MASTER

**EXPERIMENTAL ECOLOGY OF SELECTED
VERTEBRATE SPECIES**

Progress Report

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August 1, 1974 - July 31, 1975

**Prepared for the
U. S. Energy Research
and Development Administration
Under Contract No. AT(11-1)-3426**

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Work under this contract has been completely integrated with that under contract AT (11-1)-3329 at the University of Massachusetts as indicated in recent proposals for both projects. Professional personnel associated with this project during the period August 1, 1974 through July 31, 1975 were Richard T. Hartman, Dana P. Snyder, Donald L. Graybill, and George G. West.

Although substantial progress was made on the project during the past year, the data collected during the years of field work has not been completely analyzed and prepared for publication. A major feature of the past year's activity has been the conversion of UMASS data files and programs to a new CDI computer. The problems encountered and the time required for this conversion exceeded expectations. Software problems with the chipmunk and gopher data consumed the research time of Dr. Snyder for most of the year. Dr. Graybill was employed full time by Gilbert Associates, Inc., but devoted several man-weeks of effort to the project. His activities included two trips (13 days) to Amherst, Mass. and a trip (5 days) to Corvallis, Oregon to present a paper at the Symposium on Radioecology.

The following papers have been prepared during the past year:

Graybill, D. L., D. P. Snyder, and C. A. Tryon. The effects of toe-clipping on the survivorship of free-ranging eastern chipmunks. (Submitted to Journal of Mammalogy) COO-3426-2

Graybill, D. L., D. P. Snyder, C. A. Tryon, and R. T. Hartman. Seasonal and annual variations in the quantities of nitrogen, potassium, phosphorus, magnesium, calcium, and manganese reaching the forest floor as mast in Pennsylvania and Vermont forests. (To appear in Proceedings of Mineral Cycling Symposium held in Augusta, Georgia.) COO-3426-3

Graybill, D. L. The effects of season, sex, and cage size on the ingestion, respiration, and body weight of captive eastern chipmunks, Tamias striatus. (To be submitted to Journal of Wildlife Management) COO-3426-6

West, George G. Factors affecting home range, and range length of the eastern chipmunk, Tamias striatus, in northwestern Pennsylvania. (Ph. D. thesis, University of Pittsburgh) COO-3426-10

Snyder, D. P., C. A. Tryon, and D. L. Graybill. Effect of sublethal exposure to gamma radiation on range parameters in the eastern chipmunk, Tamias striatus. (Presented at the Fourth Symposium of Radioecology, Corvallis, Oregon.) COO-3426-11

Graybill, D. L. and D. P. Snyder. Bibliography of Mast Production. COO-3426-12 (Copy enclosed with this report).

It is anticipated that an additional one-year extension of the project will permit completion in publishable form of the four priority items outlined in the proposal submitted in 1974 (COO-3426-9).

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BIBLIOGRAPHY OF MAST PRODUCTION

D. L. GRAYBILL, GILBERT ASSOCIATES, INC., P.O. BOX 1498, READING, PA. 19603
 D. P. SNYDER, DEPT. OF ZOOLOGY, UNIVERSITY OF MASSACHUSETTS, AMHERST, MASS. 01002

- Abbott, H.G., and A.C. Hart. 1961. Mice and voles prefer spruce seed.
 Northeast Forest Experiment Station Paper 153. 12 pp.
- Abbott, H.G., and T.F. Quink. 1970. Ecology of eastern white pine seed caches
 made by small forest mammals. Ecology 51(2):271-278.
 (Forest Abstracts 32:368)
- Alexander, R.R. 1969. Seedfall and establishment of Engelmann spruce in clearcut
 openings: a case history. United States Forest Service Rocky Mountain Forest
 Range Experiment Station
 Research Paper No. RM-53. 8 pp.
 (Forestry Abstracts 31:6096)
- Allen, D.L., and H.D. McGinley. 1947. A method for the year to year measurement
 of mast yields. Journal of Wildlife Management 11:184-185.
- Allen, G.S. 1941. A basis for forecasting seed crops of some coniferous trees.
 Journal of Forestry 39:1014-1016.
- Allen, G.S. 1958. Factors affecting the viability and germination behaviour of
 coniferous seed. For. Chron. 34: 266-298.
 (Forestry Abstracts 20:1704)
- Allen, G.S., and J.N. Owens. 1972. The life history of Douglas fir. Ottawa,
 Canada, Forestry Service. 139 pp.
 (Forestry Abstracts 34:160)
- Allen, J.M. 1947. Mast production - a key to squirrel crops.
 Outdoor Indiana 14(5):18.
- Allen, J.M. 1952. The 1951 status of some mast producing tree species.
 Indiana Conservation Department, P-R Wildlife Research Report 13(1):55-56.
- Allen, P.H., and K.B. Trousdell. 1961. Loblolly pine seed production in the
 Virginia - North Carolina coastal plain. Journal of Forestry 59:187-190.
 (Forestry Abstracts 23:421)
- Allen, R.H., Jr. 1963. Rates and dates of shortleaf pine seed fall.
 United States Forest Service Research Notes CS-13. 3 pp.
- Altman, P.L., and D.S. Dittmer. 1964. Biology data book. Federation of
 American Societies for Experimental Biology, Washington, D.C.
- Altschul, A.M., L.Y. Yatsy, R.L. Ory, and E.M. Englemen. 1966. Seed Proteins.
 Annual Review of Plant Physiology 17:113.
 (Forestry Abstracts 28:126)

- Amelinckx, F. 1952. Harvesting, treatment, storage, and planting of tree seeds. *Cult. Handel* 18:526-528.
- Anderson, A.E. 1960. Seed orchards in Swedish forestry. *Tidsskr. Kungl. Skogs-Och Lantbruks & ad.* 99:65-87.
- Andersson, E. 1965. Cone and seed studies in Norway spruce (*Picea abies* (L.) Karst). *Stu. For. Svec.* 23. 214 pp.
(Forestry Abstracts 27:2021)
- Anonymous. 1932. British Columbia study of influences affecting seed production. *Forest Worker* 8(1):21.
- Anonymous. 1948. Woody plant seed manual. United States Department of Agriculture Miscellaneous Publication 654. 416 pp.
- Anonymous. 1956. Forest seed directory. United Nations Food and Agriculture Organization, Rome, Italy. 178 pp.
- Anonymous. 1960. Acorn production studies in Iowa. Pages 15-16 in Report of the Central States Forest Experiment Station 1959, 1960.
(Forestry Abstracts 21:4281)
- Anonymous. 1960. Collection and storage of ash, sycamore, and maple seed. Great Britain Forestry Commission Leaflet 33. 11 pp.
- Anonymous. 1969. Spruce Symposium. Proceedings of the 11th Meeting of the Commission for Forest Tree Breeding, Quebec, Canada, Part II. pp. 183-280.
(Forestry Abstracts 31:213).
- Antipov, V.G. 1957. The effect of gases discharged by industrial plants on the seeds of trees and shrubs. *J. Bot. (U.R.S.S.)* 42:1230-1232.
- Auerbach, S.I. 1971. The deciduous forest biome programme in the United States of America. Pages 677-684 In UNECCO, Productivity of forest ecosystems. Proceedings of the Brussels Symposium, 1969.
- Baldwin, H.I. 1942. Forest tree seed of the north temperate regions with special reference to North America. Cronica Botanica Company, Waltham, Massachusetts. 240 pp.
- Baldwin, H.I. 1949. New seed-extraction apparatus. *Journal of Forestry*: 47:199.
- Baldwin, H.I. 1954. Handling tree seeds. *Unasylva* 8:66-70.
- Baldwin, H.I., and M. Leloup. 1955. Handling forest tree seed. United Nations Food and Agriculture Organization, Rome, Italy. 110 pp.
- Barley, E.M. 1942. Commercial feeding stuffs. Report of Inspection, 1941, Connecticut Agricultural Experiment Station Bulletin 459. 422 pp.

- Barner, H. 1958. Seed supply and forest tree breeding. Dansk Skovfor. Tidsskr. 43:1-84.
- Baron, F.J. 1969. Ten years of forest seed crops in California. Journal of Forestry 67(7):490-492.
(Forestry Abstracts 31:548)
- Baumgartner, L.L. 1939. Foods of the fox squirrel in Ohio. Transcript of the 4th North American Wildlife Conference, Washington, D.C. pp. 579-584.
- Baumgras, P. 1944. Experimental feeding of captive fox squirrels. Journal of Wildlife Management 8(4):296-300.
- Beck, D.E., and D.F. Olson, Jr. 1968. Seed production in southern Appalachian oak stands. United States Forest Service Southeast Forest Experiment Station Research Note No. SE-91. 7 pp.
(Forestry Abstracts 30:3845)
- Beck, J.R., and D.O. Beck. 1955. A method for nutritional evaluation of wildlife foods. Journal of Wildlife Management 19(2):198-205.
- Bennett, E. 1966. Partial chemical composition of four species of coniferous seeds. Forest Science 12:316-318.
(Forestry Abstracts 28:1764)
- Benson, S.R., and H.N. Calderwood. 1936. The chemical examination of the seed of Abies balsamea (L.) Miller. Journal of the American Chemical Society 58:523-525.
- Berggren, G. 1969. Atlas of seeds and small fruits of northwest-European plant species with morphological descriptions. The Swedish Natural Science Research Council 10435, Stockholm, Sweden.
- Beveridge, A.E. 1964. Dispersal and destruction of seed in central North Island podocarp forests. Reprint from Proceedings of the New Zealand Ecological Society No. 11. pp. 48-55.
(Forestry Abstracts 27:885)
- Beveridge, A.E. 1965. Durable seed traps. Research Leaflet No. 9 of the Forest Research Institute, New Zealand Forest Service 4 pp.
(Forestry Abstracts 27:339)
- Bilan, M.V. 1960. Stimulation of cone and seed production in pole-size loblolly pine. Forest Science 6:207-220.
(Forestry Abstracts 22:1710)
- Bjorkbom, J.C. 1971. Production and germination of paper birch seed and its dispersal into a forest opening. United States Forest Service Northeast Forest Experiment Station Research Paper NE-209. 14 pp.

- Bjorkbom, J.C., D.A. Marquis, and F.E. Cunningham. 1965. The variability of paper birch seed production, dispersal and germination. United States Forest Service Northeast Forest Experiment Station Research Paper No. NE 41. 8 pp.
(Forestry Abstracts 27:3578)
- Boe, K.N. 1954. Periodicity of cone crops for five Montana conifers. Montana Academy of Science Proceeding 14:5-9.
- Boe, K.N. 1955. A one-foot square wire seed trap. Journal of Forestry 53(5):368-369.
- Bonner, F.T. 1971. Chemical contents of southern hardwood fruits and seeds. United States Forest Service Southern Forest Experiment Station Research Note No. SO-136. 3 pp.
(Forestry Abstracts 34:2571)
- Borman, F.H., and M.F. Buell. 1964. Old-age stand of hemlock-northern hardwood forest in central Vermont. Bulletin of the Torrey Club 91:451-464.
- Borthwick, H.A. 1957. Light effects on tree growth and seed germination. Ohio Journal of Science 57:357-364.
- Boyer, W.D. 1958. Longleaf pine seed dispersal in south Alabama. Journal of Forestry 56(4):265-268.
- Boyer, W.D. 1958. Harvesting and weighing vegetation. Techniques and methods of measuring understory vegetation. United States Forest Service Southern Forest Experiment Station Symposium Proceedings.
- Bramlett, D.L. 1965. Shortleaf pine seed production in the Piedmont. United States Forest Service Southeastern Forest Experiment Station Research Note No. SE-38. 4 pp.
(Forestry Abstracts 26:5039)
- Braun, E.L. 1950. Deciduous forests of eastern North America. The Blakistan Co., Philadelphia, Pennsylvania. 596 pp.
- Brender, E.V. 1958. A 10-year record of pine seed production on the Hitchiti Experimental Forest. Journal of Forestry 56:408-410.
(Forest Abstract 20:389)
- Brewster, J.F., and C.L. Alsberg. 1919. Determination of the distribution of nitrogen in certain seeds. Journal of Biological Chemistry 37:367-371.
(Botanical Abstracts 2:1318)
- Brink, C.H., and E.G. Dean. 1960. Spruce seed as a food of red squirrels and flying squirrels in northern Alaska. Journal of Wildlife Management 30:503-512.

- Brooke, M. 1956. Foods of the wild turkey in the White River bottomlands of southeastern Arkansas. *Wilson Bulletin* 68(4):305-311.
(Biological Abstracts 31:30247)
- Burns, P.Y., D.M. Christisen, and J.M. Nichols. 1954. Acorn production in Missouri Ozarks. University of Missouri Agriculture Experiment Station Bulletin 611. 8 pp.
- Cain, S.A., and G.M.O. Castro. 1959. Manual of vegetational analysis. Harper and Row, N.Y. 325 pp.
- Campbell, T.E. 1967. Loblolly-shortleaf pine seedfall in Louisiana. *Journal of Forestry* 65(12):894-895.
(Forestry Abstracts 29:5489)
- Chandler, R.F., Jr. 1938. The influence of nitrogenous fertilizer applications upon seed production of certain deciduous forest trees. *Journal of Forestry* 36:761-766.
- Christisen, D.M. 1955. Yield of seed by oaks in the Missouri Ozarks. *Journal of Forestry* 53:439-441.
- Christisen, D.M., 1955. Acorns - the staff of wildlife. *Missouri Conservationist* 14(10):10-11.
- Christisen, D.M., and L. Korschgen. 1955. Acorn yields and wildlife usage in Missouri. *Transactions of the North American Wildlife Conference* 20:337-357.
(Forestry Abstracts 18:2739)
- Church, T.W., Jr. 1954. Mice cause severe damage to Virginia pine reproduction. United States Forest Service Northeast Forest Experiment Station Research Note 35. 2 pp.
- Clark, T.F., and E.C. Lathrop. 1953. Nutshells and fruit pits: their composition, availability, agricultural and industrial uses. U.S. Department of Agriculture Bureau of Agriculture and Industrial Chemistry. Northern Regional Research Laboratory, Peoria, Illinois, AIC Report 352. 39 pp.
- Clarke, E.G.C., and E. Cotchin, 1956. A note on the toxicity of the acorn. *British Veterinary Journal* 112(4):135-139.
(Biological Abstracts 31:1374)

- Collins, J.O. 1961. Ten year acorn mast production study in Louisiana. Louisiana Wildlife and Fisheries Commission P-R Report, Project W-29-R-8. 33 pp.
- Crawford, B.T. 1950. Some specific relationships between soils and wildlife. Journal of Wildlife Management 14(2):115-123.
- Crossley, D.I. 1955. The production and dispersal of lodgepole pine seed. Canadian Department of Northern Affairs Natl. Resources Forest Research Division Technical Note 25. 12 pp.
- Culbertson, A.B. 1948. Annual variation of the winter foods taken by wild turkeys on Virginia State Forests. Virginia Wildlife 9(9):14-16.
- Cunningham, T.M. 1957. Seed production and seed fall of Eucalyptus regnans (F. Muell). Aust. For. 21(1):30-39. (Forestry Abstracts 19:1501).
- Curtis, J.T., and R.P. McIntosh. 1951. An upland forest continuum in the prairie forest border region of Wisconsin. Ecology 32:476.
- Cypert, E., and B.S. Webster. 1948. Yield and use by wildlife of acorns of water and willow oaks. Journal of Wildlife Management 12:227-231.
- Dalke, P.D. 1953. Yield of seeds and mast in second growth hardwood forest, southcentral Missouri. Journal of Wildlife Management 17:378-382.
- Daubenmire, R.A. 1960. A seven-year study of cone production as related to xylem layers and temperature in Pinus ponderosa. American Midland Naturalist 64(1):187-193. (Forestry Abstracts 23:259)
- Davis, N.F. 1904. Chestnut culture in Pennsylvania. Commonwealth of Pennsylvania Department of Agriculture Bulletin No. 123. 50 pp.
- de Castro, N.F. 1955. Analysis of acorn oil. Dissertation Abstracts 15(1):149-150.
- Denaeyer-De Smet, S. 1971. Teneurs en elements biogenes des tapis vegetaux dans les forets caducifoliees d'Europe Pages 515-525. [Content in biogenic elements of the plant covers in the deciduous forests of Europe] In UNESCO, Productivity of forest ecosystems. Proceedings of the Brussels Symposium, 1969.
- Detwiler, S.R. 1943. Better acorns from a heavily fertilized white oak tree. Journal of Forestry 41:915-916.
- Dickmann, D., and T.T. Koslowski. 1969. Seasonal changes in the macro- and micro-nutrient composition of ovulate strobili and seeds of Pinus resinosa. Canadian Journal of Botany 47(10):1547-1554. (Forestry Abstracts 31:1883)

- Downs, A.A. 1944. Estimating acorn crops for wildlife in southern Appalachians. *Journal of Wildlife Management* 8(4):339-340.
- Downs, A.A. 1947. Choosing seed trees. *Journal of Forestry* 45:593-594.
- Downs, A.A. 1949. Trees and food from acorns. Pages 571-573 In *Trees*, yearbook of agriculture. (Forestry Abstracts 13:1743)
- Downs, A.A., and W.E. McQuilkin. 1944. Seed production of southern Appalachian oaks. *Journal of Forestry* 42:913-920.
- Drozdz, A. 1966. Food habits and food supply of rodents in the beech forest. *ACTA Therologica* XI(15):363-384.
- Drozdz, A. 1967. Food preference, food digestibility and the natural food supply of small rodents. Pages 323-330 In Petruszewicz, K. (ed.). *Secondary productivity of terrestrial ecosystems*. Vol. 1. 379 pp.
- Durzan, D.J., and V. Chalupa. 1968. Free sugars, amino acids, and soluble proteins in the embryo and female gametophyte of jack pine as related to climate at the seed source. *Canadian Journal of Botany* 46(4):417-428. (Forestry Abstracts 30:205)
- Duvendeck, J.P. 1962. The value of acorns in the diet of Michigan deer. *Journal of Wildlife Management* 26(4):371-379. (Forestry Abstracts 26:4686)
- Duvigneaud, P. 1971. Productivity of forest ecosystems. UNESCO, *Proceedings of the Brussels Symposium*, 1969.
- Duvigneaud, P., and S. Denaeyer-De Smet. 1971. Cycle des elements biogenes dans les ecosystems forestiers d'Europe (principalement forets caducifolies). Pages 527-542 In *Unesco. Productivity of forest ecosystems. Proceedings of the Brussels Symposium*, 1969.
- Dylis, N. 1971. Primary production of mixed forests. Pages 1227-1232 In *UNESCO, Productivity of forest ecosystems. Proceedings of the Brussels Symposium*, 1969.
- Dzienciolowski, R. 1966. Research methods for the measurement of standing crop, production and animal utilization of food resources in forest vegetation. *Ekologia Polska, Seria B* 12:43-65.
- Earle, F.R., and Q. Jones. 1962. Analyses of seed samples from 113 plant families. *Economic Botany* 16(4):221-250. (Forestry Abstracts 24:4463)
- Easley, L.T. 1954. Loblolly pine seed production areas. *Journal of Forestry* 52:672-673.

- Easley, L.T., and L.E. Chaikern. 1951. An expendable seed trap. *Journal of Forestry* 49:652-653.
- Ebell, L.F. 1971. Girdling: its effect on carbohydrate status and on reproductive bud and cone development in douglas fir. *Canadian Journal of Botany* 49(3):453-466.
- Edwards, M.G. 1960. A technique for obtaining samples of mast. *Journal of Wildlife Management* 24(1):88.
(Biological Abstracts 34:30370)
- Edwards, M.G., and T. Evans. 1955. Mast stimulation and prediction - oak mast prediction. North Carolina Wildlife Resources Commission. Raleigh Work Plans 1955-56.
- Eldridge, K.G. 1966. A seed production experiment with Pinus radiata. 1966. *Aust. For.* 30(1):43-50.
(Forestry Abstracts 28:480)
- Faulkner, R., and J.D. Matthews. 1961. The management of seed stand and seed orchards. *Proceedings of the International Seed Testing Association* 26:366-387.
- Farmer, R.E., Jr., and P.E. Barnett. 1972. Altitudinal variation in seed characteristics of black cherry in the southern Appalachians. *Forest Science* 18(2):169-175.
(Forestry Abstracts 34:847)
- Fielding, J.M. 1960. Branching and flowering characteristics of Monterey Pine (Pinus radiata). *Bulletin, Forest and Timber Bureau, Australia* No. 37.
(Forestry Abstracts 22:1580).
- Firsova, M.K. 1937. Results of an investigation of the quality of seeds of forest trees and shrubs. *Bulletin of Applied Botany, Genetics, Plant Breeding Series* 4(2):189.
- Forbes, J.C. 1972. Production and nutrient cycling in birchwoods. (Abstract). *Transaction of the Botanical Society of Edinburgh* 41(4):556.
(Forestry Abstracts 34:4468)
- Forbes, R.D., ed. 1956. *Forestry handbook*. Ronald Press, New York. 1095 pp.
- Fowells, H.A. 1950. Some observations on the seedfall of sugar pine. U.S. Forest Service California Forest and Range Experiment Station Research Note 70. 3 pp.
- Fowells, H.A., and G.H. Schubert. 1956. Seed crops of forest trees in the pine region of California. U.S. Dept. of Agriculture Technical Bulletin 1150. 48 pp.
(Forestry Abstracts 18:1493)

- Franklin, J.F. 1968. Cone production by upper slope conifers. U.S. Forest Service Pacific Northwest Forest Range Experiment Station, Research Paper No. PNW-60. 21 pp.
(Forest Abstracts 30:3844)
- Fraps, G.S. 1919. Feeding values of certain feeding stuffs. Texas Agriculture Experiment Station Bulletin 245. 29 pp.
- Fritz, E. 1947. Seed production of a sugar pine tree. Journal of Forestry 45:201-203. (Forestry Abstracts 9:225)
- Gardner, W.W., H.A. Allard, and C.L. Foubert, 1914. Oil content of seeds as affected by the nutrition of the plants. Journal of Agric. Research 3:227-249.
- Garman, E.H. 1951. Seed production by conifers in the coastal region of British Columbia related to dissemination and regeneration. Technical Publication British Columbia Forest Service, No. T35. 47 pp.
(Forestry Abstracts 13:151)
- Gashwiler, J.S. 1966. Tree seed abundance vs. deer mouse populations in douglas fir clearcuts. Pages 219-222 in Proceedings of the Society of American Forestry, 1965.
(Forestry Abstracts 28:869)
- Gemme, E.W. 1932. Well-fed pines produce more cones. Forest Worker 8(5):15.
- Gibson, Lester P. 1972. Insects that damage white oak acorns. NE. Forest Exp. Sta., Upper Darby, Pa. 8 pp.
(USDA Forest Serv. Res. Paper NE-220).
- Ginn, W.E. 1955. The 1954 status of some mast producing tree species. Indiana Conservation Department, Indianapolis. P-R Wildlife Research Report 15(4):241-242.
- Goodman, P.D. 1959. Acorns in the diet of wildlife. Proceedings of the Southeastern Association of Game and Fish Commissioners 13:54-61.
- Goodrum, P.D., V.H. Reid, and C.E. Boyd. 1971. Acorn yield, characteristics, and management criteria of oaks for wildlife. Journal of Wildlife Management 35:520-532.
(Forestry Abstracts 33:2246)
- Gorecki, A., and Z. Gebczynska. 1962. Food conditions for small rodents in a deciduous forest. ACTA Therologica VI:275-295.
- Gosz, J.R., G.E. Likens, and F.H. Bormann. 1972. Nutrient content of litter fall on the Hubbard Brook Experimental Forest, New Hampshire, Ecology 53:769-784.
- Grano, C.X. 1958. How to recognize good seed trees. Forest Farmer 17:13.

- Grano, C.X. 1960. Strangling and girdling effects on cone production and growth of loblolly pine. *Journal of Forestry* 58:897-898.
(*Forestry Abstracts* 22:1711)
- Graybill, D.L. 1970. Food resources and ingestion rates of Tamias striatus populations. PhD Thesis. University of Pittsburgh.
- Grodzinski, W. 1963. Can food control the numbers of small rodents in the deciduous forest? *Proceeding of the XVI International Congress of Zoology*, Washington 1:257.
- Grodzinski, W., and K. Sawicka-Kapusta. 1970. Energy values of tree-seeds eaten by small mammals. *Oikos* 21:52-58.
(*Forestry Abstracts* 32:90)
- Guard, A.T., and R.E. Wean. 1941. Seed production in the tulip poplar. *Journal of Forestry* 39:1032-1033.
- Gupta, J.N.S. 1937. Seed weights, plant per cents, etc., for forest plants in India. *Indian Forest Records* 2(5):175-221.
- Guterman, Y. 1972. Differences in progeny due to daylength and hormone treatment of the mother plant. In W. Heydecker, ed., *Seed ecology*. Butterworths, London.
- Gysel, L.W. 1956. Measurement of acorn crops. *Forest Science* 2:305-313.
- Gysel, L.W. 1957. Acorn production on good, medium, and poor oak sites in southern Michigan. *Journal of Forestry* 55:570-574.
(*Forestry Abstracts* 19:317)
- Gysel, L.W. 1958. Prediction of acorn crops. *Forest Science* 4(3):239-245.
(*Forestry Abstracts* 20:1708)
- Gysel, L.W. 1971. A 10-year analysis of beechnut production and use in Michigan. *Journal of Wildlife Management* 35:516-519.
(*Forestry Abstracts* 33:2244)
- Hagner, S. 1958. [On the production of cones and seed in Swedish conifer forests.] *Medd. Statens Skogsforskningsinst* 47(8):1-120.
(*Biological Abstracts* 33:19273)
- Haney, G.P. 1957. Seed production of shortleaf pine in the Piedmont. U.S. Forest Service Southeast Forest Experiment Station Research Notes 113. 2 pp.
- Hansbrough, T., and R.C. Merrifield. 1963. The influence of partial girdling on cone and seed production of loblolly pine. *LSU Forest Notes*, Louisiana School of Forestry, No. 52. 2 pp.
(*Forestry Abstracts* 26:5043)

- Harlow, R.F., and E.L. Tyson. 1959. A preliminary report on the effect of mast abundance on the weight and reproduction of deer in central Florida. Proceedings of the Southeastern Association of Game and Fish Commissioners 13:62-69.
- Harris, A.S. 1969. Ripening and dispersal of a bumper western hemlock-sitka spruce seed crop in southeast Alaska. U.S. Forest Service Pacific Northwest Forest Range Experiment Station, Research Note No. PNW-105. 11 pp. (Forestry Abstract 31:4132)
- Hart, A.C. 1958. Report on forest tree seed crop in New England in 1957. Northeast Forest Experiment Station Forest Research Note 79. 2 pp.
- Hatano, K. 1957. [Chemistry of tree seeds]. Journal of the Japanese Forestry Society 39:238-244.
- Hawkins, P.J. 1966. Seed production and litter fall studies of Callitris columellaris. Aust. For. Res. 2(2):3-16. (Forestry Abstracts:29:311)
- Hebb, E.A. 1954. Preservative treatment for paperboard seed traps. Journal of Forestry 52:249.
- Hedrick, U.P. 1925. The small fruits of New York. Report of the New York State Agriculture Experiment Station for the year ending June 30, 1925. J.B. Lyon Co., Albany, N. Y. 614 pp.
- Hedrick, U.P. 1925. Systematic pomology. The Macmillan Co., New York. XVII 488 pp.
- Hemming, E.S. 1943. Oak trees for food crop. American Nurseryman 77(11):16
- Herman, F.R. 1963. Seed-trap liners of nylon tent screening. Journal of Forestry 61(7):531. (Forestry Abstracts 25:471)
- Hershey, J.W. 1949. Acorns - the mountain corn crop. Pages 39-42 in Report of the Nth Nut Growers Association. (Forestry Abstracts: 13:1742)
- Heydecker, W., ed. 1973. Seed ecology. Pennsylvania State University Press. 578 pp.
- Hoekstra, P.E., and F. Mergen. 1957. Experimental induction of female flowers on young slash pine. Journal of Forestry 55:827-831. (Forestry Abstract 19:1630.)
- Hocker, H.S., Jr., 1962. Stimulating conelet production by eastern white pine. Pages 35-40 in Proceedings of the 9th Northeastern Forest Tree Improvement Conference, Syracuse, 1961. (Forestry Abstracts 24:1908)

- Holmes, G.D., and G. Buszewicz. 1957. Forest tree seed investigations. Great Britain Forestry Comm. Report on Forest Research 1956:15-19.
- Holmes, G.D., and J.D. Matthews. 1951. Girdling and banding as a means of increasing cone production on pine plantations. For. Res. For. Comm. London. No. 12. 8 pp.
(Forestry Abstracts 13:2914)
- Hopkins, C.Y., and M.J. Chisholm. 1953. Some fatty acids of peanut, hickory, and acorn oils. Canadian Journal of Chemistry 31(12):1173-1180.
(Biol. Abstracts 28:29679)
- Hough, A.F. 1960. Silvical characteristics of black cherry. U.S. Forest Service, Northeast Forest Experiment Station Paper 139. 26 pp.
- Hughes, M.K. 1971. Ground vegetation biocontent and net production in a deciduous woodland. Oecologia (Berlin) 7:127-235.
- Huss, E. 1956. On the quality of forest tree seed and other factors affecting the sowing result. Medd. Statens Skogsforskningsinst 46(9):55-59.
- Hyde, H.A. 1951. Pollen output and seed production in forest trees. Quarterly Journal of Forestry 45(3):172-175.
(Forestry Abstracts 13:1045; See 27:1877)
- Hyde, H.A. 1963. Pollen-fall as a means of seed prediction in certain trees. Grana polynologica (Uppsala) 4(2):217-230.
- Hyde, H.A. 1965. Beech mast. Quarterly Journal of Forestry 59(3):263.
- James, G.A. 1959. Seed production in a scrub stand. Technical Note Alaska Forest Research Cent. No. 43. 3 pp.
(Forestry Abstracts 22:1704)
- Jemison, G.M., and C.F. Korstian. 1944. Loblolly pine seed production and dispersal. Journal of Forestry 42:734-741.
- Jennings, T. 1964. Acorn harvest. Wildlife Observer No. 1/2:10-11.
- Jolliffe, W.H. 1955. Trees on the farm. Collection, extraction, and storage of seed. New Zealand Journal of Agriculture 91:557.
- Joslyn, M.A. 1950. Methods in food analysis applied to plant products. Academic Press Inc., New York.
- Kanyak, K. 1962. Pine selection and seed production in Czechoslovakia. Lesn. Khoz. 15(10):81-85. (Biol. Abst. 43:16224)
- Kautz, L.G., and F.C. Lining. 1939. Notes on the 1937 and 1938 acorn crop in the Missouri Ozarks. Journal of Forestry 37:904.

- Kazmierczakowa, R. 1967. Runo lasu bukowego Fagetum carpaticum, jego fenologia i ekologia produkcji pierwotnej [Ecology of primary production and phenology of the beech stand Fagetum carpaticum ground flora]. Studia Naturae - Seria A Nr 1 pp 95-114.
- Kendeigh, S.C., and G.C. West. 1965. Caloric value of plant seeds eaten by birds. Ecology 46:553-555.
- Kessler, K.J., Jr. 1969. Top-dying of yellow birch associated with seed production. Plant disease Report 53(9):694-697.
(Forestry Abstracts 31:3035)
- Khutovtsov, I.I. 1965. [Research at the Caucasus Sanctuary for the past 40 years, 1924-1964]. Kavkazskii gosudarstvenno: zapovednik Trudy, Vol 8.
(1967 Biological Abstracts 52176)
- King, T.R., and H.E. McClure. 1944. Chemical composition of some American wild feedstuffs. Journal of Agricultural Research 69:33-46.
- King, T.R., and H.W. Titus. 1943. Acorns of the willow oak, Quercus phellos, a source of vitamin A¹ activity. Poultry Science 22:56-60.
(Chemical Abstracts 37:2784)
- Klawitter, R.A., and J. Stubbs. 1961. A reliable oak seed trap. Journal of Forestry 59:291-292.
(Forestry Abstracts 23:420)
- Kline, P.D. 1965. Iowa squirrels: hunting statistics, sex and age ratios, and the influence of mast and agriculture. Proceedings of the Iowa Academy of Science 71:216-227.
- Kolesnichenko, M.V. 1949. Poldonoshinie dooba [The fruition of oak]. Lesnoye Khoziastvo (U.S.S.R.) 7:26-28.
- Korstian, C.F. 1927. Factors controlling germination and early survival in oaks. Yale Forestry School Bulletin 19. 115 pp.
- Kuhn, Tracy Miller. 1941. Availability of mast for wildlife, and fall food habits of ruffed grouse, Bonasa umbellus umbellus. M. S. Thesis. Pennsylvania State University
- Larson, M.M., and G.H. Schubert. 1970. Cone crops of ponderosa pine in central Arizona, including the influence of Abert squirrels. United States Forest Service Rocky Mountain Forest Range Experiment Station, Research Paper No. RM-58. 15 pp.
(Forestry Abstracts 32:4130)
- Lay, D.W. 1957. Acorns. Texas Game and Fish 15(3):11, 27-28.
- Lay, D.W. 1965. Fruit utilization by deer in southern pine forests. Journal of Wildlife Management 29(2):370-375.

- Lay, D.W., and H.R. Siegler. 1937. The blue jay as a link between acorn and quail. Transactions of the North American Wildlife Conference 2:579-581.
- Lazarescu, C. 1957. Biometrical measurements in connection with forest seeds standardization. Rev. Padurilor 71:157-159.
- Lester, D.T. 1967. Variation in cone production of red pine in relation to weather. Canadian Journal Botany 45:1683-1691.
- Little, E.L., Jr. 1939. Suggestions for estimating pinon nut crops. United States Department of Agriculture Forest Service Southwest Forest and Range Experiment Station Research Note 58. 4 pp.
- Lomnicki, A., A. Kosior, and T. Kazmierczak. 1965. Estimation of dry weight of injuries caused by herbivores in ground vegetation of beech forest (*Fagetum carpaticum*). Ekol. Pol. B. 11(1):61-67.
- Lotti, T. 1956. Good seed production from a young stand of loblolly pine. United States Forest Service Southeast Forest Experiment Station Research Note 97. 2 pp.
- Lowry, W.P. 1966. Apparent meteorological requirements for abundant cone crop in Douglas fir. Forestry Science 12(2):185-192. (Forestry Abstracts 28:478)
- Lyons, L.A. 1956. The seed production capacity and efficiency of red pine cones. Canadian Journal of Botany 34:27-36.
- Lyons, L.A. 1957. Insects affecting seed production in red pine. IV. Recognition and extent of damage to cones. Canadian Entomologist 89:264-271.
- Maguire, W.P. 1956. Are ponderosa pine crops predictable? Journal of Forestry 54:778-779.
- Malcolm, Jess W. 1952. Certain aspects of forest release cutting with respect to tree growth and mast production - M.S. Thesis. Pennsylvania State University.
- Malcolm, Jess W. 1954. Certain aspects of forest release cuttings with respect to tree growth and mast production - M.S. Thesis. Pennsylvania State University.
- Mann, W.F., Jr., and T.E. Russell. 1957. Longleaf cone production doubled by ringing. Tree Plant Notes 28:6-7. (Forestry Abstracts 19:316)
- Martin, A.C., and W.D. Barkley. 1961. Seed identification manual. Univ. of California Press, Berkeley and Los Angeles. 221 pp.

- Martin, A.C., H.S. Zim and A. L. Nelson. 1961. American wildlife and plants, a guide to wildlife food habits; the use of trees, shrubs, weeds, and herbs by birds and mammals of the United States. 500 pp. Prepared under the direction of the U.S. Fish and Wildlife Service. Dept. of the Int., Laurel, Maryland.
- Matthews, J.D. 1954. Production of seeds by forest trees in Britain. Report For. Res. For. Comm. Lond 1953/54:64-78. (Forestry Abstracts 17:1352)
- Matthews, J.D. 1955. The influence of weather on the frequency of beech mast years in England. Forestry 28(2):107-116. (Forestry Abstracts 17:1353)
- Matthews, J.D. 1963. Factors affecting the production of seed by forest trees. (Forestry Abstracts 24:1-13.)
- McCalla, A.G. 1948. Nitrogenous constituents of plants. Annual Review Biochem 18:615-638. (Chemical Abstracts 43:9174).
- McConkey, T.W. 1960. Report on 1959 forest tree seed crop in New England. United States Forest Service Northeast Forest Experiment Station Forest Research Note 96. 3 pp.
- McConkey, T.W. 1961. Report on 1960 forest tree seed crop in New England. Northeast Forest Experiment Station Forest Research Note 115. 3 pp.
- McCulloch, C.Y., O.C. Wallmo, and P.F. Ffolliott. 1965. Acorn yield of gambel oak in northern Arizona. United States Forest Service Rocky Mountain Forest Range Experiment Station, Research Note No. RM-48. 2 pp. (Forestry Abstracts 27:2024)
- McKell, C.M., J.P. Blaisdell, and J.R. Goodin. 1972. Woodland shrubs - their biology and utilization. United States Forest Service General Technical Report INT-1, 1972. Intermountain Forest and Range Experiment Station. Ogden, Utah 84401.
- Melville, R. 1940. Wild seeds as animal feeding stuffs. Nature 146:403.
- Melville, R. 1947. The nutritive value of nuts. Chem. Ind. (London) 1947: 304-306.
- Merz, R.W., and G.K. Brakhage. 1964. The management of pin oak in a duck shooting area. Journal of Wildlife Management. 28(2):233-239. (Forestry Abstracts 26:5275)
- Michel-Durand, E. 1936. Metabolism of phosphorus compounds in acorns during germination in light. Compt. Rend. 202:866-867. (Chemical Abstracts 31:4539).

- Minckler, L.S., and D. Janes. 1965. Pin oak acorn production on normal and flooded areas. Missouri Agriculture Experiment Station, Research Bulletin No. 898. 15 pp.
(Forestry Abstracts 28:477)
- Minckler, L.S., and R.E. McDermott. 1960. Pin oak acorn production and regeneration as affected by stand density, structure, and flooding. Missouri Agriculture Experiment Station Research Bulletin 750. 24 pp.
(spelled Minkler in some citations)
- Minckler, L.S., and R.E. McDermott. 1960. Pin oak acorn production and regeneration as affected by stand density, structure, and flooding. Research Bulletin 750. 23 pp.
- Mitra, G.N., and Y. Nayak. 1972. Chemical composition of bamboo seeds (Bambusa arundinacea Willd.). Indian Forester 98:479-481.
(Forestry Abstracts 34:3162)
- Moody, R.D. 1953. Mast production of certain oak species in Louisiana. Mimeo. paper presented at the Southeast Association Game and Fish Commissioners Conference, Chattanooga, Tenn. 26 pp.
- Moody, R.D., J. Collins, and V. Reid. 1954. Oak production study underway. Louisiana Conservationist 6(9):6-8.
- Morrison, F.B., 1957. Feeds and feeding. 22nd Ed. The Morrison Publishing Co., Ithaca, N.Y. 498 pp.
- Myczkowski, S. 1967. Skład florystyczny, struktura i produktywność roślinności drzewia stej plantu Fagetum carpaticum [Floristic composition, structure, and productivity of woody plants in a beech stand Fagetum carpaticum]. Studia Naturae Seria A Nr 1. pp. 61-93.
- Narayanamurth, D., and J. Singh. 1951. Proteins of the seeds of some Indian forest trees. Cassia toro, Terminalia belerica, and Duabanga sonneratioides. Indian Forester 77(12):758-762.
(Forestry Abstracts 13:1850 - no abstract)
- National Research Council. Committee on Animal Nutrition-Subcommittee on Feed Composition. 1971. Atlas of nutritional data on United States and Canadian feeds. National Academy of Sciences. Washington.
- Nekrasov, V.I., and N.G. Smirnova. 1963. Seed production and seed quality of some introduced trees and shrubs. Bjull Glavn. Bot. Soda. Moskva No. 48:11-7.
(Forestry Abstracts 25:1919)
- Newman, E.I. 1965. Factors affecting the seed productivity of Teesdalia nudicaulis. II. Soil moisture in spring. Journal of Ecology 53:211-232
- Olsen, M.W. 1942. Acorns are cause of olive-colored yolks. Poultry Science. 21:497-499.

- Olson, J.S. 1971. Primary productivity: temperate forests, especially American deciduous types. Pages 235-258 In UNESCO. Productivity of forest ecosystems. Proc. Brussels Symposium, 1969.
- Ossowski, L. 1942. The collection and treatment of forest tree seeds. Scot. Forestry Journal 56:45-53. Biol. Abstracts 17:6882.
- Ovington, J.D. 1963. Flower and seed production. A source of error in estimating woodland production, energy flow and mineral cycling. Oikos 14:148-153.
(Forestry Abstracts 26:40)
- Ovington, J.D., and G. Murray. 1964. Determination of acorn fall. Quarterly Journal of Forestry 58:152-159.
(Forestry Abstracts 25:4944)
- Park, B.C. 1942. The yield and persistence of wildlife food plants. Journal of Wildlife Management 6 (2):118-121.
- Pearson, A.M. 1943. White-tails like acorns. Alabama Conservationist 15(6):8-9, 12.
- Perrins, C.M. 1966. The effect of beech crops on great tit populations and movements. British Birds 59(10):419-432.
- Petrides, G.A., P. Parmalee, and J.E. Wood. 1953. Acorn production in east Texas. Journal of Wildlife Management 17:380-382.
(Forestry Abstracts 15:2427)
- Phares, R.E., and N.F. Rogers, 1960. Bushel baskets make low cost seed and litter traps. Journal of Forestry 58(5):398-399.
(Forestry Abstracts 21:3950)
- Pomeroy, K.B. 1949. Loblolly pine seed trees: selection, fruitfulness, and mortality. United States Forest Service, Southeastern Forest Experiment Station Paper 5. 17 pp.
- Pomeroy, K.B., and C.F. Korstian. 1949. Further results on loblolly pine seed production and dispersal. Journal of Forestry 47:968-970.
- Pond, J.D. 1936. Girdling for seed production. Journal of Forestry. 34(1):78-79.
(Biol. Abstracts 1936, 10:19313)
- Puritch, G.S., and A.H. Vyse. 1972. Cone production in conifers. A review of the literature and evaluation of research needs. Pacific Forest Research Center, Canada. Information Report No. BC-X-65. 94 pp.
(Forestry Abstracts 34:2132)
- Quink, T.D., H.G. Abbott, and W. J. Mellen. 1970. Locating tree seed caches of small mammals with a radioisotope. Forest Science 16(2):147-148.
(Forest Abstracts 32:369)

- Radvanyi, A. 1966. Destruction of radiotagged seeds of white spruce by small mammals during summer months. *Forest Science* 12:307-315.
- Reid, V.H., and P.D. Goodrum. 1957. Factors influencing the yield and wildlife use of acorns. Louisiana University School of Forestry, Proceedings of the Forestry Symposium. 6:46-79.
- Ripley, T.H., and C.J. Perkins. 1965. Estimating ground supplies of seed available to bobwhites. *Journal of Wildlife Management* 29:117-120.
- Rodin, L.F., and N.I. Bazilevich. 1967. Production and mineral cycling in terrestrial vegetation. Oliver and Boyd, Edinburgh. 283 pp.
- Roe, E.I. 1948. Early seed production by balsam fir and white spruce. *Journal of Forestry* 46:529.
- Roe, E.I. 1948. Effect of red squirrels on red pine seed production in off years. *Journal of Forestry* 46(7):528-529.
(Forestry Abstracts 10:1429)
- Roe, E.I. 1964. Heavy crop of red pine cones yields many thousands of good seeds. United States Forest Service Lake St. Forest Experiment Station, Research Note No. LS-36. 4 pp.
(Forestry Abstracts 25:4942)
- Roeser, J., Jr. 1942. The influence of climate on seed production in Douglas fir. *Journal of Forestry* 40:304-307.
- Rottova, M. 1964. Analysis of the ash of the seeds of Aesculus hippocastanum and some Aceres. *Biologia Plantarum Praha* 6(1):35-41.
(Forestry Abstracts 26:97)
- Roy, D.F. 1959. Small seed traps perform well in the Douglas fir type of California. United States Forest Service Pacific Southwest Forest and Range Experiment Station, Research Note 150. 7 pp.
(Forestry Abstracts 21:376)
- Roy, D.F. 1960. Douglas fir seed production and dispersal in northwestern California. United States Forest Service Pacific Southwest Forest Range Experimental Station, Technical Paper No. 49. 22 pp.
(Forestry Abstracts 22:2982)
- Sarvas, R. 1952. On the flowering of birch and the quality of seed crop. *Commun. Institute Forest Fenniae* 40.7:38.
- Sarvas, R. 1955. Investigations into the flowering and seed quality of forest trees. *Commun. Institute Forest Fenniae* 45(7):1-37.
Biol. Abst. 31:22399.
(Forestry Abstracts 24:1758; Biological Abstracts 31:22399)
- Sarvas, R. 1968. Investigations on the flowering and seed crop of Picea abies. *Commun. Institute Forest Fenniae* 67(5):84.
(Forestry Abstracts 30:3717)

- Schneider, B.H. 1947. Feeds of the world, their digestibility and composition. West Virginia University Agricultural Experiment Station. Morgantown, W. Va. 299 pp.
- Schubert, G.H. 1953. Ponderosa pine cone cutting by squirrels. Journal of Forestry 51(3):202.
(Forestry Abstracts 14:3507)
- Schultz, J. 1953. Forest seed production in relation to planetary cycles. Bio-Dynamics 11(3):10-20, 11(4/5):26-34.
- Sharp, W.M. 1958. Evaluating mast yields in the oaks. Pennsylvania State University Agriculture Experiment Station Bulletin 635. 22 pp.
- Sharp, W.M., and H.H. Chisman. 1961. Flowering and fruiting in the white oaks. I. Staminate flowering through pollen dispersal. Ecology 42:365.
- Sharp, W.M., and V.C. Sprague. 1967. Flowering and fruiting in the white oaks; pistillate flowering, acorn development, weather and yields. Ecology 48:243-251.
- Shaw, M.W. 1968. Factors affecting the natural regeneration of sessile oak (*Quercus petraea*) in North Wales. I. A preliminary study of acorn production, viability and losses. Journal of Ecology 56(2):565-583.
(Forestry Abstracts 30:442)
- Shaw, M.W. 1968. Factors affecting the natural regeneration of sessile oak (*Quercus petraea*) in North Wales. II. Acorn losses and germination under field conditions. Journal of Ecology 56:647-660.
- Shaw, S.P. 1971. Wildlife and oak management. Pages 84-89 in United States Forest Service Northeast Forest Experiment Station, Oak Symposium Proceedings.
- Seidel, K.W. 1970. Estimating cone yield of shortleaf pine. Tree Plant Notes 21:10-11.
(Forestry Abstracts 32:547)
- Siggins, H.W. 1933. Distribution and rate of fall of conifer seeds. Journal of Agriculture Research 47:119-129.
- Smith, J.R. 1950. Tree crops: a permanent agriculture. Harcourt, Brace and Co., New York. 333 pp.
- Spector, W.S. (ed.) 1956. Handbook of biological data. Saunders, Philadelphia. XXXVI + 584 pp.
- Spinner, G.P., and J.S. Biship. 1950. Chemical analyses of some wildlife foods in Connecticut. Journal of Wildlife Management 14:175-180.

- Squillace, A.E. 1953. Effects of squirrels on the supply of ponderosa pine seed. United States Forest Service. North Rocky Mountain Forest and Range Experiment Station Research Note 131. 4 pp.
- Stairs, G.R. 1964. Effects of chronic gamma radiation on seed production in an oak forest. Advancing Frontiers of Plant Science, New Delhi 9:207-215. (Forestry Abstracts 27:6103)
- Stephens, G.R. 1964. Stimulation of flowering in eastern white pine. Forest Science 10(1):28-34. (Forestry Abstracts 26:476)
- Stephenson, G.K. 1963. Ten years of shortleaf pine seed crops in Texas. Journal of Forestry 61:270-272.
- Stern, K. 1972. Labeling of seeds for seed-dispersal studies in conifers. Silvae Genetica 21(1/2):61. (Forestry Abstracts 34:163)
- Stevens, H. 1944. Distribution of maple seeds. American Botanist 50:5-6.
- Sucoff, E.I., and T.W. Church, Jr., 1960. Seed production and dissemination by Virginia pine. Journal of Forestry 58:885-888. (Forestry Abstracts 22:1566)
- Szpok, C.A. 1952. The effects of winter pruning white oaks, Quercus Alba (L.) in relation to oak mast production. M.S. Thesis.- Pennsylvania State University
- Tanton, M.T. 1965. Acorn destruction potential of small mammals and birds in British woodlands. Quarterly Journal of Forestry 49:230-234. (Forestry Abstracts 27:886)
- Tevis, L., Jr. 1953. Effect of vertebrate animals on seed crop of sugar pine. Journal of Wildlife Management 17:128-131.
- Thompson, D.R., and C.W. Lemke. 1954. Miscellaneous field surveys - mast and berry survey. Conservation Department, Madison, P-R Quarterly Progress Report 12(4):53-55.
- Thompson, Richard Lee. 1962. An investigation of some techniques for measuring availability of oak mast and deer browse. M.S. Thesis. Virginia Polytechnic Institute.
- Thompson, R.L., and B.S. McGuinness. 1963. A comparison of eight types of mast traps. Journal of Forestry 61:679-680. (Forestry Abstracts 25:3434.)
- Tickle, C.G. 1958. New method of harvesting tree seed in Britain. New Zealand Timber Journal Wood Prod. Review 4(11):30-31.

- Trammell, J.R. 1964. Vegetation analysis and preliminary mast sampling at Waterloo Wildlife Experiment Station, Athens, Ohio. M.S. Thesis - Ohio University
- Treichler, R., R.W. Stow, and A.L. Nelson. 1946. Nutrient content of some winter foods for ruffed grouse. *Journal of Wildlife Management* 10:12-17.
- Trimble, G.R., Jr., and E.H. Tryon. 1967. Seeding characteristics of eleven Appalachian hardwood species. United States Forest Service Northeastern Forest Experiment Station. 20 pp.
(Forestry Abstracts 29:5310)
- Trousdell, K.B. 1950. A method of forecasting annual variations in seed crops for loblolly pine. *Journal of Forestry* 48:345-348.
(Forestry Abstracts 12:267, See Forestry Abstracts 13:2911)
- Turcek, F.J. 1967. Cycling of some forest tree-seeds with special reference to small mammals and then animals in general. Pages Vol. I 349-356 In K. Petruszewicz, Secondary productivity of terrestrial ecosystems. Polish Academy of Sciences
- Uhlig, H.G., and H.L. Wilson. 1952. A method of evaluating an annual mast index. *Journal of Wildlife Management*. 16:338-343.
- United States Department of Agriculture. 1948. Woody plant seed manual. U.S.D.A. Miscellaneous Publication 654.
- United States Department of Agriculture. 1952. Manual for testing agricultural and vegetable seeds. *Agriculture Handbook* 30:1-440.
- United States Department of Agriculture. 1955. Forest Statistics Series, Pennsylvania, Vol. 1-8. United States Forest Service Northeast Forest Experiment Station, Upper Darby, Pennsylvania.
- United Nations Food and Agriculture Organization. 1956. Forest seed directory. U.N. Food and Agricultural Organization, Rome, Italy.
- United States Department of Agriculture. 1969. Wildlife habitat improvement handbook. Forest Service Handbook 2609.11. Washington, D.C.
- United States Department of Agriculture Statistical Recording Service 1971. Tree masts by states. 1909-65; revised estimates; production; value; use. Washington D.C.: For sale by Supt. of Dos. U.S. Govt. Print. Off. 56 pp. Statistical Bulletin No. 473.
- United States Department of Agriculture. 1971. Forest tree seed orchards. Forest Service, Washington D.C. 15 pp.
- Van Dersal, W.R. 1940. Utilization of oaks by birds and mammals. *Journal of Wildlife Management* 4(4):404-428.

- Van Vredenburg, C.L.H., and J.G.A. La Bastide. 1969. The influence of meteorological factors on the cone crop of Douglas fir in the Netherlands. 18(5/6):182-186. *Silvae Genetica* (Forestry Abstracts 31:4133)
- Verme, L.J. 1953. Production and utilization of acorns in Clinton County, Michigan. M.S. Thesis. Michigan State University 77 pp.
- Wainio, Walter W. 1940. The chemical composition of the mast food products of the forests of Pennsylvania. M.S. Thesis Pennsylvania State University.
- Wainio, W.W., and E.B. Forbes. 1941. The chemical composition of forest fruits and nuts from Pennsylvania. *Journal of Agricultural Research* 62:627-635.
- Wakely, P.C. 1930. Seed yield data for southern pines. *Journal of Forestry* 28:391-394. (Biol. Abstracts 5:11852)
- Wakely, P.C. 1947. Loblolly pine seed production. *Journal of Forestry* 45:676-677.
- Waldron, R.M. 1963. August - November seed and litter fall in a mature white spruce stand. *Forest Chronicle* 39(3):333-334. (Forestry Abstracts 25:1922)
- Waldron, R.M. 1965. Cone production and seedfall in a mature white spruce stand. *Forest Chronicle* 41(3):314-329. (Forest Abstracts 27:3576)
- Ward, W.W., P.W. Fletcher, and M.A. Armstrong. 1965. Site index determination for black cherry. *Journal of Forestry* 63:15-16.
- Ward, F.D., and R.G. Leonard. 1968. Rodents drown in improvised mast traps. *Journal of Mammology* 49:530.
- Watt, B.K., and A.L. Merrill. 1963. Agriculture Handbook No. 8. Composition of foods, raw, processed, prepared. United States Department of Agriculture. 190 pp.
- Weckel, K., and H.D. Lee. 1960. Composition of cherry seed and cherry seed oil (*Prunus cerasus*). *Food Technology* 14:151-154. (Biol. Abst. 36:6806)
- Wehmer, C. 1929 - 1931. *Die Pflanzenstoffe* . . . Ed. 2, 2v. Jena.
- Wenger, K.F. 1953. The effect of fertilization and injury on the cone and seed production of loblolly pine seed trees. *Journal of Forestry* 51:570-573.

- Wenger, K.F. 1953. Preharvest release of loblolly pine seed trees will increase seed supply at harvest. United States Department of Agriculture Miscellaneous Publication 654, 416 pp.
- Wenger, K.F. 1954. The stimulation of loblolly pine seed trees by preharvest release. *Journal of Forestry* 52:115-118.
- Wenger, K.F. 1957. Annual variations in the seed crops of loblolly pine. *Journal of Forestry* 55:567-569.
(*Forestry Abstracts* 19:315)
- Wilson, S.D., W. Jui, and S. Shw-Chien. 1949. The composition of the seeds of the maple tree (*Acer truncatum* Bge). *Peking Natural History Bulletin* Peiping 17:217-221.
(*Forestry Abstracts* 13:830)
- Winton, A.L., and K.B. Winton. 1932. The structure and composition of foods. Vol. 1. John Wiley and Sons, Inc. New York and London.
- Winton, A.L., and Winton, K.B. 1935. The structure and composition of foods. Vol. II. John Wiley and Sons, Inc., New York.
- Wokes, F., and R. Melville. 1948. Vitamin C in the walnut (*Juglans regia*). *Biochem. Jour.* 43(4):585-592.
(*Biolpgoca, Abstracts* 23:23297)
- Wolf, C.B. 1945. California wild tree crops. Rancho Santa Ana Botanic Garden, California. (*Forestry Abstracts* 8) II + 68 pp.
- Wood, A.M. 1934. A brief record of seed productivity for chestnut oak in southern New Jersey. *Journal of Forestry* 32:1014-1016.
- Wright, J.W. 1952. Pollen dispersion of some forest trees. Northeast Forest Experiment Station Paper 46. 42 pp.
- Wright, J.W. 1953. Notes on flowering and fruiting of northeastern trees. United States Forest Service Northeast Forest Experiment Station Paper 60. 38 pp.
- Wright, J.W. 1953. Pollen dispersion studies: some practical applications. *Journal of Forestry* 51:114-118.
- Wright, J.W., and W.J. Gabriel. 1957. Effects of continuous bagging of white pine cones. United States Forest Service Northeast Forest Experiment Station Paper No. 99. 6 pp. (*Forestry Abstracts* 19:2720)
- Wyman, D. 1953. Seeds of woody plants. *Arnoldia* 13:41-60.
(*Biological Abstracts* 28:19401)
- Youngberg, C.T. 1951. Effect of origin and growth conditions of Norway spruce (*Picea excelsa*) on the chemical composition of seed and physiological characteristics of nursery stock. *Proc. Soil Sci. Soc. Amer.* 15:376-379.
(*Forestry Abstracts* 13:2909)

Youngberg, C.T. 1952. Effect of soil fertility on the physical and chemical properties of tree seed. Journal of Forestry 50:850-852.

Zasada, J.C., and R.A. Gregory. 1972. Paper birch seed production in the Tavana Valley, Alaska. United States Forest Service Pacific Northwest Forest and Range Experiment Station Research Note PNW-177. 7 pp.
(Forestry Abstracts 34:4516)

Zasada, J.C., and Viereck, L.A. 1970. White spruce cone and seed production in interior Alaska, 1957-68. United States Forest Service, Pacific Northwest Forest Range Experiment Station, Research Note PNW-129. 11 pp.
(Forestry Abstracts 33:543)

BIBLIOGRAPHY OF MAST PRODUCTION

UPDATED TO DECEMBER 1974

DRAFT

- Afanas'ev, V.A. 1973. [Fruiting periodicity of Kurile larch in relation to cycles of solar activity.] *Lesnoe Khozyaistvo*. No. 12, 31-33. Russian. (Forestry Abstracts 35:6015)
- Babushkin, M. and V.N. Fedorenko. 1972. [1] A slash collector-pickup. [2] Mechanizing the collection of seeds from coniferous species. Wellington, New Zealand, New Zealand Forest Service 4 pp. En. Transl. from *Lesnoe Khozyaistvo* (1971) No. 11, 58-59. Russian. Limited distribution. (Forestry Abstracts 34:910)
- Baker, H.A. 1972. Seed weight in relation to environmental conditions in California. *Ecology* 53(6):997-1010 (Forestry Abstracts 34:4519)
- Barabin, A.I. 1972. [Predicting seed production in spruce from data on the growth of female buds]. *Lesnoi Zhurnal* 15(1):149-150. Russian. (Forestry Abstracts 35:1493)
- Barabin, A.I. 1973. [Analysis of cone yields of *Picea abies* in Vel'skii leskhoz, Archangel region, in 1971]. *Lesnoi Zhurnal* 16(5):152-154. Russian. (Forestry Abstracts 35:6016)
- Barabin, A.I. [Mensurational factors in the seed production of spruce]. 1973. *Lesnoi Zhurnal* 16(2) : 169-171. Russian. (Forestry Abstracts 35:1491)
- Brender, E.V. and W.H. McNab. 1972. Loblolly pine seed production in the lower (?) under various harvesting methods. *Journal of Forestry* 70(6):345-349. (Forestry Abstracts 34:909)
- Breusova, A.I. 1973. [Use of mineral fertilizers in Scots pine seed stands]. *Lesnoe Khozyaistvo* No. 11:39-41. Russian. (Forestry Abstracts 35:5111)
- Brinkmann, W.L.F. 1972. [Losses of nutrients in the forest of the Amazons region through the export of Brazil nuts]. *Umschau* 72:190-191. From *Berichte Biochemie und Biologie* (1973) 271:2137. Danish. (Forestry Abstracts 34:6350)
- Brown, I.R. 1973. Factors affecting the yield from Scots pine seed orchards. *Scottish Forestry* 27(4): 296-307. (Forestry Abstracts 35:3566)
- Chalupa, V. 1972. [The accuracy of estimating cone crop in *Picea abies* stands in mountain regions]. *Prace Vyzkumneho Ustavu Lesniho Hospodarstvi a Myslivosti* 42:87-102. (Forestry Abstracts 35:1492)

- Copes, D.L. 1973. Effect of annual leader pruning on cone production and crown development of grafted Douglas Fir. *Silvae Genetica* 22(5/6): 167-173.
(Forestry Abstracts 35:6017)
- Crocker, T.C. Jr. 1973. Longleaf pine cone production in relation to site index, stand age, and stand density. United States Forest Service Research Note, Southern Forest Experiment Station No. SO-156, 3 pp.
(Forestry Abstracts 35:2930)
- Fowden, L., H. Pratt and A. Smith. 1972. Nitrogenous constituents of [seeds of] Billia hippocastanum and [fruits of] Acer pseudoplatanus. *Phytochemistry* 11(12):3521-3523.
(Forestry Abstracts 35:4844)
- Goebel, N.B. and W.H.D. McGregor. 1973. Seedfall of three bottomland hardwood species. *Forestry Bulletin* No. 11, Dept. of Forestry, Clemson Univ. 5 pp.
(Forestry Abstracts 35:6018)
- Gukov, G.V. 1973. [The Druzba power saw used for harvesting larch seed]. *Lesnoe Khozyaistvo* No. 2:47-50. Russian.
(Forestry Abstracts 34:5719)
- Hegarty, T.W. 1973. A directory of seed research in Britain. Invergowrie UK, Scottish Horticultural Research Institute. 44 pages.
(Forestry Abstracts 35:1490)
- Janzen, D.H. 1971. Seed predation by animals. *Annual Review of Ecology and Systematics* 2:465-492.
(Forestry Abstracts 34:4463)
- Janzen, D.H. 1972. Association of a rainforest palm and seed-eating beetles in Puerto Rico. *Ecology* 52(2):258-261.
(Forestry Abstracts 34:161)
- Krechetova, N.V., A.G. Emlevskaya, G.V. Senchukova, and V.I. Shteinikova. 1972. [Seeds and fruits of trees and shrubs of the Soviet Far East]. *Semena i plody derev'ev i kustarnikov Dal'nego Vostoka*. Moscow, USSR, *Lesnaya Promyshlennost'*. 79 pp. Russian.
(Forestry Abstracts 34:3243)
- Lamb, R.C., M.P. Walters, III, and E.V. Brender. 1973. Apparent influence of weather upon seed production of loblolly pine. United States Forest Service Research Note, Southeastern Forest Experiment Station. No. SE-183, 7 pp.
(Forestry Abstracts 35:7521)
- Lewis, R.A. and C.C. Franklin. 1969. Electrophoresis separation of general protein and isoenzymes of black cherry seed (Prunus serotina Ehrh.). In *Proceedings of the 10th Southern Conference on Forest Tree Improvement* 140-148.
(Forestry Abstracts 34:3819)

- Lomokina, M.I. and E.N. Lomokin. 1973. [Chemical composition of the wild fruit plants of the western Kopet Dag]. *Rastitel'nye Resursy* 9 (4):573-577. Russian.
(Forestry Abstracts 35:4046)
- Lopes, M.H.C., and J.S. Oliveira. 1972. [Food plants of Mozambique. IV. Wild fruits]. *Agronomia Mocambicana* 6(1):73-82. Portuguese.
(Forestry Abstracts 34:3735)
- Matschke, G.H., K.M. Barth, and R.L. Murphree. 1973. Digestion of crude protein in white oak acorns by European wild hogs and Pitman-Moore miniature hogs. *J. of the Tennessee Academy of Science* 48(3):85-87.
(Forestry Abstracts 35:4845)
- Mattson, W.J., Jr. 1972. The role of insects in the dynamics of cone production of red pine, *Pinus resinosa*. [Abstract]. *Dissertation Abstracts International*, B, (1972) 33(6) 2642-2643.
(Forestry Abstracts 35:6733)
- Merinov, A.I. and A.D. Baitov. 1972. [Method of collecting the seeds of conifers]. *Aut. sv. SSSR k.l. A Olg* 23/00 No. 322 56. From *Referativnyi Zhurnal* (1972) 1.56.153. Russian.
(Forestry Abstracts 34:5133)
- Minore, D. 1972. The wild huckleberries of Oregon and Washington - a dwindling resource. United States Forest Service Research Paper, Pacific Northwest Forest and Range Experiment Station No. PNW-143, 20 pp.
(Forestry Abstracts 34:5782)
- Mitra, G.N. and Y. Nayak. 1972. Chemical composition of Bamboo seeds (*Bambusa arundinacea* Willd.). *Indian Forester* 98(8):479-481.
(Forestry Abstracts 34:3162)
- Morris, J.E. and W.L. Beers. 1969. Fertilization of eight-year-old slash pine plantation thinned for seed production. In *Proceedings of the 10th Southern Conference on Forest Tree Improvement*, 217-221.
(Forestry Abstracts 34:3943)
- Nepomilueva, N.I. 1973. [Seed production of *Pinus sibirica* in the conditions of the central taiga of the Komi ASSR]. *Lesovedenie* No. 1:3-13. Russian.
(Forestry Abstracts 35:4338)
- Noguchi, T. and M. Watanabe. 1972. [Seed yield in self-pollination of Japanese red pine plus-tree clones]. *J. of the Japanese Forestry Society* 54(10): 356-359.
(Forestry Abstracts 34:5003)
- Quirk, J.T. 1973. Cone production stimulus related to transplanting in red pine. *Silvae Genetica* 22(3):71-72.
(Forestry Abstracts 35:1494)

- Rim, Y.-D. and T. Shidei. 1973. Study on the seed production of Japanese red and black pine (1). Bulletin of the Kyoto University Forests No. 45: 43-51.
(Forestry Abstracts 35:6011)
- Saatcioglu, F. [Forest Tree Seed] Istanbul Universitesti Orman Fakultesi Yayinlari. 1971. No. 173, xv + 242 pp. Turkish.
(Forestry Abstracts 34:3938)
- Sholto, D.J. 1973. Tree crops for food, forage and cash. Parts I and II, World Crops (1972) 24(1; 2) 2, 15-19; 86-89, 97. From Tropical Abstracts 27, v2762, v2266. See also Forestry Abstracts 30, 5722.
(Forestry Abstracts 34:5783)
- Varnell, R.J. 1969. Female-strobilus production in a slash pine seed orchard following branch pruning. In Proceedings of the 10th Southern Conference on Forest Tree Improvement, 222-228.
(Forestry Abstracts 34:3942)
- Vigorov, L.I. 1972. [Content of sterols and chlorine in some edible fruits]. Rastitel'nye Resursy 8(4):557-562. Russian.
(Forestry Abstracts 34:3161)