USDA
United States Department of Agriculture

Rocky Mountain Research Station

New Publications

January–March 2016

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The Rocky Mountain Research Station

The Rocky Mountain Research Station is one of five regional units that make up the U.S. 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 more than 400 permanent full-time employees, including about 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 Bureau of Land Management 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. These 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.

New RMRS Publication Series

Foundational literature for moving native plant materials in changing climates

Online only

Foundational literature for moving native plant materials in changing climates. Williams, Mary I.; Dumroese, R. Kasten; Pinto, Jeremiah R.; Jurgensen, Martin F. 2015. Gen. Tech. Rep. RMRS-GTR-347. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 303 p.

This bibliography reflects the growing interest in assisted migration, the intentional movement of plant materials in response to climate change, and provides a central foundation for collaboration in generating research questions, conducting studies, transferring and acquiring data, expanding studies to key species and geographic regions, and guiding native plant transfer in changing climates. The bibliography contains literature through 15 March 2015 on plant transfer guidelines as related to climate change, restoration and conservation, and adaptation strategies, such as assisted migration. References are arranged in four chapters: Climate Change, Conservation and Restoration, Migration, and Transfer Guidelines and Zones. Chapters are further divided into sections: General (editorials, reviews, summaries, surveys, and trends), Research (common garden studies, genecology research, provenance tests, range shifts), Strategies (adaptation options, decision support, frameworks, and policies) and Resources (manuals, models, tools, and websites).

http://www.fs.fed.us/rm/pubs/rmrs_gtr347.html.

Conservation and restoration of sagebrush ecosystems and sage-grouse: An assessment of USDA Forest Service Science

Contact Deborah Finch, dfinch @ fs.fed.us, for printed copies

Conservation and restoration of sagebrush ecosystems and sage-grouse: An assessment of USDA Forest Service Science. Finch, Deborah M.; Boyce, Douglas A., Jr.; Chambers, Jeanne C.; Colt, Chris J.; Dumroese, R. Kasten; Kitchen, Stanley G.; McCarthy, Clinton; Meyer, Susan E.; Richardson, Bryce A.; Rowland, Mary M.; Rumble, Mark A.; Schwartz, Michael K.; Tomosy, Monica S.; Wisdom, Michael J. 2016. Gen. Tech. Rep. RMRS-GTR-348. Fort Collins, CO; U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, 54 p.

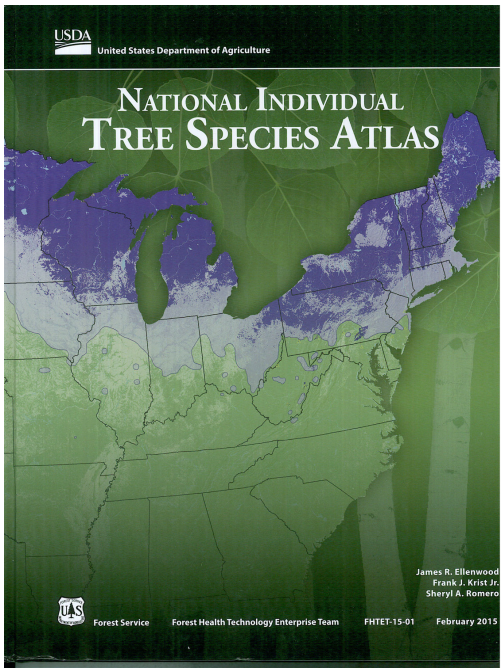
This assessment summarizes FS strengths, capabilities, partners, past and current research, and potential future high-priority research areas for conservation and restoration of sagebrush ecosystems and sage-grouse. We identified research and science-based management needs of the National Forest System where lands are important for breeding and brood-rearing habitats for sage-grouse. This work will help meet continuing widespread concerns and calls for science-based conservation to mitigate threats to sagebrush ecosystems, conserve populations of sage-grouse and other sagebrush-obligate species, and restore sagebrush ecosystems throughout the western United States.

http://www.fs.fed.us/rm/pubs/rmrs_gtr348.html

New USFS Publications

National individual tree species atlas

Contact Frank Sapio: fsapio@fs.fed.us, to request a copy.



National individual tree species atlas. Ellenwood, James R.; Krist, Frank J., Jr.; Romero, Sheryl A. 2015. FHTET-15-01. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Forest Health Technology Enterprise Team. 320 p.

The National Individual Tree Species Atlas (NITSA) describes the distribution of 264 tree species across the United States with intricately detailed maps and over 300 color photographs. The atlas represents the most precise account of America's tree species distributions ever published. Using data from the Forest Service's Forest Inventory and Analysis program (FIA), and from a predictor dataset consisting of climate, terrain, soils, and satellite imagery, we developed unique statistical models that predicted the spatial distribution for each of the individual tree species. In NITSA we map America's most prevalent tree species at a greater spatial resolution to enhance utility for ecological research and applied forest management use.

http://www.fs.fed.us/foresthealth/technology/remote_sensing.shtml

Forest Service Publications Still Available

A technical guide for monitoring wildlife habitat

Order No. 1

Contact distribution: rmrspubrequest@fs.fed.us, to request a copy.

A technical guide for monitoring wildlife habitat. Rowland, M.M.; Vojta, C.D. 2013. Gen. Tech. Rep. WO-89. Washington, DC: U.S. Department of Agriculture, Forest Service. 400 p.

Information about status and trend of wildlife habitat is important for the U.S. Department of Agriculture, Forest Service to accomplish its mission and meet its legal requirements. As the steward of 193 million acres (ac) of Federal land, the Forest Service needs to evaluate the status of wildlife habitat and how it compares with desired conditions. Habitat monitoring programs provide information to meet the needs of the agency while fostering use of standardized, integrated approaches to produce robust knowledge. This technical guide provides current, scientifically credible, and practical protocols for the inventory and monitoring of terrestrial wildlife habitat. Protocols include data standards, data-collection methods, and methods for detecting and monitoring changes over time (Powell 2000). To our knowledge, this document is the first comprehensive guide to monitoring wildlife habitats. It serves a unique role by providing protocols specifically tailored to habitat monitoring, which is especially pertinent for the Forest Service, given its role in managing landscapes that support a wide diversity of taxa across the major biomes of North America.

Meeting current and future conservation challenges through the synthesis of long-term silviculture and range management research

Order No. 2

Contact distribution: rmrspubrequest@fs.fed.us, to request a copy.

Meeting current and future conservation challenges through the synthesis of long-term silviculture and range management research. Adams, Mary Beth; NcNeel, Joe; Rodriguez-Franco, Carlos. 2010. Gen. Tech. Rep. WO-84. Washington, DC: U.S. Department of Agriculture, Forest Service. 82 p.

The Experimental Forests and Ranges (EFRs) of the Forest Service were established to represent major forest vegetation types of the United States, to provide guidelines for management of those forests and ranges, and to serve as "outdoor classrooms" for land managers to learn how to better manage their forests. Research data collected during the 100 years since the first experimental forest was established in 1908 can be used synthetically to address regional and continental scale questions related to forest and range management, key forest ecosystem processes, wildlife habitat requirements, watershed management, and other topics. Toward that end, a workshop was held to advance our knowledge and ability to meet current and future conservation challenges by synthesizing silviculture and range management information from our network of EFRs. Sixty scientists from Forest Service Research and Development and partner institutions participated in the workshop.

Forest Service Publications Still Available

A dynamic invasive species research vision: Opportunities and priorities 2009–29

Order No. 3

Contact distribution: rmrspubrequest@fs.fed.us, to request a copy.

A dynamic invasive species research vision: Opportunities and priorities 2009-29. Dix, Mary Ellen; Britton, Kerry. 2010. Gen. Tech. Rep. WO-79/83. Washington, DC: U.S. Department of Agriculture, Forest Service, Research and Development. 130 p.

Invasive species significantly impact U.S. ecosystems and are one of the greatest threats to forest, rangeland, and urban forest health. They have contributed to increases in fire frequency and intensity; reduced water resources, forest growth, and timber; and negatively affected native species and their habitats throughout the United States. Global trade, climate change, and innovations in human transportation are just a few of the factors that have increased the rate of invasive species introduction and the costs associated with their prevention, quarantine, and management. Forest and rangeland managers urgently need effective management techniques to reduce invasive species' effects.

Forest soil disturbance monitoring protocol Volume 1: Rapid Assessment

Order No. 4

Contact distribution: rmrspubrequest@fs.fed.us, to request a copy.

Forest Soil Disturbance Monitoring Protocol: Volume 1: Rapid Assessment. Page-Dumroese, Deborah S.; Abbott, Ann M.; Rice, Thomas M. 2009. Gen. Tech. Rep. WO-GTR 82a. Washington DC: U.S. Department of Agriculture, Forest Service. 31 p.

This volume of the Forest Soil Disturbance Monitoring Protocol (FSDMP) describes how to monitor forest sites before and after ground disturbing management activities for physical attributes that could influence site resilience and long-term sustainability. The attributes describe surface conditions that affect site sustainability and hydrologic function. Monitoring the attributes of surface cover, ruts, compaction, and platy structure can also be used to generate best management practices that help maintain site productivity.

Forest Service Publications Still Available

Forest soil disturbance monitoring protocol: Volume II: Supplementary methods, statistics, and data collection

Order No. 5

Contact distribution: rmrspubrequest@fs.fed.us, to request a copy.

Forest Soil Disturbance Monitoring Protocol: Volume II: Supplementary methods, statistics, and data collection. Page-Dumroese, Deborah S.; Abbott, Ann M.; Rice, Thomas M. 2009. Gen. Tech. Rep. WO-GTR-82b. Washington, DC: U.S. Department of Agriculture, Forest Service. 64 p.

Volume I and volume II of the Forest Soil Disturbance Monitoring Protocol (FSDMP) provide information for a wide range of users, including technicians, field crew leaders, private landowners, land managers, forest professionals, and researchers. Volume I: Rapid Assessment includes the basic methods for establishing forest soil monitoring transects and consistently monitoring forest sites before and after ground disturbing management activities for physical attributes that could influence site resilience and long-term sustainability. Volume II: Supplementary Methods, Statistics, and Data Collection provides more details on the protocol, the historical context of forest soil monitoring, the use of statistics in forest soil monitoring, and interpretation.

Multiple species inventory and monitoring technical guide

Order No. 6

Contact distribution: rmrspubrequest@fs.fed.us, to request a copy.

Multiple species inventory and monitoring technical guide. Manley, P.N.; Van Horne, B.; Roth, J.K.; Zielinski, W.J.; McKenzie, M.M.; Weller, T.J.; Weckerly, F.W.; Vojta, C. 2006. Gen. Tech. Rep. WO-73. Washington, DC: U.S. Department of Agriculture, Forest Service. 204 p.

The National Forest Management Act (1976) recognizes the importance of maintaining species and community diversity on National Forest System (NFS) lands as a critical component of our ecological and cultural heritage. Monitoring is required of land management to assess the success of management activities in meeting legal, regulatory, and policy objectives, including sustaining populations of native and desired nonnative species. The Multiple Species Inventory and Monitoring (MSIM) protocol is intended to serve as a consistent and efficient method for obtaining basic presence/absence data and associated habitat condition data for a large number of individual species at sites that represent a probabilistic sample. It is designed to be implemented in association with Forest Inventory and Analysis (FIA) grid points on NFS lands. The MSIM protocol is designed as a base monitoring approach on which regions and forests can build to meet their specific National Forest Land and Resource Management Plan monitoring needs with the greatest possible efficiency (measured as the amount of useful and high-quality information gained per unit cost).

Forest Service Publications Still Available

Development of protocols to inventory or monitor wildlife, fish, or rare plants

Order No. 7

Contact distribution: rmrspubrequest@fs.fed.us, to request a copy.

Development of protocols to inventory or monitor wildlife, fish, or rare plants. Vesely, David; McComb, Brenda C.; Vojta, Christina D.; Suring, Lowell H.; Halaj, Jurai; Holthausen, Richard S.; Zuckerberg, Benjamin; Manley, Patricia M. 2006. Gen. Tech. Rep. WO-72. Washington, DC: U.S. Department of Agriculture, Forest Service. 100 p.

The purpose of this technical guide (hereafter referred to as the Species Protocol Technical Guide) is to provide guidelines for developing inventory and monitoring (I&M) protocols for wildlife, fish, and rare plants (WFRP) using the U.S. Department of Agriculture (USDA) Forest Service technical guide format.

Northern goshawk inventory and monitoring technical guide

Order No. 8

Contact distribution: rmrspubrequest@fs.fed.us, to request a copy.

Northern goshawk inventory and monitoring technical guide. Woodbridge, B.; Hargis, C.D. 2006. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 p.

This technical guide provides information on all aspects of inventory and monitoring related to the northern goshawk (*Accipiter gentilis*) and is to be used by the U.S. Department of Agriculture (USDA) Forest Service consistent with national direction, local priorities, and available funding, and also by interested partners and collaborators. When the protocols described in this technical guide are implemented, the resulting data will meet standards of the Data Quality Act and, therefore, will be legally and scientifically defensible and consistent with data collected elsewhere using the same protocols.

Journals and Other Publications

Air, water, and aquatic environments

Added value from 576 years of tree-ring records in the prediction of the Great Salt Lake level. Gillies, Robert R.; Chung, Oi-Yu; Simon Wang, S.-Y.; DeRose, R. Justin; Sun, Yan. 2015. Journal of Hydrology. 529: 962–968. http://www.treesearch.fs.fed.us/pubs/50599.

Banking carbon: A review of organic carbon storage and physical factors influencing retention in floodplains and riparian ecosystems. Sutfin, Nicholas A.; Wohl, Ellen E.; Dwire, Kathleen A. 2016. Earth Surface Processes and Landforms. 41: 38–60. http://www.treesearch.fs.fed.us/pubs/50481.

Carbon pools in stream-riparian corridors: Legacy of disturbance along mountain streams of south-eastern Wyoming. Ruffing, Claire M.; Dwire, Kathleen A.; Daniels, Melinda D. 2016. Earth Surface Processes and Landforms. 41: 208–223. http://www.treesearch.fs.fed.us/pubs/50480.

Development of high-resolution (250 m) historical daily gridded air temperature data using reanalysis and distributed sensor networks for the US northern Rocky Mountains. Holden, Zachary A.; Swanson, Alan; Klene, Anna E.; Abatzoglou, John T.; Dobrowski, Solomon Z.; Cushman, Samuel A.; Squires, John; Moisen, Gretchen G.; Oyler, Jared W. 2016. International Journal of Climatology. doi:10.1002/joc.4580. http://www.treesearch.fs.fed.us/pubs/50800.

Engaging communities and climate change futures with Multi-Scale, Iterative Scenario Building (MISB) in the western United States. Murphy, Daniel; Wyborn, Carina; Yung, Laurie; Williams, Daniel R.; Cleveland, Cory; Eby, Lisa; Dobrowski, Solomon; Towler, Erin. 2016. Human Organization. 75(1): Spring. http://www.treesearch.fs.fed.us/pubs/50483.

Fire effects on aquatic ecosystems: An assessment of the current state of the science. Bixby, Rebecca J.; Cooper, Scott D.; Gresswell, Robert E.; Brown, Lee E.; Dahm, Clifford N.; Dwire, Kathleen A. 2015. Freshwater Science. 34(4): 1340–1350. http://www.treesearch.fs.fed.us/pubs/50479.

Patterns of hybridization among cutthroat trout and rainbow trout in northern Rocky Mountain streams. McKelvey, Kevin S.; Young, Michael K.; Wilcox, Taylor M.; Bingham, Daniel M.; Pilgrim, Kristine L.; Schwartz, Michael K. 2016. Ecology and Evolution. doi: 10.1002/ece3.1887. http://www.treesearch.fs.fed.us/pubs/50104.

Sampling large geographic areas for rare species using environmental DNA: A study of bull trout *Salvelinus confluentus* occupancy in western Montana. McKelvey, Kevin; Young, Michael; Knotek, W. L.; Carim, K. J.; Wilcox, T. M.; Padgett-Stewart, T. M.; Schwartz, Michael. 2016. Journal of Fish Biology. doi: 10.1111/jfb.12863. http://www.treesearch.fs.fed.us/pubs/50137.

Slow climate velocities of mountain streams portend their role as refugia for cold-water biodiversity. Isaak, Daniel J.; Young, Michael K.; Luce, Charles H.; Hostetler, Steven W.; Wenger, Seth J.; Peterson, Erin E.; Ver Hoef, Jay M.; Groce, Matthew C.; Horan, Dona L.; Nagel, David E. 2016. Proceedings of the National Academy of Sciences. 04 April 2016. doi:101073/pnas.1522429113. http://www.treesearch.fs.fed.us/pubs/50801.

Watershed-scale evaluation of the Water Erosion Prediction Project (WEPP) model in the Lake Tahoe basin. Brooks, Erin S.; Dobre, Mariana; Elliot, William J.; Wu, Joan Q.; Boll, Jan. 2016. Journal of Hydrology. 533: 389–402. http://www.treesearch.fs.fed.us/pubs/50802.

Fire, fuel, and smoke

Application of wildfire risk assessment results to wildfire response planning in the Southern Sierra Nevada, California, USA. Thompson, M.P.; Bowden, P.; Brough, A.; Scott, J.H.; Gilbertson-Day, J.; Taylor, A.; Anderson, J.; Haas, J.R. 2016. Forests. 7(3): 64. http://www.treesearch.fs.fed.us/pubs/50797.

A case study comparison of landfire fuel loading and emissions generation on a mixed conifer forest in northern Idaho, USA. Hyde, Josh; Strand, Eva K.; Hudak, Andrew T.; Hamilton, Dale. 2015. Fire Ecology. 11(3): 108–127. http://www.treesearch.fs.fed.us/pubs/50203.

Journals and Other Publications

Examining alternative fuel management strategies and the relative contribution of National Forest System land to wildfire risk to adjacent homes—A pilot assessment on Sierra National Forest, California, USA. Scott, J.H.; Thompson, M.P.; Gilbertson-Day, J.W. 2016. Forest Ecology and Management. 362: 29–37. http://www.treesearch.fs.fed.us/pubs/50667.

Examining heterogeneity and wildfire management expenditures using spatially and temporally descriptive data. Hand, Michael S.; Thompson, Matthew P.; Calkin, David E. 2016. Journal of Forest Economics. 22: 80–102. http://www.treesearch.fs.fed.us/pubs/50482.

Fire weather conditions and fire-atmosphere interactions observed during low-intensity prescribed fires—RxCADRE 2012. Clements, Craig B.; Lareau, Neil P.; Seto, Daisuke; Contezac, Jonathan; Davis, Braniff; Teske, Casey; Zajkowski, Thomas J.; Hudak, Andrew T.; Bright, Benjamin C.; Dickinson, Matthew B.; Butler, Bret W.; Jimenez, Daniel; Hiers, J. Kevin. 2016. International Journal of Wildland Fire. 25: 90–101. http://www.treesearch.fs.fed.us/pubs/50197.

Grassland and forest understorey biomass emissions from prescribed fires in the southeastern United States—RxCADRE 2012. Strand, Tara; Gullett, Brian; Urbanski, Shawn; O'Neill, Susan; Potter, Brian; Aurell, Johanna; Holder, Amara; Larkin, Narasimhan; Moore, Mark; Rorig, Miriam. 2016. International Journal of Wildland Fire. 25: 102–113. http://www.treesearch.fs.fed.us/pubs/50200.

High-resolution infrared thermography for capturing wildland fire behavior—RxCADRE 2012. O'Brien, Joseph J.; Loudermilk, E. Louise; Hornsby, Benjamin; Hudak, Andrew T.; Bright, Benjamin C.; Dickinson, Matthew B.; Hiers, J. Kevin; Teske, Casey; Ottmar, Roger D. 2016. International Journal of Wildland Fire. 25: 62–75. http://www.treesearch.fs.fed.us/pubs/50204.

Measurements, datasets and preliminary results from the RxCADRE project—2008, 2011 and 2012. Ottmar, Roger D.; Hiers, J. Kevin; Butler, Bret W.; Clements, Craig B.; Dickinson, Matthew B.; Hudak, Andrew T.; O'Brien, Joseph; Potter, Brian E.; Rowell, Eric M.; Strand, Tara M.; Zajkowski, Thomas J. 2016. International Journal of Wildland Fire. 25: 1–9. http://www.treesearch.fs.fed.us/pubs/50089.

Measurements relating fire radiative energy density and surface fuel consumption—RxCADRE 2011 and 2012. Hudak, Andrew T.; Dickinson, Matthew B.; Bright, Benjamin C.; Kremens, Robert L.; Loudermilk, E. Louise; O'Brien, Joseph J.; Hornsby, Benjamin S.; Ottmar, Roger D. 2016. International Journal of Wildland Fire. 25: 25–37. http://www.treesearch.fs.fed.us/pubs/49572.

Measuring radiant emissions from entire prescribed fires with ground, airborne and satellite sensors—RxCADRE 2012. Dickinson, Matthew B.; Hudak, Andrew T.; . . .Bright, Benjamin C.; [et al.]. 2016. International Journal of Wildland Fire. 25: 48–61. http://www.treesearch.fs.fed.us/pubs/50201.

Post-fire logging produces minimal persistent impacts on understory vegetation in northeastern Oregon, USA. Peterson, David W.; Dodson, Erich Kyle. 2016. Forest Ecology and Management. 370: 56–64. http://www.treesearch.fs.fed.us/pubs/50792.

Pre-fire and post-fire surface fuel and cover measurements collected in the southeastern United States for model evaluation and development—RxCADRE 2008, 2011 and 2012. Ottmar, Roger D.; Hudak, Andrew T.; Prichard, Susan J.; Wright, Clinton S.; Restaino, Joseph C.; Kennedy, Maureen C.; Vihnanek, Robert E. 2016. International Journal of Wildland Fire. 25: 10–24. http://www.treesearch.fs.fed.us/pubs/50198.

Production and efficiency of large wildland fire suppression effort: A stochastic frontier analysis. Katuwal, Hari; Calkin, David E.; Hand, Michael S. 2016. Journal of Environmental Management. 166: 227–236. http://www.treesearch.fs.fed.us/pubs/50303.

Quantifying the influence of previously burned ares on suppression affectiveness and avoided exposure: A case study of the Las Conchas Fire. Thompson, M.P.; Freeborn,

Journals and Other Publications

P.; Rieck, J.D.; Calkin, D.E.; Gilbertson-Day, J.W.; Cochrane, M.A.; Hand, M.S. 2016. International Journal of Wildland Fire. 25(2): 167–181. http://www.treesearch.fs.fed.us/pubs/50798.

The relative impacts of vegetation, topography and spatial arrangement on building loss to wildfires in case studies of California and Colorado. Alexandre, Patricia M.; Stewart, Susan I.; Mockrin, Miranda H.; Keuler, Nicholas S.; Syphard, Alexandra D.; Bar-Massada, Avi; Clayton, Murray K.; Radeloff, Volker C. 2015. Landscape Ecology. 31: 415–430. http://www.treesearch.fs.fed.us/pubs/49091.

The RxCADRE study: A new approach to interdisciplinary fire research. Peterson, David L.; Hardy, Colin C. 2016. International Journal of Wildland Fire. 25: i. http://www.treesearch.fs.fed.us/pubs/50298.

Toward a more ecologically informed view of severe forest fires. Hutto, Richard L.; Keane, Robert E.; Sherriff, Rosemary L.; Rota, Christopher T.; Eby, Lisa A.; Saab, Victoria A. 2016. Ecosphere. 7(2): e01255. http://www.treesearch.fs.fed.us/pubs/50804.

Forest and woodland ecosystems

Aggressive root pathogen *Phellinus noxius* and implications for western Pacific Islands. Ashiglar, Sara M.; Cannon, Phil G.; Klopfenstein, Ned B. 2015. In: Murray, Michael; Palacios, Patsy, comps. Proceedings of the 62nd annual Western International Forest Disease Work Conference; 2014 September 8–12; Cedar City, Utah: 79–81. http://www.treesearch.fs.fed.us/pubs/50643.

Community structure, biodiversity, and ecosystem services in treeline whitebark pine communities: Potential impacts from a non-native pathogen. Tomback, Diana F.; Resler, Lynn M.; Keane, Robert E.; Pansing, Elizabeth R.; Andrade, Andrew J.; Wagner, Aaron C. 2016. Forests. 7(1): 21; doi.10.3390/f7010021. http://www.treesearch.fs.fed.us/pubs/50806.

Complex challenges of maintaining whitebark pine in Greater Yellowstone under climate change: A call for innovative research, management, and policy approaches. Hansen, Andrew; Ireland, Kathryn; Legg, Kristin; Keane, Robert; Barge, Edward; Jenkins, Martha; Pillet, Michiel. 2016. Forests. 7(3): 54; doi:10.3390/f7030054. http://www.treesearch.fs.fed.us/pubs/50803.

Dendrochronology of Utah Juniper (*Juniperus osteosperma* (Torr.) Little). Derose, R. Justin; Bekker, Matthew F.; Kjelgren, Roger; Buckley, Brendan M.; Speer, James H.; Allen, Eric B. 2016. Tree-Ring Research, 72(1): 1–14. http://www.treesearch.fs.fed.us/pubs/50603.

DNA-based characterization of wood-, butt- and root-rot fungi from the western Pacific Islands. Ashiglar, Sara M.; Cannon, Phil G.; Schlub, Robert L.; Kim, Mee-Sook; Ota, Yuko; Sahashi, Norio; Klopfenstein, Ned B. 2015. In: Murray, Michael; Palacios, Patsy, comps. Proceedings of the 62nd annual Western International Forest Disease Work Conference; 2014 September 8–12; Cedar City, Utah: 41–44. http://www.treesearch.fs.fed.us/pubs/50642.

Efficacy of washing treatments in the reduction of post-harvest decay of chestnuts (*Castanea crenata* 'Tsukuba') during storage. Lee, Uk; Joo, Sukhyun; Klopfenstein, Ned B.; Kim, Mee-Sook. 2016. Canadian Journal of Plant Science. 96: 1–5. http://www.treesearch.fs.fed.us/pubs/50647.

European Ash (*Fraxinus excelsior* L.) dieback: Disintegrating forest in the mountain protected areas, Czech Republic. Vacek, Stanislav; Vacek, Zdenek; Bulusek, Daniel; Putalova, Tereza; Sarginci, Murat; Schwarz, Otakar; Srutka, Petr; Podrazsky, Vilem; Moser, W. Keith. 2015. Austrian Journal of Forest Science. 4: 203–223. http://www.treesearch.fs.fed.us/pubs/50620.

Fire history and moisture influences on historical forest age structure in the sky islands of southern Arizona, USA. Iniguez, Jose M.; Swetnam, Thomas W.; Baisan, Christopher H. 2016. Journal of Biogrgraphy. 43: 85–95.

First report of the Armillaria root disease pathogen, *Armillaria sinapina*, on subalpine fir (*Abies lasiocarpa*) and quaking aspen (*Populus tremuloides*) in Colorado.

Journals and Other Publications

Burns, K. S.; Hanna, J. W.; Klopfenstein, Ned; Kim, M.-S. 2016. Plant Disease. 100(1): 217. http://www.treesearch.fs.fed.us/pubs/50646.

Forest biogeochemistry in response to drought. Schlesinger, W.H.; Dietze, M.C.; Jackson, R.G.; Phillips, R.P.; Rhoades, C.C.; Rustad, L.E.; Vose, J.M. 2015. Global Change Biology. doi: 10.1111/gcb.13105. http://www.treesearch.fs.fed.us/pubs/50815.

L**ong-term landscape changes in a subalpine spruce-fir forest in central Utah, USA**. Morris, Jesse L.; DeRose, R. Justin; Brunelle, Andrea R. 2015. Forest Ecosystems. 2: 35. 12 p. http://www.treesearch.fs.fed.us/pubs/50600.

Low-severity fire increases tree defense against bark beetle attacks. Hood, Sharon; Sala, Anna; Heyerdahl, Emily K.; Boutin, Marion. 2015. Ecology. 96(7): 1846–1855. http://www.treesearch.fs.fed.us/pubs/50794.

Mark-recapture estimation of snag standing rates in northern Arizona mixed-conifer and ponderosa pine forests. Ganey, Joseph L.; White, Gary C.; Jenness, Jeffrey S.; Vojta, Scott C. 2015. The Journal of Wildlife Management. 79(8): 1369–1377. http://www.treesearch.fs.fed.us/pubs/49663.

Ponderosa pine resin defenses and growth: Metrics matter. Hood, Sharon; Sala, Anna. 2015. Tree Physiology. 35: 1223–1235. http://www.treesearch.fs.fed.us/pubs/50793.

Preliminary survey of wood-associated fungi in southeast O'ahu of Hawai'i using DNA-based identification. Ashiglar, S.M.; Brooks, F.; Cannon, Phil G.; Klopfenstein, Ned. 2015. In: Murray, Michael; Palacios, Patsy, comps. Proceedings of the 62nd annual Western International Forest Disease Work Conference; 2014 September 8–12; Cedar City, Utah: 67–69. http://www.treesearch.fs.fed.us/pubs/50641.

Recommendations for snag retention in southwestern mixed-conifer and ponderosa pine forests: History and current status. Ganey, Joseph L. 2016. Wildlife Society Bulletin. doi: 10.1002/wsb.609. http://www.treesearch.fs.fed.us/pubs/50323.

Response of mountain *Picea abies* forests to stand-replacing bark beetle outbreaks: Neighbourhood effects lead to self-replacement. Zeppenfeld, Thorsten; Svoboda, Miroslav; DeRose, R. Justin; Heurich, Marco; Muller, Jorg; Cizkova, Pavla; Stary, Martin; Bace, Radek; Donato, Daniel C. 2015. Journal of Applied Ecology. 52: 1402–1411. http://www.treesearch.fs.fed.us/pubs/50601.

Seedling establishment and physiological responses to temporal and spatial soil moisture changes. Pinto, Jeremy; Marshall, John D.; Dumroese, Kas; Davis, Anthony S.; Cobos, Douglas R. 2016. New Forests. 47(2): 223–241. http://www.treesearch.fs.fed.us/pubs/50485.

Short-term belowground responses to thinning and burning treatments in southwestern ponderosa pine forests of the USA. Overby, Steven T.; Hart, Stephen C. 2016. Forests. 7(2). doi:10.3390/f7020045. http://www.treesearch.fs.fed.us/pubs/50484.

Grasslands, shrublands, and desert ecosystems

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Science Program Areas

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.

Aldo Leopold Wilderness Research Institute

The Aldo Leopold Wilderness Research Institute aims to provide scientific leadership by bringing diverse groups of scientists and managers together to develop and use the knowledge needed to assure wilderness ecosystems and values endure for generations to come. Website: http://leopold.wilderness.net. Contact Susan Fox, Program Director, for more information: 406-542-4193.

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 Bret Butler, Acting Program Manager, for more information: 406-329-4801.

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 Alison Hill, Program Manager, for more information: 928-556-2105.

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 David Chapman, Program Manager, for more information: 970-498-1378.

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, Program Manager, 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. Website: http://www.fs.fed.us/rm/science-application-integration/. Contact Jan Engert, Assistant Station Director, for more information: 970-498-1377.

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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