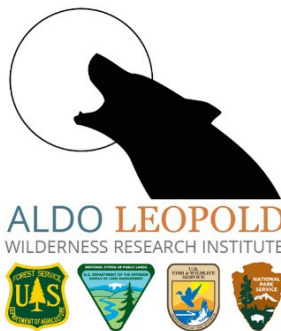


# Aldo Leopold Wilderness Research Institute

FY2020 Accomplishments Report



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Danette Paige, Sean Parks, Jason Taylor, Alan Watson, Kathy Zeller

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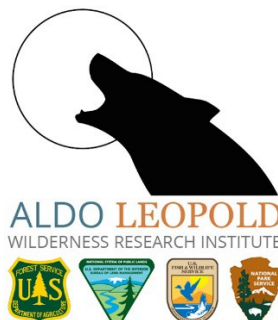
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Cover image: Gates of the Arctic Wilderness, Alaska, *Canoer on Walker Lake* (Robert Winfree). Downloaded from Wilderness Connect (<https://wilderness.net/visit-wilderness/image-search-results.php#2661-Modal>).



## LEOPOLD INSTITUTE NEWS

FY2020 was a year of transition, teleworking, and new beginnings. The Aldo Leopold Wilderness Research Institute (ALWRI) welcomed a new Director, Research Biologist, and Research Social Scientist. We also said farewell to a Research Social Scientist, who retired after 35 years of federal service, and an Assistant Director, who departed to serve the Forest Service' international mission. Due to the global pandemic of novel coronavirus, many efforts including fieldwork, training, and conferences were canceled or delayed, the most notable being the cancellation of the 11th World Wilderness Congress, which was to be held in Jaipur, India. The Leopold team teleworked for more than half of FY20, as did most other staff within the Rocky Mountain Research Station. Fortunately, the team has proactively stayed connected (virtually, and in a socially distant manner in a local park) and remained extremely productive advancing projects, serving both management and science partners and communities, and publishing manuscripts. We reconnected with longtime partners and built new relationships. There is a feeling of camaraderie and a sense of hope and opportunity for what we can achieve as a team. Our mission, *to provide scientific leadership in developing and using the knowledge needed to sustain wilderness and wildlands ecosystems and values*, remains clear, and will guide us we develop a new, ten-year, science charter in FY21-22, a process that we started in 2020.

- During summer of 2020, **Jason Taylor** was selected the Leopold Institute Director after nearly twenty years of federal and local government service, including positions with the National Park Service and Bureau of Land Management. Jason onboarded in late July.
- The Leopold Institute welcomed two new Research Scientists. **Chris Armatas** joined us in March 2020 as a Research Social Scientist. **Kathy Zeller** joined us in May 2020 as a Research Biologist.
- Deputy Director **Beth Hahn** served as the acting director after the July 2019 retirement of director Susan Fox through November 2019, when she transferred to the USFS Office of International Programs. We thank Beth for helping us through this transition.
- Senior Social Scientist **Alan Watson** led the planning of the science program for the 11th World Wilderness Congress, which was postponed indefinitely in March 2020 due to the coronavirus pandemic. Alan retired from federal service in May 2020.
- Research Ecologists **Carol Miller** and **Sean Parks** alternated as acting director, along with Alan Watson (until he retired), from December 2019 through July 2020.
- Research Ecologist **Sean Parks** submitted his research portfolio for panel review and was promoted. The panel noted that Sean's "...accomplishments at this stage in his career are truly remarkable." And, that he has "...an ability to identify critical knowledge gaps, identify the right datasets and methods to address them, to assemble effective teams to add breadth to the significance of his work, and to deliver the goods in terms of publication productivity." Congratulations, Sean!
- Ecologist **Lisa Holsinger** continued her leadership in training other researchers on the use and application of Google Earth Engine satellite imagery and geospatial datasets.
- Program Administrator **Danette Paige** helped onboard new scientists and a director during a global pandemic; and was recognized by the RMRS Director for her outstanding administrative and logistical support.

## FY20 PROJECTS

### **PA1: RECREATION EXPERIENCES AND THE IMPACTS OF RECREATION ON WILDERNESS**

**Visitor use management** – In collaboration with the University of Montana and the National Park Service, Park Planning & Special Studies team, a social science project was initiated to address visitor use management challenges in park wilderness areas. The study plan includes an exhaustive literature review of visitor use management in wilderness, and development of a survey instrument that can address issues likely to be shared across park units (e.g., protecting opportunities for solitude), as well as context-specific planning needs (e.g., effective implementation of a visitor permit system). The survey will be implemented in coming years in multiple park units that are actively engaged in wilderness planning efforts. Also, we finished a major update to Boundary Waters Canoe Area Wilderness visitor simulation modeling, originally completed in 2010. The updated model and data, which can be found at the [USFS Research Data Archive](#), were done in cooperation with the Superior National Forest.

**Wilderness use monitoring** – In collaboration with the University of Montana, a project was initiated to support wilderness use monitoring on the Frank Church – River of No Return Wilderness and Sequoia and Kings Canyon National Park (SEKI). Specifically, the project on the Frank will compile an exhaustive data set of all campground monitoring reaching back 30-40 years. Analysis of the dataset, once fully compiled, will assess trends in campsite conditions. For SEKI, analysis of an existing dataset of ranger encounters will inform a future monitoring plan, and ensure that methods of monitoring, and analysis of monitoring data, meets current scientific standards.

**Wild and Scenic Rivers user capacity** – This ongoing project has two primary objectives: (1) help Salmon River managers on the Salmon-Challis National Forest with their immediate needs to determine user capacity; and, (2) develop a framework, or basic process, that could be implemented by other WSR managers that need to integrate user capacity determinations into an existing river plan or new/ revised comprehensive river management plans. Data collection for the monitoring phase of this project, which included camera traps, is complete. Data entry and analysis are currently ongoing. Additionally, we are planning for implementation of a river-user survey in the summer of 2021.

### **PA2: RELATIONSHIPS BETWEEN PEOPLE AND WILDERNESS LANDS AND MANAGEMENT**

**Public engagement in planning** – Leopold scientists provided social science, planning support for several management units in FY20. These include: 1) the [social vulnerability protocol](#) published in 2019 is being applied at the project level on the Wallowa-Whitman National Forest. An electronic online application is being developed to facilitate public engagement of rural populations and, more generally, public engagement during COVID-19. 2) The Leopold Institute and the University of Missouri, School of Natural Resources, collaborated to gather visitor use and user information for the Eleven Point National Scenic River in Missouri to support their Comprehensive River Management Plan. Results of the research has been delivered to managers through a written report and oral presentation. 3) We conducted a social vulnerability assessment of outstandingly remarkable values for the Flathead Wild and Scenic River System. Specifically, an established social vulnerability protocol was implemented with public engagement efforts to inform the comprehensive river management plan on the Flathead. A full report of public engagement results, in addition to a review of the existing social science related to the River, was delivered. Technology transfer, through continued involvement in recurring planning team

meetings, ensured results of the assessment informed the joint planning effort conducted by the Flathead National Forest and Glacier National Park.



### PA3: WILDLAND FIRE AND SOCIAL AND ECOLOGICAL VALUES OF FIRE

**Wildfire-driven ecological change** – Following high-severity fire, forest recovery may be compromised by lack of tree seed sources, warmer and drier postfire climate, or short-interval reburning. A potential outcome of the loss of resilience is the conversion of the pre-fire forest to a different forest type, or to non-forest vegetation. A study involving a collaboration of more than 20 researchers synthesized a growing body of evidence of fire-driven conversion and its causes across western North America. The synthesis, *Wildfire-Driven Forest Conversion in Western North American Landscapes*, uncovered common themes that scientists are reporting from the borderlands of Mexico and Arizona to the boreal forests of Canada. These include: 1) Wildfire-driven forest conversion occurs when ecological resilience of forests to wildfire is overcome, leading to extensive and enduring areas of altered vegetation, 2) Conversion is initiated by high-severity fire that removes areas of mature trees, and is maintained by a range of processes that impede tree regeneration, including distant tree seed sources, short-interval fires, or unfavorable postfire climate, further shaped by fire-vegetation feedbacks, 3) In an era of change, management and conservation efforts should align with the possibility that the forest that was present before the fire, may not return.

**Lessons from wilderness fire** – The practice of allowing naturally ignited fires to burn began over 40 years ago in a handful of wilderness areas and national parks. This ongoing experiment is providing valuable lessons for managers of other areas who seek alternative strategies to aggressive fire suppression. The large wilderness areas in the Northern Rockies region have been leaders in this practice. Two efforts, both focused on the Northern Rockies region, captured the lessons learned from managing natural fires in wilderness. First, a draft GTR was completed, *A history of wilderness fire management in the Northern Rockies*, that provides comprehensive review of modern wilderness fire science and lessons learned since 1970 when fire management began to adopt the practice of allowing naturally ignited fires to burn. This synthesis, which draws on agency fire history records, geospatial fire atlases, published literature, historical and contemporary photos, and interviews with key informant managers, will be published in early FY21. Second, a 12-minute video, *The Benefits of Hard Decisions: Applying Lessons from Wilderness Fire*, uses the voices of wilderness fire experts to share their insights and experiences on lessons they've learned about wilderness fire. The video is intended to spark discussion about managing fire for resource benefit on public lands, including: reasons behind using this

management approach; factors that influence the ability to do so; resources and steps that support fire for resource benefit; considerations to keep in mind; and other wisdom from experts.

**Fire refugia and forest resilience** – Fire refugia are places within high-severity burns that remain unburned or burn with low-severity. Working with university colleagues, we had documented the importance of surviving trees within refugia as sources of seed for post-fire forest regeneration. In 2020, as described in the publication *How Do Plant Communities Differ Between Fire Refugia and Fire-generated Early-seral Vegetation*, we turned our attention to understory plant communities in four burns in dry mixed-conifer forests of Oregon’s Blue Mountains Oregon and Washington. Although we identified a suite of species that were recorded only in fire refugia, we found that high-severity fire effects have not resulted in substantial losses of flora and plant communities. The baseline understanding of fire refugia composition and structure provided by this study supports additional investigations into the functions, vulnerability, and management implications of these important landscape elements.



**Improving fire severity mapping in boreal forests** – Fire severity maps can be produced by comparing pre- and post-fire satellite imagery. The methodology used to produce these fire severity maps is well vetted and validated in the conterminous United States. However, there is concern that these maps do not well represent fire severity in Alaskan boreal forests. At the urging of resource specialists in Alaska protected areas, we are actively evaluating new approaches to map fire severity in Alaskan and western Canadian boreal forests. Most field data used to evaluate our models was collected in protected areas. Preliminary results are encouraging and we are currently writing a paper describing the methods and results. The process is developed using the Google Earth Engine cloud-computing platform; the relevant code will be publicly distributed. Partners include the USGS, USFS, USFWS, NPS, and the Canadian Forest Service. This project is a continuation of ALWRI’s line of work to improve the ability of satellites to measure fire behavior and effects.



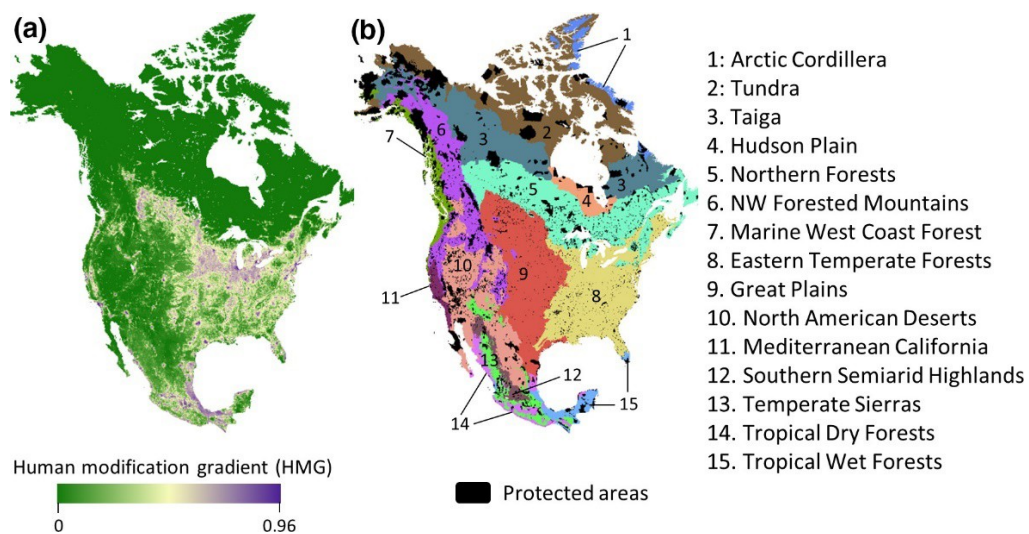
**Ecological and social resilience to fire** – Resilience to wildfire is a commonly stated goal, but ambiguity and miscommunication about resilience among researchers, managers, and policymakers have created confusion among disciplines and hindered application of the concept for fire management. Leopold scientists have been working with a team of university social and ecological scientists to demystify these concepts for academics, managers, and community members. This year we

held two facilitated group discussions in communities recently affected by wildfire to exchange insights on community resilience to fire. We also held a 90-minute session at the Association of Fire Ecology Conference during which we guided attendees through a series of collaborative and interactive exercises to clarify resilience concepts for application to fire-prone landscapes. A publication detailing these exercises is in preparation.

#### PA4: WILDERNESS STEWARDSHIP WITHIN LARGER ECOLOGICAL AND SOCIAL SYSTEMS

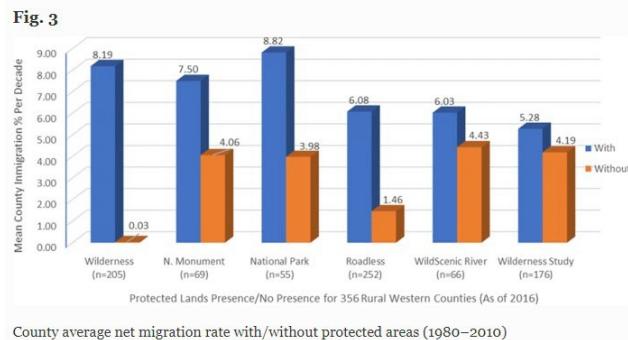
**Wilderness Economics Working Group (WEWG)** – The WEWG, initially convened by the Leopold Institute in 2014, included scientists from the Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service, and U.S. Geological Survey of the U.S. Department of the Interior; the Forest Service of the U.S. Department of Agriculture; several universities; and private industry. The working group’s 10-chapter General Technical Report (*A Perpetual Flow of Nature’s Benefits: Wilderness Economics Working Group Report on the Economic, Social, and Tribal Values of Wilderness in America*), to be submitted for publishing in early FY21, provides important progress in assessing the state and benefits of America’s National Wilderness Preservation System and identifies priority needs and opportunities for additional investigation.

**Climate connectivity** – Climate change will cause many species to shift their ranges. To do so successfully, individuals will need travel pathways that are hospitable to movement. These climate corridors – areas that form the best route between current climate types and where those climates will occur in the future under climate change – will be critical for species persistence. Our new publication, *Human land uses reduce climate connectivity across North America*, uses climate projections in North America to predict the location of climate corridors both with and without the inclusion of human land use patterns, and comparing them quantitatively to see how they differed. These climate corridors were also measured to see how well they matched up with existing protected areas. We found that when incorporating human land uses, climate connectivity decreased; climate velocity increased on average by 0.3 km/year and cumulative climatic resistance increased for ~83% of the continent. Moreover, ~96% of movement routes in North America must contend with human land uses to some degree. Work in this domain is ongoing, on a global scale, to evaluate the potential for transnational species movement among protected areas under climate change. More broadly, this ongoing work is intended to quantify climate change vulnerability of protected areas.



**Effects of management and climate change on biodiversity and connectivity** – This work, in cooperation with the Pacific Southwest Research Station, is part of a larger effort to quantify socio-ecological resiliency in the forested landscapes of the Lake Tahoe region of the Sierra Nevada Mountains. Six management and climate scenarios are being assessed with 10 different pillars of resiliency for this area: biodiversity conservation, forest resilience, fire dynamics, carbon sequestration, wetland integrity, air quality, water security, fire-adapted communities, economic diversity, and social and cultural well-being. We are initiating research to assess the biodiversity conservation pillar by modeling habitat suitability and connectivity for over 100 terrestrial wildlife species in the region across all climate and management scenarios. We and the larger team will also quantify the degree to which wilderness areas contribute to these 10 different pillars and how those contributions would change if wilderness were managed the same as the surrounding forestlands.

**Protected areas and rural communities** – Rural amenity migration, or household relocation for quality of life purposes as opposed to monetary enhancement, has been occurring for decades and has been particularly pronounced in the American West where the phenomenon peaked in the 1990s. Increased migration levels typically result in increased economic growth indicators, making amenity migration an attractive rural development strategy. ALWRI collaborators published *Amenity Migration and Public Lands: Rise of the Protected Areas*, an econometric analysis of attributes that influenced migration to rural Western counties from 1980 to 2010 found that while traditional amenities of climate, water area, and regional access were highly associated with migration levels, designated natural amenities of Wilderness and National Monuments were the most influential public lands for migration to rural Western counties. The study’s findings suggest that branding campaigns based on natural amenities can be a critical development strategy for rural communities in the US West.



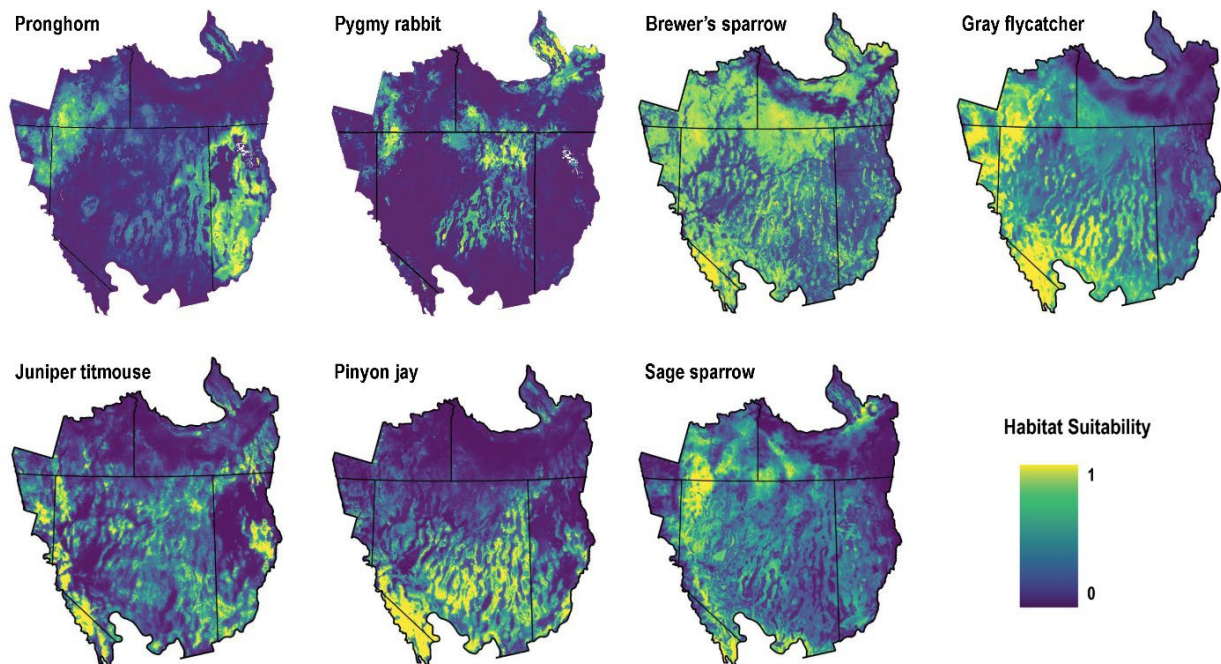
**Effectiveness of protected areas for wildlife conservation** – Wilderness and other protected areas serve as a foundation for most efforts to conserve biodiversity, but protected areas may not optimally located for this purpose. ALWRI and collaborators published *An Assessment of Vulnerable Wildlife, Their Habitats, and Protected Areas in the Contiguous United States*, the most comprehensive evaluation to date of wildlife species of conservation concern in the contiguous U.S. and how well their habitats overlap with current protected areas. Of all 537 wildlife species of conservation concern, only 62 (11%) were well represented in highly protected areas. The results can be used to guide future land protection work and provide the most up-to-date maps of habitat of 1,719 species of mammals, birds, amphibians, and reptiles, including 537 species of conservation concern.

**Contributing to a Landscape Conservation Design for the Crown of the Continent Ecosystem** – The Crown of the Continent covers nearly 18 million acres and is a patchwork of protected areas, tribal lands, wilderness, and private lands spanning the U.S.–Canada border. To facilitate planning and



management across these jurisdictions, the Crown Manager's Partnership, a partnership amongst universities and state, provincial, tribal, and federal agencies in Montana, Alberta and British Columbia, is developing a Landscape Conservation Design for the entire ecosystem. We are just initiating a multi-year study with the Manager's Partnership to incorporate connectivity into their Conservation Design. Ecological connectivity will be modeled as well as species-specific connectivity for multiple focal fish and wildlife species throughout the ecosystem. Future human development and climate predictions will be used to forecast connectivity through time. The many wilderness areas in this ecosystem will be quantified in terms of their contribution to current and future wildlife connectivity.

**Ecoregional planning for multiple wildlife species in the Great Basin** – In cooperation with other Rocky Mountain Research Station scientists, state, university, and NGO partners, we are assessing important habitat areas and corridors for multiple wildlife species of conservation concern in the Great Basin ecoregion. Planning and management at the ecoregional scale requires landscape scale assessments of species and their habitats. However, to date, these types of analyses have primarily been focused on a single species, the Greater Sage-Grouse. We are creating habitat suitability models for eight other species of conservation concern across the Great Basin to identify important habitat areas, connectivity, and the effects of climate change. We are also assessing the role of protected areas and other federal lands in maintaining habitats and corridors for these species. We have made substantial progress on this work in 2020 and are on track to complete this project in 2021.



*Habitat suitability maps generated to aid in ecoregional planning for wildlife species in the Great Basin.*

**Quantifying the contribution of wilderness to wildlife population genetics** – Landscape genetics can be used to determine landscape effects on genetic diversity and health of wildlife populations. A collaboration with the University of Montana has been initiated to assess landscape effects on a suite of wildlife species, project future genetic diversity and allelic variation, and determine the importance of wilderness areas as genetic sources for populations of species.

## SERVICE AND TECHNOLOGY TRANSFER

### **A5: DELIVERY AND APPLICATION OF SCIENTIFIC KNOWLEDGE AND TOOLS**

#### ***Management/Stewardship Community Service***

**Carol Miller**, as part of a training cadre for a biennially offered course (RX510 Advanced Fire Effects), developed and delivered a lecture in Tucson, AZ at the National Advanced Fire & Resource Institute. The intensive week-long college-level curriculum is designed to support the integration of fire effects knowledge into land management programs.

**Sean Parks** (virtually) presented, *Recent advances in measuring fire severity with satellites*, at the USFS Fire GIS Coordinators monthly meeting.

**Sean Parks** (virtually) presented *What drives high-severity fire in western US forests?* at the Western Colorado University, Remote Sensing Workshop for graduate students.

**Sean Parks** presented *Fire on the Mountain: the past, present, and future of wildfire in Montana* at the Summer Speaker Series at Lewis and Clark Caverns State Park.

**Lisa Holsinger** (virtually) presented a *Google Earth Engine Tutorial* at the Western Colorado University Remote Sensing Workshop, June 2020.

**Alan Watson** initiated the *Interagency Wilderness and Wild & Scenic River Seminar* team, in cooperation with the USFS Office of Internal Programs, and coordinated a team of Forest Service managers (Regional, Forest, District and WO and scientists) and international participants from Russia, China, Brazil, Czech Republic and the UK, co-chaired with India Forest Service Scientist (Rajasthan). This effort was indefinitely postponed due to the global pandemic of novel coronavirus.

**Chris Armatas** and **Alan Watson** served on the USFS Chief's Wilderness Advisory Group.

**Chris Armatas** served as a social science advisor to the Flathead National Forest and Glacier National Park planning team focused on revising the Flathead Wild and Scenic River comprehensive plan.

**Chris Armatas** presented an ALWRI-developed, social science approach to support inclusive public engagement at forest planning meetings during the Science You Can Use webinar series. This webinar series is focused on connecting Forest Service research with managers and planners on the ground.

**Chris Armatas** presented, as an invited guest to The Wilderness Society, *Integrating social science into planning and collaborative processes: a methods review*. Generally, the presentation conveyed several available social science methods for application in broad-scale planning processes.

**Chris Armatas** guest lectured at the University of Montana, Wildland Recreation course, discussing the U.S. Wild and Scenic Rivers Act.

**Jason Taylor** served as a member of the NWPS Interagency Wilderness Steering Committee.

**Jason Taylor** continued existing, and initiated new, outreach and engagement activities. For example, he participated in USFS and NPS monthly wilderness regional program manager meetings; contributed

to the [NPS National Wilderness Leadership Council](#); and initiated quarterly, bureau-level program updates with [IWSC](#) and [Policy Council](#) representatives.

### ***Science Community Service***

ALWRI provided significant leadership for the [11<sup>th</sup> World Wilderness Congress](#), which was to be held in Jaipur, India. We served on the Congress Executive Committee. We developed and distributed the call for interest, and then the call for abstracts. We developed a team of international scholars to work with us, and then developed the science program with cooperators around the world. We communicated with over 500 scientists and managers in 50 countries, and selected moderators, track chairs, and issued correspondence. Due to the global pandemic of novel coronavirus, the meeting was cancelled indefinitely.



**Chris Armatas** served on the planning committee for the [National Wilderness Workshop](#), which was moved to a fully virtual conference as a result of COVID-19. Specifically, Chris co-organized three sessions: Ecological change in Wilderness, Wilderness economics, and shared stewardship.

**Chris Armatas** served as a peer reviewer for journal articles in [Ecological Economics](#), [Society and Natural Resources](#), and [Ecology and Society](#). He also reviewed a graduate student fellowship proposal for the [Maryland Sea Grant College Program](#).

**Carol Miller** served as Associate Editor for the [Journal of Fire Ecology](#) and provided peer reviews for a chapter in a book on fire ecology and the journals [Current Forestry Reports](#), [Fire Ecology](#) and [Ecosphere](#).

**Carol Miller** served as panelist and subject matter editor for two [Forest Service](#) scientists undergoing Research Grade Evaluations.

**Sean Parks** served as a panelist for a [Forest Service](#) scientist undergoing a Research Grade Evaluation.

**Sean Parks** served as a peer-reviewer for scientific articles under consideration at [Global Change Biology](#), [Nature](#), [Canadian J. of Forest Research](#), [Canadian J. of Remote Sensing](#), [Fire Ecology](#), and [Remote Sensing of Environment](#). He also provided a friendly review for a paper ultimately submitted to [Ecological Applications](#) for a colleague at [U. of Idaho](#).

**Kathy Zeller** served as a co-Editor for a special issue on Dynamic Landscape Connectivity in the journal [LAND](#).

**Kathy Zeller** was a peer reviewer for four journal articles that were submitted for publication in [Oecologia](#), the [Journal of Applied Ecology](#), [Landscape Ecology](#), and [Science](#).

**Kathy Zeller** served on a thesis committee for a graduate student at the University of Montana and is advising on that research.

**Kathy Zeller** served as treasurer for The Wildlife Society Spatial Ecology and Telemetry Working Group, and in that role, organized two Google Earth Engine Workshops and a special poster session at The Wildlife Society's 2020 annual conference.

**Alan Watson** served as Executive Editor for Science for the International Journal of Wilderness.

**Alan Watson** served on annual Wilderness Manager Workshop Planning Committee in Bend, Oregon, collaborative with Wilderness Stewardship Alliance, coordinated the poster session, plus coordinated science program and made two presentations.

**Alan Watson** lectured on Wilderness and Wilderness Science at the University of Montana, two classes in Fall of 2019 and one class in 2020; and served as Adjunct Faculty.

### ***Conference/Meeting Presentations***

**Sean Parks** gave two presentations at the Association for Fire Ecology Conference titled: 1) *The good, the bad, and the ugly: re-evaluating satellite-derived fire severity metrics in boreal ecosystems*, and 2) *Clarifying the short- vs. long-term impact of climate change on fire regimes*.

**Sean Parks** (virtually) presented *Machine learning in wildland fire research and applications* to Alphabet (Google's parent company).

**Sean Parks** (virtually) presented *Giving Ecological Meaning to Satellite-Derived Fire Severity Metrics across North American Forests* at the Ecological Society of America conference.

## PUBLICATIONS

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**Armatas, C.A.**, J. Gaudry, B. Hodge, H. MacSparrow, M. Mitchell, and N. Taylor. 2020. *Building Wilderness partnership through empathy: Results from surveys and group discussions during a shared stewardship session at the 2019 National Wilderness Workshop*. Missoula, MT: The Aldo Leopold Wilderness Research Institute, 49 pp.

**Armatas, C.A.**, A.E. Watson, and W.T. Borrie. 2020. *The Flathead Wild and Scenic River system: results from public engagement asking about human-nature relationships, threats and contributors to such relationships, and opinions about planning and management*. Prepared for the Flathead River Wild and Scenic Comprehensive River Management Planning Team. Missoula, MT: The Aldo Leopold Wilderness Research Institute, 121 pp.

Belote, T., K.W. Blasch, S. Campbell, J.M. Cartwright,...**S.A. Parks**...et al. 2020. *A guidebook to spatial datasets for conservation planning under climate change in the Pacific Northwest*. (J. M. Cartwright, Ed.).

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Jennings, M.K., **K.A. Zeller**, and R.L Lewison. 2020. Supporting adaptive connectivity in dynamic landscapes. *Land* 9(9), 295; <https://doi.org/10.3390/land9090295>

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Parisien, M.A., D.A. Dawe, **C. Miller**, C.A Stockdale, and B. Armitage. 2019. Applications of simulation-based burn probability modelling: a review. *International Journal of Wildland Fire* 28:913-926.

Parisien, M.A., A.A. Ager, A.M. Barros, D. Dawe, S. Erni, M. Finney, C.W. McHugh, **C. Miller**, **S.A. Parks**, K.L. Riley, et al. 2020. Commentary on the article “Burn probability simulation and subsequent wildland

fire activity in Alberta, Canada – implications for risk assessment and strategic planning” by JL Beverly and N McLoughlin. *Forest Ecology and Management* 460: 117698

Parisien, M.A., Q.E. Barber, K.G. Hirsch, C.A. Stockdale, S. Erni, X. Wang, D. Arseneault, and **S.A. Parks**. 2020. Fire deficit increases the wildfire risk around communities in the Canadian boreal forest. *Nature Communications* 11: Article 2121. In the news: <https://ottawacitizen.com/news/local-news/forest-fire-suppression-measures-can-actually-increase-risks-around-communities-scientist-says>.

**Parks, S.A.**, C. Carroll, S.Z. Dobrowski, and B.W. Allred. 2020. Human land uses reduce climate connectivity across North America. *Global Change Biology*. 26(5): 2944-2955. Associated RMRS spotlight: <https://www.fs.usda.gov/rmrs/science-spotlights/human-land-uses-reduce-climate-connectivity>  
Associated Research Digest produced by Conservation Corridor:  
<https://conservationcorridor.org/digests/2020/02/climate-connectivity-and-humans/>.

Stumpff, L.M.; F. Sanchez-Trigueros, **A.E. Watson**, F. Mdoti, and A. Teasdale. Grassland, forest and riparian ecosystems on mixed-ownership federal lands adjacent to the Crow Indian Reservation: Developing a protective shield for sustainability of the environment and culture from the impacts of climate related disturbance. Gen. Tech. Rep. RMRS-GTR-410. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 84 p.

**Zeller, K.A.**, R. Lewison, R.J. Fletcher, M.G. Tulbure, and M.K. Jennings. 2020. Understanding the Importance of Dynamic Landscape Connectivity. *Land* 9 (9), 303. <https://doi.org/10.3390/land9090303>

**Zeller, K.A.**, D.W. Wattles, J.M. Bauder, and S. DeStefano. 2020. Forecasting seasonal habitat connectivity in a developing landscape. *Land* 9(7), 233. <https://doi.org/10.3390/land9070233>

#### **ALWRI-funded Partner Publications (where ALWRI staff are not co-authors)**

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*The Aldo Leopold Wilderness Research Institute, part of Rocky Mountain Research Station, is an interagency federal research facility located on the campus of the University of Montana. Leopold Institute scientists focus on wilderness and wildlands protected areas issues and have a long history of supporting managers stewarding the U.S. National Wilderness Preservation System, as well as collaborating with academic, NGO, community, and other partners within the U.S. and internationally. As such, the institute's impact is national and international in scope, and its work is guided by an interagency wilderness policy council and steering committee.*

