Mark D. Coleman

February 2010

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Forest Resources
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Education

Ph.D. Forest Resources, 1988, University of Washington, Seattle, WA
M.S. Forestry, 1983, University of Nebraska, Lincoln, NE
B.S. Forest Biology, 1979, Colorado State University, Ft. Collins, CO

Work Experience

Associate Professor 2008 – Present
and Director of Intermountain Forest Tree Nutrition Cooperative
Forest Resources Dept., University of Idaho, Moscow, ID

Research Biological Scientist 1998 - 2008
USDA Forest Service, Savannah River, New Ellenton, SC

Research Scientist 1996 - 1998
Michigan Technological University, School of Forestry, Houghton, MI, stationed at US Forest Service, Forestry Sciences Lab, Rhinelander, WI,

Research Plant Physiologist 1992 - 1996
USDA Forest Service, North Central Research Station, Forestry Sciences Laboratory, Rhinelander, WI

Postdoctoral Research Scientist 1990 - 1991
Michigan Technological University, School of Forestry, stationed at US Forest Service, Forestry Sciences Lab, Rhinelander, WI

Postdoctoral Research Associate 1988 - 1989
University of Washington, College of Forest Resources, Seattle, WA

Graduate Research Associate 1984 - 1988
University of Washington, College of Forest Resources, Seattle, WA

Research Forester 1981 - 1983
International Paper Co., Natchez Forest Research Center, Natchez, MS

Graduate Research Assistant 1979 - 1981
University of Nebraska, Department of Forestry, Fisheries and Wildlife, Lincoln, NE

University Affiliations

Adjunct Professor

School of Forestry & Wildlife Sciences, Auburn University, since 2001
College of Forestry, Mississippi State University, since 1992

Professional Societies

Soil Science Society of America (1988)
Ecological Society of America (1989)
American Association for the Advancement of Science (1989)
North American Truffling Society (1995)
Short Rotation Operations Working Group (1996)

Disseminating Research Results

Invited presentations

Coleman, M 2010. Forestry applications of biochar: Biomass utilization and portable pyrolysis units. The promise of biochar workship at Harvesting Clean Energy Kennewick, WA 7-9 February 2010.

Coleman, M. and Kline, K. L. 2009. Harwoods for Woody Energy Crops In the Southeast United States: Two Centuries of Practitioner Experience. Estimating Current and Future Biomass Feedstocks Symposium, ASA-CSSA-SSSA Annual Meeting, Pittsburgh, PA, 2 November 2009

Coleman, M. 2009. Can portable pyrolysis units make biomass utilization affordable? Symposium presentation to OSU/ARS Columbia Basin Agricultural Research Center, Pendelton, OR. 28 July, 2009

Coleman, M. 2009. Pyrolysis Unit for Bioenergy. 2009 Regional Smoke Management Meeting on Alternatives to Agricultural and Forestry Burning, Spokane Masonic Center, Spokane, Washington, April 29-30, 2009

Coleman, M. 2009. University of Idaho Intermountain Forest Tree Nutrition Cooperative, 2009 Foresters' Forum, Coeur d' Alene Resort, Coeur d' Alene, Idaho, February 4th-6th, 2009

Coleman, M. 2008. Seedling nutrition review: micronutrients. 29th Intermountain Container Seedling Growers' Association Meeting, 8-9 October 3009

Coleman. M. 2006. Production of woody biomass through intensive culture. Alternative energy solutions from Alabama's Natural Resources, Auburn, AL 23-24 October 2006.

Coleman, M. 2007. Producing Woody Biomass for Energy. The Future of Renewable Energy in South Carolina. Symposium sponsored by the South Carolina Soil and Water Conservation Society. Myrtle Beach, SC 3 January 2007.

Coleman, M. 2005. Locally Grown Power. Mississippi Association of Conservation District Advisers Southern Region Summer Meeting. Collins, MS. 15 June 2005.

Coleman M. 2005. Carbon sequestration through belowground carbon allocation: Forest stand development vs. soil resources availability. Clemson Horticulture Department Spring Seminar Series. 11 February 2005.

Blake, J., M. Coleman and B. Parresol. 2004. Forest Biomass for Bio-energy Production in the SE U.S. Presentation to the Francis Marion/Sumter National Forests and Forest Service Savannah River Leadership Teams. November, 2004. Hickory Knob, SC.

Coleman, M. and J. Blake Fine-root Production and the Relative Importance of fertility. Forest seedling root development conference. Eugene, OR, 12-13 May, 2004

Coleman, M., J. Blake and D. Marx. 2002. Compatibility of bioremediation technologies with bio-energy feedstock production. Electric Power Research Institute, Biomass Interest Group Meeting, Washington D.C., November 7-8.

Coleman, M.D. S.X. Chang, D.J. Robison. 2000. Diagnosing nutrient requirements in sweetgum using DRIS. NC State University Hardwood Research Cooperative 2000 Advisory Board Meeting. Raleigh, NC. May 3-5.

Coleman, M.D. 1999. Balancing resource requirements to maximize fiber farm production. Society of American Foresters National Convention. Portland, OR. September 9-15.

Coleman, M.D. 1994. Ozone and carbon allocation. 26th Annual Air Pollution Workshop, Ithaca, NY, March 22-25, 1994.

Refereed publications:

Gong, B., J. Im, J.R. Jensen, M. Coleman and E. Nelson. 2010. Characterization of Forest Crops with a Range of Nutrient and Water Treatments Using AISA Hyperspectral Imagery. Remote Sensing of Environment. (in press)

Coleman, M. and Kline, K. L. 2009. Harwoods for Woody Energy Crops In the Southeast United States: Two Centuries of Practitioner Experience. Biomass and Bioenergy (in press)

Samuelson, L., R. Mathew; T. Stokes; Y. Feng; D. Aubrey;M. Coleman. 2009. Soil and microbial respiration in a loblolly pine plantation in response to seven years of irrigation and fertilization. For Ecol Manag 258:2431-2438.

Im, J., J.R. Jensen, M. Coleman and E. Nelson 2008. Hyperspectral remote sensing analysis of short rotation woody crops grown with controlled nutrient and irrigation treatments. Geocarto International 1:1–20

Samuelson, L.J., M.G. Farris, T.A. Stokes and M.D. Coleman 2008. Fertilization but not irrigation influences hydraulic traits in plantation-grown loblolly pine. Forest Ecology and Management. 255:3331-3339.

Coyle, D.R., D. Aubrey and M.D. Coleman. 2007. Contrasting productivity, development, and biomass distribution of sweetgum and loblolly pine grown with irrigation and fertilization. Can J For Res. 38:1335-1348

Sanchez, F.G., M. Coleman, C.T. Garten, R.J. Luxmoore, J.A. Stanturf, C. Trettin and S.D. Wullschleger. 2007. Soil carbon, after three years, under Short Rotation Woody Crops grown under varying nutrient and water availability. Biomass & Bioenergy. 31:793-801.

Coleman, M.D. 2007. Spatial and temporal patterns of root distribution in developing stands of four woody crop species grown with drip irrigation and fertilization. Plant Soil. 299:195-213.

Aubrey, D., D.R. Coyle and M.D. Coleman. 2007. Fertilization increases the risk of loblolly pine to ice storm damage. For Sci. 53:580-589.

Johnson, J.M.-F., M.D. Coleman, R. Gesch, A. Jaradat, R. Mitchell, D. Reicosky and W.W. Wilhelm. 2007. Biomass-Bioenergy Crops in the United States: A Changing Paradigm. The Americas Journal of Plant Sciences and Biotechnology. 1:1-28.

Samuelson, L.J., T.A. Stokes and M.D. Coleman. 2007. Influence of irrigation and fertilization on transpiration and hydraulic properties of *Populus deltoides*. Tree Physiol. 27:765-774.

Coleman, M.D. and J.A. Stanturf Eds. 2006. Proceedings of the 5th biennial meeting of the Short Rotation Woody Crops Operations Working Group. Biomass & Bioenergy Vol 30 (8-9) pp. 121.

Coleman, M.D. and J.A. Stanturf. 2006. Biomass feedstock production systems: Economic and environmental benefits. Biomass Bioenergy. 30:693-695.

Coleman, M.D., D. Tolsted, T. Nichols, W.D. Johnson, E.G. Ween and T. Houghtaling. 2006. Post-establishment fertilization of Minnesota hybrid poplar plantations. Biomass & Bioenergy. 30:740-749.

Coyle, D.R., M.D. Coleman, J.A. Durant and L.A. Newman. 2006. Survival and growth of 31 Populus clones in South Carolina. Biomass Bioenergy. 30:750-758.

Coyle, D.R., M.D. Coleman, J.A. Durant and L.A. Newman. 2006. Multiple factors affect pest and pathogen damage on 31 Populus clones in South Carolina. Biomass Bioenergy. 30:759-768.

Coyle, D.R. and M.D. Coleman. 2005. Forest production responses to irrigation and fertilization are not explained by shifts in allocation. For Ecol Manag 208: 137–152

Allen, C.B., R.E. Will, R.C. McGarvey, D.R. Coyle and M.D. Coleman 2004. The effect of water and nutrient availability on radiation use efficiency and gas exchange in stands of sweetgum and sycamore receiving irrigation and fertilization. Tree Physiology 25: 191-200.

Callahan, T.J., J.D. Cook, M.D. Coleman, D.M. Amatya, and C.C. Trettin. 2004. Modeling Storm Water Runoff and Soil Interflow in a Managed Forest, Upper Coastal Plain of the Southeast US. ASAE Annual Meeting. Ottawa, Ontario, Canada, Paper number 042254.

Coleman, M.D., A.L. Friend and C.C. Kern 2004. Carbon Allocation and Nitrogen Acquisition in a Developing *Populus deltoides* Plantation. Tree Physiology 24: 1347-1357.

Coleman, M.D., J.G. Isebrands, D.N. Tolsted and V.R. Tolbert. 2004. Comparing soil carbon of short rotation poplar plantations with agricultural crops and woodlots in North Central United States. Environ Manag. 33:S299 - S308.

Kern, C.C., A.L. Friend, J.M. Johnson and M.D. Coleman 2004. Fine-root dynamics in a developing *Populus deltoides* plantation. Tree Physiology 24:651-660.

Coleman, M.D., S.X. Chang, and D.J. Robison. 2003. DRIS analysis identifies a common K imbalance in sweetgum (*Liquidambar styraciflua*) plantations. Commun. Soil Sci. Plant Anal. 34:1919-1941.

Dickson, R.E., M.D. Coleman, P. Pechter, and D. Karnosky. 2001. Growth and crown architecture of two aspen genotypes exposed to interacting ozone and carbon dioxide. Environ. Pollut. 115:319-334.

Stanturf, J.A., C. van Oosten, D.A. Netzer, M.D. Coleman and C.J. Portwood. 2001. Ecology and silviculture of poplar plantations. In: Poplar culture in North America, Eds. D.I. Dickmann, J.G. Isebrands, J.E. Eckenwalder and J. Richardson. National Research Council, Ottawa, pp153-206.

Coleman, M.D., R.E. Dickson and J.G. Isebrands. 2000. Contrasting fine-root production, survival and soil CO_2 efflux in pine and poplar plantations. Plant Soil 225:129-139.

Karnosky, D.F., B. Mankovska, K. Percy, R.E. Dickson, G.K. Podila, J. Sober, A. Normets, G. Hendrey, M.D. Coleman, M. Kubiske, K.S. Pregitzer and J.G. Isebrands. 1999. Effects of troposopheric O_3 on trembling aspen and interaction with CO_2: Results from and O_3-gradient and a FACE experiment. Water Air Soil Pollut. 116:311-322.

Dickson, R.E., M.D. Coleman, D.E. Riemenschneider, J.G. Isebrands, G.D. Hogan and D.F. Karnosky. 1998. Growth of five hybrid poplar genotypes exposed to interacting elevated CO_2 and O_3. Can. J. For. Res. 28:1706-1716.

Coleman, M.D., R.E. Dickson and J.G. Isebrands. 1998. Growth and physiology of aspen supplied with different fertilizer addition rates. Physiol. Plant. 103:513-526.

Karnosky, D.F., G.K. Podila, Z. Gagnon, P. Pechter, A. Akkapeddi, Y. Sheng, D.E. Riemenschneider, M.D. Coleman, R.E. Dickson and J.G. Isebrands. 1998. Genetic controls of responses to interacting tropospheric ozone and CO_2 in *Populus tremuloides*. Chemosphere 36: 807-812.

Kull, O., A. Sober, M.D. Coleman, R.E. Dickson and J.G. Isebrands, Z. Gagnon and D.F. Karnosky. 1996. Photosynthetic responses of aspen clones to simultaneous exposures of ozone and CO_2. Can. J. For. Res. 26:639-648.

Karnosky, D.F., Z.E. Gagnon, R.E. Dickson, M.D. Coleman, E.H. Lee and J.G. Isebrands. 1996. Changes in growth, leaf abscission and biomass associated with seasonal tropospheric ozone exposures of *Populus tremuloides* clones and seedlings. Can. J. For. Res. 26:23-37.

Coleman, M.D., R.E. Dickson, J.G. Isebrands and D.F. Karnosky. 1996. Root growth and physiology of potted and field-grown trembling aspen exposed to tropospheric ozone. Tree Physiol. 16:145-152.

Coleman, M.D., R.E. Dickson, J.G. Isebrands, and D.F. Karnosky. 1995a. Photosynthetic productivity of aspen clones varying in sensitivity to tropospheric ozone. Tree Physiol. 15:585-592.

Coleman, M.D., R.E. Dickson, J.G. Isebrands, and D.F. Karnosky. 1995b. Carbon allocation and partitioning in aspen clones varying in sensitivity to tropospheric ozone. Tree Physiol. 15:593-604.

Coleman, M.D., T.M. Hinckley, G. McNaughton and B.A. Smit. 1992. Root cold hardiness and native distribution of subalpine conifers. Can. J. For. Res. 22: 932-938.

Coleman, M.D., C.S. Bledsoe and B. Smit. 1990. Ectomycorrhizas decrease root hydraulic conductivity and xylem sap levels of zeatin riboside in Douglas-fir seedlings. New Phytol. 115: 275-284

Bledsoe, C.S., D. Brown, M. Coleman, W. Littke, P. Rygiewicz, U. Sangwanit, S. Rogers, J. Ammirati. 1989. Physiology and metabolism of ectomycorrhizae. Ann. Sci. For. 46 suppl. 697s-705s.

Coleman, M.D., C.S. Bledsoe and W. Lopushinsky. 1989. Pure culture response of ectomycorrhizal fungi to imposed water stress. Can. J. Bot. 67:29-39

Non-refereed publications:

Coleman, M., D. Page-Dumroese, J. Archuletta, P. Badger, W. Chung, T. Venn, D. Loeffler, G. Jones and K. McElligott 2010. Can portable pyrolysis units make biomass utilization affordable while using bio-char to enhance soil productivity and sequester carbon? . In Proceedings of the National Silviculture Workshop, Boise Idaho June 2009 Eds. R. Graham and T. Jane. USDA Forest Service, Rocky Mountain Research Station, Ft. Collins, CO.

Dumroese, D., Coleman, M. et al. 2010. Portable in-woods pyrolysis: Using forest biomass to reduce forest fuels, increase soil productivity, and sequester carbon North American Biochar Meeting. University of Colorado Press, Boulder, CO. (in press)

Giardina, C.P., M.D. Coleman, D. Binkley, J.E. Hancock, J.S. King, E.A. Lilleskov, W.M. Loya, K.S. Pregitzer, M.G. Ryan, and C.C. Trettin 2005, The response of belowground carbon allocation in forests to global change, In Tree species effects on soils: implications for global change, D. Binkley and O. Menyailo, Editors, Kluwer Academic Publishers: Dordrecht. p. 119-154.

Coleman M.D., D.R. Coyle, J. Blake, K. Britton, M. Buford, R.G. Campbell, J. Cox, B. Cregg, D. Daniels, M. Jacobson, K. Johnsen, T. McDonald, K. McLeod, E. Nelson, D. Robison,

R. Rummer, F. Sanchez, J. Stanturf, B. Stokes, C. Trettin, J. Tuskan, L. Wright, and S. Wullschleger 2003. Production of Short Rotation Woody Crops Grown with a Range of Nutrient and Water Availability: Establishment Report and First-Year Responses. General Technical Report, SRS- 72.

Coleman, M., D. Tolsted and J. Isebrands. 2004. Mid-Rotation Fertilization of Minnesota Hybrid Poplar Plantations and the Evaluation of Nutrient Balance, Final Report for WesMin RC&D

Coleman, M., D. Tolsted and J. Isebrands. 2002. Mid-Rotation Fertilization of Minnesota Hybrid Poplar Plantations and the Evaluation of Nutrient Balance, 2001 Annual Report for WesMin RC&D

Coleman, M.D. 2001. Short Rotation Woody Crops Cooperative Research Program. In: Proc. Short Rotation Woody Crops Operations Working Group Third Biennial Conference, October 10-13, 2000, Syracuse, NY.

Coleman, M. and D. Tolsted. 2001. Mid-rotation fertilization of Minnesota hybrid poplar plantations and the evaluation of nutrient balance, 2000 annual report for WesMinn R C & D

Luxmoore, R.J., Mehlhorn, T.L., Yang, B.W., Lu, B.W., Coleman, M.D., Trettin, C.C., Wullschleger, S.D. and Garten, C.T. 2000. Tillage effects on carbon and nitrogen in a coastal plain soil. American Geophysical Union Ann. Meetings in San Francisco, Dec 4.

Dickson, R.E., K.F. Lewin, J.C. Isebrands, M.D. Coleman, W.E. Heilman, D.E. Riemenschneider, J. Sober, G.E. Host, D.R. Zak, G.R. Hendrey, K.S. Pregitzer and D.F. Karnosky. 2000. Forest atmosphere carbon transfer and storage (FACTS-II) the aspen free-air CO2 and 03 enrichment (FACE) project: an overview. USDA-Forest Service, General Technical Report NC-214, 68 p.

Coleman, M. F. Lenning and D. Tolsted. 1999. Field testing of poplar optimal nutrition regimes 1999 Annual Report USDA - Forest Service / Boise Cascade Cooperative Research and Development Agreement

Coleman, M. 1998. Fertilization of poplar in Minnesota. 1998 annual report. Boise Cascade CRADA.

Coleman, M. 1997. Intensive fertilization of a commercial poplar plantation, Birchdale, MN Fertilizer Trial, 1997 annual report, Boise Cascade CRADA.

Herms, D.A., W.J. Mattson, D.N. Karowe, M.D. Coleman, T.M. Trier, B.A. Birr and J.G. Isebrands. 1995. Variable performance of outbreak defoliators on aspen clones exposed to elevated CO2 and O3. In: Proc. 1995 Meeting of the Northern Global Change Program. USDA Gen. Tech. Report RM-214, pp. 43-55.

Friend, A.L., M.D. Coleman and J.G. Isebrands. 1994. Carbon allocation to root and shoot systems of woody plants. In: Biology of Adventitious Root Formation, T.D. Davis and B.E. Hassig (eds.), Plenum Publishing, New York. pp. 245-273

Coleman, M.D., C.S. Bledsoe and B. Smit-Spinks. 1987. Douglas-fir root hydraulic conductivity. In: Proc. 7th No. Am. Conf. Mycorrhizae, Gainesville, Florida, May 3-8, 1987. IFAS, Univ. of Florida. p 243

Coleman, M.D., C.S. Bledsoe, J. Dunlap and D. Dutton. 1986. Nursery and Field evaluations of compost grown coniferous seedlings. In: Proc. West. For. Nur. Conc., Tumwater, WA, Aug. 12-15, 1986. USDA For. Ser. Gen. Tech. Report RM-137. (also published in Tree Planters Notes 38:22-27 at editors request)

France, R.C., M.D. Coleman and M.L. Cline. 1985. Cover crops to increase inoculum in the field. In: Proc. 6th No. Am. Conf. Mycorrhizae, Bend Ore, June 25-29, 1984. For. Sci. Lab., Corvallis, OR. pp. 92-94

Coleman, M.D., J.R. Brandle and W.R. Lovett. 1983. Water relations of different mycorrhizal cottonwood clones. In: Proc. 7th No. Am. For. Bio. Wkshp., Lexington, KY, July 26-28, 1982.

Theses:

Coleman, M.D. 1988. Water Relations of Ectomycorrhizal Douglas-fir. Ph.D. Dissertation, University of Washington.

Coleman, M.D. 1983. Source Variation in Water Relations of *Populus deltoides* Bartr. var. *deltoides* inoculated with vesicular-arbuscular mycorrhizal fungi. M.S. Thesis, University of Nebraska.

Research Funding

Submitted:

Coleman, M. Samuelson, L. and W. Cheng 2007 Root contribution to soil respiration in energy crops: New approaches to quantifying dynamic carbon fluxes. ($381,263) January 2008-December 2009, USDA, National Research Initiative,

Current:

Forest nutrient management research $190,244 Annually, PIs M. Coleman, T. Shaw, M. Kimsey Intermountain Forest Tree Nutrition Cooperative,

Multi-nutrient forest screening trials. $100,000 annually PIs M. Coleman, T. Shaw, M. Kimsey, Potlatch Forest Holdings

Developing Geospatial Site Type Classification Systems for Forest Nutrition Management 150,000, 2008-2011 D. Page-Dumroese, M. Coleman, P. Gessler, J. Mandzak, K. McClintock, R. Lewis, D. Hoover. USDA Forest Service Agenda 2020 Sustainable Forestry Research.

Sustainable forest bioenergy production using in-woods fast-pyrolysis conversion including bio-oil production and bio-char incorporation $150,000 1/1/08-12/31/10, D. Page-Dumroese. M. Coleman, J. Archuleta, P. Badger, W. Chung, T. Venn. USDA Forest Service Biomass Research

Bio-char incorporation into forest soils: Belowground responses 74,992, 8/2009-2/2011M. Coleman, D. Page-Dumroese.American Recovery and Reinvestment ActPast:

Trettin, C., M. Coleman, D. Amatya, T. Callahan, and M. Kane. Soil Productivity and Nutrient Management of Mid-Rotation Sweetgum and Sycamore SRWC Plantations. USDA Forest Service Funds Agenda 2020 Sustainable Forestry Research 2005-2008.

Trettin, C, M. Coleman, D. Amatya, M. Burke. Comprehensive fire effects of biomass reduction and fire for fuels and ecosystem enhancement on a first-order watershed in the southeastern wildland-urban interface. USDA Forest Service, Joint Fire Sciences Program. 2005-2007.

Short Rotation Woody Crops Cooperative Research Program. Annual research support from DOE Savannah River and member contributions (±$400,000 annually 1998-2008)

Coleman, M.D. Mid-Rotation Fertilization of Minnesota Hybrid Poplar Plantations and the Evaluation of Nutrient Balance. WesMin RC&D. SRS 00-CO-11330135-142 ($25,000), SRS 01-CO-11330135-141 ($33,310), SRS 02-CO-11330135-120 ($26,353), May 2000 – December 2003.

Coleman, M.D. and J.G. Isebrands. Intensive fertilization of a commercial poplar plantation. Cooperative Research and Development Agreement with Boise Cascade Corporation ($11,238, 1997; $12,000, 1998; $36,079, 1999; $59,317 cumulative total), June, 1997 - December, 2000.

Friend, A.L. and Coleman, M.D. Nitrogen Controls over Tree Root Production. USDA, National Research Initiative, #9700732 ($200,000), July, 1997 - December, 1999.

Coleman, M.D., J.G. Isebrands and D.F. Karnosky. Evaluating the effects of chronic ozone exposure on root growth and morphology in field-grown aspen trees. US Forest Service, Northern Global Change Research Program ($25,000), October, 1992 - September, 1993.

Dickson, R.E., M.D. Coleman and J.G. Isebrands. Physiological mechanisms and processes underlying the response of northern red oak and trembling aspen to elevated CO2, ozone stress, and nitrogen deficiency: a carbon budget approach. US Forest Service, Northern Global Change Research Program ($377,953), August, 1991 - September, 1996.

Hinckley, T.M. and B. Smit. Root water uptake and cold hardiness: Impact on maritime and continental subalpine species. National Science Foundation, BSR-8717450 ($108,726), January, 1988 - December, 1989.

Bledsoe, C.S. and J. Ammirati. Ecophysiological diversity of ectomycorrhizae in a coniferous ecosystem. National Science Foundation, BSR-8510858 ($356,132), October, 1985 - June, 1989.

Bledsoe, C.S. Screening of ectomycorrhizal fungal isolates to optimize Douglas-fir seedling drought tolerance and survival. USDA-Forest Service, Wenatchee, WA, Cooperative aid grant #PNW-83-222 ($10,923), September, 1983 - April, 1985.