Rocky Mountain Research Station

New Publications

January to March 2014

Integrated Science Working for You

Air, Water, and Aquatic Environments

Aldo Leopold Wilderness Research Institute

Fire, Fuel, and Smoke

Forest and Woodland Ecosystems

Grasslands, Shrublands, and Desert Ecosystems

Human Dimensions

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Wildlife and Terrestrial Habitats

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The Rocky Mountain Research Station

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.

To order a publication, please see the last page.

New RMRS Series Publications

Climate change impacts on carbon stores

Order 1

Review of climate change impacts on future carbon stores and management of warm deserts of the United States. Thomey, Michell L.; Ford, Paulette L.; Reeves, Matt C.; Finch, Deborah M.; Litvak, Marcy E.; Collins, Scott L. 2014. Gen. Tech. Rep. RMRS-GTR-316. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 26 p.

Reducing atmospheric carbon dioxide (CO_2) concentration through enhanced terrestrial carbon storage may help slow or reverse the rate of global climate change. We summarize studies that focus on key components of carbon exchange, including photosynthesis, soil respiration, and plant productivity, across the warm deserts of North America to determine if common trends exist that can be utilized in management. We also provide an overview of how management practices can influence carbon sequestration in this region and discuss the U.S. Department of Agriculture Forest Service Climate Change Scorecard. Since desertification is projected to increase in the future, management strategies that increase carbon sequestration or decrease carbon loss are especially important.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr316.html.

Multi-agency Oregon Pilot: National inventory and assessment of rangelands

Online only

Multi-agency Oregon Pilot: Working towards a national inventory and assessment of rangelands using onsite data. Patterson, Paul L.; Alegria, James; Jolley, Leonard; Powell, Doug; Goebel, J. Jeffery; Riegel, Gregg M.; Riitters, Kurt H.; Ducey, Craig. 2014. Gen. Tech. Rep. RMRS-GTR-317. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 56 p. **NOTE**: This publication is available only online, no printed copies are available.

Rangelands are lands dominated by grasses, forbs, and shrubs and are managed as a natural ecosystem. Although these lands comprise approximately 40 percent of the landmass of the continental United States, there is no coordinated effort designed to inventory, monitor, or assess rangeland conditions at the national scale. A pilot project in central Oregon with the U.S. Forest Service, the Natural Resources Conservation Service, and the Bureau of Land Management showed how consistent information could be collected to produce approximately unbiased estimates across the landscape. Exploratory data analysis was conducted to illustrate some of the uses for the data.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr317.html.

Logging utilization in Idaho

Online only

Logging utilization in Idaho: Current and past trends. Simmons, Eric A.; Morgan, Todd A.; Berg, Erik C.; Zarnoch, Stanley J.; Hayes, Steven W.; Thompson, Mike T. 2014. Gen. Tech. Rep. RMRS-GTR-318. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 15 p. **NOTE**: This publication is available only online, no printed copies are available.

A study of commercial timber-harvesting activities in Idaho was conducted during 2008 and 2011 to characterize current tree utilization, logging operations, and changes from previous Idaho logging utilization studies. A two-stage simple random sampling design was used to select sites and felled trees for measurement within active logging sites. Thirty-three logging sites and 815 felled trees were measured. This study confirmed two long-term timber harvesting trends in Idaho: declining diameter at breast height (dbh) of harvested timber, and declining amounts of logging residue generated per unit of mill-delivered volume.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr318.html.

To order a publication, please see the last page.

Climate-FVS Version 2

Online only

Climate-FVS Version 2: Content, users guide, applications, and behavior. Crookston, Nicholas L. 2014. Gen. Tech. Rep. RMRS-GTR-319. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 38 p. **NOTE**: This publication is available only online, no printed copies are available.

Climate-FVS is a modification to the Forest Vegetation Simulator designed to take climate change into account when predicting forest dynamics at decadal to century time scales. Individual tree climate viability scores measure the likelihood that the climate at a given location and at a given point in time is consistent with the climate recorded for species' contemporary distribution. These viability scores are input into Climate-FVS. A web-based service is available for providing this input for climate predictions generated by down scaling general circulation model (GCM) outputs run using several models and scenarios from the IPCC third (IPCC 2000) and fifth assessments (IPCC 2013). Climate-FVS contains components that modify mortality and growth rates, plus rules for establishing new trees. Commands are presented that control the model. These commands enable the users to explore the model's sensitivity to model components and parameters, to include pertinent information unknown to the model, and use the model to simulate management alternatives. Model outputs are very sensitive to the mortality component, are moderately sensitive to growth rate modifications, and are sensitive to maximum density adjustment only when a stand's maximum density is being approached. The intended model uses are to provide insights into future forest dynamics that are not otherwise evident, to provide model outputs that are relevant to forest managers, to provide a consistent way to compare management alternatives, and to do so using defensible methods.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr319.html.

Nursery Proceedings 2012

Order 2

National Proceedings: Forest and Conservation Nursery Associations: 2012. Proceedings. Haase, D. L.; Pinto, J. R.; Wilkinson, K. M., tech. coords. 2013. RMRS-P-69. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 114 p.

These proceedings are a compilation of 20 papers that were presented at the regional meetings of the forest and conservation nursery associations and the Intertribal Nursery Council meeting in the United States in 2012. Subject matter for the technical sessions included southern nursery history, nursery insect and disease management, water quality, chilling hour review, root architecture, and soil fumigation regulations and alternatives. Subject matter for the technical sessions of the Joint Meeting of the Intertribal Nursery Council, Western Forest and Conservation Nursery Association, and Intermountain Container Seedling Growers' Association was themed around seed technology for forest and conservation nurseries. This included sowing preparation, sowing strategies, advances in germination technology, seed orchards, and seed zones related to climate change and assisted migration. Subject matter for the technical sessions of the Intertribal Nursery Council portion of the meeting included reforestation and restoration, low-tech tools for seed collecting and processing, seed storage and inventory, seed dormancy, Mescalero Apache greenhouse production, native plant materials development, and greenhouse structure and function.

Papers by RMRS Authors:

Root system architecture:The invisible trait in container longleaf pine seedlings. Sung, Shi-Jean Susana; Dumroese, R Kasten.

Growing assisted migration: Synthesis of a climate change adaptation strategy. Williams, Mary I.; Dumroese, R Kasten.

Online: http://www.fs.fed.us/rm/pubs/rmrs_p069.html.

To order a publication, please see the last page.

Wyoming's forest products industry and timber harvest, 2010

Order 3

Wyoming's forest products industry and timber harvest, 2010. McIver, Chelsea P.; Sorenson, Colin B.; Keegan, Charles E.; Morgan, Todd A.; Thompson, Mike T. 2014. Resour. Bull. RMRS-RB-17. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 29 p.

This report traces the flow of Wyoming's 2010 timber harvest through the primary wood-using industries; provides a description of the structure, capacity, and condition of Wyoming's primary forest products industry, and quantifies volumes and uses of wood fiber. Historical wood products industry changes are discussed, as well as changes in harvest, production, employment, and sales.

Online: http://www.fs.fed.us/rm/pubs/rmrs_rb017.html.

N. Arizona trends in snag populations

Online only

Trends in snag populations in Northern Arizona mixed-conifer and ponderosa pine forests, 1997-2012. Ganey, J. L.; Vojta, S. C. 2014. Res. Pap. RMRS-RP-105. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 12 p. **NOTE**: This publication is available only online, no printed copies are available.

We monitored snag populations in drought-stressed mixed-conifer and ponderosa pine (Pinus ponderosa) forests, northern Arizona, at 5-yr intervals from 1997-2012. Snag density increased from 1997-2007 in both forest types, with accelerated change due to drought-related tree mortality during the period 2002-2007. Snag density declined non-significantly from 2007-2012, but median snag density in 2012 remained significantly greater than median density in 1997. Differences in composition of snag populations also persisted through 2012. Our results suggest that the drought-mediated spike in tree mortality observed from 2002-2007 did not persist from 2007-2012 and snag populations may be converging toward previous levels in terms of both snag density and composition of snag populations.

Online: http://www.fs.fed.us/rm/pubs/rmrs_rp105.html.

RMRS Series Publications Still Available

Effects of fire on cultural resources and archaeology

Order 4

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.

This state-of-knowledge review provides a synthesis of the effects of fire on cultural resources, which can be used by fire managers, cultural resource (CR) specialists, and archaeologists to more effectively manage wildland vegetation, fuels, and fire. The goal of the volume is (1) to provide cultural resource/archaeological professionals and policy makers with a primer on fuels, fire behavior, and fire effects to enable them to work more effectively 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 protection and the methods available to evaluate and mitigate risks to cultural resources.

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

National Forests lands: Risk of impaired condition of watersheds

Order 5

Risk of impaired condition of watersheds containing National Forest lands. Brown, Thomas C.; Froemke, Pamela. 2010. Gen. Tech. Rep. RMRS-GTR-251. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 57 p.

We assessed the risk of impaired condition of the nearly 3700 5th-level watersheds in the contiguous 48 states containing the national forests and grasslands that make up the U.S. Forest Service's National Forest System (NFS). The assessment was based on readily available, relatively consistent nationwide data sets for a series of indicators representing watershed stressors and resources at risk of watershed impairment. Using a set of weights that express the relative importance of the indicators, a summary measure of relative risk of watershed impairment was computed for each entire watershed, each NFS part of each watershed, and each non-NFS part of each watershed. The results of this assessment offer a starting point for deciding about risk mitigation efforts, one that could be supplemented by locally available data on additional indicators and by a comparison of the costs and benefits of mitigation options.

Online: http://www.fs.fed.us/rm/pubs/rmrs_gtr251.html.

Raising native plants in nurseries

Order 6

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.

Growing native plants can be fun, challenging, and rewarding. This booklet, particularly the first chapter that introduces important concepts, is for the novice who wants to start growing native plants as a hobby; however, it can also be helpful to someone with a bit more experience who is wondering about starting a nursery. The second chapter provides basic information about collecting, processing, storing, and treating seeds. Chapter three focuses on using seeds to grow plants in the field or in containers using simple but effective techniques. For those native plants that reproduce poorly from seeds, the fourth chapter describes how to start native plants from cuttings. The final chapter provides valuable information on how to successfully move native plants from the nursery and establish them in their final planting location. Several appendices expand on what has been presented in the chapters, with more details and specific information about growing a variety of native plants.

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

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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

Applications of spatial statistical network models to stream data. Isaak, Daniel J.; Peterson, Erin E.; Ver Hoef, Jay M.; Wenger, Seth J.; Falke, Jeffrey A.; Torgersen, Christian E.; Sowder, Colin; Steel, E. Ashley; Fortin, Marie-Josee; Jordan, Chris E.; Ruesch, Aaron S.; Som, Nicholas; Monestiez, Pascal. 2014. WIREs Water. doi:10.1002/wat2.1023. Online: http://www.treesearch.fs.fed.us/pubs/45559.

Bed stability in unconfined gravel bed mountain streams: With implications for salmon spawning viability in future climates. McKean, Jim; Tonina, Daniele. 2013. Journal of Geophysical Research: Earth Surface. 118: 1227-1240. Online: http://www.treesearch.fs.fed.us/pubs/45561.

A blocking primer increases specificity in environmental DNA detection of bull trout (*Salvelinus confluentus*). Wilcox, Taylor M.; Schwartz, Michael K.; McKelvey, Kevin S.; Young, Michael K.; Lowe, Winsor H. 2014. Conservation Genetics Resources. doi.10.1007/s12686-013-0113-4.

Climate change and forest values. Wear, D.N.; Joyce, L.A.; Butler, B.J.; Gaither, C.J.; Nowak, D.J.; Steward, S.I. 2014. In: Peterson, D.L.; Vos, J.M.; Patel-Weynand, T., eds. Climate change and United States forests. Advances in Global Change Research. Dordrecht: Springer Science + Business Media. 57: 91-112.

Climate change impacts on future carbon stores and management of warm deserts of the United States. Thomey, Michell L.; Ford, Paulette L.; Reeves, Matthew C.; Finch, Deborah M.; Litvak, Marcy E.; Collins, Scott L. 2014. Rangelands. 36(1): 16-24. Online: http://www.treesearch.fs.fed.us/pubs/45552.

***Cottus schitsuumsh*, a new species of sculpin (Scorpaeniformes: Cottidae) in the Columbia River basin, Idaho-Montana, USA**. Lemoine, Michael; Young, Michael K.; McKelvey, Kevin S.; Eby, Lisa; Pilgrim, Kristine L.; Schwartz, Michael K. 2014. Zootaxa. 3755(3): 241-258. Online: http://www.treesearch.fs.fed.us/pubs/45377.

Effects of climate change and wildfire on soil loss in the Southern Rockies Ecoregion. Litschert, S.E.; Theobald, D.M.; Brown, T.C. 2014. Catena. 118: 206-219.

Linear diffusion-wave channel routing using a discrete Hayami convolution method. Want, Li; Wu, Joan Q.; Elliot, William J.; Fiedler, Fritz R.; Lapin, Sergey. 2014. Journal of Hydrology. 509(13): 282-294. Online: http://www.treesearch.fs.fed.us/pubs/45558.

Modeling the effects of pulsed versus chronic sand inputs on salmonid spawning habitat in a low-gradient gravel-bed river. Maturana, Oscar; Tonina, Daniele; McKean, James A.; Buffington, John M.; Luce, Charles H.; Caamano, Diego. 2013. Earth Surface Processes and Landforms. doi: 10.1002/esp.3491. Online: http://www.treesearch.fs.fed.us/pubs/45562.

Net primary productivity of subalpine meadows in Yosemite National Park in relation to climate variability. Moore, Peggy E.; van Wagtendonk, Jan W.; Yee, Julie L.; McClaran, Mitchel P.; Cole, David N.; McDougald, Neil K.; Brooks, Matthew L. 2013. Western North American Naturalist. 73(4): 409-418.

Pronounced differences in genetic structure despite overall ecological similarity for two Ambystoma salamanders in the same landscape. Whiteley, Andrew R.; McGarigal, Kevin; Schwartz, Michael K. 2014. Conservation Genetics. doi.10.1007/s10592-014-0562-7.

Respiratory disease and particulate air pollution in Santiago Chile: Contribution of erosion particles from fine sediments. Garcia-Chevesich, Pablo A.; Alvarado, Sergio; Neary, Daniel G.; Valdes, Rodrigo; Valdes, Juan; Aguirre, Juan José; Mena, Marcelo; Pizarro, Roberto; Jofré, Paola; Vera, Mauricio; Olivares, Claudio. 2014. Environmental Pollution. 187: 202-205.

Soil erosion and sediment production on watershed landscapes: Processes, preventon, and control. Ffolliott, P.F.; Brooks, K.N.; Neary, D.G.; Tapia, R.P.; Garcia-Chevesich, P. 2013. Special Technical Publication No. 32. Montevideo, Uraguay: United Nations Educational, Scientific and Cultural Organization, International Hydrological Programme of the Regional Office for Science for Latin America and the Carribbean Basin. 73 p.

A synoptic survey of ecosystem services from headwater catchments in the United States. Hill, Brian H.; Kolka, Randall K.; McCormick, Frank H.; Starry, Matthew A. 2013. Ecosystem Services. 7:106-115. Online: http://www.treesearch.fs.fed.us/pubs/45560.

Wildland fire emissions, carbon, and climate: Emission factors. Urbanski, Shawn. 2014. Forest Ecology and Management. 317: 51-60. Online: http://www.treesearch.fs.fed.us/pubs/45727.

Wildland fire emissions, carbon, and climate: Plume rise, atmospheric transport, and chemistry processes. Heilman, Warren; Liu, Yongqiang; Urbanski, Shawn; Kovalev, V.; Mickler, R. 2014. Forest Ecology and Management. 317: 70-79. Online: http://www.treesearch.fs.fed.us/pubs/45645.

Wildland fire emissions, carbon, and climate: Science overview and knowledge needs. Sommers, William T.; Loehman, Rachel A.; Hardy, Colin C. 2014. Forest Ecology and Management. 317: 1-8. Online: http://www.treesearch.fs.fed.us/pubs/45726.

Wildland fire emissions, carbon, and climate: Seeing the forest and the trees—A cross-scale assessment of wildfire and carbon dynamics in fire-prone, forested ecosystems.

Loehman, Rachel A.; Reinhardt, Elizabeth; Riley, Karin L. 2014. Forest Ecology and Management. 317: 9-19. Online: http://www.treesearch.fs.fed.us/pubs/45724.

Wildland fire emissions, carbon, and climate: U.S. emissions inventories. Larkin, Narasimhan K.; Raffuse, Sean M.; Strand, Tara M. 2014. Forest Ecology and Management. 317: 61-69. Online: http://www.treesearch.fs.fed.us/pubs/45723.

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Fire, fuel, and smoke

Mapping day-of-burning with coarse-resolution satellite fire-detection data. Parks, S.A. 2014. International Journal of Wildland Fire. 23: 215-223.

A new metric for quantifying burn severity: The relativized burn ratio. Parks, S.A.; Dillon, G.K.; Miller, C. 2014. Remote Sensing. 6: 1827-1844.

Opportunities abound for affordable mechanical fuels treatment in dry mixed-conifer forests. Fried, Jeremy S.; Jain, Theresa B. 2013. Western Forester. November/December: 14-15, 21. Online: http://www.treesearch.fs.fed.us/pubs/45611.

Previous fires moderate burn severity of subsequent wildland fires in two large western US wilderness areas. Parks, S.A.; Miller, C.; Nelson, C.R.; Holden, Z.A. 2014. Ecosystems. doi: 10.1007/s10021-013-9704-x.

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Forest and woodland ecosystems

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Bioconversion of beetle-killed lodgepole pine using SPORL: Process scale-up design, lignin coproduct, and high solids fermentation without detoxification. Zhou, Haifeng; Zhu, J.Y.; Luo, Xiaolin; Leu, Shao-Yuan; Wu, Xiaolei; Gleisner, Roland; Dien, Bruce S.; Hector, Ronald E.; Yang, Dongjie; Qiu, Xueqing; Horn, Eric; Negron, Jose. 2013. Industrial and Engineering Chemistry Research. 52: 16057-16065. Online: http://www.treesearch.fs.fed.us/pubs/45297.

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Forest processes. Ryan, M.G.; Vose, J.M.; Hanson , P.J.; Iverson, L.R.; Miniat, C.F.; Luce, C.H.; Band, L.E.; Klein, S.L. 2014. In: Peterson, D.L.; Vose, J.M.; Patel-Weynand, T., eds. Climate change and United States forests. New York: Springer: 25-54. Online: http://www.treesearch.fs.fed.us/pubs/45690.

Interactions among the mountain pine beetle, fires, and fuels. Jenkins, Michael J.; Runyon, Justin B.; Fettig, Christopher J.; Page, Wesley G.; Bentz, Barbara J. 2014. Forest Science. 60. doi: http://dx.doi.org/10.5849/forsci.13-017. Online: http://www.treesearch.fs.fed.us/pubs/44259.

Morphology, gas exchange, and chlorophyll content of longleaf pine seedlings in response to rooting volume, copper root pruning, and nitrogen supply in a container nursery. Dumroese, R.K.; Sung, S-J.S.; Pinto, J.R.; Ross-Davis, A.; Scott, A.D. 2013. New Forests. 44: 881-897.

Mountain pine beetle voltinism and life history characteristics across latitudinal and elevational gradients in the western United States. Bentz, Barbara; Vandygriff, James; Jensen, Camille; Coleman, Tom; Maloney, Patricia; Smith, Sheri; Grady, Amanda; Schen-Langenheim, Greta. 2014. Forest Science 60(2): http://dx.doi.org/10.5849/forsci.13-056.

Overview of the Manitou Experimental Forest observatory: Site description and selected science results from 2008-2013. . . . Ryan, M.G.; Fornwalt, P.J.; and others. 2014. Atmospheric, Chemistry, and Physics Discussion. 14: 1647-1709. Online: http://www.treesearch.fs.fed.us/pubs/45693.

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Phloem transport in trees. Ryan, Michael G.; Asao, Shinichi. 2014. Tree Physiology. 34:1-4. Online: http://www.treesearch.fs.fed.us/pubs/45691.

Role of climate change in reforestation and nursery practices. Williams, Mary I.; Dumroese, R. Kasten. 2014. Western Forester. 59(1): 11-13.

Silviculture research: The intersection of science and art across generations. Jain, Theresa B. 2013. Western Forester. September/October: 8-9. Online: http://www.treesearch.fs.fed.us/pubs/45612.

Grasslands, shrublands, and desert ecosystems

Adaptive responses reveal contemporary and future ecotypes in a desert shrub. Richardson, Bryce A.; Kitchen, Stanley G.; Pendleton, Rosemary L.; Pendleton, Burton K.; Germino, Matthew J.; Rehfeldt, Gerald E.; Meyer, Susan E. 2014. Ecological Applications. 24(2): 413-427. Online: http://www.treesearch.fs.fed.us/pubs/45555.

De novo genome assembly of the fungal plant pathogen *Pyrenophora semeniperda*. Soliai, Marcus M.; Meyer, Susan E.;

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Udall, Joshua A.; Elzinga, David E.; Hermansen, Russell A.; Bodily, Paul M.; Hart, Aaron A.; Coleman, Craig E. 2014. PLoS ONE. 9(1): e87045. Online: http://www.treesearch.fs.fed.us/pubs/45553.

Effect of strain and cultural conditions on the production of cytochalasin B by the potential mycoherbicide *Pyrenophora semeniperda* (Pleosporaceae, Pleosporales). Masi, Marco; Evidente, Antonio; Meyer, Susan; Nicholson, Joshua; Munoz, Ashley. 2014. Biocontrol Science and Technology. 24(1): 53-64. Online: http://www.treesearch.fs.fed.us/pubs/45557.

Factors affecting host range in a generalist seed pathogen of semi-arid shrublands. Beckstead, Julie; Meyer, Susan E.; Reinhart, Kurt O.; Bergen, Kellene M.; Holden, Sandra R.; Boekweg, Heather F. 2014. Plant Ecology. 215(4): 427-440.

GSD Update: Year in Review: Spotlight on 2013 research by the Grassland, Shrubland and Desert Ecosystems Science Program. Finch, Deborah M. 2013. February 2014. Albuquerque, NM: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 9 p. Online: http://www.fs.fed.us/rm/grassland-shrubland-desert/docs/gsd-update/2014-02.pdf.

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Disturbance Ecology

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- Regional assessment of post-fire native seeding strategies
- Tactics for conserving unique biological resources
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Influence of climate and environment on post-fire recovery of mountain big sagebrush. Nelson, Zachary J.; Weisberg, Peter J.; Kitchen, Stanley G. 2014. International Journal of Wildland Fire. 23: 131-142.

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Restoring abandoned agricultural lands in cold desert shrublands: Tradeoffs between water availability and invasive species. Chambers, Jeanne C.; Eldredge, Eric P.; Snyder, Keirith A.; Board, David I.; de Queiroz, Tara Forbis; Hubbard, Vada. 2014. Invasive Plant Science and Management. 7(1): 176-189..

Spirostaphylotrichin W, a spirocyclic γ-lactam isolated from liquid culture of Pyrenophora semeniperda, a potential mycoherbicide for cheatgrass (*Bromus tectorum*) biocontrol. Masi, Marco; Meyer, Susan; Clement, Suzette; Andolfi, Anna; Cimmino, Alessio; Evidente, Antonio. 2014. Tetrahedron. 70(7):1497-1501. Online: http://www.treesearch.fs.fed.us/pubs/45556.

Staged invasions across disparate grasslands: Effects of seed provenance, consumers and disturbance on productivity and species richness. Maron, John L.; Auge, Harald; Pearson, Dean E.; Korell, Lotte; Hensen, Isabell; Suding, Katharine N.; Stein, Claudia. 2014. Ecology Letters. 17: 499-507.

Science application and integration

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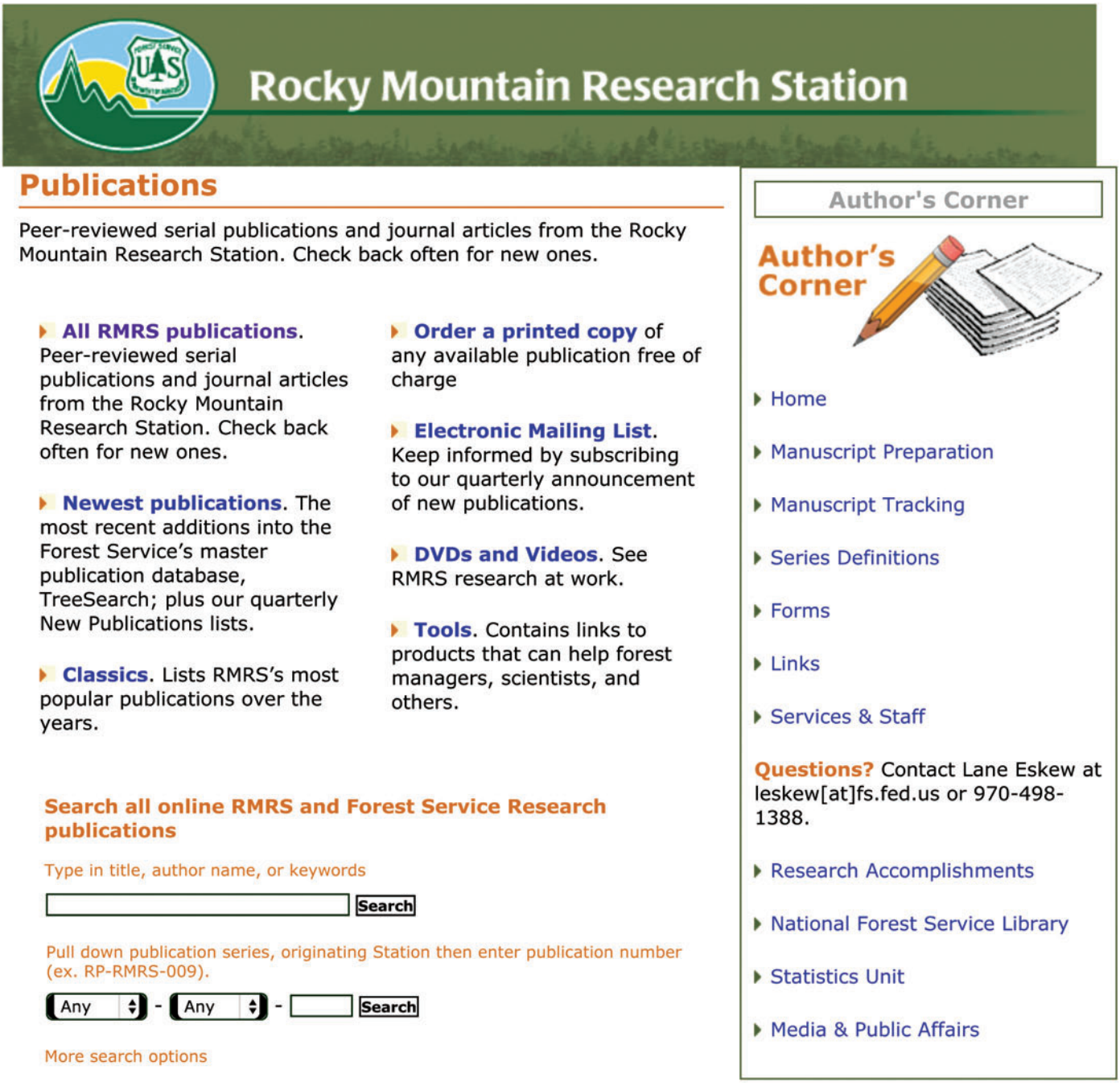

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Science Program Areas

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. Contack 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.

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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