

ORNL Publications on the Direct Effects of Elevated CO₂ (Pre-FACE)

1981

Luxmoore, R. J. 1981. CO₂ and phytomass. *BioScience* 31: 626.

1984

Norby, R. J., R. J. Luxmoore, E. G. O'Neill, and D. G. Weller. 1984. Plant responses to atmospheric CO₂ with emphasis on belowground processes. ORNL/TM-9426. Oak Ridge National Laboratory, Oak Ridge, TN.

1986

Luxmoore, R. J., R. J. Norby, and E. G. O'Neill. 1986. Seedling tree responses to nutrient stress under atmospheric CO₂ enrichment. pp. 178-183 IN *Proceedings, 18th IUFRO World Congress, Division II, Vol. I. IUFRO Secretariat, Vienna, Austria.*

Luxmoore, R. J., E. G. O'Neill, J. M. Ells, and H. H. Rogers. 1986. Nutrient-uptake and growth responses of Virginia pine to elevated atmospheric CO₂. *Journal of Environmental Quality*. 15:244-251.

Norby, R. J., E. G. O'Neill, and R. J. Luxmoore. 1986. Effects of atmospheric CO₂ enrichment on the growth and mineral nutrition of *Quercus alba* seedlings in nutrient-poor soil. *Plant Physiology* 82:83-89.

Norby, R. J., J. Pastor, and J. M. Melillo. 1986. Carbon-nitrogen interactions in CO₂-enriched white oak: Physiological and long-term perspectives. *Tree Physiology* 2:233-241.

1987

Norby, R. J. 1987. Nodulation and nitrogenase activity in nitrogen-fixing woody plants stimulated by CO₂ enrichment of the atmosphere. *Physiologia Plantarum* 71:77-82.

Norby, R. J., E. G. O'Neill, W. G. Hood, and R. J. Luxmoore. 1987. Carbon allocation, root exudation, and mycorrhizal colonization of *Pinus echinata* seedlings grown under CO₂ enrichment. *Tree Physiology* 3:203-210.

O'Neill, E. G., R. J. Luxmoore, and R. J. Norby. 1987. Elevated atmospheric CO₂ effects on seedling growth, nutrient uptake, and rhizosphere bacterial populations of *Liriodendron tulipifera* L. *Plant and Soil* 104:3-11.

[O'Neill, E. G., R. J. Luxmoore, and R. J. Norby. 1987. Increases in mycorrhizal colonization and seedling growth in *Pinus echinata* and *Quercus alba* in an enriched CO₂ atmosphere. *Canadian Journal of Forest Research* 17:878-883.

1989

Norby, R. J., and E. G. O'Neill. 1989. Growth dynamics and water use of seedlings of *Quercus alba* L. in CO₂-enriched atmospheres. *New Phytologist* 111:491-500.

Norby, R. J. and L. L. Sigal. 1989. Nitrogen fixation in the lichen *Lobaria pulmonaria* in elevated atmospheric carbon dioxide. *Oecologia* 79:566-568.

Norby, R. J. 1989. Direct responses of forest trees to rising atmospheric carbon dioxide. pp. 243-249 IN R. G. Noble, J. L. Martin, and K. F. Jensen (eds.), *Air Pollution Effects on Vegetation Including Forest Ecosystems*. Proceedings of the second US-USSR Symposium; Corvallis OR, Raleigh NC, and Gatlinburg TN, September 13-25, 1988. U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station, Broomall, PA.

1990

Luxmoore, R. J., M. L. Tharp, and D. C. West. 1990. Simulating the physiological basis of tree ring responses to environmental changes. p. 393-401. In: R. K. Dixon, R. S. Meldahl, G. A. Ruark, and W. G. Warren (eds.), *Process Modeling of Forest Growth Responses to Environmental Stress*. Timber Press, Inc., Portland, Oregon

1991

Baldocchi, D. D., R. J. Luxmoore, and J. L. Hatfield. 1991. Discerning the forest from the trees: An essay on scaling canopy stomatal conductance. *Agricultural and Forest Meteorology* 54:197-226

Luxmoore, R. J. 1991. A source-sink framework for coupling water, carbon, and nutrient dynamics of vegetation. *Tree Physiology* 9:267-280.

Luxmoore, R. J., A. W. King, and M. L. Tharp. 1991. Approaches to scaling up physiologically-based soil-plant models in space and time. *Tree Physiology* 9:281-292.

Mooney, H. A., B. G. Drake, R. J. Luxmoore, W. C. Oechel, and L. F. Pitelka. 1991. Predicting ecosystem responses to elevated CO₂ concentrations. *BioScience* 41:96-104.

Norby, R. J., and E. G. O'Neill. 1991. Leaf area compensation and nutrient interactions in CO₂-enriched yellow-poplar (*Liriodendron tulipifera* L.) seedlings. *New Phytologist* 117: 515-528.

O'Neill, E. G., R. V. O'Neill, and R. J. Norby. 1991. Hierarchy theory as a guide to mycorrhizal research on large-scale problems. *Environmental Pollution* 73:271-284.

1992

Norby, R. J., C. A. Gunderson, S. D. Wullschleger, E. G. O'Neill, and M. K. McCracken. 1992. Productivity and compensatory responses of yellow-poplar trees in elevated CO₂. *Nature* 357:322-324.

Wullschleger, S. D., R. J. Norby, and D. L. Hendrix. 1992. Carbon exchange rates, chlorophyll content, and carbohydrate status of two forest tree species exposed to carbon dioxide enrichment. *Tree Physiology* 10:21-31.

Wullschleger, S. D., R. J. Norby, and C. A. Gunderson. 1992. Growth and maintenance respiration in leaves of *Liriodendron tulipifera* L. saplings exposed to long-term carbon dioxide enrichment in the field. *New Phytologist* 121: 515-523.

Wullschleger, S. D. and R. J. Norby. 1992. Respiratory cost of leaf growth and maintenance in white oak saplings exposed to atmospheric CO₂ enrichment. *Canadian Journal of Forest Research* 22: 1717-1721.

1993

Apps, M. J., W. A. Kurz, R. J. Luxmoore, L. O. Nilsson, R. A. Sedjo, R. Schmidt, L. G. Simpson, and T. S. Vinson. 1993. Boreal forests and Tundra. p. 39-53. In: J. Wisniewski and R. N. Samson (eds.), *Terrestrial Biospheric Carbon Fluxes: Quantification of Sinks and Sources of CO₂*. Kluwer Academic Publishers, Dordrecht.

Gunderson, C. A., R. J. Norby, and S. D. Wullschleger. 1993. Foliar gas exchange responses of two deciduous hardwoods during three years of growth in elevated CO₂: No loss of photosynthetic enhancement. *Plant, Cell, and Environment* 16:797-807.

Luxmoore, R.J., S.D. Wullschleger and P.J. Hanson. 1993. Forest response to CO₂ enrichment and climate warming. *Water, Air, and Soil Pollution* 70: 309-323.

Stewart, D. B., and R. J. Norby. 1991. Interactions between water stress and elevated CO₂ in five eastern deciduous tree seedlings. IN, Proceedings of the Fifth National Conference on Undergraduate Research, California Institute of Technology, Pasadena, CA, March 21-23, 1991.

Tschaplinski, T. J., R. J. Norby, and S. D. Wullschleger. 1993. Responses of loblolly pine seedlings to elevated CO₂ and fluctuating water supply. *Tree Physiology* 13: 283-296.

West, D. C., T. W. Doyle, M. L. Tharp, J. J. Beauchamp, W. J. Platt, and D. J. Downing. 1993. Recent growth increases in old-growth longleaf pine. *Canadian Journal of Forest Research* 23: 846-853.

Wullschleger, S.D., W.M. Post and A.W. King. 1995. On the potential of a CO₂ fertilization effect in forests: Estimates of the biotic growth factor based on 58 controlled-exposure studies. pp. 85-107. In G.M. Woodwell and F.T. Mackenzie (eds.) *Biotic Feedbacks in the Global Climatic System: Will Warming Feed the Warming?* Oxford University Press, New York.

Wullschleger, S.D. 1993. Biochemical limitations to carbon assimilation in C₃ plants - A retrospective analysis of the A/C_i curves from 109 species. *Journal of Experimental Botany* 44: 907-920.

1994

Cooper, L. W. and R. J. Norby. 1994. Atmospheric CO₂ enrichment can increase the ¹⁸O content of leaf water and cellulose: paleoclimatic and ecophysiological implications. *Climate Research* 4:1-11.

Curtis, P. S., E. G. O'Neill, J. A. Teeri, D. R. Zak, and K. S. Pregitzer. 1994. Belowground responses to rising atmospheric CO₂: implications for plants, soil biota and ecosystem processes. *Plant and Soil* 165: 1-8.

Gunderson, C. A. and S. D. Wullschleger. 1994. Photosynthetic acclimation of forest trees to a doubling of atmospheric CO₂: a broader perspective. *Photosynthesis Research* 39: 369-388.

Norby, R. J. 1994. Issues and perspectives for investigating root responses to elevated atmospheric carbon dioxide. *Plant and Soil* 165: 9-20.

O'Neill, E. G. 1994. Responses of soil biota to elevated atmospheric carbon dioxide. *Plant and Soil* 165:55-65.

Wullschleger, S. D., L. H. Ziska, and J. A. Bunce. 1994. Respiratory response of higher plants to atmospheric CO₂ enrichment. *Physiologia Plantarum* 90: 221-229.

Wullschleger, S.D., J.P. Lynch and G.M. Berntson. 1994. Modeling the belowground response of plants and soil biota to edaphic and climatic change - What can we expect to gain? *Plant and Soil* 165:149-160.

1995

[40] Belowground Responses to Rising Atmospheric CO₂: Implications for Plants, Soil Biota, and Ecosystem Processes. Kluwer Academic Press, Dordrecht, The Netherlands. 169 pp.

[Norby, R. J., E. G. O'Neill, and S. D. Wullschleger. 1995. Belowground responses to atmospheric carbon dioxide in forests. pp. 397-418, In: W. W. McFee and J. M. Kelly (eds.), *Carbon Forms and Functions in Forest Soils*. Soil Science Society of America, Madison, WI

Wullschleger, S. D., R. J. Norby, and P. J. Hanson. 1995. Growth and maintenance respiration in stems of *Quercus alba* L. after four years of carbon dioxide enrichment. *Physiologia Plantarum* 93: 47-54.

Tschaplinski, T. J., D. B. Stewart, P. J. Hanson, and R. J. Norby. 1995. Interactions between drought and elevated CO₂ on growth and gas exchange of seedlings of three deciduous tree species. *New Phytologist* 129: 63-71.

Tschaplinski, T. J., D. B. Stewart, and R. J. Norby. 1995. Interactions between drought and elevated CO₂ on osmotic adjustment and solute concentrations of tree seedlings. *New Phytologist* 131:169-177.

Norby, R. J., S. D. Wullschleger, C. A. Gunderson, and C. T. Nietch. 1995. Increased growth efficiency of *Quercus alba* trees in a CO₂-enriched atmosphere. *New Phytologist* 131: 91-97.

1996

Norby, R. J. 1996. Oaks in a high CO₂ world. *Annales des Sciences Forestières* 53: 413-429.

Norby, R. J. 1996. Forest canopy productivity index. *Nature* 381: 564.

Norby, R. J., S. D. Wullschleger, and C. A. Gunderson. 1996. Tree responses to elevated CO₂ and the implications for forests. pp. 1-21 In: G. W. Koch and H. A. Mooney (eds.), Carbon Dioxide and Terrestrial Ecosystems. Academic Press, San Diego.

O'Neill, E. G. and R. J. Norby. 1996. Litter quality and decomposition rates of foliar litter produced under CO₂ enrichment. pp. 87-103 In: G. W. Koch and H. A. Mooney (eds.), Carbon Dioxide and Terrestrial Ecosystems. Academic Press, San Diego.

1997

Norby, R. J. 1997. Carbon cycle: Inside the black box. *Nature* 388: 522-523.

Norby, R. J., N. T. Edwards, J. S. Riggs, C. H. Abner, S. D. Wullschleger, and C. A. Gunderson. 1997. Temperature-controlled open-top chambers for global change research. *Global Change Biology* 3:259-267.

Ringelberg, D. B., J. O. Stair, J. Almeida, R. J. Norby, E. G. O'Neill, and D. C. White. 1997. Consequences from rising atmospheric carbon dioxide levels for the belowground microbiota associated with white oak. *Journal of Environmental Quality* 26:495-502.

Wullschleger, S. D., R. J. Norby, J. C. Love, and C. Runck. 1997. Energetic cost of tissue construction in yellow-poplar and white oak trees exposed to long-term CO₂ enrichment. *Annals of Botany* 80: 289-297.

Wullschleger, S. D., R. J. Norby, and C. A. Gunderson. 1997. Forest trees and their response to atmospheric CO₂ enrichment: A compilation of results. pp. 79-100 In: L. H. Allen, Jr., M. B. Kirkham, D. M. Olszyk, and C. E. Williams (eds.), *Advances in Carbon Dioxide Effects Research*. ASA Special Publication no. 61, American Society of Agronomy, Madison, WI.

1998

Edwards, N.T. and R.J. Norby. 1998. Below-ground respiratory responses of sugar maple and red maple saplings to atmospheric CO₂ enrichment and elevated air temperature. *Plant and Soil* 206:85-97.

Norby, R. J. 1998. Nitrogen deposition: A component of global change analyses. *New Phytologist* 139:189-200.

Norby, R. J. 1998. Global change: a question of litter quality. *Nature* 396: 17-18.

Williams, R. S., D. E. Lincoln, and R. J. Norby. 1998. Leaf age effects of elevated CO₂-grown white oak leaves on spring-feeding lepidopterans. *Global Change Biology* 4:235-246.

1999

BassiriRad H., S. A. Prior, R. J. Norby, and H. H. Rogers. 1999. A field method of determining NH₄⁺ and NO₃⁻ uptake kinetics in intact roots: Effects of CO₂ enrichment on trees and crop species. *Plant and Soil* 217:195-204.

Norby, R. J., S. D. Wullschlegel, C. A. Gunderson, D. W. Johnson, and R. Ceulemans. 1999. Tree responses to rising CO₂: implications for the future forest. *Plant, Cell & Environment* 22: 683-714.

Peterson, A.G., Ball, J.T., Luo Y., Field C.B., Reich P.B., Curtis P.S., Griffin K.L., Gunderson C.A., Norby, R.J., Tissue, D.T., Forstreuter M., Rey A., Vogel C.S. & CMEAL participants. 1999. The photosynthesis--leaf nitrogen relationship at ambient and elevated carbon dioxide: a meta-analysis. *Global Change Biology* 5:331-346.

Peterson, A.G., Ball, J.T., Luo Y., Field C.B., Curtis P.S., Griffin K.L., Gunderson C.A., Norby, R.J., Tissue, D.T., Forstreuter M., Rey A., Vogel C.S. & CMEAL participants. 1999. Quantifying the response of photosynthesis to changes in leaf nitrogen content and leaf mass per area in plants grown under atmospheric CO₂ enrichment. *Plant, Cell and Environment* 22: 1109-1119.

2000

Canadell, J., Norby, R. J., Cotrufo, M. F., and Nösberger, J., editors. 2000. Litter Quality and Decomposition Under Elevated Atmospheric CO₂. *Plant and Soil* 224: 1-170.

Carter, G. A., R. Bahadur, and R. J. Norby. 2000. Effects of elevated atmospheric CO₂ and temperature on leaf optical properties in *Acer saccharum*. *Environmental and Experimental Botany* 43: 267-273.

Norby R.J., T. M. Long, J. S. Hartz-Rubin, and E. G. O'Neill. 2000. Nitrogen resorption in senescing tree leaves in a warmer, CO₂-enriched atmosphere. *Plant and Soil* 224: 15-29.

Norby, R. J. and R. B. Jackson. 2000. Root dynamics and global change: seeking an ecosystem perspective. *New Phytologist* 147: 3-12.

Norby, R. J., R. B. Jackson, and A. H. Fitter, editors. 2000. Root Dynamics and Global Change: An Ecosystem Perspective. New Phytologist Trust.

Norby, R. J., editor. 2000. Atmospheric CO₂ and ecosystem feedback between carbon and nitrogen cycles: synthesis of an integrated experiment. Ecological Applications 10:1-59.

Williams, R. S., R. J. Norby, and D. E. Lincoln. 2000. Effects of elevated CO₂ and temperature-grown red and sugar maple on gypsy moth performance. Global Change Biology 6: 685-695.

2001

Norby, R. J., K. Ogle, P. S. Curtis, F.-W. Badeck, A. Huth, G. C. Hurtt, T. Kohyama, and J. Penuelas. 2001. Aboveground growth and competition in forest gap models: An analysis for studies of climatic change. Climatic Change 51: 415-447.

Norby, R. J., K. Kobayashi, and B. A. Kimball. 2001. Rising CO₂ - future ecosystems. New Phytologist 150: 215-221.