USDA
United States Department of Agriculture

Rocky Mountain Research Station

New Publications

April–June 2018

CONTENTS

Publications are also available at https://www.fs.fed.us/rmrs/publications.

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

Climate change vulnerability and adaptation in the Intermountain Region, Part 1

Limited paper copies are available from RMRS Distribution: rmrspubrequest@fs.fed.us

Climate change vulnerability and adaptation in the Intermountain Region [Part 1]. Halofsky, Jessica E.; Peterson, David L.; Ho, Joanne J.; Little, Natalie, J.; Joyce, Linda A., eds. 2018. Gen. Tech. Rep. RMRS-GTR-375. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 1–197.

The Intermountain Adaptation Partnership (IAP) identified climate change issues relevant to resource management on Federal lands in Nevada, Utah, southern Idaho, eastern California, and western Wyoming, and developed solutions intended to minimize negative effects of climate change and facilitate transition of diverse ecosystems to a warmer climate. Part I includes the Introduction [Chapter 1]; Biogeographic, cultural, and historical setting [Chapter 2]; Historical and projected climate [Chapter 3]; Effects of climate change on hydrology, water resources, and soil [Chapter 4]; Effects of climate change on native fish and other aquatic species [Chapter 5]; Effects of climate change on forest vegetation [Chapter 6]; and Effects of climate change on nonforest vegetation [Chapter 7].

https://www.fs.usda.gov/treesearch/pubs/56101

Climate change vulnerability and adaptation in the Intermountain Region, Part 2

Limited paper copies are available from RMRS Distribution: rmrspubrequest@fs.fed.us

Climate change vulnerability and adaptation in the Intermountain Region [Part 2]. Halofsky, Jessica E.; Peterson, David L.; Ho, Joanne J.; Little, Natalie, J.; Joyce, Linda A., eds. 2018. Gen. Tech. Rep. RMRS-GTR-375. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 199–513.

The Intermountain Adaptation Partnership (IAP) identified climate change issues relevant to resource management on Federal lands in Nevada, Utah, southern Idaho, eastern California, and western Wyoming, and developed solutions intended to minimize negative effects of climate change and facilitate transition of diverse ecosystems to a warmer climate. Part 2 includes Effects of climate change on ecological disturbances [Chapter 8]; Effects of climate change on terrestrial animals [Chapter 9]; Effects of climate change on outdoor recreation [Chapter 10]; Effects of climate change on infrastructure [Chapter 11]; Effects of climate change on cultural resources [Chapter 12]; Effects of climate change on ecosystem services [Chapter 13]; Adapting to the effects of climate change [Chapter 14]; and Conclusions [Chapter 15].

https://www.fs.usda.gov/treesearch/pubs/56102

New RMRS Publication Series

Climate change vulnerability assessment of aquatic and terrestrial ecosystems in the U.S. Forest Service Rocky Mountain Region

Limited paper copies are available from RMRS Distribution: rmrspubrequest@fs.fed.us

Climate change vulnerability assessment of aquatic and terrestrial ecosystems in the U.S. Forest Service Rocky Mountain Region. Rice, J.R.; Joyce, L.A.; Regan, C.; Winters, D.; Truex, R. 2018. Gen. Tech. Rep. RMRS-GTR-376. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 216 p.

Six priority ecosystems were identified in the USDA Forest Service, Rocky Mountain Region: alpine turf and dwarf-shrubland; aquatic, riparian, and wetland ecosystems in glaciated valleys; subalpine spruce-fir; low-gradient mountain stream reaches; ponderosa pine; and Great Plains streams and riparian areas. Vulnerability to nonclimate and climate stressors for these priority ecosystems is assessed. Criteria used to assess vulnerability include ecosystem traits related to the sensitivity and adaptive capacity of the ecosystem. We engaged scientists through an expert review to vet the vulnerability rankings and confidence in the assessment. Aquatic ecosystems were the most vulnerable priority ecosystem, and alpine ecosystems had higher vulnerability than lower elevation terrestrial ecosystems. The narrative for each priority ecosystem describes the nature of the vulnerability to climate change.

https://www.fs.usda.gov/treesearch/pubs/56392

Proceedings of the IUFRO joint conference: Genetics of five-needle pines, rusts of forest trees, and Strobusphere

Limited paper copies are available from RMRS Distribution: rmrspubrequest@fs.fed.us

Proceedings of the IUFRO joint conference: Genetics of five-needle pines, rusts of forest trees, and Strobusphere; 2014 June 15-20; Fort Collins, CO. Schoettle, Anna W.; Sniezko, Richard A.; Kliejunas, John T., eds. 2018. Proc. RMRS-P-76. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 245 p.

Proceedings from the 2014 IUFRO Joint Conference: Genetics of five-needle pines, rusts of forest trees, and Strobusphere in Fort Collins, Colorado. The published proceedings include 91 papers pertaining to research conducted on the genetics and pathology of five-needle pines and rusts of forest trees. Topic areas are: ecology and climate change, common garden genetics, genomic resources, rust resistance, and rust biology, ecology, and management.

https://www.fs.usda.gov/treesearch/pubs/56054

New RMRS Publication Series

Arizona's forest resources, 2001–2014

Limited paper copies are available from RMRS Distribution: rmrspubrequest@fs.fed.us

Arizona's forest resources, 2001–2014. Shaw, John D.; Menlove, Jim; Witt, Chris; Morgan, Todd A.; Amacher, Michael C.; Goeking, Sara A.; Werstak, Charles E., Jr. 2018. Resour. Bull. RMRS-RB-25. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 126 p.

This report presents a summary of the most recent inventory of Arizona's forests based on field data collected between 2001 and 2014. The report includes descriptive highlights and tables of forest and timberland area, numbers of trees, biomass, volume, growth, mortality, and removals. Most sections and tables are organized by forest type or forest-type group, species group, diameter class, or owner group. The report also describes the inventory's design, inventory terminology, and data reliability. Results show that Arizona's forest land covers 18.6 million acres. Forty-one percent (7.7 million acres) of this forest land is administered by the USDA Forest Service, and another 39 percent (7.3 million acres) is privately owned. The State's most abundant forest type is pinyon/juniper woodland, which covers more than 7.3 million acres. Pinyon/juniper woodlands, combined with juniper woodland, cover over 11 million acres, or almost 60 percent of Arizona's forest land area.

https://www.fs.usda.gov/treesearch/pubs/56264

Characterizing fire behavior from laboratory burns of multi-aged, mixed-conifer masticated fuels in the western United States

Online only

Characterizing fire behavior from laboratory burns of multi-aged, mixed-conifer masticated fuels in the western United States. Heinsch, Faith Ann; Sikkink, Pamela G.; Smith, Helen Y.; Retzlaff, Molly L. 2018. RMRS-RP-107. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 23 p.

Masticated materials from different ecosystems are unique and may react differently to fire. Therefore, there are no standard guidelines to help managers understand the potential fire behavior in treated areas. In this study, we evaluated burn characteristics for several mixed-conifer masticated fuels that range from 0 to 10 years since treatment. Overall, there was great variety in observed fire behavior, and time since treatment did not affect fire behavior characteristics. The method used to masticate fuel has some impact on burning, with larger pieces of fuel tending to act as a barrier to fire spread. From our limited experimental burns, fire behavior in the laboratory was best represented by the SB1 (low load activity fuels) fuel model. These results may not reflect how variations in fuel bed moisture and in situ environment would alter fire behavior characteristics in masticated fuels in management units.

https://www.fs.usda.gov/treesearch/pubs/56296

Forest Service Publications Still Available

Diseases of trees in the Great Plains

Limited paper copies are available from RMRS Distribution: rmrspubrequest@fs.fed.us

Diseases of trees in the Great Plains. Bergdahl, Aaron D.; Hill, Alison, tech. coords. 2016. Gen. Tech. Rep. RMRS-GTR-335. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 229 p.

Hosts, distribution, symptoms and signs, disease cycle, and management strategies are described for 84 hardwood and 32 conifer diseases in 56 chapters. Color illustrations are provided to aid in accurate diagnosis. A glossary of technical terms and indexes to hosts and pathogens also are included.

https://www.fs.usda.gov/treesearch/pubs/53010

Journals and Other Publications

Online links are provided if available. For the general public, some links may hit a pay wall. Please accept our apologies for any inconvenience.

Air, water and aquatic environments

Comment: The importance of sound methodology in environmental DNA sampling. Wilcox, T.M.; Carim, K.J.; Young, M.K.; McKelvey, K.S.; Franklin, T.W.; Schwartz, M.K. 2018. North American Journal of Fisheries Management. 38: 592–596. doi 10.1002/nfm.10055. https://www.fs.usda.gov/treesearch/pubs/56192.

Global warming of salmon and trout rivers in the northwestern U.S.: Road to ruin or path through purgatory? Isaak, Daniel J.; Luce, Charles H.; Horan, Dona L.; Chandler, Gwynne; Wollrab, Sherry; Nagel, David E. 2018. Transactions of the American Fisheries Society. doi: 10.1002/tafs.10059. https://www.fs.usda.gov/treesearch/pubs/56060.

Regional climate response collaboratives: Multi-institutional support for climate resilience. Averyt, Kristen; Reeves, Matt; Travis, William.; [et al.] 2018. Bulletin of the American Meteorological Society. 99: 891–898. https://www.fs.usda.gov/treesearch/pubs/56429.

Repurposing environmental DNA samples—Detecting the western pearlshell (*Margaritifera falcata*) as a proof of concept. Dysthe, Joseph C.; Young, Michael K.; McKelvey, Kevin S.; Schwartz, Michael K. 2018. Ecology and Evolution. 00:1–12. doi: 10.1002/ece3.3898. https://www.fs.usda.gov/treesearch/pubs/55666.

Journals and Other Publications

Online links are provided if available. For the general public, some links may hit a pay wall. Please accept our apologies for any inconvenience.

Fire, fuel and smoke

Characterizing spatial neighborhoods of refugia following large fires in northern New Mexico, USA. Haire, Sandra L.; Coop, Jonathan D.; Miller, Carol. 2017. Land. 6: 19. https://www.fs.usda.gov/treesearch/pubs/56428.

Fire regimes approaching historic norms reduce wildfire-facilitated conversion from forest to non-forest. Walker, Ryan B.; Coop, Jonathan D.; Parks, Sean A.; Trader, Laura. 2018. Ecosphere. 9(4): e02182. https://www.fs.usda.gov/treesearch/pubs/56059.

High-severity fire: Evaluating its key drivers and mapping its probability across western US forests. Parks, Sean A.; Holsinger, Lisa M.; Jolly, W. Matt; Dillon, Gregory K.; [et al.]. 2018. Environmental Research Letters. 13: 44037. https://www.fs.usda.gov/treesearch/pubs/56057**.**

Influence of landscape structure, topography, and forest type on spatial variation in historical fire regimes, Central Oregon, USA. Merschel, Andrew G.; Heyerdahl, Emily K.; Spies, Thomas A.; Loehman, Rachel A. 2018. Landscape Ecology. 33: 1195–1209. https://www.fs.usda.gov/treesearch/pubs/56417.

Mean composite fire severity metrics computed with Google Earth engine offer improved accuracy and expanded mapping potential. Parks, Sean A.; Holsinger, Lisa M.; Loehman, Rachel A.; [et al.]. 2018. Remote Sensing. 10: 879. https://www.fs.usda.gov/treesearch/pubs/56293.

What drives low-severity fire in the southwestern USA? Parks, Sean A.; Dobrowski, Solomon Z.; Panunto, Matthew H. 2018.Forests. 9: 165. https://www.fs.usda.gov/treesearch/pubs/56058.

Forest and woodland ecosystems

Amount and location of damage to residual trees from cut-to-length thinning operations in a young redwood forest in northern California. Hwang, Kyungrok; Han, Han-Sup; Page-Dumroese, Deborah S.; [et al.]. 2018. Forests. 9: 352. https://www.fs.usda.gov/treesearch/pubs/56424.

***Armillaria mexicana*, a newly described species from Mexico**. Elias-Roman, Ruen Damian; Hanna, John W.; Ross-Davis, Amy L.; Klopfenstein, Ned B.; [et al.]. 2018. Mycologia. 110; (2): 347–360. https://www.fs.usda.gov/treesearch/pubs/56432.

Changes in forest structure since 1860 in ponderosa pine dominated forests in the Colorado and Wyoming Front Range, USA. Battaglia, Mike A.; Fornwalt, Paula J.; Huckaby, Laurie S.; [et al.]. 2018. Forest Ecology and Management. 422: 147–160. https://www.fs.usda.gov/treesearch/pubs/56069.

Evidence for a prepupal diapause in the mountain pine beetle (*Dendroctonus ponderosae*, Coleoptera: Curculionidae, Scolytinae). Bentz, Barbara J.; Hansen, E. Matthew. 2017. Environmental Entomology. 47(1): 175–183. https://www.fs.usda.gov/treesearch/pubs/56248.

Genetic and genotypic diversity of *Puccinia psidii* —The cause of guava/eucalypt/myrtle rust—And preliminary predictions of global areas at risk. Ross-Davis, Amy L.; Hanna, John W.; Klopfenstein, Ned B.; [et al.] 2018. In: Schoettle, Anna W.; Sniezko, Richard A.; Kliejunas, John T., eds. Proceedings of the IUFRO joint conference: Genetics of five-needle pines, rusts of forest trees, and Strobusphere; 2014 June 15–20; Fort Collins, CO. Proc. RMRS-P-76. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 186–173. https://www.fs.usda.gov/treesearch/pubs/56431.

Genetic diversity of the myrtle rust pathogen (*Austropuccinia psidii*) in the Americas and Hawaii: Global implications for invasive threat assessments. Stewart, J. E.; Ross-Davis, A. L.; Hanna, J. W.; Klopfenstein, N. B. [et al.]. 2017. Forest Pathology. 48: e12378. https://www.fs.usda.gov/treesearch/pubs/54868.

Limber pine and white pine blister rust monitoring and assessment guide for Rocky Mountain National Park. Cleaver, Cristy M.; Burns, Kelly S.; Schoettle, Anna W. 2017. Final Report prepared by Rocky Mountain Research Station for Rocky Mountain National Park. Inter-Agency Agreement 15-IA-11221633-157. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 28 p. https://www.fs.usda.gov/treesearch/pubs/56244.

Low offspring survival in mountain pine beetle infesting the resistant Great Basin bristlecone pine supports the preference-performance hypothesis. Eidson, Erika L.; Mock, Karen E.; Bentz,

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Online links are provided if available. For the general public, some links may hit a pay wall. Please accept our apologies for any inconvenience.

Barbara J. 2018. PLoS ONE. 13(5): e0196732. https://www.fs.usda.gov/treesearch/pubs/56251.

Management of western North American bark beetles with semiochemicals. Seybold, Steven J.; Bentz, Barbara J.; Fettig, Christopher J.; [et al.]. 2018. Annual Review of Entomology. 63: 407-32. https://www.fs.usda.gov/treesearch/pubs/56252.

Molecular genetic approaches toward understanding forest-associated fungi and their interactive roles within forest ecosystems. Stewart, Jane E.; Kim, Mee-Sook; Klopfenstein, Ned B. 2018. Current Forestry Reports. doi: 10.1007/s40725-018-0076-5. https://www.fs.usda.gov/treesearch/pubs/56433.

Quantifying understory vegetation density using small-footprint airborne lidar. Campbell, Michael J.; Hudak, Andrew T.; Butler, Bret W.; [et al.] 2018. Remote Sensing of Environment. 215: 330-342.https://www.fs.usda.gov/treesearch/pubs/56418.

Rapid neo-sex chromosome evolution and incipient speciation in a major forest pest. Bracewell, Ryan R.; Bentz, Barbara J.; Sullivan, Brian T.; [et al.]. 2017. Nature Communications 8(1): 1593. https://www.fs.usda.gov/treesearch/pubs/56249.

Reproductive isolation and environmental adaptation shape the phylogeography of mountain pine beetle (*Dendroctonus ponderosa*). Dowle, Eddy J.; Bracewell, Ryan R.; Bentz, Barbara J.; [et al.]. 2017. Molecular Ecology. 26(21): 6071-6084. https://www.fs.usda.gov/treesearch/pubs/56250.

Stand dynamics 11 years after retention harvest in a lodgepole pine forest. Crotteau, Justin S.; Hood, Sharon M.; Sutherland, Elaine Kennedy; Wright, David K.; Egan, Joel M.; [et al.]. 2018. Forest Ecology and Management. 427: 169-181. https://www.fs.usda.gov/treesearch/pubs/56426.

Grasslands, shrublands and desert ecosystems

Comprehensive inventory of true flies (Diptera) at a tropical site. Brown, Brian V.; Borkent, Art; Runyon, Justin B.; [et al.]. 2018. Communications Biology. 1: 21. https://www.fs.usda.gov/treesearch/pubs/56087.

Container volume and subirrigation schedule influence *Quercus variabilis* seedling growth and nutrient status in the nursery and field. Sun, Qiaoyu; Dumroese, R. Kasten; Liu, Yong. 2018. Scandinavian Journal of Forest Research. doi: 10.1080/02827581.2018.1444787. https://www.fs.usda.gov/treesearch/pubs/56065.

Drought and increased CO_2 alter floral visual and olfactory traits with context-dependent effects on pollinator visitation. Glenny, William R.; Runyon, Justin B.; Burkle, Laura A. 2018. New Phytologist. doi: 10.1111/nph.15081. https://www.fs.usda.gov/treesearch/pubs/56088.

The emergy of metabolism in the same ecosystem (maize) under different environmental conditions. Zhai, X.; Huan, Z.; Finch, D.M.; [et al.]. 2018. Journal of Cleaner Production. 191: 233–239. https://www.fs.usda.gov/treesearch/pubs/56153.

How can my research paper be useful for future meta-analyses on forest restoration practices? Andivia, Enrique; Villar Salvador, Pedro; Dumroese, R. Kasten.; [et al.]. 2018. New Forests. doi: 10.1007/s11056-018-9631-y. https://www.fs.usda.gov/treesearch/pubs/56062.

Invasive Species Science Update (No. 10). Runyon, Justin, ed. 2018. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 12 p. https://www.fs.usda.gov/treesearch/pubs/56085.

Irrigation requirements for seed production of three leguminous wildflowers of the U.S. Intermountain West. Shock, C.C.; Shaw, N.; Kilkenny, F.F.; [et al.]. 2018. Hortscience. 53(5): 692–697. https://www.fs.usda.gov/treesearch/pubs/56420.

Palpi aplenty: New species in the *Chrysotus longipalpus* species group (Diptera: Dolichopodidae). Runyon, Justin B.; Capellari, Renato S. 2018. Zootaxa. 4399(4): 579–585. https://www.fs.usda.gov/treesearch/pubs/56089.

Priority actions to improve provenance decision-making. Breed, Martin F.; Harrison, Peter A.; Kilkenny, Francis F.; [et al.]. 2018. Bioscience. 68(7): 510–516. https://www.fs.usda.gov/treesearch/pubs/56419.

Remarkable fly (Diptera) diversity in a patch of Costa Rican cloud forest: Why inventory is a vital science. Borkent, Art; Brown, Brian

Journals and Other Publications

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V.; Runyon, Justin B.; [et al.]. 2018. Zootaxa. 4402(1): 53-90. https://www.fs.usda.gov/treesearch/pubs/56086.

Revisiting historical beech and oak forests in Indiana using a GIS method to recover information from bar charts. Hanberry, Brice. 2018. PeerJ. 6:e5158; doi 10.7717/peerj.5158. https://www.fs.usda.gov/treesearch/pubs/56416.

Stocktype and vegetative competition influences on *Pseudotsuga menziesii* and *Larix occidentalis* seedling establishment. Pinto, Jeremiah R.; McNassar, Bridget A.; Kildisheva, Olga A.; [et al.]. 2018. Forests. 9(5): 228. https://www.fs.usda.gov/treesearch/pubs/56245.

Tips for executing exceptional conferences, meetings, and workshops. Haase, Diane L.; Dumroese, R. Kasten; Zabel, Richard. 2017. Tree Planters' Notes. 60(1): 16–27. https://www.fs.usda.gov/treesearch/pubs/56061.

Tree seedling response to LED spectra: Implications for forest restoration. Montagnoli, Antonio; Dumroese, R. Kasten; Pinto, Jeremiah R.; [et al.]. 2018. Plant Biosystems. 152(3): 515–523. doi: 10.1080/11263504.2018.1435583. https://www.fs.usda.gov/treesearch/pubs/56064.

Twenty-five years after: Post-introduction association of *Mecinus janthinus* s.l. with invasive host toadflaxes *Linaria vulgaris* and *Linaria dalmatica* in North America. Toševski, I.; Sing, S.E.; De Clerck-Floate, R.; [et al.]. 2018. Annals of Applied Biology. 173: 16–34. https://www.fs.usda.gov/treesearch/pubs/56430.

Water management in container nurseries to minimize pests. Dumroese, R. Kasten; Haase, Diane L. 2018. Tree Planters' Notes. 61(1): 4–11. https://www.fs.usda.gov/treesearch/pubs/56063.

Human dimensions

Misleading prioritizations from modelling range shifts under climate change. Sofaer, Helen R.; Jarnevich, Catherine S.; Flather, Curtis H. 2018. Global Ecology and Biogeography. 27: 658–666. https://www.fs.usda.gov/treesearch/pubs/56295.

A model of communicative and hierarchical foundations of high reliability organizing in wildland firefighting teams. Jahn, Jody L.S.; Black, Anne E. 2018. Management Communication Quarterly. 1–24. doi: 10.1177/0893318917691358. https://www.fs.usda.gov/treesearch/pubs/56394.

Inventory and monitoring

Assessing the effects of fire disturbance and timber management on carbon storage in the Greater Yellowstone Ecosystem. Zhao, Feng; Healey, Sean P.; Goeking, Sara A.; [et al.]. 2018. Environmental Management. doi: 10.1007/s00267-018-1073-y. https://www.fs.usda.gov/treesearch/pubs/56400.

Implementation of the LandTrendr algorithm on Google Earth Engine. Kennedy, Robert E.; Cohen, Warren B.; Healey, Sean; [et al.]. 2018. Remote Sensing. 10: 691. https://www.fs.usda.gov/treesearch/pubs/56399.

Improved prediction of stream flow based on updating land cover maps with remotely sensed forest change detection. Hernandez, Alexander J.; Healey, Sean P.; Huang, Hongsheng; [et al.]. 2018. Forests. 9: 317. https://www.fs.usda.gov/treesearch/pubs/56398.

A LandTrendr multispectral ensemble for forest disturbance detection. Cohen, Warren B.; Yang, Zhiqiang; Healey, Sean P.; [et al.]. 2018. Remote Sensing of Environment. 205: 131–140. https://www.fs.usda.gov/treesearch/pubs/56396.

Mapping forest change using stacked generalization: An ensemble approach. Healey, Sean P.; Cohen, Warren B.; Kennedy, Robert E.; Moisen, Gretchen G.; [et al.]. 2018. Remote Sensing of Environment. 204: 717–728. https://www.fs.usda.gov/treesearch/pubs/56397.

Wilderness research

Manipulating the wild: A survey of restoration and management interventions in U.S. wilderness. Lieberman, Lucy; Hahn, Beth; Landres, Peter. 2018. Restoration Ecology. doi: 10.1111/rec.12670. https://www.fs.usda.gov/treesearch/pubs/56422.

A mental model of science informed by public lands managers: Increasing the chances for management based on science. Watson, Alan E.; Armatas, Christopher A. 2017. Journal of Contemporary

Journals and Other Publications

Online links are provided if available. For the general public, some links may hit a pay wall. Please accept our apologies for any inconvenience.

Management. 8(4): Article ID: 1929-0128-2017-04-01-17. https://www.fs.usda.gov/treesearch/pubs/56294.

A watershed moment for river conservation and science. Chesterton, Steve; Watson, Alan. 2017. International Journal of Wilderness. 23(2): 3, 9. https://www.fs.usda.gov/treesearch/pubs/56395.

Wildlife and terrestrial habitats

A conservation planning tool for Greater Sage-grouse using indices of species distribution, resilience, and resistance. Ricca, Mark A.; Chambers, Jeanne C.; Espinosa, Shawn P.; [et al.]. 2018. Ecological Applications. 28(4): 878 – 896. https://www.fs.usda.gov/treesearch/pubs/56423.

The genetic network of greater sage-grouse: Range-wide identification of keystone hubs of connectivity. Cross, T.B.; Schwartz, M.K.; Naugle, D.E.; [et al.]. 2018. Ecology and Evolution. https://onlinelibrary.wiley.com/doi/abs/10.1002/ECE3.4056. https://www.fs.usda.gov/treesearch/pubs/56110.

The importance of sound methodology in environmental DNA sampling. Wilcox, T. M.; Carim, K. J.; Young, M. K.; McKelvey, K. S.; Franklin, T. W.; Schwartz, M. K. 2018. North American Journal of Fisheries Management. 38: 592–596. https://www.fs.usda.gov/treesearch/pubs/56192.

Quantifying functional connectivity: The role of breeding habitat, abundance, and landscape features on range-wide gene flow in sage-grouse. Row, J.R.; Doherty, K.E.; Cross, T.B.; Schwartz, M.K.; [et al.]. 2018. Evolutionary Applications. https://onlinelibrary.wiley.com/doi/abs/10.1111/eva.12627. https://www.fs.usda.gov/treesearch/pubs/56154.

Spatio-temporal responses of Canada lynx (*Lynx canadensis*) to silvicultural treatments in the Northern Rockies, U.S. Holbrook, J.D.; Squires, J.R.; Graham, R.; [et al.]. 2018. Forest Ecology and Management. 422: 114–124. https://www.fs.usda.gov/treesearch/pubs/56421.

Weather conditions and date influence male Sage Grouse attendance rates at leks. Fremgen, Aleshia L.; Hansen, Christopher P.; Rumble, Mark A.; [et al.]. 2018. International Journal of Avian Science. doi: 10.1111/ibi.12598. https://www.fs.usda.gov/treesearch/pubs/56425.

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. Webpage: https://www.fs.fed.us/rmrs/science-program-areas/air-water-and-aquatic-environmentss. Contact Frank McCormick, Program Manager, for more information: 970-498-1175.

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. Webpage: https://www.fs.fed.us/rmrs/science-program-areas/aldo-leopold-wilderness-research-institute. 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. Webpage: https://www.fs.fed.us/rmrs/science-program-areas/fire-fuel-and-smoke. 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. Webpage: https://www.fs.fed.us/rmrs/science-program-areas/forest-and-woodland-ecosystems. 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. Webpage: hhttps://www.fs.fed.us/rmrs/science-program-areas/grassland-shrubland-and-desert-ecosystems. 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. Webpage: https://www.fs.fed.us/rmrs/science-program-areas/human-dimensions 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. Webpage: https://www.fs.fed.us/rmrs/science-program-areas/inventory-and-monitoring. Contact Michael Wilson, Program Manager, for more information: 801-625-5407.

Science Application and Communication

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. Webpage: https://www.fs.fed.us/rmrs/science-program-areas/science-application-and-communication. 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. Webpage: https://www.fs.fed.us/rmrs/science-program-areas/wildlife-and-terrestrial-ecosystems. Contact Michael Schwartz, Program Manager, for more information: 406-542-4161.

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