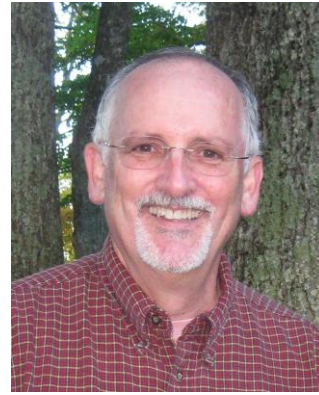


Steven E. McKeand

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PROFESSIONAL EXPERIENCE:

- 1983-Present: Professor ('94), Associate Professor ('89), Assistant Professor ('83) of Forestry, Cooperative Tree Improvement Program, Department of Forestry and Environmental Resources, NC State University, Raleigh,
- 2005-Present: Director, Cooperative Tree Improvement Program, NC State University
- 2000-2003: Director of Graduate Programs, Department of Forestry, NC State University
- 1980-1983: Research Assistant and Tree Improvement Specialist, Tissue Culture Program, Department of Forestry, NC State University

EDUCATION:

- 1983 - Ph.D. North Carolina State University (Forest Genetics)
1978 - M.S. Purdue University (Forest Genetics)
1976 - B.S. Purdue University (Forest Production)

DIRECTOR, COOPERATIVE TREE IMPROVEMENT PROGRAM:

[Members of the NC State Tree Improvement Program](#) are responsible for developing the genetic resources of loblolly pine and other southern forest tree species that are planted on almost 1 million acres per year. 78% of the nation's tree planting is by landowners in the southern US and over 60% of this regeneration is with genetically improved loblolly pine from our program. The present value of continued genetic gains from tree improvement is estimated to be \$1.9 billion to landowners and citizens in the southern US. In North Carolina alone, the value of genetic improvement is \$220 million. In-kind support from Cooperative members for our research programs via field trials and access to germplasm is estimated to be \$170 million over the past 59 years.

Direct contributions to NCSU from Cooperative members comprised of forestry companies, state forestry agencies, and forest landowners have enabled these education, research, and outreach accomplishments:

- 224 graduate students have received advanced degrees with Cooperative faculty.
- Provides undergraduates with opportunities to apply classroom training to research in the lab and field.
- 67 post-docs and visiting scientists representing 34 countries over 5 continents have studied and conducted research with Cooperative staff.
- 922 papers, 346 published in refereed journals, signify the intellectual contribution of Cooperative students, scientists, staff, and collaborators to forestry, tree improvement, and biological sciences.
- Cooperative and University funds have been leveraged to attract over \$7.6 million in competitive grants over the last 10 years.

RESEARCH, TEACHING, AND EXTENSION:

My research in forest genetics has been in support of the breeding program of the Tree Improvement Cooperative at NC State University, with primary responsibility in the breeding, testing, and selection phases of the program. Specific research interests include: genetic effects on nutritional and ecophysiological processes in forest trees, genetic and environmental control of wood properties, biotechnology/breeding interface, propagation effects on forest trees, seed orchard management, and genotype by environment interactions.

Graduate education has been the focus of most of my teaching career. I have taught Forestry 725, Forest Genetics since 1986. More recently, I have taught the undergraduate course in Tree Improvement (FOR 411) and Tree Improvement Research Techniques (FOR 727). I currently chair or co-chair the committees of 1 PhD and 3 Masters students.

My extension and outreach activities are mainly with the operational breeding program of the Tree Improvement Cooperative. I travel throughout the southern U.S. working with foresters and breeders helping them develop efficient breeding and testing programs and deployment strategies to maximize gains from the breeding programs.

As Director of Graduate Programs for the Department of Forestry from 2000 to 2003, I had administrative responsibilities for the 100+ graduate students in our programs in all disciplines of Forestry and Natural Resources. I coordinated the teaching of FOR603/803 the graduate course Seminar in Forest Research.

PROFESSIONAL ORGANIZATIONS, LICENSES, AND RECOGNITIONS

Society of American Foresters, Sigma Xi, Certified Forester (SAF), Registered Forester (No. 1246) in North Carolina, Certified Pesticide Operator (No. 2647) in North Carolina, Past Board Member and Chair of the NC Board of Registered Foresters (2006-2012), 2006 Recipient of NC State University Award for Service to Environment and Society, 2014 Academy of Outstanding Faculty Engaged in Extension

RECENT (last 5 years) SELECTED PUBLICATIONS (178 total, 105 refereed since 1980):

- Egbäck, S., B.P. Bullock, F. Isik, and S. McKeand. 2015. Height-diameter relationships for different genetic planting stock of loblolly pine at age six. *For. Sci.* 61(3): 424-428.
- Farjat, A.E., F. Isik, B.J. Reich, R.W. Whetten, and S.E. McKeand. 2015. Modeling climate change effects on the height growth of loblolly pine. *For. Sci.* 61 (4, 5): 703-715.
- Ford, G.A., S.E. McKeand, J.B. Jett, and F. Isik. 2015. Effects of inbreeding on growth and quality traits in loblolly pine. *For. Sci.* 61(3): 579-585.
- Kim, T.J., B.P. Bullock, and S.E. McKeand. 2015. Spatial autocorrelation among different levels of genetic control and spacings in loblolly pine. *For. Sci.* 61(3): 438-444.
- McKeand, S. 2015. The success of tree breeding in the southern US. Editorial in: *BioResources* 10(1): 1-2.
- Wood, E.R., B.P. Bullock, F. Isik, and S.E. McKeand. 2015. Variation in stem taper and growth traits in a clonal trial of loblolly pine. *For. Sci.* 61(1): 76-82.
- Zapata-Valenzuela, J., F. Ogut, A. Kegley, W.P. Cumbie, F. Isik, B. Li, and S.E. McKeand. 2015. Seedling evaluation of Atlantic Coastal and Piedmont sources of *Pinus taeda* L. and their hybrids for cold hardiness. *For. Sci.* 61(1): 169-175
- McKeand, S., J.B. Jett, Tom Byram. 2014. Good wood. *Forest Landowners.* 73(2): 14-19

- Ögüt, F., C. Maltecca, R.W. Whetten, S.E. McKeand, and F. Isik. 2014. Genetic analysis of diallel progeny test data using factor analytic linear mixed models. *For. Sci.* 60(1): 119-127.
- Smith, B.C., B.P. Bullock, F. Isik, and S.E. McKeand. 2014. Modeling genetic effects on growth of diverse provenances and families of loblolly pine across optimum and deficient nutrient regimes. *Can. J. For. Res.* 44: 1453–1461.
- Xiong, S.J., S.E. McKeand, R.W. Whetten, and F.T. Isik. 2014. Genetics of stem forking and ramicorn branches in a cloned loblolly pine family. *For. Sci.* 60(2):360-366.
- Aspinwall, M.J., J.S. King, and S.E. McKeand. 2013. Productivity differences among loblolly pine genotypes are independent of individual-tree biomass partitioning and growth efficiency. *Trees* 27:533–545.
- Nelson, C.D., G.F. Peter, S.E. McKeand, E.J. Jokela, R.B. Rummer, L.H. Groom, and K.H. Johnsen. 2013. Pines. P. 427-459, In: B.P. Singh (ed.). *Biofuel Crops: Production, Physiology and Genetics*, Chapter 20. CABI Wallingford, UK.
- Ögüt, F., C. Maltecca, R.W. Whetten, S.E. McKeand, and F. Isik. 2013. Genetic analysis of diallel progeny test data using factor analytic linear mixed models. *For. Sci.* <http://dx.doi.org/10.5849/forsci.12-108>.
- Zapata-Valenzuela, J., Whetten, R., Neale, D. McKeand, S., Isik, F. 2013. Genomic estimated breeding values using genomic relationship matrices in a cloned population of loblolly pine. *G3: Genes Genomes Genetics*. doi:10.1534/g3.113.005975.
- Aspinwall, M.J., S.E. McKeand, and J.S. King. 2012. Carbon sequestration from 40 years of planting genetically improved loblolly pine across the southeast United States *For. Sci.* 58:446-456.
- Cumbie, W.P., F. Isik, and S.E. McKeand. 2012. Genetic improvement of sawtimber potential in loblolly pine. *For. Sci.* 58:168 –177.
- Espinoza, J.A., H.L. Allen, S.E. McKeand, and P.M. Dougherty. 2012. Stem sinuosity in loblolly pine with nitrogen and calcium additions. *For. Ecol. and Manag.* 265: 55–61.
- Isik, F., H.V. Amerson, R.W. Whetten, S.A. Garcia, and S.E. McKeand. 2012. Interactions of Fr genes and mixed-pathogen inocula in the loblolly pine-fusiform rust pathosystem. *Tree Genetics & Genomes*. 8(1): 15-25.
- McKeand, S. and R. Pohl. 2012. The Arrowhead Tree Breeding Center, \$483 million present value to the citizens of Georgia and the South. *Georgia Forestry Today*. 8(1): 24-29.
- Zapata-Valenzuela, J., F. Isik, C. Maltecca, J. Wegrzyn, D. Neale, S. McKeand, and R. Whetten. 2012. SNP markers trace familial linkages in a cloned population of *Pinus taeda* – prospects for genomic selection. *Tree Genetics and Genomes* DOI 10.1007/s11295-012-0516-5.
- Aspinwall, M.J., J.S. King, F.L. Booker, and S.E. McKeand. 2011. Genetic effects on total phenolics, condensed tannins and non-structural carbohydrates in loblolly pine (*Pinus taeda* L.) needles. *Tree Physiology* 31: 831-842, doi: 10.1093/treephys/tpr073.

- Aspinwall, M.J., J.S. King, J-C. Domec, S.E. McKeand and F. Isik. 2011. Genetic effects on transpiration, canopy conductance, stomatal sensitivity to vapor pressure deficit, and cavitation resistance in loblolly pine. *Ecohydrology*. Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/eco.197.
- Aspinwall, M.J., J.S. King, S.E. McKeand, and B.P. Bullock. 2011. Genetic effects on stand-level uniformity, and above- and belowground biomass production in juvenile loblolly pine. *Forest Ecology and Management*. 262: 609–619.
- Aspinwall, M.J., J.S. King, S.E. McKeand, and J-C. Domec. 2011. Leaf-level gas-exchange uniformity and photosynthetic capacity among loblolly pine (*Pinus taeda* L.) genotypes of contrasting inherent genetic variation. *Tree Physiology*. 31: 78-91.
- Grissom, J.E., J.H. Roberds, C.D. Nelson, F.T. Isik, S.E. McKeand, and R. Rousseau. 2011. Genetic variation in a longleaf pine population: a long-term field study of a 13-parent diallel. P. 51-53. In: Proc. 31th Southern Forest Tree Improvement Conf., Biloxi, MS. <http://www.sftic.org>.
- Mullin, T.J., Andersson, B., Bastien, J.-C., Beaulieu, J., Burdon, R.D., Dvorak, W.S., King, J.N., Kondo, T., Krakowski, J., Lee, S.D., McKeand, S.E., Pâques, L., Raffin, A., Russell, J.H., Skrøppa, T., Stoehr, M., and Yanchuk, A. 2011. Economic importance, breeding objectives and achievements. Chapter 2, P.40-127 In: *Genetics, Genomics and Breeding of Conifers*. Edited by: C. Plomion, J. Bousquet, and C. Kole. Volume in *Genetics, Genomics and Breeding of Crop Plants*. Science Publishers, an imprint of Edenbridge Ltd., Enfield, NH, USA. 456p.
- Sherrill, J.R., B.P. Bullock, T.J. Mullin, S.E. McKeand, and R.P. Purnell. 2011. Total and merchantable stem volume equations for mid-rotation loblolly pine (*Pinus taeda* L.). *South. J. Appl. For.* 35:105-108.
- Aspinwall, M.J., B. Li, S.E. McKeand, F. Isik, and M.L. Gumpertz. 2010. Prediction of whole-stem α -cellulose yield, lignin content, and wood density in juvenile and mature loblolly pine. *South. J. Appl. For.* 34:84-90.
- Dougherty, D., R. Bryant, H. Burkhart, P. Dougherty, S. Jones, S. McKeand. 2010. Valuing tomorrow's loblolly pine plantations today. *Forest Landowner*. Jan./Feb. 2010: 19-21.
- McKeand, S., P. Cumbie, and B. Abt. 2010. Investment in genetically improved loblolly pine – landowner benefits today and for generations to come. *Forest Landowner*. Jan./Feb. 2010: 27-29.
- Xiong, S.J., F. Isik, S.E. McKeand and R.W. Whetten. 2010. Genetic variation of stem forking in loblolly pine. *For. Sci.* 56: 429-436.