



New Publications

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New RMRS Series Publications

Fire effects on cultural resources and archaeology

Order 12

Wildland fire in ecosystems: Effects of fire on cultural resources and archaeology. Ryan, Kevin C.; Jones, Ann Trinkle; Koerner, Cassandra L.; Lee, Kristine M., tech. eds. 2012. Gen. Tech. Rep. RMRS-GTR-42-vol. 3. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 224 p.

The goal of the volume is to (1) provide cultural resource/archaeological professionals and policy makers with a primer on fuels, fire behavior, and fire effects to help them work with the fire management community to protect resources during fuels treatment and restoration projects and wildfire suppression activities; and (2) to provide fire and land management professionals and policy makers with a greater understanding of the value of cultural resource (CR) protection and the methods available to evaluate and mitigate risks to CR.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr042_3.html.

Climate change and wildlife in the Sky Islands

Order 13

An assessment of climate change and the vulnerability of wildlife in the Sky Islands of the Southwest. Coe, Sharon J.; Deborah M. Finch; Megan M. Friggens. 2012. Gen. Tech. Rep. RMRS-GTR-273. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 208 p.

We evaluated the historical and projected trends in climate and vegetation relevant to the Coronado National Forest in southeast Arizona, USA. We then applied this information in an assessment of the vulnerability of 30 species of terrestrial vertebrates on the Coronado National Forest to the potential effects of future climate change. We used a pilot version of a decision-support tool that produces scores that represent relative measures of vulnerability to climate change as related to habitat, physiology, phenology, and biotic interactions.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr273.html.

Raising native plants in nurseries

Order 14

Raising native plants in nurseries: Basic concepts. Dumroese, R. Kasten; Landis, Thomas D.; Luna, Tara. 2012. Gen. Tech. Rep. RMRS-GTR-274. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 84 p.

This booklet introduces important concepts; provides basic information about collecting, processing, storing, and treating seeds; discusses using seeds to grow plants in the field or in containers using simple but effective techniques; describes how to start native plants from cuttings; and provides valuable information on how to successfully move native plants from the nursery and establish them in their final planting location.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr274.html.

Impact of forest insect pests

Online only

Nonmarket economic values of forest insect pests: An updated literature review. Rosenberger, Randall S.; Bell, Lauren A.; Champ, Patricia A.; Smith, Eric L. 2012. Gen. Tech. Rep. RMRS-GTR-275WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 46 p.

This report updates the literature review and synthesis of economic valuation studies on the impacts of forest insect pests by Rosenberger and Smith (1997). This report also discusses the concept of ecosystem services; identifies key elements of each study; examines areas of future research; and includes appendices that further explain nonmarket valuation methods, a narrative of each study, and tables that summarize each study.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr275.html.

Economics of ranching in New Mexico

Order 15

Social, cultural, and economic aspects of livestock ranching on the Santa Fe and Carson National Forests. McSweeney, Alice M.; Raish, Carol. 2012. Gen. Tech. Rep. RMRS-GTR-276. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 199 p.

We examined the cultural, social, and economic aspects of livestock operations of ranchers who have Federal grazing permits (called permittees) on the Santa Fe and Carson National Forests of northern New Mexico. Recognizing the importance of these small livestock operations to area communities and families is crucial to comprehending and resolving disputes over public land and resource use. This report will assist agency land managers in the effective administration of forest lands by promoting greater cultural understanding of the local ranching community.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr276.html.

Climate projections FAQ

Online only

Climate projections FAQ. Daniels, A.E.; Morrison, J.F.; Joyce, L.A.; Crookston, N.L.; Chen, S.C.; McNulty, S.G. 2012. Gen. Tech. Rep. RMRS-GTR-277WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 32 p.

The series of questions in this report describes key concepts that end-users of climate projection products should understand to appropriately interpret down-scaled climate projections, including various sources of uncertainty. The selection used for each component of a downscaled climate projection has implications for interpreting the resulting climate scenario.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr277.html.

Whitebark pine restoration strategy

Order 16

A range-wide restoration strategy for whitebark pine (*Pinus albicaulis*). Keane, Robert E.; Tomback, D.F.; Aubry, C.A.; Bower, A.D.; Campbell, E.M.; Cripps, C.L.; Jenkins, M.B.; Mahalovich, M.F.; Manning, M.; McKinney, S.T.; Murray, M.P.; Perkins, D.L.; Reinhart, D.P.; Ryan, C.; Schowetle, A.W.; Smith, C.M. 2012. Gen. Tech. Rep. RMRS-GTR-279. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 108 p.

Whitebark pine is a keystone species because of its various roles in supporting community diversity and a foundation species for its roles in promoting community development and stability. We outline a range-wide strategy for maintaining whitebark pine populations in high mountain areas, which is organized into six scales of implementation, and each scale is described by assessment factors, restoration techniques, management concerns, and examples.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr279.html.

Forest roads and watersheds inventory data collection

Online only

The Geomorphic Road Analysis and Inventory Package (GRAIP) Volume 1: Data collection method. Black, Thomas A.; Cissel, Richard M.; Luce, Charles H. 2012. Gen. Tech. Rep. RMRS-GTR-280WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 110 p.

The Geomorphic Roads Analysis and Inventory Package (GRAIP) was developed as a tool for making a comprehensive inventory and analysis of the effects of forest roads on watersheds. The GRAIP road inventory and model work together to provide a flexible tool box to quantify the impacts of roads on watersheds and aquatic systems. This manual describes the data collection and process of a GRAIP road inventory study using GRAIP v. 1.0.8 and the field data dictionary INVENT 5.0. The GRAIP model uses field data collected with a GPS and a specific data dictionary using drop-down menus that is designed to be imported into an ArcGIS model. This document describes the field process as well as each feature in the data dictionary. It also addresses frequently asked questions and specialized field processes used during data collection.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr280.html.

Forest roads and watersheds inventory office procedures

Online only

The Geomorphic Road Analysis and Inventory Package (GRAIP) Volume 2: Office procedures. Cissel, Richard M.; Black, Thomas A.; Schreuders, Kimberly A.T.; Prasad, Ajay; Luce, Charles H.; Tarboton, David G.; Nelson, Nathan A. 2012. Gen. Tech. Rep. RMRS-GTR-281WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 160 p.

The Geomorphic Roads Analysis and Inventory Package (GRAIP) was developed as a tool for making a comprehensive inventory and analysis of the effects of forest roads on watersheds. This manual describes the data analysis and process of a GRAIP road inventory study using GRAIP v. 1.0.8 and the field data dictionary INVENT 5.0. The GRAIP road inventory and model work together to provide a flexible tool box to quantify the impacts of roads on watersheds and aquatic systems. This document describes each of these steps in sufficient detail that an ArcGIS user with basic skills will be able to perform the analysis.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr281.html.

Four Corners timber harvest and products industry

Order 17

The Four Corners timber harvest and forest products industry, 2007. Hayes, Steven W.; Morgan, Todd A.; Berg, Erik C.; Daniels, Jean M.; Thompson, Mike T. 2012. Resour. Bull. RMRS-RB-13. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 61 p.

This report traces the flow of timber harvested in the "Four Corners" States (Arizona, Colorado, New Mexico, and Utah) during calendar year 2007, describes the composition and operations of the region's primary forest products industry, and quantifies volumes and uses of wood fiber. Historical wood products industry changes are discussed, as well as trends in timber harvest, production, and sales of primary wood products.

Online: http://www.fs.fed.us/rm/pubs/rmrs_rb013.html.

Surface water chemistry: Sampling procedure

Order 18

Sampling procedure for lake or stream surface water chemistry. Musselman, Robert. 2012. Res. Note RMRS-RN-49. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 11 p.

Surface waters collected in the field for chemical analyses are easily contaminated. This research note presents a step-by-step detailed description of how to avoid sample contamination when field collecting, processing, and transporting surface water samples for laboratory analysis.

Online: http://www.fs.fed.us/rm/pubs/rmrs_rn049.html.

Functional connectivity of native species

Order 19

Ecological associations, dispersal ability, and landscape connectivity in the northern Rocky Mountains. Cushman, Samuel A.; Landguth, Erin L. 2012. Res. Pap. RMRS-RP-90. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 21 p.

We present a general method for efficient evaluation of functional connectivity for large numbers of native species across vast geographical areas. Connectivity was evaluated for 36 groups of species with different ecological associations; within each of these groups, three dispersal abilities were evaluated across the United States northern Rocky Mountains. Species associated with high-elevation forest appear highly vulnerable to habitat loss and fragmentation based on limited extents and connectivity of habitat.

Online: http://www.fs.fed.us/rm/pubs/rmrs_rp090.html.

Multiscale habitat relationships in pine marten

Order **20**

Multi scale habitat relationships of *Martes americana* in northern Idaho, U.S.A. Wasserman, Tzeidle N.; Cushman, Samuel A.; Wallin, David O.; Hayden, Jim. 2012. Res. Pap. RMRS-RP-94. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 21 p.

We used bivariate scaling and logistic regression to investigate multiple-scale habitat selection by American marten (*Martes americana*). Comparison of current landscape conditions to those expected under the historic range of variability indicates that road building and timber harvest in the past century may have substantially reduced the amount of suitable marten habitat in northern Idaho. Our results are generally consistent with previous research in the Rocky Mountains, with additional insights related to the relative importance, functional form, and scale at which each habitat variable has the largest influence on marten occurrence.

Online: http://www.fs.fed.us/rm/pubs/rmrs_rp094.html.

Safety analysis report for IM

Online only

Safety analysis report: A comparison of incidents from Safety Years 2006 through 2010, USDA Forest Service, Rocky Mountain Research Station Inventory and Monitoring Program. Donahue, Devon. 2012. Res. Pap. RMRS-RP-97WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 18 p.

This paper is an analysis of 5 years of accident data for the USDA Forest Service, Rocky Mountain Research Station (RMRS) Inventory and Monitoring (IM) Program that identifies past trends, allows for standardized self-comparison, and increases our understanding of the true costs of injuries and accidents. Measuring safety is a difficult task. While most agree that measuring leading indicators (linked to preventative actions) is a better indication for future performance, measuring lagging indicators (accidents, past occurrences) has been the more commonly accepted approach.

Online: http://www.fs.fed.us/rm/pubs/rmrs_rp097.html.

Fire Publications Still Available



Cascade Complex wildfires

Order **21**

Fuel treatments, fire suppression, and their interaction with wildfire and its impacts: the Warm Lake experience during the Cascade Complex of wildfires in central Idaho, 2007. Graham, Russell T.; Jain, Theresa B.; Loseke, Mark. 2009. Gen. Tech. Rep. RMRS-GTR-229. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 36 p.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr229.html.

Wildfire risk and hazard

Order **22**

Wildfire risk and hazard: procedures for the first approximation. Calkin, David E.; Ager, Alan A.; Gilbertson-Day, Julie, eds. 2010. Gen. Tech. Rep. RMRS-GTR-235. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 62 p.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr235.html.

Mitigating old tree mortality

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Post-fire hillslope stabilization

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Post-fire soil burn

Order 25

Fuel treatment review

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Fire characteristics charts

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FireBGCv2 model

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Wildfire risk perception

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Wildfire risk assessment

Order 30

Mitigating old tree mortality in long-unburned, fire-dependent forests: A synthesis. Hood, Sharon M. 2010. Gen. Tech. Rep. RMRS-GTR-238. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 71 p.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr238.html.

Post-fire treatment effectiveness for hillslope stabilization. Robichaud, Peter R.; Ashmun, Louise E.; Sims, Bruce D. 2010. Gen. Tech. Rep. RMRS-GTR-240. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 62 p.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr240.html.

Field guide for mapping post-fire soil burn severity. Parson, Annette; Robichaud, Peter R.; Lewis, Sarah A.; Napper, Carolyn; Clark, Jess T. 2010. Gen. Tech. Rep. RMRS-GTR-243. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 49 p.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr243.html.

Review of fuel treatment effectiveness in forests and rangelands and a case study from the 2007 megafires in central, Idaho, USA. Hudak, Andrew T.; Rickert, Ian; Morgan, Penelope; Strand, Eva; Lewis, Sarah A.; Robichaud, Peter R.; Hoffman, Chad; Holden, Zachary A. 2011. Gen. Tech. Rep. RMRS-GTR-252. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 60 p.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr252.html.

How to generate and interpret fire characteristics charts for surface and crown fire behavior. Andrews, Patricia L.; Heinsch, Faith Ann; Schelvan, Luke. 2011. Gen. Tech. Rep. RMRS-GTR-253. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 40 p.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr253.html.

The FireBGCv2 landscape fire and succession model: A research simulation platform for exploring fire and vegetation dynamics. Keane, Robert E.; Loehman, Rachel A.; Holsinger, Lisa M. 2011. Gen. Tech. Rep. RMRS-GTR-255. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 137 p.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr255.html.

A qualitative and quantitative analysis of risk perception and treatment options as related to wildfires in the USDA FS Region 3 National Forests. Martin, Ingrid M.; Martin, Wade E.; Raish, Carol B. 2011. Gen. Tech. Rep. RMRS-GTR-260. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 57 p.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr260.html.

A comparative risk assessment framework for wildland fire management: The 2010 cohesive strategy science report. Calkin, David E.; Ager, Alan A.; Thompson, Matthew P., eds. 2011. Gen. Tech. Rep. RMRS-GTR-262. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 63 p.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr262.html.

Preventing home ignition DVD

Order **31**

Protecting home from wildfire DVD

Order **32**

Wildfire! Preventing home ignitions. This is a 19-minute video that explains how a wildfire can ignite your home, and includes: the combustion process; how some homes are destroyed while others survive; and most effective home protection efforts

Online: <http://www.fs.fed.us/rm/publications/titles/videos/wildfire.html>.

Protecting your home from wildfire. This 25-minute video shows examples of homes that were unprotected during a wildfire; homes using Home Protection Guidelines; and examples where home protection guidelines can be put to use.

Online: <http://www.fs.fed.us/rm/publications/titles/videos/protecting.html>.

Journals and Other Publications

Obtain the following publications through university libraries, the publisher, or other outlets. Forest Service employees may request these items from the National Forest Service Library at FSLibrary-DocsFC@fs.fed.us or telephone: (970) 498-1205. We have also provided links to electronic copies when available.

Air, water, and aquatic environments

Depositional characteristics and sediment availability resulting from the post-Schultz Fire floods of 2010. Koestner, Karen A.; Carroll, Mike D.; Neary, Daniel G.; Koestner, Peter E.; Youberg, Ann. 2011. Paper presented at the 24th Annual Symposium of the Arizona Hydrological Society; Watersheds near and far: Response to changes in climate and landscape; September 18-20, 2010; Flagstaff, AZ. 5 p. Online: <http://www.treesearch.fs.fed.us/pubs/40611>.

Hydrologic impacts of high severity wildfire: Learning from the past and preparing for the future. Neary, Daniel G.; Koestner, Karen A.; Youberg, Ann. 2011. Paper presented at the 24th Annual Symposium of the Arizona Hydrological Society; Watersheds near and far: Response to changes in climate and landscape; September 18-20, 2010; Flagstaff, AZ. 8 p. Online: <http://www.treesearch.fs.fed.us/pubs/40608>.

Rill and gully formation following the 2010 Schultz Fire. Neary, Daniel G.; Koestner, Karen A.; Youberg, Ann; Koestner, Peter E. 2011. Paper presented at the 24th Annual Symposium of the Arizona Hydrological Society; Watersheds near and far: Response to changes in climate and landscape; September 18-20, 2010; Flagstaff, AZ. 6 p. Online: <http://www.treesearch.fs.fed.us/pubs/40609>.

Rainfall and geomorphic aspects of post-fire soil erosion—Schultz Fire 2010. Youberg, Ann; Koestner, Karen A.; Neary, Daniel G.; Koestner, Peter E. 2011. Paper presented at the 24th Annual Symposium of the Arizona Hydrological Society; Watersheds near and far: Response to changes in climate and landscape; September 18-20, 2010; Flagstaff, AZ. 5 p. Online: <http://www.treesearch.fs.fed.us/pubs/40607>.

Revisiting experimental catchment studies in forest hydrology. Webb, Ashley A.; Bonell, Mike; Bren, Leon; [and others], eds. 2012. Proceedings of an IAHS workshop; July

2011; Melbourne, Australia. IAHS Pub. 353. Wallingford, UK: International Association of Hydrological Sciences (IAHS) Press. 248 p.

Papers in this proceedings from RMRS authors:

Preface. Webb, Ashley A.; Bonell, Mike; Neary, Daniel G.; [and others]: v-vi.

The hidden treasures of long-term paired watershed monitoring in the forests and grasslands of Arizona, USA. Poff, B.; Neary, D.G.; Henderson, V.; Teclé, A.: 42-48.

US Forest Service experimental forests and ranges network: A continental research platform for catchment-scale research. Neary, Daniel; Hayes, Deborah; Gottfried, Gerald; [and others]: 49-57.

Cascabel prescribed fire long-term watershed study: An opportunity to monitor climate change. Gottfried, Gerald; Neary, Daniel; Ffolliott, Peter; Koestner, Karen: 144-153.

Forest paired catchment studies of water quality: Past, present, and future. Neary, Daniel G.: 169-184.

Sediment loads and erosion in forest headwater streams of the Sierra Nevada, California. Hunsaker, Carolyn T.; Neary, Daniel G.: 195-204.

Rock gabion, rip-rap, and culvert treatments: Successes and failures in post-fire erosion mitigation, Schultz Fire 2010. Neary, Daniel G.; Koestner, Karen A. 2011. Paper presented at the 24th Annual Symposium of the Arizona Hydrological Society; Watersheds near and far: Response to changes in climate and landscape; September 18-20, 2010; Flagstaff, AZ. 5 p. Online: <http://www.treesearch.fs.fed.us/pubs/40610>.

Understanding the effectiveness of vegetated streamside management zones for protecting water quality. Smethurst, Philip; Petrone, Kevin; Neary, Daniel. 2012. In: Lefroy, Ted; Curtis, Allan; Jakeman, Anthony; McKee, James, eds. Landscape logic: Integrating science for landscape management. Collingwood, Australia: CSIRO Publishing: 51-68. Online: <http://www.treesearch.fs.fed.us/pubs/40770>.

Water quality, biodiversity, and codes of practice in relation to harvesting forest plantations in streamside management zones. Neary, Daniel G.; Smethurst, Philip J.; Baillie, Brenda; Petrone, Kevin C. 2011. CSIRO Special Report. Canberra, Australia: CSIRO Ecosystem Sciences, National Research Flagships, Sustainable Agriculture. 100 p. Online: <http://www.treeseearch.fs.fed.us/pubs/40771>.

Fire, fuel, and smoke

Entrainment regimes and flame characteristics of wildland fires. Nelson, Ralph M.; Butler, Bret W.; Weise, David R. 2012. *International Journal of Wildland Fire*. 21: 127-140. Online: <http://www.treeseearch.fs.fed.us/pubs/40492>.

Field trip guide to the 2010 Schultz Fire burn area. Koestner, Karen; Youberg, Ann; Neary, Daniel G. 2011. Arizona Hydrological Society Annual Symposium; Flagstaff, AZ; September 18, 2011. Flagstaff: Northern Arizona University, College of Engineering, Forestry, and Natural Sciences, Bilby Research Center. 22 p. Online: <http://www.treeseearch.fs.fed.us/pubs/40612>.

The hidden consequences of fire suppression. Miller, Carol. 2012. *Park Science*. 28(3). Online: <http://www.treeseearch.fs.fed.us/pubs/40395>.

Historic and future extent of wildfires in the Southern Rockies Ecoregion, USA. Litschert, Sandra E.; Brown, Thomas C.; Theobald, David M. 2012. *Forest Ecology and Management*. 269: 124-133. Online: <http://www.treeseearch.fs.fed.us/pubs/40203>.

Short- and medium-term effects of fuel reduction mulch treatments on soil nitrogen availability in Colorado conifer forests. Rhoades, C. C.; Battaglia, M. A.; Rocca, M. E.; Ryan, M. G. 2012. *Forest Ecology and Management*. 276: 231-238. Online: <http://www.treeseearch.fs.fed.us/pubs/40596>.

Spatial bottom-up controls on fire likelihood vary across western North America. Parks, Sean A.; Parisien, Marc-Andre; Miller, Carol. 2012. *Ecosphere*. 3(1): Article 12. Online: <http://www.treeseearch.fs.fed.us/pubs/40394>.

Forest and woodland ecosystems

Advances toward DNA-based identification and phylogeny of North American *Armillaria* species using elongation factor-1 alpha gene. Ross-Davis, Amy L.; Hanna, John W.; Kim, Mee-Sook; Klopfenstein, Ned B. 2012. *Mycoscience*. 53: 161-165. Online: <http://www.treeseearch.fs.fed.us/pubs/40380>.

Armillaria species: Primary drivers of forest ecosystem processes and potential impacts of climate change. Klopfenstein, Ned B.; Kim, Mee-Sook; Hanna, John W.; Ross-Davis, Amy L.; Ashiglar, Sara M.; McDonald, Geral I. 2012. In: *Proceedings, 2012 International conference on etiology, ecology and integrated management of forest and fruit tree diseases; 2012 May 24-25; Taipei, Taiwan*. National Taiwan University, Department of Plant Pathology and Microbiology: 53-76.

Biology of the invasive banded elm bark beetle (Coleoptera: Scolytidae) in the western United States. Lee, J.C.; Negrón, J.F.; McElwey, S.J.; Popp, J.B.; [and others]. 2011. *Annals of*

the Entomological Society of America. 104: 705-717. Online: <http://www.treeseearch.fs.fed.us/pubs/39127>.

Development of vegetation based soil quality indices for mineralized terrane in arid and semi-arid regions. Blecker, S.W.; Stillings, L.L.; Amacher, M.C.; [and others]. 2012. *Ecological Indicators*. 20: 65-74. Online: <http://www.treeseearch.fs.fed.us/pubs/40738>.

Do changes in soil properties after rooting by wild boars (*Sus scrofa*) affect understory vegetation in Swiss hardwood forests? Wirthner, Sven; Schütz, Martin; Page-Dumroese, Deborah S.; [and others]. *Canadian Journal of Forest Research*. 42: 585-592. Online: <http://www.treeseearch.fs.fed.us/pubs/40737>.

The effects of drought and disturbance on the growth and developmental instability of loblolly pine (*Pinus taeda* L.). Graham, John H.; Duda, Jeffrey J.; Kitchen, Stanley; [and others]. 2012. *Ecological Indicators*. 20: 143-150. Online: <http://www.treeseearch.fs.fed.us/pubs/40577>.

Effects of organic matter removal, soil compaction and vegetation control on 10th year biomass and foliar nutrition: LTSP continent-wide comparisons. Ponder, Felix, Jr.; Fleming, Robert L.; Page-Dumroese, Deborah; [and others]. 2012. *Forest Ecology and Management*. 278: 35-54. Online: <http://www.treeseearch.fs.fed.us/pubs/40791>.

Effects of mountain pine beetle on fuels and expected fire behavior in lodgepole pine forests, Colorado, USA. Schoennagel, Tania; Veblen, Thomas T.; Negrón, Jose F.; Smith, Jeremy M. 2012. *PLoS ONE*. 7(1): e30002. Online: <http://www.treeseearch.fs.fed.us/pubs/40717>.

Factors influencing the spatial and temporal dynamics of engelmann spruce mortality during a spruce beetle outbreak on the Markagunt Plateau, Utah. DeRose, R. Justin; Long, James N. 2012. *Forest Science*. 58(1): 1-14. Online: <http://www.treeseearch.fs.fed.us/pubs/40579>.

Indicator 1.04: Number of native forest-associated species. Flather, C.H.; Knowles, M.S.; Sieg, C.H. 2011. In: *National report on sustainable forests - 2010*. FS-979. Washington, DC: U.S. Department of Agriculture, Forest Service: 11-22—11-23.

Indicator 1.05: Number of status of native forest-associated species at risk, as determined by legislation or scientific assessment. Flather, C.H.; Knowles, M.S.; Sieg, C.H. 2011. In: *National report on sustainable forests - 2010*. FS-979. Washington, DC: U.S. Department of Agriculture, Forest Service: 11-23—11-25.

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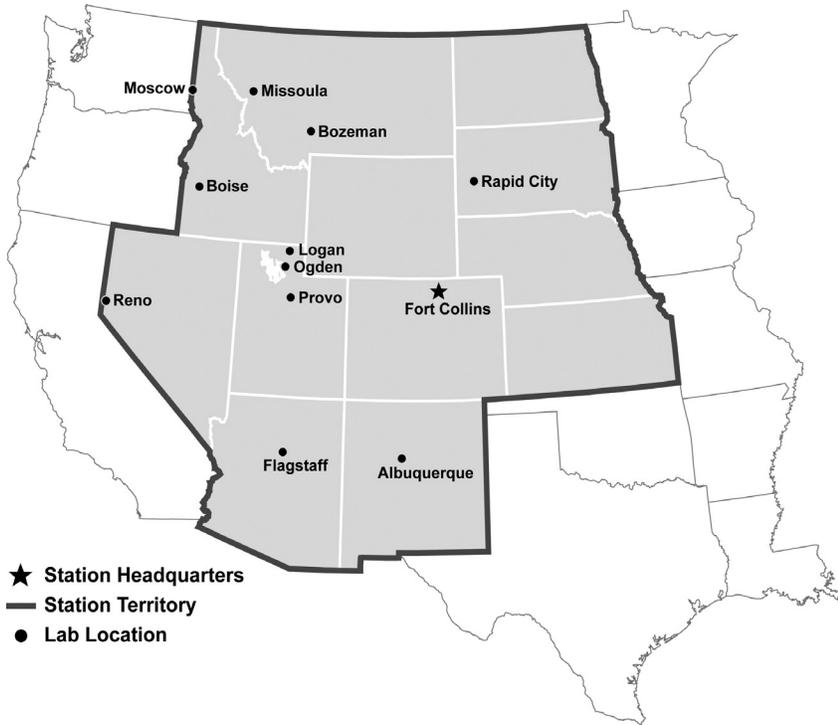
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The Rocky Mountain Research Station



- ★ Station Headquarters
- Station Territory
- Lab Location

The Rocky Mountain Research Station is one of five regional units that make up the US Forest Service Research and Development organization—the most extensive natural resources research organization in the world. We maintain 14 research locations throughout a 12 state territory encompassing the Great Basin, Southwest, Rocky Mountains and parts of the Great Plains. The Station employs over 400 permanent full-time employees, including roughly 100 research scientists.

Scientists conduct research that spans an area containing 52% of the nation's National Forest System lands (54 National Forests and Grasslands). In the lower 48 states, our territory also includes 55% of the nation's BLM lands; 48% of the designated wildernesses; 37% of National Park Service lands; numerous other public and tribal lands; and 41% of the non-urban/rural private lands.

We administer and conduct ecological research on 14 experimental forests, ranges, and watersheds over the long-term, even centuries, enabling us to learn how forests change as climate and other factors change over time.

We also oversee activities on several hundred research natural areas, a network of ecosystems set aside to conserve biological diversity. The areas represent a wide variety of habitats and ecosystems from alpine ecosystems to lowlands; and from coniferous forests of the Northern Rockies to semiarid deserts of the Southwest and prairie ecosystems of the Great Plains.



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Science Program Areas

The Rocky Mountain Research Station is evolving from a Station with 30 research work units (including ecosystem management units and national programs) to a comprehensive programmatic structure consisting of eight Science Program areas and several Research, Development and Applications programs. Descriptions of the Science Program areas follow below.

Air, Water and Aquatic Environments

Air quality, water availability, water quality, and aquatic habitats are critical issues within the rapidly changing Western United States. The Air, Water and Aquatic Environments program is committed to the development of knowledge and science applications related to air and water quality, as well as the habitat quality, distribution, diversity, and persistence of fish and other aquatic species. Website: http://www.fs.fed.us/rm/boise/awae_home.shtml. Contact Frank McCormick, Program Manager, for more information: 208-373-4351.

Fire, Fuel and Smoke

The Fire, Fuel and Smoke program works to improve the safety and effectiveness of fire management through the creation and dissemination of basic fire science knowledge. The program investigates the impacts of fires on the environment by means of fundamental and applied research for understanding and predicting fire behavior, its effects on ecosystems, and its emissions into the atmosphere. Website: <http://www.firelab.org>. Contact Colin Hardy, Program Manager, for more information: 406-329-4978.

Forest and Woodland Ecosystems

Forests and woodlands are increasingly being impacted by large scale urbanization and human developments, uncharacteristically large and severe wildfires, insect and disease outbreaks, exotic species invasions, and drought, and interactions of multiple stressors at local, landscape, and regional scales. The Forest and Woodland Ecosystems program acquires, develops, and delivers the scientific knowledge for sustaining and restoring forests and woodlands landscape health, biodiversity, productivity, and ecosystem processes. Website: <http://www.fs.fed.us/rmrs/research/programs/forest-woodlands-ecosystem/>. Contact Tom Crow, Program Manager, for more information: 970-498-1378.

Grassland, Shrubland and Desert Ecosystems

Disruptions by large-scale clearing for agriculture, water diversions, extensive grazing, changes in the native fauna, the advent of alien weeds, altered fire regimes, and increases in human-caused insect and disease epidemics have contributed to produce areas that are in unsuitable condition. The Grassland, Shrubland and Desert Ecosystems program addresses the biology, use, management, and restoration of these grass and shrublands. Website: <http://www.fs.fed.us/rmrs/research/programs/grassland-shrubland-desert/>. Contact Debbie Finch, Program Manager, for more information: 505-724-3671.

Human Dimensions

The Human Dimensions program provides social and economic science based innovation to human societies as they develop a sustainable relationship with their environment. Major issues confronting societies across the globe such as global climate change, energy, fire, water, and ecosystem services all have important social-economic dimensions that will be explored and addressed by this program. Website: <http://www.fs.fed.us/rmrs/research/programs/social-economics-decision/>. Contact Cindy Swanson, Program Manager for more information: 406-329-3388.

Inventory, Monitoring and Analysis

The Inventory, Monitoring and Analysis program provides the resource data, analysis, and tools needed to effectively identify current status and trends, management options and impacts, and threats and impacts of fire, insects, disease, and other natural processes. Website: <http://www.fs.fed.us/rm/ogden/>. Contact Michael Wilson for more information: 801-625-5407.

Science Application and Integration

The Science Application and Integration program is a knowledge transfer unit that provides leadership for the integration and use of scientific information in natural resource planning and management across the Interior West.

Wildlife and Terrestrial Ecosystems

The Wildlife and Terrestrial Ecosystems program is engaged in sustaining species and ecosystems of concern through studies of ecological interactions within and between plant, aquatic, and terrestrial animal communities; understanding public use effects through studies elucidating social and economic values associated with consumptive and non-consumptive uses of fish and wildlife; managing terrestrial and aquatic habitats; and evaluating outcomes of land and water uses and natural disturbances. Website: <http://www.rmrs.nau.edu/wildlife/>. Contact William Block, Program Manager, for more information: 928-556-2161.

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