

Christopher R. Keyes, PhD, CF

curriculum vitae

Associate Director, Montana Forest & Conservation Experiment Station
Research Professor, W.A. Franke College of Forestry & Conservation
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Degrees & Credentials

- 2010** Certified Forester (CF) Credential #4013, Society of American Foresters, Bethesda, MD
- 2002** Ph.D. Oregon State University. Silviculture – Forest Regeneration emphasis;
Minor in Integrated Forest Protection
- 1996** M.S. University of Montana. Silviculture – Forest Stand Dynamics emphasis
- 1990** B.A. Holy Cross College. Political Science – International Development emphasis

Work Experience

- 2017-** Associate Director, Montana Forest & Conservation Experiment Station, Missoula, MT
- 2014-** Research Professor, University of Montana, Missoula, MT
- 2007-17** Director, Applied Forest Management Program, Montana Forest & Conservation Experiment Station, Missoula, MT
- 2007-14** Research Associate Professor, University of Montana, Missoula, MT
- 2001-07** Assistant Professor, Humboldt State University, Arcata, CA
- 1997-2001** Graduate Research Assistant, Oregon State University, Corvallis, OR
- 1996-97** Graduate Research Assistant, University of Washington Seattle, WA
- 1995-96** Forester, USDA Forest Service Northeastern Research Station, Rangeley, ME
- 1993-95** Graduate Research Assistant, University of Montana, Missoula, MT
- 1992-93** Graduate Research/Teaching Assistant, University of Massachusetts, Amherst, MA
- 1991** Tree Seedling Nursery Technician, Gainesville Tree Farm, Gainesville, FL
- 1989** Intern, International Center for Development Policy, Washington, DC

Professional Service Positions

- 2013-** Faculty Advisor, Soc. Am. For. Student Chapter – University of Montana
- 2011-** Steering Committee Member, Inland Empire Tree Improvement Cooperative
- 2010-** Deputy Coordinator, IUFRO Temperate Forest Regeneration Working Party (1.01.03)
- 2013-17** Associate Editor, Forest Science
- 2011-13** Associate Editor, Western Journal of Applied Forestry
- 2012-13** Chair, Inland Empire Reforestation Council

- 2011-12** Outplanting Advisor, USAID Lebanon Reforestation Initiative
- 2011-12** Chair-Elect, Inland Empire Reforestation Council
- 2010** Chair, Montana Society of American Foresters, Missoula Chapter
- 2009** Chair-Elect, Montana Society of American Foresters, Missoula Chapter
- 2004-07** Faculty Advisor, *Xi Sigma Pi* (national forestry honor society), *Alpha Lambda* chapter
- 2001-04** Faculty Advisor, Soc. Am. For. Student Chapter – Humboldt State University
- 1998-2001** Officer, *Xi Sigma Pi* forestry honor society, *Zeta* chapter – Oregon State University

Distinctions

- 2017** Merit Award for Outstanding Performance, University of Montana
- 2015** Awarded Sabbatical Leave, University of Montana
- 2014** Promoted to Research Professor, University of Montana
- 2014** Nominee, Regional Forester’s Honor Award for Excellence in Science and Technology, USDA Forest Service Northern Region (for the project: Improving Management Options for Lodgepole Pine to Reduce Mountain Pine Beetle Impacts)
- 2013** Merit Award for Outstanding Performance, University of Montana
- 2013** Award for Contributions, Service and Leadership, Inland Empire Reforestation Council
- 2013** Nominee, Federal Laboratories Consortium Award for Excellence in Technology Transfer (RMRS-GTR-292)
- 2012** Nominee, Outstanding Technology Transfer Publication, USDA Forest Service Rocky Mountain Research Station (RMRS-GTR-292)
- 2010** Outstanding Service Award, Society of American Foresters, Missoula (Montana) Chapter
- 2008** Outstanding Effort Award, Montana Department of Natural Resources and Conservation
- 2006** Awarded Tenure & Promoted to Associate Professor, Humboldt State University
- 2006** President Alistair McCrone Promising Scholar Award, Humboldt State University
- 2002** Forestry Club Faculty Award, Humboldt State University
- 2001** J. Richard Dilworth Memorial Award, Oregon State University
- 1998** *Xi Sigma Pi* National Forestry Honor Society
- 1996** Kenneth P. Davis Memorial Scholarship, University of Montana
- 1995** Maine Forest Inventory Perseverance and Dedication Award, USDA Forest Service
- 1994** Earl F. Clark Memorial Scholarship, University of Montana

Grants & Contracts

- 2018-20** \$219,369 Control of Annual Invasive Grasses in Rocky Mountain Intermountain Montane Grasslands with Esplanade (Indaziflam) Herbicide and No-till Seeding (Co-PI). USDA-NIFA Tribal College Research Grant Program. Keyes share = \$65,078.
- 2018-20** \$15,000 Phase IV - Data Archiving and Climate Change Experiments at Coram Experimental Forest (PI). USDA Forest Service Rocky Mountain Research Station.
- 2018-20** \$12,000 Lubrecht Forest – Nordic Ski Trail Grooming Machine (PI). Recreational Trails Program, Montana Fish, Wildlife & Parks.

2018-19	\$57,998	Forest, Range, and Stream Enhancement on Bandy Ranch (Co-PI). Landscape Scale Restoration Grant Program, Montana Department of Natural Resources & Conservation.
2017-20	\$10,505	Phase II - Data Archiving and Treatment Analysis at Lick Creek Demonstration / Research Forest (PI). USDA Forest Service Rocky Mountain Research Station.
2017-20	\$10,000	Phase III - Data Archiving and Climate Change Experiments at Coram Experimental Forest (PI). USDA Forest Service Rocky Mountain Research Station.
2016-20	\$44,995	Data Archiving and Treatment Analysis at Lick Creek Demonstration / Research Forest (PI). USDA Forest Service Rocky Mountain Research Station.
2016-20	\$35,000	Phase II - Data Archiving and Climate Change Experiments at Coram Experimental Forest (PI). USDA Forest Service Rocky Mountain Research Station.
2016-19	\$39,492	Multi-Regional Development of Stand Density Index-Based Susceptibility Guidelines for Western Yellow Pine Forests (Project Cooperator). Special Technology Development Program, Forest Health Protection (Region 1), USDA Forest Service. Keyes Co-Author; funds managed by USFS-R1FHP.
2015-20	\$24,000	Data Archiving and Climate Change Experiments at Coram Experimental Forest (PI). USDA Forest Service Rocky Mountain Research Station.
2015-19	\$295,443	Lick Creek Demonstration-Research Forest: 25-Year Fire and Cutting Effects on Vegetation and Fuels (PI). USDI Joint Fire Science Program.
2015-18	\$8,000	Lubrecht Experimental Forest Cross Country Ski Trail Maintenance (Co-PI). Recreational Trails Program, Montana Fish, Wildlife & Parks.
2015-17	\$48,115	Guatemala Altiplano Forest Regeneration and Protection Initiative: Research and Technical Transfer Program (PI). USDA Forest Service International Programs.
2015-16	\$57,000	Adaptive Management for Climate Change: Dry Douglas-fir/Western Larch (co-PI). Resource Information Management Board, USDA Forest Service (Northern Region). Keyes Co-Author; funds managed by USFS-RMRS.
2014-16	\$88,938	Assessment of Primary Ecological Factors Influencing Widespread and Severe Mountain Pine Beetle-Caused Mortality Events in Lodgepole Pine Forests within the Western United States (PI). USDA Forest Service Northern Region (Forest Health Protection).
2013-14	\$24,000	Phase III – Effects of Variable-Retention Silvicultural Treatments in Lodgepole Pine on Mountain Pine Beetle Activity, Wildfire Hazard, and Their Interactions (Co-PI). Special Technology Development Program, USDA Forest Service (Forest Health Protection).

2013-16	\$98,069	Effects of Fire and Fire Surrogate Treatments on Ponderosa Pine Crown Fuel Dynamics at Lubrecht Experimental Forest. USDA McIntire-Stennis Forestry Research Program.
2012-16	\$50,700	Phase II – Effects of Variable-Retention Silvicultural Treatments in Lodgepole Pine on Mountain Pine Beetle Activity, Wildfire Hazard, and Their Interactions (Co-PI). Special Technology Development Program, USDA Forest Service (Forest Health Protection).
2011-16	\$5,073,000	Integration of Biofuels and Bioproducts Production in Forest Products Supply Chains Using Modular Biomass Gasification and Carbon Activation (Co-PI). USDA-NIFA Biomass Research and Development Initiative. Keyes share = \$474,689.
2011-16	\$40,000	Phase I – Effects of Variable-Retention Silvicultural Treatments in Lodgepole Pine on Mountain Pine Beetle Activity, Wildfire Hazard, and Their Interactions (Co-PI). Special Technology Development Program, USDA Forest Service (Forest Health Protection).
2011-14	\$23,576	Below-ground impacts of pile burning in the inland Northwest U.S. (Co-PI). USDI Joint Fire Science Program.
2009-12	\$308,598	A Comprehensive Guide to Fuels Management Practices for Ponderosa Pine – Mixed-Conifer Forests (Co-PI). USDI Joint Fire Science Program. Keyes share = \$47,255.
2011-12	\$1,800	Supplement – Inventory of Forest Structure and Composition and the Development of Site-Specific Prescriptions for Two Mechanical Treatment Units in Whiskeytown National Recreation Area. USDI National Park Service.
2010-11	\$166,964	Ecological and Social Dynamics of Mountain Pine Beetle Outbreaks in Western Montana (Lead PI). USDA McIntire-Stennis Forestry Research Program.
2010	\$3,850	Western Mensurationists’ Conference – Special Session and Workshop on Quantification of Tree Crowns and Canopies (Co-PI). USDI Joint Fire Science Program.
2009-11	\$30,000	Improved Restoration Burning in Old-Growth Forests at Whiskeytown National Recreation Area: Decision-Support for Predictable Duff Consumption under Varying Burning and Field Conditions. USDI National Park Service.
2009-10	\$34,956	Vegetation Management and Restoration at Palo Alto Battlefield National Historic Park – Plan and Environmental Assessment. USDI National Park Service.
2009	\$13,842	The Pines Recreation Area: Stand Analysis, Inventory, and Reports. U.S. Army Corps of Engineers.
2008-10	\$30,000	Stand Structure, Understory Vegetation Condition, Fuels Status, and Potential Fire Behavior Before and After Restoration Treatments in Fire-

		Excluded Old Growth Ponderosa Pine and Western Larch Stands in Western Montana. USDA Forest Service Rocky Mountain Research Station.
2008-09	\$30,000	Inventory of Forest Structure and Composition and the Development of Site-Specific Prescriptions for Two Mechanical Treatment Units in Whiskeytown National Recreation Area. USDI National Park Service.
2007-09	\$35,000	Experimental Silvicultural Forest Restoration Treatments at Panther Creek: Implementation and Analysis. California State Parks.
2006-09	\$65,000	Design & Evaluation of Silvicultural Treatments to Restore Watershed Function at Humboldt Redwoods State Park. California State Parks.
2006-08	\$150,000	Natural Resource Condition Assessment for Redwood National and State Parks, Whiskeytown National Recreation Area, and Oregon Caves National Monument. USDI National Park Service.
2006-07	\$25,019	Monitoring & Evaluation of a Technique for Efficient Variable-Density Thinning in Young Stands. California State Parks.
2005-07	\$34,000	Inventory and Analysis of Second-Growth Encroachment in Relict Forest Ecosystems at Whiskeytown National Recreation Area. USDI National Park Service.
2002-07	\$50,000	Ecology and Management of Stump Sprouting in Coast Redwoods (Co-PI). USDA McIntire-Stennis Forestry Research Program.
2005-06	\$19,657	Stand Composition, Structure, and Development of Pre-Commercially Thinned Redwood-Douglas-fir Forests. Save-the-Redwoods League Research Grant.
2005-06	\$8,188	Prescription for Forest Restoration: Panther Creek, Humboldt Redwoods State Park. California State Parks.
2002-06	\$55,000	Comparison of Silvicultural Treatments for Abatement of Wildfire Hazard. USDA McIntire-Stennis Forestry Research Program.
2004	\$17,000	25-Year Assessment of Redwood Ecosystem Response to Restorative Thinning. Save-the-Redwoods League Research Grant.
2003	\$9,982	Strategies for Reforestation and Forest Restoration at Humboldt Redwoods State Park. California State Parks.

Publications

* *Refereed*

2018 Original Research Articles

Crotteau, J.S., S.M. Hood, D.C. Lutes, **C.R. Keyes**, A. Sala, and M.G. Harrington. *In press*. Management and succession at the Lick Creek Demonstration/Research Forest, Montana. *Journal of Forestry*. DOI: 10.1093/jofore/fvy030.*

Crotteau, J.S., **C.R. Keyes**, S.M. Hood, D.L.R. Affleck, and A. Sala. *In press*. Fuel changes after a bark beetle outbreak impacts experimental fuel treatments. *Fire Ecology*.*

Crotteau, J.S., **C.R. Keyes**, S.M. Hood, A.J. Larson, E.K. Sutherland, D.K. Wright, and J.M. Egan. 2018. Stand dynamics 11 years after retention harvest in a lodgepole pine forest. *Forest Ecology and Management* 427:169-181. DOI: 10.1016/j.foreco.2018.05.013.*

Matt, C.P., **C.R. Keyes**, and R.K. Dumroese. 2018. Biochar effects on the nursery propagation of 4 northern Rocky Mountain native plant species. *Native Plants Journal* 19(1):14-26.*

Jang, W., **C.R. Keyes**, and D.S. Page-Dumroese. 2018. Negligible impacts of biomass removal on Douglas-fir growth 29 years after outplanting in the northern Rocky Mountains. *Biomass & Bioenergy* 108:236-243. DOI: 10.1016/j.biombioe.2017.11.012.*

Monographs & Book Chapters

O'Hara, K.L., L.P. Leonard, **C.R. Keyes**, and L. Narayan. 2018. Ch. 12 – Actividades de restauración en bosques jóvenes de *Sequoia sempervirens*: Implicaciones para la restauración de otros tipos de bosques (Restoration activities in young *Sequoia sempervirens* forests: Implications for restoration in other forest types). P. 233-244 in: P.J. Donoso, A. Promis, and D.P. Soto, eds., *Silvicultura en Bosques Nativos: Avances en la Investigación en Chile, Argentina, y Nueva Zelandia*. Oregon State University Press, Corvallis, OR.

Conference Proceedings

Bowen, K.J., **C.R. Keyes**, S.M. Hood, C. Seielstad, and D.C. Lutes. *In press*. Comparison of two methods for quantifying coarse surface fuel loading. P. XX-XX in: Proceedings – The Fire Continuum Conference: Preparing for the Future of Wildland Fire, Missoula, MT, 21-24 May 2018. USDA Forest Service Rocky Mountain Research Station RMRS-P-XXX.*

Management Plans & Project Reports

C.R. Keyes, D. Sicular, and K. Runyon. 2018. Sempervirens 236 Southern Conifer Flats Old Growth Restoration Project: Supplement to the Five-Year Monitoring Study – Statistical Analysis. Sicular Environmental Consulting and Natural Lands Management, Berkeley, CA. Report on file with Sempervirens Fund, Los Altos, CA. 6 p.

D. Sicular, **C.R. Keyes**, J. King, J. Culver, K. Runyon, R. Teitel, and B. Vahey. 2018. Sempervirens 236 Southern Conifer Flats Old Growth Restoration Project: Five-Year Monitoring Study Final Report. Sicular Environmental Consulting and Natural Lands Management, Berkeley, CA. Report on file with Sempervirens Fund, Los Altos, CA. 65 p.

Datasets

Hood, S.M., D.C. Lutes, J.S. Crotteau, **C.R. Keyes**, A. Sala, M.G. Harrington, and G.T. Munger. 2018. Lick Creek historic photograph series: A century of change in a ponderosa pine forest in western Montana, US. Fort Collins, CO: Forest Service Research Data Archive. DOI:10.2737/RDS-2018-0023.

2017 Original Research Articles

Clyatt, K.A., **C.R. Keyes**, and S.M. Hood. 2017. Long-term effects of fuel treatments on aboveground biomass accumulation in ponderosa pine forests of the northern Rocky Mountains. *Forest Ecology and Management* 400:587-599. DOI:10.1016/j.foreco.2017.06.021.*

Keyes, C.R., and C.M. Brissette. 2017. Effect of container size and design on morphological attributes of *Cercocarpus ledifolius* Nutt. (curlleaf mountain mahogany) seedlings. *Tree Planters' Notes* 60(1):37-43.*

Jang, W., **C.R. Keyes**, and D.S. Page-Dumroese. 2017. Long-term regeneration responses to overstory retention and understory vegetation treatments in the northern Rocky Mountains. *Forest Science* 63:136-146. DOI:10.5849/forsci.16-044.*

Conference Proceedings

Teraoka, J.R., P.J. van Mantgem, and **C.R. Keyes**. 2017. Low thinning and crown thinning of two intensities as restoration tools at Redwood National Park. P. 259-266 In: R. Standiford and Y. Valachovic, tech. coords., Proceedings of the Coast Redwood Forest Symposium – 2016, Eureka, CA, 13-15 Sep 2016. USDA Forest Service General Technical Report PSW-GTR-258.*

Datasets

Williams, H.L., S.M. Hood, **C.R. Keyes**, and J.M. Egan. 2017. Mountain pine beetle attack severity data in lodgepole pine in the Northern Rockies from 1998-2014. Fort Collins, CO: Forest Service Research Data Archive. DOI:10.2737/RDS-2017-0006.

2016 Original Research Articles

Jang, W., **C.R. Keyes**, and D.S. Page-Dumroese. 2016. Recovery and diversity of the forest shrub community 38 years after biomass harvesting in the northern Rocky Mountains. *Biomass & Bioenergy* 92:88-97. DOI:10.1016/j.biombioe.2016.06.009.*

Jang, W., D. S. Page-Dumroese, and **C.R. Keyes**. 2016. Long-term soil changes from forest harvesting and residue management in the northern Rocky Mountains. *Soil Science Society of America Journal* 80:727-741. DOI:10.2136/sssaj2015.11.0413.*

Crotteau, J.C., **C.R. Keyes**, E.K. Sutherland, D.K. Wright, and J.M. Egan. 2016. Forest fuels and potential fire behaviour twelve years after variable-retention harvest in lodgepole pine. *International Journal of Wildland Fire* 25:633-645. DOI:10.1071/WF14223.*

Jang, W., **C.R. Keyes**, and J.M. Graham. 2016. Evaluation of predictive models for Douglas-fir bark thickness following 12 biomass harvest treatments. *Biomass and Bioenergy* 84:118-123. DOI:10.1016/j.biombioe.2015.11.015.*

Stover, K.C., and **C.R. Keyes**. 2016. Forest fuels and wildfire hazard in two fire-excluded old-growth ponderosa pine stands: Contrasting stand-average calculations with measures of spatial heterogeneity. *Journal of Biodiversity Management and Forestry* 5:2. DOI:10.4172/2327-4417.1000158. 8 p.*

Book Reviews

Keyes, C.R. 2016. Silviculture concepts tailored to the forests of the North American West. *Journal of Forestry*. 114(6):672. Invited book review: Tappeiner, J.C. II, D.A. Maguire, T.B.

Harrington, and J.D. Bailey. 2015. *Silviculture and Ecology of Western U.S. Forests*, 2nd ed. Oregon State University Press, Corvallis, OR. 448 p. DOI:10.5849/jof.15-495.

2015 Original Research Articles

Jang, W., **C.R. Keyes**, and D.S. Page-Dumroese. 2015. Long-term effects on distribution of forest biomass following different harvesting levels in the northern Rocky Mountains. *Forest Ecology and Management* 358:281-290. DOI:10.1016/j.foreco.2015.09.024.*

Keyes, C.R., and R. Manso. 2015. Climate-influenced ponderosa pine (*Pinus ponderosa*) seed masting trends in western Montana, USA. *Forest Systems* 24(1):e021. 7p. DOI:10.5424/fs/2015241-05606.*

Dodson, E.M., S. Hayes, J. Meek, and **C.R. Keyes**. 2015. Montana logging machine rates. *International Journal of Forest Engineering* 26(2). 11p. DOI:10.1080/14942119.2015.1069497.*

Jang, W., **C.R. Keyes**, S.W. Running, J.-H. Lim, and P.S. Park. 2015. Climate-growth relationships of relict *Picea jezoensis* at Mt. Gyeong, South Korea. *Forest Science and Technology* 11(1):19-26. DOI:10.1080/21580103.2014.940001.*

Monographs & Book Chapters

Jang, W., **C.R. Keyes**, and D. Page-Dumroese. 2015. Impact of biomass harvesting on forest soil productivity in the northern Rocky Mountains. USDA Forest Service General Technical Report RMRS-GTR-341. 35 p. <http://www.treearch.fs.fed.us/pubs/49778>.

Book Reviews

Keyes, C.R. 2015. An authoritative treatment of the dynamics and practical management of complex forest stands. *Ecology* 96(9):2571-2572. Invited book review: O'Hara, K.L. 2014. *Multiaged Silviculture: Managing for Complex Forest Stand Structures*. Oxford University Press, New York, NY. 213 p. DOI:10.1890/BR15-38.1.

Management Plans & Project Reports

Keyes, C.R., D. Sicular, and J. Culver. 2015. Chapter 4: Restoration Reserves. P. 4.1-4.52 in: *San Vicente Redwoods Management Plan*, D. Sicular and others. Report on file with Peninsula Open Space Trust, Palo Alto, CA.

2014 Original Research Articles

Keyes, C.R., T.E. Perry, E.K. Sutherland, D.K. Wright, and J.M. Egan. 2014. Variable-retention harvesting as a silvicultural option for lodgepole pine. *Journal of Forestry*. 112(5):440-445. DOI:10.5849/jof.13-100*

Keyes, C.R., and E.K. Teraoka. 2014. Structure and composition of old-growth and second-growth riparian forests at Redwood National Park, USA. *Forests* 5:256-268. DOI:10.3390/f5020256.*

Technical Transfer Articles

Miller, S., M. Essen, N. Anderson, W. Chung, W. Elliot, D. Page-Dumroese, H-S Han, J. Hogland, and **C.R. Keyes**. 2014. Burgeoning biomass: Creating efficient and sustainable forest biomass supply chains in the Rockies. *Science You Can Use Bulletin*, Issue 13. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO. 10 p.

<http://www.fs.fed.us/rm/science-application-integration/docs/science-you-can-use/2014-09.pdf>

Jain, T.B., M.A. Battaglia, H-S. Han, R.T. Graham, **C.R. Keyes**, J.S. Fried, and J. Sandquist. 2014. A comprehensive guide to fuels management practices for dry mixed conifer forests of the northwestern United States: Inventory and model-based economic analysis of mechanical fuel treatments. USDA Forest Service Research Note RMRS-RN-64. 2 p.

Jain, T.B., M.A. Battaglia, H-S. Han, R.T. Graham, **C.R. Keyes**, J.S. Fried, and J. Sandquist. 2014. A comprehensive guide to fuels management practices for dry mixed conifer forests of the northwestern United States: Monitoring. USDA Forest Service Research Note RMRS-RN-63. 2 p.

Jain, T.B., M.A. Battaglia, H-S. Han, R.T. Graham, **C.R. Keyes**, J.S. Fried, and J. Sandquist. 2014. A comprehensive guide to fuels management practices for dry mixed conifer forests of the northwestern United States: Prescribed fire. USDA Forest Service Research Note RMRS-RN-62. 2 p.

Jain, T.B., M.A. Battaglia, H-S. Han, R.T. Graham, **C.R. Keyes**, J.S. Fried, and J. Sandquist. 2014. A comprehensive guide to fuels management practices for dry mixed conifer forests of the northwestern United States: Mechanical, chemical, and biological fuel treatment methods. USDA Forest Service Research Note RMRS-RN-61. 2 p.

Management Plans & Project Reports

Keyes, C.R., D. Sicular, and J. Culver. 2014. Forest Stands within the CEMEX Redwoods Restoration Reserves: Preliminary Identification of Impaired Forest Condition Classes and Restoration Prescriptions. Peninsula Open Space Trust, Palo Alto, CA. 18 p.

2013 Original Research Articles

Jang, W., **C.R. Keyes**, and J.-H. Lim. 2013. Application of mathematical models in the spatial analysis of early tree seedling distribution patterns within a treefall gap at Gwangneung Experimental Forest, Korea. *Journal of Plant Biology* 56:283-289. DOI: 10.1007/s12374-013-0044-3.*

Garlough, E.C., and **C.R. Keyes**. 2013. Properties of long-unburned duff mounds in an old-growth ponderosa pine stand. *Advances in Forestry Letters* 2:57-60. <http://www.afl-journal.org/paperInfo.aspx?ID=7141>.*

Conference Proceedings

Jang, W., **C.R. Keyes**, and T.E. Perry. 2013. Long-term biomass harvesting effects on forest productivity under three silvicultural systems in the northern Rocky Mountains. In: Proceedings –Council on Forest Engineering Annual Meeting, Missoula, MT, 7-10 July 2013.

2012 Original Research Articles

Affleck, D.L.R., **C.R. Keyes**, and J.M. Goodburn. 2012. Conifer crown fuel modeling: Current limits and potential for improvement. *Western Journal of Applied Forestry* 27:165-169. DOI:10.5849/wjaf.11-039.*

Larson, A.J., K.C. Stover, and **C.R. Keyes**. 2012. Effects of restoration thinning on spatial heterogeneity in old-growth mixed-conifer forest. *Canadian Journal of Forest Research* 42:1505-1517. DOI: 10.1139/X2012-100.*

Manso, R., M. Pardos, **C.R. Keyes**, and R. Calama. 2012. Modelling the spatio-temporal pattern of primary dispersal in stone pine (*Pinus pinea* L.) stands in the northern plateau (Spain). *Ecological Modelling* 226:11-21. DOI: 10.1016/j.ecolmodel.2011.11.028.*

O'Hara, K.L., L.P. Leonard, and **C.R. Keyes**. 2012. Variable-density thinning and a marking paradox: Comparing prescription protocols to attain stand variability in coast redwood. *Western Journal of Applied Forestry* 27:143-149. DOI:10.5849/wjaf.11-042.*

Plummer, J.F., **C.R. Keyes**, and J.M. Varner. 2012. Early-stage thinning for the restoration of young redwood – Douglas-fir forests in northern coastal California, USA. *ISRN Ecology* Vol. 2012, Article ID 725827. 9 p. DOI: 10.5402/2012/725827.*

Monographs & Book Chapters

Jain, T.B., M.A. Battaglia, H-S. Han, R.T. Graham, **C.R. Keyes**, J.S. Fried, and J. Sandquist. 2012. A Comprehensive Guide to Fuels Management Practices for Dry Mixed Conifer Forests of the Northwestern United States. General Technical Report RMRS-GTR-292. Fort Collins, CO: Rocky Mountain Research Station, Forest Service, U.S. Department of Agriculture. 331 p. http://www.fs.fed.us/rm/pubs/rmrs_gtr292.html.*

Conference Proceedings

O'Hara, K.L., L.P. Leonard, and **C.R. Keyes**. 2012. Variable-density thinning in coast redwood: A comparison of marking strategies to attain stand variability. P. 525-526 in *Proceedings of Coast Redwood Forests in a Changing California: A Symposium for Scientists and Managers*, R.B Standiford, T.J. Weller, D.D. Piirto, and J.D. Stuart, tech. coords. USDA Forest Service General Technical Report PSW-GTR-238. http://www.fs.fed.us/psw/publications/documents/psw_gtr238.

Technical Transfer Articles

Keyes, C.R. 2012. A new resource for Montana Tree Farmers: Seedlings and reforestation assistance at the University of Montana's Experimental Seedling Nursery. *Montana Family Forest News* 40:10-11. Montana Tree Farm System, Missoula, MT. www.mttreefarm.org.

Management Plans & Project Reports

Keyes, C.R. 2012. Strategic Plan for Evaluating Outplanting Practices via Experimental Testing. Report for the Lebanon Reforestation Initiative (LRI), a USAID project administered by USDA Forest Service International Programs. Report on File at LRI Headquarters, Beirut, Lebanon. 7 p.

T.E. Perry, and **C.R. Keyes**. 2012. Boulder Creek Forest Restoration Activities – 2012 Summary: Whiskeytown National Recreation Area, Whiskeytown, California. Applied Forest Management Program, Montana Forest & Conservation Experiment Station, University of Montana, Missoula, MT. Report on file at Whiskeytown National Recreation Area, National Park Service, P.O. Box 188, Whiskeytown, CA 96095. 11 p.

Keyes, C.R. 2012. Boosting Outplanting Performance. Review of outplanting practices for the Lebanon Reforestation Initiative (LRI), a USAID project administered by USDA Forest Service International Programs. Report on File at LRI Headquarters, Beirut, Lebanon. 27 p.

Stringer, D.S., and **C.R. Keyes.** 2012. LRI Outplanting Practices Recommendations. Prescribed implementation of outplanting and post-planting practices for the Lebanon Reforestation Initiative (LRI), a USAID project administered by USDA Forest Service International Programs. Report on File at LRI Headquarters, Beirut, Lebanon. 23 p.

2011 Original Research Articles

Garlough, E.C. and **C.R. Keyes.** 2011. Influences of moisture content, mineral content, and bulk density on smouldering combustion of ponderosa pine duff mounds. *International Journal of Wildland Fire* 20:589-596. DOI:10.1071/WF10048.*

Keyes, C.R. 2011. Thinning promotes the restoration of branch structure in second-growth redwoods at Redwood National Park. *Ecological Restoration* 29:325-327. DOI:10.3368/er.29.4.325.*

Teraoka, J.R. and **C.R. Keyes.** 2011. Low thinning as a forest restoration tool at Redwood National Park. *Western Journal of Applied Forestry* 26:91-93.*

Technical Transfer Articles

Keyes, C.R. 2011. Reviving the Memorial Greenhouse. *The University of Montana Forestry and Conservation News* December 2011, p. 7.

Management Plans & Project Reports

T.E. Perry and **C.R. Keyes.** 2011. Whiskeytown National Recreation Area (Whiskeytown, California): Phase II Forest Restoration Activities. Applied Forest Management Program, Montana Forest & Conservation Experiment Station, University of Montana, Missoula, MT. Report on file at Whiskeytown National Recreation Area, National Park Service, P.O. Box 188, Whiskeytown, CA 96095. 24 p.

2010 Original Research Articles

Leonzo, C.M. and **C.R. Keyes.** 2010. Fire-excluded forests in the southeastern Klamath Mountains, California. *Fire Ecology* 6(3):62-76. DOI:10.4996/fireecology.0603062.*

Conference Proceedings

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1996 *Theses / Dissertations*

Keyes, C.R. 1996. Structures and Silvicultural Strategies to Prevent Crown Fires in Northern Rocky Mountain Forests. M.S. Thesis, University of Montana, Missoula, MT. 116 p. <http://scholarworks.umt.edu/etd/3656>.

Presentations

2018 *Presented by Graduate Students / Post-Docs / Staff*

Comparison of two methods for quantifying coarse surface fuel loading. K.J. Bowen, C.R. Keyes, S.M. Hood and D. Lutes. The Fire Continuum Conference: Preparing for the Future of Wildland Fire, Missoula, MT 21-24 May 2018. Poster presentation by K.J. Bowen.

Presented by Collaborators

Long-term impacts of slash pile burning on wood decomposition and fungal communities. D.S. Page-Dumroese, M. Jurgensen, J. Stewart, C.R. Keyes, N. Klopfenstein, C. Miller, and J. Tirocke. 13th North American Forest Soils Conference: Soils-Forests Interactions in Changing Environments, Quebec City, QC, Canada, 10-14 Jun 2018. Poster presentation by D.S. Page-Dumroese.

2017 *Presented by C.R. Keyes*

Impacts of biomass harvesting on forest development and productivity. W. Jang, C.R. Keyes, and D.S. Page-Dumroese. Annual Meeting of the Montana Society of American Foresters, Missoula, MT. 14 Apr 2017. Poster presentation by C.R. Keyes.

An assessment of biochar-amended soilless media for nursery propagation of Rocky Mountain native plants. C.P. Matt, C.R. Keyes, R.K. Dumroese, and A.J. Larson. Annual Meeting of the Montana Society of American Foresters, Missoula, MT. 14 Apr 2017. Poster presentation by C.R. Keyes.

Presented by Graduate Students / Post-Docs / Staff

Are fuel treatments undone by beetle outbreak? Fire & Fire Surrogate Study sheds light. J.C. Crotteau and C.R. Keyes. 2017 Society of American Foresters National Convention, Albuquerque, NM. 15-19 Nov 2017. Oral presentation by J.S. Crotteau.

Stand dynamics 11 years after retention harvest in Rocky Mountain lodgepole pine. J.C. Crotteau and C.R. Keyes. North American Forest Ecology Workshop, Edmonton, AB, Canada. 19-22 Jun 2017. Oral presentation by J.C. Crotteau.

Lessons from the Tenderfoot Project: Structural restoration in Rocky Mountain lodgepole pine. J.S. Crotteau, C.R. Keyes, E.K. Sutherland, D.K. Wright, and J.M. Egan. USDA Forest Service Region 1 Silviculture Workshop, Missoula, MT. 18 Apr 2017. Oral presentation by J.C. Crotteau.

Ponderosa pine growth responses to biochar, fertilizer or woody biomass mastication. H.C. Anderson, C.R. Keyes, D.S. Page-Dumroese, and M.D. Coleman. Annual Meeting of the Montana Society of American Foresters, Missoula, MT. 14 Apr 2017. Poster presentation by H.C. Anderson.

Long-term impacts of fuel treatments on aboveground biomass in ponderosa pine forests of the Intermountain West. K.A. Clyatt, C.R. Keyes, D.S. Page-Dumroese, and S.M. Hood. Annual Meeting of the Montana Society of American Foresters, Missoula, MT. 14 Apr 2017. Poster presentation by K.A. Clyatt.

Fuels dynamics and potential fire behavior after variable retention harvest in lodgepole pine. J.S. Crotteau, C.R. Keyes, E.K. Sutherland, D.K. Wright, and J.M. Egan. Annual Meeting of the Montana Society of American Foresters, Missoula, MT. 14 Apr 2017. Poster presentation by J.S. Crotteau.

Back to the Fire and Fire Surrogate Study for wisdom on fuels treatment longevity. J.S. Crotteau and C.R. Keyes. Annual Meeting of the Montana Society of American Foresters, Missoula, MT. 14 Apr 2017. Poster presentation by J.S. Crotteau.

Effectiveness and longevity of ponderosa pine fuels reduction treatments at Lick Creek Demonstration/Research Forest, Montana. K.J. Jenkins, C.R. Keyes, S.M. Hood, and A. Sala. Annual Meeting of the Montana Society of American Foresters, Missoula, MT. 14 Apr 2017. Poster presentation by K.J. Jenkins.

Stand dynamics 11 years after retention harvest in Rocky Mountain lodgepole pine J.C. Crotteau and C.R. Keyes. Inland Growth and Yield Cooperative, City, Spokane Valley, WA. 13 Mar 2017. Oral presentation by J.C. Crotteau.

2016 Presented by C.R. Keyes

BRDI's-eye view of biomass harvesting impacts on northern Rocky Mountain forests. C.R. Keyes, D.S. Page-Dumroese, W. Jang, K.A. Clyatt, H.C. Anderson, and K.J. Jenkins. 2016 Annual Biomass Research and Development Initiative Meeting, Missoula, MT. 21 Apr 2016. Oral presentation by C.R. Keyes (Invited).

Summary of biochar amendment effects on greenhouse propagated native plant seedling growth and water use. C.R. Keyes, C.P. Matt, and R.K. Dumroese. 2016 Annual Biomass Research and Development Initiative Meeting, Missoula, MT. 20 Apr 2016. Oral presentation by C.R. Keyes (Invited).

An assessment of biochar-amended soilless media for nursery propagation of Rocky Mountain native plants. C.P. Matt, C.R. Keyes, R.K. Dumroese, and A.J. Larson. 2016 Annual Biomass Research and Development Initiative Meeting, Missoula, MT. 19 Apr 2016. Poster presentation by C.R. Keyes.

Presented by Graduate Students / Post-Docs / Staff

Advances in using biochar as a media amendment. C.P. Matt, C.R. Keyes, and R.K. Dumroese. 7th Western Native Plant Conference, Vancouver, WA. 7-8 Dec 2016. Oral presentation by C.P. Matt.

Longevity of fuel reduction treatments at Lick Creek Demonstration / Research Forest. K.J. Jenkins, C.R. Keyes, and S.M. Hood. 3rd Southwest Fire Ecology Conference and 1st Applied Fire Science Workshop – Beyond Hazardous Fuels: Managing Fire for Social, Economic, and Ecological Benefits, Tucson, AZ. 28 Nov – 2 Dec 2016. Oral presentation by K.J. Jenkins.

Effectiveness and longevity of ponderosa pine fuels reduction treatments: A legacy of research at Lick Creek Demonstration/Research Forest in western Montana. K.J. Jenkins, C.R. Keyes, and S.M. Hood. 3rd Southwest Fire Ecology Conference and 1st Applied Fire Science Workshop – Beyond Hazardous Fuels: Managing Fire for Social, Economic, and Ecological Benefits, Tucson, AZ. 28 Nov – 2 Dec 2016. Poster presentation by K.J. Jenkins.

Years down the fire road: Mature tree growth responses to Montana's Fire and Fire Surrogate Study. J.S. Crotteau and C.R. Keyes. 2016 Society of American Foresters National Convention, Madison, WI. 2-6 Nov 2016. Oral presentation by J.S. Crotteau.

Ponderosa pine growth responses to biochar, fertilization or woody biomass mastication. H.C. Anderson, C.R. Keyes, D.S. Page-Dumroese, and M.D. Coleman. 2016 Society of American Foresters National Convention, Madison, WI. 2-6 Nov 2016. Poster presentation by H.C. Anderson.

Effectiveness and longevity of ponderosa pine fuel reduction treatments at Lick Creek Research/Demonstration Forest, Montana. K.J. Jenkins, C.R. Keyes, and S.M. Hood. 2016 Society of American Foresters National Convention, Madison, WI. 2-6 Nov 2016. Poster presentation by K.J. Jenkins.

Long-term impacts of fuel treatments on productivity and biomass in ponderosa pine forests of the Intermountain West. K.A. Clyatt, C.R. Keyes, D.S. Page-Dumroese, and S.M. Hood. 2016 Annual Biomass Research and Development Initiative Meeting, Missoula, MT. 19 Apr 2016. Poster presentation by K.A. Clyatt.

Ponderosa pine ecosystem responses to thinning, biochar, fertilization or mastication in the Bitterroot National Forest: Impacts on tree growth and soil properties. H.C. Anderson, C.R. Keyes, D.S. Page-Dumroese, and M.D. Coleman. 2016 Annual Biomass Research and Development Initiative Meeting, Missoula, MT. 19 Apr 2016. Poster presentation by H.C. Anderson.

Seedling responses to forest biomass harvesting in the northern Rocky Mountains, USA. W. Jang, C.R. Keyes, and D.S. Page-Dumroese. 2016 Annual Biomass Research and Development Initiative Meeting, Missoula, MT. 19 Apr 2016. Poster presentation by W. Jang.

Effectiveness and longevity of ponderosa pine fuels reduction treatments at Lick Creek Demonstration/Research Forest, Montana. K.J. Jenkins, C.R. Keyes, and S.M. Hood. 2016 Annual Biomass Research and Development Initiative Meeting, Missoula, MT. 19 Apr 2016. Poster presentation by K.J. Jenkins.

Ponderosa pine ecosystem responses to thinning, biochar, fertilization or mastication in the Bitterroot National Forest: Impacts on tree growth and soil properties. H.C. Anderson, C.R. Keyes, D.S. Page-Dumroese, and M.D. Coleman. Annual Meeting of the Montana Society of American Foresters, Helena, MT. 15 Apr 2016. Poster presentation by H.C. Anderson.

Forest fuels and potential fire behavior 12 years after variable retention harvest in lodgepole pine. J.S. Crotteau, C.R. Keyes, E.K. Sutherland, D.K. Wright, and J.M. Egan. 5th International Fire Behavior & Fuels Conference, Portland, OR. 11-15 Apr 2016. Oral presentation by J.S. Crotteau.

Back to the Fire and Fire Surrogate Study for wisdom on fuels treatment longevity. J.S. Crotteau and C.R. Keyes. 5th International Fire Behavior & Fuels Conference, Portland, OR. 11-15 Apr 2016. Poster presentation by J.S. Crotteau.

Effectiveness and longevity of ponderosa pine fuels reduction treatments at Lick Creek Demonstration/Research Forest, Montana. K.J. Jenkins, C.R. Keyes, and S.M. Hood. 5th International Fire Behavior & Fuels Conference. Portland, OR. 11-15 Apr 2016. Poster presentation by K.J. Jenkins.

Presented by Collaborators

Maintaining and improving soil and site productivity during bioenergy harvest operations. D.S. Page-Dumroese, C.R. Keyes, and W. Jang. IUFRO Regional Congress for Asia and Oceania 2016 – Forests for Sustainable Development: The Role of Research, Beijing, China. 24-27 Oct 2016. Oral presentation by D.S. Page-Dumroese.

Low thinning and crown thinning of varying intensities as restoration tools at Redwood National Park. J.R. Teraoka, P.J. van Mantgem, and C.R. Keyes. Coast Redwood Science Symposium, Eureka, CA. 13-15 Sep 2016. Poster presentation by J.R. Teraoka.

Ponderosa pine responses to biochar, fertilization or mastication. H.C. Anderson, C.R. Keyes, D.S. Page-Dumroese, and M.D. Coleman. SER Europe Conference 2016 – Best Practice in Restoration, Freising, Germany. 22-26 Aug 2016. Poster presentation by D.S. Page-Dumroese.

2015 Presented by C.R. Keyes

Stand dynamics following variable-retention harvesting in lodgepole pine. C.R. Keyes, J.S. Crotteau, E.K. Sutherland, D.K. Wright, J.M. Egan, and T.E. Perry. 2015 Society of American Foresters National Convention, Baton Rouge, LA. 3-7 Nov 2015. Oral presentation by C.R. Keyes.

Regeneration and growth of lodgepole pine (*Pinus contorta*) following experimental variable-retention harvesting in the northern Rocky Mountains, USA. C.R. Keyes, E.K. Sutherland, D.K. Wright, J.M. Egan, and J.S. Crotteau. Reforestation Challenges: First International Symposium, Belgrade, Serbia. 3-6 Jun 2015. Oral presentation by C.R. Keyes.

Seedling responses to forest biomass harvesting in the northern Rocky Mountains, USA. W. Jang, C.R. Keyes, and D.S. Page-Dumroese. Reforestation Challenges: First International Symposium, Belgrade, Serbia. 3-6 Jun 2015. Poster presentation by C.R. Keyes.

Lodgepole pine forest dynamics and management options. USDA Forest Service Northern Region Silviculture – Wildlife Workshop, Missoula, MT. 8 Apr 2015. Oral presentation by C.R. Keyes (Invited).

Biomass harvesting impacts on forest condition & productivity in the northern Rocky Mountains. 2015 Annual Biomass Research and Development Initiative Meeting, Baton Rouge, LA. 19 Feb 2015. Oral presentation by C.R. Keyes (Invited).

Presented by Graduate Students / Post-Docs / Staff

Lick Creek Demonstration-Research Forest: 25- year fire and cutting effects on vegetation and fuels. S.M. Hood, C.R. Keyes, A. Sala, D.C. Lutes, K.A. Clyatt, and K.J. Jenkins. 6th International Fire Ecology & Management Congress: Advancing Ecology in Fire Management, San Antonio, TX. 16-20 Nov 2015. Poster presentation by S.M. Hood.

Long-term impacts of intensive forest biomass utilization on understory shrub vegetation. W. Jang, C.R. Keyes, and D.S. Page-Dumroese. 2015 Society of American Foresters National Convention, Baton Rouge, LA. 3-7 Nov 2015. Oral presentation by W. Jang.

Lodgepole pine forest conditions influencing mountain pine beetle outbreaks in the western US. S.M. Hood, C.R. Keyes, and J.M. Egan. 2015 Society of American Foresters National Convention, Baton Rouge, LA. 3-7 Nov 2015. Oral presentation by S.M. Hood.

Forest fuels and potential fire behavior 12 years after variable retention harvest in lodgepole pine. J.S. Crotteau, C.R. Keyes, E.K. Sutherland, D.K. Wright, and J.M. Egan. 2015 Society of American Foresters National Convention, Baton Rouge, LA. 3-7 Nov 2015. Oral presentation by J.S. Crotteau.

Back to the Fire and Fire Surrogate Study for wisdom on fuels treatment longevity. J.S. Crotteau and C.R. Keyes. 2015 Society of American Foresters National Convention, Baton Rouge, LA. 3-7 Nov 2015. Poster presentation by J.S. Crotteau.

Long-term impacts of fuel treatments on productivity and biomass in ponderosa pine forests of the Intermountain West. K.A. Clyatt, C.R. Keyes, D.S. Page-Dumroese, and S.M. Hood. 2015 Society of American Foresters National Convention, Baton Rouge, LA. 3-7 Nov 2015. Poster presentation by K.A. Clyatt.

Ponderosa pine responses to biochar treatments on the Bitterroot National Forest: Impacts on tree growth and soil properties. H.C. Anderson, C.R. Keyes, D.S. Page-Dumroese, and M.D. Coleman. 2015 Society of American Foresters National Convention, Baton Rouge, LA. 3-7 Nov 2015. Poster presentation by H.C. Anderson.

Effectiveness and longevity of ponderosa pine fuels reduction treatments at Lick Creek Research Forest, Montana USA. K.J. Jenkins, C.R. Keyes, and S.M. Hood. 2015 Society of American Foresters National Convention, Baton Rouge, LA. 3-7 Nov 2015. Poster presentation by K.J. Jenkins.

Advances in biochar as a media amendment. C.P. Matt, C.R. Keyes, A.J. Larson, and R.K. Dumroese. 2015 Intertribal Nursery Council Meeting, Pendleton, OR. 22-24 Sep 2015. Oral presentation by C.P. Matt.

Advances in biochar as a media amendment. C.P. Matt, C.R. Keyes, A.J. Larson, and R.K. Dumroese. 36th Intermountain Container Seedling Growers Association Annual Meeting, Moscow, ID. 16-17 Sep 2015. Oral presentation by C.P. Matt.

Retention forestry in the northern Rockies: Making time and space work for stand stability. J.S. Crotteau, C.R. Keyes, E.K. Sutherland, D.K. Wright, and J.M. Egan. 2015 10th North American Forest Ecology Workshop, Veracruz, Mexico. 14-18 Jun 2015. Oral presentation by J.S. Crotteau.

An assessment of biochar-amended soilless media for the nursery propagation of Rocky Mountain native plants. C.P. Matt, C.R. Keyes, R.K. Dumroese, and A.J. Larson. University of Montana Graduate Student Research Conference, Missoula, MT. 18 Apr 2015. Poster presentation by C.P. Matt.

Ponderosa pine forest restoration treatments in the northern Rocky Mountains: Long-term implications for residual biomass and productivity. K.A. Clyatt, C.R. Keyes, and D.S. Page-Dumroese. Montana Society of American Foresters Annual Meeting: Effective Forest Practices for Today's Resource Challenges, Whitefish, MT. 10-11 Apr 2015. Poster presentation by K.A. Clyatt.

Seedling responses to biomass extraction in the northern Rocky Mountains, USA: Indicators of forest productivity impacts. W. Jang, C.R. Keyes, and D.S. Page-Dumroese. Montana Society of American Foresters Annual Meeting: Effective Forest Practices for Today's Resource Challenges, Whitefish, MT. 10-11 Apr 2015. Poster presentation by W. Jang.

Fuels dynamics and potential fire behavior after variable retention harvest in lodgepole pine. J.S. Crotteau, C.R. Keyes, E.K. Sutherland, D.K. Wright, and J.M. Egan. Montana Society of American Foresters Annual Meeting: Effective Forest Practices for Today's Resource Challenges, Whitefish, MT. 10-11 Apr 2015. Poster presentation by J.S. Crotteau. Awarded best student poster.

An assessment of biochar-amended soilless media for the nursery propagation of Rocky Mountain native plants. C.P. Matt, C.R. Keyes, R.K. Dumroese, and A.J. Larson. Montana Society of American Foresters Annual Meeting: Effective Forest Practices for Today's Resource Challenges, Whitefish, MT. 10-11 Apr 2015. Poster presentation by C.P. Matt.

2014 *Presented by C.R. Keyes*

San Vicente Redwoods Management Plan: Restoration Reserves. C.R. Keyes and D. Sicular. Presentation to staff of Sempervirens Fund, Save-the-Redwoods League, and Peninsula Open Space Trust, Palo Alto, CA. 21 Oct 2014. Oral presentation by C.R. Keyes (Invited).

Indicators of biomass harvesting effects on northern Rocky Mountain mixed conifer forest condition and productivity. 2014 Annual Biomass Research and Development Initiative Meeting, Charlotte, NC. Oral presentation by C.R. Keyes (Invited).

Presented by Graduate Students / Post-Docs / Staff

Long-term planted seedling responses to forest biomass utilization intensity in the northern Rockies. W. Jang, C.R. Keyes, and D.S. Page-Dumroese. 14th IUFRO World Congress and 2014 Society of American Foresters National Convention. Salt Lake City, UT. 6-11 Oct 2014. Oral presentation by W. Jang.

Fuels dynamics and potential fire behavior after variable retention harvest in lodgepole pine. J.S. Crotteau, C.R. Keyes, E.K. Sutherland, D.K. Wright, and J.M. Egan. Large Wildland Fires: Social, Political & Ecological Effects Conference, Missoula, MT. 19-23 May 2014. Poster presentation by J.S. Crotteau.

Segmented polynomial regression provides best predictive model for Rocky Mountain Douglas-fir bark thickness following four biomass harvest utilization treatments. W. Jang, C.R. Keyes, and J.M. Graham. 2014 Montana SAF State Meeting: Building Capacity to Manage Forests in a Climate of Change, Missoula, MT. 11 Apr 2014. Poster presentation by W. Jang. Awarded best student poster.

Managing for stand resilience in Rocky Mountain lodgepole pine: Effects of heterogeneous stand treatments on woody fuel dynamics, postulated fire behavior. J.S. Crotteau, C.R. Keyes, E.K. Sutherland, D.K. Wright, and J.M. Egan. 85th Annual Northwest Scientific Association Conference, Missoula, MT. 26-29 Mar 2014. Poster presentation by J.S. Crotteau.

2013 *Presented by C.R. Keyes*

Evaluating dispersed and aggregated variable-retention cutting in lodgepole pine. 2013 Society of American Foresters National Convention, Charleston, SC. 23-27 Oct 2013. Oral presentation by C.R. Keyes.

Silviculture research in the Interior West: New frontiers. Seminar, Forest and Woodland Ecosystems Science Program, USDA Forest Service Rocky Mountain Research Station, Missoula, MT. 23 Apr 2013. Oral presentation by C.R. Keyes (Invited).

Presented by Graduate Students / Post-Docs / Staff

Impact of biomass harvesting on forest productivity and species composition in the northern Rockies. W. Jang, C.R. Keyes, and D.S. Page-Dumroese. 2013 Society of American Foresters National Convention, Charleston, SC. 23-27 Oct 2013. Oral presentation by W. Jang.

Long-term biomass harvesting effects on forest productivity under three silvicultural systems in the northern Rocky Mountains. W. Jang, C.R. Keyes, and T.E. Perry. 2013 Council on Forest Engineering Annual Meeting, Missoula, MT. 7-10 Jul 2013. Oral presentation by W. Jang.

2012 *Presented by C.R. Keyes*

Biomass harvesting effects on forest condition and productivity. C.R. Keyes, D.S. Page-Dumroese, and W. Jang. 2012 Annual BRDI Meeting, Spokane, WA. 10 Oct 2012. Oral presentation by C.R. Keyes (Invited).

Silvicultural management of coppice-regenerated redwood stump sprouts. C.R. Keyes. Inland Empire Reforestation Council Annual Meeting, Coeur d'Alene, ID. 28 Feb 2012. Oral presentation by C.R. Keyes (Invited).

Presented by Graduate Students / Post-Docs / Staff

Thinning intensity studies and growth modeling of Montana mixed conifer forests at the University of Montana's Lubrecht Experimental Forest. T.E. Perry and C.R. Keyes. 2012 Inland Northwest Growth & Yield Cooperative Technical Meeting, Spokane, WA. 6-7 Mar 2012. Oral presentation by T.E. Perry.

Ponderosa pine seedling height growth beneath partial overstories in the central Oregon Cascade Range. W. Jang, C.R. Keyes, D.L.R. Affleck, and D.A. Maguire. 2012 Inland Growth & Yield Cooperative Technical Meeting, Spokane, WA. 6-7 Mar 2012. Oral presentation by W. Jang.

Evaluating the silvicultural potential of variable-retention harvesting in lodgepole pine. T.E. Perry, C.R. Keyes, E.K. Sutherland, D.K. Wright, J.M. Egan, and B.E. Steed. 2012 Society of American Foresters National Convention, Spokane, WA. 25-27 Oct 2012. Poster presentation by T.E. Perry.

Consequences of biomass harvesting on forest condition and productivity in northern Rocky Mountain forests. W. Jang, C.R. Keyes, and D.S. Page-Dumroese. 2012 Society of American Foresters National Convention, Spokane, WA. 25-27 Oct 2012. Poster presentation by W. Jang.

2011 Presented by C.R. Keyes

Silvicultural restoration of second-growth redwood forests: Challenges and strategies. C.R. Keyes. 4th World Conference on Ecological Restoration, Merida, Mexico. 21-25 Aug 2011. Oral presentation by C.R. Keyes.

Presented by Collaborators

A comprehensive guide to fuels management practices for ponderosa pine / mixed conifer forests. M.A. Battaglia, T.B Jain, C.R. Keyes, H.-S. Han, and R.T. Graham. Interior West Fire Ecology Conference: Challenges and Opportunities in a Changing World, Snowbird Resort, UT. 14-17 Nov 2011. Poster presentation by M.A. Battaglia.

A comprehensive guide to fuels management practices for ponderosa pine / mixed conifer forests. M.A. Battaglia, T.B Jain, C.R. Keyes, H.-S. Han, and R.T. Graham. 2011 Society of American Foresters National Convention. Honolulu, HI. 2-6 Nov 2011. Poster presentation.

2010 Presented by C.R. Keyes

The Applied Forest Management Program: Research, demonstration, outreach. C.R. Keyes and T.E. Perry. Frontiers in Forestry and Forest Science: Annual Meeting of the Montana Society of American Foresters, Missoula, MT. 22-23 Apr 2010. Poster presentation by C.R. Keyes.

Presented by Collaborators

A comprehensive guide to fuels management practices for ponderosa pine / mixed conifer forests. M.A. Battaglia, T.B Jain, C.R. Keyes, H.-S. Han, and R.T. Graham. 3rd Fire Behavior and Fuels Conference, Spokane, WA. 25-29 Oct 2010. Poster presentation by M.A. Battaglia.

A comprehensive guide to fuels management practices for ponderosa pine / mixed conifer forests. M.A. Battaglia, T.B Jain, C.R. Keyes, H.-S. Han, and R.T. Graham. Frontiers in

Forestry and Forest Science: Annual Meeting of the Montana Society of American Foresters, Missoula, MT. 22-23 Apr 2010. Poster presentation.

A comprehensive guide to fuels management practices for ponderosa pine / mixed conifer forests. M.A. Battaglia, T.B Jain, C.R. Keyes, H.-S. Han, and R.T. Graham. USDA Forest Service Rocky Mountain Research Station All-Scientists Meeting, Fort Collins, CO. 22-24 Mar 2010. Poster presentation by M.A. Battaglia.

2009 *Presented by C.R. Keyes*

Built for the future: New directions in silviculture research and demonstration at Montana's Lubrecht Experimental Forest. C.R. Keyes and T.E. Perry. 2009 National Silviculture Workshop, Boise, ID. 15-18 Jun 2009. Oral presentation by C.R. Keyes.

Variable-density thinning for parks and reserves: an experimental case study at Humboldt Redwoods State Park, California. C.R. Keyes, T.E. Perry, and J.F. Plummer. 2009 National Silviculture Workshop, Boise, ID. 15-18 Jun 2009. Poster presentation by C.R. Keyes.

Presented by Collaborators

A comprehensive guide to fuels management practices for ponderosa pine / mixed conifer forests. M.A. Battaglia, T.B Jain, C.R. Keyes, H.-S. Han, and R.T. Graham. 4th International Fire Ecology and Management Congress: Fire as a Global Process, Savannah, GA. 30 Nov – 4 Dec 2009. Poster presentation.

2008 *Presented by C.R. Keyes*

From stumps to stratosphere: Emerging silvicultural applications in the redwood empire. C.R. Keyes. Montana Society of American Foresters, Libby Chapter Meeting, Libby, MT. 15 May 2008. Oral presentation by C.R. Keyes (Invited).

2007 *Presented by C.R. Keyes*

Variable-density thinning as a disturbance force to restore natural conditions in re-growth forests. C.R. Keyes. IUFRO Natural Hazards and Natural Disturbances in Mountain Forests: Challenges and Opportunities for Silviculture conference, Trento, Italy. 18-21 Apr 2007. Oral presentation by C.R. Keyes.

New challenges and opportunities for active forest management. C.R. Keyes. Montana Society of American Foresters, Eastside Chapter Meeting, Helena, MT. 17 Dec 2007. Oral presentation by C.R. Keyes (Invited).

Active forest management: Adapting silviculture to new challenges. C.R. Keyes. Montana Society of American Foresters, Flathead Chapter Meeting, Kalispell, MT. 13 Dec 2007. Oral presentation by C.R. Keyes (Invited).

McCrone Promising Faculty Scholar Awards Reception, Humboldt State University, Arcata, CA. 26 Apr 2007. Oral presentation by C.R. Keyes (Invited).

Presented by Collaborators

Fuels management and old-growth restoration: Silvicultural options for discordant objectives. J.M. Varner and C.R. Keyes. 2nd Fire Behavior and Fuels Conference: Fire

Behavior Fundamentals and Applications, Destin, FL. 26-30 Mar 2007. Poster presentation by J.M. Varner.

2006 *Presented by C.R. Keyes*

Foliar moisture contents of North American conifers. C.R. Keyes. 1st Fire Behavior and Fuels Conference: Fuels Management – How to Measure Success, Portland, OR. 28-30 Mar 2006. Poster presentation by C.R. Keyes.

Invited Panelist. Sustainable Forestry in the West: Past, Present, and Future symposium, The Bill Lane Center for the American West, Stanford University, Palo Alto, CA. (Invited).

Old tool with a new edge: Thinning to restore disturbed forests. C.R. Keyes. City of Arcata Forest Lecture Series, Arcata, CA. 19 Jan 2006. Oral presentation by C.R. Keyes (Invited).

Resurrecting giants: Silvicultural forest restoration at Redwood National Park. Seminar, Sustainable Forest Ecosystems in Central Appalachian Forests Science Program, USDA Forest Service Northeastern Research Station, Parsons, WV. 24 Apr 2004. Oral presentation by C.R. Keyes (Invited).

Presented by Graduate Students / Post-Docs / Staff

Stand structure and development of pre-commercially thinned coast redwood – Douglas-fir forests. J.F. Plummer and C.R. Keyes. National Meeting of the Society of American Foresters, Pittsburgh, PA. 25-29 Oct 2006. Poster presentation by J.F. Plummer.

2005 *Presented by C.R. Keyes*

Applying silvicultural principles to redwood forest restoration: A case study and experiment at Redwood National Park, USA. C.R. Keyes, A.J. Chittick, L.A. Arguello, and J.R. Teraoka. The World Conference on Ecological Restoration, Zaragoza, Spain. 12-18 Sep 2005. Oral presentation by C.R. Keyes.

Intensive management of stump sprout reproduction in coppice-regenerated coast redwoods (*Sequoia sempervirens*). C.R. Keyes and P.J. Matzka. The Thin Green Line: A Symposium on the State-of-the-Art in Reforestation, Thunder Bay, Ontario, Canada. 26-28 Jul 2005. Oral presentation by C.R. Keyes.

Putting out fire with gasoline: Pitfalls in the silvicultural treatment of canopy fuels. C.R. Keyes and J.M. Varner. The 2005 National Silviculture Workshop, Tahoe City, CA. 6-10 Jun 2005. Poster presentation by C.R. Keyes.

Exploratory assessment of redwood branch dimensions at the Holter Ridge Thinning Study, Redwood National Park. Y.R. King, M.J. Lombardi, and C.R. Keyes. 78th Annual Meeting of the Northwest Scientific Association, Corvallis, OR. 23-26 Mar 2005. Poster presentation by C.R. Keyes.

2004 *Presented by C.R. Keyes*

Positive seedling-shrub relationships in natural regeneration of ponderosa pine. C.R. Keyes and D.A. Maguire. Ponderosa Pine: Management, Issues and Trends conference, Klamath Falls, OR. 18-21 Oct 2004. Oral presentation by C.R. Keyes (Invited).

Observed dynamics of ponderosa pine (*Pinus ponderosa* var. *ponderosa* Dougl. ex Laws) seedling recruitment in the Cascade Range, USA. C.R. Keyes and D.A. Maguire. IUFRO Regenerating Mountain Forests – Prerequisite for Sustainable Management symposium, Kloster Seeon, Bavaria, Germany. 12-16 Sep 2004. Oral presentation by C.R. Keyes.

Silvicultural treatments to control stump sprout density in coast redwoods. C.R. Keyes and P.J. Matzka. Redwood Region Forest Science Symposium: What Does the Future Hold?, Rohnert Park, CA. 15-17 Mar 2004. Poster presentation by C.R. Keyes.

Regeneration dynamics of ponderosa pine seedlings beneath partial overstories. Seminar, Disturbance Ecology and Management of Oak-Dominated Forests Science Program, USDA Forest Service Northeastern Research Station, Morgantown, WV. 7 Jan 2004. Oral presentation by C.R. Keyes (Invited).

Presented by Graduate Students / Post-Docs / Staff

Holter Ridge Thinning Study, Redwood National Park: Preliminary results of a 25-year retrospective. A.J. Chittick and C.R. Keyes. Redwood Region Forest Science Symposium: What Does the Future Hold?, Rohnert Park, CA. 15-17 Mar 2004. Oral presentation by A.J. Chittick.

2001 Presented by C.R. Keyes

Primer on silvicultural practices and systems. C.R. Keyes. Docent Training Program, Campus Center for Appropriate Technology, Humboldt State University, Arcata, CA. Oct 2001. Oral presentation by C.R. Keyes (Invited).

Using silviculture to prevent crown fires. Seminar, Department of Forestry and Watershed Management, Humboldt State University, Arcata, CA. Apr 2001. Oral presentation by C.R. Keyes (Invited).

Recruitment and growth of ponderosa pine seedlings under variable retention harvests. Seminar, Department of Forestry and Watershed Management, Humboldt State University, Arcata, CA. Apr 2001. Oral presentation by C.R. Keyes (Invited).

2000 Presented by C.R. Keyes

Regeneration studies associated with the Demonstration of Ecosystem Management Options project: Initial findings. Demonstration of Ecosystem Management Options (DEMO) Project Cooperator's Conference, Vancouver, WA. 14 Dec 2000. Oral presentation by C.R. Keyes (Invited).

Growth of ponderosa pine seedlings under partial overstories. Seminar, Department of Environmental Science, Policy and Management, University of California, Berkeley, CA. 30 Oct 2000. Oral presentation by C.R. Keyes (Invited).

1999 Presented by C.R. Keyes

A long-term study of ponderosa pine regeneration dynamics under partial overstories. C.R. Keyes w/ D.A. Maguire. 1999 Society of American Foresters National Convention, Portland, OR. 11-15 Sep 1999. Poster presentation by C.R. Keyes.

Natural regeneration dynamics and early growth trends of two-aged ponderosa pine stands. C.R. Keyes and D.A. Maguire. Natural Resources Division of the Confederated Tribes of Warm Springs, Warm Springs, OR. Feb 1999. Oral presentation by C.R. Keyes (Invited).

1997 *Presented by C.R. Keyes*

Designing silvicultural guidelines to prevent crown fires in the northern Rockies. C.R. Keyes. Topics in Silviculture Seminar Series, Oregon State University, Corvallis, OR. 24 Nov 1997. Oral presentation by C.R. Keyes (Invited).

Yields from a long-rotation thinning regime in coastal Douglas-fir. C.R. Keyes and S.D. Stinson. Symposium on Thinning in Westside Forests, Newport, OR. 1-2 Apr 1997. Poster presentation by C.R. Keyes.

1996 *Presented by C.R. Keyes*

Silvicultural opportunities for restoring low-intensity fire regimes to Northern Rocky Mountain forests. C.R. Keyes and K.L. O'Hara. Montana Academy of Sciences Symposium on Ecosystem Conservation, Preservation, and Restoration, Missoula, MT. Apr 1996. Oral presentation by C.R. Keyes.

University Courses Taught

University of Montana

- 2018** Multiple-Resource Silviculture (Instructor). 3 cr.
Emerging Topics in Silviculture (Co-Instructor). 1 cr.
- 2017** Multiple-Resource Silviculture (Instructor). 3 cr.
- 2015** Multiple-Resource Silviculture (Instructor). 3 cr.
Emerging Topics in Silviculture (Co-Instructor). 2 cr.
- 2014** Multiple-Resource Silviculture (Instructor). 3 cr.
Forestry and Conservation Graduate Seminar (Seminar Coordinator). 1 cr.
- 2013** Multiple-Resource Silviculture (Instructor). 3 cr.
Applied Forest Restoration: Guatemala (Instructor). Study-abroad field course. 2 cr.
- 2012** Multiple-Resource Silviculture (Instructor). 3 cr.
Silviculture Research: Forest Regeneration (Instructor). 1 cr.
- 2011** Multiple-Resource Silviculture (Instructor). 3 cr.
- 2010** Multiple-Resource Silviculture (Instructor). 3 cr.
- 2009** Multiple-Resource Silviculture (Instructor). 3 cr.
Timber Stand Management (Instructor). 3 cr.
- 2008** Multiple-Resource Silviculture (Instructor). 3 cr.

Humboldt State University

- 2007** Silvicultural Restoration of Disturbed Forests (Instructor). 2 cr.
Silviculture (Instructor). 4 cr.
Forestry Capstone (Instructor). 3 cr.
- 2006** Forest Resource Protection (Instructor). 4 cr.
Silviculture (Instructor). 4 cr.
Forestry Capstone (Instructor). 3 cr.

- 2005 Applied Forest Ecology (Instructor). 3 cr.
Forest Resource Protection (Instructor). 4 cr.
Silviculture (Instructor). 4 cr.
Forestry Capstone (Instructor). 3 cr.
- 2004 Advanced Silviculture (Instructor). 3 cr.
Applied Forest Ecology (Instructor). 3 cr.
Forest Resource Protection (Instructor). 4 cr.
Silviculture (Instructor). 4 cr.
Forestry Capstone (Instructor). 3 cr.
- 2003 Applied Forest Ecology (Instructor). 3 cr.
Forest Resource Protection (Instructor). 4 cr.
Silviculture (Instructor). 4 cr.
Forestry Capstone (Instructor). 3 cr.
Wildland Fire and Fuels Management (Instructor). 1 cr.
American Wildland Fire History (Instructor). 1 cr.
- 2002 Applied Forest Ecology (Instructor). 3 cr.
Forest Resource Protection (Instructor). 4 cr.
Silviculture (Instructor). 4 cr.
Forestry Capstone (Instructor). 3 cr.
- 2001 Forest Regeneration Ecology (Instructor). 3 cr.
Forest Resource Protection (Instructor). 4 cr.
Forestry Capstone (Instructor). 3 cr.

Oregon State University

- 1998 Topics in Silviculture (Seminar Coordinator). 1 cr.
- 1997 Introduction to Forestry (Teaching Assistant). 3 cr.

University of Massachusetts

- 1993 Forest Ecology (Teaching Assistant). 3 cr.

Professional Service & Outreach

- 2000- Manuscript & Book Reviewer: Forest Science, Ecology, Journal of Forestry, Forest Ecology and Management, Forests, National Geographic, New Forests, Northern Journal of Applied Forestry, Western Journal of Applied Forestry, Fire Ecology, Restoration Ecology, Landscape and Urban Planning, Environmental Management, Northwest Science, USDA Forest Service PSW and RMRS Research Stations.
- 2018 Field Tour Co-Leader– Fire & Fire Surrogates Study at Lubrecht Experimental Forest. Part of The Fire Continuum Conference: Preparing for the Future of Wildland Fire, Missoula, MT. 23 May 2018.
- 2018 Field Event Speaker – 1st Western RxBurn Field Tour, Lubrecht Experimental Forest. Part of The Fire Continuum Conference: Preparing for the Future of Wildland Fire, Missoula, MT. 25 May 2018.
- 2018 Field Tour & Workshop Co-Leader – Long-Term Fuel Treatment Effects in Ponderosa Pine and Dry Mixed Conifer Forests: 17 Years after the Fire & Fire Surrogates Study. Sponsored by Northern Rockies Fire Science Network; co-sponsored by UM-FCFC,

- USDA Forest Service Rocky Mountain Research Station, and MFCES. Lubrecht Experimental Forest, Greenough, MT. 31 May 2018.
- 2018** Invited Moderator, Session on Precommercial Thinning, Inland Northwest Growth & Yield Cooperative Winter Technical Meeting, Coeur d'Alene, ID. 16 Apr 2018.
- 2017** "Grow Your Own Seedlings" 1-day classroom/greenhouse workshop for private family forest owners. Forestry Mini-College, Montana State University Extension Service, Missoula, MT.
- 2015** Invited Member of Scientific Planning Committee – Reforestation Challenges: First International Symposium (IUFRO), Belgrade, Serbia.
- 2014** "Seedling Factory" 1-day reforestation/nursery practice workshop for schoolchildren. Missoula (MT) County Public Schools, Gifted Education program.
- 2013** Session Moderator, "Resource Assessment for Operational Planning," *Council on Forest Engineering Annual Meeting*. Missoula, MT.
- 2013** "Reforestation Station" 1-day reforestation/nursery practice workshop for Montana/Wyoming Girl Scouts. Missoula (MT).
- 2013** "Seedling Factory" 1-day reforestation/nursery practice workshop for schoolchildren. Missoula (MT) County Public Schools, Gifted Education program.
- 2011-12** Outplanting Advisor. Lebanon Reforestation Initiative, a program of USAID and USDA Forest Service International Programs, Beirut, Lebanon.
- 2012** "Forest Regeneration" 1-day workshop for private family forest owners. Forestry Mini-College, Montana State University Extension Service, Missoula, MT.
- 2012** "Seedling Factory" 1-day reforestation/nursery practice workshop for schoolchildren. Missoula (MT) County Public Schools, Gifted Education program.
- 2012** Conference Co-Coordinator. *Inland Empire Reforestation Council Annual Meeting*, Coeur d'Alene, ID.
- 2011** "Forest Regeneration" 1-day workshop for private family forest owners. Forestry Mini-College, Montana State University Extension Service, Missoula, MT.
- 2011** Symposium Chair and Moderator. "Forest Restoration as a Dynamic Process: Concept and Application in Temperate Forests" symposium at the 4th World Conference on Ecological Restoration, Merida, MX.
- 2011** "Seedling Factory" 1-day reforestation/nursery practice workshop for schoolchildren. Missoula (MT) County Public Schools, Gifted Education program.
- 2010** Conference Coordinator. *Frontiers in Forestry and Forest Science Conference: Annual Meeting of the Montana Society of American Foresters*, Missoula, MT.
- 2010** Conference Co-Organizer. *Western Mensurationists' Conference*, Missoula, MT.
- 2008** Field Tour Leader. Joint Fire Science Program *Fire & Fire Surrogates Study* Site Review Team, Lubrecht Experimental Forest, MT. Tour and overview of long-term ecological research installations.
- 2008** Co-Organizer. *Red Storm: Bark Beetles in Montana* symposium, Missoula, MT.
- 2008** Panel Moderator, "Management Practices and Policies" session, *Red Storm: Bark Beetles in Montana* symposium, Missoula, MT.
- 2008** Field Tour Leader. Forest Stewardship Council of the Montana Department of Natural Resources and Conservation. Interpretive tour of forest stewardship demonstrations at Lubrecht Experimental Forest, MT.
- 2001-07** Silviculture Advisor. L.W. Schatz Demonstration Tree Farm, Maple Creek, CA. Establishment of reforestation, thinning, and fuels management demonstration areas.
- 2003-06** Lecturer. SAF Forestry Institute for Teachers, Arcata, CA. Lecture and field overview of silviculture and forest stand dynamics.

- 2005** Symposium Chair and Moderator. “Resurrecting Giants: Forest Restoration in the Redwood Empire” symposium at the 1st World Conference on Ecological Restoration (Society for Ecological Restoration), Zaragoza, Spain.
- 1996** Assistant Program Coordinator. *Continuing Education in Ecosystem Management Workshop Module IV*. Montana Forest & Conservation Experiment Station, Missoula, MT.
- 1995** Assistant Program Coordinator. *Uneven-Aged Management: Opportunities, Constraints, and Methodologies Workshop*. University of Montana, Missoula, MT.

Graduate Students

Advisor & Graduate Committee Chair

UM = University of Montana; HSU = Humboldt State University

- In prep** Ben G. O’Connor, MS (UM) – Lodgepole Pine Forest Stand Dynamics following Mountain Pine Beetle Outbreak and Salvage Logging at Lubrecht Experimental Forest.
- 2018** Katelynn J. Jenkins, MS (UM) – Effectiveness and Longevity of Ponderosa Pine Fuels Reduction Treatments: A Legacy of Research at Lick Creek Demonstration/Research Forest in Western Montana.
- 2017** Justin S. Crotteau, PhD (UM) – Forest Vegetation, Fuel, and Fire Hazard Development in Stands Treated to Resist Crown Fire.
- 2017** Haley C. Anderson, MS (UM) – Ponderosa Pine Responses to Biochar, Fertilization, and Mastication in the Bitterroot National Forest, USA.
- 2016** Kate A. Clyatt, MS (UM) – Long-Term Impacts of Fuel Treatments on Tree Growth and Aboveground Biomass Accumulation in Ponderosa Pine Forests of the Northern Rocky Mountains.
- 2015** Woongsoon Jang, PhD (UM) – Consequences of Biomass Harvesting on Forest Condition and Productivity in Northern Rocky Mountain Forests.
- 2015** Clarice P. Matt, MS (UM) – Assessment of Biochar-Amended Soilless Growing Media for Nursery Propagation of Rocky Mountain Native Plants.
- 2011** Kyle C. Stover, MS (UM) – Stand Structure, Wildfire Hazard, and Fuels Heterogeneity in Dry and Moist Old-Growth Ponderosa Pine Forests: Case Studies from Western Montana.
- 2010** Emily C. Garlough, MS (UM) – Factors that Influence Ponderosa Pine Duff Mound Consumption.
- 2010** Emily K. Teraoka, MS (HSU) – Structure and Composition in Old-Growth and Unmanaged Second-Growth Riparian Forests at Redwood National Park.
- 2008** Jesse F. Plummer, MS (HSU) – Effects of Precommercial Thinning on the Structural Development of Young Coast Redwood – Douglas-fir Forests.
- 2005** Andrew J. Chittick, MS (HSU) – Stand Structure and Development Following Thinning in a Second-Growth Forest, Redwood National Park.

Graduate Committee Member

UM = University of Montana; HSU = Humboldt State University

- In prep** George C. Gaines, III, PhD (UM) – Evaluating Regeneration of Burned Forest Areas.
- 2016** Robert Campbell, PhD (UM) – Quantifying Social Preferences for Woody Biomass Energy Generation.

- 2014 Joshua P. Meek, MS (UM) – Montana Logging Costs: Resources for Continued Industry Viability.
- 2009 Aaron Kash, MS (UM) – Biomass Utilization and the Use of Roll-Off Containers and Bunks with Hydraulic Hook-Lifts for Forest Residue Removal and Transport.
- 2008 Jesse Kreye, MS (HSU) – Moisture Dynamics and Fire Behavior in Mechanically Generated (Masticated) Fuelbeds.
- 2008 Lawrence Maurin, MS (HSU) – First Year Erosion Responses Following Stream Channel Crossing Fill Removal in Redwood National and State Parks, Northwestern California.
- 2006 Carol Ewell, MS (HSU) – Methods and Modeling Equations to Quantify the Litter Layer of Coniferous Forests in California National Forests.
- 2006 David Sperry, MS (HSU) – Productivity of Songbirds Nesting in Post-Logging Beach Buffer Strips on Prince of Wales Island, Alaska.
- 2006 Jeff Jones, MS (HSU) – The Spatial Correlation Between Digital Elevation Models and Vegetation on the Mendocino National Forest: 10-meter Versus 30-meter DEMs.

Personnel Supervised

MFCEs = Montana Forest & Conservation Experiment Station, University of Montana

AFMP = MFCEs Applied Forest Management Program, University of Montana

MFCEs Field Stations Staff

- 2017- Frank Maus, Forest Manager, Lubrecht Experimental Forest (1.0 FTE)
- 2017- Keanan Ritchey, Caretaker, Lubrecht Experimental Forest (1.0 FTE)
- 2017- David Weis, Ranch Manager, Bandy Experimental Ranch (1.0 FTE)
- 2017- Devi Zdziebko, Facilities Manager, Lubrecht Experimental Forest (0.5 FTE)
- 2017-18 Thomas Perry, Planning Forester, Lubrecht Experimental Forest (1.0 FTE)

AFMP Research Staff

- 2017- Dr. Alan J. Tepley, Post-Doctoral Scientist (shared)
- 2018 Dr. Justin S. Crotteau, Post-Doctoral Scientist
- 2017-18 Nate Stewart, Research Technician (work study)
- 2017-18 Katalina Pfeil, Research Technician (work study)
- 2017-18 Thomas McClure, Research Technician (work study)
- 2017 Adrian Poloni, Research Technician
- 2017 Samantha Farwell, Research Technician
- 2017 Cody Sherrod, Research Technician (work study)
- 2016-17 Finn Leary, Research Associate
- 2015-17 Dr. Woongsoon Jang, Post-Doctoral Scientist
- 2016 Howard Williams, GIS Analyst
- 2016 Sean Pinnell, Research Associate
- 2015-16 Greg Munger, Data Analyst
- 2015 Dr. Sharon M. Hood, Post-Doctoral Scientist
- 2014-15 Christine Brissette, Research Associate, Experimental Seedling Nursery
- 2014 Felipe Grigoletto, Nursery Intern, Experimental Seedling Nursery
- 2013-14 Irina Scully, Nursery Intern, Experimental Seedling Nursery
- 2009-13 Thomas Perry, Research Forester

- 2013** Justin Crotteau, Research Specialist
- 2013** Dr. Taiyyibe Altunel, Visiting Scholar (sabbatical), Kastamonu University, Turkey
- 2012-13** Monica Lomahukluh, Nursery Intern, Experimental Seedling Nursery
- 2011-13** Emily Stark, Nursery Supervisor, Experimental Seedling Nursery
- 2011-13** Kenneth Quick, Technical Advisor, Experimental Seedling Nursery
- 2012-13** Ian Hyp, Postgraduate Researcher
- 2012** Léa Estrade, Research Intern, Ministère de l'Agriculture, Université de Bordeaux, Bordeaux, France
- 2009-11** Dr. Michael A. Battaglia, Post-Doctoral Scientist (shared)
- 2010** Rubén Manso, Visiting Scholar, Forest Research Center of the National Institute of Agrarian Research (CIFOR-INIA), Madrid, Spain

Professional Affiliations

Society of American Foresters (1992-present); SAF Silviculture Instructors Working Sub-Group (2000-present); Inland Empire Reforestation Council (2010-present); Intermountain Container Seedling Growers' Association (2011-present); Western Forest and Conservation Nursery Association (2012-present); Forest Vegetation Management Conference (1999-2007); California Forest Pest Council (2001-07).