

Christopher R. Keyes

curriculum vitae

Associate Research Professor of Silviculture
Director, Applied Forest Management Program
College of Forestry & Conservation
University of Montana
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Expertise

Silviculture and applied forest stand dynamics. Natural regeneration ecology and reforestation; silvicultural restoration of disturbed forests; dynamics and silvicultural management of forest fuels.

Education

- 2002** **Oregon State University.** Ph.D. Silviculture; forest regeneration ecology emphasis. Integrated Forest Protection minor.
- 1996-97** **University of Washington.** Post-Graduate Study in Forest Ecosystem Management
- 1996** **University of Montana.** M.S. Silviculture; forest stand dynamics emphasis.
- 1992-93** **University of Massachusetts.** Post-Baccalaureate Study in Forest Management
- 1990** **College of the Holy Cross.** B.A. Political Science; international development emphasis.

Experience

2007-Present. Associate Research Professor; Director of the Applied Forest Management Program, College of Forestry & Conservation, University of Montana (Missoula, MT)
Direction of an emerging research and outreach program in the area of applied forest management within the Montana Forest and Conservation Experiment Station, with emphasis on promoting innovative, multi-party efforts to address key challenges facing the active management of forest ecosystems in the northern Rocky Mountains. Execution and coordination of interdisciplinary research and demonstration projects at The University of Montana's Lubrecht Experimental Forest, including the development of demonstration areas that highlight sustainable forest operations. Development and delivery of technology-transfer seminars and workshops for forest professionals and landowners. University instruction in Silviculture (FOR347; once annually).

2001-2007. Assistant Professor of Silviculture, Humboldt State University (Arcata, CA)

Research and instruction in silviculture, forest stand dynamics, and applied forest ecology. Research programs in: 1) silvicultural restoration of disturbed forests, 2) natural regeneration ecology and reforestation techniques, and 3) dynamics and silvicultural treatment of forest fuels. Regular university course instruction (once annually): Silviculture (2002-06); Applied Forest Ecology (2002-05); Forest Resource Protection (2001-2006); Forestry Capstone (2001-07). Development and instruction of experimental course offerings: Silvicultural Restoration of Disturbed Forests (2007); Advanced Silviculture (2004); Wildland Fire and Fuels Management (2003); American Wildland Fire History (2003); Forest Regeneration Ecology (2001).

1997-2001. Research & Teaching Assistant, Oregon State University (Corvallis, OR)

Natural regeneration dynamics of ponderosa pine; Cascade Range conifer regeneration performance under variable-retention harvests; effects of thinning and fertilization on eucalyptus wood quality. Teaching assistant for undergraduate *Introduction to Forestry* course.

1996-1997. Research Assistant, University of Washington Silviculture Lab (Seattle, WA)

Effects of extended thinning rotations on growth and yield of Douglas-fir stands.

1995-1996. Forester, USDA Forest Service Northeastern Research Station (Rangeley, ME)

Inventory of New England forest structure, composition, and health.

1993-1995. Research Assistant, University of Montana (Missoula, MT)

Forest fuel dynamics and canopy fuel management in Rocky Mountain conifer forests; ponderosa pine and lodgepole pine uneven-age stocking guidelines; post-disturbance development of Rocky Mountain mixed-conifer forests.

1992-1993. Research & Teaching Assistant, University of Massachusetts (Amherst, MA)

Effects of gypsy moth defoliation on northern hardwood forest stand dynamics. Teaching assistant for undergraduate *Forest Ecology* course.

1991. Nursery Technician, Gainesville Tree Farm (Gainesville, FL)

Propagation and tending of trees and shrubs.

Extension & Outreach

- 2001-2007** Silviculture Consultant. L.W. Schatz Demonstration Tree Farm (Maple Creek, CA). Establishment of reforestation, thinning, and fuels management demonstration areas.
- 2003-2006** Lecturer. SAF Forestry Institute for Teachers (Arcata, CA). Lecture and field overview of silviculture and forest stand dynamics.
- 2001** Guest Lecturer. Docent Training Program of the Campus Center for Appropriate Technology, Humboldt State University. Primer on silvicultural practices and systems.
- 1999** Guest Lecturer. Natural Resources Division of the Confederated Tribes of Warm Springs (Warm Springs, Oregon). Natural regeneration and growth of ponderosa pine.
- 1998** Program Coordinator. *Topics in Silviculture* Seminar Series, Oregon State University. Series of lectures focused on alternative silvicultural systems for Pacific Coast forests.
- 1997** Guest Lecturer. *Topics in Silviculture* Seminar Series, Oregon State University. Designing silvicultural guidelines to prevent crown fires in the northern Rockies.

- 1996 Assistant Program Coordinator. *Continuing Education in Ecosystem Management Workshop Module IV*. Montana Forest and Conservation Experiment Station.
- 1995 Assistant Program Coordinator. *Uneven-Aged Management: Opportunities, Constraints, and Methodologies Workshop*. Montana Forest and Conservation Experiment Station.

Distinctions

- 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

Projects

- 2007-09 *Experimental Silvicultural Forest Restoration Treatments at Panther Creek: Implementation and Analysis*. California State Parks.
- 2006-09 *Cuneo Creek Forest Restoration Project*. California State Parks.
- 2006-08 *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 *Monitoring & Evaluation of a Technique for Efficient Variable-Density Thinning in Young Stands*. California State Parks.
- 2005-07 *Inventory and Analysis of Second-Growth Encroachment in Relict Forest Ecosystems at Whiskeytown National Recreation Area*. Northwest Forest Plan (USDA/USDI/EPA/NOAA/DOD).
- 2002-07 *Ecology and Management of Stump Sprouting in Coast Redwoods*. USDA McIntire-Stennis Forestry Research Program (Co-PI).
- 2005-06 *Stand Composition, Structure, and Development of Pre-Commercially Thinned Redwood-Douglas-fir Forests*. Save-the-Redwoods League Research Grant.
- 2005-06 *Prescription for Forest Restoration: Panther Creek, Humboldt Redwoods State Park*. California State Parks.
- 2002-06 *Comparison of Silvicultural Treatments for Abatement of Wildfire Hazard*. USDA McIntire-Stennis Forestry Research Program.
- 2004 *25-Year Assessment of Redwood Ecosystem Response to Restorative Thinning*. Save-the-Redwoods League Research Grant.

Publications

*Refereed

Journals

Keyes, C.R. and D.A. Maguire. 2007. Seed rain of ponderosa pine beneath partial overstories. *New Forests* 34:107-114.*

Keyes, C.R., D.A. Maguire, and J.C. Tappeiner. 2007. Observed dynamics of ponderosa pine (*Pinus ponderosa* var. *ponderosa* Dougl. ex Laws.) seedling recruitment in the Cascade Range, USA. *New Forests* 34:95-105.*

Keyes, C.R. 2006. Role of foliar moisture content in the silvicultural management of forest fuels. *Western Journal of Applied Forestry* 21(4):228-231.*

Keyes, C.R. and J.M. Varner. 2006. Pitfalls in the silvicultural treatment of canopy fuels. *Fire Management Today* 66(3):46-50.

Keyes, C.R., D.A. Jaramillo, B.M. Woolley, and M.S. Lancaster. 2005. Creation times and costs for five tree-based wildlife cavity structures (California). *Ecological Restoration* 23(3):207-208.*

Keyes, C.R. and K.L. O'Hara. 2002. Quantifying stand targets for silvicultural prevention of crown fires. *Western Journal of Applied Forestry* 17(2):101-109.*

DeBell, D.S., **C.R. Keyes**, and B.L. Gartner. 2001. Wood density of *Eucalyptus saligna* grown in Hawaiian plantations: Effects of silvicultural practices and relation to growth rate. *Australian Forestry* 64(2):106-110.*

Keyes, C.R., S.A. Acker, and S.E. Greene. 2001. Overstory and shrub influences on seedling recruitment patterns in an old-growth ponderosa pine stand. *Northwest Science* 75(3):204-210.*

Keyes, C.R. 2000. Natural regeneration of ponderosa pine: Pest management strategies for seed predators. *Forestry Chronicle* 76(4):623-626.

Keyes, C.R. and M.G. Keyes. 2000. Silvopastoral agroforestry: A key to longleaf pine restoration. *Ecological Restoration* 18(2):93-99.

Conference Proceedings

Chittick, A.J. and **C.R. Keyes**. 2007. Holter Ridge Thinning Study, Redwood National Park: Preliminary results of a 25-year retrospective. Pp. 270-280 in *Proceedings of the Redwood Region Forest Science Symposium*. USDA Forest Service General Technical Report PSW-GTR-194.*

Keyes, C.R. 2006. Foliar moisture contents of North American conifers. Pp. 395-399 in *Fuels Management – How to Measure Success: Proceedings of the 1st Fire Behavior and Fuels Conference*. USDA Forest Service Proceedings RMRS-P-41.*

Keyes, C.R. and D.A. Maguire. 2005. Positive seedling-shrub relationships in natural regeneration of ponderosa pine. Pp. 95-107 in *Proceedings of the Symposium on Ponderosa Pine: Issues, Trends, and Management*. USDA Forest Service General Technical Report PSW-GTR-198.*

Keyes, C.R. and P.J. Matzka. 2005. Intensive management of stump sprout reproduction in coppice-regenerated coast redwoods (*Sequoia sempervirens*). Pp. 51-55 in *The Thin Green Line: A Symposium on the State-of-the-Art in Reforestation* (Proceedings). Ontario Forest Research Institute Forest Research Information Paper No. 160. Ontario Ministry of Natural Resources, Sault Ste. Marie, Ontario, Canada.*

Reports

Keyes, C.R. 2007. *Brandy Creek Forest Restoration Demonstration Project, Whiskeytown National Recreation Area (California)*. Report on file at Whiskeytown National Recreation Area Headquarters, National Park Service, P.O. Box 188, Whiskeytown, CA 96095. 17 p.

Keyes, C.R. 2007. *Cuneo Creek Forest Restoration Project at Humboldt Redwoods State Park: Summary of Findings*. Report on file at California Department of Parks and Recreation, North Coast Redwoods District Headquarters, Eureka, CA. 7 p.

Leonzo, C.M. and **C.R. Keyes**. 2007. *Second-Growth Encroachment in Relictual Forest Ecosystems at Whiskeytown National Recreation Area, California*. Report on file at Whiskeytown National Recreation Area Headquarters, P.O. Box 188, Whiskeytown, CA 96095. 83 p.

Keyes, C.R. 2007. *Panther Creek Forest Restoration Project: Final Report*. Report on file at California Department of Parks and Recreation, North Coast Redwoods District Headquarters, Eureka, CA. 15 p.

Keyes, C.R. 2005. *Ecological Basis for Old-Growth Forest Restoration: 25-year Assessment of Redwood Ecosystem Response to Restorative Thinning*. Report on file at Save-the-Redwoods League, San Francisco, CA. 67 p.

Keyes, C.R. 2005. *Forest Restoration and Reforestation Strategies for Humboldt Redwoods State Park*. Report on file at California Department of Parks and Recreation, North Coast Redwoods District Headquarters, Eureka, CA. 41 p.

Theses

Keyes, C.R. 2002. *Recruitment of Ponderosa Pine Seedlings Beneath Partial Overstories*. Ph.D. dissertation, Oregon State University, Corvallis, OR. 193 p.

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.

Presentations

* *Published abstract*; ** *Published proceedings paper (see Publications)*

- 2007** Variable-density thinning as a disturbance force to restore natural conditions in re-growth forests. *IUFRO Natural Hazards and Natural Disturbances in Mountain Forests: Challenges and Opportunities for Silviculture* conference. Trento, Italy.
- Fuels management and old-growth restoration: Silvicultural options for discordant objectives. *2nd Fire Behavior and Fuels Conference: Fire Behavior Fundamentals and Applications*. Destin, Florida. Poster w/ J.M. Varner.
- 2006** Foliar moisture contents of North American conifers. *1st Fire Behavior and Fuels Conference: Fuels Management – How to Measure Success*. Portland, Oregon. Poster.**
- Stand structure and development of pre-commercially thinned coast redwood – Douglas-fir forests. *National Meeting of the Society of American Foresters*. Pittsburgh, Pennsylvania. Poster w/ J.F. Plummer.*
- Invited Panelist. *Sustainable Forestry in the West: Past, Present, and Future* conference, Stanford University, California.
- Old tool with a new edge: Thinning to restore disturbed forests. *City of Arcata Forest Lecture Series*. Arcata, California. (Invited)
- 2005** Invited Symposium Convener and Moderator. *Resurrecting Giants: Forest Restoration in the Redwood Empire* symposium at the *World Conference on Ecological Restoration*. Zaragoza, Spain.
- Applying silvicultural principles to redwood forest restoration: The case of Redwood National Park, USA. *The World Conference on Ecological Restoration*. Zaragoza, Spain.
- Intensive management of stump sprout reproduction in coppice-regenerated coast redwoods (*Sequoia sempervirens*). *The Thin Green Line: A Symposium on the State-of-the-Art in Reforestation*. Thunder Bay, Ontario, Canada.**
- Putting out fire with gasoline: Pitfalls in the silvicultural treatment of canopy fuels. *The 2005 National Silviculture Workshop*. Tahoe City, California. Poster w/ J.M. Varner.*
- Exploratory assessment of redwood branch dimensions at the Holter Ridge Thinning Study, Redwood National Park. *78th Annual Meeting of the Northwest Scientific Association*. Corvallis, Oregon. Poster w/ Y.R. King and M.J. Lombardi.
- 2004** Natural regeneration of ponderosa pine: Field evidence of positive seedling-shrub associations. *Ponderosa Pine: Management, Issues and Trends* conference. Klamath Falls, Oregon. (Invited)**
- Observed dynamics of ponderosa pine (*Pinus ponderosa* var. *ponderosa* Dougl. ex Laws) seedling recruitment in the Cascade Range, USA. *IUFRO Regenerating Mountain Forests* symposium. Kloster Seeon, Bavaria, Germany.
- Silvicultural treatments to control stump sprout density in coast redwoods. *Redwood Region Forest Science Symposium*. Rohnert Park, California. Poster w/ P.J. Matzka.*

- 2000** Regeneration studies of the Demonstration of Ecosystem Management Options project: Initial findings. *DEMO Project Cooperator's Conference*. Vancouver, Washington.
- A long-term study of ponderosa pine regeneration dynamics under partial overstories. *National Meeting of the Society of American Foresters*. Portland, Oregon. Poster w/ D.A. Maguire.*
- 1997** Yields from a long-rotation thinning regime in coastal Douglas-fir. *Symposium on Thinning in Westside Forests*. Newport, Oregon. Poster w/ S.D. Stinson.
- 1996** Silvicultural opportunities for restoring low-intensity fire regimes to northern Rocky Mountain forests. *Montana Academy of Sciences Symposium on Ecosystem Conservation, Preservation, and Restoration*. Missoula, Montana.*

Professional Service

- 2004-2007** Faculty Advisor. *Xi Sigma Pi* (national forestry honor society), *Alpha Lambda* chapter.
- 2000-2007** Manuscript Reviewer. *Forest Ecology and Management*, *Northern Journal of Applied Forestry*, *Western Journal of Applied Forestry*, *Landscape and Urban Planning*, USDA Forest Service PSW Research Station.
- 2003-2007** Grant Proposal Reviewer. National Fish and Wildlife Foundation, USDA Small Business Innovation Research Program, USDA McIntire-Stennis Cooperative Forestry Program.
- 2001-2004** Faculty Advisor. Society of American Foresters – Humboldt State University Chapter.
- 1998-2001** Officer. *Xi Sigma Pi* (national forestry honor society), *Zeta* chapter.

Professional Affiliations

Society of American Foresters (1992-present); Society for Ecological Restoration International (1999-present); SAF Silviculture Instructors Working Sub-Group (2000-present).