Addressing the Conservation Gap in Colorado's Private Lands: Community-Based Organizations Strengthen Conservation Efforts By Supporting Land Stewardship Behavior within Expanding Exurban Developments

Janae M. Coston-Malpas
Conservation Leadership Graduate Program 2022
Department of Human Dimensions of Natural Resources | Colorado State University

Community-based organizations are needed to support rural stewardship behavior in Colorado's rapidly growing rural and WUI regions, as this gap in conservation has crucial impacts on ecosystem services, natural resources and human well-being. This annotated bibliography provides background information to support the increase in conservation efforts within rural communities, summarized in Part I. However, as this paper will go on to examine in Part II, these practices are only feasible with the required levels of support and appropriate resources. The 'Project Development' section will do a deep dive into how community-based organizations[1] (CBO) can amplify conservation efforts through support of stewardship practices within U.S. rural and wildland-urban interface[2] (WUI) communities as these regions are social-ecological hotspots for conservation and may have crucial impacts for ecosystem services[3] (ES), wildlife habitat and natural resources. This is needed now more than ever as the U.S.'s private lands are undergoing a dramatic transformation; for the first time in more than a century, more people are moving to rural areas than they are moving away from them, accelerating the conversion of land-use from agriculture to development. This trend of human migration is known as exurban development and is the most rapidly growing form of land use in the U.S., which has been significantly compounded due to the COVID-19 pandemic. Colorado is especially feeling this population growth; in 2017, it was the ninth fastest growing state in the country, growing at a rate of 1.4% annually, and is projected to continue to grow by over twenty percent between 2020 and 2040, with the highest growth rates expected to be on the Western Slope, along the Front Range, and in Larimer County. With private lands covering twenty-five percent of the conterminous US, and more than nine percent identified as WUI, this development leads to more ecological damage and habitat destruction. Regions identified as WUI are facing the greatest impacts as humans continue to alter these landscapes, creating pockets of rapid ecological change that have major implications in future conservation goals, elaborated on below. The conservation of ecosystems, water, wildlife, production of energy, ES and many other natural resources in these regions depends on the actions taken by rural residents. As we continue to see changes in land use, we will need to address these changes with new strategies, particularly in relation to outdated viewpoints separating humans from nature, as we no longer have the land mass or luxury for this perspective. While this pervasive and fast-growing form of land use has large potential to alter conservation outcomes, developing conservation guidelines for these communities, such as housing developments that

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[1] Community-based Organization: a public or private nonprofit organization of demonstrated effectiveness that—(A) is representative of a community or significant segments of a community; and (B) provides educational or related services to individuals in the community.

[2] Wildland-urban Interface: the zone of transition between unoccupied land and human development. It is the line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels and is at risk of wildfire.

[3] Ecosystem Services: benefits to humans provided by natural processes and are categorized as; Provisioning Services or the provision of food, fresh water, fuel, fiber, and other goods, Regulating Services such as climate, water, and disease regulation as well as pollination, Supporting Services such as soil formation and nutrient cycling; and Cultural Services such as educational, aesthetic, and cultural heritage values as well as recreation and tourism.

encourage green design and stewardship practices for residents, or outreach and education strategies that rural Americans will support, is inherently challenging. Not only are rural communities diverse, they also vary in how they view environmental issues, particularly when compared to their urban counterparts. Additionally, research suggests that rural Americans have a closer connection to nature, and could therefore be a major component for protecting it. However, rural residents can't do this alone and need varying levels of support. CBOs work to support community-based conservation by linking biodiversity goals and local benefits in rural communities through a variety of resources and services, and can also work to bring in much needed financial assistance and funding for community stewardship. By tailoring outreach and initiatives to rural communities, conservation organizations will be more effective in educating the target audience and getting practices implemented. As elaborated on below, management of these areas needs improved institutional support, an increase in funding and on-the-ground resources to address environmental impacts that are reflective of rural and WUI context. Closing the gap in rural and WUI conservation will require engagement and new partnerships with rural stakeholders, rethinking the design of conservation practices, and new communication strategies.

Part I: Background

Dimke C., Lee M.C., Bayham J. (2021). COVID-19 and the renewed migration to the rural west. Western Economics Forum. 19(1), 89-102. 10.22004/ag.econ.311309

> Throughout history, the U.S. has experienced different economic disturbances that have prompted increases in rural populations, however, this article examines current trends and how COVID-19 has affected them. In recent history, Western states experienced resource booms, especially in the late 1970s and 1980s, and had large migrations of oil and gas workers. These "boomtowns" experienced boosts in capital, revenue, and labor, yet in the aftermath, many communities were left with depressed wages and increased unemployment. After these resource booms, quality-of-life migrants and retirees have flocked to rural communities as these areas became desirable for their open spaces, natural amenities, and recreational appeal, according to Dimke et al. However, during the COVID-19 pandemic, with increasing risk of infection due to population densities in urban areas, this study found that rural areas have become more appealing to a wider demographic of Americans. While less density and more space in rural areas makes social distancing easier, the decision of where to live depends on factors such as employment opportunities, cost of living, proximity to friends and family, as well as physical amenities. Another unforeseen side effect of the pandemic has been the rapid shift to remote work, allowing many to reevaluate where they live without having to necessarily factor in employment, which has been a primary barrier to many working-class Americans. These factors, combined with a growing interest in outdoor recreation, has spurred migration to rural areas with scenic and recreation amenities.
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> Though this migration likely benefited individuals leaving urban areas, new residents also create challenges for rural communities. Additional burdens may include a rapidly

increasing population, leading to more traffic and road-wear, adding further strains on local schools and other public services, increasing the cost of housing, as well as additional environmental impacts. Furthermore, the authors believe that an increase in rural migration to amenity-rich counties versus low-amenity counties may create a larger income gap between these two demographics. However, it's important to note that not all impacts will be negative as the movement of populations to rural areas may provide opportunities for established residents. Some rural communities may see an increase in income due to natural and recreation tourism. New residents with higher incomes may bring more stability to local economies, as those seeking to relocate to rural areas will likely bring higher incomes from jobs in urban areas that can be done remotely. Moreover, new residents may benefit rural communities by increasing spending locally and contributing to local taxes, which can provide improved infrastructure and additional amenities.

While some may see this migration as environmentally detrimental, I believe it provides an opportunity to improve conservation efforts in these regions, as new residents bring in new values, perspectives, and resources. Having personally experienced the impacts of the pandemic in rural America, I foresee rural communities needing to adapt to changing economic and environmental conditions, with an expectation to experience an even larger increase due to future pandemics and the option for remote work. The balance of community benefits and costs will need to be considered, where local decision-makers can help make informed decisions, as well as gather community input. Specifically, they will need to work to leverage the positive economic impacts to reduce inequality between rural and urban communities, as the median household income in rural areas is lower than in urban areas, yet rural residents shoulder the burden for many of these environmental costs. However, as many rural communities often don't have local leaders in conservation, the lack of leadership may cause issues and lapses in conservation efforts. Additional support will be needed on the local level to also ensure equity among community residents, as well. All of these benefits can work towards improved conservation practices and support, where extended, long-term conservation efforts are a potential.

Talbert C.B., Knight R.L., Mitchell J.E. (2007). Private ranchlands and public land grazing in the southern Rocky Mountains. Society for Range Management. Pg. 5-8. https://www.fs.fed.us/rm/pubs_journals/2007/rmrs_2007_talbert_c001.pdf

A consequence of this migration from urban areas to exurban areas is leading to profound changes in the American West's Rocky Mountain states, as private lands are undergoing a land-use conversion from agriculture to exurban development. This study found that residential development, once largely confined to the urban fringes, is moving to rural areas at alarming rates, and large areas of land that had historically been private ranches are being sold and converted to exurban developments. As a result of this trend, they found that private lands bordering public lands are often the most at risk of being developed. Although the ramifications of widespread land use conversion

are not fully understood, Talbert et al expressed increasing concern about the lasting cultural, economic, and ecological effects, as conversion of working ranches to residential development leads to an increase in the number of houses and length of roads with corresponding impacts for the natural community. Research has shown that exurban developments and urban expansion rarely, if ever, revert back to agricultural and ranching uses; thus, the ecological changes are likely to remain on the landscape.

As these regions continue to see rapid expansion, now is the time to implement development policies, as well as improve building codes and guidelines, versus waiting until even further environmental degradation has been done. I believe these communities have the potential to reach conservation goals through new and innovative models. According to Colorado Rural Health, seventy-three percent of Colorado's counties are rural, with seventy-seven percent of the state's land mass being rural. This is a significant area for conservation efforts that are being predominantly overlooked, as small-acreage rural residents have not been a focus for conservationists. These areas are prime for new conservation techniques, which may be specific to their regions and community, which is why it's so important to have leadership, support, engagement and collaboration at the local level.

Hansen A.J., Knight R.L., Marzluff J.M., Powell S., Brown K., Gude P.H., Jones K. (2005). Effects of exurban development on biodiversity: patterns, mechanisms, and research needs. Ecological Applications. 15(6), 1893-1905. https://doi.org/10.1890/05-5221

Between 1990 and 2000, approximately thirty million acres were developed in exurban lands nationwide, where the Rocky Mountain West has the top five fastest growing states in the country, and population growth rates are two to three times the national rate. While urban areas have seen much of this migration, this study found that growth in rural areas is occurring at a faster rate and is requiring more land because of the large lot sizes associated with rural development. Exurban development includes urban fringe development (UFD) on the periphery of cities and rural residential development (RRD) in rural areas. UFD is largely driven by urban dwellers seeking rural lifestyles, areas attractive in scenery, climate, outdoor recreation and other natural amenities, while still having access to urban jobs and services. RRD, on the other hand, differs from other rural land uses due to its longevity. While activities that occur on protected lands, farms, and ranches may occur in cycles, often having rest rotations, RRD is considered more permanent on the order of decades or longer and its effects may intensify over time. RRD is common in the rural counties of Colorado and within the Rocky Mountains, where growth has been occurring at three times the nation's average. Eventually, these exurban developments often transition to suburban and urban land uses, further impacting local ecosystems, according to the authors. To compound these issues, they also found that exurban development is often in closer proximity to borders of national parks and other public lands such as rivers, lakes, or coastal areas. Consequently, the indirect impacts radiating from each home may extend hundreds of yards to miles within the public land boundaries, altering biodiversity within protected areas. Homes

on the periphery of public lands may also attract wilderness species, such as bear or mountain lion, leading to increased mortality and declines in population sizes.

Furthermore, disturbances caused by the construction of houses, roads, trails, or overgrazing by domestic animals may result in the increased prevalence of non-native plants. Conversion of native habitat to roads, yards, and structures fragments the landscape, impacting biodiversity through a loss of habitat and disruption of nutrient cycling. Additionally, this study explains that alteration of ecological processes that are less visible than habitat destruction may be altered by exurban development and in turn influence habitats and biotic assemblages. In addition to development impacts, humans have excluded fires from rural landscapes to protect human property and lives, alteration of flood regimes may also occur with consequences for riparian communities, changes to nutrient cycles are also likely with conversion to exurban land uses, and pets may also displace, injure, or kill wildlife. Lastly, they found that exurban residential growth increases roadkill, impacting the demographics and migrations of birds, snakes, invertebrates, and amphibians, and is a major cause of mortality for moose, lynx, and wolves within the U.S.

Relative to other types of land use, exurban development remains substantially understudied. However, I believe it's critical to recognize that the impacts of exurban growth don't have to always be detrimental to local ecosystems. Many of the negative impacts mentioned in this study are generalizations; such as exurban developments promoting non-native species at the expense of other native species, or nature reserves possibly not protecting biodiversity as well as they are assumed to. Both of these assumptions have implications for stewardship conservation, as this study helps provide justification for groups to work with private landowners to protect ecological systems. Nonetheless, the effects of exurban development on native species and ecological communities have only recently been the topic of ecological studies. Going forward, it's worth taking the time to understand how different land uses will have their pros and cons, and their ability to support certain wildlife than others, but it doesn't diminish the ecological value.

Maestas J.D., Knight R.L., Gilgert W.C. (2003). Biodiversity across a Rural Land-Use Gradient. Conservation Biology. 17(5), 1425-1434. https://doi-org.ezproxy2.library.colostate.edu/10.1046/j.1523-1739.2003.02371.x

As private lands are increasingly converted to exurban development, the amount of low-quality habitat on western landscapes may become more prevalent and jeopardize the persistence of some species on private and public lands. As a result, efforts to protect the biodiversity within the Rocky Mountain states may require less reliance on nature reserves and a greater focus on private lands. While reserves are often assumed to protect biodiversity, this study found that they were somewhat ecologically degraded, suggesting that ranches can be more effective than reserves at maintaining native biotic communities, in some instances. This Larimer County, Colorado, case study compared

avian, meso-predator, and plant communities in protected areas, ranches, and exurban developments, the three primary land uses outside of city limits. Their data came from sites that were similar in elevation, soil type, and plant community type, and found that many native species have reduced survival and reproduction near homes, and native species richness often drops with increased exurban densities. It was also found that exurban areas and reserves showed increased richness and cover of non-native plant species, as human activities can change plant communities by accidentally or deliberately introducing invasive and non-native species. Out of seventeen recorded bird species, seven species reached their greatest densities on exurban developments. Furthermore, several species of birds, predators, and plants were observed solely on exurban developments. It's important to note that few studies outside of this have examined wildlife and plant communities on exurban developments and therefore further research is needed as this study found mixed results as to the ecological implications of exurban developments compared to ranch lands and natural areas.

Exurban growth can't be stopped or even slowed, and human migration can't -and probably shouldn't- be regulated or controlled. While exurban areas may not be ideal for all wildlife, improved conservation practices and stewardship can still help to support a range of species, promoting conservation practices through green building and construction concepts -referred to as conservation development- and is described in better detail in Kretser et al's study, is just one of the tools mentioned in this annotated bibliography that can help preserve biodiversity and ES. I believe striving for improved conservation, to ensure protections for biodiversity in the midst of this growth, is the best option forward. Nonetheless, some nongovernmental organizations (NGO) are working with ranchers in an effort to keep these lands from development because they believe biodiversity is better protected on ranches than on exurban developments regardless of assumptions that have not been tried and tested, according to the authors of this study. I question whether this perspective could be viewed as a style of "fortress conservation", in which affordable land in rural areas that may have been more accessible for lower-income Americans, would not be available through this method of conservation. I once again emphasize the value of recognizing the pros and cons to each conservation method and weigh accordingly with the input of local stakeholders and decision-makers.

Jenerette G.D., Anderson K.E., Cadenasso M.L., Fenn M., Franklin J., Goulden M.L., Larios L., Pincetl S., Regan H.M., Rey S.J., Santiago L.S., Syphard A.D. (2022). An expanded framework for wildland-urban interfaces and their management. Frontiers in Ecology and the Environment. https://doi.org/10.1002/fee.2533

Colorado's WUI is often seen as a focal point for human–environment conflicts, such as the destruction of homes by wildfires, habitat fragmentation, biodiversity decline, and invasive species invasions. This study focuses on the juxtaposition between highly and minimally developed lands, WUI regions are rapidly growing emergent systems, arising from interactions between human development and ecological processes that come

with unique risks, services, and conservation opportunities. This study examined how changes in developed and undeveloped lands leads to landscapes with spatial variations, and also impacts disturbance regimes, ecosystem functioning, and species distributions. WUIs are of particular importance in conservation as they contribute to the production of critical ES, further elaborated on in Hernandez-Blanco et al's study. The authors stress the need for an interdisciplinary understanding of WUI dynamics, particularly as it relates to the coupling between rural communities and their surrounding wildlands.

However, because WUIs emerge from coupled societal and environmental systems, people can work to improve future dynamics and conditions. These dynamics are a combination of socioeconomic and cultural drivers that reflect interactions among a variety of private and public stakeholders, including but not limited to land developers, landowners, residents, businesses, NGOs, and government agencies. However, WUI stakeholders are one in the same as rural stakeholders, in which they differ widely in their values regarding development, perceived need for services, vulnerability to hazards, and conservation priorities. These stakeholder actions are influenced by a range of goals, jurisdictions, and overall capacity as they operate across different spatial scales, ranging from small-scale residential to large acreage. In either case, decision making often takes place despite limited knowledge about critical environmental interactions and trade-offs. Jenerette et al argues that management of WUIs in the face of rapidly expanding development needs improved governance models and on-the-ground tools to address environmental impacts that are reflective of local context throughout the WUI landscape. Recurring wildfire catastrophes associated with the WUI both dominate the scientific literature and command public attention, but WUIs also provide critical ES and include habitats for many threatened species. Expanding WUI fire risk goals with other frameworks that emphasize practices surrounding invasive species management, wildlife, water withdrawals, and pollution is a facet of conservation not being utilized despite its notable impacts. Additionally, the authors recommend that in order to move forward more effectively, we need an interdisciplinary framework that expands on the original focus of wildfire threat, and works to combine this with other frameworks that emphasize conservation practices.

This study helped to bring my attention to rural communities that are identified as WUI, as they have particular importance pertaining to social and ecological coupling, as the provision of ES is especially critical, and these areas are uniquely poised to interact with ecological systems in more direct and impactful ways, both positively or negatively. However, given that these areas are often composed of small-acreage rural residential landowners, there is little to no regulation or requirements for the actions and decisions being made. As mentioned by Jenerette et al and further elaborated on below by Perry-Hill et al, these decisions are often made without full knowledge of any ecological impacts. Coincidentally, many of these negative impacts can be abated with education and various methods of support, in which local organizations can serve to bridge this gap. I will go into greater detail on the value of local organizations in these areas further

on in the paper. These factors name only a few reasons why we should be placing greater conservation emphasis on rural and/or WUI areas within Colorado, as these areas provide a portion of the nation's ES. All the more reason to improve conservation practices in these regions, support stakeholders, and share financial accountability.

Perry-Hill R., Prokopy L. (2014). Comparing different types of rural landowners; Implications for conservation practice adoption. Journal of Soil & Water Conservation Society, 69(3), 266-278. DOI: https://doi.org/10.2489/jswc.69.3.266

While there is a substantial body of research on the factors affecting rural farmers' adoption of conservation practices, there is little existing research comparing different types of rural landowners and their land management decisions. As stated in this article, small-scale rural landowners include both rural residential and small-scale agricultural landowners, where small agricultural landowners are defined as having between five and fifty acres, while rural residential with less than five acres. Though individual small farms and rural residences have less of an impact on environmental quality than large farms, the overall impact of small-scale rural landowners grows as they increase in numbers and change land use practices. Notwithstanding, this study found that small agricultural and rural residential landowners have an increased willingness to try conservation practices and generally have more positive attitudes towards conservation issues like water quality, despite being unfamiliar with many of the issues. As a result of rural residents' overall positive attitudes towards the importance of water quality and perceive water quality issues as an environmental issue, they were found to be more willing to try conservation practices than their urban counterparts.

However, developing natural resource policy and outreach strategies for areas experiencing exurban development is inherently challenging due to so much diversity in rural landowners' backgrounds, values, land use goals, and property characteristics. According to the study, the greatest barriers to adoption are a lack of contact with conservation organizations, lack of conservation awareness, and cost. Cost was the greatest barrier to conservation practice adoption as small-scale landowners face considerable constraints to adopting conservation practices due to low-income levels and more limited access to land, equipment, capital, and labor. However, as Pannell et al will later explain, the challenge of reaching and engaging rural stakeholders can be reduced with the support and collaboration of local nongovernmental agencies that build trust and relationships within these communities, greatly increasing the effectiveness of conservation goals. Therefore, local decision-makers need to understand and address the behavior of small-scale rural landowners. By tailoring outreach and initiatives, local decision-makers and agencies will be more effective and efficient in educating rural residents and getting conservation practices implemented. Based on these results, the authors of this study suggest that to be successful, conservation programs targeted at small agricultural and rural residential landowners should address pollution and conservation practice awareness, as well as assist in reducing the cost of implementation, similar to Jenerette et al's findings.

This study has significant implications for increasing the funding and overall support for conservation organizations within rural communities, as these will serve as the bridge and gap-filler for many of the issues raised. Once again, I feel it's important to recognize that a lack of understanding and overall knowledge in relation to conservation issues within exurban developments should not inherently suggest that only negative impacts on local ecological systems are an end result. However, with cost as the primary limiting factor, and little to no support for small-acreage rural landowners, valuable improvements can't be made until this linkage is addressed. As discussed below in Berkes et al, local organizations can serve as a bridge for these connections, and may be critical for conservation efforts in rural communities. It is of my belief that these areas, with the right support and management, can aid in major improvements in conservation goals.

Bonnie R., Pechar Diamond E., Rowe E. (2020). Understanding Rural Attitudes Toward the Environment and Conservation in America. NI R 20-03. Durham, NC: Duke University. https://www.landcan.org/pdfs/understanding-rural-attitudes-toward-environment-conservation-america.pdf

This article examines the heavy influence rural Americans have on U.S. environmental policy and coincidentally, being from rural America influences how voters view the environment as well as environmental policy. Though rural portions of the U.S. account for roughly ninety-seven percent of the country's land area, according to the US Census Bureau from 2017, only an estimated 19 percent of Americans inhabit these areas. Yet, as this study found, rural Americans have an outsized impact on conservation of natural resources and environmental policy. While rural voters often acknowledge the need for regulation related to the environment, they tend to be more skeptical of environmental policies than urban voters. Even rural voters from traditionally pro-environmental demographics are more likely to be skeptical of government intervention than urban voters from the same groups. This study found that rural Americans value environmental protection about the same as urban Americans, though there are differences in which specific environmental issues are most important. Clean water is the highest priority for rural voters, corroborated above by Perry-Hill et al's findings; however, they differ from their urban counterparts by placing higher emphasis on farmland conservation and less priority on climate change. While rural Americans express support for natural resource conservation and often have close personal and occupational ties to the natural environment, they (and their elected representatives) often exhibit less support for existing environmental protection policies and laws. This study also found that rural voters feel a deep connection to the fate of the environment and want to have a say in managing local resources. As a result of their sense of place identity, rural Americans feel a strong connection to the natural world. This perceived closer tie to nature and the outdoors shapes how rural Americans view environmental issues and will be discussed in depth in Larson et al's study further on. Due to their close connection to the natural world, many rural Americans have a deep sense of natural

resource stewardship and a conservation ethic, yet political trends suggest a general opposition to environmental conservation policies.

This article informed me that not only do rural voters have an outsized impact on national policy, but also manage huge portions of American lands and watersheds. Consequently, conservation of ecosystems, water, wildlife, production of energy, and many other natural resource issues depend on the actions taken by rural residents. This study found that environmental policies that emphasize moral responsibility, acting on behalf of future generations and clean water are the top three core values rural Americans share in response to environmental issues. Yet, as already pointed out by Perry-Hill et al, rural Americans are not monolithic. There is substantial diversity among U.S. rural populations and a better understanding of rural perspectives on environmental issues will require engagement and new partnerships with rural stakeholders, new communication strategies, and rethinking the design of environmental policies. The authors argue that conservation groups and local policy-makers should engage with rural stakeholders in developing environmental policies that impact rural communities, stating that policies that allow for collaboration with rural stakeholders are more likely to be popular among rural voters. Additionally, they believe that amplifying scientific outreach through local organizations will help to create additional and much needed pathways for science to reach rural communities, thus improving local partnerships, positioning rural stakeholders as part of the solution, and aiding in increasing rural voters' interest in clean water, conservation, and other local issues. This can also help to provide opportunities to connect environmental policy priorities and rural economies in ways that residents will value and support as it will benefit their communities directly.

Despite their influence on national environmental policy, small-acreage rural resident landowners currently do not receive the same level of support as large-scale rural landowners, like land trusts, ranches and farms, which often have more institutional and financial assistance. I believe this may be a significant component missing to conservation efforts in these regions, as these conditions do not serve to support conservation goals for such a large area of land mass, pointing to further evidence in an overall gap in conservation. Research has focused on wild or semi-wild lands, regardless of land use, acreage or impact, resulting in an inequitable portion of funding and efforts, despite the potential exurban development has to alter biodiversity. Understandably, as I believe this area of conservation has been overlooked simply due to the complexity of managing natural resources on private lands through traditional management styles. However, as our climate crisis unravels, I believe we will need to have new and innovative management strategies, as we no longer have the luxury of overlooking such a pervasive and fast-growing form of land use.

Pannell D. J., Marshall G. R., Barr N., Curtis A., Vanclay F., Wilkinson R. (2006). Understanding and promoting adoption of conservation practices by rural landholders. Australian Journal of Experimental Agriculture, 46, 1407-1424. https://doi.org/10.1071/EA05037

This study examined factors influencing adoption of conservation practices in rural communities within the US, in turn providing answers to questions raised in Jenerette et al's study pertaining to rural landowners making uninformed decisions surrounding environmental choices. They found that, in general, decisions rural landowners make about land management are indeed made without full information and any decision-making is often a social process. Although, awareness of an environmental problem or opportunity must first be identified if a solution exists, and must be of practical relevance to the landowner. Importantly, they found that reaching this point of awareness is a trigger that prompts the landowner to begin collecting information about the environmental issue in order to inform their decision about whether or not to go to the next step of taking action. However, taking action requires time, energy, finances and/or workable land. As this study found, to be willing to take action, the landowner's perceptions need to be sufficiently positive, with a belief that it will produce the desired outcome without excessive time, energy, or cost, if there is a reasonable chance of their adopting it in the long run. Additionally, landowners' assessment of a technology or practice relies strongly on information from outsiders. At this stage, social and information networks are important influences on the decision to proceed with action on an environmental issue or not. Yet, if small-scale action is not effective, too difficult or costly, the chances of widespread adoption are greatly diminished, resulting in landowners being cautious about the adoption of future conservation practices. Furthermore, they found that after the landowner has taken action, personal experience gained as a result is likely to be the main influence on further decisions. The probability of making a good decision that best advances their goals improves over time with increasing knowledge and experience with a conservation practice. The knowledge that is developed through this process is unique to the landowner and is likely based on a mixture of scientific information, personal experience, and cultural influences. This learning process is influenced by other landowners, their families, broader social environments and by the characteristics of the conservation practice. The authors stress the importance of recognizing that the trade-offs between the costs of acquiring additional information and the benefits of improved decision-making needs to be balanced in order for the adoption of conservation practices to be lasting and effective.

Surprisingly, they also found that physical distance of the landowners' property from sources of information plays an important role as the more distant the landowners are, the less likely to adopt conservation practices. While the reason behind this is unknown, the authors of this study suggest that perhaps because the information may appear less relevant to them than to those who are close to the information source, or possibly because they are less exposed to the information, is cause for further research. They also found that the existence and strength of landowners' social networks, local organizations and group memberships have been shown to be positively related to the adoption of conservation practices. A number of studies have found a positive relationship between membership of conservation groups and adoption of conservation practices. They suggest that conservation organizations working with landowners

encourages a participatory process, permitting conservationists to recognize that their own organization's goals may be different from landowners' goals. These interactions may increase landowners' knowledge and ownership of the outcome, hopefully helping them to better understand the goals of conservation practices. As mentioned in the study, a history of respectful relationships between landowners and conservation organizations is positively related to adoption, through earned trust in the advice of the advocates. This level of community participation also helps develop improved programs and practices by making better use of local knowledge, as well as serving to promote landowners' trust in these programs, practices and even organizations and agencies over time.

This study supports my belief that local organizations are needed for conservation in rural communities for a myriad of reasons. These local organizations can provide a source of guidance and knowledge-sharing, relieve individual financial burdens associated with conservation practices, shortens the distance of scientific information to rural residents, and can provide resources and technology, to name a few. Based on these findings, I believe that as landowners learn and experience more about how their choices impact nature, this will serve to further conservation efforts, as this knowledge will be shared and expanded upon throughout the community, as more residents take ownership of their decisions.

Larson L.R., Cooper C.B., Stedman R.C., Decker D.J, Gagnon R.J. (2017). Place-Based Pathways to Pro-environmental Behavior: Empirical Evidence for a Conservation–Recreation Model. Society & Natural Resources. 31(8), 871-891. DOI: 10.1080/08941920.2018.1447714

Larson et al's study examined pro-environmental behavior (PEB), which involves actions taken by an individual or group that benefits the natural environment, enhances environmental quality, or promotes the sustainable use of natural resources. These actions encompass behaviors such as individual sustainable lifestyles, pro-environmental public activities, social environmentalism, and stewardship. However, they found that before engaging in conservation behaviors, individuals may need to develop a sense of personal investment in an issue—a connection to a problem and a commitment to resolving it. This has been described as "emotional involvement" with nature, in which contextual forces shape one's interaction with a particular place; a sense of connection, ownership, and stewardship responsibility may ultimately have a strong influence on PEB. In many cases, positive nature-based experiences inspire conservation action and foster efforts to support a sense of place and as this study highlights, a connection to nature may be the key to protecting it. Additionally, community participation helps to emphasize the value and importance of environmental conservation practices and policy for individuals. As this approach requires enhanced understanding of public participation in activities likely to lead to the adoption of personal conservation behaviors, local organizations and groups are poised to lead in their communities. However, the authors stress that when communities bond

over a common attachment to place and passion for protecting it, civic action in all sectors (not just environmental) might be expected.

Expanding on this information, it would seem that rural and WUI communities are prime for conservation efforts, however, only if the appropriate resources and support are available. I believe the connection rural Americans have to nature will prove to be a key component if conservation is to succeed in these regions. However, this study, as well as Anton et al's study below, informed me that these connections are not always fully understood, and can have adverse repercussions if not, emphasizing the importance in understanding rural perspectives on conservation, as well as adaptive management. The following article will go into greater detail on the implications of place attachment and how these values play an important role in individuals taking personal ownership over environmental choices and outcomes.

Anton C.E., Lawrence C. (2014). Home is where the heart is: The effect of place of residence on place attachment and community participation. Journal of Environmental Psychology. 40, 451-461. https://doi.org/10.1016/j.jenvp.2014.10.007

People who live in rural areas often actively choose to live there, as they are drawn to the location and environment of these places, despite the hardships that may come from being isolated from services and major employment hubs. The strong desire to live in these places for their environmental attributes could explain this study's results that people in rural areas reported a higher place identity than people living in urban areas. This phenomenon, as described by Anton et al, is referred to as place-identity and is "a substructure of self-identity consisting of memories, ideas, feelings, attitudes, values, preferences, meanings, and conceptions of behavior and experience that occur in places that satisfy an individual's biological, psychological, social, and cultural needs." This study found that developing place attachment to one's home and region has been linked with many positive health and community participation outcomes. People with higher place attachment report greater social and political involvement in their communities, and communities comprised of highly attached people are more likely to work together to achieve a desired outcome, such as protecting the environment or preserving the social and physical features that characterize their community. Benefits of place attachment to the individual include a better quality of life, better physical and psychological health, more satisfying social relationships, and greater satisfaction with one's physical environment.

As explained by Pannell et al's findings earlier, this study corroborates that rural residents were more likely than urban residents to belong to local clubs or organizations, increasing place attachment, resulting in local residents taking more of an interest in the local area and community, leading to greater local participation and likely increasing their ties to the area. Place attachment can also lead to conflicts when new people move to a place with a high proportion of attached people, as established residents may perceive new residents as threatening to their way of life and to the

physical and social characteristics of the area. This argument has been used to explain local opposition to new conservation developments, such as wind turbines and more energy-efficient building concepts. Furthermore, living in a threatened place may cause people to feel more dependent towards that place. If people feel that the place they are attached to is threatened and that the landscape could change into a place to which they no longer feel an emotional bond, they could act negatively towards the people or organizations they feel are responsible for that change.

Based on this research so far, it's suggested that rural residents make up a massive conservation void; conversely, rural Americans have also demonstrated not only concern in particular environmental issues, but also a higher likelihood of wanting to take actions to protect nature, as they feel especially connected to it. This study, in addition to Laron et al's study, has implications of profound stewardship opportunities, further discussed below in Bennett et al's research, as all levels of conservation efforts will be needed in these areas, discussed in greater detail later on in Berkes et al's study. These levels, starting with individual landowners' behavior, all the way up to government agencies, are critical to conservation efforts, but can't work effectively without the appropriate bridges between them.

Part II: Project Development

Bennett N.J., Whitty T.S., Finkbeiner E. (2018). Environmental Stewardship: A Conceptual Review and Analytical Framework. Environmental Management 61, 597–614. https://doi.org/10.1007/s00267-017-0993-2

Many of today's current environmental issues often feel too global, leading to the perception that local actions can no longer meet these challenges. However, one way through which people engage in sustainability using their own expertise and knowledge gained through experience, supported by Pannell et al's research, is through participation in local environmental stewardship actions and initiatives. According to this study, stewardship actions have three fundamental elements—actors, motivations and capacity—that are influenced by social–ecological interactions that converge to impact both environmental and social outcomes. They found that stewardship depends on intrinsic and extrinsic motivations, as well as the capacity to act on these motivations. Intrinsic motivations are associated with actions that are expected to bring personal enjoyment, while extrinsic motivations are associated with the expectation to achieve outcomes, such as economic benefits, that are externally beneficial outside of the individual. Once motivation is present, they found that the capacity of communities to practice stewardship is primarily determined by the presence or absence of local assets; these provide the resources or capabilities to take action, suggesting that factors such as infrastructure, technology, financing, levels of wealth or poverty, rights, knowledge, skills, leadership, and good relations can all support the capacity of communities to take stewardship action. Governance also influences capacity, which includes systems of institutions such as laws and policies, formal and informal

organizations, and decision-making processes, as well as structural processes related to power and politics. Additional factors that also influenced capacity and motivation were the presence of formal government agencies, NGOs, local organizations, co-management bodies, or informal networks, as well as procedural considerations, such as inclusion of stakeholders, participation in planning, social learning, knowledge co-production, cooperative management, trust building, negotiation, and conflict resolution.

This study was of particular value in my research, as the central-role of local residents in caring for the environment that they are close to, connected to, and may even depend on for subsistence and livelihoods, may produce strong motivations to take stewardship actions but might simply lack the capacity to do so. I believe this further supports the need for local governance, institutions and/or leaders to help ensure that responsibility is not expected from individuals or groups who do not have the capacity to carry out stewardship practices, or who might experience costs that are greater than benefits. They go on to recommend that organizations and individuals moving to develop or support pre-existing conservation stewardship efforts by local people, should promote and implement specific policies, programs and market strategies that facilitate or enable local stewardship potential, once again emphasizing a need for local conservation organizations. This research further supports my belief that the inclusion of local communities in decision-making and stewardship practices has the potential to help increase the likelihood of reaching conservation goals.

Hernandez-Blanco M., Costanza R., Chen H., deGroot D., Jarvis D., Kubiszewski I., Montoya J., Sangha K., Stoeckl N., Turner K., van 't Hoff V. (2022). Ecosystem health, ecosystem services, and the well-being of humans and the rest of nature. Global Change Biology. https://doi.org/10.1111/gcb.16281

Ecosystem health should be considered an integral component of development, sustainability, and human well-being. This article focuses on how ecosystem health is impacted, both positively and negatively, by interactions with human, social, and built capital, and that more importantly, how ES is dependent on healthy ecosystems. Ecosystems are subject to both natural and human-caused disturbances, such as drought, flood, fire, development, pollution, and landscaping practices, in addition to other drivers of ecological change, explained by the authors, and these disturbances can significantly transform the structure and functions of an ecosystem, and therefore its health, setting the stage for issues in ES and therefore human-wellbeing. While the determination of ecosystem health is independent of the presence or absence of human intervention, Hernandez-Blanco et al states that it’s important to recognize that stewardship activities often enhance ES, while other anthropogenic disturbances rarely contribute to the resilience and adaptation capabilities of ecosystems, instead degrading them. Therefore, ES are affected by different ecosystem management and stewardship schemes and society should be aiming for ecosystem health stewardship at all levels to maintain and improve ES. In practice, ecosystem management should focus

on maintaining the ecosystem's structure and function, allowing the system to maintain redundancies and resilience in the face of changes.

I believe that the culmination of individual actions within a community can have reaching effects, not only on surrounding ecosystems but also within the culture of the community, as well. Stewardship behavior has the potential to be adopted by neighboring residents and possibly by nearby communities as more individuals learn and experience these benefits firsthand, but only if the needed support and knowledge is made easily available to them. With the right resources, rural communities can have a positive impact in the continued production of ES, along with promoting the preservation of biodiversity and other conservation goals. In many cases, conservation actions taken by individuals, aka environmental stewardship, involves a hybrid of conservation goals. Individual stewardship actions, for example, might include daily decisions made about resource management regarding maintenance or restoration of soil, the management of vegetation, removal of invasive species, reduction of source-pollution, and impacts on local watersheds and riparian areas, are just a few examples of possible actions taken. However, I also believe that many rural residents are not aware of the critical role they play in these services, supported by Bonnie et al's findings above, as we have lost our deeper connection to nature, explained in greater detail below.

Bliege Bird R., Nimmo D. (2018). Restore the lost ecological functions of people. Natural Ecology Evolution. 2, 1050–1052. https://doi.org/10.1038/s41559-018-0576-5

Despite our understanding that humans are the primary cause of the global biodiversity crisis, there is little to no discussion surrounding missing ecological functions once performed by people, or ecological restoration with the added component of societies, according to this study. Bliege Bird et al argues that people have been functionally vital to many ecosystems across the globe for millennia, and that the absence of this component amongst conservation discussions ignores key facts and evidence. Furthermore, they go on to state that in many parts of the world, ecological degradation has arisen through the loss of people. This doesn't imply that negative interactions do not occur; however, it is important to recognize that for the vast majority of human history, many of these interactions have provided vital ecological functions, according to the authors. Some of these functions, they say, such as herbivory, predation, seed dispersal and bioturbation 'closely parallel those performed by non-human keystone species.' One of the challenges they found in considering the role of people in ecosystem functioning is the enormous variation in the scale and scope of human ecological interactions. For long periods of time humans were nomadic, yet in more recent post-industrial history, societies are place-based, as already discussed in Anton et al's study. Place-based societies interacted — and continue to interact — with their ecosystems in a myriad of ways, Bliege Bird et al states. In short, this study found that modern place-based societies exhibit both positive and negative feedbacks with local ecosystems, as ecological interactions are changed by human social, cultural and economic behaviors, intentionally or otherwise. To the authors' dismay,

however, ecological research on human–environment dynamics has historically focused on the negative impacts of these interactions, inevitably shaping the lenses through which we approach conservation goals. More importantly, this study highlights that conservation projects have maintained ecological targets that 'mimic natural systems prior to the emergence of modern humans, ignoring tens to hundreds of thousands of years of co-occurrence and co-evolution between modern humans and ecosystems'.

This article has particular relevance for my capstone, as it stresses the dangers in overlooking the functional roles of people in ecosystems. This shortcoming inhibits our ability to truly understand past and current ecological change, while missing opportunities to improve modern-day ecosystem management. In doing this, we run the risk of retaining ecosystems in an artificial and functionally impoverished state. Even more importantly, I believe it's simply not realistic to maintain nature in its historic state; between high human population levels with coinciding needs, a changing climate and shrinking protected areas, there will not be enough land to protect biodiversity or ES under these conditions. Regardless of individual values and conservation objectives, I can't fathom how they will be reached if we don't move forward in ways that not only include humans in the definition of ecosystem health, but work to use this to our advantage to make major booms in conservation targets, as well as human well-being.

Ellis E.C., Gauthier N., Goldewijk K.K., Bliege Bird R., Boivin N., Díaz S., Fuller D.Q., Gill J.L., Kaplan J.O., Kingston N., Locke H., McMichael C.N.H., Ranco D., Rick T.C., Shaw M.R., Stephens L., Svenning J., Watson J.E.M. (2021). People have shaped most of terrestrial nature for at least 12,000 years. Biological Sciences. 118 (17). https://doi.org/10.1073/pnas.2023483118

The current biodiversity crisis is often depicted as a struggle to preserve untouched habitats; disregarding crucial information surrounding how human societies have been shaping and sustaining natural systems for thousands of years, as discussed above. This study combined global maps of human populations and land use over the past twelve-thousand years with current biodiversity data, and found that nearly three quarters of terrestrial ecosystems have been shaped by human use and behavior. Lands that are identified as 'natural' and 'wild' have long histories of human use, as do protected areas. Importantly, they found that current patterns of species richness and biodiversity areas are more strongly associated with past patterns of land use than with present ones. The growth of industrial economies has amplified this trend through more intensively used and homogeneous landscapes shaped by global supply chains, mechanization, chemical nutrients and pest control, resulting in ecologically simplified habitats and biotic homogenization. More importantly, they found that with rare exceptions, current biodiversity losses are caused not by human conversion or degradation of untouched ecosystems, but rather by the appropriation, colonization, and intensification of land use. Although some societies contributed to extinctions in the past, this study concludes that human use of ecosystems and landscapes is not, in itself, the primary cause of the current extinction crisis, nor is the conversion of untouched wildlands, which were nearly as rare ten thousand years ago as they are today.

The archaeological and palaeoecological evidence they found showed that all human societies employed varying degrees of transformative land use practices, including burning, hunting, species propagation, domestication, and cultivation, that have left long-term ecological legacies. While conservationists' focus has been on negative outcomes relating to these interactions, there is increasing evidence that human practices can also produce sustained ecological benefits that expand habitat for other species, enhance plant diversity, increase hunting sustainability, provide important ecological functions, and improve soil nutrient levels. However, the lingering paradigm among scientists, conservationists, and policy-makers is that human transformation of nature is predominately recent in historical terms and nearly always destructive. Yet, the authors point out that long-term global changes in climate, fire regimes, and biodiversity, including failed policies of fire suppression, wildlife management, and ecological restoration, is raising important questions as a result of the real-world consequences of our further disregarding of this knowledge. Ellis et al argues that depicting human use of nature as predominantly negative is not only incorrect but has profound implications for both science and policy; further stating that reaching conservation and restoration goals will not succeed without recognizing and incorporating societal connections in relation to the ecosystems they interact with. In conclusion, they believe recognizing this deep cultural connection with nature to be essential to resolve the global climate and biodiversity crisis, as their findings support the notion that environmental stewardship will be critical to conserving natural systems across the planet.

I have long believed the enduring goal of preserving nature in its historical state is based on inconclusive evidence, lacking both adaptive and systems thinking management strategies, substantiated by this study. Not to imply that management styles are solely to blame for past conservation missteps, rather, it demonstrates additional shortcomings in standard "command and control" or "fortress" management methods. Additionally, it disregards Indigenous knowledge about North America's landscape, maintaining the misconception that the ecosystems we are now familiar with were not drastically altered and shaped by colonization. However, I believe the conservation community is beginning to embrace management strategies that allow for more holistic and intuitive approaches, and also incorporate perspectives and values of the communities that rely on their surrounding ecological systems.

Kretser H.E., Dale E., Karasin L., Pejchar L., Reed S.E. (2019). Factors Influencing Adoption and Implementation of Conservation Development Ordinances in Rural United States, Society & Natural Resources, 32(9), 1021-1039. doi:10.1080/08941920.2019.1605435

This article explains how the integration of conservation objectives into local land-use regulations is important for reaching conservation goals within rural communities, and why it requires an understanding of the underlying processes at work. Conservation development (CD) is one tool designed to reduce the impacts of rural development on

natural resources and can help protect ES on private lands. As described in this study, CD focuses on the design, construction, and stewardship of a development in order to achieve functional protection for natural resources while also providing social and economic benefits to human communities. Ideally, it also serves to identify and protect ecologically important areas within the development by concentrating development away from natural resources. CD sustainability practices include guidelines for recycling, reduction of energy use, green building, invasive species management, and land-use practices to maintain habitat for wildlife. According to this study, with large enough open spaces and well-coordinated stewardship, CD can help to preserve sensitive birds and mammals on private lands. Given the continued preference home-buyers have for developing near protected areas, private lands protection is essential for a comprehensive nationwide effort to reach conservation goals. According to the authors, one-third of rural communities in the western and northeastern U.S. have adopted CD ordinances into local land-use regulations, protecting nearly 10 million acres, approximately one-quarter of all privately conserved lands.

According to the authors, to meet current housing demands while providing effective private lands conservation, CD and similar ordinances will need to be adopted and implemented in many more towns and counties across the country and ultimately around the world. However, less is known about the conditions that enable adoption of such ordinances and contribute to subsequent implementation, though Pannell et al's study helps to shine light on many of these questions, at least in regards to individual adoption of conservation practices. How many conservation policies are adopted by a community has been shown to be influenced positively by state and federal mandates, environmental interests, the size of the community (larger communities tend to adopt more policies), an increasing threat of development, and institutional structures with adequate fiscal and staff capacities, this particularly includes the ability to facilitate communication among local leaders. They found that factors hindering the adoption of conservation and sustainability practices also should be considered; smaller communities, lack of social diversity in a community, and inequitable geographic distribution of capacity within a region have contributed to lower adoption rates for conservation and sustainability policies. For biodiversity conservation efforts specifically, they found low levels of support by the public and elected officials remain important factors limiting adoption. Overall, the eventual implementation of CD ordinances was positively associated with ample opportunity for dialog, but those ordinances lacked strength for achieving conservation outcomes unless the community had access to outside expertise.

This is why rural communities may be ideal locations for conservation stewardship. For this reason, I would once again suggest that a key role that has been missing from this equation is the presence of local organizations and groups that serve as a linkage between communities and needed resources. These organizations can also serve to introduce new actors, provide incentives, augment local capacity or institutions, promote or support the implementation of specific actions, or monitor and evaluate the

outcomes of stewardship practices to encourage adaptive management. Likewise, local conservation organizations can help in more ways than research suggests; bringing in additional funding can help provide employment in depressed communities, as well as other community benefits, that may be overlooked in current research, further elaborated on below in Berkes et al's study.

Berkes F. (2004). Rethinking Community-Based Conservation. Conservation Biology. 18(3), 621-630. https://doi.org/10.1111/j.1523-1739.2004.00077.x

This article examines how stewardship practices, also known as community-based conservation when performed by entire communities, have emerged at a time when the science of ecology and applied ecology are shifting from 'fortress conservation', as touched on earlier in Maestas et al's study, to a systems view of the world that includes humans in the ecosystem, as well as a shift away from an expert-based approach to participatory conservation and management. Explained by Berkes et al, participatory conservation is based on the idea that if conservation and development could be simultaneously achieved, then the interests of both could be served. Yet, community-based conservation may be viewed as controversial due to community development objectives not necessarily being consistent with conservation objectives. The authors believe that science and local knowledge can interact to improve the understanding of both parties, resulting in paradigm shifts that emphasize the importance of cross-scale conservation, adaptive co-management, the challenges of incentives for multiple stakeholders, and the use of local ecological knowledge. They found that co-management in practice is often a linkage of multiple parties, involving both horizontal and vertical dimensions. These linkages across levels of conservation can take a number of different forms; such as multi-stakeholder groups, citizen science organizations, policy communities, social movement networks, and 'boundary' organizations, which are community-based organizations that enhance linkages between local and national levels.

While multiscale linkages are key, the authors of this study emphasize that the community level is still singularly important because long-term conservation objectives are easier to achieve with the cooperation of local people than without them. They go on to say that in order to address complex systems, partnerships can be built between community-based organizations and stakeholders through adaptive management, which recognizes that information shared between parties will never be perfect, necessitating close cooperation, trust and risk-sharing between the community-based organizations and local stakeholders. Such a process requires collaboration, transparency, and accountability to support a learning environment where practice builds experience. This approach brings the community into the management and decision-making process, which is fundamentally different from the fortress style mentioned above. According to the authors, this level of cross-scale conservation has to be planned bottom-up, rather than top-down, to see any lasting effects. Many of these complex conservation issues have been dubbed 'wicked problems' with "no definitive formulation, no stopping rule,

no test for a solution, and cannot be separated from issues of values, equity, and social justice", as defined in this study. They found that, historically, there has often been conflicting ideas between what conservationists and community stakeholders have thought of as community benefits. The conception of local incentives purely in terms of community economic benefits has proven to be too narrow, too simplistic, and potentially counterproductive. Many of these payment schemes will be discussed below, going into greater detail surrounding these complications. Because many rural livelihoods are based on mixed strategies of wage employment and resource use, this study found that what people value is going to vary from case to case.

While it is quickly become increasingly important to consider and also incorporate the dynamic interactions between societies and natural systems, rather than viewing people merely as 'managers' or 'stressors', how this can be accomplished is yet to be determined. I believe that the failure of community conservation is not due to the weakness or impracticality of the concept, but rather to its improper implementation, especially with regard to leadership, funding and accountability. However, where there are no clearly defined objectives and diverse (or even contradictory) approaches, I feel that a new strategy must be designed in which conservation organizations and stakeholders collaborate in order to define important questions, objectives, evidence, and issues of equity. Using knowledge and perspectives from the community level can help build more complete information than may be available from scientific studies alone. It is of my belief that the concept of community-based conservation has the ability to give adequate attention to many of the questions surrounding 'wicked problems' of local equity and empowerment, distribution of benefits and costs, stakeholders' different interactions of natural resources, and power relations at the local level, all of which will be addressed below.

Salafsky N., Cauley H., Balachander G., Cordes B., Parks J., Margoluis C., Bhatt S., Encarnacion C., Russel D., Margoluis R. (2002) A systematic test of an enterprise strategy for community-based conservation. Conservation Biology. Vol 15, Is 16, pag 1585-1595. https://doi-org.ezproxy2.library.colostate.edu/10.1046/j.1523-1739.2001.00220.x

Addressing the competing challenges of biodiversity conservation and economic development are among the most difficult problems facing humanity, as a typical conservation project occurs in a complex system that involves biological habitats and human-caused threats. A critical need exists to determine the specific conditions under which various conservation strategies are effective, and while this study found that a community-based 'enterprise strategy' (also commonly referred to as a corporate strategy, in which conservation is pulling in concepts from the business sector to utilize in conservation) can lead to improved conservation goals, but can only do so under specific conditions and never on its own, as many of these studies have already demonstrated. The central idea behind using an enterprise strategy to promote conservation is that if a viable enterprise -a worthwhile outcome that generates benefits for a community of stakeholders- is linked to the biodiversity of a region, it will

incentivize the stakeholders to preserve it. The study found this to be true; if local communities receive sufficient benefits from a viable enterprise that is dependent on biodiversity, they will act to counter internal threats caused by other stakeholders, as well as external threats caused by outsiders. However, if an enterprise approach to community-based conservation is going to be effective, three main conditions must occur, according to the authors. The first condition is that there must be a financially viable, 'linked enterprise' as community-based organizations are difficult to establish without this; of the thirty-seven organizations looked at, four had no revenues and only seven made a profit. As a result, it was difficult for these organizations to pay for the skilled management necessary to make them viable, further compounding more challenges. Key factors that influenced success included good management and bookkeeping skills, good market research, and a simple strategy that used skills and technologies that members of the community already possessed.

Additionally, the study found a strong association between enterprise success and the degree of local involvement in the ownership and management of the enterprise. The second condition is that the enterprise must generate benefits for stakeholders. Contrary to the expectations of the study, conservation occurred regardless of the percentage of stakeholder households receiving cash benefits, or the average amount of benefits each household received. However, they also found that conservation was associated with high levels of noncash benefits. These results imply that although cash benefits are not important in influencing stakeholders' willingness to counter conservation threats, stakeholders do need some incentives to take action. In particular, noncash benefits seem to be effective in promoting trust and cooperation between key stakeholders and the organization's staff. The third condition they found is that there must be a community of stakeholders who have the capacity and resources to counter internal and external threats to biodiversity, however strong and balanced local leadership was needed to ensure this.

As CBOs have a history of challenges, like most conservation organizations, this article helped to piece together key components to a successful strategy. Information from this study taken together, suggests that an enterprise strategy can lead to conservation when a conservation organization establishes a viable enterprise. Additionally, they emphasize the value in education and awareness, and stresses that a good staff are particularly important as community participation in the enterprise was significantly associated with conservation behavior. Lastly, this study also found that if the organization promotes education and awareness, then stakeholders may be more willing to listen and take actions to counter both internal and external threats. The takeaway is that whether or not this alternate pathway works in all cases, the broader point is that any one conservation strategy will not work by itself. Instead, it seems best for organizations to have the appropriate mixture of strategies tailored to meet local conditions. I believe this is best accomplished by conservation practitioners asking for help from local residents to define conservation and objectively measure the success in moving toward it, to discover and refine guiding principles for using enterprise-based

and other strategies for conservation, and to capture the knowledge they have gained in learning institutions.

Governance, Land and Distribution: A discussion on the political economy of community-based conservation (2017). Departmento de Economia, Facultad de Economia y Empresa, Universidad Diego Portales, Avenida Santa Clara 797, Huechuraba, Santiago, Chile. Department of Economics, McGill University, Montreal, Canada.
https://doi.org/10.1016/j.ecolecon.2017.05.012

Community-based conservation, as already discussed by Salafsky et al, serves as a linkage for multiple spatial scales, including conservation and local benefits in rural communities, formal and informal institutions, natural resource management and governance, local interactions and potential conflicts, and how benefits and costs are shared, to name a few. The strategies behind community-based conservation focus on the integration of conservation and rural livelihood goals, providing economic and development benefits in return for conservation, and providing communities control over their natural resources. The emerging concept of payment for ecosystem services[4] (PES), where payments for reforestation, conservation, natural resource management, and ES preservation to local stakeholders and communities, is becoming more popular in community-based conservation strategies and has potential implications for justice and equity issues within rural conservation projects. Yet, simplified monetary-based incentives for PES may be impacting other capital streams for rural communities, as briefly mentioned earlier by Berkes et al, as PES schemes may be affecting funders' intrinsic motivations for environmental protection behavior. This study found that non-cash benefits were sometimes more valuable than monetary benefits for local stakeholders as it promoted greater trust and cooperation. Non-monetary incentives, collective goods and development projects are also crucial in promoting support for community action and were also significantly associated with conservation. They also found that communities took action in support where they had good working relationships with the organization's staff members as they come to know and trust them, becoming more receptive to the conservation ideas introduced. However, as this study points out, while PES plays a key role in rural community-based conservation, it cannot stand alone.

For this reason, I believe it's crucial that conservationists use an evidence-based approach to conservation targets, as this will allow them to become more efficient and effective. Simply implementing strategies that may not have community support not only impede current conservation efforts, but has the potential to have legacy effects of

[4] Payment for Ecosystem Services: Payments for Ecosystem Services is the name given to a variety of arrangements through which the beneficiaries of environmental services, from watershed protection and forest conservation to carbon sequestration and landscape beauty, reward those whose lands provide these services with subsidies or market payments.

distrust towards conservation organizations in the future within that community. While PES or other simplified monetary-based schemes may have the best intention behind them, without open communication and a better understanding of recipients needs and desires, they can work to hinder progress. While I believe that PES schemes have a role to play in rural conservation, exactly how is likely going to be a case-to-case scenario in which local leadership will be needed to help walk this delicate line. This level of monetary schemes will likely require place-based leadership in order to understand the dynamic interactions between these socio-ecological systems and work to ensure equity as much as possible.

Martin P., Lawson A., Luiza Luz M., Nauschutz S., Davies K. (2021) Funding rural stewardship: the case for significant reform. Landcare NSW. The University of New England. https://hdl.handle.net/1959.11/31203

Despite monetary conservation schemes having their pros and cons, a viable investment system for rural conservation is needed to achieve sustainable ES and protect declining biodiversity. As this study points out, the current system does not provide the sustained and adequate investment needed to restore and protect the rural environment. As this study points out, this is reflected in the continuing, significant decline in the natural environment. Together with the impacts of climate change, environmental pressures are predicted to grow, increasing this rural environmental stewardship funding gap. The authors feel that if funding issues are not addressed, ecological loss will continue, because without sufficient resources, policy and regulation will be ineffective, and pressure to protect declining biodiversity is likely to generate further pressures on rural communities. Additionally, rural environmental and economic opportunities will be missed, creating 'lose-lose' outcomes where 'win-win' scenarios are possible. This study highlights a need for a broadly based investment system, to ensure sufficient funding for the rural environment in order to share responsibility and accountability for environmental impacts and ES protections. Funding models, such as PES, purchasing of ES, industry regulation, offsets, and market instruments have been proposed, however, no viable funding source or governance support has been identified to make their widespread use feasible, as stated in this study. The authors believe reforms are needed to motivate and enable stewardship by landowners, and enable innovative approaches such as payments for environmental stewardship or through conservation programs that benefit rural communities. Furthermore, an effective governance and financial system is needed to identify investment sources and instruments to match needs to resources, as well as to allocate and administer funds in order to ensure accountability and to support continuous improvement.

While my research has helped better inform me of conservation gaps within rural communities, and has even equipped me with the knowledge on how to best proceed, it does not provide the solution to effectively reach these goals, as funding is almost always the linchpin for organizations. Yet, the time is ripe for innovation in the funding of effective, efficient and equitable rural environmental stewardship. Currently, costs,

bureaucracy and impeding systems are adversely affecting many significant conservation goals, a sentiment that nearly all conservation organizations would likely share. I strongly believe that the responsibility to provide stewardship incentives and resources has to be genuinely shared between governments, industry, NGOs, land stewards and stakeholders. Furthermore, developing economically and politically feasible solutions requires the engagement of all levels of government, as well as the private sector, and must include NGOs and local stakeholders. Obtaining funding and resources must be realistic and achievable for those involved, otherwise we will continue to see failures in conservation goals. Lastly, funding systems that are 'user-friendly' for all parties who interact with them will help facilitate participation and success. However, as stated in previous studies, rural stewardship funding requires more than money alone. Effective leadership is also needed to substantially grow and ensure that the funding system has clear goals, sound strategies, adequate resources, accountability, and transparency.

Echols A., Front A., Cummins J. (2019) Broadening conservation funding. Wildlife Society. Vol. 43, Issue 3. Pg. 372-381. https://doi-org.ezproxy2.library.colostate.edu/10.1002/wsb.1003

Moving forward, environmental challenges will continue to increase in number and intensity, requiring improvements in efficiency of conservation delivery and broadening of the base of financial support to address these challenges. This study focused on funds made available by federal institutions to assist conservation, and more importantly, they suggest how to produce more with existing funds, as well as potential strategies to increase and broaden conservation funding. As this study points out, there are a myriad of federal funding programs for conservation, but these are inadequate if we are to meet the current needs to address climate change and biodiversity declines. Despite active efforts to advance innovation in ecosystem and conservation finance over the past twenty years, the demand for conservation funding exceeds what's federally available, as virtually every program investing in conservation is overexerted, according to the authors. The portion of the federal budget that includes all environmental and natural resource funding is currently less than one percent, whereas during the Reagan Administration, the portion of the federal budget that went to these programs was almost four percent.

Additionally, this study states that, overall, we have done a poor job of documenting conservation benefits that have been delivered through funding programs, arguing that success has been measured with poor metrics, such as dollars allocated, acres enrolled, or miles 'protected.' They go on to say that these metrics don't speak to the actual conservation objectives measured as ecological services, including improvements in water quality, wildlife populations, soil productivity, or biodiversity. Additionally, they argue that we should move to models that require a greater environmental return-on-investment, versus the standard of funding "entitlement programs" that have gotten accustomed to receiving funding. A system of 'Ecosystem Service Markets', such as PES schemes, has been an objective of the conservation finance community for over two

decades, which considers the value of ES and emphasizes the need to incorporate them into economic systems. However, these markets have not developed as hoped, where one of the major impediments is thought to be the reluctance of consumers of ES to pay for something they may get for free.

To my dismay, the reduction of federal funding for conservation, despite the widely-known climate crisis looming over the planet, is evidence of a desperate need to reprioritize federal spending. This increase in funding can also help to boost uses in technology within conservation, which have been sorely lacking due to cost and availability. While technology won't act as a panacea for conservation issues, it can help to drastically improve outcomes and reduce spending waste. Ultimately, we have the resources, desire, and knowledge to restore many ecological systems and move forward with an overall improved and more holistic sense of conservation, however, without the needed funding and institutional support, these factors are dubious. To compound this challenge, the conservation community has carried much of the burden in promoting funding for conservation programs, working as both the capitalist and custodian. However, it is of my belief that governments and corporations should be paying for ES, as well as ecological restoration, as the perpetual burdening of American citizens to pay for all of this is not feasible or equitable. In an effort to find research in support of this, results fell short of holding corporations accountable for environmental impacts through meeting strategic business goals that are also environmentally-friendly, but aren’t yet diving into the topic of financial accountability. The private sector, particularly the ones responsible for significant ecological impacts, should be held accountable, with the expectation of monetary support for conservation efforts, as well as through direct mitigation of their companies’ environmental impacts. Now is the time to implement and encourage rural stewardship practices and conservation, without delay, but without the financial backing and accountability needed, this will be a long and difficult battle.