

Pete Bettinger

Hargreaves Distinguished Professor in Forest Management
School of Forestry and Natural Resources
University of Georgia
Athens, GA 30602
706.542.1187
pbettinger@warnell.uga.edu

EDUCATION

Ph.D., Forest Resources, Oregon State University, 1996.
M.S., Forest Economics / Management, Virginia Polytechnic Institute and State University, 1989.
B.S., Forestry, Virginia Polytechnic Institute and State University, 1987.

ACADEMIC POSITIONS HELD

Leon "Buddy" Hargreaves Jr. Distinguished Professor in Forest Management, University of Georgia, 2019-present.
Professor, School of Forestry and Natural Resources, University of Georgia, 2009-present.
Interim Associate Dean for Academic Affairs, School of Forestry and Natural Resources, University of Georgia, 2015.
Faculty Fellow, Institute of Artificial Intelligence, University of Georgia, 2004-present.
Associate Professor, School of Forestry and Natural Resources, University of Georgia, 2002-2009.
Assistant Professor–Senior Research, Department of Forest Resources, Oregon State University, 1998-2002.
Faculty Research Associate, Department of Forest Resources, Oregon State University, 1996.
Faculty Research Assistant, Department of Forest Engineering, Oregon State University, 1991-1993.

NON-ACADEMIC POSITIONS HELD

Geographic Information Systems Manager, Champion Pacific Timberlands, Inc., Puyallup, WA, 1997-1998.
Research Forester, Champion International Corporation, Puyallup, WA, 1996-1997.
Economist, USDA Forest Service, Pacific Northwest Research Station, Corvallis, OR, 1993-1996.
Volunteer, GIS Department, Siuslaw National Forest, Corvallis, OR, 1991-1994.
Research Forester, Procter & Gamble Cellulose, Perry, FL, 1990-1991.
Resource Planning Forester, Procter & Gamble Cellulose, Perry, FL, 1989-1990.
Forest Technician, Sierra Pacific Industries, Redding, CA, 1989.
Independent Contractor, Site preparation burning, Chesterfield, VA, 1987.
Forester (Cooperative ed.), Continental Forest Investments, Prince George, VA, 1985-1987; Taylor, FL, 1984.

FIELDS OF SPECIALIZATION

Forest Planning and Management, Harvest Scheduling, Geographic Information Systems, Global Positioning Systems

HONORS AND RECOGNITION

2025. Faculty Award for Outstanding Teaching, School of Forestry and Natural Resources, University of Georgia.
2023. Award in Forest Science, Society of American Foresters.
2021. Regional Award, U.S. Department of Agriculture National Awards Program for Excellence in College and University Teaching in the Food and Agricultural Sciences.
2020. Member, University of Georgia Teaching Academy.
2020. Carl Alwin Schenck Award, Society of American Foresters.
2018. Fellow, Society of American Foresters.
2018. 2nd Degree Rector's Prize for Scientific Achievements, Warsaw University of Technology.
2017. Faculty Award for Outstanding Teaching, School of Forestry and Natural Resources, University of Georgia.
2016. Creative Research Medal, University of Georgia.
2012. Xi Sigma Pi Herrick Professor of the Year, School of Forestry and Natural Resources, University of Georgia.
2011. Outstanding Teacher, School of Forestry and Natural Resources, University of Georgia.
2009. Southeastern Society of American Foresters, Award of Excellence, Research and Development.

2009. Honorary Member, AGHON (The University of Georgia Agricultural Honorary Society).
 2006. Herrick Superior Teaching Award, School of Forest Resources, University of Georgia.
 2005. Xi Sigma Pi Outstanding Professor in Forest Resources, School of Forest Resources, University of Georgia.
 1999. Certified Forester #866, Society of American Foresters (re-certified 2017).

PUBLICATIONS

Books

- Bettinger, P. 2025. *Forest harvest scheduling. From linear programming to heuristic search*. Springer, Cham, Switzerland. 270 p.
- Merry, K., P. Bettinger, M. Crosby, and K. Boston. 2023. *Geographic information system skills for foresters and natural resource managers*. Elsevier, Amsterdam. 396 p.
- Grebner, D.L., P. Bettinger, J.P. Siry, and K. Boston. 2022. *Introduction to Forestry and Natural Resources. Second edition*. Academic Press, London. 494 p.
- Bettinger, P., K. Merry, and K. Boston. 2020. *Mapping Human and Natural Systems*. Academic Press, London. 341 p.
- Bettinger, P., K. Boston, J.P. Siry, and D.L. Grebner. 2017. *Forest Management and Planning. Second edition*. Academic Press, London. 349 p.
- Siry, J.P., P. Bettinger, K. Merry, D.L. Grebner, K. Boston, and C. Cieszewski (eds.). 2015. *Forest Plans of North America*. Academic Press, London. 458 p.
- Grebner, D.L., P. Bettinger, and J.P. Siry. 2013. *Introduction to Forestry and Natural Resources*. Academic Press, London. 496 p.
- Bettinger, P., K. Boston, J.P. Siry, and D.L. Grebner. 2012. 森林经营规划 *Forest Management and Planning* (Chinese translation). Ke'AI Communications, Beijing, China. 394 p.
- Bettinger, P. 2011. *Forest planning desk reference: Terminology and examples*. LAP Lambert Academic Publishing, Saarbrücken, Germany. 102 p.
- Bettinger, P., and K.L. Merry. 2011. *Global navigation satellite system research in forest management*. LAP Lambert Academic Publishing, Saarbrücken, Germany. 64 p.
- Bettinger, P., K. Boston, J.P. Siry, and D.L. Grebner. 2009. *Forest Management and Planning*. Academic Press, London. 331 p.
- Wing, M.G., and P. Bettinger. 2008. *Geographic Information Systems: Applications in Natural Resource Management*. Oxford University Press, Canada. Don Mills, ON. 268 p.
- Davis, L.S., K.N. Johnson, P. Bettinger, and T.E. Howard. 2005. *Forest Management. Fourth edition*. Waveland Press, Inc., Long Grove, IL. 804 p.
- Bettinger, P., and M.G. Wing. 2004. *Geographic Information Systems: Applications in Forestry and Natural Resources Management*. McGraw-Hill, Inc., New York. 230 p.
- Davis, L.S., K.N. Johnson, P.S. Bettinger, and T.E. Howard. 2001. *Forest Management. Fourth edition*. McGraw-Hill, Inc., New York. 804 p.

Refereed Journal Articles

- Bettinger, P. 2025. The quality of outcomes from tabu search when enhanced to address contemporary forest harvest scheduling problems. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 17(2): 14-32.
- Dong, L., X. Wu, P. Bettinger, and Z. Liu. 2025. Opposing effects of warming and increased precipitation on site productivity of planted larch (*Larix* spp.) forests in Northeast China. *Trees, Forests and People*. 22: 101050.
- Merry, K., and P. Bettinger. 2025. The geography of forest management. *Land Use Policy*. 157: 107691.
- Bettinger, P., S. Sandoval, K. Merry, R.C. Lowe III, and K. Rasheed. 2025. Approaches for simulating alternative futures of complex forested landscapes: A review. *Environmental Development*. 56: 101285.
- Caglayan, I., O. Eriksson, K. Ohman, A. Yeşil, and P. Bettinger. 2025. Using optimization for maximizing the future utility of ecosystem services. *Croatian Journal of Forest Engineering*. 46(2): 309-328.
- Cudjoe, E., F. Bravo, H. Pretzsch, P. Bettinger, and R. Ruiz-Peinado. 2025. Competition in mixed Scots pine and Pyrenean oak stands modifies allometry and partially affects biomass allocation during early stand development. *Ecological Indicators*. 176: 113713.
- Bettinger, P. 2025. Quality of threshold accepting heuristic search results when attempting to solve forest harvest scheduling problems. *Journal of Forest Planning*. 31: 12-28.

- Vatandaslar, C., P. Bettinger, K. Merry, J. Stober, and T. Lee. 2025. Semi-automatic stand delineation based on very-high-resolution orthophotographs and topographic features: A case study from a structurally complex natural forest in the southern USA. *Forests*. *Forests*. 16(4): Article 666.
- Masteali, S.H., M. Bayat, P. Bettinger, and M. Ghorbanpour. 2025. Uncertainty analysis of linear and non-linear regression models in the modeling of water quality in the Caspian Sea basin: Application of Monte-Carlo method. *Environmental Indicators*. 170: 112979.
- Vatandaslar, C., P. Bettinger, K. Merry, A.R. Gutierrez Garzon, K. Boston, and T. Lee. 2024. Sustainability language found in forest plans and its mathematical modelling potential. *Discover Sustainability*. 5: Article 471.
- Bettinger, P., K. Rasheed, F. Maier, and K. Merry. 2024. Associations between forest harvest scheduling and artificial intelligence. *International Forestry Review*. 26(4): 387-397.
- Vatandaslar, C., T. Lee, P. Bettinger, Z. Ucar, J. Stober, and A. Peduzzi. 2024. Mapping percent canopy cover using individual tree- and area-based procedures that are based on airborne LiDAR data: Case study from an oak-hickory-pine forest in the USA. *Ecological Indicators*. 167: Article 112710.
- Merry, K., P. Bettinger, and T. Lee. 2024. OLAF: An assessment of online learning outcomes among forestry and natural resource management university students. *Journal of Extension*. 62(3): Article 30.
- Lee, T., C. Vatandaşlar, K. Merry, P. Bettinger, A. Peduzzi, and J. Stober. 2024. Estimating forest inventory information for the Talladega National Forest using airborne laser scanning systems. *Remote Sensing*. 16(16): Article 2933.
- Kane, T., W.K. Clatterbuck, K. Merry, T. Lee, and P. Bettinger. 2024. Technology to assist land management: User satisfaction with an online forest management system. *Land*. 13(8): Article 1247.
- Dong, L., X. Lin, P. Bettinger, and Z. Liu. 2024. How to maximize the joint benefits of timber production and carbon sequestration for rural areas? A case study of larch plantations in northeast China. *Carbon Balance and Management*. 19: Article 24.
- Dong, L., P. Bettinger, and Z. Liu. 2024. Stand spatial structural diversity: Developing and validating a novel index. *Forest Ecology and Management*. 569: Article 122157.
- Dong, L., X. Lin, P. Bettinger, and Z. Liu. 2024. The contributions of stand characteristics on carbon sequestration potential are triple that of climate variables for *Larix* spp. plantations in northeast China. *Science of the Total Environment*. 911: Article 168726.
- Hiegel, A., J. Siry, B. Mei, and P. Bettinger. 2023. Transaction costs and investment interest in the U.S. South and the Pacific Northwest timberland regions. *Forests*. 14(8): Article 1588.
- Shahi, K., J. Siry, P. Bettinger, Y. Li, and J. Smith. 2023. Estimating timber supply elasticity of private forest landowners in the US South. *Forest Policy and Economics*. 154: Article 103038.
- Bayat, M., P. Bettinger, S.H. Masteali, S.K. Hamidi, H.U.M. Awan, and A. Abolhasani. 2023. Recreation potential assessment at Tamarix forest reserves: A method based on multi-criteria evaluation approach and landscape metrics. *Forests*. 14(4): Article 705.
- Lee, T., P. Bettinger, K. Merry, and C. Cieszewski. 2023. The effects of nearby trees on the positional accuracy of GNSS receivers in a forest environment. *PLoS ONE*. 18(3): e0283090.
- Vatandaşlar, C., P. Bettinger, A.R. Gutierrez Garzon, K. Merry, K. Boston, T. Lee, and J. Uzu. 2023. Sustainability language in forest management plans: A comparative analysis for public forests of the US and Turkey. *Forests*. 14(3): Article 447.
- Dong, L., P. Bettinger, and Z. Liu. 2023. Periodic harvests, rather than passive conservation, increase the carbon balance of boreal forests much more in northeast China. *Forest Ecology and Management*. 530: Article 120777.
- Bettinger, P., K. Merry, S. Fei, A. Weiskittel, and Z. Ma. 2023. Usefulness and need for digital technology to assist forest management: Summary of findings from a survey of registered foresters. *Journal of Forestry*. 121(1): 1-11.
- Masteali, S.H., P. Bettinger, M. Bayat, B.J. Amiri, and H.U.M. Awan. 2023. Comparison between graph theory connectivity indices and landscape connectivity metrics for modeling river water quality in the southern Caspian Sea basin. *Journal of Environmental Management*. 328: Article 116965.
- Hiegel, A., J. Siry, P. Bettinger, and B. Mei. 2022. Timberland transaction costs: survey results and insights. *Journal of Forest Business Research*. 1(1): 21-50.
- Dong, L., P. Bettinger, and Z. Liu. 2022. Maximizing the canopy openness for replanted Korean pine seedlings under secondary forests in northeast China. *Computers and Electronics in Agriculture*. 202: Article 107421.
- Uzu, J., P. Bettinger, J. Siry, and B. Mei. 2022. Timber business in West Africa: A review and outlook. *International Forestry Review*. 24(2): 240-256.

- Bettinger, P., K. Merry, and J. Stober. 2022. A hierarchical binary process model to assess deviation from desired ecological condition across a broad forested landscape in Alabama. *Land*. 11(6): Article 775.
- Lee, T., P. Bettinger, K. Merry, V. Bektaş, and C.J. Cieszewski. 2022. Mission impossible: Positions determined by basic mapping-grade and recreation-grade GNSS receivers cannot emulate the actual spatial pattern of trees. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 14(1): 15-31.
- Restrepo, H.I., P. Bettinger, and B.P. Bullock. 2022. A theoretical minimum solution for heuristics: The case of the spatial timber harvest problem. *Computers & Operations Research*. 143: Article 105792.
- Bektas, V., P. Bettinger, N. Nibbelink, J. Siry, K. Merry, K.A. Henn, and J. Stober. 2022. Habitat suitability modelling of rare turkeybeard (*Xerophyllum Asphodeloides*) species in the Talladega National Forest, Alabama, USA. *Forests*. 13(4): Article 490.
- Gutierrez Garzon, A.R., T. Lee, K. Merry, V. Bektas, J. Cruise-Palmer, and P. Bettinger. 2022. Urban land use cover changes in three developed cities of the United States: San Diego, Denver, and Buffalo. *Heliyon*. 8(3): Article e09093.
- Kayhomayoon, Z., S.G. Milan, N.A. Azar, P. Bettinger, F. Babaian, and A. Jaafari. 2022. A simulation-optimization modeling approach for conjunctive water use management in a semi-arid region of Iran. *Sustainability*. 14(5): Article 2691.
- Dong, L., P. Bettinger, H. Qin, and Z. Liu. 2022. Optimizing rotation lengths for maximizing carbon balance of larch plantations in northeast China. *Journal of Cleaner Production*. 343: Article 131025.
- Gutierrez Garzon, A.R., P. Bettinger, J. Abrams, J.P. Siry, and B. Mei. 2022. Forest sustainability in state forest management plans: A content analysis. *Journal of Sustainable Forestry*. 41(1): 92-113.
- Merry, K., P. Bettinger, J. Siry, S. McNulty, and M. Gavazzi. 2022. Forester preferences on revising *Silvics of North America*: A survey of registered foresters in four states. *Journal of Forestry*. 120(1): 1-9.
- Ucar, Z., A.S. Değermenci, H. Zengin, and P. Bettinger. 2022. Evaluating the accuracy of remote dendrometers in tree diameter measurements at breast height. *Croatian Journal of Forest Engineering*. 43(1): 185-197.
- Demirci, M., A. Yeşil, and P. Bettinger. 2022. Introducing a new approach in stand tending planning and thinning block designation by using mixed integer goal programming. *Croatian Journal of Forest Engineering*. 43(1): 137-154.
- Dong, L., P. Bettinger, and Z. Liu. 2022. Optimizing neighborhood-based stand spatial structure: Four cases of boreal forests. *Forest Ecology and Management*. 506: Article 119965.
- Bayat, M., P. Bettinger, S. Heidari, S.K. Hamidi, and A. Jaafari. 2021. A combination of biotic and abiotic factors and diversity determine productivity in natural deciduous forests. *Forests*. 12(11): Article 1450.
- Bettinger, P., K. Merry, A.R. Gutierrez Garzon, T. Lee, J. Siry, S. McNulty, and M. Gavazzi. 2021. Stakeholder perceptions on the need for updated tree species distributions maps. *Forests*. 12(10): Article 1367.
- Jaafari, A., I. Pazhouhan, and P. Bettinger. 2021. Machine learning modeling of forest road construction costs. *Forests*. 12(9): Article 1169.
- Bayat, M., P. Bettinger, M. Hassani, and S. Heidari. 2021. Ten-year estimation of Oriental beech (*Fagus orientalis* Lipsky) volume increment in natural forests: a comparison of an artificial neural networks model, multiple linear regression and actual increment. *Forestry*. 94(4): 598-609.
- Fazeli-Varzaneh, M., P. Bettinger, E. Ghaderi-Azad, M. Kozak, D. Mafi-Gholami, and A. Jaafari. 2021. Forestry research in the Middle East: A bibliometric analysis. *Sustainability*. 13(15): Article 8261.
- Shabani, S., A. Jaafari, and P. Bettinger. 2021. Spatial modeling of forest stand susceptibility to logging operations. *Environmental Impact Assessment Review*. 89: Article 106601.
- Ezzati, S., C.D. Palma, P. Bettinger, L.O. Eriksson, and A. Awasthi. 2021. An integrated multi-criteria decision analysis and optimization modeling approach to spatially operational road repair decisions. *Canadian Journal of Forest Research*. 51(3): 465-483.
- Obata, S., C.J. Cieszewski, R.C. Lowe III, and P. Bettinger. 2021. Random forest regression model for estimation of the growing stock volumes in Georgia, USA, using dense Landsat time series and FIA dataset. *Remote Sensing*. 13(2): Article 218.
- Caglayan, İ., A. Yeşil, Ö. Kabak, and P. Bettinger. 2021. A decision making approach for assignment of ecosystem services to forest management units: A case study in northwest Turkey. *Ecological Indicators*. 121: Article 107056.
- Dong, L., P. Bettinger, and Z. Liu. 2021. Estimating the optimal internal carbon prices for balancing forest wood production and carbon sequestration: The case of northeast China. *Journal of Cleaner Production*. 281: Article 125342.

- Stober, J., K. Merry, and P. Bettinger. 2020. Analysis of fire frequency on the Talladega National Forest, USA, 1998–2018. *International Journal of Wildland Fire*. 29(10): 919–925.
- Gutierrez Garzon, A.R., P. Bettinger, J. Siry, J. Abrams, C. Cieszewski, K. Boston, B. Mei, H. Zengin, and A. Yeşil. 2020. A comparative analysis of five forest certification programs. *Forests*. 11(8): Article 863.
- Demirci, M., A. Yeşil, and P. Bettinger. 2020. Using mixed integer goal programming in final yield harvest planning: A case study from the Mediterranean region of Turkey. *Forests*. 11(7): Article 744.
- Reeves, T., B. Mei, J. Siry, P. Bettinger, and S. Ferreira. 2020. Effect of working forest conservation easements on surrounding property values. *Forest Policy and Economics*. 118: Article 102241.
- Reeves, T., B. Mei, J. Siry, P. Bettinger, and S. Ferreira. 2020. Towards a characterization of working forest conservation easements in Georgia, USA. *Forests*. 11(6): Article 635.
- Hiegel, A., J. Siry, P. Bettinger, and B. Mei. 2020. Timberland transaction costs and due diligence: a literature review and assessment of research needs. *International Forestry Review*. 22(2): 199–210.
- Lee, T., P. Bettinger, C.J. Cieszewski, and A.R. Gutierrez Garzon. 2020. The applicability of recreation-grade GNSS receiver (GPS watch, Suunto Ambit Peak 3) in a forested and an open area compared to a mapping-grade receiver (Trimble Juno T41). *PLoS ONE*. 15(4): e0231532.
- Obata, S., P. Bettinger, C.J. Cieszewski, R.C. Lowe III. 2020. Mapping forest disturbances between 1987–2016 using all available time series Landsat TM/ETM+ imagery: Developing a reliable methodology for Georgia, United States. *Forests*. 11(3): Article 335.
- Bayat, M., P. Bettinger, S. Heidari, A.H. Khalyani, M. Jourholami, and S.K. Hamidi. 2020. Estimation of tree heights in an uneven-aged, mixed forest in northern Iran using artificial intelligence and empirical models. *Forests*. 11(3): Article 324.
- Gutierrez Garzon, A.R., P. Bettinger, J. Siry, B. Mei, and J. Abrams. 2020. The terms foresters and planners in the United States use to infer sustainability in forest management plans: A survey analysis. *Sustainability*. 12(1): Article 17.
- Merry, K., P. Bettinger, J. Siry, and J.M. Bowker. 2020. Preferences of motorcyclists to views of managed, rural southern United States landscapes. *Journal of Outdoor Recreation and Tourism*. 29: Article 100259.
- Kalbi, S., A. Fallah, S. Shataee, P. Bettinger, and R. Yousefpour. 2019. Growth and yield models for uneven-aged forest stands managed under a selection system in northern Iran. *Eurasian Journal of Forest Science*. 7(3): 321–333.
- Merry, K., and P. Bettinger. 2019. Smartphone GPS accuracy study in an urban environment. *PLoS ONE*. 14(7): e0219890.
- Zhang, S., P. Bettinger, C. Cieszewski, S. Merkle, K. Merry, S. Obata, X. He, and H. Zheng. 2019. Evaluation of sites for reestablishment of the American chestnut (*Castanea dentata*) in northeast Georgia, USA. *Landscape Ecology*. 34(4): 943–960.
- Obata, S., C.J. Cieszewski, P. Bettinger, R.C. Lowe III, and S. Bernardes. 2019. Preliminary analysis of forest stand disturbances in coastal Georgia (USA) using Landsat time series stacked imagery. *FORMATH*. 18: 1–11.
- Bettinger, P., and K. Merry. 2019. Land cover transitions in the United States South: 2007–2013. *Applied Geography*. 105: 102–110.
- Bettinger, P., K. Merry, M. Bayat, and J. Tomašík. 2019. GNSS use in forestry – A multi-national survey from Iran, Slovakia and southern USA. *Computers and Electronics in Agriculture*. 158: 369–383.
- Reeves, T., B. Mei, P. Bettinger, and J. Siry. 2018. Review of the effects of conservation easements on surrounding property values. *Journal of Forestry*. 116(6): 555–562.
- Kalbi, S., A. Fallah, P. Bettinger, S. Shataee, R. Yousefpour. 2018. Mixed-effects modeling for tree height prediction models of Oriental beech in the Hyrcanian forests. *Journal of Forestry Research*. 29(5): 1195–1204.
- Merry, K., P. Bettinger, J. Siry, J.M. Bowker, S. Weaver, and Z. Ucar. 2018. Mapping potential motorized sightseeing recreation supply across broad privately-owned landscapes of the southern United States. *Landscape Research*. 43(5): 721–734.
- Bettinger, P., and K. Merry. 2018. Follow-up study of the importance of mapping technology knowledge and skills for entry-level forestry job postings, as deduced from recent job advertisements. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 10(1): 15–23.
- Sahoo, K., S. Mani, L. Das, and P. Bettinger. 2018. GIS-based sustainable assessment of crop residues for optimal siting of biogas plants. *Biomass and Bioenergy*. 110: 63–74.
- Dong, L., P. Bettinger, H. Qin, and Z. Liu. 2018. Reflections on the number of independent solutions for forest spatial harvest scheduling problems: A case of simulated annealing. *Silva Fennica*. 52(1): article id 7803.

- Zengin, H., A.S. Değermenci, and P. Bettinger. 2018. Analysis of temporal changes in land cover and landscape metrics of a managed forest in the west Black Sea region of northern Turkey: 1970 to 2010. *Journal of Forestry Research*. 29(1): 139-150.
- Ucar, Z., K. Merry, P. Bettinger, R. Akbulut, and J. Siry. 2018. Estimation of urban vegetation cover using multispectral imagery and LiDAR. *Urban Forestry & Urban Greening*. 29: 248-260.
- Bettinger, P., and K. Boston. 2017. Forest planning heuristics - Current recommendations and research opportunities for s-metaheuristics. *Forests*. 8(12): Article 476.
- Akbulut, R., P. Bettinger, Z. Ucar, S. Obata, K. Boston, and J. Siry. 2017. Spatial forest plan development using heuristic processes seeded with a relaxed linear programming solution. *Forest Science*. 63(5): 518-528.
- Merry, K., P. Bettinger, D. Grebner, J. Siry, C. Cieszewski, S. Weaver, and Z. Ucar. 2017. Assessment of potential agricultural and short-rotation forest bioenergy crop establishment sites in Jackson County, Florida, USA. *Biomass and Bioenergy*. 105: 453-463.
- Przeździecki, K., J. Zawadski, C. Cieszewski, and P. Bettinger. 2017. Estimation of soil moisture across broad landscapes of Georgia and South Carolina using the triangle method applied to MODIS satellite imagery. *Silva Fennica*. 51(4): article id 1683.
- Kalbi, S., A. Fallah, S. Shatee, R. Yousefpour, and P. Bettinger. 2017. Mapping the spatial distribution of forest growth characteristics using different geostatistical methods (Case Study: District 3 Sangdeh-Sari). *Iranian Journal of Forest and Poplar Research*. 25(2): 196-208.
- Klepacka, A.M., J.S. Siry, and P. Bettinger. 2017. Stumpage prices: A review of influential factors. *International Forestry Review*. 19(2): 158-169.
- Akbulut, R., Z. Ucar, P. Bettinger, K. Merry, and S. Obata. 2017. Effects of forest thinning on static horizontal positions collected with a mapping-grade GNSS receiver. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 9(1): 14-21.
- Merry, K., P. Bettinger, D.L. Grebner, K. Boston, and J. Siry. 2016. Assessment of geographic information system (GIS) skills employed by graduates from three forestry programs in the United States. *Forests*. 7(12): Article 304.
- Ezzati, S., A. Najafi, and P. Bettinger. 2016. Finding feasible harvest zones in mountainous areas using integrated, spatial multi-criteria decision analysis. *Land Use Policy*. 59: 479-491.
- Dong, L., P. Bettinger, Z. Liu, H. Qin, and Y. Zhao. 2016. Evaluating the neighborhood, hybrid and reversion search techniques of simulated annealing algorithm in solving forest spatial harvest scheduling problems. *Silva Fennica*. 50(4): article id 1622.
- Dong, L., Z. Liu, and P. Bettinger. 2016. Nonlinear mixed-effects branch diameter and length models for natural Dahurian larch (*Larix gmelini*) forest in northeast China. *Trees*. 30(4): 1191-1206.
- Kašpar, J., R. Marušák, and P. Bettinger. 2016. Time efficiency of selected types of adjacency constraints in solving unit restriction models. *Forests*. 7(5): Article 102.
- Bettinger, P., K. Merry, and C. Cieszewski. 2016. The importance of mapping technology knowledge and skills for students seeking entry-level forestry positions: Evidence from job advertisements. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 8(1): 14-24.
- Ucar, Z., P. Bettinger, K. Merry, J. Siry, J.M. Bowker, and R. Akbulut. 2016. A comparison of two sampling approaches for assessing the urban forest canopy cover from aerial photography. *Urban Forestry & Urban Greening*. 16: 221-230.
- Kaya, A., P. Bettinger, K. Boston, R. Akbulut, Z. Ucar, J. Siry, K. Merry, and C. Cieszewski. 2016. Optimisation in forest management. *Current Forestry Reports*. 2(1): 1-17.
- Ezzati, S., A. Najafi, M. Yaghini, A.A. Hashemi, and P. Bettinger. 2015. An optimization model to solve skidding problem steep slope terrain. *Journal of Forest Economics*. 21(4): 250-268.
- Merry, K., P. Bettinger, J. Siry, and J.M. Bowker. 2015. Estimating urban forest carbon sequestration potential in the southern United States using current remote sensing imagery sources. *Geographia Technica*. 10(2): 78-89.
- Dong, L., P. Bettinger, Z. Liu, and H. Qin. 2015. A comparison of a neighborhood search technique for forest spatial harvest scheduling problems: A case study of the simulated annealing algorithm. *Forest Ecology and Management*. 356: 124-135.
- Siry, J., K. McGinley, F.W. Cabbage, and P. Bettinger. 2015. Forest tenure and sustainable forest management. *Open Journal of Forestry*. 5(5): 526-545.
- Walliser, M.A., W.D. Potter, and P. Bettinger. 2015. Response and recovery after severe wind storms using hierarchical open vehicle routing. *International Journal of Emergency Management*. 11(1): 20-45.

- Weaver, S.A., Z. Ucar, P. Bettinger, and K. Merry. 2015. How a GNSS receiver is held may affect static horizontal position accuracy. *PLoS ONE*. 10(4): e0124696.
- Dong, L., P. Bettinger, Z. Liu, and H. Qin. 2015. Spatial forest harvest scheduling for areas involving carbon and timber management goals. *Forests*. 6(4): 1362-1379.
- Demirci, M., and P. Bettinger. 2015. Using mixed integer multi-objective goal programming for stand tending block designation: A case study from Turkey. *Forest Policy and Economics*. 55: 28-36.
- Bettinger, P., and M. Tang. 2015. Tree-level harvest optimization for structure-based forest management based on the species mingling index. *Forests*. 6(4): 1121-1144.
- Bettinger, P., M. Demirci, and K. Boston. 2015. Search reversion within s-metaheuristics: Impacts illustrated with a forest planning problem. *Silva Fennica*. 49(2): article id 1232.
- Weaver, S.A., Z. Ucar, P. Bettinger, K. Merry, K. Faw, and C.J. Cieszewski. 2015. Assessing the accuracy of tree diameter measurements collected at a distance. *Croatian Journal of Forest Engineering*. 36(1): 73-83.
- Zengin, H., Ü. Asan, S. Destan, M.E. Ünal, A. Yeşil, P. Bettinger, and A.S. Değermenci. 2015. Modeling harvest scheduling in multifunctional planning of forests for longterm water yield optimization. *Natural Resource Modeling*. 28(1): 59-85.
- Ucar, Z., P. Bettinger, S. Weaver, K.L. Merry, and K. Faw. 2014. Dynamic accuracy of recreation-grade GPS receivers in oak-hickory forests. *Forestry*. 87(4): 504-511.
- Merry, K., J. Siry, P. Bettinger, and J.M. Bowker. 2014. Urban tree cover change in Detroit and Atlanta, USA, 1951-2010. *Cities*. 41(Part A): 123-131.
- Bettinger, P., K. Merry, and Z. Ucar. 2014. Assessment of a global land cover classification allocated across the landscape of Georgia (USA). *Journal of Scientific Research and Reports*. 3(3): 457-478.
- Akay, A.E., K. Aruga, P. Bettinger, and J. Sessions. 2013. Using optimization techniques in designing forest roads and road networks. *Journal of the Bartın Faculty of Forestry*. 15(1-2): 49-62.
- Zengin, H., A. Yeşil, Ü. Asan, P. Bettinger, C. Cieszewski, and J.P. Siry. 2013. Evolution of modern forest management planning in the Republic of Turkey. *Journal of Forestry*. 111(4): 239-248.
- Cieszewski, C.J., M. Strub, F. Antony, P. Bettinger, J. Dahlen, and R.C. Lowe. 2013. Wood quality assessment of tree trunk from the tree branch sample and auxiliary data based on NIR spectroscopy and SilviScan. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 5(1): 86-111.
- Cieszewski, C.J., R.C. Lowe, P. Bettinger, and A. Kumar. 2013. Micro-detail comparative forest site analysis using high-resolution satellite imagery. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 5(1): 16-37.
- Merry, K., J. Siry, P. Bettinger, and J.M. Bowker. 2013. Efficient assessments of urban tree planting potential within or near the southern Piedmont region of the United States. *Computers, Environment and Urban Systems*. 39: 39-47.
- Bettinger, P., J. Siry, and K. Merry. 2013. Forest management planning technology issues posed by climate change. *Forest Science and Technology*. 9(1): 9-19.
- Merry, K., J. Siry, P. Bettinger, and J.M. Bowker. 2013. Assessing potential urban tree planting sites in the Piedmont of the United States: A comparison of methods. *Southeastern Geographer*. 53(1): 79-101.
- Bettinger, P., J. Siry, C. Cieszewski, K.L. Merry, H. Zengin, and A. Yeşil. 2013. Forest management issues of the southern United States and comparisons with Turkey. *Turkish Journal of Agriculture and Forestry*. 37(1): 83-96.
- Shan, Y., P. Bettinger, C. Cieszewski, and W. Wang. 2012. Pitfalls and potential of particle swarm optimization for contemporary spatial forest planning. *Forest Systems*. 21(3): 468-480.
- Bettinger, P., and K.L. Merry. 2012. Relative vulnerability of the forests along southeastern African coasts to cyclones. *Singapore Journal of Tropical Geography*. 33(3): 320-334.
- Kim, H., P. Bettinger, and C. Cieszewski. 2012. Reflections on the estimation of stand-level forest characteristics using Landsat satellite imagery. *Applied Remote Sensing Journal*. 2(2): 45-56.
- Bettinger, P., and K.L. Merry. 2012. Influence of the juxtaposition of trees on consumer-grade GPS position quality. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 4(2): 81-91.
- Bettinger, P., and K. Merry. 2012. Static horizontal positions determined with a consumer-grade GNSS receiver: One assessment of the number of fixes necessary. *Croatian Journal of Forest Engineering*. 33(1): 149-157.
- Merry, K.L., P. Bettinger, and J. Hepinstall-Cymerman. 2011. A prototype model for estimating the location of forest damage from tropical cyclones. *Geographia Technica*. 12(2): 65-80.
- Bettinger, P. 2011. Cypress dome characteristics within one county of the southern United States: A case study of changes. *Regional Environmental Change*. 11(3): 569-578.

- Bettinger, P. 2011. Forest management in a climate change era: Options for planning. *Journal of Forest Planning*. 16: 57-66.
- Bettinger, P., K.L. Merry, and D.L. Grebner. 2010. Two views of the impact of strong wind events on forests of the southern United States. *Southeastern Geographer*. 50(3): 291-304.
- Bettinger, P., and S. Fei. 2010. One year's experience with a recreation-grade GPS receiver. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 2(2): 153-160.
- Merry, K.L., P. Bettinger, D.L. Grebner, and J. Hepinstall-Cymerman. 2010. Perceptions of foresters of wind damage in Mississippi forests. *Southern Journal of Applied Forestry*. 34(3): 124-130.
- Bettinger, P., T. Lowe, J. Siry, K. Merry, and N. Nibbelink. 2010. Analytical decisionmaking considerations for upgrading or changing geographic information system software. *Journal of Forestry*. 108(5): 238-244.
- Li, R., and P. Bettinger. 2010. Assessing forest fragmentation in southern U.S. industrial forest plans that accommodate different clearcut size restrictions. *Journal of Forest Planning*. 15(2): 81-98.
- Ransom, M.D., J. Rhynold, and P. Bettinger. 2010. Performance of mapping-grade GPS receivers in southeastern forest conditions. *RURALS: Review of Undergraduate Research in Agricultural and Life Sciences*. 5(1): Article 2.
- Roberts, S.B., J.D. Jordan, P. Bettinger, and R.J. Warren. 2010. Using bobcat habitat suitability to prioritize preservation on a suburbanizing barrier island. *Journal of Wildlife Management*. 74(3): 386-394.
- Li, R., P. Bettinger, and K. Boston. 2010. Informed development of meta heuristics for spatial forest planning problems. *The Open Operational Research Journal*. 4: 1-11.
- Li, R., P. Bettinger, and A. Weiskittel. 2010. Comparisons of three different methods used to generate forest landscapes for spatial harvest scheduling problems with adjacency restrictions. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 2(1): 53-60.
- Bettinger, P. 2010. An overview of methods for incorporating wildfires into forest planning models. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 2(1): 43-52.
- Bettinger, P. 2009. Effectiveness of repeated basic navigational training sessions designed for novice natural resource managers. *Research Journal of Forestry*. 3(3): 94-100.
- Bettinger, P., K.L. Merry, and J. Hepinstall. 2009. Post-hurricane forest management responses in the southern United States. *Journal of Emergency Management*. 7(6): 35-50.
- Clutter, M.L., J.P. Siry, and P. Bettinger. 2009. Urbanization and forest fragmentation in Georgia (USA): Challenges to sound forest management. *Journal of Forest Planning*. 14(1): 1-6.
- Bettinger, P., M. Clutter, J. Siry, M. Kane, and J. Pait. 2009. Broad implications of southern United States pine clonal forestry on planning and management of forests. *The International Forestry Review*. 11(3): 331-345.
- Shan, Y., P. Bettinger, C.J. Cieszewski, and R.T. Li. 2009. Trends in spatial forest planning. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 1(2): 86-112.
- Danskin, S., P. Bettinger, and T. Jordan. 2009. Multipath mitigation under forest canopies: A choke ring antenna solution. *Forest Science*. 55(2): 109-116.
- Danskin, S.D., P. Bettinger, T.R. Jordan, and C. Cieszewski. 2009. A comparison of GPS performance in a southern hardwood forest: Exploring low-cost solutions for forestry applications. *Southern Journal of Applied Forestry*. 33(1): 9-16.
- Kim, Y.-H., P. Bettinger, and M. Finney. 2009. Spatial optimization of the pattern of fuel management activities and subsequent effects on simulated wildfires. *European Journal of Operational Research*. 197(1): 253-265.
- Bettinger, P. 2009. A prototype method for integrating spatially-referenced wildfires into a tactical forest planning model. *Research Journal of Forestry*. 3(1): 8-22.
- Bettinger, P., K.L. Merry, and J. Hepinstall. 2009. Average tropical cyclone intensity along the Georgia, Alabama, Mississippi, and north Florida coasts. *Southeastern Geographer*. 49(1): 49-66.
- Merry, K., P. Bettinger, and J. Hepinstall. 2009. Physical and biological responses of forests to tropical cyclones affecting the United States Atlantic Ocean and Gulf of Mexico coasts. *American Journal of Environmental Sciences*. 5(1): 16-32.
- Bettinger, P., J. Sessions, and K. Boston. 2009. A review of the status and use of validation procedures for heuristics used in forest planning. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 1(1): 26-37.

- Kim, Y.-H., and P. Bettinger. 2008. Effects of arranging forest fuel reduction treatments in spatial patterns on hypothetical, simulated, human-caused wildfires. *Journal of Environmental Science and Technology*. 1(4): 187-200.
- Zhu, J., and P. Bettinger. 2008. Assessment of three heuristics for developing large-scale spatial forest harvest scheduling plans. *Journal of Applied Sciences*. 8(22): 4113-4120.
- Merry, K.L., P. Bettinger, and W.G. Hubbard. 2008. Back to the future part 2: Surveying geospatial technology needs of Georgia agriculture and natural resources Extension professionals. *Journal of Extension*. 46(4): 4RIB1.
- Merry, K.L., P. Bettinger, and W.G. Hubbard. 2008. Back to the future part 1: Surveying geospatial technology needs of Georgia land use planners. *Journal of Extension*. 46(3): 3RIB6.
- Zhu, J., and P. Bettinger. 2008. Estimating the effects of adjacency and green-up constraints on landowners of different sizes and spatial arrangements located in the southeastern U.S. *Forest Policy and Economics*. 10(5): 295-302.
- Bettinger, P., and K. Boston. 2008. Habitat and commodity production trade-offs in coastal Oregon. *Socio-Economic Planning Sciences*. 42(2): 112-128.
- Merry, K.L., P. Bettinger, M. Clutter, J. Hepinstall, and N.P. Nibbelink. 2007. An assessment of Geographic Information System skills employed by field-level natural resource managers. *Journal of Forestry*. 105(7): 364-370.
- Zhu, J., P. Bettinger, and R. Li. 2007. Additional insight into the performance of a new heuristic for solving spatially constrained forest planning problems. *Silva Fennica*. 41(4): 687-698.
- Bettinger, P., C.P. Holliday, M.S. Threadgill, and C.A. Hyldahl. 2007. On integrating water yield models with forest planning efforts. *Water Policy*. 9(6): 631-643.
- Li, R., P. Bettinger, S. Danskin, and R. Hayashi. 2007. A historical perspective on the use of GIS and remote sensing in natural resource management, as viewed through papers published in North American forestry journals from 1976 to 2005. *Cartographica*. 42(2): 165-178.
- Spies, T.A., K.N. Johnson, K.M. Burnett, J.L. Ohmann, B.C. McComb, G.H. Reeves, P. Bettinger, J.D. Kline, and B. Garber-Yonts. 2007. Cumulative ecological and socioeconomic effects of forest policies in coastal Oregon. *Ecological Applications*. 17(1): 5-17.
- Johnson, K.N., P. Bettinger, J.D. Kline, T.A. Spies, M. Lennette, G. Lettman, B. Garber-Yonts, and T. Larsen. 2007. Simulating forest structure, timber production, and socioeconomic effects in a multi-owner province. *Ecological Applications*. 17(1): 34-47.
- Bettinger, P., K. Boston, Y.-H. Kim, and J. Zhu. 2007. Landscape-level optimization using tabu search and stand density-related forest management prescriptions. *European Journal of Operational Research*. 176(2): 1265-1282.
- Bettinger, P. 2006. Measures of change in projected landscape conditions. *Journal of Forest Planning*. 12(2): 39-47.
- Bettinger, P., and J. Zhu. 2006. A new heuristic for solving spatially constrained forest planning problems based on mitigation of infeasibilities radiating outward from a forced choice. *Silva Fennica*. 40(2): 315-333.
- Boston, K. and P. Bettinger. 2006. An economic and landscape evaluation of the green-up rules for California, Oregon, and Washington (USA). *Forest Policy and Economics*. 8(3): 251-266.
- Akay, A.E., J. Sessions, P. Bettinger, R. Toupin, and A. Eklund. 2006. Evaluating the salvage value of fire-killed timber by helicopter - effects of yarding distance and time since fire. *Western Journal of Applied Forestry*. 21(2): 102-107.
- Thompson, J.R., K.N. Johnson, M. Lennette, T. Spies, and P. Bettinger. 2006. Historical disturbance regimes as a reference for forest policy in a multiowner province: a simulation experiment. *Canadian Journal of Forest Research*. 36(2): 401-417.
- Batten, W.H., Jr., P. Bettinger, and J. Zhu. 2005. The effects of spatial harvest scheduling constraints on the value of a medium-sized forest holding in the southeastern United States. *Southern Journal of Applied Forestry*. 29(4): 185-193.
- Bettinger, P., D. Graetz, and J. Sessions. 2005. A density-dependent stand-level optimization approach for deriving management prescriptions for interior northwest (USA) landscapes. *Forest Ecology and Management*. 217(2-3): 171-186.
- Bettinger, P., M. Lennette, K.N. Johnson, and T.A. Spies. 2005. A hierarchical spatial framework for forest landscape planning. *Ecological Modelling*. 182(1): 25-48.
- Bettinger, P., and W. Chung. 2004. The key literature of, and trends in, forest-level management planning in North America, 1950-2001. *The International Forestry Review*. 6(1): 40-50.
- Sessions, J., P. Bettinger, R. Buckman, M. Newton, and J. Hamann. 2004. Hastening the return of complex forests

- following fire: The consequences of delay. *Journal of Forestry*. 102(3): 38-45.
- Bettinger, P. 2003. A vegetation similarity index driven by distance-dependent spatial information. *Journal of Forest Planning*. 9(2): 73-83.
- Bettinger, P., D.L. Johnson, and K.N. Johnson. 2003. Spatial forest plan development with ecological and economic goals. *Ecological Modelling*. 169(2-3): 215-236.
- Wing, M.G., and P. Bettinger. 2003. GIS: An updated primer on a powerful management tool. *Journal of Forestry*. 101(4): 4-8.
- Bettinger, P., and K.N. Johnson. 2003. Spatial scheduling of forest management activities using a dynamic deterministic harvest block aggregation process. *Journal of Forest Planning*. 9(1): 25-34.
- Bettinger, P., and J. Sessions. 2003. Spatial forest planning: to adopt, or not to adopt? *Journal of Forestry*. 101(2): 24-29.
- Bettinger, P., D. Graetz, K. Boston, J. Sessions, and W. Chung. 2002. Eight heuristic planning techniques applied to three increasingly difficult wildlife planning problems. *Silva Fennica*. 36(2): 561-584.
- Boston, K. and P. Bettinger. 2002. Combining tabu search and genetic algorithm heuristic techniques to solve spatial harvest scheduling problems. *Forest Science*. 48(1): 35-46.
- Boston, K. and P. Bettinger. 2001. Development of spatially feasible forest plans: A comparison of two modeling approaches. *Silva Fennica*. 35(4): 425-435.
- Bettinger, P. 2001. Challenges and opportunities for linking the modeling of forest vegetation dynamics with landscape planning models. *Landscape and Urban Planning*. 56(3-4): 107-124.
- Bettinger, P. and K. Boston. 2001. A conceptual model for describing decision-making situations in integrated natural resource planning and modeling projects. *Environmental Management*. 28(1): 1-7.
- Bocco, G., F. Rosete, P. Bettinger, and A. Velázquez. 2001. Developing a GIS program in rural Mexico. *Journal of Forestry*. 99(6): 14-19.
- Boston, K. and P. Bettinger. 2001. The economic impact of green-up constraints in the southeastern United States. *Forest Ecology and Management*. 145(3): 191-202.
- Bettinger, P., K. Boston, and J. Sessions. 1999. Intensifying a heuristic forest harvest scheduling search procedure with 2-opt decision choices. *Canadian Journal of Forest Research*. 29(11): 1784-1792.
- Alig, R.J., D.A. Adams, J.T. Chmelik, and P. Bettinger. 1999. Private forest investment and long-run sustainable timber harvest volumes. *New Forests*. 17(1-3): 307-327.
- Bettinger, P., K. Boston, and J. Sessions. 1999. Combinatorial optimization of elk habitat effectiveness and timber harvest volume. *Environmental Modeling and Assessment*. 4(2-3): 143-153.
- Bettinger, P. 1999. Distributing geographic information systems capabilities to field offices: Benefits and challenges. *Journal of Forestry*. 97(6): 22-26.
- Boston, K. and P. Bettinger. 1999. An analysis of Monte Carlo integer programming, simulated annealing, and tabu search heuristics for solving spatial harvest scheduling problems. *Forest Science*. 45(2): 292-301.
- Bettinger, P., K.N. Johnson, and J. Sessions. 1998. Evaluating the association among alternative measures of cumulative watershed effects on a forested watershed in eastern Oregon. *Western Journal of Applied Forestry*. 13(1): 15-22.
- Bettinger, P., J. Sessions, and K.N. Johnson. 1998. Ensuring the compatibility of aquatic habitat and commodity production goals in eastern Oregon with a Tabu search procedure. *Forest Science*. 44(1): 96-112.
- Bettinger, P., K.A. Bettinger, and K. Boston. 1998. Correlation among spatial and non-spatial variables describing a cut-to-length thinning site in the Pacific Northwest, USA. *Forest Ecology and Management*. 104(1-3): 139-149.
- Bettinger, P., K.N. Johnson, and J. Sessions. 1998. Improving aquatic habitat conditions over time while producing wood products: an examination of options. *Journal of the American Water Resources Association*. 34(4): 891-907.
- Bettinger, P., J. Sessions, and K. Boston. 1997. Using Tabu search to schedule timber harvests subject to spatial wildlife goals for big game. *Ecological Modelling*. 94(2-3): 111-123.
- Bettinger, P., K.N. Johnson, and J. Sessions. 1996. Forest planning in an Oregon case study: defining the problem and attempting to meet goals with a spatial-analysis technique. *Environmental Management*. 20(4): 565-577.
- Kellogg, L.D., P. Bettinger, and R.M. Edwards. 1996. A comparison of logging planning, felling, and skyline yarding costs between clearcutting and five group-selection harvesting methods. *Western Journal of Applied Forestry*. 11(3): 90-96.
- Bettinger, P., G.A. Bradshaw, and G.W. Weaver. 1996. Effects of geographic information system vector-raster-vector data conversion on landscape indices. *Canadian Journal of Forest Research*. 26(8): 1416-1425.
- Bettinger, P. and R.J. Alig. 1996. Timber availability on non-federal land in western Washington: implications based

- on physical characteristics of the timberland base. *Forest Products Journal*. 46(9): 30-38.
- Siegel, W.C., H.L. Haney, Jr., D.M. Peters, P. Bettinger, and D.S. Callihan. 1996. The impact of federal and state income taxes on timber income in the Northeast and Midwest following the 1986 Tax Reform Act. *Northern Journal of Applied Forestry*. 13(1): 8-15.
- Kellogg, L.D. and P. Bettinger. 1994. Thinning productivity and cost for a mechanized cut-to-length system in the Northwest Pacific Coast region of the USA. *Journal of Forest Engineering*. 5(2): 43-54.
- Bettinger, P., D. Armlovich, and L.D. Kellogg. 1994. Evaluating area in logging trails with a geographic information system. *Transactions of the ASAE*. 37(4): 1327-1330.
- Bettinger, P., J. Sessions, and L.D. Kellogg. 1993. Potential timber availability for mechanized harvesting in Oregon. *Western Journal of Applied Forestry*. 8(1): 11-15.
- Bettinger, P. 1993. Incorporating state income taxes in soil expectation values - impacts and pitfalls. *Forest Products Journal*. 43(5): 61-67.
- Bettinger, P. and L.D. Kellogg. 1993. Residual stand damage from cut-to-length thinning of second-growth timber in the Cascade Range of western Oregon. *Forest Products Journal*. 43(11/12): 59-64.
- Bettinger, P., H.L. Haney, Jr., and W.C. Siegel. 1991. The impact of federal and state income taxes on timber income in the West following the 1986 Tax Reform Act. *Western Journal of Applied Forestry*. 6(1): 15-20.
- Bettinger, P., H.L. Haney, Jr., and W.C. Siegel. 1989. The impact of federal and state income taxes on timber income in the South following the 1986 Tax Reform Act. *Southern Journal of Applied Forestry*. 13(4): 196-202.

Book Chapters

- Bettinger, P. 2024. Approaches for addressing spatial connectivity of final harvests within forest harvest scheduling algorithms. *In Geographical Information Systems Theory, Applications and Management*, 9th International Conference, GISTAM 2023, Grueau, C., A. Rodrigues, and L. Ragia (eds.). Springer Nature Switzerland AG, Cham Switzerland. pp. 54-68.
- Bettinger, P. 2023. Modelling spatial connectivity of forest harvest areas: Exact and heuristic approaches. *In Proceedings of the 9th International Conference on Geographical Information Systems Theory, Applications and Management (GISTAM 2023)*, Grueau, C., A. Rodrigues, and L. Ragia (eds.). SCITEPRESS – Science and Technology Publications, Lda, Setubal, Portugal. pp. 136-143.
- Bettinger, P., A.R. Gutierrez Garzon, K. Merry, A. Tsao, V. Bektas, T. Lee, J. Uzu, and J. Siry. 2023. Part 2: Technologies for Climate Change Adaptation, 22. Forest management planning technologies in the light of climate change. *Handbook on Climate Change and Technology*, Urban, F., and J. Nordensvard (eds.). Edward Elgar Publishing, Cheltenham, UK. pp. 355-371.
- Grebner, D.L., and P. Bettinger. 2019. Key challenges in forest management. *In Achieving sustainable management of boreal and temperate forests*, Stanturf, J. (ed.). Burleigh Dodds Science Publishing, Cambridge, UK.
- Bettinger, P., K. Merry, E. Mavity, D. Rightmyer, and R. Stevens. 2015. Chattahoochee-Oconee National Forest, Georgia, United States of America. *In Forest Plans of North America*, Siry, J.P., P. Bettinger, K. Merry, D.L. Grebner, K. Boston, and C. Cieszewski (eds.). Academic Press, New York. pp. 277-284.
- Demirci, M., P. Bettinger, and K. Merry. 2015. San Juan National Forest, Colorado, United States of America. *In Forest Plans of North America*, Siry, J.P., P. Bettinger, K. Merry, D.L. Grebner, K. Boston, and C. Cieszewski (eds.). Academic Press, New York. pp. 403-411.
- Bettinger, P., K. Merry, M. Demirci, and A.M. Klepacka. 2015. Tongass National Forest, Alaska, United States of America. *In Forest Plans of North America*, Siry, J.P., P. Bettinger, K. Merry, D.L. Grebner, K. Boston, and C. Cieszewski (eds.). Academic Press, New York. pp. 413-421.
- Boston, K., K. Merry, D.L. Grebner, C. Cieszewski, P. Bettinger, and J.P. Siry. 2015. Synopsis of Forest Management Plans of North America. *In Forest Plans of North America*, Siry, J.P., P. Bettinger, K. Merry, D.L. Grebner, K. Boston, and C. Cieszewski (eds.). Academic Press, New York. pp. 443-448.
- Bettinger, P., K.L. Merry, and K. Boston. 2012. Comparison of landscape planning models. *In Sustainable built environment (UNESCO-EOLSS Joint Committee, eds.)*, located in the *Encyclopedia of Technology, Information, and Systems Management Resources (EOLSS)*. UNESCO, Eolss Publishers, Oxford, UK, [<http://www.eolss.net>].
- Bettinger, P., and K. Merry. 2012. Management of forests in hurricane-prone regions of the southern United States: Basic considerations. *In Advances in Environmental Research*, Volume 17, Daniels, J.A. (ed.). Nova Science Publishers, Inc., Hauppauge, NY. pp. 371-380.
- O'Neill, T.A., P. Bettinger, B.G. Marcot, W.B. Cohen, O. Taft, R. Ash, H. Bruner, C. Langhoff, J.A. Carlino, V. Hutchinson, R.E. Kennedy, and Z. Yang. 2012. Application of spatial technologies in wildlife biology. *In The*

- wildlife techniques manual, 7th edition, Silvy, N.J. (ed.). Johns Hopkins University Press, Baltimore, MD. pp. 429-461.
- Bettinger, P., and K. Merry. 2011. Knowledge gained and gaps suggested from recent forestry-related GPS research. *In* Forestry: Research, Ecology and Policies, Boehm, D.A. (ed.). Nova Science Publishers, Inc., Hauppauge, NY. pp. 21-35.
- Potter, W.D., E. Drucker, P. Bettinger, F. Maier, M. Martin, D. Luper, M. Watkinson, G. Handy, and C. Hayes. 2009. Diagnosis, configuration, planning, and pathfinding: Experiments in nature-inspired optimization. *In* Natural Intelligence for Scheduling, Planning and Packing Problems, Chiong, R., and S. Dhakal (eds.). Springer, Berlin. pp. 267-294.
- Bettinger, P., and R. Li. 2009. Rotation age determination for even-aged forest plantations. *In* Forest Management, Grossberg, S.P. (ed.). Nova Science Publishers, Inc., Hauppauge, NY. pp. 295-303.
- Bettinger, P. 2008. Tabu search experience in forest management and planning. *In* Local Search Techniques: Focus on Tabu Search, Jaziri, W. (ed.). IN-TECH Education and Publishing KG, Vienna. pp. 199-208.
- Shan, Y., P. Bettinger, and T. Li. 2008. Lessons learned from assessing the cost of adjacency and green-up rules on forest harvesting options. *In* Natural Resources: Economics, Management and Policy, White, J.R., and W.H. Robinson (eds.). Nova Science Publishers, Inc., Hauppauge, NY. pp. 225-235.
- Bettinger, P., K. Boston, and J. Sessions. 2008. Simulated Annealing. *In* Encyclopedia of Ecology, Jørgensen, S.E., and B.D. Fath (eds.). Elsevier, Oxford, UK. 4: 3255-3261.
- Bettinger, P., and Y.-H. Kim. 2008. Spatial optimisation - computational methods. *In* Designing Green Landscapes, Gadow, K., and T. Pukkala (eds.). Springer, New York. pp. 111-135.
- Sessions, J., P. Bettinger, and G. Murphy. 2007. Heuristics in forest planning. *In* Handbook of Operations Research in Natural Resources, Weintraub, A., C. Romero, T. Bjørndal, and R. Epstein (eds.). Springer, New York. pp. 431-448.
- Sessions, J., P. Overhulser, P. Bettinger, and D. Johnson. 2006. Linking multiple tools: An American case. *In* Computer Applications in Sustainable Forest Management, Including Perspectives on Collaboration and Integration, Shao, G., and K. Reynolds (eds.). Springer, New York. pp. 223-238.
- O'Neil, T.A., P. Bettinger, B.G. Marcot, B.W. Luscombe, G.T. Koeln, H.J. Bruner, C. Barrett, J.A. Pollock, and S. Bernatus. 2005. Application of spatial technologies in wildlife biology. *In* Techniques for Wildlife Investigations and Management, 6th Edition, Braun, C.E. (ed.). The Wildlife Society, Bethesda, MD. pp. 418-447.
- Spies, T.A., G.H. Reeves, K.M. Burnett, W.C. McComb, K.N. Johnson, G. Grant, J.L. Ohmann, S.L. Garman, and P. Bettinger. 2002. Assessing the ecological consequences of forest policies in a multi-ownership province in Oregon. *In* Integrating landscape ecology into natural resource management, Liu, J., and W.W. Taylor (eds.). Cambridge University Press, Cambridge, UK. pp. 179-207.
- Bettinger, P., K. Boston, J. Sessions, and W.C. McComb. 2001. Integrating wildlife species habitat goals in quantitative land management planning processes. *In* Wildlife-habitat relationships in Oregon and Washington, Johnson, D.H., and T.A. O'Neil (eds.). Oregon State University Press, Corvallis, OR. pp. 567-579.
- Haynes, R. and P. Bettinger. 2000. Timber Programs. *In* Forest roads: A synthesis of scientific information, Gucinski, H., M.J. Furniss, R.R. Ziemer, and M.J. Brookes, (eds.). USDA Forest Service. Draft Final. pp. 52-54. <<http://www.fs.fed.us/news/roads/science.pdf>>.
- Alig, R., D. Adams, J. Chmelik, and P. Bettinger. 1999. Private forest investment and long-run sustainable timber harvest volumes. *In* Planted forests: Contributions to the quest for sustainable societies, Boyle, J.R., J.K. Winjum, K. Kavanaugh, and E.C. Jensen (eds.). Kluwer Academic Press, Volume 56.

Book Reviews

- Bettinger, P. 2011. Carbon sinks and climate change, Forests in the fight against global warming, by Colin A.G. Hunt. *Journal of Sustainable Forestry*. 30(3): 261-262.
- Bettinger, P. 2008. Cross-sectoral policy developments in forestry, Y.C. Dubé and F. Schmithüsen (eds.). *Journal of Sustainable Forestry*. 27(3): 343-344.

Proceedings

- Merry, K., P. Bettinger, C. Cieszewski, M. Crosby, A.R. Gutierrez Garzon, J. Siry, B. Song, Z. Ucar, and J. Uzu. 2022. Proceedings of the 13th Southern Forestry and Natural Resource Management GIS Conference. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 99 p.

- Merry, K., P. Bettinger, M. Crosby, I-K. Hung, T. Lee, R. Lowe, Q. Meng, J. Siry, and B. Song (eds.). 2020. Proceedings of the 12th Southern Forestry and Natural Resource Management GIS Conference. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 188 p.
- Merry, K., P. Bettinger, C. Cieszewski, M. Crosby, R. Lowe, and J. Siry (eds.). 2018. Proceedings of the 11th Southern Forestry and Natural Resource Management GIS Conference. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 112 p.
- Merry, K., P. Bettinger, T. Brown, C. Cieszewski, M. Crosby, J. Fan, Q. Meng, J. Siry, and B. Song. 2016. Proceedings of the 10th Southern Forestry and Natural Resource Management GIS Conference. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 106 p.
- Merry, K., P. Bettinger, T. Brown, C. Cieszewski, I-K. Hung, and Q. Meng. 2014. Proceedings of the 9th Southern Forestry and Natural Resources GIS Conference. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 165 p.
- Merry, K.L., P. Bettinger, T. Lowe, N. Nibbelink, and J. Siry (eds.). 2012. Proceedings of the 8th Southern Forestry and Natural Resources GIS Conference. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 82 p.
- Merry, K., P. Bettinger, J. Hepinstall-Cymerman, J. Fan, J. Siry, J. Kushla, T. Litts, and B. Song (eds.). 2010. Proceedings of the 7th Southern Forestry and Natural Resources GIS Conference. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 141 p.
- Siry, J., B. Izlar, P. Bettinger, T. Harris, T. Tye, S. Baldwin, and K. Merry (eds.). 2009. Proceedings of the 2008 Southern Forest Economics Workers Annual Meeting. Center for Forest Business, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. Center for Forest Business Publication No. 30. 282 p.
- Bettinger, P., K. Merry, S. Fei, J. Drake, N. Nibbelink, and J. Hepinstall (eds.). 2008. Proceedings of the 6th Southern Forestry and Natural Resources GIS Conference. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 278 p.
- Prisley, S., P. Bettinger, I-K. Hung, and J. Kushla (eds.). 2006. Proceedings of the 5th Southern Forestry and Natural Resources GIS Conference. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 191 p.
- Bettinger, P., C. Hyldahl, S.D. Danskin, J. Zhu, Y. Zhang, W.G. Hubbard, T. Lowe, M. Wimberly, and B. Jackson (eds.). 2005. Proceedings of the 4th Southern Forestry and Natural Resources GIS Conference. Warnell School of Forest Resources, University of Georgia, Athens, GA. 177 p.

Non-Refereed Publications

- Vatandaslar, C., P. Bettinger, and K. Merry. 2025. Online Learning in Applied Forestry: Introduction to remote sensing. https://olaf.uga.edu/wp-content/uploads/2024/08/OLAF_RemoteSensing_022725.pdf
- Merry, K., P. Bettinger, and C. Vatandaslar. 2025. Satellite systems. In the Remote Sensing course of Online Learning in Applied Forestry (OLAF). https://olaf.uga.edu/wp-content/uploads/2024/08/OLAF_RemoteSensing_022725.pdf
- Merry, K., and P. Bettinger. 2025. Aerial systems. In the Remote Sensing course of Online Learning in Applied Forestry (OLAF). https://olaf.uga.edu/wp-content/uploads/2024/08/OLAF_RemoteSensing_022725.pdf
- Vatandaslar, C., K. Merry, and P. Bettinger. 2025. Unmanned aerial vehicles. In the Remote Sensing course of Online Learning in Applied Forestry (OLAF). https://olaf.uga.edu/wp-content/uploads/2024/08/OLAF_RemoteSensing_022725.pdf
- Lee, T., K. Merry, and P. Bettinger. 2025. Lidar. In the Remote Sensing course of Online Learning in Applied Forestry (OLAF). https://olaf.uga.edu/wp-content/uploads/2024/08/OLAF_RemoteSensing_022725.pdf
- Borges, J.G., L.C. Estraviz Rodriguez, S. Nobre, J. Garcia-Gonzalo, and P. Bettinger. 2025. Systems Analysis in Forest Resources: Description. International Union of Forest Research Organizations. <https://www.iufro.org/events/decisiones-br2025-symposium-on-ecosystem-services-forest-management-and-decision-making>
- Bettinger, P., T. Lee, K. Merry, and D. Drummond. 2024. A forest management evaluation system for small private forest landowners. *Journal of Extension*. 62(3): Article 19.
- Vatandaslar, C., T. Lee, A. Peduzzi, P. Bettinger, K. Merry, and J. Stober. 2023. Mapping ecological condition classes of a natural pine-dominated national forest in the southeastern US. *In Proceedings of the IEEE International Symposium on Geoscience and Remote Sensing (IGARSS)*. The Institute of Electrical and Electronics Engineers, Inc., Piscataway, NJ. pp. 2676-2679.

- Bettinger, P., T. Lee, K. Merry, and D. Drummond. 2023. eYield user's manual 2023. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 59 p.
- Bettinger, P., and K. Merry. 2022. Virtually exhausted: Experiences in hybrid conference management during the pandemic. *In* Proceedings of the 13th Southern Forestry and Natural Resource Management GIS Conference, Merry, K., P. Bettinger, C. Cieszewski, M. Crosby, A.R. Gutierrez Garzon, J. Siry, B. Song, Z. Ucar, and J. Uzu (eds.). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 1-8.
- Bettinger, P., B. Izlar, T. Harris, C. Cieszewski, J. Conrad, D. Greene, A. Mech, J. Shelton, J. Siry, M. Kane, K. Merry, S. Baldwin, J. Smith. 2022. Handbook of land and tree measurements. Center for Forest Business, University of Georgia, Athens, GA. 325 p.
- Bettinger, P., K. Merry, S. McNulty, J. Siry, and M. Gavazzi. 2021. Variation in results of three biology-focused search engines: A case study using North American tree species. *Bulletin of the Ecological Society of America*. 102(1): Article e01808.
- Bettinger, P., B. Izlar, T. Harris, C. Cieszewski, J. Conrad, D. Greene, A. Mech, J. Shelton, J. Siry, M. Kane, K. Merry, S. Baldwin, J. Smith. 2020. Handbook of land and tree measurements. Center for Forest Business, University of Georgia, Athens, GA. 323 p.
- Bettinger, P., and K. Merry. 2020. The use of GPS in forestry: Perspectives from three different groups of forestry professionals. *In* Proceedings of the 12th Southern Forestry and Natural Resource Management GIS Conference, Merry, K., P. Bettinger, M. Crosby, I-K. Hung, T. Lee, R. Lowe, Q. Meng, J. Siry, and B. Song (eds.). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 9-15.
- Lee, T., and P. Bettinger. 2020. GPS watch accuracy within a forest environment. *In* Proceedings of the 12th Southern Forestry and Natural Resource Management GIS Conference, Merry, K., P. Bettinger, M. Crosby, I-K. Hung, T. Lee, R. Lowe, Q. Meng, J. Siry, and B. Song (eds.). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 71-81.
- Williams, T.M., B. Song, and P. Bettinger. 2020. Contributions of Donald J. Lipscomb to early forestry GIS and low cost applications to address issues of southern forestry. *In* Proceedings of the 12th Southern Forestry and Natural Resource Management GIS Conference, Merry, K., P. Bettinger, M. Crosby, I-K. Hung, T. Lee, R. Lowe, Q. Meng, J. Siry, and B. Song (eds.). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 123-133.
- Williams, T., B. Song, and P. Bettinger. 2020. Contributions of Donald J. Lipscomb to early forestry GIS and low cost applications to address issues of southern forestry. *Mathematical and Computational Forestry & Natural-Resources Sciences*. White Paper. 13 p. <http://mcfns.net/index.php/Peer/article/view/280>.
- Bektaş, V. and P. Bettinger. 2020. The use of spatial technologies in every-day Turkish forestry practice. *In* Proceedings of the 12th Southern Forestry and Natural Resource Management GIS Conference, Merry, K., P. Bettinger, M. Crosby, I-K. Hung, T. Lee, R. Lowe, Q. Meng, J. Siry, and B. Song (eds.). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 152. [Abstract]
- Cieszewski, C., R.C. Lowe, B. Strimbu, T. Lee, and P. Bettinger. 2020. 3D point cloud modeling for analysis of stand regeneration origins. *In* Proceedings of the 12th Southern Forestry and Natural Resource Management GIS Conference, Merry, K., P. Bettinger, M. Crosby, I-K. Hung, T. Lee, R. Lowe, Q. Meng, J. Siry, and B. Song (eds.). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 155. [Abstract]
- Merry, K., and P. Bettinger. 2020. iPhone 6 GPS accuracy assessment. *In* Proceedings of the 12th Southern Forestry and Natural Resource Management GIS Conference, Merry, K., P. Bettinger, M. Crosby, I-K. Hung, T. Lee, R. Lowe, Q. Meng, J. Siry, and B. Song (eds.). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 163. [Abstract]
- Stober, J., K. Merry, and P. Bettinger. 2020. Ecosystem condition class tools to facilitate assessment, planning and monitoring of the longleaf and shortleaf pine woodlands of the Talladega Division, Alabama. *In* Proceedings of the 12th Southern Forestry and Natural Resource Management GIS Conference, Merry, K., P. Bettinger, M. Crosby, I-K. Hung, T. Lee, R. Lowe, Q. Meng, J. Siry, and B. Song (eds.). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 170. [Abstract]
- Wei, M., S. Obata, C. Cieszewski, P. Bettinger, R.C. Lowe, and B. Strimbu. 2020. Using auxiliary multisource information to improve kNN imputation-based forest inventory for Georgia, USA. *In* Proceedings of the 12th Southern Forestry and Natural Resource Management GIS Conference, Merry, K., P. Bettinger, M. Crosby, I-K. Hung, T. Lee, R. Lowe, Q. Meng, J. Siry, and B. Song (eds.). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 172. [Abstract]
- Bettinger, P., B. Izlar, T. Harris, C. Cieszewski, J. Conrad, D. Greene, A. Mech, J. Shelton, J. Siry, M. Kane, K. Merry, S. Baldwin, J. Smith. 2019. Handbook of land and tree measurements. Center for Forest Business, University of

- Georgia, Athens, GA. 323 p.
- Reeves, T., R.B. Mei, P. Bettinger, and J. Siry. 2019. Review of the effects of conservation easements on surrounding property values. *In* Forest resource economics in transition: Traditional and emerging markets. Proceedings of the International Society of Forest Resource Economics 2018 annual meeting. (Brandeis, C., D.G. Hodges, and N. Poudyal, eds.). U.S. Department of Agriculture, Forest Service, Southern Research Station, Asheville, NC. e-General Technical Report SRS-247.
- Siry, J., P. Bettinger, and R. Gutierrez. 2019. Empowering Native American forest management through forest business education. *NACTA Journal*. 63(Supplement 1): 115. (Abstract).
- Gutierrez, R., P. Bettinger, and J. Siry. 2019. The meaning of "sustainability" to foresters and planners: Survey results. *NACTA Journal*. 63(Supplement 1): 115. (Abstract).
- Bettinger, P., B. Izlar, T. Harris, C. Cieszewski, J. Conrad, D. Greene, A. Mech, J. Shelton, J. Siry, M. Kane, K. Merry, S. Baldwin, J. Smith. 2018. Handbook of land and tree measurements. Center for Forest Business, University of Georgia, Athens, GA. 323 p.
- Bettinger, P. 2018. Synthesis of what we have learned studying GPS in forests. *In* Proceedings of the 11th Southern Forestry and Natural Resource Management GIS Conference (Merry, K., P. Bettinger, C. Cieszewski, M. Crosby, R. Lowe, and J. Siry (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 25-31.
- Bettinger, P., K. Merry, and C. Cieszewski. 2018. A perspective of the mapping technology knowledge and skills required of entry-level forestry job candidates, as deduced from recent job advertisements. *In* Proceedings of the 11th Southern Forestry and Natural Resource Management GIS Conference (Merry, K., P. Bettinger, C. Cieszewski, M. Crosby, R. Lowe, and J. Siry (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 11-23.
- Kašpar, J., P. Bettinger, H. Vacik, R. Marušák, and J. Garcia-Gonzalo. 2018. Decision support approaches in adaptive forest management. *Forests*. 9(4): Article 215.
- Bettinger, P., B. Izlar, T. Harris, C. Cieszewski, J. Conrad, D. Greene, A. Mech, J. Shelton, J. Siry, M. Kane, K. Merry, S. Baldwin, J. Smith. 2017. Handbook of land and tree measurements. Center For Forest Business, University of Georgia, Athens, GA. 324 p.
- Bettinger, P. 2017. Current thought on the use of heuristics for adaptive forest management. *In* Proceedings of the IUFRO 125th Anniversary Congress, Freiburg, Germany. pp. 52. (Abstract).
- Bettinger, P., K. Merry, J. Siry, and J.M. Bowker. 2017. Geospatial approaches to the assessment of urban forest cover. *In* Proceedings of the IUFRO 125th Anniversary Congress, Freiburg, Germany. pp. 156. (Abstract).
- Bettinger, P., K. Merry, K. Boston, D. Grebner, and J. Siry. 2017. Assessment of the GIS skills needed of recent forestry graduates. *Journal of Forestry*. 115(2): S50. (Abstract).
- Siry, J., and P. Bettinger. 2017. Training of underrepresented minorities in forestry: Experiences with National Needs Master's Fellowship Program. *Journal of Forestry*. 115(2): S13. (Abstract).
- Tran, Y.L., J.P. Siry, B. Izlar, J.M. Bowker, N. Poudyal, and P. Bettinger. 2016. Atlanta's households' willingness to increase urban forests to mitigate climate change. *In* Advances and challenges in managerial economics and accounting (Sekot, W., P. Toscani, and E. Ungerböck (eds.)). IUFRO Unit 4.05.00 - Managerial Economics and accounting, Vienna, Austria. pp. 113-114.
- Bettinger, P., B. Izlar, T. Harris, D. Greene, A. Mech, J. Shelton, J. Siry, M. Kane, C. Cieszewski, K. Merry, S. Baldwin, J. Smith. 2016. Handbook of land and tree measurements. Center For Forest Business, University of Georgia, Athens, GA. 320 p.
- Siry, J., and P. Bettinger. 2016. Recruitment, training, and placement of underrepresented minorities in forestry: Lessons from National Needs Master's Fellowship Program. *NACTA Journal*. 60(Supplement 1): 81-82. (Abstract).
- Bettinger, P., K. Merry, and C. Cieszewski. 2016. The importance of mapping technology knowledge and skills for students seeking entry-level forestry positions: Evidence from job advertisements. *In* Proceedings of the 10th Southern Forestry and Natural Resource Management GIS Conference (Merry, K., P. Bettinger, T. Brown, C. Cieszewski, M. Crosby, J. Fan, Q. Meng, J. Siry, and B. Song (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 1-15.
- Ucar, Z., P. Bettinger, K. Merry, J. Siry, J.M. Bowker, and R. Akbulut. 2016. A comparison of two sampling approaches for assessing the urban forest canopy cover from aerial photography. *In* Proceedings of the 10th Southern Forestry and Natural Resource Management GIS Conference (Merry, K., P. Bettinger, T. Brown, C. Cieszewski, M. Crosby, J. Fan, Q. Meng, J. Siry, and B. Song (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 92.

- Bettinger, P., and K. Merry. 2016. A brief overview of the second special section of papers from the 10th Southern Forestry and Natural Resource Management GIS Conference. *Mathematical and Computational Forestry & Natural-Resources Sciences*. 8(2): 16-17.
- Bettinger, P., and K. Merry. 2016. An overview of the 10th Southern Forestry and Natural Resource Management GIS Conference. *Mathematical and Computational Forestry & Natural-Resources Sciences*. 8(1): 1-3.
- Bettinger, P., B. Izlar, T. Harris, D. Greene, A. Mech, J. Shelton, B. Borders, J. Siry, M. Kane, C. Cieszewski, K. Merry, S. Baldwin, J. Smith. 2015. Handbook of land and tree measurements. Center For Forest Business, University of Georgia, Athens, GA. 320 p.
- Ezzati, S., A. Najafi, P. Bettinger, and L.O. Eriksson. 2015. Terrain evaluation model to identify landing locations in mountain areas. *In* Forest engineering: making a positive contribution. Abstracts and Proceedings of the 48th Symposium on Forest Mechanization, Kanzian, C., G. Erber, and M. Kuhmaier (eds). Institute of Forest Engineering, University of Natural Resources and Life Sciences, University of Natural Resources and Life Sciences, Vienna, Austria. pp. 45-49.
- Sample, V.A., R. Birdsey, R.A. Houghton, C. Swanston, D. Hollinger, M. Dockry, and P. Bettinger. 2015. Forest carbon conservation and management: Integration with sustainable forest management for multiple resource values and ecosystem services. Discussion Paper. Pinchot Institute for Conservation, Washington, D.C. 21 p.
- Bettinger, P., and K. Merry. 2014. A brief overview of the 9th Southern Forestry and Natural Resources GIS Conference. *Mathematical and Computational Forestry & Natural-Resources Sciences*. 6(2): 62-64.
- Bettinger, P., B. Izlar, T. Harris, D. Greene, B. Borders, J. Siry, M. Kane, C. Cieszewski, K. Merry, S. Baldwin, J. Smith, M. Clutter, and R.F. Daniels. 2014. Handbook of land and tree measurements. Center For Forest Business, University of Georgia, Athens, GA. 286 p.
- Bettinger, P., and J. Siry. 2014. Recent experiences with forestry Master's fellowships designed for underrepresented groups. *NACTA Journal*. 58(Supplement 1): 30. (Abstract).
- Bettinger, P. 2013. Issues facing forest planning in the southeastern United States. *In* Proceedings of the International Symposium for the 50th Anniversary of the Forestry Sector Planning in Turkey. Orman Genel Müdürlüğü, Ankara, Turkey. Orman İdaresi ve Planlama Dairesi Başkanlığı Yayın. No. 107. pp. 43-51.
- Siry, J., P. Bettinger, K. Merry, and J.M. Bowker. 2012. Assessing urban land area for planting and development of forest carbon projects in select US cities. *Journal of Forestry*. 110(8): 522. (Abstract).
- Bettinger, P. 2012. Forest farmers and collective forest management in southern China. *In* Working Group Newsletter, Society of American Foresters Working Group B3, International Forestry, Fall 2012.
- Smythe, J., W.D. Potter, and P. Bettinger. 2012. Application of a new multi-valued particle swarm optimization to forest harvest schedule optimization. *In* Proceedings of the 9th International Conference on Genetic and Evolutionary Methods (GEM'12). Computer Science Research, Education and Applications (CSREA) Press, Las Vegas, NV.
- Bettinger, P., D. Greene, B. Borders, B. Izlar, J. Siry, T. Harris, M. Kane, C. Cieszewski, K. Merry, S. Baldwin, R. Simmons, J. Smith, M. Clutter, and R.F. Daniels. 2012. Handbook of land and tree measurements. Center For Forest Business, University of Georgia, Athens, GA. 315 p.
- Bettinger, P., and K. Merry. 2012. Determining the relative vulnerability of forests to tropical cyclones. *In* Proceedings of the 8th Southern Forestry and Natural Resources GIS Conference (Merry, K.L., P. Bettinger, T. Lowe, N. Nibbelink, and J. Siry (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 1-7.
- Bettinger, P. 2011. The impact of prescribed fire on longleaf pine productivity. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Georgia. 7 p.
- Siry, J., P. Bettinger, K. Merry, and J.M. Bowker. 2011. Assessing the feasibility of dedicated urban forestry carbon markets in the United States. *In* Proceedings of the 2011 Society of American Foresters National Convention. *Journal of Forestry*. 109: 508. (Abstract).
- Cieszewski, C.J., P. Bettinger, and A. Falcao. 2011. The conclusion of perspectives on new developments of decision support systems for sustainable forest management. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 3(2): 73-74.
- Bettinger, P., R. Molpus, D. Greene, B. Borders, B. Izlar, J. Siry, T. Harris, M. Kane, C. Cieszewski, K. Merry, S. Baldwin, R. Simmons, and J. Smith. 2011. Handbook of land and tree measurements. Center For Forest Business, University of Georgia, Athens, GA. 315 p.
- Bettinger, P., C.J. Cieszewski, and A. Falcao. 2011. Perspectives on new developments of decision support systems for sustainable forest management. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 3(1): 15-17.

- Sessions, J., P. Overhulser, and P. Bettinger. 2010. Box 1.4 Sustainability into forest planning for the western United States. *In* Sustainability Unpacked: Food, Energy and Water for Resilient Environments and Societies (Vogt, K.A., T. Patel-Weynand, M. Shelton, D.J. Vogt, J.C. Gordon, C.T. Mukumoto, A.S. Suntana, and P.A. Roads (authors)). Earthscan, London. p. 16.
- Bettinger, P. 2010. Recent evaluations of GPS technology in the southeastern United States. Proceedings of the 2010 Society of American Foresters National Convention, Albuquerque, NM. Society of American Foresters, Bethesda, MD. (Abstract).
- Bettinger, P., and W.G. Hubbard. 2010. The 2009 Southern Forestry and Natural Resources GIS Conference. *Mathematical and Computational Forestry & Natural-Resource Sciences*. 2(2): 135-137.
- Bettinger, P., R. Molpus, D. Greene, B. Borders, B. Izlar, J. Siry, T. Harris, M. Kane, C. Cieszewski, K. Merry, S. Baldwin, R. Simmons, and J. Smith. 2010. Handbook of land and tree measurements. Center For Forest Business, University of Georgia, Athens, GA. 325 p.
- Bettinger, P., and S. Fei. 2010. One year's experience with a recreation-grade GPS receiver. *In* Proceedings of the 7th Southern Forestry and Natural Resources GIS Conference (Merry, K., P. Bettinger, J. Hepinstall-Cymerman, J. Fan, J. Siry, J. Kushla, T. Litts, and B. Song (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 14-25.
- Bettinger, P., M.D. Ransom, and J. Rhynold. 2010. Leaf-off accuracy of mapping-grade GPS receivers. *In* Proceedings of the 7th Southern Forestry and Natural Resources GIS Conference (Merry, K., P. Bettinger, J. Hepinstall-Cymerman, J. Fan, J. Siry, J. Kushla, T. Litts, and B. Song (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 29-32.
- Bettinger, P. 2010. Intensity of tropical cyclones along portions of the southeastern U.S. coasts. *In* Proceedings of the 7th Southern Forestry and Natural Resources GIS Conference (Merry, K., P. Bettinger, J. Hepinstall-Cymerman, J. Fan, J. Siry, J. Kushla, T. Litts, and B. Song (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 54-57.
- Merry, K., P. Bettinger, and J. Hepinstall-Cymerman. 2010. Modeling forest damage from hurricanes. *In* Proceedings of the 7th Southern Forestry and Natural Resources GIS Conference (Merry, K., P. Bettinger, J. Hepinstall-Cymerman, J. Fan, J. Siry, J. Kushla, T. Litts, and B. Song (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 58-73.
- Roberts, S.B., J.D. Jordan, P. Bettinger, and R.J. Warren. 2010. Are bobcats saving Kiawah Island? *The Wildlife Professional*. 4(1): 42-44, 78.
- Bettinger, P., K.L. Merry, and J. Hepinstall-Cymerman. 2010. Fort Stewart timber salvage and recovery study, and modeling of potential windthrow and storm surges associated with hurricanes, Final Report. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 57 p.
- Bettinger, P. 2010. Timber salvage response plan (Prepared for the Fort Stewart military installation). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 26 p.
- Bettinger, P., K.L. Merry, and J. Hepinstall-Cymerman. 2010. Potential storm surges of concern to Fort Stewart and Hunter Army Airfield. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 260 p.
- Bettinger, P., D. Greene, B. Borders, B. Izlar, T. Tye, J. Siry, T. Harris, M. Kane, C. Cieszewski, K. Merry, S. Baldwin, R. Simmons, and J. Smith. 2009. Handbook of land and tree measurements. Center For Forest Business, University of Georgia, Athens, GA. 325 p.
- Bettinger, P., J. Hepinstall-Cymerman, and K. Merry. 2009. Hurricane damage to forests at Fort Stewart, Georgia, Final Report. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 126 p.
- Merry, K.L., P. Bettinger, and J. Hepinstall. 2009. Annotated bibliography of hurricane-related publications of interest to land managers of forests of the southern United States. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 63 p.
- Marshall, D.J., M. Wimberly, P. Bettinger, and J. Stanturf. 2008. Synthesis of knowledge of hazardous fuels management in loblolly pine forests. USDA Forest Service, Southern Research Station, Asheville, NC. General Technical Report SRS-110. 43 p.
- Bettinger, P., D. Greene, B. Borders, B. Izlar, T. Tye, J. Siry, T. Harris, M. Kane, C. Cieszewski, K. Merry, S. Baldwin, R. Simmons, and J. Smith. 2008. Handbook of land and tree measurements. Center For Forest Business, University of Georgia, Athens, GA. 324 p.
- Merry, K.L., and P. Bettinger. 2008. Surveys of GIS usage and needs among natural resource managers, Extension agents, and land use planners. *In* Proceedings of the 6th Southern Forestry and Natural Resources GIS

- Conference (Bettinger, P., K.L. Merry, S. Fei, J. Drake, N. Nibbelink, and J. Hepinstall (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 15-21.
- Bettinger, P. 2008. Status of GPS research at the Whitehall GPS test course. *In* Proceedings of the 6th Southern Forestry and Natural Resources GIS Conference (Bettinger, P., K.L. Merry, S. Fei, J. Drake, N. Nibbelink, and J. Hepinstall (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. pp. 29-36.
- Merry, K.L., P. Bettinger, and J. Hepinstall. 2008. Annotated bibliography of publications on hurricane activity and hurricane impacts of interest to land managers of forests of the southern and eastern United States. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. 72 p.
- Merry, K.L., P. Bettinger, and W.G. Hubbard. 2008. Visualizing future landscapes: Options for natural resource managers and land use planners. Center for Forest Business, University of Georgia, Athens, GA. Research Note No. 28. 141 p.
- Bettinger, P., D. Greene, B. Borders, B. Izlar, T. Tye, J. Siry, T. Harris, M. Kane, and C. Cieszewski. 2007. Handbook of land and tree measurements. Center For Forest Business, University of Georgia, Athens, GA. 320 p.
- Marshall, D.J., P. Bettinger, M. Wimberly, and J. Stanturf. 2007. General management practices for hazardous fuels management in loblolly pine (*Pinus taeda*) forests. Center For Forest Business, University of Georgia, Athens, GA. Research Note 27. 12 p.
- Roberts, S.R., J.D. Jordan, P.S. Bettinger, and R.J. Warren. 2006. The bobcat as an icon for integrating research, education, and habitat preservation on Kiawah Island, South Carolina. *In* Proceedings of the 13th Annual Conference of The Wildlife Society. The Wildlife Society, Bethesda, MD.
- Bettinger, P. 2006. Technology advancement in land management planning: Dual-edged sword. *In* Proceedings of the Society of American Foresters 2006 National Convention. Society of American Foresters, Bethesda, MD.
- Clutter, M., J. Siry, and P. Bettinger. 2006. Calculating the internal rate of return on marginal silviculture investments. Plantation Management Research Cooperative. Technical Report 2006-2. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA.
- Bettinger, P., and M. Lennette. 2006. Simulation of landowner behavior and potential forest policies at a large scale in coastal Oregon. *In* Proceedings of the Second International Conference on Forest Measurements and Quantitative Methods and Management (Cieszewski, C.J., and M. Strub (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. p. 177-184.
- Danskin, S.D., P. Bettinger, and T.R. Jordan. 2006. Assessing GPS accuracy, WAAS, and a choke ring antenna solution in a southern hardwood forest. *In* Proceedings of the 5th Southern Forestry and Natural Resources GIS Conference (Prisley, S., P. Bettinger, I-K. Hung, and J. Kushla (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. p. 10-18.
- Hayashi, R., and P. Bettinger. 2006. Above-ground biomass estimation in forestland using a Landsat Thematic Mapper image with supervised regression analysis. *In* Proceedings of the 5th Southern Forestry and Natural Resources GIS Conference (Prisley, S., P. Bettinger, I-K. Hung, and J. Kushla (eds.)). Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. p. 63-69.
- Bettinger, P., and R. Hayashi. 2006. Estimation of above-ground biomass with remotely sensed imagery: A brief literature review. Center for Forest Business, University of Georgia, Athens, GA. Research Note 25. 10 p.
- Marshall, D.J., P. Bettinger, M.C. Wimberly, and J. Stanturf. 2006. A selective bibliography of scientific literature on hazardous fuel management in loblolly pine-dominated forests of the southeastern U.S. Center for Forest Business, University of Georgia, Athens, GA. Research Note 24. 23 p.
- Bettinger, P. 2005. HATT: The heuristic algorithm teaching tool for advanced forest planning courses. *In* Systems Analysis in Forest Resources: Proceedings of the 2003 Symposium (Bever, M., and T.M. Barrett (Comps.)). USDA Forest Service, Pacific Northwest Research Station, Portland, OR. General Technical Report PNW-GTR-656. p. 61-70.
- Bettinger, P., and J. Drake. 2005. Examination of tradeoffs between timber production and spotted owl habitat in coastal Oregon. *In* Systems Analysis in Forest Resources: Proceedings of the 2003 Symposium (Bever, M., and T.M. Barrett (Comps.)). USDA Forest Service, Pacific Northwest Research Station, Portland, OR. General Technical Report PNW-GTR-656. p. 131-139.
- Bettinger, P., and M. Lennette. 2005. Extreme policies modeled within the Landscape Management Policy Simulator (LAMPS). *In* Systems Analysis in Forest Resources: Proceedings of the 2003 Symposium (Bever, M., and T.M. Barrett (Comps.)). USDA Forest Service, Pacific Northwest Research Station, Portland, OR. General Technical Report PNW-GTR-656. p. 291-297.

- Graetz, D., and P. Bettinger. 2005. Determining thinning regimes to reach stand density targets for any-aged stand management in the Blue Mountains of eastern Oregon. *In Systems Analysis in Forest Resources: Proceedings of the 2003 Symposium* (Bever, M., and T.M. Barrett (Comps.)). USDA Forest Service, Pacific Northwest Research Station, Portland, OR. General Technical Report PNW-GTR-656. p. 255-264.
- Kim, Y-H., and P. Bettinger. 2005. Spatial optimization of fuel management activities. *In Systems Analysis in Forest Resources: Proceedings of the 2003 Symposium* (Bever, M., and T.M. Barrett (Comps.)). USDA Forest Service, Pacific Northwest Research Station, Portland, OR. General Technical Report PNW-GTR-656. p. 205-214.
- Wimberly, M.C., P. Bettinger, and S.D. Danskin. 2005. Incorporating cross-cutting spatial technologies into natural resources education. *In Proceedings of the 4th Southern Forestry and Natural Resources GIS Conference* (Bettinger, P., C. Hyldahl, S.D. Danskin, J. Zhu, Y. Zhang, W.G. Hubbard, T. Lowe, M. Wimberly, and B. Jackson (eds.)). Warnell School of Forest Resources, University of Georgia, Athens, GA. p. 171-177.
- Bettinger, P., D., Graetz, A. Ager, and J. Sessions. 2004. Chapter 4: The SafeD forest landscape planning model. *In Methods for Integrated Modeling of Landscape Change: Interior Northwest Landscape Analysis System* (Hayes, J.L., A.A. Ager, and J.R. Barbour (eds.)). USDA Forest Service, Pacific Northwest Research Station, Portland, OR. General Technical Report PNW-GTR-610. p. 41-63.
- Akay A.E., J. Sessions., P. Bettinger, and O. Erdas. 2004. Finding the vertical alignment of forest roads using several heuristic techniques. *In 2004 Proceedings of the Council of Forest Engineering*. Council on Forest Engineering, Corvallis, OR.
- Bettinger, P., and M. Lennette. 2004. LAndscape Management Policy Simulator (LAMPS), Version 1.1 User's Guide. Forest Research Laboratory, Oregon State University, Corvallis, OR. Research Contribution 43. 117 p.
- Bettinger, P., J. Sessions, W. Chung, D. Graetz, and K. Boston. 2003. Eight heuristic planning techniques applied to three increasingly difficult wildlife planning problems: A summary. *In Systems analysis in forest resources, proceedings of the Eighth Symposium* (Arthaud, G.J. and T.M. Barrett (eds.)). Kluwer Academic Publishers, Dordrecht, The Netherlands. pp. 249-257.
- Spies, T.A., K.N. Johnson, P. Bettinger, W.C. McComb, J.L. Ohmann, and G.H. Reeves. 2002. Challenges in integrating wood production, biodiversity, and other socioeconomic values at broad scales: an example from Coastal Oregon. *In Congruent management of multiple resources: Proceedings from the wood compatibility initiative workshop* (Johnson, A., R.W. Haynes, and R.A. Monserud (eds.)). USDA Forest Service, Pacific Northwest Research Station, Portland, OR. General Technical Report PNW-GTR-563. pp. 13-25.
- Spies, T.A., K.N. Johnson, G. Reeves, P. Bettinger, M.T. McGrath, R. Pabst, K. Burnett, and K. Olsen. 2002. An evaluation of tradeoffs between wood production and ecological integrity in the Oregon Coast Range. *In Congruent management of multiple resources: Proceedings from the wood compatibility initiative workshop* (Johnson, A., R.W. Haynes, and R.A. Monserud (eds.)). USDA Forest Service, Pacific Northwest Research Station, Portland, OR. General Technical Report PNW-GTR-563. pp. 111-119.
- Sessions, J., and P. Bettinger. 2001. Hierarchical planning: Pathway to the future? *In Proceedings of the first international Precision Forestry Cooperative symposium*. University of Washington College of Forest Resources, University of Washington College of Engineering, and USDA Forest Service, Pacific Northwest Research Station, Seattle, WA. pp. 185-190.
- Bettinger, P. and G.A. Bradshaw. 1994. Utilizing GIS for spatial analysis with a decision-support program: a case study of error sources, quantification and alleviation. *In Proceedings: International symposium on the accuracy of natural resource databases*. American Society for Photogrammetry and Remote Sensing, Bethesda, MD. pp. 189-198.
- Kellogg, L.D., P. Bettinger, and D. Studier. 1993. Terminology of ground-based mechanized harvesting machines and logging methods. Forest Research Laboratory, Oregon State University, Corvallis, OR. Research Contribution 1. 12 p.
- Bettinger, P., L.D. Kellogg, and E.O. Olsen. 1993. Key issues and future directions of mechanized harvesting: discussions and guidance from working groups. Forest Research Laboratory, Oregon State University, Corvallis, OR. Research Contribution 5. 8 p.
- Kellogg, L.D., P. Bettinger, S. Robe, and A. Steffert. 1992. Mechanized harvesting: a compendium of research. Forest Research Laboratory, Oregon State University, Corvallis. 410 p.
- Edwards, R., L. Kellogg, and P. Bettinger. 1992. Skyline logging planning and harvest cost in five alternative group selection systems. *In Proceedings: International Mountain Logging and Eighth Pacific Northwest Skyline Symposium*. Cooperative for Forest Systems Engineering, College of Forest Resources, University of Washington, Seattle, WA. pp. 121-133.
- Bettinger, P. 1991. Husky Hunter 2 and SIWORK3 user's guide. Department of Forest Engineering, Oregon State

University, Corvallis. 27 p.

Software with Registered U.S. Copyright

HATT (Heuristic Algorithm Teaching Tool) version 1.0, 2003.

HATT (Heuristic Algorithm Teaching Tool) version 2.0, 2013. Registration number TXu 1-897-176.

SOFIE (Scheduling of Forest Investment Endeavors), version 1.0, 2016. Registration number TXu 2-008-943.