaz.* 18: 369-375.

J. virginiana is simply annual-fruited, flowering about the latter part of April and maturing its fruit in the autumn of the same year.

Pack, D. A. 1921. CHEMISTRY OF AFTER-RIPENING, GERMINATION, AND SEEDLING DEVELOPMENT OF JUNIPER SEEDS. *Bot. Gaz.* 72: 139-150.

Physiological and chemical changes in the fats during after-ripening, and the seedling development of redcedar.

U.S. Department of Agriculture. 1961. SEEDS. USDA Yearb. 1961, p. 556, 558.

Seed characteristics and other data.

165 PHYLOGENY, EVOLUTION, HEREDITY, GENETICS AND BREEDING, VARIATION

Fassett, N. C. 1943. THE VALIDITY OF JUNIPERUS VIRGINIANA VAR. CREBRA. *Amer. J. Bot.* 30: 469-477.

Var. crebra, a narrow-crowned extreme, is concentrated on an area from eastern Pennsylvania to southern Maine, and on a second area following a series of moraines from northern Indiana to southeastern Wisconsin. It occurs in sporadic colonies in central New York, Tennessee, western Indiana, eastern Missouri, and probably elsewhere. Degree of acuteness of leaves has no taxonomic value. Seeds are a little less conspicuously pitted than in typical redcedar.

Fassett, N. C. 1944. JUNIPERUS VIRGINIANA, *J. HORIZONTALIS* AND *J. SCOPULORUM*. I. THE SPECIFIC CHARACTERS. *Bull. Torrey Bot. Club* 71: 410-418.

Mass collections throughout much of the ranges of the species show that the variation within species is often more conspicuous than, but never as constant as, the variation between species, and that many of the distinguishing features are statistical in nature.

Fassett, N. C. 1944. JUNIPERUS VIRGINIANA, *J. HORIZONTALIS* AND *J. SCOPULORUM*. II. HYBRID SWARMS OF *J. VIRGINIANA* AND *J. SCOPULORUM*. *Bull. Torrey Bot. Club* 71: 475-483.

Where J. virginiana grows by itself, and where J. scopulorum grows by itself, each species retains pure characteristics, except in areas of the western part of the J. virginiana range, where certain tendencies toward J. scopulorum suggest an ancient

invasion of that species. Where the ranges meet, all recombinations of the characteristics of each occur in the individuals of one colony.

Fassett, N. C. 1945. JUNIPERUS VIRGINIANA, *J. HORIZONTALIS* AND *J. SCOPULORUM*. IV. HYBRID SWARMS OF *J. VIRGINIANA* AND *J. HORIZONTALIS*. *Bull. Torrey Bot. Club* 72: 379-384.

J. virginiana and J. horizontalis show no intergradation except where their ranges overlap. In the Driftless Area of Wisconsin the two species grow together, and in the same colony there may be various intermediates. The most common intermediate, described as var. ambigens, combines the habit of horizontalis with the foliage and fruit of virginiana.

Hall, M. T. 1952. A HYBRID SWARM IN JUNIPERUS. *Evolution* 6: 347-366.

A hybrid swarm between J. ashei and J. virginiana from Platt National Park in the Arbuckle Mountains of southern Oklahoma is illustrated and discussed.

Hall, M. T. 1952. VARIATION AND HYBRIDIZATION IN JUNIPERUS. *Ann. Mo. Bot. Gard.* 39: 1-64.

Evidence for hybridization of J. ashei and J. virginiana is the character recombinations in many trees found where these species grow together.

Hall, M. T. 1955. COMPARISON OF JUNIPER POPULATIONS ON AN OZARK GLADE AND OLD FIELDS. *Ann. Mo. Bot. Gard.* 42: 171-194.

Variability within and between populations of the northern and Ozark races of junipers suggests three populations. The Glade population of the Ozark race is the most southwestern in affinity, and most closely resembles ashei. The Cedar Hill population of the Ozark race is intermediate between Glade and typical redcedar and occurs on old fields which are in good condition. The Old Field population of the northern race, with a little mixing from the Ozark race, occurs on worn-out acidic and sandy lands in the vicinity of St. Louis and northeastward.

Hall, M. T., and Carr, C. J. 1964. DIFFERENTIAL SELECTION IN JUNIPER POPULATIONS FROM THE BAUM LIMESTONE AND TRINITY SAND OF SOUTHERN OKLAHOMA. *Butler Univ. Bot. Stud.* 14: 21-40.

J. ashei occupies the Baum limestone in nearly pure stands. J. virginiana occupies the Trinity sand on cleared, reverted land normally supporting a post oak-blackjack oak forest. Juniper populations on mixed talus sites are hybrid but closer to ashei than to virginiana.

Mathews, A. C. 1939. THE MORPHOLOGICAL AND CYTOLOGICAL DEVELOPMENT OF THE SPOROPHYLLS AND SEED OF JUNIPERUS VIRGINIANA L. *Elisha Mitchell Sci. Soc. J.* 55: 7-62.

Chronological development of sporophylls and seed, beginning with staminate and ovulate cones.

Minckler, L. S., and Ryker, R. A. 1959. COLOR, FORM, AND GROWTH VARIATIONS IN EASTERN REDCEDAR. *J. Forest.* 57: 347-349.

Characteristics such as survival, winter-foliage color, form, and growth rate differ inherently according to location of seed source.

Ottley, A. M. 1909. THE DEVELOPMENT OF THE GAMETOPHYTES AND FERTILIZATION IN JUNIPERUS COMMUNIS AND JUNIPERUS VIRGINIANA. *Bot. Gaz.* 48: 31-46. *Cytological study.*

Ross, J. G., and Duřan, R. E. 1949. CYTOLOGICAL EVIDENCES OF HYBRIDIZATION BETWEEN JUNIPERUS VIRGINIANA AND J. HORIZONTALIS. Bull. Torrey Bot. Club 76: 414-429.

Colonies of presumed hybrids were observed in the eastern fringe of the Driftless Area in Wisconsin, where the geographic ranges and habitats of these species overlap. A comparative study of the somatic chromosome complements of the species and several of the presumed hybrids revealed an unbalance in those of the hybrids, as evidenced by the presence of heterobrachial chromosomes without counterparts.

Sax, K., and Sax, H. J. 1933. CHROMOSOME NUMBER AND MORPHOLOGY IN THE CONIFERS. J. Arnold Arbor. 14: 356-375.

Chromosome counts of representative conifers, including redcedar. The materials studied were chiefly the female gametophyte tissue and the two meiotic divisions of the pollen mother cells.

Williamson, M. J. 1957. SILVICAL CHARACTERISTICS OF EASTERN REDCEDAR. USDA Forest Serv. Cent. States Forest Exp. Sta. Misc. Release 15, 14 p.

See entry below.

Williamson, M. J. 1965. EASTERN REDCEDAR (JUNIPERUS VIRGINIANA L.). In *Silvics of Forest Trees of the United States*, p. 212-216. USDA Agr. Handb. 271.

Habitat conditions, life history, and races. A northern form, var. crebra, has slightly pitted seeds and a narrower crown than typical redcedar. No hybrids have been recognized, though there is some evidence of hybridization.

17 SYSTEMATIC BOTANY

Fassett, N. C. 1945. JUNIPERUS VIRGINIANA, J. HORIZONTALIS AND J. SCOPULORUM. V. TAXONOMIC TREATMENT. Bull. Torrey Bot. Club 72: 480-482.

Detailed botanical descriptions, plus a key.

Kent, A. H. 1900. JUNIPERUS VIRGINIANA. In *Veitch's Manual of the Coniferae*, p. 192-196. London: James Veitch and Sons.

Botanical description with a list of varieties. Describes the geographical range but does not distinguish it from ranges of other junipers in the United States.

Little, E. L., Jr. 1949. IMPORTANT TREES OF THE UNITED STATES. In *Trees*, p. 763-814. USDA Yearb.

Key for U. S. trees.

Loudon, J. C., editor. 1829. AN ENCYCLOPEDIA OF PLANTS, p. 848-849. London: Longman, Rees, Orme, Brown, and Green.

History, use, propagation, and culture of Juniperus.

Loudon, J. C. 1838. J. VIRGINIANA L., THE VIRGINIAN JUNIPER, OR RED CEDAR. In *The Trees and Shrubs of Britain*. Vol. 4, p. 2495-2498. London: Longman, Orme, Brown, Green, and Longmans.

Special characteristics, varieties, geography and history, properties and uses, and propagation and culture.

Rehder, A. 1929. JUNIPERUS. In *Bailey, L. H., Standard Cyclopedia of Horticulture*. Ed. 2, p. 1726-1729. N.Y., London: Macmillan.

Botanical description of the genus with specific details on redcedar and its varieties.

Sargent, C. S. 1891-1902. JUNIPERUS VIRGINIANA. In *Silva*

of North America. Vol. 10, p. 93-96. Boston: Houghton Mifflin. *See next entry.*

Sargent, C. S. 1921. MANUAL OF THE TREES OF NORTH AMERICA (EXCLUSIVE OF MEXICO). 910 p. Boston: Houghton Mifflin.

Botanical description, distribution, and characteristics.

Swingle, C. F. 1937. A PROMISING NEW CEDAR FOR EROSION CONTROL. *Soil Conserv.* 3: 75-78.

Describes Ozark white cedar, J. ashei, and compares identifying features with those of redcedar.

18 PLANT ECOLOGY

181 MODE OF LIFE, AUTOECOLOGY, SILVICULTURAL CHARACTER OF TREES

Arend. 1948. (114)

Arend. 1950. (114)

Afanasiev, M. 1949. CEDAR AND PINE AS FARM TREES FOR OKLAHOMA. *Okla. Agr. Exp. Sta. Bull.* 331, 18 p.

Survival of planted redcedar averaged about 80 percent. Best growth was on light soils and poorest on heavy soils. Cedars removed in thinning were graded for Christmas trees, with 43 percent classed as Grade A.

Agramont, Busking, Mitchell, and Enzinger. 1948. (164)

Bagley, W. T., and Read, R. A. 1960. SOME TEMPERATURE AND PHOTOPERIOD EFFECTS ON GROWTH OF EASTERN REDCEDAR SEEDLINGS. *Iowa State J. Sci.* 34: 595-601.

Supplemental light increased and sustained height growth of seedlings at a minimum temperature of 75° F. in the greenhouse and in environmental control chambers. Supplemental light increased height growth in early summer in an outdoor environment at Lincoln, Nebraska, but failed to sustain it after mid-August.

Bailey, L. H. 1933. THE CULTIVATED CONIFERS OF NORTH AMERICA, COMPRISING THE PINE FAMILY AND THE TAXADS. 404 p. N.Y.: Macmillan.

Botanical description of redcedar with information on cultivation and propagation and on insects, diseases, and injuries.

Beilmann, A. P., and Brenner, L. G. 1951. THE RECENT INTRUSION OF FORESTS IN THE OZARKS. *Ann. Mo. Bot. Gard.* 38: 261-282.

Redcedar is a most aggressive invader of grassland and run-down fields. The beginning of its invasion coincides roughly with reduced burning as a result of white settlement.

Broadfoot. 1951. (114)

Buchholz, J. T. 1930. THE OZARK WHITE CEDAR. *Bot. Gaz.* 90: 326-332.

Juniperus ashei occurs in association with redcedar and superficially resembles it. However, J. ashei has a different habit of growth, its stem usually forking at or near the base, while redcedar is invariably single-stemmed. In general, J. ashei has a one-seeded fruit.

Bunger, M. T., and Thomson, H. J. 1938. ROOT DEVELOPMENT AS A FACTOR IN THE SUCCESS OR FAILURE OF WINDBREAK TREES IN THE SOUTHERN HIGH PLAINS. *J. Forest.* 36: 790-803.

Roots of Asiatic elm, Osage-orange, redcedar, and black locust

were observed at depths of 24.5-27 feet. Survivals of these deep-rooted species averaged 68 percent, with redcedar showing highest survival.

Coile. 1933. (114)

Crawford, H. S., Jr. 1961. EASTERN REDCEDAR. In Deer Browse Plants of Southern Forests, p. 34-35. USDA Forest Serv. S. Forest Exp. Sta., New Orleans, La.

Site requirements, susceptibility to fire, growth habits of foliage and use by deer, use of fruit by wildlife, durability of wood, and aggressiveness on poor range and croplands.

Fletcher and Ochrymowich. 1955. (114)

Fox, W. S., and Soper, J. H. 1952. THE DISTRIBUTION OF SOME TREES AND SHRUBS OF THE CAROLINIAN ZONE OF SOUTHERN ONTARIO. Roy. Can. Inst. Trans. 29: 65-84. *This zone contains some tree species commonly found further south, among which is redcedar.*

Fox, W. S., and Soper, J. H. 1953. THE DISTRIBUTION OF SOME TREES AND SHRUBS OF THE CAROLINIAN ZONE OF SOUTHERN ONTARIO. Roy. Can. Inst. Trans. 30: 3-32.

Redcedar commonly occurs on dry sandy or rocky ground, most frequently in soil over limestone. In certain areas it appears to be a primary arborescent species invading abandoned fields and pastures.

Harper, R. M. 1912. THE DIVERSE HABITATS OF THE EASTERN RED CEDAR AND THEIR INTERPRETATION. Torreyia 12(7): 145-154.

The species occurs in a variety of habitats and is regarded by some authors as almost indifferent to environmental conditions. However, it is conspicuous by its absence in: (1) the great northern coniferous forests; (2) the common dry woods with oak and hickories, represented in all eastern States; (3) the prairies; and (4) the pine barrens, including the Pinus rigida barrens of Long Island and New Jersey, the P. palustris barrens from North Carolina to Texas, and the P. caribaea barrens of south Florida. One primary character is apparent: the coniferous forests, dry woods, prairies, and pine barrens are regularly burned, while redcedar habitats are rarely or never visited by fire.

Harper, H. J. 1940. RELATION OF CLIMATIC CONDITIONS, SOIL CHARACTERISTICS, AND TREE DEVELOPMENT IN THE SOUTHERN GREAT PLAINS REGION. Soil Sci. Soc. Amer. Proc. 5: 327-335.

Black locust, shortleaf pine, redcedar, and catalpa outgrew many other species on sandy soil containing less than 0.03 percent total nitrogen.

Hawley, F. M. 1937. RELATIONSHIP OF SOUTHERN CEDAR GROWTH TO PRECIPITATION AND RUNOFF. Ecology 18: 398-405.

In eastern Tennessee, cedar growth was more closely correlated with annual precipitation than with stream runoff.

Jackson, L. W. R. 1952. RADIAL GROWTH OF FOREST TREES IN THE GEORGIA PIEDMONT. Ecology 33: 336-341. *Redcedar began growth 80-89 days after January 1. It required 100-109 days to complete 50 percent of total growth, and the grand period of growth was from 200-209, both the longest periods of any species studied. Radial growth of redcedar and pine ceased in October, while hardwood species completed growth by late August.*

Kellogg, R. S. 1905. FOREST BELTS OF WESTERN KANSAS

AND NEBRASKA. USDA Forest Serv. Bull. 66, 44 p.

Redcedar is the only native conifer of Kansas and while widely distributed is seldom abundant. In Nebraska two Juniperus species are recognized: J. virginiana, of the eastern and central portions of the State, and J. scopulorum, of the western part.

Kent. 1900. (17)

King, D. B., Roberts, E. V., and Winters, R. K. 1949. FOREST RESOURCES AND INDUSTRIES OF MISSOURI. Mo. Agr. Exp. Sta. Res. Bull. 452, 89 p.

The greatest concentration of the cedar-hardwood type is in the White River watershed of the southwestern Ozarks. All together, the area covered by this type totals 492,000 acres, about 3 percent of Missouri's commercial forest area.

Krusekopf, H. H. 1963. FOREST SOIL AREAS IN THE OZARK REGION OF MISSOURI. Mo. Agr. Exp. Sta. Res. Bull. 818, 28 p.

The upland oak forest type prevails over the entire region, but shortleaf pine and redcedar sometimes are the most important species. Redcedar generally occupies dry uplands that have shallow soil and numerous limestone outcrops. Although it will grow on good soil, it usually is replaced by faster growing species. It is a common invader of glades and old prairie openings.

Kucera, C. L., Ehrenreich, J. H., and Brown, C. 1963. SOME EFFECTS OF FIRE ON TREE SPECIES IN MISSOURI PRAIRIE. Iowa J. Sci. 38(2): 179-185.

The effects of prairie fire on young trees of four broadleaved species and redcedar were observed under various burning conditions.

Lorio. 1963. (114)

Lorio and Gatherum. 1965. (114)

Loudon. 1829. (17)

Loudon. 1838. (17)

Lutz, H. J. 1928. TRENDS AND SILVICULTURAL SIGNIFICANCE OF UPLAND FOREST SUCCESSIONS IN SOUTHERN NEW ENGLAND. Yale Univ. Sch. Forest. Bull. 22, 68 p.

One of the three associations reported was redcedar-gray birch. It is classed as xerophytic and is commonly designated "old field" type, since it usually originates on abandoned farmland. Silviculturally the greatest value of this association lies in its beneficial influence on soil conditions.

McAtee, W. L. 1944. NURSE KILLERS. J. Forest. 42: 683.

Volunteer redcedars suppressed apple trees in an abandoned orchard.

McAtee, W. L. 1944. NURSE KILLERS. Nature 37: 146-147. *See entry above.*

McCormack, M. L., and Korstian, C. F. 1963. CONVERSION OF POST OAK-BLACKJACK OAK TYPE TO PINE IN NORTH CAROLINA PIEDMONT. J. Forest. 61: 445-446.

Improvement cutting and planting with P. taeda after clear-cutting both proved satisfactory. In the improvement cuts, redcedar was retained along with pines.

McDermott, R. E., and Fletcher, P. W. 1955. INFLUENCE OF LIGHT AND NUTRITION ON COLOR AND GROWTH OF REDCEDAR SEEDLINGS. Mo. Agr. Exp. Sta. Res. Bull. 587, 15 p.

Growth responses were the same in one-third sunlight as in full light, but in one-tenth sunlight seedlings were stunted. Fertilizers

did not affect growth under any of three light intensities.

Mann, D. T., and Hays, R. S. 1948. EFFECT OF GRASS ON INVASION OF CEDAR. *J. Soil and Water Conserv.* 3: 49.

A Texas range in fair condition had 456 cedar trees per acre, while there were only 196 cedars per acre on range in good condition.

Martin, S. C., and Crosby, J. S. 1955. BURNING AND GRAZING ON GLADE RANGE IN MISSOURI. USDA Forest Serv. Cent. States Forest Exp. Sta. Tech. Pap. 147, 13 p.

Carrying capacities of many glade range areas in Missouri are being reduced by the spread of redcedar; Burning cannot be recommended for control of redcedar; the fires damage forage and cover plants. Cutting or chemical control is effective.

Meade, F. M. 1955. CONVERTING LOW-GRADE HARDWOOD STANDS TO CONIFERS IN THE ARKANSAS OZARKS. *Ark. Agr. Exp. Sta. Bull.* 551, 26 p.

Shortleaf pine and redcedar were planted under four conditions of hardwood overstory. Cedar survived less well than pine and grew much more slowly. Under no condition of overstory tested was the cedar able to compete with the hardwoods.

Michaux, F. A. 1857. THE NORTH AMERICAN SYLVA. Vol. III, 180 p. Philadelphia, Pa.: D. Rice and A. N. Hart.

Distribution of redcedar in the United States. The author reports its occurrence in Oregon but obviously was unaware of species differences that were later documented.

Minckler, L. S. 1953. POOR OAK SITES MAY GROW GOOD PINE. USDA Forest Serv. Cent. States Forest Exp. Sta. Tech. Pap. 134, 6 p.

On clearcut areas cedars were planted in groups of about 25 trees each. Approximately one-third remained after 3 years. Most were thrifty, but required release.

Mohr, C. 1901. PLANT LIFE OF ALABAMA. *Contrib. U. S. Nat. Herb.* 6: 1-49.

Cedar glades occur on limestone strata which comprise the lower terraces of the higher ridges. Almost bare of soil, these rugged grounds support redcedar; few other trees gain a foothold. Trees grow to 50-75 feet in height, and 15-24 inches in diameter. The large trees average from 140-175 years of age. Redcedar reaches its highest perfection on gentle slopes with deep soil and in narrow valleys with damp, rich soil.

Munns, E. N. 1938. THE DISTRIBUTION OF IMPORTANT FOREST TREES OF THE UNITED STATES. USDA Misc. Publ. 287, 176 p.

Redcedar is mapped on page 63.

Palmer, E. J. 1921. THE FOREST FLORA OF THE OZARK REGION. *J. Arnold Arbor.* 2: 216-232.

Physiography of the Ozark Uplift and the associated vegetation. Redcedar occurs almost throughout the area but is abundant only along the bluffs.

Read, R. A., and Bagley, W. T. 1967. RESPONSE OF TREE SEEDLINGS TO EXTENDED PHOTOPERIODS. USDA Forest Serv. Res. Pap. RM-30, 16 p. Rocky Mtn. Forest Exp. Sta., Fort Collins, Colo.

Redcedar seedlings were grown under 14- and 24-hour photoperiods, and under 14-hour photoperiods with one and two light interruptions in the dark period. Seedlings were usually tallest and heaviest under continuous light, intermediate under the interrupted dark. Long photoperiods stimulated top growth more than root growth, but did not affect field survival.

Sargent, C. S. 1895. THE RED CEDAR. *Gard. and Forest* 8:

61-62.

Characteristics, distribution, uses, and culture.

Sargent. 1896. (17)

Shirley, H. L. 1945. LIGHT AS AN ECOLOGICAL FACTOR AND ITS MEASUREMENT. *Bot. Rev.* 11: 497-532.

Pioneer woody species such as redcedar rarely cast shade dense enough to preclude invasion of other species, but their shade and root competition may markedly reduce the growth of all but the most tolerant species.

Spurr. 1940.(114)

Starker, T. J. 1932. FIRE RESISTANCE OF THE TREES OF THE NORTHEAST UNITED STATES. *Forest Worker* 3(3): 8-9. *Redcedar was ranked twentieth, with only northern white cedar and balsam fir being considered more susceptible.*

Steyermark, J. A. 1940. STUDIES OF THE VEGETATION OF MISSOURI. I. NATURAL PLANT ASSOCIATIONS AND SUCCESSION IN THE OZARKS OF MISSOURI. *Field Mus. Natur. Hist., Chicago Bot. Ser.* 9(5): 349-475.

A redcedar subclimax occurs over an eroded limestone substratum eventually covered by a sugar maple-white oak association.

USDA Forest Service. 1948. WOODY PLANT SEED MANUAL. USDA Misc. Publ. 654, 416 p.

Specific information on distribution and use; seeding habits; collection, extraction, and storage; germination; and nursery and field practice.

Vimmerstedt, J. P. 1968. ROOT CATION-EXCHANGE CAPACITY AND THE MINERAL NUTRITION OF EASTERN WHITE PINE AND EASTERN REDCEDAR. *Soil Sci. Soc. Amer. Proc.* 32: 289-292.

Foliage of redcedar had a lower ratio of monovalent to divalent cations than did white pine. The author concluded that root cation exchange capacity did not cause the difference in cation ratios and that cation ratio in the soil had a strong influence on the ratio in trees.

White, L. L. 1907. PRODUCTION OF RED CEDAR FOR PENCIL WOOD. USDA Forest Serv. Circ. 102, 19 p.

The wood and its uses, together with the species' range, silvical characteristics, and reproduction. Also describes logging methods and proposals for management.

Wherry. 1920. (114)

Williamson. 1965. (165)

Wyman, D. D. 1947. GIANT RED CEDARS--VIRGINIA VS. BAY STATE. *Horticulture* 25: 74.

Dimensions of several redcedars of exceptional size.

Yeager, A. F. 1935. ROOT SYSTEMS OF CERTAIN TREES AND SHRUBS GROWN ON PRAIRIE SOILS. *J. Agr. Res.* 51: 1085-1092.

In North Dakota, in an area with 22.4 inches of rainfall per year, planted redcedars had roots up to 22 feet long at age 25 years. The greatest depth of roots was over 12 feet.

182 SYNECOLOGY. PLANT SOCIOLOGY (GENERAL, PRINCIPLES, AND METHODS)

Albertson, F. W., and Weaver, J. E. 1945. INJURY AND DEATH OR RECOVERY OF TREES IN PRAIRIE CLIMATE. *Ecol. Monogr.* 15: 395-433.

Redcedar is limited to steep north-facing slopes with a mantle

of soil at their bases.

Arend. 1948. (114)

Arend. 1950. (114)

Bard, G. E. 1952. SECONDARY SUCCESSION ON THE PIEDMONT OF NEW JERSEY. *Ecol. Monogr.* 22: 195-215. *Redcedar invades abandoned fields within the first few years and remains the dominant vegetation for 60 years or more.*

Beilmann and Brenner. 1951. (181)

Fox and Soper. 1952. (181)

Fox and Soper. 1953. (181)

Freeman. 1933. (116)

Harper, R. M. 1926. THE CEDAR GLADES OF MIDDLE TENNESSEE. *Ecology* 7: 48-54. *Cedar glades of middle Tennessee are a unique type of vegetation. Although they have been damaged nearly everywhere by lumbering and grazing, there is no immediate prospect of their being destroyed by cultivation.*

Krusekopf. 1963. (181)

Lutz. 1928. (181)

Oosting, H. J. 1942. AN ECOLOGICAL ANALYSIS OF THE

PLANT COMMUNITIES OF PIEDMONT, NORTH CAROLINA. *Amer. Midland Natur.* 28: 1-126.

Since redcedar grows in every habitat and is associated with every plant community it can have no bearing on the trend of events (succession). Infrequently it may be the first tree pioneer in old fields. It is never a dominant, never a dependent, and rarely in significant numbers.

Palmer. 1922. (181)

Quarterman, E. 1950. ECOLOGY OF CEDAR GLADES. I. DISTRIBUTION OF GLADE FLORA IN TENNESSEE. *Bull. Torrey Bot. Club* 77: 1-9.

Cedar glades cover about 5 percent of the Central Basin of middle Tennessee. Open glades and woods dominated by redcedar are the most typical communities of the region.

Quarterman, E. 1950. MAJOR PLANT COMMUNITIES OF TENNESSEE CEDAR GLADES. *Ecology* 31: 234-254. *Cedar glades occur in Lebanon limestone, a dolomitic rock of Ordovician Age.*

Read. 1950. (114)

Read. 1952. (114)

Steyermark. 1940. (181)

2. SILVICULTURE

22 SILVICULTURAL SYSTEMS.

CONSTITUTION AND COMPOSITION OF STANDS

Arend, J. L. 1946. GROWING EASTERN RED CEDAR ON THE FARM. *S. Lumberman* 173 (2177): 240, 242, 244. *See entry below.*

Arend, J. L. 1947. AN EARLY EASTERN RED CEDAR PLANTATION IN ARKANSAS. *J. Forest.* 45: 358-360. *A redcedar plantation was established with wildling stock in 1902. After 44 years the average survival was 85 percent and the 1,027 trees were estimated to contain 5,866 fence posts with a value of approximately \$800. Under intensive management total returns would have been much larger.*

Read, R. A. 1958. THE GREAT PLAINS SHELTERBELT IN 1954. *Univ. Nebr. Exp. Sta. Bull.* 441, 125 p. *Despite s. ppression by trees, damage by livestock, competition from sod, and dry, shallow soil, initial survival of redcedar was high and subsequent losses were slight.*

23 REGENERATION AND FORMATION OF STANDS

231 NATURAL REGENERATION

George. 1939. (136)

Parker. 1951. (136)

Phillips. 1910. (136)

232 ARTIFICIAL REGENERATION

Anonymous. 1938. JUNIPER SEEDS. *Amer. Nurseryman* 68(11): 18.

Collection, cleaning, storage, and stratification of redcedar seed. Nursery techniques.

Anonymous. 1946. RED CEDAR GERMINATION. *Amer. Nurseryman* 84(12): 18-19. *To insure rapid and satisfactory germination the waxy coat must be removed by repeated soakings in alcohol and the seed stratified overwinter in moist sand and peat at about 40° F. Seed should be sown around March 15 to April 1.*

Afanasiev, M. 1948. PRELIMINARY STUDY OF TREE PLANTATIONS IN OKLAHOMA: RELATIVE SURVIVAL BY SPECIES AND FACTORS AFFECTING SURVIVAL. *Okla. Agr. Exp. Sta. Tech. Bull.* T-29, 27 p. *In north-central Oklahoma, six of 14 redcedar plantings had between 80 and 98 percent survival. Adverse weather caused the failure of several plantations. Growth was slow, averaging about 1 foot per year. In western Oklahoma loss was under 10 percent in seven out of 10 plantings, but growth was slow here also. In eastern Oklahoma three of five plantings were complete failures but the surviving plantations were of good health and vigor.*

Afanasiev. 1949. (181)

Afanasiev, M. 1949. A STUDY OF RED CEDAR PLANTATIONS IN NORTH CENTRAL OKLAHOMA. *Okla. Agr. Exp. Sta. Tech. Bull.* T-34, 16 p. *Cedar plantations were established and maintained on sites commonly classed as poor. Survival over 4 years averaged 80 percent; 1-1 seedlings survived better than 1-2 stock. Direct seeding failed in two attempts.*

Afanasiev, M. 1955. STORAGE OF AFTERRIPENED SEED OF EASTERN REDCEDAR. *USDA Forest Serv. Tree Plant. Notes* 21, p. 28-30. *Afterripening and germination can be arrested by storing afterripened but ungerminated seed at +15° to +20° F.*

Germinating seed is injured by subfreezing temperature and does not resume growth later.

Afanasiev, M., and Cress, M. 1942. PRODUCING SEEDLINGS OF EASTERN RED CEDAR (JUNIPERUS VIRGINIANA L.). Okla. Agr. Exp. Sta. Bull. B-256, 21 p.

Description of nursery practices, including collecting, storing, and cleaning seed; treating seed to insure germination; and growing seedlings from afterripened seed.

Afanasiev, M., Engstrom, A., and Johnson, E. W. 1959. EFFECTS OF PLANTING DATES AND STORAGE ON SURVIVAL OF EASTERN RED CEDAR IN CENTRAL AND WESTERN OKLAHOMA. Okla. Agr. Exp. Sta. Bull. B-527, 19 p.

Planting dates from November to May and fresh-lifted and stored seedlings were compared for 3 successive years. Plantings made between mid-December and mid-March survived best. There was little difference between freshly lifted stock and that stored for 7 days. Weather and soil conditions at time of planting had a strong effect. Survivals ranged from 40 to 90 percent.

Arend. 1946. (22)

Arend. 1947. (22)

Bailey. 1933. (181)

Barton, L. V. 1952. GERMINATION OF SEEDS OF JUNIPERUS VIRGINIANA L. Contrib. Boyce Thompson Inst. 16: 387-393.

Seeds are dormant and require 3 months at 5° C. to afterripen; 1° C. is less effective and 10° is totally ineffective. Seedcoats may be made permeable (to improve stratification) by exposure to moisture at approximately 25° C. for 2-8 weeks, or by soaking for 30 minutes in concentrated sulphuric acid.

Buckley, A. R. 1957. THE GRAFTING OF JUNIPERUS VIRGINIANA VARIETIES ON UNROOTED CUTTINGS. Plant Propagators Soc. Proc. 7: 81-83.

Cutting-graft combinations are a quick means of ascertaining the stocks which may be used for grafting in the ordinary way.

Caroselli, N. E. 1957. JUNIPER BLIGHT AND PROGRESS ON ITS CONTROL. USDA Plant Dis. Rep. 41: 216-218.

Juniper blight, caused by the fungus Phomopsis juniperovora Hahn, is a serious disease of 1- and 2-year-old trees. Several chemicals are effective.

Chadwick, L. C. 1946. ON AND OFF THE NURSERY—SEEDS OF RED CEDAR. Amer. Nurseryman 83(9): 10.

The waxy seedcoat and a resting condition of the embryo delay germination of redcedar. The coat can be removed by soaking for several hours in alcohol or by pouring warm water over the seeds and bringing the water to a boil; this process should be repeated three times. Recommends stratification in moist sand or peat at 40° F. for 3 months.

Cotrufo, C. 1962. PRETREATMENT OF EASTERN WHITE PINE SEED. USDA Forest Serv. Southeast. Forest Exp. Sta. Res. Note 176, 2 p.

Citric-acid treatments were effective on redcedar seed.

Cotrufo, C. 1963. CITRIC ACID STIMULATES SEED GERMINATION. Abstr. Plant Physiol. 38 (Suppl.): 14.

See next entry.

Cotrufo, C. 1963. STIMULATION BY CITRIC ACID OF GERMINATION OF EASTERN RED CEDAR (JUNIPERUS VIRGINIANA L.). Nature 199: 92-93.

Pretreatment with citric acid increases both speed and total germination. The recommended treatment is to soak seed 4 days in a 10,000 p.p.m. solution of citric acid, and then stratify for 90 days.

Davis, W. C., Young, G. Y., Latham, D. H., and Hartley, C. 1938. DISEASES OF CONIFERS IN FOREST NURSERIES. USDA Bur. Plant Ind., 63 p.

Describes two types of diseases found on redcedar in the nursery: cedar blight (Phomopsis juniperovora) and cedar rusts (Gymnosporangium spp.). Gives information on control and precautionary measures.

Dayharsh, V. J. 1934. STRATIFICATION VS. SCARIFICATION FOR CEDAR SEED. USDA Forest Serv. Plant. Quart. 3: 15-16.

Recommends scarification of the coat to improve germination of freshly gathered seed.

Dean, G. A. 1942. CONTROL OF THREE RED CEDAR SCALES. Kans. Hort. Soc. 6: 80-82.

Life histories and controls for three scale insects: redcedar scale, Cryptaspidotus shasta; European fruit lecanium, Lecanium corni (or L. fletcheri); and redcedar mealy bug, Pseudococcus juniperi.

Deters, M. E., and Schmitz, H. 1936. DROUGHT DAMAGE TO PRAIRIE SHELTER BELTS IN MINNESOTA. Minn. Agr. Exp. Sta. Bull. 329, 28 p.

Redcedar and Rocky Mountain juniper both appear to be drought-resistant. Although they grow somewhat slowly, they are excellent for border rows and low windbreaks and are fairly long-lived under prairie conditions.

Doran, W. L. 1952. EFFECTS OF TREATING CUTTINGS OF WOODY PLANTS WITH BOTH A ROOT-INDUCING SUBSTANCE AND A FUNGICIDE. Amer. Soc. Hort. Sci. Proc. 60: 487-491.

Combined hormone and fungicidal treatment resulted in a maximum of 83 percent rooting of redcedar cuttings in 200 days.

Ealy, R. P. 1960. THE EFFECT OF A COMBINED FUNGICIDE-HORMONE TREATMENT ON THE PROPAGATION OF REDCEDAR (JUNIPERUS VIRGINIANA L.) BY CUTTINGS. Okla. State Univ. Processed Ser., 5 p.

The combination of a fungicide and a hormone produced the greatest percentage of rooting, but maximum success was only 20 percent and root systems were poor.

Eastman, R. E. 1911. CARE OF THE SEED OF RED CEDAR. Forest. Quart. 9: 173-174.

Recommends stratification of seeds for approximately 17 months in sandboxes buried in soil and mulched with leaves, straw, or grass.

Elk, B. C. M. van. 1965. [POTTING SOIL FOR STOCKS.] (Extr.) Jaarb. Proefsta. Boomkwek. Boskoop. 1964: 74-75.

Table shows relative success in grafting cultivars onto redcedar stocks grown in various mixtures of peat and sand.

Engstrom, A. 1950. MULCHING SEEDBEDS WITH CELLOPHANE. J. Forest. 48: 283.

Cellophane, in conjunction with burlap on wire netting, was used to mulch nursery seedbeds of redcedar.

Engstrom, A. 1955. POLYETHYLENE FILM FOR SEEDBED MULCH. USDA Forest Serv. Tree Plant. Notes 21, p. 26-27.

Polyethylene sheets were a satisfactory mulch for cedar seedbeds. Sowing techniques are as follows: in early December clean,

- dry, untreated seed is sown on conventional seedbeds and lightly covered (1/8 to 1/4 inch thick) with sawdust. After watering, polyethylene film is laid over the beds and covered with burlap. All covering is anchored.
- Engstrom, H. E., and Stoeckeler, J. H. 1941. NURSERY PRACTICE FOR TREES AND SHRUBS SUITABLE FOR PLANTING ON THE PRAIRIE PLAINS. USDA Misc. Publ. 434, 159 p.
Recommends redcedar for planting in Texas, Oklahoma, Kansas, Nebraska, South Dakota, and southern portions of North Dakota.
- Garin, G. I. 1963. CHRISTMAS TREE PRODUCTION IN EASTERN REDCEDAR AND ARIZONA CYPRESS PLANTATIONS. Ala. Agr. Exp. Sta. Circ. 145, 13 p.
In a plantation in central Alabama, both species required some pruning and considerable clipping to shape. Customers preferred Arizona cypress to redcedar for its color and because it was less prickly. It was harvestable earlier and more easily grown from stumps, but survival was slightly poorer.
- Garin, G. I., and Moore, J. C. 1951. CHRISTMAS TREE PRODUCTION. Ala. Agr. Exp. Sta. Circ. 92, 15 p.
In central Alabama seven species were compared for growth and desirability as Christmas trees. Arizona cypress (Cupressus arizonica Greene) ranked first and redcedar second.
- George, E. J. 1965. METHODS OF IMPROVING CONIFER SURVIVALS. USDA Forest Serv. Tree Plant. Notes 71, p. 6-13.
Redcedar was planted on 82 plots in the northern Great Plains. Survival averaged 80-100 percent on 65 plots and 50-79 percent on the other 17. The stock required careful handling from the time of lifting in the nursery.
- Gerbracht, J. H. 1937. EVERGREENS FROM SEED. N. and S. D. Hort. 10: 46, 48.
Procedures for producing redcedar seedlings from seed.
- Gruschow, G. F. 1948. A TEST OF METHODS OF PLANTING EASTERN REDCEDAR IN THE VIRGINIA PIEDMONT. J. Forest. 46: 842-843.
Seven methods of planting were compared but all yielded disappointingly low survivals at the end of 4 years.
- Harper. 1940. (181)
- Heit, C. E. 1955. THE EXCISED EMBRYO METHOD FOR TESTING GERMINATION QUALITY OF DORMANT SEED. Assoc. Offic. Seed Anal. Proc. 45: 108-117.
The method was successful on Juniperus spp.
- Hodges, C. S., Jr. 1962. DISEASES IN SOUTHEASTERN FOREST NURSERIES AND THEIR CONTROL. USDA Forest Serv. Southeast. Forest Exp. Sta., Sta. Pap. 142, 16 p.
Two diseases of redcedar nursery seedlings, Phomopsis juniperovora and Cercospora sequoiae, with recommendations for chemical control.
- Hodges, C. S., and Green, H. J. 1960. SURVIVAL IN THE PLANTATION OF EASTERN REDCEDAR SEEDLINGS INFECTED WITH PHOMOPSIS JUNIPEROVORA IN THE NURSERY. Phytopathology 50: 639.
Seedlings showing any symptoms of Phomopsis blight in the nursery should be culled.
- Hodges, C. S., and Green, H. J. 1961. SURVIVAL IN THE PLANTATION OF EASTERN REDCEDAR SEEDLINGS INFECTED WITH PHOMOPSIS BLIGHT IN THE NURSERY. USDA Plant Dis. Rep. 45: 134-136.
When blighted nursery seedlings were outplanted, their survival after two growing seasons was 24 to 30 percent.
- Jelly, M. E. 1937. EASTERN RED CEDAR. J. Forest. 35: 865-867.
Describes the importance of redcedar in Tennessee and summarizes research on hastening seed germination.
- Keen, R. A. 1951. CUTTING GRAFTS OF JUNIPER: A PROGRESS REPORT. Amer. Soc. Hort. Sci. Proc. 58: 298-300.
Cutting-grafts, in which the stock was an unrooted cutting, were used for the propagation of junipers. While the percentage of successes was low, the process was considered satisfactory.
- Lorio. 1963. (114)
- Lorio and Gatherum. 1965. (114)
- Loudon. 1829. (17)
- Loudon. 1838. (17)
- McCormack and Korstian. 1963. (181)
- Mallison, J. W. 1926. GRAFTING RHODODENDRONS, AND CHOICE CONIFERS IN WINTER. III. (JUNIPERS). Fla. Exch. 61: 749, 751.
Procedures and requirements for grafting junipers, including use of redcedar for understock, need for healthy stocks, cutting techniques on scions, and shade requirements.
- Maple, W. R. 1965. FOREST SPECIES COMPARED IN OZARK PLANTATIONS. USDA Forest Serv. Res. Note SO-28, 2 p. S. Forest Exp. Sta., New Orleans, La.
Redcedars planted on loamy sand in north Arkansas were 19 feet tall and 3.6 inches in diameter at age 15 years. The seedlings were in low vigor when planted, and survivals ranged from 17 to 44 percent.
- Meade, F. M. 1951. FOREST PLANTATIONS IN ARKANSAS. Ark. Agr. Exp. Sta. Bull. 512, 50 p.
In a 9-year-old plantation on a mountaintop field in Pope County, mean annual height growth was 1.2 feet, and survival was 90 percent.
- Meade, F. M. 1954. GROWTH AND SURVIVAL OF SHORT LEAF PINE AND EASTERN REDCEDAR IN NORTH ARKANSAS. Ark. Farm Res. 3(2): 4.
After three growing seasons, survival was best where planting sites had been prepared by removal of competing vegetation from areas 2 feet square. There was no appreciable difference in height growth.
- Meade. 1955. (181)
- Meines, M. K. 1965. JUNIPER GERMINATION SIMPLIFIED. USDA Forest Serv. Tree Plant. Notes 70, p. 6-7.
Recommends sowing fresh seed from berries gathered in September. The seed usually germinates the following spring. Stored seed needs long and variable periods of stratification.
- Minckler. 1953. (181)
- Minckler, L. S., and Downs, A. A. 1946. MACHINE AND HAND DIRECT SEEDING OF PINE AND CEDAR IN THE PIEDMONT. USDA Forest Serv. Southeast. Forest Exp. Sta. Tech. Note 67, 10 p.
Suggests storing redcedar seed for 1 year and sowing it, after stratification, in the fall. Seed should be sown in drills and covered with 1/4 inch of soil. For machine sowing in furrows, suggests three viable seeds per linear foot, with vegetative mulch.

- Moore, J. C. 1945. CHRISTMAS TREE PRODUCTION. Ala. Agr. Exp. Sta. Circ. 92, 15 p.
Arizona cypress and redcedar give promise as Christmas tree selections.
- Munns, E. N., and Stoeckeler, J. H. 1946. HOW ARE THE GREAT PLAINS SHELTERBELTS? J. Forest. 44: 237-257.
Considering survival, growth, and adaptation to a wide variety of conditions, redcedar and Rocky Mountain juniper are by far the outstanding conifers in the Plains region.
- Newcomer, F. R. 1936. CEDAR FOR GREAT PLAINS PLANTING. USDA Forest Serv. Plant. Quart. 5: 27-28.
Stratification (in boxes buried in the ground for several months) and scarification both resulted in dependable germination. Plantation survivals ranged from failure to 87 percent.
- Pack, D. A. 1921. AFTER-RIPENING AND GERMINATION OF JUNIPERUS SEEDS. Bot. Gaz. 71: 32-60.
Describes afterripening, germination, and seedling development, as well as some of the chemical and physiological changes that these processes involve. Because redcedar has a dormant embryo that must afterripen before germination, a number of treatments normally used to force germination in other species were ineffective.
- Parker, J. 1950. GERMINATION OF EASTERN REDCEDAR SEEDS. J. Forest. 48: 255-256.
Exposure of seeds to 41° F. for 2-3 months appears essential for germination. Ordinarily, sufficient exposure will be obtained when seeds are planted under natural conditions in the autumn. Scarification speeded but did not increase germination.
- Parker, J. 1950. THE EFFECTS OF FLOODING ON THE TRANSPIRATION AND SURVIVAL OF SOME SOUTHEASTERN FOREST TREE SPECIES. Plant Physiol. 25: 453-460.
Redcedar, red oak, loblolly pine, white oak, and swamp chestnut oak all showed a similar response to flooding.
- Parker, J. 1952. ESTABLISHMENT OF EASTERN REDCEDAR BY DIRECT SEEDING. J. Forest. 50: 914-917.
Seedling survival was better where the litter had been removed than where it had been left in place, and better under an open canopy than a closed.
- Peterson, G. W. 1965. FIELD SURVIVAL AND GROWTH OF PHOMOPSIS-BLIGHTED AND NON-BLIGHTED EASTERN REDCEDAR PLANTING STOCK. USDA Plant Dis. Rep. 49: 121-123.
Blighted stock, even if only slightly damaged, should not be outplanted.
- Peterson, G. W., Nuland, D., and Weihing, J. L. 1960. TEST OF FOUR FUNGICIDES FOR CONTROL OF CEDAR BLIGHT. USDA Plant Dis. Rep. 44: 744-746.
Redcedar seedlings in an eastern Nebraska nursery were treated with various formulations to control cedar blight (Phomopsis juniperovora). Puratized Agricultural Spray gave superior blight control in 1-0 and 2-0 redcedar. The amount of blight in 3-0 seedling was very light, and was unaffected by spraying.
- Peterson, G. W., Sumner, D. R., and Norman, C. 1965. CONTROL OF PHOMOPSIS BLIGHT OF EASTERN REDCEDAR SEEDLINGS. USDA Plant Dis. Rep. 49: 529-531.
Blight in an eastern Nebraska nursery was controlled by Puratized Agricultural Spray, at concentrations of 1, 1-1/2 or 2 pints per 100 gallons of water. Control was not improved by addition of two spreader-stickers.
- Poulsen, W. G. 1965. SIMAZINE WEED CONTROL. USDA Forest Serv. Tree Plant. Notes 73, p. 1-2.
In conifer transplant beds Simazine achieved 77-100 percent control of weeds, and reduced costs of weeding by 50-75 percent.
- Read and Bagley. 1967. (181)
- Sargent. 1895. (181)
- Slagg, C. M., and Wright, E. 1944. THE CONTROL OF PHOMOPSIS BLIGHT IN RED CEDAR SEEDBEDS. Kans. Hort. Soc. Trans. 1942-43: 76-79.
Description of the blight, incidence of infection in relation to thickness of stand and method of watering, and control by fungicidal sprays, roguing, and other sanitary measures.
- Stiles, E. H., and Melchers, L. E. 1935. THE DROUGHT OF 1934 AND ITS EFFECT ON TREES IN KANSAS. Kans. Acad. Sci. Trans. 38: 107-127.
Of the various species of street trees in Manhattan, redcedar was the most drought-hardy, with 96 percent surviving. In tree nurseries, also, redcedar withstood dry weather to a marked degree.
- Stoeckeler, J. H. 1946. ALKALI TOLERANCE OF DROUGHT-HARDY TREES AND SHRUBS IN THE SEED AND SEEDLING STAGE. Minn. Acad. Sci. Proc. 14: 79-83.
Redcedar had one of the lowest alkali tolerances of the 20 species tested.
- Stoeckeler, J. H. 1966. TREES FOR THE COULEE REGION. Wis. Conserv. Bull. 31 (1): 14-16.
In 1961 and 1962, some 40,000 trees of 13 species (both conifers and hardwoods) were established on abandoned farmland and pastures on steep slopes in the Coulee Region of southwestern Wisconsin. On a steep, exposed, limestone-strewn, prairie-soil slope that had never carried high forest, redcedar made an outstanding showing.
- Stoeckeler, J. H., and Baskin, L. C. 1937. THE DENBIGH DISC SCARIFIER, A NEW METHOD OF SEED TREATMENT. J. Forest. 35: 396-398.
The machine greatly reduces time required for scarification of redcedar seed.
- Stoeckeler, J. H., and Jones, G. W. 1957. FOREST NURSERY PRACTICE IN THE LAKE STATES. USDA Agr. Handb. 110, 124 p.
Summary table for seed collection, extraction, and nursery seeding of redcedar. Discusses treatment for cedar blight and cedar apple rust.
- Stoeckeler, J. H., and Slabaugh, P. E. 1965. CONIFER NURSERY PRACTICE IN THE PRAIRIE-PLAINS. USDA Agr. Handb. 279, 93 p.
Nursery practices for growing redcedar seedlings. Includes data on collection and handling of seed, preparation and sowing, care during germination and seedling stage, and nursery protection from insects and diseases.
- Strong, F. C., and Cation, D. 1940. CONTROL OF CEDAR RUST WITH SODIUM DINITROCRESYLATE. Phytopathology 30: 983.
A 1-percent solution of sodium dinitrocresylate was applied as a single spray in May, when rust galls were showing signs of activity. It inhibited telial column extension and teliospore germination from galls of Gymnosporangium globosum and G. juniperi-virginianae.
- Strong, F. C., and Klomprens, W. 1955. THE CONTROL OF

RED CEDAR-APPLE AND HAWTHORN RUSTS WITH ACTIDIONE. USDA Plant Dis. Rep. 39: 569.

Germination of the teliospores and resultant sporidia were prevented by a single application of cycloheximide at 100 p.p.m. The spray was applied to the galls. No injury to the foliage resulted.

Strong, F. C., and Rasmussen, E. J. 1939. SPRAY TRIALS ON ORNAMENTAL RED CEDARS. Mich. Agr. Exp. Sta. Quart. Bull. 21, p. 277-279.

Trees were sprayed with wettable sulphur, alone and with three stickers, to determine whether this fungicide could be used without injury to the foliage and whether the stickers were of value. No conclusions were drawn about the sulphur, but soybean oil (as a sticker) injured the foliage.

Sudworth, G. B. 1900. THE FOREST NURSERY: COLLECTION OF TREE SEEDS AND PROPAGATION OF SEEDLINGS. USDA Div. Forest. Bull. 29, 63 p.

Collecting and storing seed, sowing and care in the nursery. Specific information on redcedar includes number of seeds per ounce, approximate seedling height at 1 year, geographical range of species, character of seed, time to collect, and storage methods.

USDA Forest Service. 1948. (181)

Webster, C. B., and Ratliffe, G. T. 1942. A METHOD OF FORCING QUICK GERMINATION OF JUNIPERUS VIRGINIANA L. SEED. J. Forest. 40: 268.

Satisfactory quick germination was achieved by depulping seed with a hammermill in December, storing dry until February, soaking in a lukewarm sodium-lye solution for 20 minutes, washing in cool water for 1 hour, soaking in fresh water for 8 hours, and stratifying in sand from February 4 to March 29.

Wells, C. G. 1961. UNDERPLANTING TESTS IN PINE STANDS. USDA Forest Serv. Southeast. Forest Exp. Sta. Res. Notes 160, 2 p.

Redcedar was underplanted and fertilized in a recently thinned 19-year-old loblolly pine plantation. Survival ranged from 34 to 44 percent, much poorer than for hardwood species in similar trials.

Westervelt, D. D., and Keen, R. A. 1960. CUTTING GRAFTS OF JUNIPERS. II. STONIC EFFECTS. Amer. Soc. Hort. Sci. Proc. 76: 637-643.

Cutting grafts and grafts on potted redcedar stock were compared for compatibility, and survival.

Wilde. 1946. (114)

Wright, E., and Wells, H. R. 1948. TESTS ON THE ADAPTABILITY OF TREES AND SHRUBS TO SHELTERBELT PLANTING ON CERTAIN PHYMATOTRICHUM ROOT ROT INFESTED SOILS OF OKLAHOMA AND TEXAS. J. Forest. 46: 256-262.

Redcedar and Rocky Mountain cedar are recommended for all shelterbelts on soils infested with root rot. They have high resistance to the rot and live long even under adverse climatic conditions.

Wycoff, H. B. 1961. REDCEDAR SEEDING PRACTICES. USDA Forest Serv. Tree Plant. Notes 47, p. 3-4.
Standard procedures at the Mason State Tree Nursery in central Illinois.

24 TENDING OF STANDS AND TREES

Afanasiev. 1949. (181)

McCormack and Korstian. 1963. (181)

Maple, W. R. 1957. REDCEDAR GROWTH IN ARKANSAS OZARKS. USDA Forest Serv. S. Forest Exp. Sta. S. Forest. Notes 112.

Improvement cutting and hardwood control stimulated a stand of 161 cubic feet per acre to grow at the rate of 10 percent annually. Annual growth was computed to be worth \$3.69 per acre.

Miller, J. K. 1943. FOMES ANNOSUS AND REDCEDAR. J. Forest. 41: 37-40.

Redcedar in the Southeastern United States may be attacked by the polypore Fomes annosus. This fungus kills trees regardless of age and causes a pocket-rot of butt logs. Cedars competing for light with pines or hardwoods are susceptible. Silvicultural practices that lessen or eliminate competition for light greatly reduce losses from this disease.

Minckler. 1953. (181)

Parker. 1951. (13)

26 COMBINATIONS OF FORESTRY WITH AGRICULTURE AND PASTORAL HUSBANDRY

Cromie, G. A. 1944. FIELDS OF RED CEDAR. Conn. Woodlands 9: 23-25.

In Connecticut, cedar can be one of the most profitable tree crops on farms edges. Discusses the variety of products and the number of salable trees that can be grown per acre.

George, E. J. 1953. 31-YEAR RESULTS IN GROWING SHELTERBELTS ON THE NORTHERN GREAT PLAINS. USDA Circ. 924, 57 p.

Redcedar has survived and grown well, though it is susceptible to winter burning of foliage. It is recommended for planting on the outside leeward row.

George, E. J. 1957. SHELTERBELTS FOR THE NORTHERN GREAT PLAINS. USDA Farmers' Bull. 2109, 16 p.

Suggests redcedar for planting in outside rows of shelterbelts and rates it as "good" for light, medium, or heavy soil.

Hahn. 1945. (116)

Hansen, N. E. 1930. EVERGREENS IN SOUTH DAKOTA. S. D. Agr. Exp. Sta. Bull. 254, 33 p.

Occurrence, growth habits, and prevalent diseases of redcedar. Discusses variable hardiness of the species and recommends that local seed sources be utilized exclusively.

Mann and Hays. 1948. (181)

Martin and Crosby. 1955. (181)

Munns and Stoeckeler. 1946. (232)

Stevenson, H. A., Gearhart, H. E., and Curtis, R. L. 1943. LIVING FENCES AND SUPPLIES OF FENCE POSTS. J. Wildl. Manage. 7: 257-261.

Redcedar is mentioned as being used in fencerow planting in southern Illinois to replace, ultimately, the existing posts.

Wright and Wells. 1948. (232)

27 ARBORETA. ARBORICULTURE FOR ORNAMENTAL PURPOSES

Lindgren, R. M., True, R. P., and Toole, E. R. 1949. SHADE TREES FOR THE SOUTHEAST. In *Trees*, p. 60-65. USDA Yearb.

Redcedar is described as a medium-sized pyramidal conifer commonly used as an ornamental; it tolerates various soils but is often subject to a complex of pest and environmental troubles.

Wright, E., and Bretz, T. W. 1949. SHADE TREES FOR THE PLAINS. In *Trees*, p. 65-72. USDA Yearb.

Redcedar is among the most desirable species for planting on the Plains.

28 HUSBANDRY OF FOREST PRODUCTS OTHER THAN WOOD

Afanasiev. 1949. (181)

3. WORK SCIENCE. HARVESTING OF WOOD: LOGGING AND TRANSPORT

Shoulder, E. 1954. COSTS OF SKIDDING EASTERN REDCEDAR. USDA Forest Serv. S. Forest Exp. Sta. S. Forest. Notes 90.

Skidding redcedar in tree lengths and bucking the stems at loading points appears cheaper than bucking at the stump and skidding the products. Savings increased with the diameter and merchantable length of the trees handled.

4. FOREST INJURIES AND PROTECTION

41 GENERAL TECHNIQUE OF FOREST PROTECTION

Crowell, I. H. 1935. THE CEDAR APPLE RUST AND ITS CONTROL. Eleventh Natur. Shade Tree Conf. Proc., p. 80-83. *Life history of the cedar-apple rust fungus. Recommends sprays for controlling the disease on redcedar and on pomaceous hosts.*

Davis, W. C., Wright, E., and Hartley, C. 1942. DISEASES OF FOREST-TREE NURSERY STOCK. U. S. Fed. Secur. Agency, Civ. Conserv. Corps Forest. Publ. 9, p. 58-61.

Cedar rust does not ordinarily appear in nurseries, but the likelihood of an infection increases if apples, quinces, or hawthorns occur in the immediate neighborhood. Cedar blight is a widespread nursery disease. Some control can be achieved by use of sprays. Sanitation should also be practiced.

Hansbrough, J. R. 1952. CEDAR-APPLE RUST. In *Important Tree Pests of the Northeast*, p. 98-99. Soc. Amer. Forest., New England Sect., Concord, N. H.

Distribution and hosts, life history and symptoms, and control.

Livingston, J. E. 1946. CEDAR APPLE RUST. Nebr. Agr. Coll. Ext. Circ. 1806, 4 p.

Symptoms on cedars and on apples, and control methods.

Peterson, Nuland, and Weihing. 1960. (232)

Peterson, Sumner, and Norman. 1965. (232)

Strong, F. C. 1948. RED CEDAR-APPLE AND HAWTHORN RUST DISEASE CONTROL BY SPRAYING RED CEDARS IN THE SPRING. Mich. Agr. Exp. Sta. Quart. Bull. 30, p. 283-288. *Recommends a single application of bordeaux 180 in the spring*

Alvord, B. F. 1957. MARKETING CHRISTMAS TREES IN ALABAMA. Ala. Agr. Exp. Sta. Bull. 309, 26 p.

Redcedar represented about 10 percent of U. S. domestic production in 1947 and 12 percent in 1955. Lack of organization in harvesting and marketing Christmas trees appears to be a serious handicap, particularly with regard to cedar.

Garin. 1963. (232)

Garin and Moore. 1951. (232)

Graeber, R. W. 1944. CHRISTMAS CEDARS BEAT COTTON CROP. S. Plant. 105(2): 19.

At age 6 years a 2-acre redcedar plantation yielded 630 Christmas trees for a value of \$785. The plantation still had more than 500 trees per acre for future harvest.

Moore. 1945. (232)

Sowder, A. M. 1966. CHRISTMAS TREES, THE TRADITION AND THE TRADE. USDA Agr. Inform. Bull. 94, 31 p.

Redcedar ranks fifth in popularity among all U. S. species. In 1964 it comprised 7 percent of the Christmas tree harvest, with more than 2 million cedars cut.

when the telia are about 1/8 to 1/4 inch extended.

Strong and Cation. 1940. (232)

Strong and Klomprens. 1955. (232)

Strong and Rasmussen. 1939. (232)

42 INJURIES FROM INORGANIC AGENCIES

Afanasiev. 1948. (232)

Albertson, F. W. 1940. STUDIES OF NATIVE RED CEDARS IN WEST CENTRAL KANSAS. Kans. Acad. Sci. Trans. 43: 85-95.

Along its western limit of growth in Kansas, 10 to 80 percent of the cedars were killed by the drought of the early 1930's.

Albertson and Weaver. 1945. (182)

Deters and Schmitz. 1936. (232)

George. 1953. (26)

Kaye, S. V. 1965. USE OF MINIATURE GLASS ROD DOSIMETERS IN RADIATION ECOLOGY. Ecology 46: 201-206. *The rods have been used for estimating exposure of foliage of redcedars adjacent to a stream containing radioactive wastes.*

Parker. 1950. (232)

Stiles and Melchers. 1935. (232)

Stoekeler. 1946. (232)

Stoeckeler, J. H., and Rudolf, P. O. 1949. WINTER INJURY AND RECOVERY OF CONIFERS IN THE UPPER MIDWEST. USDA Forest Serv. Lake States Forest Exp. Sta., Sta. Pap. 18, 20 p. *In several localities in Wisconsin, Minnesota, North Dakota, and South Dakota, redcedar in either natural or planted stands suffered only light damage during the severe winter of 1947-1948.*

Van Dersal. 1938. (116)

44 DAMAGE BY HARMFUL PLANTS

Anderson, P. J., Haskell, R. J., Muenscher, W. C., and others. 1926. CHECK LIST OF DISEASES OF ECONOMIC PLANTS IN THE UNITED STATES. USDA Agr. Bull. 1366, 111 p. *Lists 18 specific diseases known to attack redcedar.*

Bailey. 1933. (181)

Baxter, D. V. 1943. PATHOLOGY IN FOREST PRACTICE. 618 p. N.Y.: Wiley. *Important diseases of redcedar, with descriptions of organisms and suggested controls.*

Berg, A. 1940. A RUST-RESISTANT RED CEDAR. Phytopathology 30: 876-878. *Individual redcedars, ranging from highly resistant to highly susceptible to cedar-apple rust, were observed over a period of 16 years. Grafted scions were grown in a nursery for a year and then transplanted. After 4 years rust injury ranged from very light to fatal. One tree was classed as highly resistant.*

Boyce, J. S. 1948. FOREST PATHOLOGY. 550 p. N.Y.: McGraw-Hill. *Important diseases of redcedar.*

Boyce, J. S., Jr. 1962. GREENHOUSE INOCULATIONS OF CONIFEROUS SEEDLINGS WITH FOMES ANNOSUS. Phytopathology 52: 4. *Pieces of infected root were placed in pots containing 1- or 2-year-old loblolly and white pines and redcedar. After 1 year, seedlings of each species had infected roots, although the foliage was normal.*

Boyce, J. S., Jr. 1968. FOREST DISEASE CONTROL. Forest Farmer 27(7): 46-49. *Important diseases of redcedar are root rot and cedar-apple rust. Symptoms and controls are described.*

Caroselli. 1957. (232)

Crowell. 1935. (41)

Davis, W. C., and Latham, D. H. 1939. CEDAR BLIGHT ON WILDING AND FOREST TREE NURSERY STOCK. Phytopathology 29: 991-992. *Infection in native stands is a source of infection in the nursery.*

Davis, Wright, and Hartley. 1942. (41)

Davis, Young, Latham, and Hartley. 1938. (232)

Dodge, B. O. 1931. A DESTRUCTIVE RED-CEDAR RUST DISEASE. J. N. Y. Bot. Gard. 32: 101-108. *The destructive effect of what appears to be the effuse type of infection by Gymnosporangium nidus-avis.*

Dwyer, W. W., Jr. 1951. FOMES ANNOSUS ON EASTERN REDCEDAR IN TWO PIEDMONT FORESTS. J. Forest. 49: 259-262.

Examination of over 10,300 redcedars in the Piedmont showed that Fomes annosus is a common and sometimes serious pathogen. In the Piedmont, stands approaching post and pole size can be expected to sustain losses exceeding 10 percent of the trees.

Ellis, J. B., and Everhart, B. M. 1887. ADDITIONS TO CERCOSPORA, GLOEOSPORIUM AND CYLINDROSPORIUM. J. Mycol. 3: 13-22. *Cercospora sequoie var. juniperi on redcedar foliage has dark-colored tufts and dwarfish habit.*

Hahn, G. G. 1920. PHOMOPSIS JUNIPEROVORA, A NEW SPECIES CAUSING BLIGHT OF NURSERY CEDARS. Phytopathology 10: 249-253. *The alpha and beta type spores and the pycnidium establish that the organism belongs to the genus Phomopsis. It is described as Phomopsis juniperovora n. sp., and its characteristics are listed.*

Hahn, G. G. 1926. PHOMOPSIS JUNIPEROVORA AND CLOSELY RELATED STRAINS ON CONIFERS. Phytopathology 16: 899-914. *The cedar blight fungus is now known to be widespread in the United States. The predisposing factors are discussed.*

Hahn, G. G. 1930. LIFE-HISTORY STUDIES OF THE SPECIES OF PHOMOPSIS OCCURRING ON CONIFERS. Brit. Mycol. Soc. Trans. 15: 32-93. *Describes and differentiates between eight species of Phomopsis, including P. juniperovora. Includes a dichotomous key.*

Hahn, G. G. 1941. REPORTS OF CEDAR BLIGHT IN 1940 AND NOTES ON ITS PREVIOUS OCCURRENCE IN NURSERIES. USDA Plant Dis. Rep. 25: 186-190. *Records cedar blight in a number of the States of the Mississippi Valley.*

Hahn, G. G. 1943. TAXONOMY, DISTRIBUTION, AND PATHOLOGY OF PHOMOPSIS OCCULTA AND P. JUNIPEROVORA. Mycologia 35: 112-119. *P. occulta is nonpathogenic on redcedar.*

Hahn, G. G. 1947. BERG'S RUST-RESISTANT RED CEDAR SUSCEPTIBLE TO PHOMOPSIS JUNIPEROVORA IN GREENHOUSE TESTS. Phytopathology 37: 530-531. *Inoculations indicated that the Berg clone was not resistant.*

Hahn, G. G. 1949. JUNIPERS PREVIOUSLY REPORTED BLIGHT RESISTANT NOW PROVED SUSCEPTIBLE TO PHOMOPSIS JUNIPEROVORA. USDA Plant Dis. Rep. 33: 328-330. *The scant number of known junipers reported to be resistant to cedar blight is further reduced by tests showing that the Dundee juniper, J. virginiana var. hilli, and two specimens of J. virginiana, are susceptible under experimental conditions.*

Hahn, G. G., Hartley, C., and Pierce, R. G. 1917. A NURSERY BLIGHT OF CEDARS. J. Agr. Res. 10: 533-539. *A disease of unknown origin was tentatively identified as being caused by Phoma sp.*

Hansbrough. 1952. (41)

Hartley, C. 1910. FOMES ANNOSUS AND TWO SPECIES OF GYMNOSPORANGIUM ON JUNIPERUS VIRGINIANA. Science 31: 639. *Report of mortality from Fomes annosus. Also an undescribed gymnosporangium suspected of causing gradual death of redcedars.*

- Hartley, C. 1913. BARK RUSTS OF JUNIPERUS VIRGINIANA. *Phytopathology* 8: 249.
The three commonest cedar bark rusts in the District of Columbia appear to be Gymnosporangium clavipes, G. nidus-avis and G. effusum, the first-named being the most abundant.
- Hartley, C. 1913. THE BLIGHTS OF CONIFEROUS NURSERY STOCK. USDA Agr. Bull. 44, 21 p.
A blight of unknown origin affects redcedar in the nursery.
- Heald, F. D. 1909. THE LIFE HISTORY OF THE CEDAR RUST FUNGUS. Nebr. Agr. Exp. Sta. Annu. Rep. 22, p. 105-113.
Detailed life history.
- Hodges, C. S. 1961. NEW HOSTS FOR CERCOSPORA THUJINA PLAKIDAS. USDA Plant Dis. Rep. 45: 745.
Four genera of Cupressaceae are now known to be hosts to the fungus: Chamaecyparis, Cupressus, Juniperus, and Thuja.
- Hodges, C. S. 1962. COMPARISON OF FOUR SIMILAR FUNGI FROM JUNIPERUS AND RELATED CONIFERS. *Mycologia* 54: 62-69.
A fungus causing a serious needle blight of redcedar in the eastern United States was previously thought to be Exosporium glomerulosum but has been identified as Cercospora sequoiae var. juniperi.
- Hodges. 1962. (232)
- Hodges and Green. 1960. (232)
- Hodges and Green. 1961. (232)
- Kelman, A., Hodges, C. S., and Garriss, H. R. 1960. NEEDLE BLIGHT OF REDCEDAR, JUNIPERUS VIRGINIANA L. USDA Plant Dis. Rep. 44: 527-531.
The blight has been observed in North Carolina, Virginia, and South Carolina. It is characterized by an ash-brown color of affected needles, severe defoliation of lower branches, and unusual development of juvenile needles. An associated fungus is considered to be Exosporium glomerulosum.
- Livingston. 1946. (41)
- Long, W. H. 1945. NOTES ON FOUR EASTERN SPECIES OF GYMNOSPORANGIUM. J. Wash. Acad. Sci. 35: 182-188.
In the District of Columbia and adjacent areas in 1912-1913 G. clavipes and G. nidus-avis were widely distributed, G. effusum was in limited occurrence, while G. juniperi-virginianae was not abundant.
- Miller, P. R. 1939. PATHOGENICITY, SYMPTOMS, AND THE CAUSATIVE FUNGI OF THREE APPLE RUSTS COMPARED. *Phytopathology* 29: 801-811.
Three distinct rusts affect apples in the United States: Gymnosporangium juniperi-virginianae, G. globosum, and G. clavipes. Comparative symptomatology of the three diseases and the morphological characters of their causative fungi are tabulated.
- Miller. 1943. (24)
- Nichols, L. P. 1968. TREE DISEASES—DESCRIPTION AND CONTROL. Pa. State Univ. Coll. Agr. Spec. Circ. 85, p. 6, 14-15.
Cedar-apple rust and twig blight are described and control methods are suggested.
- Palmiter, D. H. 1952. THREE RUST DISEASES OF APPLES AND FUNGICIDE TREATMENTS FOR THEIR CONTROL. N. Y. Agr. Exp. Sta. Bull. 756, p. 1-26.
Life histories of the three common apple rust fungi are briefly reviewed and symptoms on the alternate hosts are described.
- Palmiter, D. H. 1953. RUST DISEASES OF APPLE. In *Plant Diseases*, p. 658-663. USDA Yearb.
Identifies the fungi responsible for three rust diseases of apple and discusses life history, symptoms on apple and cedar, and controls.
- Peterson. 1965. (232)
- Peterson, Nuland, and Weihing. 1960. (232)
- Peterson, Sumner, and Norman. 1965. (232)
- Pirone, P. P., Dodge, B. O., and Rickett, H. W. 1960. DISEASES AND PESTS OF ORNAMENTAL PLANTS. Ed. 3, p. 439-444. N.Y.: Ronald Press.
Describes phomopsis twig blight, cedar-apple rust, redcedar aphid, bagworm, juniper midge, juniper scale, juniper webworm, redcedar bark beetle, and red spider mite. Suggests controls for each.
- Riker, A. J. 1945. SOME POSSIBILITIES FOR DEVELOPING RESISTANCE TO DISEASE IN TREES. *Amer. Nurseryman* 81(12): 5-7.
A selection of a redcedar resistant to the cedar-apple rust is commercially available under the name "Berg's rust-resistant."
- Scheld, H. W., Jr., and Kelman, A. 1963. INFLUENCE OF ENVIRONMENTAL FACTORS ON PHOMOPSIS JUNIPEROVORA. USDA Plant Dis. Rep. 47: 932-935.
The optimum temperature for mycelial growth of the fungus on a solid medium was approximately 26°C. Light was requisite for fertile pycnidia. Both mycelium and conidia in pycnidia survived the winter on live infected seedlings; conidia in pycnidia also survived the winter on surface debris.
- Slagg and Wright. 1944. (232)
- Stewart, F. C. 1918. THE PHOMA BLIGHT OF RED CEDAR. *Phytopathology* 8: 33-34.
Documents initial identification as 1896.
- Stoekeler and Jones. 1957. (232)
- Strong. 1948. (41)
- Strong and Cation. 1940. (232)
- Strong and Klomparens. 1955. (232)
- Strong and Rasmussen. 1939. (232)
- USDA Agricultural Research Service. 1960. INDEX OF PLANT DISEASES IN THE UNITED STATES: PLANT PESTS OF IMPORTANCE TO NORTH AMERICAN AGRICULTURE. USDA Agr. Handb. 165, 531 p.
List of diseases and pathogens known to attack redcedar.
- Von Schrenk, H. 1900. TWO DISEASES OF RED CEDAR, CAUSED BY POLYPORUS JUNIPERINUS N. SP. AND POLYPORUS CARNEUS NEES. USDA Bull. 21, 29 p.
Describes mycelium, fruiting bodies, and effects on wood of the white rot and the red rot (pecky cedar).
- Waite, M. B. 1927. APPLE TREES ATTACKED BY CEDAR RUST. USDA Yearb., p. 145-151.
Historical importance of cedar rust on apple production in early 1900's. Describes the life cycle of cedar rust and suggests the eradication of redcedar in the vicinity of apple orchards.

Weimer, J. L. 1917. THE ORIGIN AND DEVELOPMENT OF THE GALLS PRODUCED BY TWO CEDAR RUST FUNGI. Amer. J. Bot. 4: 241-251.

Galls produced by G. juniperi-virginianae and G. globosum on Juniperus virginiana originate as modified leaves. The vascular systems of the galls are composed of the enlarged and modified leaf-trace bundles.

Wright and Wells. 1948. (232)

45 DAMAGE BY ANIMALS

451 MAMMALS

Crawford. 1961. (181)

Dunkeson, R. L. 1955. DEER RANGE APPRAISAL FOR THE MISSOURI OZARKS. J. Wildlife Manage. 19: 358-364.

Redcedar and shortleaf pine have been destructively browsed during winter. Both rank low in palatability, and browsing was heaviest during mast shortages.

Hahn. 1945. (116)

Halls, L. K., and Crawford, H. S., Jr. 1960. DEER-Forest HABITAT RELATIONSHIPS IN NORTH ARKANSAS. J. Wildlife Manage. 24: 387-395.

When deer populations are heavy, young redcedars may have a hedged appearance from being overbrowsed.

Read, R. A. 1948. WINTER BROWSING OF CEDAR BY OZARK DEER. USDA Forest Serv. S. Forest Exp. Sta. S. Forest. Notes 55.

During the winter of 1947-48, white-tailed deer in heavy concentrations browsed almost three-fourths of all cedar trees under 5-1/2 feet high, eating 85 percent of the terminal height growth these trees had made the previous growing season.

Van Dersal. 1939. (13)

453 INSECTS

Appleby, J. E., and Neiswander, R. B. 1965. OLIGOTROPHUS APICIS SP. N., A MIDGE INJURIOUS TO JUNIPERS; WITH KEY TO SPECIES OF OLIGOTROPHUS FOUND IN THE UNITED STATES. Ohio J. Sci. 65: 166-175.

Includes life history of the new species.

Bailey. 1933. (181)

Caveness, F. E. 1957. ROOT-LESION NEMATODE RECOVERED FROM EASTERN REDCEDAR AT HALSEY, NEBRASKA. USDA Plant Dis. Rep. 41: 1058.

One- and 2-year seedlings from the Bossey Nursery at Halsey, Nebraska, had numerous root lesions caused by Pratylenchus penetrans. Infected 2-year seedlings were 6-8 cm. in height, while unaffected seedlings were 31-37 cm.

Craighead, F. C. 1950. INSECT ENEMIES OF EASTERN FORESTS. USDA Misc. Publ. 657, 679 p.

Practical keys (based on types of injuries) to the orders, families, and genera of forest insects.

Dean. 1942. (232)

Haseman, L. 1912. THE EVERGREEN BAGWORM. Mo. Agr. Exp. Sta. Bull. 104, p. 309-330.

Extensive account of the bagworm, Thyridopteryx ephemeraeformis.

Jones, F. M., and Parks, H. B. 1928. THE BAGWORMS OF TEXAS. Tex. Agr. Exp. Sta. Bull. 382, 36 p.

Discusses bagworm girdling and attendant gall-like growth around the girdle, and shows that twigs beyond the point of attachment of the bag are weakened or killed. Identifies the evergreen bagworm as attacking cedar.

Peterson, G. W. 1964. HEAT TREATMENT OF NEMATODE-INFESTED EASTERN REDCEDAR ROOTS. USDA Plant Dis. Rep. 48: 862.

Hot-water treatment was used to kill root-lesion nematodes (Pratylenchus penetrans). Immersion in hot water at 52° C. for 2 minutes was the safest and most effective combination. Hot water was more injurious to roots of healthy plants than to roots of nematode-infested plants.

Pirone, Dodge, and Rickett. 1960. (44)

Stannard, L. J., Jr. 1964. SECONDARY BAGWORM INJURY. J. Econ. Entomol. 57: 176.

Winds broke off twigs weakened by constrictions caused by the supporting bands of bagworms, 95 percent of which had been killed in the previous year by carbaryl treatment.

Wilford, B. H. 1940. THE SEED-CORN MAGGOT, A PEST OF RED CEDAR SEEDLINGS. J. Forest. 38: 658-659.

In Tennessee, nursery seedlings were seriously injured by seed-corn maggots. Maggots feed in early May, attacking the roots or boring through and beneath the thin bark of the stem. Recommendations for control include delaying sowing so as to avoid seedling development during the wet weather of April and May, substitution of inorganic for organic fertilizers, and application of miscible carbon disulfide when maggots are feeding.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE

52 MEASUREMENTS: STEM DIMENSIONS AND VOLUMES

Grosenbaugh, L. R., and Arend, J. L. 1949. INTERNATIONAL RULE MODIFIED FOR SMALL EASTERN REDCEDAR LOGS. J. Forest. 47: 736, 738-739.

Greatly improved predictions of the lumber actually cut from logs was achieved by revising the International 1/4-inch rule for a 4-foot section.

Maughan, W. 1936. A CUBIC VOLUME TABLE FOR EASTERN RED CEDAR. J. Forest. 34: 777-778.

A local volume table in cubic feet, presumed to be applicable in

most of the middle Atlantic Piedmont.

Maughan, W. 1937. A BOARD FOOT VOLUME TABLE FOR EASTERN RED CEDAR. J. Forest. 35: 734-735.

A board-foot volume table for the middle Atlantic Piedmont.

Zimmerman, A. H., and Cummings, W. H. 1952. REDCEDAR CUMULATIVE VOLUME TALLY. J. Forest. 50: 867.

A form based on volume tables constructed for redcedar in the Tennessee Valley.

54 ASSESSMENT OF SITE QUALITY

Arend and Collins. 1949. (114)

56 INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS

561 INCREMENT: HEIGHT, DIAMETER, BASAL AREA

Jackson. 1952. (181)

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY

61 FOREST MANAGEMENT, GENERAL, THEORY AND PRINCIPLES

Cromie. 1944. (26)

62 METHODS OF MANAGEMENT

Arend. 1946. (22)

Arend. 1947. (22)

Maple. 1965. (232)

Schulman, E. 1944. NOTES ON DENDROCHRONOLOGIES AT THE ARNOLD ARBORETUM. *Tree-Ring Bull.* 10, p. 30-32. *The presence of false rings in the junipers make "reading" the chronology very difficult. At least part of the pronounced intraseasonal fluctuation in ring growth of redcedar is related to weather changes.*

Graeber. 1944. (28)

Maple. 1957. (24)

65 SPECIAL BUSINESS PROBLEMS OF TIMBER-GROWING

Arend. 1946. (22)

Arend. 1947. (22)

8. FOREST PRODUCTS AND THEIR UTILIZATION

81 WOOD AND BARK: STRUCTURE AND PROPERTIES

Agramont, Busking, Mitchell, and Enzinger. 1948. (164)

Bannan, M. W. 1942. WOOD STRUCTURE OF THE NATIVE ONTARIO SPECIES OF JUNIPERUS. *Amer. J. Bot.* 29: 245-252.

Redcedar resembled Thuja occidentalis in such characters as size of the tracheids, size and distribution of the intertracheary pits, size and number of pits per crossing field, height and distribution of rays, and size of ray cells.

Brown, H. P., Panshin, A. J., and Forsaith, C. C. 1949. TEXTBOOK OF WOOD TECHNOLOGY. I. STRUCTURE, IDENTIFICATION, DEFECTS, AND USES OF THE COMMERCIAL WOODS OF THE UNITED STATES. 652 p. N.Y.: McGraw-Hill.

General characteristics and properties of redcedar wood, with information on minute anatomy and uses. Wood identification keys.

Hall, W. L., and Maxwell, H. 1911. USES OF COMMERCIAL WOODS OF THE UNITED STATES. I. CEDARS, CYPRESSES, AND SEQUOIAS. USDA Forest Serv. Bull. 95, p. 19-29.

Discusses properties, uses, and supply of redcedar. Cites an essay by Benjamin Franklin in "Poor Richard's Almanack" (1749) on uses, planting, and management of redcedar in eastern Pennsylvania and in New Jersey.

Hallauer, F. J. 1914. TESTS AND SUPPLIES OF PENCIL WOOD. *Amer. Lumberman* 2049, p. 42.
No species equalled redcedar for pencil manufacture.

Jane, F. W. 1954. THE STRUCTURE OF WORLD TIMBERS. XXII. FOUR SPECIES OF THE CEDAR. *Timber Technol.* 62: 67-69.

Compares wood characteristics of four North American cedars, including redcedar.

Johnson, R. P.A., and Van Hagan, C. E. 1949. THE WOOD FOR THE JOB. *In Trees*, p. 615-619. USDA Yearb.

Redcedar is listed as a wood that is comparatively free from warping.

Koehler, A. 1949. KEY FOR THE IDENTIFICATION OF WOODS WITHOUT THE AID OF A HAND LENS OR MICROSCOPE. *In Trees*, p. 833-838. USDA Yearb.
Includes redcedar.

Mamada, S. 1954. WOOD STUDY ON JUNIPERUS VIRGINIANA L. AND JUNIPERUS CHINENSIS L. *Bull. Tokyo Univ. Forest.* 105, p. 225-231 (English summary).

Physical and mechanical properties of redcedar wood grown in a plantation in Japan did not differ from properties of wood grown in the U. S.

Markwardt, L. J. 1930. COMPARATIVE STRENGTH PROPERTIES OF WOODS GROWN IN THE UNITED STATES. USDA Tech. Bull. 158, 38 p.

Specific gravity, weight per cubic foot, shrinkage during drying, and composite strength values for redcedar.

Sargent. 1895. (181)

USDA Forest Service. 1955. WOOD HANDBOOK. USDA Agr. Handb. 72, 528 p.

Specific information on wood properties of redcedar, including color and figure, gluability, moisture content, weight per cubic foot and per 1,000 board-feet, and working quality with hand tools.

Veer, J. J. G., and King, F. W. 1963. MOISTURE BLISTERING OF PAINTS ON HOUSE SIDING. *Can. Dep. Forest. Publ.* 1024, 25 p.

In susceptibility to paint blistering redcedar was intermediate among a number of common siding woods.

White. 1907. (181)

83 TIMBER MANUFACTURING INDUSTRIES AND PRODUCTS

Back, E. A., and Rabak, F. 1922. RED CEDAR CHESTS AS PROTECTORS AGAINST MOTH DAMAGE. USDA Bull. 1051, 14 p.

Chests made of redcedar heart wood protect fabrics from moths.

Blackwell, R. 1945. TO CORRECTLY FINISH AROMATIC RED CEDAR. *Ind. Finish.* 21(4): 104, 106, 108.
Procedures to treat and finish aromatic redcedar.

Booth, F. L. 1929. MANUFACTURING AND SHIPPING CEDAR CHESTS. *Wood-Worker* 48, p. 32-33.
Manufacturing techniques and shipping procedures of one large plant are described in detail.

Laudani, H., and Clark, P. H. 1954. THE EFFECTS OF RED, WHITE, AND SOUTH AMERICAN CEDAR CHESTS ON THE VARIOUS STAGES OF THE WEBBING CLOTHES MOTH AND THE BLACK CARPET BEETLE. *J. Econ. Entomol.* 47: 1107-1111.

Test cedar chests had an inhibiting effect on hatching of eggs laid in the chests but little or no effect on eggs introduced after oviposition. Mortality of the young larvae was much higher than that of mature larvae after exposure in the chests. Exposure of mature larvae had little or no effect on the pupation and adult emergence of either species.

Scott, E. W., Abbott, W. S., and Dudley, J. E. 1918. RESULTS OF EXPERIMENTS WITH MISCELLANEOUS SUBSTANCES AGAINST BEDBUGS, COCKROACHES, CLOTHES MOTHS, AND CARPET BEETLES. *USDA Bull.* 707, 36 p.
Redcedar chests provided protection against clothes moths and carpet beetles, but redcedar chips were only moderately effective.

84 PRESERVATIVE AND OTHER TREATMENTS TO IMPROVE PROPERTIES OF WOOD

Anderson, Haskell, Muenscher, and others. 1926. (44)

Baxter. 1943. (44)

Boyce. 1948. (44)

Morton, H. L., and French, D. W. 1966. FACTORS AFFECTING GERMINATION OF SPORES OF WOOD-ROTTING FUNGI ON WOOD. *Forest Prod. J.* 16(3): 25-30.

Germination of Lenzites trabea basidiospores was less on the heartwood than on the sapwood of eastern redcedar. For both types of wood, germination was less on western redcedar (Thuja plicata Donn) than on eastern redcedar or Douglas-fir.

Von Schrent. 1900. (44)

Walters, C. S., and Meek, W. L. 1951. THE COLD-SOAK PRESERVATIVE TREATMENT OF EASTERN RED CEDAR. *Ill. Agr. Exp. Sta. Forest. Note* 27, 1 p.
Sapwood of redcedar is easy to treat by the cold-soak method.

86 PULP INDUSTRIES. COMPOSITE MATERIALS

Guenther, E. 1943. OIL OF CEDAR WOOD. *Soap Sanit. Chem.* 19: 94-97.

Oil of cedar wood is distilled almost exclusively from shavings and refuse obtained in the processing of boards, shingles, and specialty wood products.

Huddle, H. B. 1936. OIL OF TENNESSEE RED CEDAR. *Ind. and Eng. Chem.* 28(1): 18-21.

Production of redcedar oil is dependent on the supply of virgin redcedar, which is being depleted rapidly. Briefly reviews history of oil production, gives detailed description of a typical still, and summarizes physical properties and analyses of samples of oil distilled in 1932, 1933 and 1935.

Huddle, H. B. 1938. A PRELIMINARY REPORT ON THE VACUUM FRACTIONATION OF THE OIL OF JUNIPERUS VIRGINIANA. *J. Tenn. Acad. Sci.* 13: 259-267.

Describes conditions for fractionation.

Rabak, F. 1929. CEDROL; ITS SOURCE AND DERIVATION. *Amer. Perfum. and Essent. Oil Rev.* 23: 727-728.

Describes methods of determining the percentage of cedrol in cedar-wood oil and compares properties of oils from fresh and old cedar.

Runeberg, J. 1960. THE CHEMISTRY OF THE NATURAL ORDER CUPRESSALES. XVIII. CONSTITUENTS OF JUNIPERUS VIRGINIANA L. *Acta Chem. Scand.* 14: 1288-1294.

Commercial cedar-wood oil contains cuparene, cedrol, widdrol, a-cedrene, and thujopsene.

Sweetman, H. L., Benson, D. A., and Kelley, R. W., Jr. 1953. EFFICACY OF AROMA OF CEDAR IN CONTROL OF FABRIC PESTS. *J. Econ. Entomol.* 46: 29-33.

The aroma of cedar oils from a commercial cedar plaster for wall application was not repellent or toxic to larvae and adults of the webbing clothes moth, black carpet beetle, and furniture carpet beetle.

89 OTHER FOREST PRODUCTS

Bailey, L. F. 1948. LEAF OILS FROM TENNESSEE VALLEY CONIFERS. *J. Forest.* 46: 882-889.

Aromatic oils recovered from the foliage of the four important coniferous lumber species in the Tennessee Valley are described, and the literature on leaf oils of other North American conifers is reviewed. Optimum yields of leaf oils range from 0.46 percent for redcedar to 0.35, 0.32, and 0.28 percent for loblolly, shortleaf, and Virginia pines, respectively.

Bender, F. 1963. CEDAR LEAF OILS. *Can. Dep. Forest. Publ.* 1008, 16 p.

Lists species from which cedar leaf oils are prepared, and discusses methods of preparation.

Greaves, C. 1939. CEDAR LEAF OILS. *Can. Forest Prod. Lab.*, 18 p.

Review of species, status of industry in Canada, method of preparation, yields, physical and chemical properties, and uses.

Kupchan, S. M., Hemingway, J. C., and Knox, J. R. 1965.

TUMOR INHIBITORS. VII. PODOPHYLLOTOXIN, THE ACTIVE PRINCIPLE OF JUNIPERUS VIRGINIANA. *J. Pharm. Sci.* 54: 659-660.

Alcoholic extracts of leaves and twigs showed significant inhibitory effect.

Schwartz, H. 1949. STRUCTURAL BOARDS FROM CEDAR BARK. *Pap. Trade J.* 128(23): 27-28.

Tests indicated a good possibility of producing insulating boards from eastern and western redcedar barks, but results with hardboards were unsatisfactory.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW

90 GENERAL

902 HISTORY OF FORESTS AND FORESTRY

Brown, L. E. 1912. TENNESSEE RED CEDAR. S. Lumberman 69(900): 109-111.

Early uses of redcedar.

Brown, L. E. 1926. TENNESSEE RED CEDAR. S. Lumberman 125(1629): 201-202.

See entry above.

Evelyn, J. 1664. SYLVA, OR A DISCOURSE OF FOREST-TREES AND THE PROPAGATION OF TIMBER. 320 p. London: Martyn and Allestay.

"The cedar. . . grows in all extremes: in the moist Barbados; the hot Bermudas, the cold New England; even where the snow lies (as I am assur'd) almost half the year: Why then it should not thrive in Old England, I conceive is from our want of industry: It grows in the bogs of America. . . ."

Hall and Maxwell, 1911. (81)

Morton, T. 1637. NEW ENGLISH CANAAN. In Force, P., Tracts Relating to the Colonies in North America. Vol. 2, p. 45-54.

In citing the trees that are found in New England, Morton stated, "Cedar, of this sorte there is an abundance: and this wood was such as Solomon used for the building of that glorious temple at Hierusalem This wood cuts red, and is good for bedsteads, tables and chests"

904 GENERAL REGIONAL ACCOUNTS OF FORESTS AND FORESTRY

Barton, J. E. 1919. THE AMOUNT OF STANDING TIMBER IN KENTUCKY. In Resources of Kentucky. Vol. 1, p. 251-284. Frankfort, Ky.: Ky. Dep. Geol. and Forest.

Redcedar was reported in 24 counties; the aggregate volume was 34, 412 thousand board feet.

DeBald, P. S., and Gansner, D. A. 1966. KENTUCKY FORESTS, WESTERN COALFIELD UNIT. USDA Forest Serv. Resour. Bull. CS-9, 45 p. Cent. States Forest Exp. Sta., Columbus, Ohio.

Over 116,000 acres of redcedar type are reported, with 12.4 million cubic feet of growing stock and 26.3 million board feet of sawtimber.

Gansner, D. A. 1965. MISSOURI'S FORESTS. USDA Forest Serv. Resour. Bull. CS-2, 53 p. Cent. States Forest Exp. Sta., Columbus, Ohio.

Growing-stock volume of redcedar type is 17 million cubic feet and sawtimber volume is 6.6 million board feet.

Gansner, D. A., and DeBald, P. S. 1966. KENTUCKY FORESTS, BLUE GRASS UNIT. USDA Forest Serv. Resour. Bull. CS-7, 33 p. Cent. States Forest Exp. Sta., Columbus, Ohio.

Almost 224,000 acres of redcedar type reported, with 19.0 million cubic feet of growing stock and 39.6 million board feet of sawtimber.

Gansner, D. A., and DeBald, P. S. 1966. KENTUCKY FORESTS, PENNYROYAL UNIT. USDA Forest Serv. Resour. Bull. CS-6, 46 p. Cent. States Forest Exp. Sta., Columbus, Ohio.

Over 190,000 acres of redcedar type reported, with 22.0 million cubic feet of growing stock and 24.8 million board feet of sawtimber.

Hall, W. L. 1900. NOTES IN OKLAHOMA. I. THE EXTERMINATION OF THE RED CEDAR. Forester 6: 163-164.

Redcedar trees have furnished most of the posts used by ranchmen and settlers of Oklahoma and southern Kansas.

Kellogg, 1905. (181)

King, Roberts, and Winters. 1949. (181)

Knight, H. A., and McClure, J. P. 1966. NORTH CAROLINA'S TIMBER. USDA Forest Serv. Resour. Bull. SE-5, 47 p. Southeast. Forest Exp. Sta., Asheville, N. C.

About 28,000 acres of redcedar type reported, with 36 million cubic feet of growing stock and 57 million board feet of sawtimber.

Knight, H. A., and McClure, J. P. 1966. VIRGINIA'S TIMBER, 1966. USDA Forest Serv. Resour. Bull. SE-8, 47 p. Southeast. Forest Exp. Sta., Asheville, N. C.

Some 120,000 acres of cedar type reported, with 50 million cubic feet of growing stock and 65 million board feet of sawtimber.

Larson, R. W. 1960. SOUTH CAROLINA'S TIMBER. USDA Forest Serv. Southeast. Forest Exp. Sta. Forest Surv. Release 55, 103 p.

Redcedar type covers 77,000 acres, and contains 37 million cubic feet of growing stock and 40 million board feet of sawtimber.

Miller, L. C. 1902. THE RED CEDAR IN NEBRASKA. Forest. and Irrig. 8: 282-285.

Considering its wide distribution, annual height and diameter growth, and excellent reproduction, redcedar is destined to be widely used for future planting throughout Nebraska.

Sternitzke, H. S. 1960. ARKANSAS FORESTS. USDA Forest Serv. S. Forest Exp. Sta. Forest Surv. Release 84, 58 p.

Redcedar aggregates more than 595,000 acres, with 28 million cubic feet of growing stock and 43 million board feet of sawtimber.

Sternitzke, H. S. 1962. TENNESSEE FORESTS. USDA Forest Serv. S. Forest Exp. Sta. Forest Surv. Release 86, 29 p.

Redcedar is the dominant species on 600,000 acres, with 66 million cubic feet of growing stock and 105 million board feet of sawtimber.

Ware, E. R., and Smith, L. F. 1939. WOODLANDS OF KANSAS. Kans. Agr. Exp. Sta. Bull. 285, 42 p.

Though little mention is made of redcedar occurring in natural stands, it is listed first among trees found to be suitable for Statewide planting.

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