

RESEARCH WORK UNIT DESCRIPTION Ref: FSM 4070	1. Number 4901	2. Station Rocky Mountain Research Station (RMRS)
	3. Unit Location Missoula, MT	
4. Research Work Unit Title Aldo Leopold Wilderness Research Institute (ALWRI)		
5. Project Leader (Name and address) Jason J. Taylor, PhD, 790 E. Beckwith Ave, Missoula MT, 59801		
6. Area of Research Applicability U.S. National Wilderness Preservation System		7. Estimated Duration 10 years

8. Mission: The Leopold Institute is the only Federal research group in the United States dedicated to development and dissemination of knowledge needed to steward the 111-million acre National Wilderness Preservation System (NWPS), all 800+ units managed by two Departments and four agencies, from Puerto Rico to Alaska. We have a long history of conducting and sharing science in support of the NWPS, as well as collaborating with management, tribal, academic, non-governmental organization, community, and other partners within the U.S. and internationally.

In addition to being administered by the RMRS, the Institute works to address the wilderness research needs of an Interagency Wilderness Policy Council (IWPC). This responsiveness is defined by an interagency agreement among the United States Department of Agriculture (USDA), U.S. Forest Service (USFS), and the Department of the Interior (DOI), Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), National Park Service (NPS), and U.S. Geological Survey (USGS). Further, the Institute participates on an Interagency Wilderness Steering Committee (IWSC) to ensure its work is relevant to federal wilderness managers.

The vision of the Aldo Leopold Wilderness Research Institute is "a world where science, wilderness, and relationships between all people and wild lands thrive." Toward this end, we aspire to be the premier institution for wilderness stewardship research, nationally and internationally. We intend to be the focal point for scientists and managers from different disciplines and backgrounds who seek to conduct, communicate, and learn about research that addresses the challenges of wilderness stewardship, including the sustainability of ecosystems, and relationships between people and landscapes, with wilderness characteristics.

The Institute is committed to the core values of quality, credibility, integrity, equity, and responsiveness to wilderness stewardship as a basis for all our activities. Further, we are guided by principles (see the attached Appendix) that reflect our relationship with the Forest Service, as well as our status as an interagency institute.

The Leopold Institute provides a focal point for the research needs of scientists, managers, and others from various disciplines and from across the country (and internationally), relevant to the stewardship of wilderness. Our emphasis on generating knowledge needed to improve the interagency stewardship of wilderness provides a focus that is unique among research groups within Forest Service R&D and more broadly. Through research, science delivery, and partnerships, we aim to be responsive to the needs of wilderness managers and realize the Institute's mission, "advancing wilderness stewardship through transformational science."

For a detailed account of the Institute, its history, strategic direction (vision, mission, values, principles, and roles), program of work, and administration, please see the attached Appendix: "Aldo Leopold Wilderness Research Institute - Strategic Plan" (18 April 2022).

9. Justification and Problem Selection

In addition to partner input, several realities are driving the program of work described below. Our planet faces large-scale losses in biodiversity and associated ecosystem function, consequences of a changing climate, and a rapidly evolving and increasingly diverse society, to name only a few. Through these changes, wilderness areas, the most environmentally protected public lands in the United States, remain extremely valuable because they provide long-term protection of wild lands despite social and ecological changes. The importance of wilderness and similarly protected wildlands to society was clearly recognized in the 2015-2020 Forest Service Strategic Plan. The national goals of providing resilient and adaptive forest and grassland ecosystems in a changing environment; social, economic, and environmental benefits to people; and improved natural resource decision-making all apply to the preservation and stewardship of wilderness. In addition, the RMRS Strategic Priorities of disturbance ecology, human-landscape interactions, and resilient landscapes are all supported by the program of work described below. As an interagency organization, the Leopold Institute also recognizes the wilderness stewardship needs of all federal agencies managing wilderness; the USFS, BLM, FWS, and NPS. Through a partner engagement process that included all wilderness management agencies, as well as other key partners at home and internationally, we developed a program of work that will address key wilderness research needs for each agency and a broader wilderness stewardship community.

Developing a science charter (//strategic plan) for the Leopold Institute was a complex task, because: (1) science needs relevant for effective stewardship of the interagency NWPS are diverse and expansive; (2) identifying priority needs requires consideration of agency and other partners' needs, guiding policy for Institute scientists, and the knowledge and opinions of a diverse range of wilderness stewards and interested parties, nationally and internationally; and (3) the capacity to pursue science needs is finite and influenced by the expertise and size of current Institute staff. We engaged a broad wilderness community to gather diverse input regarding priorities for our next ten years of wilderness stewardship research through a scientifically rigorous public engagement process. The approach applied Q-methodology to develop an understanding of priority science needs based on input from a broad range of partners.

Our problem selection process, leveraging Q-methodology, had seven key steps:

1. We developed a "universe" of potential research questions, called a "research concourse", based on previous science planning efforts, literature, and knowledge of Institute scientists and staff.
2. We then shared broadly with partners (nationally and internationally) an opportunity to provide feedback on the research concourse and add other important research questions that may be missing.
3. Next, we distilled the concourse into a 'Q-set', which is a tractable set of statements that broadly represent the ideas in the concourse. This effort generated 31 integrated research topics or areas for prioritization.
4. A broad group of partners (again, nationally and internationally) were then invited to prioritize the integrated research topics, based on their own needs, using a web application.
5. The prioritized needs (Q-sorts), across 175 respondents, were analyzed using factor analysis, which yielded three typified perspectives that captured the broad range of opinions on the rankings of wilderness research priorities.
6. We then conducted five public workshops with partners to share results to date, and to understand the nuances and context within the typified perspectives. During the workshops, we presented the three perspectives, and asked partners: (1) do any of the perspectives resonate with you, and if so, which one(s); (2) why do the perspectives resonate with you, and/or what is your reasoning for prioritizing the research topics as you did; and, (3) what might you name the three perspectives?
7. Finally, Institute scientists reviewed research topics not in the top priorities (from the partner engagement effort) to determine if other topics, based on their expertise and current research, should be considered in the new charter.

Analyzing the partner input, we identified that research priorities generally organized into three groups, with little overlap between the groups. That is, there were three primary perspectives (typified responses) that emerged from the input, where everyone within a given perspective responded similarly (with some variation) to one another. The three perspectives were ultimately labeled: Perspective 1 - Societal, Perspective 2 - Ecological, and Perspective 3 - Managerial, since the types of questions that had the highest priority in each group were largely societal, ecological, or managerial, respectively, in nature.

Leveraging the five highest research priorities from each perspective, along with the five highest priorities, on average, from each of the NWPS management agencies and Tribal respondents, we identified the 15 highest priority research needs (research topics). In turn, Leopold Institute scientists identified which of the top 15 priorities they could address based on expertise and opportunity. Eleven of the top 15 priorities were integrated to create five research priority areas (RPAs). These 11 priorities are identified below, within each RPA. The five RPAs also integrate three additional research topics not identified in the top 15 priorities, for a total of 14 research topics (out of 31 considered) addressed in the RPAs. Collectively, the RPAs capture both perspective (typified response) priorities and raw (based on source data average) priorities and provide the foundation upon which the Leopold Institute science charter is developed. We strived to develop broad RPAs that have an inter-disciplinary focus, that are inclusive of managerial, ecological, and social perspectives, and that address the three foundational tenets of the previous charter: science for wilderness, wilderness for science, and wilderness in a landscape content.

10. Approach to Problem Solution:

We will address the following five Research Priority Areas inclusive of priority partner needs and perspectives. These RPAs will form the basis of most of the Institute's research, most of the time, and are linked to each other through overlapping research questions.

1. **Biodiversity Conservation:** Develop an understanding of the values, opportunities, and challenges for wilderness to support biodiversity conservation in an era of unprecedented change.
2. **Climate Change and Disturbance:** Improve knowledge about the impacts and consequences of climate change and climate-disturbance interactions, including wildland fire, relevant to wilderness stewardship.
3. **Stewardship Effectiveness:** Examine the effects and effectiveness of wilderness stewardship decisions, including the potential for and effects of management interventions.
4. **Relevance and Inclusivity:** Expand our understanding of wilderness relevance, experiences, inclusivity, and use amid social-ecological change.
5. **Shared Stewardship:** Improve our understanding of co-production approaches and abilities to harmonize multiple knowledge systems toward more inclusive wilderness stewardship.

RPA1: Biodiversity Conservation - Develop an understanding of the values, opportunities, and challenges for wilderness to support biodiversity conservation in an era of unprecedented change.

Scientists involved: Christopher Armatas, Kellie Carim, Lisa Holsinger, Sean Parks, Lauren Redmore, Katherine Zeller

Biodiversity is essential for the functioning of ecosystems and the ability for people to thrive. The Millennium Ecosystem Assessment (2005) highlighted the consequences of loss of biodiversity as well as the degradation of ecosystem functionality. The improved capability in predicting the consequences of changes in drivers for biodiversity and ecosystem function, with improved measures of biodiversity, would aid wilderness management decision-making at all levels. Therefore, the conservation of biological diversity (including genetic, species, biological communities, ecosystems, processes, and landscapes) has become an increasingly important goal globally, and specifically for many protected areas, including wilderness. The many potential indirect effects of human activities aside (e.g., deposition of contaminants), wilderness can provide a particularly valuable setting for biodiversity conservation because of the limited, direct human impacts on species and their habitats.

Areas designated as wilderness (the NWPS within the U.S., and IUCN Category Ib, internationally) receive a strict form of protection. Wilderness areas are often assumed to promote and protect biodiversity by providing safe havens, or refugia, for animals and plants. These assumptions need to be tested. Wilderness may be particularly important for species of conservation concern under increasing environmental stress. If protected and connected by corridors, wilderness could help to mediate the effects of fragmentation and climate change, to allow for the natural flow of ecological processes, and maintain gene flow and species viability.

In addition, climate change has the potential to cause large shifts in the presence and composition of species in wilderness. In addition to ecological ramifications of these shifts, there may also be wide-ranging impacts on the human communities that rely on natural resources. We can expect that many wilderness areas will lose or gain species as climate-induced range shifts unfold. This topic is further addressed in RPA2 Climate Change and Disturbance.

Wilderness areas provide an opportunity to investigate what may be the best-case scenario for species persistence, maintenance of biodiversity, and ecosystem function in an era of unprecedented change. Understanding the patterns of biodiversity across and among wilderness and similarly protected areas, the mechanisms underlying the persistence of biodiversity in a wilderness setting, the effects of wilderness management on biodiversity and natural resource-dependent people, and the limitations of wilderness designations to protect biodiversity are critical research needs for the effective stewardship of biodiversity.

The Leopold Institute will advance wilderness-relevant biodiversity conservation knowledge across multiple temporal and spatial scales by addressing the following, overarching research questions (see Fig. 4):

- a) How well does the NWPS cover the diversity of ecoregions and ecosystems within the U.S. and where are key areas of ecological importance that remain unprotected?
- b) Are wilderness and protected areas sufficiently large, distributed, and connected to support long-term viability of biodiversity and critical (human) life support systems?
- c) What are the benefits and limitations of wilderness for supporting fish and wildlife biodiversity and related human uses (e.g., subsistence)? (Link to RPA4)

RPA2: Climate Change and Disturbance - Improve knowledge about the impacts and consequences of climate change and climate-disturbance interactions, including wildland fire, relevant to wilderness stewardship.

Scientists involved: Christopher Armatas, Kellie Carim, Lisa Holsinger, Sean Parks, Lauren Redmore, Katherine Zeller

Average Earth surface temperature has risen about one degree Celsius since the late 19th century, driven largely by increased carbon dioxide emission and other human activities. Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years, with most of the warming occurring in the past 40 years (IPCC 2021). Climate change affects ecological systems via direct impacts such as drought and glacial melt, as well as indirectly through changes in disturbance regimes. The protection of landscapes relatively free from direct alteration by modern development, such as wilderness, may buffer impacts of climate change. This buffering capacity could be localized, as wilderness provides refuge for climate sensitive species. It may also be broadscale with benefits to society outside wilderness boundaries, such as water retention that buffers floods and drought and carbon storage. In addition, wilderness has the potential to provide a reference point, or research control, for understanding how changes in broad-scale drivers affect landscapes that are both less and more impacted by modern development.

Climate change is resulting in increases in area burned by wildland fire, which is arguably the most pervasive/prevalent disturbance agent affecting both wilderness and non-wilderness. Recent wildfires across the globe are thought to have burned in a manner that is considered “uncharacteristically severe” compared to fires that burned in past centuries. As wildfire increasingly threatens ecosystem sustainability and communities broadly, lessons learned from fire in wilderness may help more effectively understand and manage fires outside of wilderness.

Climate change has, and will continue to have, implications for people's experiences in wilderness and other wild lands. The impact of a changing climate on how people interact with wilderness resources is likely to be significant. The social impacts of climate change on wilderness spans a diversity of people, economies, and values. For example, peak season and travel patterns could be affected, as well as recreation opportunities, cultural resources, and distribution of fish and game species. Furthermore, it is unclear how climate change will impact different groups of people disproportionately when wilderness is, for instance, traditional homelands of Native Americans, a place to connect to the natural world for urban Americans, and a hazard to forest-proximate residents concerned about wildfire.

Understanding how climate change will impact wilderness ecosystems, as well as people's relationships with wilderness, can provide stewards with the knowledge and feasibility of potential adaptation approaches. Increasing wilderness-relevant climate change knowledge can inform best practices for stewardship of wilderness recreation, help us understand the relevance of wilderness for broader society, and ultimately may promote the preservation of wilderness areas in general.

The Leopold Institute will advance knowledge related to climate change, disturbance, and wilderness by addressing the following, overarching research questions (see Fig. 4):

- a) How do climate change and climate-mediated disturbances, such as fire, affect biodiversity, ecosystem processes, and connectivity in wilderness? (Link to RPA1)
- b) How does wilderness contribute to a broader understanding of the effects of climate change and climate-disturbance interactions, on landscapes, ecosystems, and people?
- c) Do wilderness areas serve as climate refugia and/or steppingstones for biodiversity at multiple scales and if so, how? (Link to RPA1)
- d) How will climate change affect human-nature relationships within the wilderness context? (Link to RPA4)

RPA3: Stewardship Effectiveness - Examine the effects and effectiveness of wilderness stewardship decisions, including the potential for and effects of management interventions.

Scientists involved: Christopher Armatas, Kellie Carim, Lisa Holsinger, Sean Parks, Katherine Zeller

The 1964 Wilderness Act and subsequent wilderness legislation identify wilderness as "an area where the earth and its community of life are untrammelled by man" and "retaining its primeval character and influence." The Wilderness Act further directs that wilderness be "protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; and, (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation....". Values related to both naturalness and wildness are central to the wilderness concept.

However, managers and scientists have increasingly questioned the feasibility of maintaining naturalness in wilderness. There is a growing awareness that (1) historical Indigenous land management practices often produced the landscapes identified today as "wilderness", and (2) Indigenous Knowledge can broaden understanding of natural ecosystems. Contrary to earlier assumptions that natural ecosystems are stable and self-regulating, scientists now know that natural ecosystems are highly dynamic; Indigenous Knowledge can add richness to this understanding. Scientists also now know most of the world's ecosystems, including the most remote wilderness areas, have been modified to some extent by human activity. In light of increased knowledge about historical and current human influence on wilderness areas, "naturalness", as once thought of, may no longer fully capture the evolving and expanding perspectives on wilderness values. Human activities, including climate change, are altering wilderness ecosystems and therefore managers must decide if intervention(s) may be appropriate.

Management decisions, both inside and outside wilderness areas can affect the structure and functioning of wilderness ecosystems. Understanding the cascading effects of these decisions across spatial and temporal scales can provide wilderness stewards knowledge about how management actions are influencing wilderness character and help target passive management activities that promote biodiversity and protection of sensitive species and ecosystem function across wilderness boundaries. Restoring and/or maintaining the natural function of ecosystems, particularly in the face of climate change, may involve management

interventions that create tradeoffs in wilderness qualities on different time scales. Understanding tradeoffs between the costs and benefits of implementing management interventions, as well as the temporal scale of impacts to wilderness character associated with management inside of wilderness, may help prioritize whether, and if so, which, management interventions are necessary to preserve wilderness character for future generations.

The Leopold Institute will develop an understanding about the effectiveness of and opportunities for wilderness management interventions and other decisions, in the context of climate change and other drivers, by addressing the following, overarching questions (see Fig. 4):

- a) What is the spatial and temporal variation in management objectives and interventions across the NWPS?
- b) How do wilderness stewardship decisions and practices affect wilderness character, visitor preference, biodiversity, and ecosystem function? (Link to RPA1, RPA4 & RPA5)
- c) What are the short and long-term social-ecological trade-offs (benefits and costs) of resisting, accepting, or directing wilderness ecosystems in the context of climate change? (Link to RPA2)

RPA4: Relevance and Inclusivity - Expand our understanding of wilderness relevance, experiences, inclusivity, and use amid social-ecological change.

Scientists involved: Christopher Armatas, Lauren Redmore

The opening lines of the Wilderness Act state: “An Act to establish a National Wilderness Preservation System for the permanent good of the whole people...”. Today, we have yet to meet that ideal. There remain varying opportunities (or lack thereof) to access wilderness for people who were historically excluded from wilderness, for example, Native Americans, people of color, immigrants and new Americans, people with disabilities, and people who identify as LGBTQIA+. The study of diversity, equity, and inclusion in wilderness is especially important when you consider the origins of wilderness in contrast to our increasingly diverse society.

There is a long history of forced removal of Native Americans and other people of color from lands that became wilderness. Early romantic ideals of wilderness conceptualized a place devoid of humans, mostly in the western United States, that is often inaccessible to all except the “rugged” individual—for most of recent history, white, upper-class men. This, in part, is an artifact of who had political power, and who counted or could vote at the time wilderness designations were made. Wilderness managers are clearly expected to steward wilderness in such a way that opportunities are protected for all Americans; research to enable achievement of this expectation is needed.

Further, shifts in demography, changes in technology, environmental changes, variation in uses, and an emerging understanding of the traditional knowledge that shaped the environment settled by Europeans, all bring opportunity and complexity to wilderness stewardship. Adding to the complexity and opportunity, wilderness areas in Alaska, totaling over 57 million acres or just over half of the NWPS, are legislatively mandated through the 1980 Alaska National Interest Lands Conservation Act as “inhabited wilderness,” particularly as it relates to subsistence-use by rural residents.

We need a better understanding of the evolution of wilderness use and experience as well as improved delivery of wilderness benefits. This includes temporal and spatial trends in use, how the experiences and trends vary based on social-ecological factors, and the preferences, barriers, and incentives to wilderness access, in particular for communities that have been historically excluded from and/or underserved with respect to Federal wilderness. Improved information on how the demographics of society are changing and how those changes impact the way people value and use wilderness play an emergent role in successful wilderness stewardship and improving the relevancy of wilderness.

The Leopold Institute will advance knowledge around wilderness use, experience, and relevance relative to a changing society by addressing the following, overarching research questions (see Fig. 4):

- a) What is the relevancy of wilderness to a diverse America, and how has that changed over time?
- b) How do underrepresented and underserved communities define and engage with wilderness and what

social-ecological factors affect their relationships with wilderness?

c) What is the impact of DEI wilderness programming, and how can wilderness managers increase inclusive use of, and experience in, wilderness for historically excluded groups? (Link to RPA3)

d) How does the Alaska National Interest Lands Conservation Act interact with the Wilderness Act and affect the wilderness use opportunity? (Link to RPA3 & RPA5)

RPA5: Shared Stewardship - Improve our understanding of co-production approaches and abilities to harmonize multiple knowledge systems toward more inclusive wilderness stewardship.

Scientists involved: Christopher Armatas, Kellie Carim, Lauren Redmore

Co-production brings together, in partnership, people with different knowledge, expertise, and experiences to identify specific problems, to cooperatively define the scope and context of those problems, potential research questions, and research methods, and to make scientific inferences and develop strategies to address those problems. Co-production acknowledges the interdependence between fact and values, and builds investment in knowledge and outcomes. It requires that all partners are willing to engage with humility, and that they are open to ideas different than their own. Wilderness research and stewardship may benefit from participation of multiple partners who are invested in problem development and improved outcomes, however such co-produced work is often challenging to put into practice given that partners have different life experiences, values systems, worldviews, and areas of expertise.

Research and management decisions are often made without directly incorporating multiple worldviews. Biocultural approaches to wilderness stewardship aim to consider the diversity of life in all its manifestations, thereby acknowledging a plurality of worldviews and human-nature interactions. Such approaches are particularly inclusive of different ways of knowing, including local ecological knowledge, cultural values, traditional practices, and natural scientific knowledge. Harmonization of multiple ways of knowing through a biocultural lens would increase our understanding of wilderness use, experience, importance, and the very meaning of wilderness.

The Leopold Institute is committed to using a biocultural lens to co-produce wilderness stewardship with a diversity of partners. This refers not only to our research partners, but to all the groups we asked to participate in our partner engagement, including managers of wilderness, Indigenous tribes and communities, scientists, policy makers, NGOs, interested publics, and others.

The Leopold Institute will advance knowledge around harmonizing multiple ways of knowing to support co-producing wilderness stewardship by addressing the following, overarching research questions (see Fig. 4):

a) How can western and Indigenous knowledge systems be harmonized to create a more inclusive and richer understanding of wilderness character and improve best practices for wilderness research, stewardship, and management interventions? (Link to RPA1, RPA2, RPA3 & RPA4)

b) How/what does co-produced stewardship look like, in practice? And, how can we leverage this understanding to improve wilderness research, stewardship, and planning efforts? (Link to RPA1, RPA2, RPA3, RPA4)

Staffing and Resources:

Although the Leopold Institute remains largely staffed and funded by the Forest Service, Rocky Mountain Research Station, its ultimate success as an interagency effort depends on the support provided by all participating agencies. We continue to strive toward the vision of a fully interagency program that focuses on the National Wilderness Preservation System with full applicability to and input from all four Federal wilderness management agencies. Liaison with the partner agencies is coordinated through a Washington, DC based, senior level, Interagency Wilderness Policy Council and a program-level Interagency Wilderness Steering Committee (/coordinating group), as well as interactions with intra-agency wilderness management and science committees. Base funding for Institute operations has been supplemented since 1994 by the BLM, since 1999 by the FWS, and from 2014 to 2018 by the NPS. Project funding has been provided by the

BLM, FWS, and NPS from national offices and/or individual field units. This section provides further details related to staffing, funding, and facilities, and discusses what is needed to assure the Leopold Institute remains a sustainable, interagency program.

Permanent staff at the Leopold Institute consists of the Institute Director, a Deputy Director, five Research Grade Scientists, an Ecologist, and an Office Manager. These positions are all supported by USFS R&D base funding. There is an annual, salary, cost recovery target of roughly 15%. This target must be met with external funds, including base and project funds provided by our DOI partners. Demands for research in the areas of our permanent staff expertise are greater than we can be responsive to. Similarly, we do not have adequate staff to address the full suite of wilderness research needs that have been identified by the partner agencies. Therefore, staffing is supplemented, as funding allows, by post doc, term, temporary, and student appointments.

Staffing as of April 2022

Permanent:

Director, GS-15
 Deputy Director, GS-14 (currently filled with a long-term detail)
 Research Ecologist, GS-14, Fire Ecology/Landscape Ecology
 Research Ecologist, GS-13, Aquatic Ecology
 Research Biologist, GS-13, Wildlife Biology/Landscape Ecology
 Research Social Scientist, GS-13, Diversity, Equity, and Inclusion
 Research Social Scientist, GS-12, Conservation Social Science
 Ecologist, GS-12, Geospatial Analyst
 Support Services Specialist, GS-7

Post-Doc and Term (project funded):

Post-Doc, GS-11 (FS appointment), Climate Change
 Post-Doc, (U Montana appointment), Landscape Connectivity, Crown of the Continent
 Post-Doc, (ORISE appointment via PSWRS), Landscape Connectivity, Central Sierras

Staff Responsibilities by Research Priority Area (scientists, post-docs, and related positions included)

Problem 1 (Biodiversity conservation in an era of unprecedented change) - Christopher Armatas, Kellie Carim, Kira Hefty, Lisa Holsinger, Eric Palm, Sean Parks, Lauren Redmore, Kathy Zeller

Problem 2 (Climate change and climate-disturbance interactions) - Christopher Armatas, Kellie Carim, Kira Hefty, Lisa Holsinger, Eric Palm, Sean Parks, Lauren Redmore, Kathy Zeller

Problem 3 (Effectiveness of wilderness stewardship decisions, including management interventions) - Christopher Armatas, Kellie Carim, Lisa Holsinger, Sean Parks, Lauren Redmore, Erana Taylor, Kathy Zeller

Problem 4 (Wilderness relevance, experiences, inclusivity, and use) - Christopher Armatas, Lauren Redmore

Problem 5 (Harmonizing multiple knowledge systems with a diversity of partners to co-produce stewardship research) - Christopher Armatas, Kellie Carim, Lauren Redmore

While there remains a commitment by the partner agencies to jointly support the Leopold Institute, base funding continues to come primarily from USFS Research and Development appropriations (see the following funding history table). R&D funds remain inadequate to cover the Institute's full operating expenses. As mentioned above, there is an annual, salary "cost recovery" target of roughly 15%. This target must be met with external funds, including base and project funds provided by our DOI partners. In addition, beyond salaries covered at 85%, there are effectively no project/research support funds provided by the Forest Service. This has been exacerbated by "Budget Modernization". While there remains an urgent need for increased parity in agency sponsorship of the Leopold Institute, DOI partner (BLM, FWS, and NPS) base and project funds remain critical to short- and long-term success.

Looking forward, these funds will contribute to the Institute’s ability to implement the research priority areas outlined in this charter and to maintain relevance on behalf of the NWPS. In addition to any unit specific research funding, nominally, the agencies provide \$336K annually (FWS - \$150K, NPS - \$100K, and BLM \$86K) to the Institute.

Importantly, the research direction in this charter is endorsed by the IWSC and is heavily influenced by wilderness stewardship priorities, as identified during multiple partner engagement activities in 2021. The program charter codifies roles, relationships, and activities that have developed at the Institute over the decades since its establishment and identifies a future program of work. It provides a guide for how we will serve as a catalyst to bring diverse groups of scientists and managers together and pursue various opportunities for the funding and staff support required to address the scientific needs of wilderness stewardship. It is anticipated that the structure and direction outlined in this program charter will serve the Leopold Institute for the next ten years.

Literature Cited:

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IPCC. 2021. Climate Change 2021: The Physical Science Basis. Contributions of Working Group 1 to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK.

	Signature	Title	Date
Recommended:	 Digitally signed by JASON TAYLOR Date: 2022.04.18 14:09:18 -06'00'	Program Manager	4/18/22
	CHRISTOPHER CARLSON Digitally signed by CHRISTOPHER CARLSON Date: 2022.04.25 10:05:47 -04'00'	WO Program Lead	4/25/22
	CHRISTOPHER CARLSON Digitally signed by CHRISTOPHER CARLSON Date: 2022.04.25 10:06:07 -04'00'	WO Staff Director	4/25/22
Approved:	 Digitally signed by MONICA LEAR Date: 2022.04.25 09:30:11 -06'00'	Station Director	4/25/22
Concurred:	ALEXANDER FRIEND Digitally signed by ALEXANDER FRIEND Date: 2022.04.27 20:44:36 -04'00'	Deputy Chief for Research	4/27/22