



Rocky Mountain Research Station New Publications

October–December 2019

CONTENTS

ROCKY MOUNTAIN RESEARCH STATION2

NEW SERIES PUBLICATIONS

User guide to the FireCLIME Vulnerability Assessment (VA) tool:
A rapid and flexible system for assessing ecosystem
vulnerability to climate-fire interactions3

Montana’s forest resources, 2006–20153

Fire ecology and management in lowland riparian ecosystems
of the southwestern United States and northern Mexico4

Assessment of the influence of disturbance, management
activities, and environmental factors on carbon stocks of
U.S. national forests4

JOURNALS AND OTHER PUBLICATIONS

Air, Water and Aquatic Environments.....5

Aldo Leopold Wilderness Research Institute5

Fire, Fuel and Smoke5

Forest and Woodland Ecosystems5

Grasslands, Shrublands and Desert Ecosystems6

Human Dimensions6

Inventory, Monitoring and Analysis7

Wildlife and Terrestrial Ecosystems7

PUBLICATION ORDERS AND CONTACT INFORMATION9



Rocky Mountain Research Station

The Rocky Mountain Research Station is one of seven regional units that make up the U.S. Forest Service Research and Development organization.



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 percent of the nation’s National Forest System lands (54 national forests and grasslands). In the lower 48 States, our territory also includes 55 percent of the nation’s Bureau of Land Management lands; 48 percent of the designated wildernesses; 37 percent of National Park Service lands; numerous other public and tribal lands; and 41 percent 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.

Contact us

Phone: (970) 498-1100
 Web: www.fs.usda.gov/rmrs/
 Twitter @usfs_rmrs



The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual’s income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA’s TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, DC 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

New RMRS Publication Series

User guide to the FireCLIME Vulnerability Assessment (VA) tool: A rapid and flexible system for assessing ecosystem vulnerability to climate-fire interactions

Print copies will be available

User guide to the FireCLIME Vulnerability Assessment (VA) tool: A rapid and flexible system for assessing ecosystem vulnerability to climate-fire interactions. Friggens, M.; Loehman, R.; Thode, A.; Flatley, W.; Evans, A.; Bunn, W.; Wilcox, C.; Mueller, S.; Yocom, L.; Falk, D. 2019. Gen. Tech. Rep. RMRS-GTR-395. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 42 p.

Decision makers need better methods for identifying critical ecosystem vulnerabilities to changing climate and fire regimes. Climate-wildfire-vegetation interactions are complex and hinder classification and projection necessary for development of management strategies. One such vulnerability assessment (VA) is FireCLIME VA, which allows users to compare management strategies under various climate scenarios and gauge the potential effectiveness of those strategies for reducing undesirable impacts of climate on wildfire regimes and resulting impacts of wildfire on natural ecosystems. Developed as part of the SW FireCLIME science-management partnership, FireCLIME is meant to be quick, flexible, and amendable to a range of data inputs (literature review, expert, and modeling or monitoring activities). These inputs allow users to easily compare various fire-climate outcomes for one or more ecosystems of interest. Users can use literature, hypothetical scenarios, or quantitative data to implement the FireCLIME VA tool. This tool, unlike other vulnerability assessment, is best used iteratively to explore a range of possible scenarios and management strategies.

<https://www.fs.usda.gov/treearch/pubs/59033>

Montana's forest resources, 2006–2015

Online only

Montana's forest resources, 2006–2015. Witt, Chris; Shaw, John D.; Menlove, Jim; Goeking, Sara A.; DeRose, R. Justin; Pelz, Kristen A.; Morgan, Todd A.; Hayes, Steven W. 2019. Montana's forest resources, 2006–2015. Resour. Bull. RMRS-RB-30. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 102 p.

This report presents a summary of the most recent Forest Inventory and Analysis summary of Montana's forests based on field data collected between 2006 and 2015. The report includes descriptive highlights and tables of area, numbers of trees, biomass, volume, growth, and mortality, as well as an industry report. Most sections and tables are organized by forest type or forest-type group, tree species group, diameter class, or owner group. Results show that Montana's forest land covers 25.9 million acres, of which 7 million acres (27 percent) are privately owned, and 15.5 million acres (60 percent) are administered by the USDA Forest Service. The State's most abundant forest type is Douglas-fir, which covers more than 7.5 million acres. Lodgepole pine is the most abundant tree species by number of trees 5.0 inches or greater in diameter, and Douglas-fir is the most abundant by volume and biomass. Montana's forests contain 42 billion cubic feet of net volume in trees 5.0 inches diameter and larger. Montana had a negative mean annual net growth of all live trees 5.0 inches diameter at -54 million cubic feet per year over the report's evaluation period (2006–2015).

<https://www.fs.usda.gov/treearch/pubs/59034>

Fire ecology and management in lowland riparian ecosystems of the southwestern United States and northern Mexico

Online only

Fire ecology and management in lowland riparian ecosystems of the southwestern United States and northern Mexico. Webb, Amanda D.; Falk, Donald A.; Finch, Deborah M. 2019. Fire ecology and management in lowland riparian ecosystems of the southwestern United States and northern Mexico. Gen. Tech. Rep. RMRS-GTR-401. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 132 p.

Lowland riparian ecosystems, defined as those occurring at elevations at or below 5,000 feet (1,564 meters), constitute a small fraction of total land area in the southwestern United States and northern Mexico, yet they are extremely important to human livelihoods and biotic communities. In the hotter and drier conditions projected under ongoing climate change, riparian ecosystems are increasingly critical to the well-being of humans and wildlife. Few naturally functioning riparian areas remain in the region, and those that do are imperiled by climate change, groundwater pumping, land use, and altered disturbance regimes. Some evidence suggests that fire regimes are changing in southwestern riparian zones; wildfires may be increasing in frequency and severity. This literature review summarizes and synthesizes the state of the knowledge of wildfire and prescribed fire effects on physical processes and vegetation, and postfire rehabilitation. This study is intended to inform management and identify gaps in systematically reviewed literature.

<https://www.fs.usda.gov/treesearch/pubs/59156>

Assessment of the influence of disturbance, management activities, and environmental factors on carbon stocks of U.S. national forests

Online only

Assessment of the influence of disturbance, management activities, and environmental factors on carbon stocks of U.S. national forests. Birdsey, Richard A.; Dugan, Alexa J.; Healey, Sean P.; Dante-Wood, Karen; Zhang, Fangmin; Mo, Gang; Chen, Jing M.; Hernandez, Alexander J.; Raymond, Crystal L.; McCarter, James. 2019. Assessment of the influence of disturbance, management activities, and environmental factors on carbon stocks of U.S. national forests. Gen. Tech. Rep. RMRS-GTR-402. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 116 pages plus appendices.

This report presents a summary of the most recent Forest Inventory and Analysis summary of Montana's forests based on field data collected between 2006 and 2015. The report includes descriptive highlights and tables of area, numbers of trees, biomass, volume, growth, and mortality, as well as an industry report. Results show that Montana's forest land covers 25.9 million acres, of which 7 million acres (27 percent) are privately owned, and 15.5 million acres (60 percent) are administered by the USDA Forest Service. The State's most abundant forest type is Douglas-fir, which covers more than 7.5 million acres. Lodgepole pine is the most abundant tree species by number of trees 5.0 inches or greater in diameter, and Douglas-fir is the most abundant by volume and biomass. Montana's forests contain 42 billion cubic feet of net volume in trees 5.0 inches diameter and larger. Montana had a negative mean annual net growth of all live trees 5.0 inches diameter at -54 million cubic feet per year over the report's evaluation period (2006–2015).

<https://www.fs.usda.gov/treesearch/pubs/59157>

Journals and Other Publications

External publications written by our scientists and cooperators and grouped by our Science Program Areas. For more information on our Science Program Areas, please visit our web site: www.fs.usda.gov/rmrs/science-program-areas/.

Air, Water and Aquatic Environments

Forest soil disturbance: Implications of factors contributing to the wildland fire nexus. Neary, Daniel G. 2019. Soil Science Society of America Journal. 83(Suppl1): S228-S243. <https://www.fs.usda.gov/treesearch/pubs/58812>

Evaluating the factors responsible for post-fire water quality response in forests of the western USA. Rust, Ashley J.; Saxe, Samuel; McCray, John; Rhoades, Charles C.; Hogue, Terri S. 2019. International Journal of Wildland Fire. doi: 10.1071/WF18191. <https://www.fs.usda.gov/treesearch/pubs/58813>

Hydrogeomorphic controls on soil carbon composition in two classes of subalpine wetlands. Daugherty, Ellen E.; McKee, Georgina A.; Bergstrom, Robert; Burton, Sarah; Pal-lud, Celine; Hubbard, Robert M.; Kelly, Eugene F.; Rhoades, Charles C.; Borch, Thomas. 2019. Biogeochemistry. 145: 161-175. <https://www.fs.usda.gov/treesearch/pubs/58643>

Wild salmon and the Shifting Baseline Syndrome: Application of archival and contemporary redd counts to estimate historical Chinook salmon (*Oncorhynchus tshawytscha*) production potential in the Central Idaho wilderness. Thurow, Russell F.; Copeland, Timothy; Oldemeyer, Bryce N. 2019. Canadian Journal of Fisheries and Aquatic Sciences. doi: 10.1139/cjfas-2019-0111. <https://www.fs.usda.gov/treesearch/pubs/59146>

Aldo Leopold Wilderness Research Institute

Mitigating the impact of field and image registration errors through spatial aggregation. Hogland, John; Affleck, David L. R. 2019. Mitigating the impact of field and image registration errors through spatial aggregation. Remote Sensing. 11: 222. <https://www.fs.usda.gov/treesearch/pubs/57922>

Mapping threats to wilderness character in the National Wilderness Preservation System. Tricker, James; Landres, Peter. 2018. Biological Conservation. 227: 243-251. <https://www.fs.usda.gov/treesearch/pubs/59123>

Fire, Fuel and Smoke

Cesium emissions from laboratory fires. Hao, Wei Min; Baker, Stephen; Lincoln, Emily; Hudson, Scott; Lee, Sang Don; Lemieux, Paul. 2018. Journal of the Air and Waste Management Association. 68(11): 1211-1223. <https://www.fs.usda.gov/treesearch/pubs/58645>

***Echinocereus triglochidiatus*, kingcup cactus.** Fryer, Janet L.; Matthews, Robin F. 2018. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory. Online: <https://www.fs.fed.us/database/feis/plants/cactus/echtri/all.html> <https://www.fs.usda.gov/treesearch/pubs/58807>

Fire regimes of ponderosa pine (*Pinus ponderosa*) eco-systems in Colorado: A systematic review and meta-analysis. McKinney, Shawn T. 2019. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory. Online: https://www.fs.fed.us/database/feis/fire_regimes/CO_ponderosa_pine/all.html. <https://www.fs.usda.gov/treesearch/pubs/58810>

Fire regimes of juniper communities in the Columbia and northern Great basins. Murphy, Shannon K.; Fryer, Janet L. 2019. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory. Online: https://www.fs.fed.us/database/feis/fire_regimes/Columbia_GB_juniper/all.html. <https://www.fs.usda.gov/treesearch/pubs/58811>

***Juniperus occidentalis*.** Fryer, Janet L.; Tirmenstein, D. 2019. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Online: <https://www.fs.usda.gov/treesearch/pubs/58808>

Persistence of fire-killed conifer snags in California, USA. Grayson, Lindsay M.; Cluck, Daniel R.; Hood, Sharon M. 2019. Fire Ecology: 15: 1 <https://www.fs.usda.gov/treesearch/pubs/58644>

***Artemisia tridentata* subsp. *wyomingensis*.** Innes, Robin J. 2019. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory. Online: <https://www.fs.fed.us/database/feis/plants/shrub/arttriw/all.html>. <https://www.fs.usda.gov/treesearch/pubs/58809>

Forest and Woodland Ecosystems

Boreal forest vegetation and fuel conditions 12 years after the 2004 Taylor Complex fires in Alaska, USA. Hammond, Darcy H.; Strand, Eva K.; Hudak, Andrew T.; Newingham, Beth A. 2019. *Fire Ecology*. 15: 32.
<https://www.fs.usda.gov/treearch/pubs/59150>

Characterizing fire effects on conifers at tree level from airborne laser scanning and high-resolution, multispectral satellite data. Klauber, Carine; Hudak, Andrew T.; Silva, Carlos Alberto; Lewis, Sarah A.; Robichaud, Peter R.; Jain, Terrie B. 2019. *Ecological Modelling*. 412: 108820.
<https://www.fs.usda.gov/treearch/pubs/59151>

Effect of forest thinning and wood quality on the short-term wood decomposition rate in a *Pinus tabulaeformis* plantation. Wang, Weiwei; Page-Dumroese, Deborah; Jurgensen, Martin; Tirocke, Joanne; Liu, Yong. 2018. *Journal of Plant Research*. 131: 897-905
<https://www.fs.usda.gov/treearch/pubs/57432>.

Multi-scale niche modeling of three sympatric felids of conservation importance in central Iran. Khosravi, Rasoul; Hemami, Mahmoud-Reza; Cushman, Samuel A. 2019. *Land-scape Ecology*. doi: 10.1007/s10980-019-00900-0.
<https://www.fs.usda.gov/treearch/pubs/58642>

Short- and long-term effects of ponderosa pine fuel treatments intersected by the Egley Fire Complex, Oregon, USA. Dodge, Jessie M.; Strand, Eva K.; Hudak, Andrew T.; Bright, Benjamin C.; Hammond, Darcy H.; Newingham, Beth A. 2019. *Fire Ecology*. 15: 40.
<https://www.fs.usda.gov/treearch/pubs/59149>

Variability in mixed conifer spatial structure changes understory light environments. Cannon, Jeffery B.; Tinkham, Wade T.; DeAngelis, Ryan K.; Hill, Edward M.; Battaglia, Mike A. 2019. *Forests*. 10: 1015.
<https://www.fs.usda.gov/treearch/pubs/59145>

Grasslands, Shrublands and Desert Ecosystems

The effects of fall fertilization on the growth of Chinese pine and Prince Rupprecht's larch seedlings. Zhu, Yan; Li, Shan; Wang, Caiyun; Dumroese, R. Kasten; Li, Guolei; Li, Qingmei. 2019. *Journal of Forestry Research*. doi: 10.1007/s11676-019-01054-0.
<https://www.fs.usda.gov/treearch/pubs/59087>

Effects of fertilizer on media chemistry and red-flowering current seedling growth using a subirrigation system. Dunlap, Layla J.; Pinto, Jeremiah R.; Davis, Anthony S. 2018. *HortScience*. 53(12):1862-1871.
<https://www.fs.usda.gov/treearch/pubs/58646>

Field establishment techniques for guindo santo, an endemic species from central Chile. Alvarez, Carolina; Acevedo, Manuel; Gonzalez, Marta; Dumroese, R. Kasten; Cartes, Eduardo; Quiroz, Ivan. 2019. *Tree Planters' Notes*. 62(1-2): 35-43.
<https://www.fs.usda.gov/treearch/pubs/59085>

Handbook of standardized protocols for collecting plant modularity traits. Klimesova, Jitka; Martínková, Jana; Paussas, Juli G.; de Moraes, Moemy Gomes; Herben, Tomas; Yu, Fei-Hai; Puntieri, Javier; Vesk, Peter A.; de Bello, Francesco; Janecek, Stepan; Altman, Jan; Appezzato-da-Gloria, Beatriz; Bartuskova, Alena; Crivellaro, Alan; Dolezal, Jiri; Ott, Jacqueline P.; et. al. 2019. *Perspectives in Plant Ecology, Evolution and Systematics*. 40: 125485.
<https://www.fs.usda.gov/treearch/pubs/58806>

Ongoing modifications to root system architecture of *Pinus ponderosa* growing on a sloped site revealed by tree-ring analysis. Montagnoli, Antonio; Terzaghi, Mattia; Chiatante, Donato; Scippa, Gabriella S.; Lasserre, Bruno; Dumroese, R. Kasten. 2019. *Dendrochronologia*. 58: 125650.
<https://www.fs.usda.gov/treearch/pubs/59121>

The persistence of container nursery treatments on the field performance and root system morphology of long-leaf pine seedlings. Sung, Shi-Jean S.; Dumroese, R. Kasten; Pinto, Jeremiah R.; Sayer, Mary Anne S. 2019. *Forests*. 10: 807.
<https://www.fs.usda.gov/treearch/pubs/59086>

Organic or inorganic nitrogen and rhizobia inoculation provide synergistic growth response of a leguminous forb and tree. Zhang, Peng; Dumroese, R. Kasten; Pinto, Jeremiah R. 2019. *Frontiers in Plant Science*. 10: Article 1308.
<https://www.fs.usda.gov/treearch/pubs/59084>

Reproduction and dispersal of biological soil crust organisms. Warren, Steven D.; St. Clair, Larry L.; Stark, Lloyd R.; Lewis, Louise A.; Pombubpa, Nuttapon; Kurbessoian, Tania; Stajich, Jason E.; Aanderud, Zachary T. 2019. *Frontiers In Ecology Evolution*. 7: 344.
<https://www.fs.usda.gov/treearch/pubs/59122>

Human Dimensions

Adaptation to future water shortages in the United States caused by population growth and climate change. Brown, Thomas C.; Mahat, Vinod; Ramirez, Jorge A. 2019. *Earth's Future*: 7.
<https://www.fs.usda.gov/treearch/pubs/58041>

Between fixities and flows: Navigating place attachments in an increasingly mobile world. Di Masso, Andres; Williams, Daniel R.; Raymond, Christopher M.; et. al. 2019. *Journal of Environmental Psychology*. 61: 125-133.
<https://www.fs.usda.gov/treearch/pubs/58648>

Geographical associations with anthropogenic noise pollution for North American breeding birds. Klingbeil, Brian T.; Frank A. La Sorte; Lepczyk, Christopher A.; Fink, Daniel; Flather, Curtis H. 2020. *Global Ecology and Biogeography*. 29: 148-158.
<https://www.fs.usda.gov/treearch/pubs/59144>

Incorporating social diversity into wildfire management: Proposing 'pathways' for fire adaptation. Paveglio, Travis B.; Carroll, Matthew S.; Stasiewicz, Amanda M.; Williams, Daniel R.; Becker, Dennis R. 2018. *Forest Science*: 64: 515-532.
<https://www.fs.usda.gov/treearch/pubs/58814>

Quantifying ecological integrity of terrestrial systems to inform management of multiple-use public lands in the United States. Carter, Sarah K.; Fleishman, Erica; Leinwand, Ian I. F.; Flather, Curtis H.; Carr, Natasha B.; Fogarty, Frank A.; Leu, Matthias; Noon, Barry R.; Wohlfeil, Martha E.; Wood, David J. A. 2019. *Environmental Management*. 64: 1-19.
<https://www.fs.usda.gov/treearch/pubs/57924>

Inventory, Monitoring and Analysis

Large, high-severity burn patches limit fungal recovery 13 years after wildfire in a ponderosa pine forest. Owen, Suzanne M.; Patterson, Adair M.; Gehring, Catherine A.; Sieg, Carolyn H.; Baggett, L. Scott; Fule, Peter Z. 2019. *Soil Biology and Biochemistry*. 139: 107616.
<https://www.fs.usda.gov/treearch/pubs/59052>

Wildlife and Terrestrial Ecosystems

Factors affecting lifetime reproduction, long-term territory-specific reproduction, and estimation of habitat quality in northern goshawks. Reynolds, Richard T.; Lambert, Jeffrey S.; Kay, Shannon L.; Sanderlin, Jamie S.; Bird, Benjamin J. 2019. *PLoS ONE*. 14(5): e0215841. <https://www.fs.usda.gov/treearch/pubs/58059>

Winter scavenging of ungulate carrion by bald eagles, common ravens, and coyotes in northern Arizona. Grubb, Teryl G.; Lopez, Roy G.; Ellis, Martha M. 2018. *Journal of Raptor Research*. 52(4): 471-483.
<https://www.fs.usda.gov/treearch/pubs/58647>

Publication Orders and Contact Information

To minimize our environmental footprint as well as eliminate unnecessary printing, most of our research publications are now being published online only. If paper copies are available, they will be available in a limited supply. All of our publications, old and new, can be downloaded from Treearch (link below). If you are unable to download a copy of one of our research publications, please let us know and we will help you obtain a copy.

To obtain a copy of RMRS series publications:

Download an online copy from Treearch

Treearch is an online system for sharing free, full text publications by Research and Development scientists in the U.S. Forest Service. Included in Treearch are scholarly works published by the agency as well as papers appearing in journals, conference proceedings, or books. All publications in Treearch are based on peer reviewed research.

<https://www.fs.usda.gov/treearch/>

Request a paper copy from Publications Distribution:

MAIL Publications Distribution
 Rocky Mountain Research Station
 240 W. Prospect Road
 Fort Collins, CO 80526 U.S.A.

PHONE (970) 498-1393
EMAIL SM.FS.rmrspubsreq@usda.gov

NOTE: You received this RMRS New Publications List because your name is on our mailing list. We will continue to notify you of new RMRS publications unless you ask us to remove your name by contacting Publications Distribution.