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Approaches and Tools to Solving Complex Problems in Private Land Conservation

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APPROACHES AND TOOLS TO SOLVING COMPLEX PROBLEMS IN PRIVATE LAND CONSERVATION

By

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Portfolio

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Approaches and Tools to Solving Complex Problems in Private Land Conservation

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The central theme throughout my four portfolio pieces is: approaches and tools that can be used to address complex problems involving private land conservation. I consider the broader human and environmental community health to be factors in successful private land conservation. The first portfolio piece examines a number of studies of conservation easements implemented to improve water quality, as well as their utility in avoiding land use conflict. My second portfolio piece is a reflective paper on my experience conducting a stakeholder assessment for the organization OneMontana. The assessment focused on creating a shared understanding of the issues related to land ownership and business transitions on agricultural land in Montana. Appended to this piece is the final report I co-authored for OneMontana on my research. My Third portfolio piece is a final report on a situation assessment I conducted for The Nature Conservancy. The assessment examined a successful floodplain restoration program in Washington State, and through stakeholder interviews created an understanding of local needs to determine feasibility of an analogous program in Montana. My final portfolio piece is a reflective essay comparing my experiences and the different contexts of my work with OneMontana and The Nature Conservancy.

Acknowledgements

I would like to thank my committee members, Robin Saha and Shawn Johnson, for their guidance, feedback, thoughtful questions, and encouragement over the course of my time at University of Montana.

I'd like to thank the Environmental Studies and Natural Resource Conflict Resolution programs and each of their communities for providing such a welcoming, creative, and energizing space for all of us to grow in.

I would like to thank the Max Baucus Institute for providing me with the opportunity to be a 2022 Baucus Climate Scholar, and carry on former senator Baucus's legacy of environmental advocacy and action.

I would like to thank the organizations OneMontana and The Nature Conservancy for allowing me the opportunity to work with each of you over the past year.

Lastly, I would like to thank my family and partner for their support and encouragement over the course of my education. I'm not sure if I would have gotten this far without your love and encouragement.

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Portfolio Introduction

I applied to the Environmental Studies program at a transitional time in my life's journey. I had spent the majority of my adulthood as an outdoor educator, stoking curiosity and environmental awareness in the minds of students. I also happened to be coming of age during an era of American Life marked by increasingly widespread political combativeness, while at the same time a growing acceptance that the increasing frequency of large-scale ecological disasters was related to climate change. I spent much of this time interacting with a range of different people and places, and developing a desire to see community members come together in addressing their shared issues, be it environmental or social. After a chance meeting with a student in the program while working in Washington State, I eventually came to the University of Montana with the goal of transitioning into a career in environmental policy and facilitation. However, more than any distinct future career I hoped to expand my knowledge of environmental policy, conflict mediation, and community activism to grow as a citizen and an agent of change.

We currently face a range of problems that challenge the prosperity of local communities. In Montana, climate change continues to raise average temperatures, leading to an increased risk of severe flooding while at the same time contributing to prolonged drought conditions and aridification (Martin et al., 2020). Montana has seen a sharp increase in populations over the past decade, leading to an increase in development and resource use. Many agricultural operations throughout the state are experiencing a generational transition in ownership, often without concrete plans. Meanwhile, the complexity of addressing these challenges is compounded by a politics that often pits ecological conservation against resource use. While public land conservation utilizes a range of tools to preserve ecological function, landowner rights and attitudes create an additional challenge to the conservation of privately owned lands. Given that private land accounts for 62 percent of the state of Montana, and 60 percent of all land

nationally, their continued health has far-reaching impacts on the broader environment (Wild Montana, 2023). These problems are nuanced and require solutions that benefit the multiplicity of groups that live and rely on the landscape. There is a need to take the health of our environment into account as we think of solutions to these issues, while at the same time considering the health and resilience of local communities and economies.

To design solutions that can benefit a multitude of groups within an area, it is necessary to understand their individual needs. Through developing an understanding of these needs, solutions can be designed that benefit the environment and improve the resiliency of communities. This portfolio demonstrates my competencies in information gathering and analysis to identify gaps in knowledge, and understand the context, needs, and priorities of the many groups that rely on the landscape. These competencies are exemplified through two approaches I have utilized to understand complex issues: situation assessments, and stakeholder assessments. Situation assessments and stakeholder assessments are both evaluations of a conflict or situation that is based off of stakeholder interviews (McKinney, 2015). Their objective is "to develop a common understanding of the substance of the problem, the needs and interests of the parties, and the risks associated with different procedures for resolving the issues" (McKinney, p. 2, 2015). Stakeholder assessments are a component of situation assessments which focus specifically on the needs and interests of the parties involved. My portfolio highlights both situation and stakeholder assessments that I have conducted around generational transitions on Montana ranches, and floodplain management in Missoula County, as well as a reflective essay on those two experiences. Additionally, this portfolio examines a number of conservation tools which have been used throughout the country to balance landowner needs with the ecological health of the surrounding landscape.

The first component of my portfolio is a literature review titled: *The Impact of Conservation Easements on Local Water Quality.* This literature review was written as the final project for the Environmental Studies Program course *Scientific Approaches to Environmental Problems* and then revised in Spring 2023. The objective of that assessment is to provide examples from communities around the country of several tools that balance landowner needs and conservation actions to preserve or improve water quality. The review focuses on three case studies observed in the Prairie Pothole Region of the Upper Midwest, Chesapeake Bay Watershed, and the State of Vermont. In each of these places, decreasing water quality or increasing flood risk led to the implementation of conservation easements. These easements were designed to reduce runoff, improve water quality and groundwater recharge, and reduce flooding and related damages while at the same time addressing the needs of landowners and agricultural operations. A significant amount of the literature reviewed for this paper focuses on the implementation of conservation easements on working lands. These tools acknowledge the needs of agricultural operations while maintaining the goal of conserving water quality and improving groundwater recharge. This academic paper relates closely to both work experiences included in the portfolio by discussing strategies for land conservation and restoration that benefit both landowners, their communities, and the ecosystems which they rely on.

The second component of this portfolio is a summary of my work promoting succession planning in local agriculture with the organization One Montana. From May 2022 through January 2023 I was a member of a research team hired by OneMontana to conduct a stakeholder assessment in support of a new online tool they are designing. As a part of their Landowners Education and Resource Network, OneMontana sought to further research the potential of an online tool that could help landowners interested in planning for the succession of their land and business. As a member of this research team, I designed interview questions for several different stakeholder groups to answer key questions related to

the program's goals. Most notably, we sought to clarify whether an online platform would be utilized by farmers and ranchers, or if they would prefer in-person consultation with professional legal and financial planners. Additionally, we sought to determine what resources an online platform would direct landowners to, and what organization should manage such a platform to reach the largest audience. Appended to this component is the completed OneMontana report, which was published by the organization in March 2023.

The third component of my portfolio is a report on research I conducted into local needs and potential tools for Floodplain Management in Montana for *The Nature Conservancy.* In the Spring of 2022, I was selected by The University of Montana's Baucus Institute to be a Baucus Climate Scholar, a fellowship position with the goal of adding capacity to partnering organizations around environmental policy and climate issues. As a Climate Scholar, I was assigned to work with The Nature Conservancy, who sought to clarify the potential of implementing a program in Missoula County analogous to Washington State's *Floodplains by Design* (FPbD) program. Initially a salmon habitat restoration program, by the time I began research for The Nature Conservancy, *Floodplains by Design* had transformed into a regional floodplain restoration program, with the objectives of reducing flooding and flood related damage to infrastructure, as well as improving water quality and habitat for wildlife across the state of Washington. As a Baucus Climate Scholar, The Nature Conservancy enlisted my help in conducting a situation assessment that could help them better understand Washington's FPbD program, identify stakeholder needs, and assess the benefits of a FPbD program for Missoula County. This component of my portfolio consists of the final report of my research given to The Nature Conservancy, which contains: a description of the context and need for an assessment, a description of the methodology of my research and analysis, a discussion of my key findings and unanswered questions, and recommendations for The Nature Conservancy going forward.

The fourth Component of my portfolio is a reflective essay I wrote comparing my experiences conducting research for the organizations OneMontana and The Nature Conservancy. For each organization I completed an assessment of particular issues they sought to understand more thoroughly. While the subject of each project was different, the process of information gathering and analysis was similar. As a component of my practicum in collaborative conservation for the Natural Resource Conflict Resolution Certificate Program, I wrote a reflective paper examining the similarities and differences between working with the two organizations, and the process involved in completing each assessment. Additionally, I reflect upon the challenges, successes and incites I identified throughout each process.

References

Martin, J. D., Pederson, G. T., Woodhouse, C. A., Cook, E. R., McCabe, G. J., Anchukaitis, K. J., Wise, E. K., Erger, P. J., Dolan, L., McGuire, M., Gangopadhyay, S., Chase, K. J., Littell, J. S., Gray, S., St George, S., Friedman, J., Sauchyn, D. J., St-Jacques, J., & King, J. R. (2020b). Increased drought severity tracks warming in the United States' largest river basin. *Proceedings of the National Academy of Sciences of the United States of America*, *117*(21), 11328–11336. https://doi.org/10.1073/pnas.1916208117

McKinney, M. (2015). Analyzing the conflict or situation [class handout]. Center for Natural Resources and Environmental Policy. University of Montana, Missoula, Montana.

Wild Montana. (2023). Public Lands 101. *Wild Montana*. Retrieved May 1, 2023, from https://wildmontana.org/public-lands-101/

Portfolio Component 1

The Impact of Conservation Easements on Local Water Quality

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Abstract

Conservation easements are a commonly used tool to improve water quality, particularly in areas that have large amounts of nonpoint source pollutants from agricultural activity. The purpose of this paper is to highlight what factors contributed to, or limited, the improvement of water quality and water system function on easement areas, to inform the best practices for land managers. Water system for the purpose of this paper is broadly defined as the normal functioning of hydrologic and hydrogeologic systems that support wildlife habitat and biodiversity, groundwater recharge, floodwater storage and regulation, and water filtration. This review examines studies of conservation easements implemented in a variety of locations throughout the US, to consider what factors contributed to improvement of local water quality, and system function. I reviewed studies on the impacts of wetland conservation easements in the Prairie Pothole Region of Minnesota, South and North Dakota, forest buffer zone easements in the Chesapeake Bay Watershed, and channel migration zone easements in Vermont and Montana. The review concludes that factors including easement age, underlying hydrogeology, and appropriate vegetation significantly influence the degree of success in restoration projects on easement land. Additionally, there is a clear lack of data on the beneficial impacts of channel migration zone easements which may limit their adoption as a conservation tool. The review concludes with a set of recommendations for land managers that address these factors to increase the efficacy of conservation easements in the future.

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Introduction

Conservation easements are a commonly used tool to protect species and ecosystems on private property in the United States. Over the past 40 years, they have gained prominence among government and conservation groups as a mechanism to protect and improve water quality. Though there are many ways that conservation easements can benefit water quality, this review focuses on the following three forms of conservation easements: wetland conservation easements, forest buffer zone easements, and channel migration zone easements. The primary focus of this review is to assess their benefit on local water quality and the improvement of water system function. Water system for the purpose of this paper is broadly defined as the normal functioning of hydrologic and hydrogeologic systems that support wildlife habitat and biodiversity, groundwater recharge, floodwater storage and regulation, and water filtration. Throughout this research and discussion, my goal is to highlight the benefits of easements in conservation and offer recommendations for land managers to design easements that benefit landowners while achieving conservation goals.

Within the contemporary American conservation movement, the conservation easement is one of the most commonly used tools to protect or improve the character of privately owned property. According to the National Conservation Easement Database, there were 24.7 million acres of land under conservation easement in the US as of 2017 (NCED, 2017). Easements are a voluntary legal agreement between private landowners and a government or certified land trust that typically are designed to limit the use of the land to protect its ecological and conservation value. Another critical aspect of the conservation easement is that it often has associated financial benefits. The conservation easement came into its current form in 1980 when Congress made the Conservation Easement Deduction Provision a permanent part of the Internal Revenue Code (Cheever & McLaughlin, 2015). This provision stated that a landowner "donating a qualifying perpetual conservation easement to a government entity or

charitable organization is eligible for a federal charitable income tax deduction generally equal to the easement's value" (Cheever & McLaughlin, 2015, P #121).

As mentioned above, one of the appeals of conservation easements to private landowners is the financial benefits related to property valuation, providing that development remains limited. This incentive translates to an annual property tax reduction for owners and reduced estate taxes during the transfer of land ownership, so long as the development rights under easement were donated. In other cases, due to the interest of certified land trusts and governments in land and resource conservation, landowners may receive payments outright for their agreement to an easement. These contracted agreements give landowners one-time payments for their easement. However, this does not meet the donation requirement stipulated under the Internal Revenue Code needed for tax benefits. In each case, the net result is that an easement agreement offers landowners compensation or tax benefits for the development rights they have given up.

In addition to the financial benefits of conservation easements to landowners, conservation easements have gained popularity with land managers as a tool in resolving multi-party land use disputes. Easements are private agreements often specific to each property, allowing for a range of different actions to be stipulated. Since conservation easements are voluntary agreements that fall outside of most governmental regulatory processes, they remain a versatile means of fostering landowner cooperation to achieve conservation goals.

In the following sections I will review studies that explore the effect of conservation easements in the Prairie Pothole Region of Minnesota, and the Dakotas, forest buffer zone easements in the Chesapeake Bay Watershed, and channel migration zone easements in the states of Vermont and Montana. I also discuss key themes, common issues, and factors that contributed to their success. I conclude this paper by offering a number of suggestions for land managers going forward that will improve their implementation and maintenance of conservation easements.

The sources utilized for this paper include scientific research conducted by the USGS on conservation easements in agricultural lands in the prairie pothole region, PhD research, academic literature reviews, NGO reports on forest buffer zones, and case studies published by the state of Vermont and water conservation groups on channel migration zone easements. In reviewing these sources, I identified recurring factors found on conservation easements or their related restoration projects, as well as factors which the literature identified as significant in their effect on water quality and systems.

The Use of Conservation Easements in Water Resource Conservation

Research attributes agricultural activity as a source of environmental degradation and water system pollution in the US. Since the Clean Water Act in 1972, water quality has improved as states and tribes must meet minimum water quality standards. Toxic and organic chemicals released from a single identifiable source, also known as a point source, have been mainly reduced from pre-1972 levels (United States Environmental Protection Agency, 2022). Though there has been a reduction in point-source pollution, runoff from agricultural and urban areas that do not have a single traceable source is often not subject to regulation under the Clean Water Act. As a result, urban and agricultural runoff negatively impacts our environment, notably our water systems. Since the 1940s, agriculture in the US has witnessed a significant increase in fertilizer and pesticide use due to the advent of synthetic nitrogen and phosphorus fertilizers, pesticides and herbicides, and more intensive agriculture (Water Resources, 2019).

Over the past several decades, the US government has experienced a shift in attitudes regarding the benefits and utility of wetlands, from incentivizing filling and draining them for agricultural use to encouraging their restoration and conservation to improve water quality. As a result, the Federal Government funds several effective programs to enhance wetland function and water quality through various actions, including conservation easements. The National Resource Conservation Service (NRCS)

has several programs focused on using conservation easements to restore or protect critical wetlands, most notably the Wetland Reserve Easement (WRE) program and the Conservation Reserve Enhancement (CREP) program. The WRP was a provision of the Food, Agriculture, Agriculture, and Trade Act of 1990 until 2014 when the program was repealed and absorbed into the current Agricultural Conservation Easement Program, which the NRCS administers.

The purpose of WRE is to preserve existing wetlands, restore degraded or lost wetlands, and mitigate the current loss of wetlands. To enhance wetland ecosystems, WRE seeks to improve habitat for wetland-dependent species, water quality, groundwater recharge, floodplains, water flows to reduce flooding, aesthetics of open spaces and native flora and fauna, and education and scientific scholarship (Hanson et al., 2015). It achieves these goals by providing technical and financial support to both public and private landowners, as well as through land use restrictions stipulated through each easement. As of 2015, the federal government has spent more than $4.2 billion on WRE, and as of 2012, it held approximately 2.6 million acres of land under easement through WRE (Hanson et al., 2015). The US Farm Services Agency administers the Conservation Enhancement Reserve Program (CREP). The CREP has a more broadly defined goal of assisting agricultural producers in protecting environmentally sensitive land, wildlife habitat, and safeguarding ground and surface water. While its main focus is not water conservation specifically, the Conservation Reserve Enhancement program has also contributed to large areas of conserved wetlands. As of 2012, 2.29 million acres of privately owned wetlands were under easement through the program (Hanson et al., 2015). In both cases, the administering agency determines eligibility to enter into a conservation easement. However, landowners whose property contains functioning or degraded wetlands are eligible to apply for the program. The administering agency determines eligibility based on each easement's potential for protecting and enhancing wildlife habitat, as well as the probability of successful and cost-effective restoration in the case of degraded wetlands (Hanson et al., 2015).

In addition to large federal programs which aim to conserve wetlands and enhance water quality, there are large numbers of water management programs administered through government and non-government organizations on the state and regional levels. These programs focus on improving water quality by reducing non-point source pollution, increasing groundwater recharge, and improving flood management. Many of these programs focus on balancing water conservation in the face of increasing populations and urban expansion. Non-profit groups such as The Nature Conservancy and Sierra Club, as well as local and regional land trusts, have also played a historically significant role in using conservation easements to benefit water quality and restoration. Utilizing federal, state, and private funding from sources such as the waterSMART Program, the Land and Water Conservation Fund, US Environmental Protection Agency's 319 Nonpoint Source Project, and US Fish and Wildlife Service's Small Watershed Grant Programs, non-profit conservation organizations have been able to implement a range of helpful restoration projects with the objective of improving local water quality and ecological function.

The use of conservation easements to benefit water quality and the surrounding ecosystem is based on practical thinking and scientific evidence. Transitioning land use away from intensive agriculture, residential development, or other activities that may introduce pollutants to the ecosystem, coupled with replanting perennial native vegetation, can reduce the input of pollutants into local waterways. The following sections analyze studies on conservation easements from various locations where restoration projects were implemented to improve surrounding water quality and ecosystem function.

Review of Conservation Easement Impacts

The conservation and restoration of wetland and riparian areas are tools in improving water quality. Functional wetlands and riparian zones both help to store and regulate floodwaters, improve water quality and groundwater recharge, and provide critical habitat for a range of different animals

(United States Environmental Protection Agency, 2023). While the restoration of wetland areas on easement lands has become a common tool in improving local water quality, the successful restoration of wetland function and a related increase in water quality varies across different projects. In this section, I will examine the biotic and abiotic factors discussed in the scientific studies reviewed that contribute to the improvement of wetland and riparian function on conservation easement lands. In examining these factors and how they can be addressed, I plan to inform land managers to improve the efficacy of future restoration projects in easement areas.

Federal Wetland Conservation Easements and Their Effect on Agricultural Lands in Upper Midwest and Florida

The American Midwest has experienced some of the most expansive conversion of riparian areas to agricultural production compared to the rest of the country. For this reason, several case studies examined for this paper focus on the Upper Midwest, in the prairie pothole region of the Dakotas, Minnesota, and Iowa. The studies reviewed found a wide array of improvements to wetland ecosystem function and related benefits to flora and fauna. The most commonly discussed benefits of conservation easements were: improved wetland plant community quality and richness, floodwater storage, and reduced sediment and nutrient loading. However, as discussed below, the degree that conservation easements improved these indicators varied among the different easement areas studied, with the majority of benefits found in erosion and nutrient reduction, and floodwater storage.

In many cases, agricultural conservation easements under the WRE and CRE have undergone moderate restoration work in conjunction with land use restrictions. Because the easements studied were on agricultural lands, these restoration practices typically involved reversing land drainage infrastructure, such as plugging tile drainages and ditches, as well as planting perennial cover vegetation to replace annual crops. The restoration of perennial and native plant diversity in wetland areas has been observed to improve animal diversity and contribute to normal ecosystem function (Bobbink et al.,

2006). In addition to improving critical habitat for fauna, the restoration of wetland flora has been observed to benefit local water quality and flood mitigation. Another benefit of revegetation of wetland areas is the extension of the topographical lifespan of depressional wetlands. Planting perennial vegetation in the areas surrounding depressional wetland helps reduce the inflow of eroded sediment from upland areas, preventing the wetland area from filling up with sediment and diminishing its water storage capacity (Gleason & Tangen, 2008).

A United States Geological Survey study on conservation easements throughout the Prairie Pothole Region found that the restoration practices stipulated under agreements through the WREP and CREP programs in upland and wetland riparian areas improved floristic quality (Laubhan & Gleason, 2008). Floristic quality for this study was defined by the diversity of native plant species, with native prairie wetland areas having the highest level of native plant diversity. This study compared upland and wetland areas under easement with upland and wetland areas that were actively drained and cropped for agricultural use. Floristic diversity from the research sites was compared to those observed in native prairie wetland and upland areas. The restoration activities in easement areas consisted of reversing drainage infrastructure in wetland areas and planting native grassland species in upland areas.

The study found that upland areas reseeded with native plant species showed lower floristic quality compared to the native prairie areas studied. In wetland areas where drainage infrastructure was reversed, they found that floristic quality increased relative to the hydrological characteristics specific to the wetlands. Restored seasonal wetlands, which retain water for only several weeks to several months of the year, showed the lowest improvements in floristic quality. Restored semi-permanent wetlands showed the highest improvement in floristic quality.

The study concluded that while underlying hydrogeological factors influenced the degree to which floral quality was improved, restoration activities on easement areas improved floristic quality compared to cropped areas for agricultural use. The findings from this study indicate that while

restoration on conservation easements improved plant and animal diversity in certain sites, the degree to which they benefitted wetland areas was influenced by more complex variables such as precipitation and hydrogeology (Laubhan & Gleason, 2008). These findings imply that hydrogeology, precipitation, and flora should be considered when designing restoration projects in easement areas.

Another study examined the benefits of restoration on two WREP easements located on ranch land in central Florida (Sonnier et al, 2018). The two easement plots studied were historically shallow wetlands and marshlands, which had been drained and converted to pasture in 1950 and 1980, respectively. The restoration goals within the two sites were to increase water depth and duration of soil saturation to a level similar to the surrounding natural wet prairie in Florida, defined as having fifty or fewer days of flooding per year. To achieve this restoration, drainage ditches for the two pastures were plugged, thus restoring the hydrological conditions of the shallow marshland. The restoration of these two easement areas did not include planting native trees or vegetation. This study aimed to determine if wetland restoration would raise the local water table and hydroperiod. Additionally, they sought to determine if restoring wet prairie conditions would increase wetland floral diversity and decrease the upland grasses planted for pasture. They determined the effects on the water table and hydroperiod by analyzing local rainfall data and collecting data from eighteen groundwater wells throughout each easement property. Floristic diversity was determined by a series of vegetation surveys conducted on easement properties three years before and four years after restoration work.

Overall, there was an observed improvement in floristic quality on the restored easement land. Across both easement properties, researchers observed increases in wetland plant species diversity in response to the restoration in shallow marshes and former pastured areas (Sonnier et al., 2018). Additionally, they observed that the median water table and the number of flooded days increased following restoration within the south marsh. However, they did not detect any effect on the hydrology of the east marsh. The results of this study indicate that the restoration of wetland conditions within

these easements reduced the number of non-native pasture species and encouraged wetland plant diversity. Given that the restorative actions taken on these easement areas did not include replanting native vegetation, the results indicate that the increase in wetland vegetation was related to the restoration of wetland hydrology. These results emphasize the importance of hydrology in the success of wetland conservation easements. These two studies show similar findings that hydrogeology and wetland water levels should be considered when identifying easement locations and planning restorative actions (Laubhan & Gleason, 2008).

A USGS study in the Prairie Pothole Region in Minnesota and North Dakota sought to calculate the water storage potential of restored wetland areas in former agricultural land. This study analyzed the current surface area, wetland volume, and the adjacent upland area of 497 wetlands across North Dakota and Minnesota conservation easements. Throughout the easements studied, perennial native grasses were planted to replace annual crops. The researchers did not account for several influential water cycle processes, including evapotranspiration, groundwater recharge, and infiltration. The researchers acknowledged that excluding these factors in their analysis could indicate that easement restoration may have a more considerable benefit to water storage than observed in their study (Gleason & Tangen, 2008a). Still, the study discusses significant improvements to flood mitigation from restricted land use. In addition, they found that the restoration of wetland areas could store precipitation that would otherwise contribute to downstream flooding (Gleason & Tangen, 2008a). Another study conducted in the Prairie Pothole Region estimated that the restoration of drained and farmed wetlands could increase the water retention capacity of a given watershed of Minnesota by up to 63 percent (Gleason & Tangen, 2008a). These studies of wetland easements in the prairie pothole region of the upper midwest show that wetlands surrounded by grassland ecosystems have lower surface water inputs than those surrounded by cropland (Gleason & Tangen, 2008a). This indicates that the restoration of grassland species on upland areas within wetland conservation easements can increase flood reduction

and water retention compared to drained and cropped wetlands in agricultural areas. Additionally, these findings indicate that the easements incorporating moderate restorative action in the form of revegetation of grassland species may provide further flood water storage beyond water catchment by allowing more water to be absorbed into groundwater systems.

Reducing soil erosion is a common conservation objective in agricultural land easements. Eroded soil and chemical fertilizers are some of the most common non-point source pollutants agricultural operations release. Researchers from the US Geological Survey analyzed the effects of WRE conservation easements on soil sedimentation and nutrient reduction across the Prairie Pothole Region. To determine the amount of sediment and nutrient runoff reduced by conservation easements, they obtained data from the National Resource Inventory Database regarding soil loss and total phosphorus and nitrogen levels in agricultural lands and lands enrolled in the WRE and CRE programs. The study found that the restoration of grasslands across the prairie pothole region could reduce average annual soil losses by approximately 94 percent, or approximately 23,314,050 tons of soil (Gleason & Tangen, 2008b). The study also estimated that total nitrogen and phosphorus runoff would be decreased by approximately 5,622 tons annually (Gleason & Tangen, 2008b). Furthermore, reductions in non-point source pollution refer to the average soil loss *annually*. Thus, over the length of conservation easements ranging from 10-30 years, much larger amounts would be reduced. These findings offer a strong indication that restoring perennial upland grass cover leads to significant improvements in reducing soil and nutrient loading in local water systems.

Wetland conservation easements have been shown to improve water quality and retention. As seen in the studies above, floristic quality, flood water storage, soil sedimentation, and nutrient reduction have all seen moderate to significant improvements from implementing conservation easements and the restoration of native vegetation. However, it is clear from these studies that more than simply creating an easement is needed to improve water quality and flood reduction. Instead, the

mixed results across easement areas indicate that restoration projects must utilize data on local hydrogeology and precipitation patterns to determine the proper vegetation to offer noticeable benefits to the surrounding ecology and hydrogeological systems.

Forest Buffer Zones and the Chesapeake Bay Watershed

Forest buffer zones are a conservation tool focused on restoring forested riparian areas to decrease non-point source pollution. There are various names for easements that buffer agricultural areas from nearby waterways. However, using forest buffer zone easements here reflects the program studied in the Chesapeake Bay Watershed. These easements can reduce local pollutants by increasing riparian vegetation, which filters pollutants and sediments before they enter adjacent surface water systems. While the practice of using vegetation to filter pollutants is common, the purpose of this review is to determine what factors contribute to the efficacy of this practice. Research has shown that implementing a forest buffer can reduce sediment loads by 50-80% before entering a stream (Orzetti, 2004). Additionally, forest buffers have the potential to convert or trap up to 75 percent of nitrogen runoff and 70 percent of phosphorus runoff, depending on the underlying hydrogeology (Orzetti, 2004). Restoring forested riparian areas provides food and habitat for aquatic and terrestrial wildlife, stabilizes river and stream banks, and provides shade which is critical for water temperature control (Orzetti, 2004).

The Chesapeake Bay is located off the coasts of Virginia and Maryland and is the largest estuary in the United States. Its watershed spans the six states of New York, Pennsylvania, Maryland, Delaware, West Virginia, and Virginia. Within it are several significant metropolitan areas, including the Washington DC/Baltimore area, Richmond, VA, and Harrisburg, PA. During the 1970s, the formation of a hypoxia or "dead" zone was identified in the bay, resulting in significant fish kill events (Chesapeake Bay Foundation, 2008). The Chesapeake Bay Dead zones were primarily a result of algal blooms related to the runoff of nitrogen and phosphorus from residential, agricultural, and industrial sources across the watershed

(Chesapeake Bay Foundation, 2008). The impact of hypoxia zones in the Chesapeake Bay on its benthic communities is significant. For example, a 2008 study estimates they may kill or prevent the growth of around 75,000 metric tons of clams and worms each year (Chesapeake Bay Foundation, 2008). Additionally, soil erosion from agricultural lands across the watershed has contributed to further water quality degradation in the bay, with increased turbidity leading to decreasing sunlight available for aquatic vegetation (Chesapeake Bay Foundation, 2008).

In response to the decreasing water quality of the bay, the states of Maryland, Virginia, and Pennsylvania signed The Chesapeake Bay Agreement of 1983, which recognized the need for a cooperative approach to improving the bay and established the Chesapeake Bay Program. The program was an interagency partnership between federal and state agencies, academic institutions, citizen groups, and NGOs. In the 1990s, The Chesapeake Bay Program began advocating for the implementation of The Riparian Forest Buffer Initiative, a watershed-wide restoration plan which called for restoring 2,010 miles of riparian forest area by the year 2010 (Orzetti, 2004). The forest buffer zone program saw significant success within its first decade and, in 2003, expanded its goal to reforest 70% of riparian areas in the watershed by 2036. As of 2015, studies estimated that 55% of riparian areas within the watershed had been reforested (Alliance for the Chesapeake Bay, 2015).

State and local governments, NGOs, and citizen groups utilized various tools and funding sources to meet the goals set by the Chesapeake Bay Program, including regulating development near waterways and conservation easements. Federal funding from the CRE program helped to purchase conservation easements and revegetate buffer zones. As of 2015, over 37,000 acres in the Chesapeake Bay watershed had enrolled in CREP riparian forest buffer easement contracts (Alliance for the Chesapeake Bay, 2015).

One study analyzing the effects of forest buffer zones in the Chesapeake Bay Watershed observed improvements to stream community structure and water quality (Orzetti, 2004). The study used measures of macrobenthic community structure, nitrogen, phosphate, and sediment levels to

compare natural and restored riparian buffer zones (Orzetti, 2004). The study also examined the efficacy of buffer zones by tree stand age to determine how long it might take to realize their benefits fully. The same metrics were then examined in areas with a variety of different land uses, including pastureland (animal grazing), Agricultural lands (cropped vegetation), rural (land with housing lots >5 acres), and suburban (land with housing lots <5 acres).

The study found that nitrogen and total phosphorus concentrations were significantly lower in restored buffer zones compared to the other five categories of land use. Additionally, there were two significant findings related to a buffer zone's ability to improve water quality. First, the result from this study supports previous findings that the age of buffer zone vegetation influences its ability to filter nutrients and sediment. The study also found that the ability of a buffer zone area to filter nutrients and improve water quality peaked between 15 and 20 years and, on average, did not improve beyond that age range. Additionally, they observed that the underlying hydrogeology considerably influenced in-stream nutrient levels. The study observed that areas of higher groundwater recharge, where nitrogen, in particular, could more easily enter groundwater tables, were less effective at surface water nutrient absorption (Orzetti, 2004). This indicates that buffer zones planted in areas with higher groundwater recharge, such as the Piedmont Plateau, rely on vegetation to absorb nitrogen before it enters groundwater to avoid nitrogen bypassing the forest buffer zone, and entering waterways downstream (Orzetti, 2004). These findings have implications for the planning of buffer zones to meet conservation goals, in that areas determined to have high groundwater recharge will rely on more widespread vegetation to reduce nutrient runoff when compared to areas of slower groundwater recharge. Furthermore, the relationship between the efficacy of buffer zones and the age of their vegetation presents an issue to land managers within the forest buffer zone program. The issue being that many of the program's easements were created through the federal CRE program, which typically

enrolls landowners in 15-30 year terms, leaving the potential for landowners to not renew just as forest buffer zones may be peaking in efficacy.

Another study that the Chesapeake Bay Program commissioned sought to analyze existing information on forest buffer zones to inform best practices for regional land managers. The study found that forest buffer zones are generally effective for controlling sedimentation and nutrients carried in surface runoff. However, their review noted that the efficacy of forest buffer zones was related to an area's hydrogeology and soil composition (Lowrance et al*.,* 1997). Specifically, it found that in watersheds with shallow soils and slower groundwater recharge, forest buffer zones could retain 50-90% of total nitrates in both surface runoff and groundwater (Lowrance et al*.,* 1997). Similarly to the previously discussed study on forest buffer zones, the research team found that in areas with high groundwater recharge, pollutants can bypass forest buffer zones and emerge in nearby stream channels. The review also found that forest buffer zones' ability to absorb dissolved phosphorus levels was dependent on vegetation (Lowrance et al*.,* 1997). While dissolved phosphorus can be absorbed by vegetation, the researchers found that there was a very low retention of dissolved phosphorus within the riparian forest areas studied. This finding indicates that for a forest buffer zone to mitigate dissolved phosphorus pollution effectively, it must incorporate vegetation that has higher uptakes of phosphorus. Additionally, the study concluded that the main factor limiting the effectiveness of forest buffer zones in removing sedimentation was the slope of an area. When the surface water flow is concentrated into smaller channels in steeper areas, as opposed to the uniform sheets of water found in flat areas, the ability of a forest buffer zone to mitigate pollutants is diminished (Lowrance et al*.,* 1997). This finding has significant implications for designing buffer zones, as they are commonly implemented in agricultural lands which have historic stream and river channelization, leading to steep riverbanks. Further background information on riverbank channelization will be provided in the following section.

Studies have shown wetland conservation easements and forest buffer zone easements reduce sedimentation and nutrient loading in local waterways generally. Several studies have noted that some of this benefit results from portions of land taken out of agricultural land use. Beyond land use changes, the degree to which a forest buffer zone easement effectively reduces sediment and nutrient loads depends on site-specific factors, including tributary and riverbank slope, underlying hydrogeology, and the vegetation being planted along waterways. An emergent theme between wetland conservation easements and forest buffer zone easements is that their success often depends on understanding underlying hydrogeology and appropriate vegetation to absorb nutrient runoff for each conservation easement area.

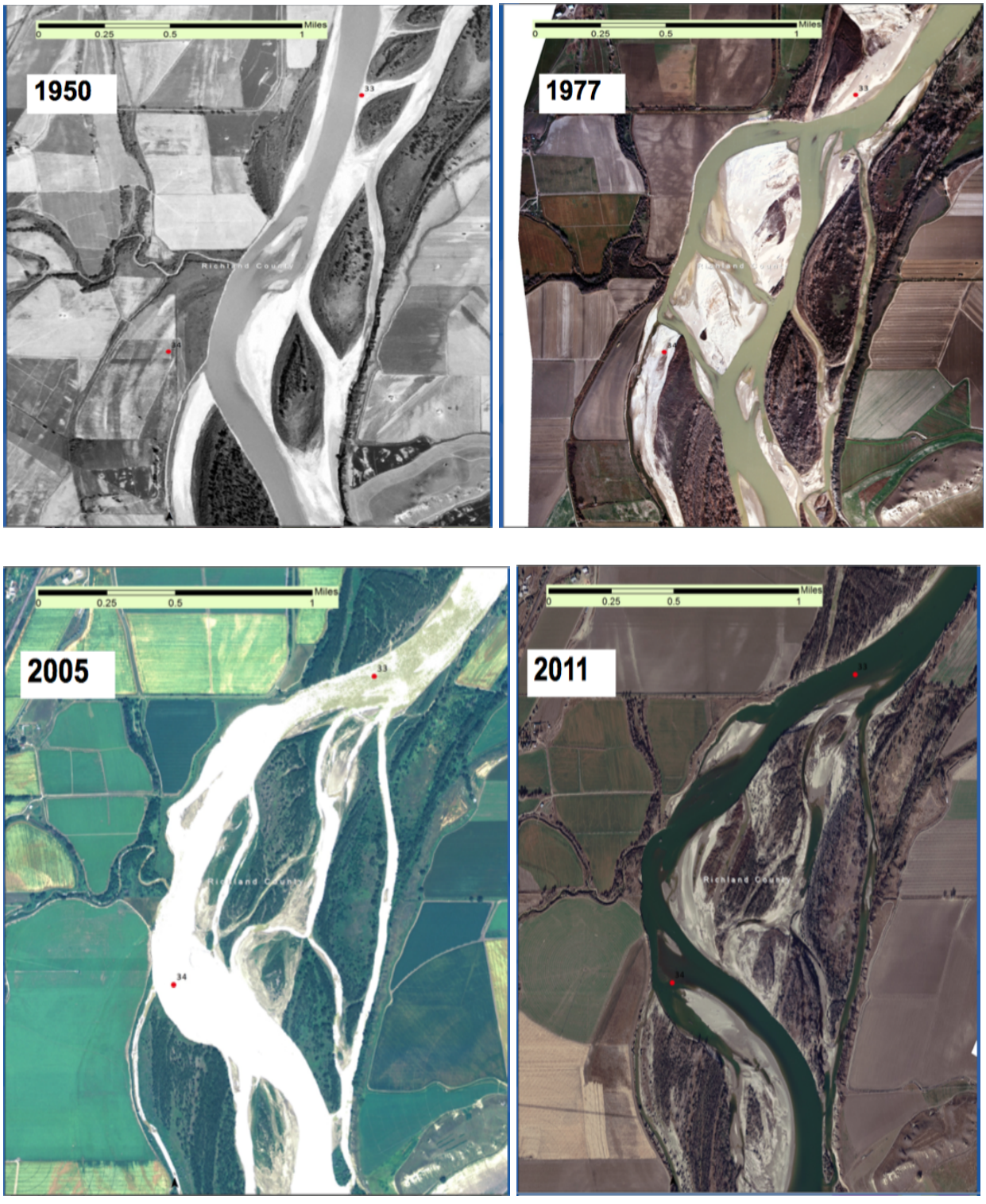
Channel Migration Zone Easements: Overview and Examples

River channel migration is a naturally occurring geomorphological process that constantly alters the shape and location of rivers. As water flows through its channel, the loose sediments of clay, sand, silt, and gravel found within a floodplain shift through the processes of riverbank erosion and soil deposition in bars (Vermont River Management Program, 2005). As a result, rivers are constantly reworking themselves, eroding sediment where the flow has higher energy and carrying capacity and depositing sediment where the flow has slowed down (Vermont River Management Program, 2005). Periods of high stream flow increase a river's capacity to carry sediments and sometimes create entirely new river channels when flood water overflows its banks. In addition, flooding events initiate other environmental processes, such as the dispersal of seeds and the deposition of sediments across the floodplain and adjacent upland areas (Vermont River Management Program, 2005).

The aerial photographs shown in Figure 1 below illustrate channel migration within the floodplain. The photos were taken of an agricultural property along the Yellowstone River in Richland County, Montana. These photos were taken from a Montana Aquatic Resource Services presentation to a Montana Department of Natural Resource Conservation Floodplain Resources Seminar. The red dots

mark the same location over various years since 1950, illustrating how the river channel has migrated around them.

Figure 1: Channel migration on the Yellowstone River 1950- 2011



Source: Montana Aquatic Resources Services. July 2014

Channelization by humans alters the naturally meandering path of a river or stream to be straighter and deeper (Vermont River Management Program, June 2005). There are numerous reasons to channelize a river: it allows larger ships to navigate them. Often it has been regarded as a way to prevent flooding. Additionally, channeling streams and rivers in agricultural lands allows agriculturalists to use more land without concern for riverbank erosion from channel migration. However, while channelization does accomplish specific economic and social goals, it also negatively impacts several natural processes of rivers. Notably, confining rivers from their normal movement limits the process of erosion and deposition, which prevents related natural ecological processes such as sediment and plant redistribution (Vermont River Management Program, 2005). Furthermore, the straightening of a meandering river channel shortens the overall length of the river. Confining a river to a more consistently narrow, straight, and deep channel can increase its flow rate (Vermont River Management Program, 2005). Once a river is channelized, its sediment-carrying capacity balance is disturbed, reducing erosion and deposition. A significant benefit of channelization is the effect of increasing carrying capacity and flow, which increases the likelihood of downstream flooding and peak flood levels downstream (Pierce & King, 2013).

Channel migration zone easements are conservation easements focused primarily on conserving the natural process of channel migration in streams and rivers. In a channel migration zone easement, landowners sell or donate their ability to prevent a river from migrating within its floodplain on their property. The definition of the floodplain where the river will be free to meander varies, however, in several case studies the migration zone is defined by a stream or river's 100-year floodplain. On properties that have implemented channel migration zone easements, landowners are often free to use the remainder of their property that does not fall within the defined floodplain as they would under

normal regulations. In case studies from Vermont and Montana, many easement holders continued to practice agriculture and forestry on their property. The purpose of channel migration zone easements is to improve flood management of an area by preserving or restoring the processes of erosion and deposition in a stream or river (Kline, 2010). Removing rip rap, rocks, or other human-placed channelization methods allows a river channel to become more expansive, shallower, and sinuous. The act of restoring floodplains also encourages the growth of riparian vegetation (Kline, 2010). Altogether these conditions slow down the river flow, improve riparian species diversity, and contribute to increased resiliency to significant flooding events (Kline, 2010). Additionally, by restricting development in flood-prone areas, there is a reduction in flood-related damages to human-made structures.

Channel migration zone easements are a relatively new management tool, and most literature related to their benefits has been published in the past two decades. As a result, there are only a few case studies available. The most extensive case, from Vermont, has incorporated a form of channel migration zone easement named "river corridor easements" into its state flood management program. Additionally, with cooperation from The Nature Conservancy and Montana Land Reliance, the Montana Aquatic Resources Services has purchased several channel migration zone easements along the Yellowstone River in eastern Montana. The following examples were provided to highlight the growing use of these easements, their benefit to surrounding water quality, and the issues encountered so far in their implementation.

Case Study: Vermont State Agency of Natural Resources

In 1999, the State of Vermont created the Vermont River Management Program to "manage toward, protect, and restore natural geomorphic conditions, and avoid new and resolve existing conflicts between human investments and river dynamics in the most economically and ecologically sustainable manner" (Kline & Cahoon, 2010, page 2). They have so far accomplished this by regulating stream alterations, promoting riparian zones and floodplain regulation locally, and promoting river corridor

easement purchases throughout the state. To restore natural river corridor conditions in the face of increasing infrastructure development, they first developed a series of protocols and assessment tools to understand better the state of stream and river corridor degradation in Vermont. Next, they developed "Stream Geomorphic and Reach Habitat Assessment protocols," which helped municipalities assess the extent of channelization and channel degradation throughout the state (Kline & Cahoon, 2010). Their analysis determined that 73.7% of streams had been significantly altered from their historic floodplains. The state river management program then developed a GIS Stream Geomorphic Assessment Tool to delineate river corridor size using stream and river survey data (Kline & Cahoon, 2010). For funding, the program utilized State and Federal Farm Service Agency grants to assist in purchasing easement areas, with a significant amount of funding coming from USDA's Conservation Reserve Enhancement(CRE) program.

Regarding the program's effect on local water quality, the Vermont Agency of Natural Resources studied one river corridor easement property in Fairfield, Vermont, to determine the easement's effect on soil and nutrient runoff. The easement shared the property with a dairy farm and was purchased to improve Wanzer Brook, which flowed through the property eventually emptying into Lake Champlain and over time had become channelized and deeply incised. The easement included a restriction on land use within the river corridor, and all 2,000 feet of the riverbank within the originally incised floodplain was widened and vegetated with willows, thus restoring its natural ability to migrate within its floodplain (Kline, 2010). Regarding the water quality benefits of restoration on this easement, the Vermont ANR estimated that the total quantity of deposited soils that would have since eroded into the lake would have contained six metric tons of phosphorus (Kline, 2010).

Further Examples: Middle and Lower Yellowstone River, Montana

Montana Aquatic Resource Services is an NGO based in Livingston, Montana, that focuses on bringing together governmental, NGO, and private interests to uphold the health, integrity, function, and

abundance of Montana's aquatic habitats. In 2016, working in partnership with several organizations and government departments, the Montana Aquatic Resources Services (MARS) purchased two private channel migration zone easements on the middle and lower Yellowstone River in eastern Montana. In both the lower and middle Yellowstone River easement agreements, there was a restriction on all forms of bank stabilization along the 200 acres of the easement. Additionally, riparian vegetation was restored along the riverbank to prevent erosion. Outside the easement areas, agricultural activities on the remainder of the properties, including flood irrigation and alfalfa production, are allowed. To purchase the easements, MARS utilized funding from a number of different grant sources, including Montana Fish, Wildlife and Parks, the Upper Pallid Sturgeon Working Group, Western Area Power Administration, Northern Great Plains Joint Venture, and MARS' Supplemental Environmental Project partners including Montana DEQ and the Exxon Mobil Pipeline Company.

While these easements are excellent examples of the potential ecological benefits of restoring natural floodplains in easement areas, the middle and lower Yellowstone River easements also offer an example of the challenges presented by dynamic river management in a more static system of property ownership. In the case of both easements, property boundaries were originally delineated on one side by the river. However, in allowing the river to migrate freely across its historic floodplain, it has migrated into their property. In the case of the lower Yellowstone River property, there was dramatic erosion over the past 50 years, causing the parcel boundary to shrink by 70 acres. In the case of the middle Yellowstone River channel migration easement, MARS, and the property owner engaged in a "Quiet Title Action," a legal action taken to clarify the ownership of land accredited to a landowner's property. This Title Action was necessary because the natural property boundaries along the Yellowstone River had changed as a result of the natural migration of the river channel. Recent erosion along the property's northwest border and the development of a river island on its southwestern border had altered the boundaries, so they sought legal clarification before implementing this easement.

While channel migration zone easements are a promising tool to conserve and restore the natural function of stream and river systems, there is currently a need for more literature on their benefits. Currently, a body of research exists into why they will reduce downstream flood severity and improve water quality. However, there needs to be more research into the observable benefits that current easements have brought to the surrounding ecosystem and infrastructure through flood reduction and natural channel migration. Additionally, further research into legal actions related to changing property boundaries will be necessary to increase public buy-in for channel migration zone easements.

Discussion

There are several clear benefits to local hydrological quality and water systems due to conservation easements. In all three forms of easements, restrictions on land use are usually paired with moderate restoration activity. In the case of the wetland conservation easements studied, wetland drainage infrastructure was removed, and perennial and native species were planted over the fallow fields. Forest buffer zone easements require planting appropriate native tree species and understory plants. Channel migration easements often involve the removal of rip-rap or other channelization infrastructure. These common restoration practices indicate that restoring certain natural features within an easement helps improve water quality. Restoring riparian vegetation in both wetland and forest buffer zone easements is essential in preventing nutrient runoff. Likewise, in channel migration easements, the prevention and removal of channelization infrastructure is essential to the natural regulation of floodwaters by the riparian zone.

This combination of voluntary land use restrictions and restorative actions improves water quality in easement areas. Notably, wetland conservation easements exhibited significant reductions in soil erosion, nutrient runoff, and floodwater storage. The effect of wetland conservation easements on floral diversity was less clear due to the complexity of reintroducing species into an ecosystem, and

climatic factors, which I will discuss further below. Forest buffer zone easements generally demonstrated an ability to significantly reduce sediment and nutrient runoff into water systems in the Chesapeake Bay watershed. In both studies reviewed, the underlying hydrogeology and stream bank slope of a forest buffer zone was found to play a role in projects' ability to absorb nutrient runoff. Channel migration zone easements are based on our understanding and observations of river dynamics and have seen limited implementation in the US so far. Studies regarding their efficacy in reducing flood severity and improving water quality are sparse. However, one case study from Vermont showed a significant reduction in phosphorus runoff after implementing a channel migration easement combined with restoration activities. Additionally, adopting river corridor easements into state policy in Vermont increases the opportunity to further study the benefits of these easements to the surrounding ecosystem.

The literature on the efficacy of wetland conservation easements and forest buffer zones shows that the degree to which easements can improve local water quality and vegetation is related to local geology, hydrology, weather patterns, and soil. For example, regarding the success of restored plant communities in wetland conservation easements, Laubhan and Gleason (2008) found that the restored potholes' catchment types, zones, and physiographic regions were all critical factors in the success of the restored flora. In addition*, in their respective studies,* Orzetti (2004) and Lowrence(1997) found that the underlying geology of a forest buffer zone was an essential factor in its ability to absorb nutrient runoff. This finding led *Lowrence* to recommend that areas such as the piedmont plateau and certain outer coastal plain regions should adjust their buffer zones to include different vegetation that might better absorb nutrient runoff before it reaches groundwater systems. Additionally, Gleason and Tangen (2008b) and Orzetti (2004) found that the conservation easements' ability to reduce erosion and nutrient runoff increased with time. This temporal improvement is significant for wetland conservation easements and forest buffer zones. In both studies, most easement lands were under federally contracted easements, which were often 15 -30 year agreements.

The recognition that the positive results of conservation easements depends on complex environmental factors unique to each area has several implications. First, it indicates that implementing a uniform set of restoration actions for all types of easements would be less effective than prioritizing restoring native vegetation and improving maintenance actions for each easement. Second, tailoring restoration action to each easement area would require additional research into underlying ecological and hydrological conditions for each easement site, which on a practical level, entails spending more money on employees.

Additionally, the understanding that the benefits of easements grows over time has implications for easements funded through the CREP or WREP programs, as these federal easements are typically under 15 to 30-year contracts. These termed contracts highlight a significant problem with federally-contracted easements: their legacy is dependent on landowner attitudes that are subject to change. Cooper & Jacobson (2009) found that 75% percent of easement holders surveyed indicated they would renew their easements out of a sense of environmental stewardship. However, they also raised concerns that the landowner's likelihood of renewing easements was related to agricultural commodity prices. Specifically, the surveyors found that in the event of an increase in crop prices previously grown in easement zones, including soy and maize, a landowner may be less likely to renew their easement. Landowner temptation to not renew easements highlights the problem: when easements in agricultural areas are not perpetual, they can be in jeopardy due to crop prices when their term ends. Furthermore, knowing easements' ability to improve local water quality may increase over time, uncertainty about whether a landowner will renew their contract jeopardizes the benefits on water quality from easements.

Another challenge with these easements is that maintenance is often needed to ensure their success, particularly for forest buffer zone easements (Alliance for the Chesapeake Bay 2015). For example, trees and understory restored by the Chesapeake Bay program were often damaged by deer

browsing, competing vegetation, and even lawn mowing by property owners. The failure of vegetation restoration on some easements indicates the need for better planning, planting, and upkeep of restored vegetation. The Alliance for The Chesapeake Bay (2015) report noted better outcomes from greater use of tree tubing to protect from wildlife, and selective pesticide use to prevent competition from unwanted vegetation while establishing the understory within buffer zones. There is currently an array of grant funding through the NRCS that can assist landowners with easement maintenance. However, given the degree to which maintaining vegetation influences improvements to water quality, greater emphasis should be placed on increasing outreach and education on best practices for easement maintenance for landowners.

Regarding channel migration zone easements, Montana Aquatic Resources Services (2017) discussed a fundamental challenge to their wide-scale implementation observed during their two pilot easements on the Yellowstone River. One easement required an Environmental Analysis and a public comment period, as it was created in partnership with the Montana Department of Fish, Wildlife, and Parks. Throughout the public comment period, local stakeholders voiced concerns that implementing this easement would put their properties at risk for flood damage. The challenge of overcoming public opinion and opposition to channel migration zone easements is essential to their acceptance. The flood mitigation benefits from channel migration zone easements increase as more areas within a floodplain are restored. Furthermore, the channelization of a section of the river increases its flow. It decreases erosion within that section leaving the river with greater energy and discharge downstream, which has the potential to cause more severe flooding in areas downstream without armored banks. Often, landowners do not want to be the first to implement a new form of flood control on their property, particularly one that runs counter to the flood control measures that have been prevalent for the past several decades or that their neighbors oppose them. Thus a significant challenge with channel migration zone easements will be changing landowner attitudes towards them.

Recommendations

The following recommendations should be considered by land managers to increase the benefits of conservation easements to surrounding water quality:

- *Incorporate greater ecological data in the designing of restoration projects on easement properties, as well as additional upkeep after the restoration of vegetation.* It is clear that the successful restoration of perennial or native vegetation is one of the most significant factors in improving water quality. To ensure that easements maximize their benefit to the surrounding ecosystem, it is necessary to fully understand the underlying hydrogeology and precipitation patterns, to ensure long lasting benefits from vegetation.
- *Increase of contracted easement terms to be greater than 30 years*, or *create a more flexible easement revision process.* In numerous studies it has been documented that the efficacy of restoration projects increases with age. This is a significant problem for federal contracted easements that have 15-30 year terms. To solve this, I recommend two things. Federal WRE and CRE easements should utilize longer term agreements, greater than thirty years. This will allow the ecosystem benefits to be fully realized, and allow landowners the opportunity to observe the benefit of easements on their property. Alternatively, I recommend that *in-perpetuity* easements be more frequently utilized, but with more flexible mechanisms to revise easement agreements. While it is currently possible to revise easement agreements, the legal process for revision is often arduous and subsequently not frequently done. Changing the process to allow for easier revisions may increase the appeal of easements to landowners. Additionally, the impact of climate change on local ecology will likely increase the need to be flexible in our easement agreements and restoration projects, to adapt to changes in flora, fauna, and weather patterns.
- *Further research on the local impacts of easements currently implemented.* To promote the use of channel migration zone easements, it will be necessary to have a body of research

documenting their benefits on the environment, and benefit to society. To do so, I recommend further research into easements which have already been implemented in states such as Washington, Vermont, and Montana.

References

Alliance for the Chesapeake Bay. (2015). *Chesapeake Bay Riparian Forest Buffer Initiative: Final Report*. Retrieved May 1, 2023, from https://chesapeakeforestbuffers.net/wp-content/uploads/2017/09/Ches-Bay-RFB-Initiative-Final-Report_Sept-2015.pdf

Bobbink, R., Whigham, D. F., Beltman, B., & Verhoeven, J. T. A. (2006). Wetland Functioning in Relation to Biodiversity Conservation and Restoration. In *Ecological studies* (pp. 1–12). Springer Nature. https://doi.org/10.1007/978-3-540-33189-6_1

Capel, P. D., McCarthy, K. D., Coupe, R. H., Grey, K. M., Amenumey, S. E., Baker, N. A., & Johnson, R. J. (2018). Agriculture — A river runs through it — The connections between agriculture and water quality. *U.S. Geological Survey Circular*, 1–201. https://doi.org/10.3133/cir1433

Chesapeake Bay Foundation. (2008). Bad Water and the Decline of Blue Crabs in the Chesapeake Bay. In *Chesapeake Bay Foundation*. Retrieved May 1, 2023, from https://www.cbf.org/document-library/cbf-reports/CBF_BadWatersReport6d49.pdf

Cheever, F., & McLaughlin, N. A. (2015). An Introduction to Conservation Easements: A Simple Concept and a Complicated Mosaic of Law. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2650157

Cooper, E., & Jacobson, M. J. (2009). Establishing Conservation Easements on Forested Riparian Buffers: Opportunities for Long-term Streamside Protection. *Small-scale Forestry*. https://doi.org/10.1007/s11842-009-9082-6

Gleason, R.A., Tangen, B.A., Laubhan, M.K. (2008). Chapter C: Carbon sequestration, ecosystem services derived from wetland conservation practices in the United States Prairie Pothole Region with an emphasis on the US Department of Agriculture Conservation Reserve and Wetlands Reserve Programs. In R.A Gleason, M.K Laubhan, N.H Euliss (Eds.) Ecosystem services derived from

wetland conservation practices in the United States prairie Pothole Region with an emphasis on the U.S. Department of Agriculture Conservation Reserve and Wetlands Reserve Programs. PP #23-25. United States Geological Survey. https://pubs.usgs.gov/pp/1745/pdf/pp1745web.pdf

Gleason, R.A., Tangen, B.A. (2008a). Chapter D: Floodwater storage, ecosystem services derived from wetland conservation practices in the United States Prairie Pothole Region with an emphasis on the US Department of Agriculture Conservation Reserve and Wetlands Reserve Programs. In R.A Gleason, M.K Laubhan, N.H Euliss (Eds.) Ecosystem services derived from wetland conservation practices in the United States prairie Pothole Region with an emphasis on the U.S. Department of Agriculture Conservation Reserve and Wetlands Reserve Programs. PP #31-32. United States Geological Survey. https://pubs.usgs.gov/pp/1745/pdf/pp1745web.pdf

Gleason, R.A., Tangen, B.A. (2008b). Chapter E: Reduction of sediment and nutrient loading, ecosystem services derived from wetland conservation practices in the United States Prairie Pothole Region with an emphasis on the US Department of Agriculture Conservation Reserve and Wetlands Reserve Programs. In R.A Gleason, M.K Laubhan, N.H Euliss (Eds.) Ecosystem services derived from wetland conservation practices in the United States prairie Pothole Region with an emphasis on the U.S. Department of Agriculture Conservation Reserve and Wetlands Reserve Programs. PP #38-40. United States Geological Survey. https://pubs.usgs.gov/pp/1745/pdf/pp1745web.pdf

LeRoy, H., Hellerstein, D., Ribaudo, M., Williamson, J., Nulph, D., Loesch, C., & Crumpton, W. (2015). *Targeting Investments To Cost Effectively Restore and Protect Wetland Ecosystems: Some Economic Insights* (No. 183). Economic Research Service. Retrieved May 1, 2023, from https://www.ers.usda.gov/webdocs/publications/45347/51895_err183.pdf?v=0

Kline, M. (2010). *A Guide to River Corridor Easements*. Vermont Agency of Natural resources. Retrieved May 1, 2023, from https://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/rv_RiverCorridorEasementGuide.pdf

Kline, M., & Cahoon, B. (2010). Protecting River Corridors in Vermont[1]. *Journal of the American Water Resources Association*, *46*(2), 227–236. https://doi.org/10.1111/j.1752-1688.2010.00417.x

Laubhan, M. Gleason, R. (2008). Chapter B: Plant community quality and richness, ecosystem services derived from wetland conservation practices in the United States Prairie Pothole Region with an emphasis on the US Department of Agriculture Conservation Reserve and Wetlands Reserve Programs. In R.A Gleason, M.K Laubhan, N.H Euliss (Eds.) Ecosystem services derived from wetland conservation practices in the United States prairie Pothole Region with an emphasis on the U.S. Department of Agriculture Conservation Reserve and Wetlands Reserve Programs. PP #15-18. United States Geological Survey. https://pubs.usgs.gov/pp/1745/pdf/pp1745web.pdf

Lowrance, R., Altier, L. S., Newbold, J., Schnabel, R. R., Groffman, P. M., Denver, J. M., Correll, D., Gilliam, J. W., Robinson, J. E., Brinsfield, R., Staver, K., Lucas, W., & Todd, A. (1997). Water Quality Functions of Riparian Forest Buffers in Chesapeake Bay Watersheds. *Environmental Management*, *21*(5), 687–712. https://doi.org/10.1007/s002679900060

Montana Aquatic Resources Services. (2017). *Channel Migration Easements In Montana: How Conservation Easements and Rivers Can Work Together*. Retrieved May 1, 2023, from http://freshwaterpartners.org/wp-content/uploads/2021/08/MARS-CME-Whitepaper-FINAL-DRAFT-20171004-v1.0.pdf

Montana Freshwater Partners. (n.d.). *Channel Migration Easements (CMEs)*. Retrieved May 1, 2023, from https://freshwaterpartners.org/cme-program/

Morefield, P. E., LeDuc, S. D., Clark, C. M., & Iovanna, R. (2016). Grasslands, wetlands, and agriculture: the fate of land expiring from the Conservation Reserve Program in the Midwestern United States. *Environmental Research Letters*, *11*(9), 094005. https://doi.org/10.1088/1748-9326/11/9/094005

Trust for Public Land. (2023). *Conservation easements and the National Conservation Easement Database*. National Conservation Easement Database. Retrieved May 1, 2023, from https://site.tplgis.org/NCED/storymap/

Orzetti, L. L., & Jones, R. C. (2005). Stream Community Structure: An Analysis of Riparian Forest Buffer Restoration in the Chesapeake Bay Watershed. *AGUSM*, *2005*. https://ui.adsabs.harvard.edu/abs/2005AGUSMNB24E..04O/abstract

Pierce, A., & King, S. L. (2013). 12.14 Valley Plugs, Land Use, and Phytogeomorphic Response. In *Treatise on Geomorphology*. https://doi.org/10.1016/b978-0-12-374739-6.00330-4

Sonnier, G., Bohlen, P. J., Swain, H. M., Orzell, S. L., Bridges, E. M., & Boughton, E. H. (2018). Assessing the success of hydrological restoration in two conservation easements within Central Florida ranchland. *PLOS ONE*, *13*(7), e0199333. https://doi.org/10.1371/journal.pone.0199333

Vermont River Management Program. (2005). *River Dynamics 101 - Fact Sheet*. Vermont Agency of Natural resources. Retrieved May 1, 2023, from https://floodready.vermont.gov/sites/floodready/files/documents/rv_river_dynamics_101.pdf

United States Environmental Protection Agency. (2023a, March). *Why are Wetlands Important?* United States Environmental Protection Agency. Retrieved May 1, 2023, from https://www.epa.gov/wetlands/why-are-wetlands-important

United States Environmental Protection Agency. (2022b, July). Summary of the Clean Water Act. United States Environmental Protection Agency. Retrieved May 1, 2023, from

https://www.epa.gov/laws-regulations/summary-clean-water-act#:~:text=%22Clean%20Water%20Act%22%20became%20the,for%20pollutants%20in%20surface%20waters.

Water Resources Mission Area. (2019, March 1). *Agricultural Contaminants*. United States Geological Survey. Retrieved May 1, 2023, from https://www.usgs.gov/mission-areas/water-resources/science/agricultural-contaminants

Portfolio Component 2

OneMontana Research Assistantship

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May, 2023

Reflections on a Summer Working With OneMontana

From May 2022 through January 2023, I worked with the non-profit organization *OneMontana* as a research assistant. One Montana is a non-profit organization based out of Bozeman founded with the purpose of providing resources to both rural and urban communities throughout the state, and supporting working lands and private land stewardship. I joined a team tasked to conduct research over the summer related to the planning for succession of agricultural lands and businesses here in Montana. The goal of this research is to assist OneMontana with their Landowner Education and Resource Network (L.E.A.R.N) program, which focuses on providing education and resources to farmers and ranchers in the state. By the time I began my research, One Montana had identified that numerous tools and resources currently existed to assist landowners in succession planning, however barriers remained that limited the number of landowners that were accessing these resources. One Montana sought my and another Environmental Studies student's assistance to help understand the barriers that landowners experience in accessing succession planning resources, and to identify and consolidate available resources for succession planning into a single location.

Overall I found this experience to be beneficial to me both personally and professionally. Throughout the course of these duties, I was able to practice and refine my interpersonal and organizational skills, and gained knowledge about the issue of succession planning in agriculture from those who are directly experiencing it. As I conducted outreach and interviews with ranchers, farmers, and legal and financial professionals, I developed greater competence and comfort in communicating clearly and effectively with unfamiliar people. One aspect of my communication skills in which I observed this growth was my

ability to establish rapport with interviewees and provide them space to feel comfortable, and to share personal stories and thoughts throughout our interviews. I found that the process of arranging, conducting, and analyzing interviews necessitated organization. Subsequently, my organizational skills grew over the course of my work as I developed systems of ensuring my interview questions were clear and concise, and my interview notes were organized and filed properly to help facilitate an easier analysis afterwards. It often seemed like I was pursuing a balance between striking up casual conversations with interviewees, and maintaining professional and research goals.

In addition to the personal and professional growth achieved throughout the course of my work this summer, my other accomplishments include completing around 20 interviews with a variety of different stakeholders, and contributing to the completion of a final report which details the entirety of our project. The final report is the culmination that describes all of the work the research team did with OneMontana, and thus, it is a meaningful accomplishment and a valuable contribution to the L.E.A.R.N program. In addition to these accomplishments, there were a number of skills and concepts I've learned throughout the course of my education at The University of Montana which I was able to apply to my work with OneMontana.

I found this internship provided me with opportunities to work on several competencies from the Natural Resource Conflict Resolution(NRCR) program. Through engaging with a diversity of stakeholders, I sought to understand their needs and interests, as well as the institutional incentives and constraints that many of them operated under. This work also entailed me evaluating knowledge gleaned from interviews and identifying their utility to OneMontana as they decided what to do next, which was reflected in the final recommendations and next steps presented to each organization. Additionally, in curating my interviews I provided space for a range of different stakeholders to tell their truth, often

embracing different ways of knowing which ultimately led to a fuller and more complex understanding of the issues and underlying needs for each program. The application of these concepts improved my analysis of the interviews and the end results and takeaways, as well as the research team's recommendations for OneMontana.

Over the course of my work, I was also able to accomplish each of the goals set for myself in my initial internship description and goals' write-up. As mentioned earlier, I found over the course of interviewing people a growth in my ability to design and facilitate conversations that were comfortable for the interviewee, and also yielded useful information for our project. Additionally, I was able to refine my skills in communication throughout the interview process and the creation of our final report. The interview process demanded that I ask clear, concise questions to each interviewee, and actively listen to their response in order to follow up with adequate questions and increase my understanding of their perspective. I was also communicating with co-workers daily, providing work progress updates, and exchanging helpful information about the interview process in order to improve our practices as a team. The act of analyzing my interview notes in order to create our final report further refined my communication skills through the process of distilling and communicating large amounts of information from interview notes succinctly in our reports findings and discussion sections (Appendix A).

I also gained a greater understanding of several aspects of succession planning, including: its historical context, its prevalence today across the country, and the impact which it has on local and family run agricultural operations in Montana. I found the interview process to be a beneficial way of learning about this issue, as I had the opportunity to understand it from numerous perspectives including those of farmers and ranchers, as well as legal experts, financial planners, and mediators that are assisting landowners through the process. Each of these different groups offered particular insights from their

experience which allowed me to gain greater understanding of this issue. Over the course of conducting outreach and interviews for this project, I found myself in conversation with many incredible people involved with the preservation and conservation of natural areas as well as working lands here in Montana. These conversations provided me both with an introduction and connection to conservation organizations in the state, as well as discussions into the values and insights these professionals had to offer.

As I reflect on the overall experience I've had working with OneMontana, I find it to be a positive and beneficial one. I enjoyed most stages of the process, from designing and conducting interviews to analyzing them into our report. Though time consuming, I found the most enjoyable and rewarding aspect of the work to be the interviews themselves. I was so grateful to have the opportunity to hold conversations with so many knowledgeable professionals from a variety of fields, who all cared so deeply about the landscape they exist in, and the farmers and ranchers they work with. The level of care they had permeated the conversations, and their knowledge of conservation practices and tools was beneficial to me both personally and professionally as I consider my next steps towards working in the landscape conservation field.

One aspect of this job which I found the most challenging personally was the level of organization needed to efficiently plan, conduct, and analyze interviews. As I learned throughout the process, the way interview notes are taken and organized directly impacts how easy or time consuming it will be to analyze them down the line. Similarly, the organizing and consolidating of interview notes by category and stakeholder group allowed us to more quickly and efficiently review our data once interviews finished up. These smaller details of organizing during the interview process were a learning curve for me, and have provided me with an opportunity to grow professionally.

Another aspect of my internship work that proved to be difficult was the nature of conducting outreach and interviews over email and phones (Appendix B). As the one scheduling interviews, the consistency of my work was dependent on the response of those I was reaching out to. Thus there were some weeks over the course of my work that I would only end up conducting one interview, and some days in which I may conduct three interviews. I learned to get ahead of this inconsistency by increasing the number of people I was reaching out to, under the assumption that many would not respond, or would respond days or weeks after initial contact. After adjusting my outreach habits by routinely sending follow up emails and regularly identifying new potential interviewees, I saw more consistent interviews.

Additionally, I found that working with our project supervisor, OneMontana's Executive Director Sarah Davies Tilt, helped to make the experience as good as it was. She was a responsive, supportive, and encouraging supervisor for our team. I found her to be accessible and helpful throughout the process through her availability to answer any questions the team had, and our frequent team check-ins, in which we provided updates and sought direction throughout the course of our work. Given the structure and support provided by OneMontana, and the expertise offered by our supervisor, there is little that I would change regarding the work opportunity provided for me. I would recommend any student to take the opportunity to work with OneMontana in the future.

This internship experience furthered my academic and career goals by providing me with hands-on experience working with an organization whose focus is in line with my interests. Given my interest in collaborative conservation, conflict resolution, and balancing working lands with ecological conservation, I am grateful to have had this opportunity to hold conversations with numerous professionals who are working in related fields. I am also grateful to have had the opportunity to lend a hand on an issue such

as succession planning, which has far reaching effects that are related to each of the interests mentioned above. The analytical and interview skills I was able to practice and the practical knowledge of conservation tools and the issues landowners and conservation groups face will all benefit me professionally in the future. Most importantly, the information distilled into our final report will ideally contribute to the development of a succession planning tool for landowners, which could assist a larger number of farmers and ranchers in Montana plan for the continuation of their lands and businesses, ultimately keeping them in local and family hands. I hope that the work I contributed to this summer will help to preserve local communities, economies, and landscapes here in Montana.

Appendix A

One Montana Final Report

Keeping Working Land in Working Hands

by Elyse Caiazzo and John Curnyn

January 2023

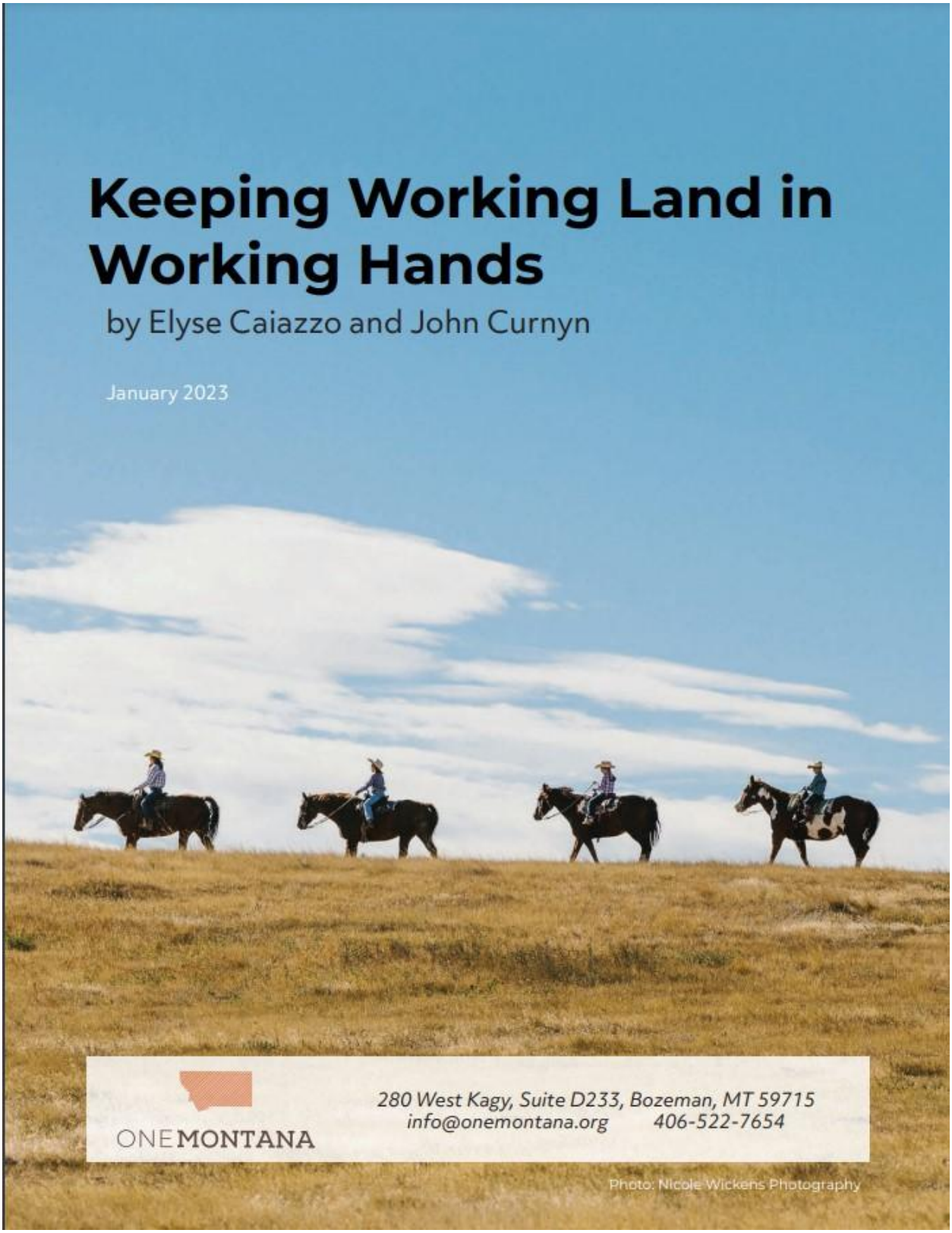

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Photo: Nicole Wickens Photography

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PURPOSE

One Montana is a nonprofit dedicated to sustaining a vibrant Montana by connecting our rural and urban communities.

In 2021, One Montana began exploring opportunities to provide tools, resources, and case studies to help private landowners prepare for succession. We researched many of the tools and resources already available for succession planning and found an abundance of financial tools and resources, and conservation options. We aggregated this information into a database and compiled seven designs we believe can guide the development and functionality of the online tool.

We also explored who our end user might be. Currently, the information that is out there is not getting to landowners effectively. We wanted to understand why, and how we can deliver tools, content, and resources more effectively to landowners.

By the end of 2021 we began to shift our hypothesis that landowners may not be the end user of this tool, but community connectors, such as extension agents, might be compiling relevant information for landowners through this tool. In early 2022, we hired graduate students, Brooke Reynolds, Elize Caiazzo and John Curnyn, to take our effort further and engage in more data gathering, expanding conversations with potential partners, and conducting surveys for potential users and partners. Brooke, Elyse and John completed more than 40 individual interviews during spring and summer 2022. They expanded our database to include information and resources from more than 70 different organizations. They also connected with a number of organizations who are interested in sharing the information we develop. Collectively, we attended 15+ events to specifically network with folks about our effort and build relationships.

Our hypotheses is that landowners are challenged to find and access information about succession. While this is true, it is also only part of the story. There was unanimous opinion among our interviewees that there was a need to aggregate information and resources. And there was additional evidence pointing to the need for a learning platform with a resource library and training modules. Elyse, John and Brooke heard that there is a real need for an investment in the "human" side of the equation and for trainings focused on how to talk to landowners and engage in the difficult conversation about succession planning.

This Report includes their findings, remaining questions, follow-up areas, and recommendations.

Sarah Davies Tilt
Executive Director
One Montana

INTRODUCTION

As the current generation of farm and ranch owners retire, the continuity of their operations and land ownership is dependent on their ability to find a successor. The establishment of a successor to agricultural land and business ownership, and the development of a succession plan to assist this transition is essential to the process of passing a farm on to the next generation as smoothly and successfully as possible. The succession of land ownership and related agricultural business is an issue that continues to grow in prevalence as demographic and generational changes occur. In Montana, the average age for all agricultural producers is 58.9, climbing 1.1 years from 2007-2017 (Sommer, 2017), and in one national survey, two thirds of retiring farmers did not have an identified successor (Land for Good, 2021).

Today, it is often difficult for children of farmers to take over the family farm. Farm equity is often the default retirement plan for farmers because of their financial investment into the land and business; therefore, they can't simply give it to the next generation. Furthermore, financing for the next generation wishing to buy the farm can be difficult in this era of high land values, high estate taxes, and tight credit markets – not to mention the difficulty of beginning to make payments on a loan before ever bringing in a crop. In cases where there are multiple siblings, equitable distribution of inheritable assets can be an issue. Understanding rules related to taxes, land transfers, incorporation, etc. can be extremely important. Additionally, there are numerous interpersonal and values issues that often need to be dealt with in succession arrangements. Family or locally owned agricultural operations have a significant link to their neighboring community, economy, and culture, and the loss of this connection has far-reaching impacts on rural communities throughout the state of Montana.

Given the significant impact succession planning has in local communities and economies, One Montana sought to address this issue through the establishment of their Landowner Education and Resource Network (L.E.A.R.N). The stated goals of the L.E.A.R.N program are "to provide tools, resources and case studies to help prepare and support private landowners to sustain profitable working lands and prepare for succession." To that end, One Montana identified through research that a significant number of effective tools for succession planning exist both online and in person, however, the ability of landowners to find and access these various tools is often challenging, resulting in less people utilizing the wide range of resources available for them. Thus, a goal of the L.E.A.R.N program is to increase access to the many resources available, in order to increase the overall number of farmers and ranchers that will create a succession plan for their land and business.

The objectives of the research were the following: to identify and consolidate the different resources for succession planning in the United States, to find different resource and tool formats that have been successful elsewhere, and to identify and clarify what barriers that exist for landowners wanting to create a succession plan. Over the course of several months, interviews were conducted with people associated with succession planning from a variety of backgrounds, including: nonprofit

organizations, government agencies, State university extension agents, mediators and facilitators, land trusts, and farmers and ranchers.

The following report was written with the purpose of discussing the content of the interviews conducted over the course of the Summer of 2022. This discussion includes the common themes and topics brought up by interviewees, as well as their concerns, needs, and attitudes regarding the state of farm and ranch succession in the State of Montana.

RANCHER INTERVIEW EXAMPLE

Dale Veseth, *Rancher, Phillips County*

(Interviewed By John Curnyn)

I was honored to interview Dale Veseth, a rancher from Phillips County with personal experience with succession planning, and a longtime member of the Rancher Stewardship Alliance.

Dale told us one of the most important things to do is develop a process and plan for transitioning. He found it is not so difficult to get a plan down on paper, but ensuring the plan is implemented is a key to success. For example, part of their family's succession plan involves both an educational process and a responsibility process for the ranch, meaning the next generations, or successors, are required to learn the ins and outs of the ranch and take on more and more responsibilities through the process. It can be challenging to plan for specific deliverables within a prescribed timeline because things are never stagnant on a ranch.

Dale is a strong proponent for creating a "one-stop-shop clearinghouse" for succession planning resources. To have a single resource that provided a list of professionals, and a ballpark expected cost, could save precious time in getting new plans started. If a resource that aggregated information was simple and easily available on the internet, it would cut down on a lot of research time. People are going through this process in a piecemeal way over the course of many years. They are grappling with both the weight of making big decisions and finding information which takes time to gather. In Dale's experience, there are good resources out there that he didn't know about and finding them was difficult and time consuming. He believes that by making this information available, when people realize they have a need they will be able to find help more easily and quickly.

Dale felt that expertise was another important factor. Having help within his own community would be ideal, but many folks expect to travel to find someone with succession planning expertise. Something Dale thought might be lacking is recommendations for paid specialized professionals, such as accounting and legal. Dale suggested that a list of people that can support succession planning efforts across Montana, with ratings from other ranchers who have used their services, would be really useful.

METHODS

We collected qualitative data gathered from 35 interviews with a variety of stakeholders such as non-profit organizations, government agents, succession mediators and facilitators, land trusts, and farmers and ranchers. 34 of the interviewees are stakeholders in the United States, and 1 interviewee was from Canada. The list of organizations interviewed can be found in Appendix I. Figure 1 shows a map of all 35 stakeholders interviewed. The vast majority of our interviews were with organizations which include non-profit organizations and private organizations (Figure 2). Qualitative methods are ideal at providing insights into little studied topics (Kreuger and Casey 2009), and these methodical benefits have been noted in past work in agricultural context (Prokopy et al. 2017). Given that we have limited understanding of how U.S. producers deal with land transition, retirement, and estate planning, aka succession planning, we use a qualitative approach to develop a preliminary understanding of this process.

Figure 1. Map of Montana Farmers and Ranchers interviewed

Interviews were conducted on a one-on-one basis between a graduate student researcher and the stakeholder between May 2022 and August 2022. The majority of the interviews were done over the phone, with a small number conducted over Zoom and via email. Each interviewee was asked some or all the standardized questions, based on time restrictions and the direction of the conversation. The standardized questions for stakeholders can be found in Appendix II. The average interview time duration was an hour long, with some lasting as long as 3 hours and others, 30 minutes. All interviews were transcribed with the permission of the participants. Initial interviewed participants were primarily recruited through One Montana affiliates and connections from ranching network conferences, with a reliance on snowball sampling after initial contacts. Snowball sampling is a recruitment technique in which research participants are asked to assist researchers in identifying other potential subjects. It is considered a good method in the context of the study and the target audience (Oregon State University, 2010). The objective of this study was to (1) find tools used in succession planning, (2) what various stakeholders in this field need, (3) if those are met with the current resources, if not, how could One Montana help, and (4) what are the barriers in succession planning?

Stakeholders Interviewed

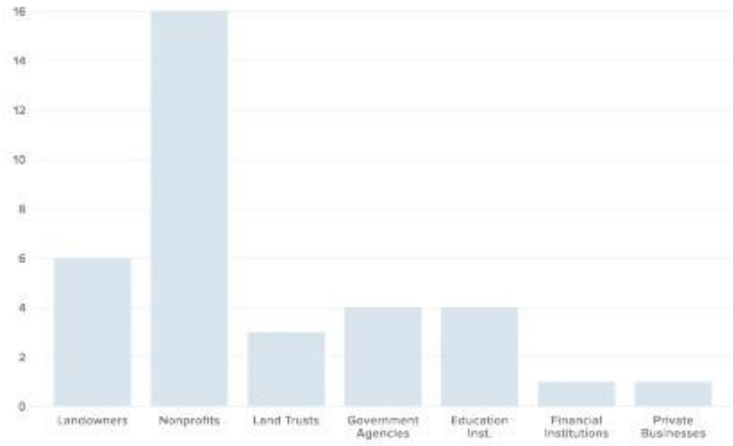

Figure 2. Number of different Stakeholders interviewed

All information transcribed from interviews were uploaded to an online database called Airtable. Airtable is a professional collaborative platform that allows individuals to customize workflow, organize research, and achieve outcomes (airtable.com). Airtable was an efficient tool to consolidate our research. Our Airtable workspace was divided into 7 tables: resources, organizations and efforts, design and layout inspiration, possible audiences, case studies, contacts, and landowners. If an interviewee shared a resource created by their organization, we added it to our list of resources categorized by types of resources or tools such as website, technical assistance, workshops, membership programs, PDF fill out form, case study, PDF report, and videos. Organizations responses to certain standardized questions allowed us to navigate potential partnerships or access available tools.

OUR FINDINGS

Based on our research and outreach, we recognized a few common threads.

1. There is a plethora of succession resources and tools

At the beginning of our research, we thought One Montana might need to invest in creating a tool for succession. However, new tools do not need to be created because many organizations have already done so. The barrier to accessing these tools is time. The time it takes to search for all the available tools for farmers, ranchers, and succession planning professionals could be utilized in different ways. By consolidating available tools and resources in one place such as a platform could alleviate time for organizations to follow up with members seeking help with certain tools and resources provided from the platform.

INTERVIEW EXAMPLE

Caroline Caldwell, Quivira Coalition and American Farmland Trust
(Interview by Elyse Caiazzo)

We had the opportunity to speak with Caroline Caldwell, a Montanan rancher who helps connect ranchers with young apprentices. She currently works for the Quivira Coalition as the New Agrarian Program Northern Plains Coordinator and in collaboration with American Farmland Trust (AFT). In her position, she partners with ranchers and farmers on large landscape operations in the intermountain west to offer 8-month apprenticeships on working ranches and farms. She has a deep connection to the farming and ranching networks in western and central Montana, especially working with established ranchers looking to educate a next generation of agricultural producers. When I asked her about what succession looks like for a landowner in this day in age, Caroline talked about land being sold and not being passed down to the next generation, which was a reoccurring theme in our research. She brought up the idea of managers on land being given the opportunity to own cattle, lease some land on the property, and getting paid to care for the property. There are many paths to be taken in succession planning, but Caroline feels that family ranches are having the hardest time with succession planning.

Caroline gave examples of how Quivira and AFT are building relationships and working with farmers and ranchers by providing more technical advice and science to back the ranch "plan". The preferred tools used at the organization are primarily in person advising, workshops, and providing podcasts with accessible, relatable stories for farmers/ranchers to listen to in their own time. She was a strong proponent of having third-party voice for family succession planning primarily because the topic is so emotional.

Ranch communities are supportive of each other, and Montanan's are willing to drive far to meet and learn from likeminded ranchers. They trust each other and getting support from each other can be a critical part to the succession process. She believes that by providing ranchers with the opportunities to get together and tell their successful succession planning stories goes a long way to moving the process along. Bringing folks together to tell their stories helps everyone know they are "in it together", builds trust, and provides a safe place to talk and learn.

She also emphasized the importance of knowing whether the ranch will transition to the next generation of family or an outside successor. Planning can look very different to these audiences and while goals may be similar, techniques to meet those goals can be very different. Another challenge is that many landowners are struggling to train and employ managers who might be a future successor.

2. People value person to person connections

Trust is often an important ingredient in the process. That could be trust of a familiar face/fellow community member, or the authority of technical expertise such as lawyers, financial planners, and mediators. When asked what makes a good succession tool, most organizations stress the importance of "getting in person, talking through the resources available and who to call."

3. Good communication is necessary – from start to finish

The single biggest hang-up for succession planning is beginning the process—which often boils down to communication. When asked what aspects of succession planning process to be most difficult for landowners to overcome, a stakeholder talked about "the conflict avoidance. People are not coming to the table because they're afraid of conflict. They avoid planning because they don't want to let go of control". There is a degree of vulnerability that comes with talking about succession and what that really means for a person, which can be difficult to fathom for many landowners. "They keep and do not want to think of their futures". Conflict is part of the process of communication. While overcoming hurdles, a family/business can identify values and goals for their future and communicate them to each other. This is key to creating a successful business and transition plan.

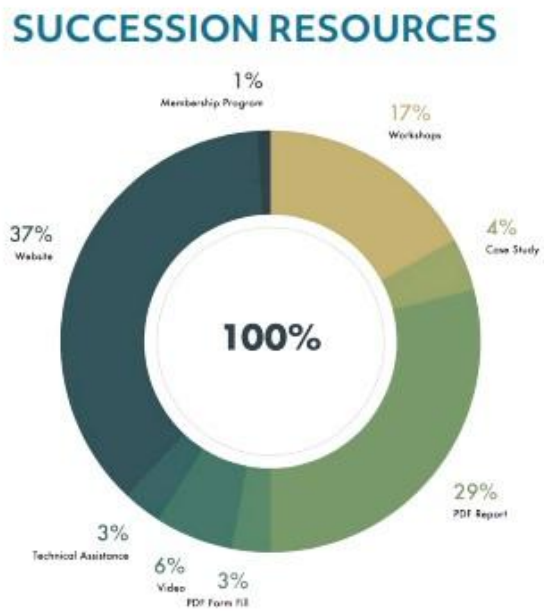

Figure 3. Percentage of Succession Planning Resources compiled in Airtable.

4. Not one single path for succession planning

There is not one single path for succession planning, therefore, we need a variety of tools such as face to face conversations, workshops, fill in PDF's, paid professionals, facilitation, etc. To have a single platform that offers technical information sources, as well as contact information for paid legal and financial professionals, and mediators would allow a variety of stakeholders to find exactly what they need without sifting through multiple websites. People are all different, thus the way they approach situations will be different. Given that one of the most important and challenging steps taken in this process is to start, the ability to offer a variety of different resources could help the largest amount of people.

These common threads led us to a few important solutions to our research questions.

1. Need for aggregation of resources

Cut down time for other organization across Montana to find all the tools and resources for succession planning and therefore, can dedicate more time to having the one-on-one conversation with farmers and ranchers and following up with businesses in the process of planning for succession.

2. Who is the audience for this platform?

A platform that can appeal to a wide variety of audiences would be beneficial. In some cases, farmers and ranchers are independent enough to find the right tools and resources for their situation. On the other hand, some farmers need assistance from organizations and technical experts. Therefore, a platform that can provide information and education to both the independent producers and to professionals helping producers. An important and unique characteristic of this platform is the opportunity to provide information and education to a wide variety of professionals, and include both technical skills, such as financial and legal, and "soft-skills" training such as facilitation.

3. Platform design and functionality

A successful platform is a learning platform with resource library and training modules focused on soft skills, mediation, and relatable/successful succession stories. A single platform that offers technical information sources, as well as contact information for paid legal and financial professionals, mediators. People are all different, thus the way they approach situations will be different. One of the most important steps taken in this process is to start the process.

RECOMMENDATION

Host a collaborative workshop for succession planning professionals

This workshop would be geared towards individuals who work in the succession planning realm as well as individuals who have direct ties to farming and ranching networks that can provide feedback on what is needed to build an aggregated platform. The goals of this workshop are (1) to discuss the next steps necessary for a platform to exist, (2) to explore what is working or not working for different organizations in creating successful succession plans, and (3) how to communicate or present helpful information to a wide variety of audiences, i.e., an app, or a database. Workers in this field put an immense amount of time and effort to conduct research, find tools, create tools and resources, and distribute them to agricultural networks. However, not all organizations have the funding to follow up with each agriculture producer who reached out for help. Therefore, an aggregated platform would alleviate the time necessary to find tools and resources and provide more availability for organizations to help producers through the process of succession planning. Some questions that we hope to answer at this workshop would be:

1. What mutually trusted organization will house this platform?
2, Who would run the platform and update it?
3. How would it be sustained?
4. Would organizations subscribe to this platform, or would it be free?

Additional funding would support the event as well as the planning for the collaborative workshop. The event would require a space to house the invited attendees and a conference room to congregate with food provided, as well as staffing from One Montana, travel assistance, and materials potentially needed such as technology rentals. Money would be allocated for travel purposes. Organizations beyond Montana such as Nebraska Hotline, Land for Good, Holistic Management, and Center for Rural Affairs are leaders in creating tools for ranchers and farmers, providing mediation education for organizations and assistance in the succession process. Therefore, it is important to bring in outside organizations with different perspectives and creative ideas to help facilitate discussions.

REMAINING QUESTIONS

Upon analyzing our research, we are left with several questions that should be answered as One Montana moves forward with this initiative. The following questions have been identified as important yet remain to be answered:

What organization should host the L.E.A.R.N succession planning resource tool?
Given that the purpose of the tool is to increase the number of producers that will create a succession plan, the tool must be hosted by an organization that is broadly trusted across the state of Montana and its communities.

If the platform is made, how can we increase engagement with it?
It has been identified through our research that there are several distinct groups that could benefit from this consolidated resource. Would it make sense to design the tool to offer resources for all individual group identified, as opposed to just one stakeholder group?

CONCLUSION

The information provided over the course of this report serves to reflect some key takeaways, as well as the fluid nature of our research. Over the course of our assessment, the focus of our interviews evolved to reflect the concerns and issues being discussed. Our initial objectives focused primarily on identifying and consolidating the resources available, as well as identifying effective formats currently in use. To those ends, we succeeded in identifying numerous resources as well as effective formats for the L.E.A.R.N succession planning tool. We also sought to learn more of issues brought up by interviewees that reflected the more personal and social barriers that landowners face as they attempt to start a succession plan. Many common barriers to succession planning we found to be related to communication, both with family and planning professionals. As such, a resource designed to maximize the number of landowners that will create a succession plan should reflect the need for guidance with communication. Thus, an ideal final product might offer resources from three distinct categories: guidance for soft skills such as mediation and communication, in-person professional expertise such as financial and legal planning, and online resources such as FAQ pages and informational websites.

It was also revealed throughout our interviews that a convening of the many professionals currently assisting in succession planning across the region could be beneficial for both of them professionally, and One Montana. A convention

may provide an opportunity for experts to clarify best practices and discuss their common issues and successes. As an organizing party, One Montana would benefit from the shared knowledge of these professionals and would be able to synthesize and clarify the learnings that take place, and ultimately more efficiently help communities in Montana with succession planning.

Throughout the course of our work, the research team was delighted and often moved by the discussions had with a variety of individuals. The level of care observed in the professionals assisting with succession planning, as well as the awareness seen in landowners of the gravity of the situation served to further highlight the importance of this project. The interviews with landowners felt special as they allowed the interviewers to step into their world for a moment by sharing their experiences and family matters over the phone, sometimes talking on horseback herding cattle. Moreover, these conversations were educational; they allowed the interviewers to learn about the challenges being faced with succession planning directly from those who are experiencing them. Learning about these issues from the personal experiences of community members and landowners added greater dimensions to the issue and allowed the interviewers to more holistically understand the challenges, and what's at stake when it comes to succession planning.

AUTHORS

John Curnyn is a graduate student at the University of Montana's Environmental Studies Program and Natural Resource Conflict Resolution Certificate Program. He has been assisting research for One Montana's L.E.A.R.N Program since May 2022. During his time living in several different states throughout the country, he has found work as a teacher of environmental science, or helping out on farms. Over the course of his work and travels, he developed an interest in how to balance working lands and functioning ecosystems. In his free time, he enjoys playing music, cooking food, and walking through the beautiful hills of the Missoula Valley.

Elyse Caiazzo is a graduate student at the University of Montana's Environmental Studies Program, concentrating in sustainable food and farming. Since May 2022, Elyse has been an intern for One Montana working on their L.E.A.R.N program. Her love of farming started in Maine during her undergraduate degree. She worked at the college farm, where she spent most of her free time tending to the vegetable field, feeding animals, and preparing seedlings for each season. Following the completion of her degree, she worked on small organic farms and farm to table restaurants in Portland, Maine area. In her spare time, Elyse enjoys hiking with her partner and dog, Atlas.

Appendix I

List of organizations interviewed:

1. American Farmland Trust
2. Center for Rural Affairs
3. Community Food & Agriculture Coalition
4. Dan Scott Ranch Management Program
5. DNRC Rangeland Resources Program
6. Ducks Unlimited
7. Elaine Froese: Farm Family Transition Expert
8. Gallatin Valley Land Trust
9. Holistic Management International
10. Land For Good
11. Land Stewardship Project
12. Montana Land Reliance
13. Montana Stockgrowers
14. MSU Extension
15. MT DNRC
16. MT Farm Bureau
17. Nebraska Department of Agriculture
18. Northern Plains Resource Council
19. Northwest Farm Credit Services
20. Pheasants Forever
21. Plank Stewardship Initiative
22. Prickly Pear Land Trust
23. Quivira Coalition
24. Ranchers Stewardship Alliance
25. Ranching for Profit School
26. Rocky Mountain Elk Foundation
27. Sustainable Ranching Initiative World Wildlife Fund
28. The Nature Conservancy, Matador Ranch
29. University of Iowa
30. USDA NRCS
31. Wheatland County Weed District
32. Winnett ACES

Appendix II

List of Standardized questions asked to certain stakeholders

1. Non-Profit
   a. Do you have succession planning tools?
   b. Do you have members/farmers/ranchers approaching you looking for succession planning help?
   c. What questions are members asking?
   d. Are there certain succession planning subjects that members are especially concerned about?
   e. What have been the most successful tools or resources used by members?
   f. What makes a good succession tool?
   g. Are there tools that members are missing?
   h. Would you be willing to share its tools with One Montana?
   i. Would you want to partner with One Montana to create a succession planning platform?
   j. Could you provide One Montana with ranchers/farmers that would want to speak about succession planning?

2. Government Agencies
   a. Does the USDA have constituents ask questions about succession planning
   b. What questions are they asking?
   c. Are there certain succession planning subjects that constituents are especially concerned about?
   d. Does USDA have succession planning tools?
   e. Are there tools that the USDA is missing?
   f. What type of format are these tools? Does this work for people? Is it what they are looking for?
   g. What is the best format for succession planning tools for the USDA constituents?
   h. Would the USDA be willing to share its tools with One Montana?
   i. Would the USDA be willing to partner with One Montana to roll out a succession planning resource?

3. Farmers and Ranchers
    a. Could you share your experience with land transitioning and succession planning? Was your plan "successful"?
    b. When did you start your succession plan? How did you find the proper resources to start this process?
    c. Were any tools or resources helpful?
    d. Did you have any facilitation or mediation involved? If so, what was that experience like?
    e. What were some barriers to succession planning or land transitioning on your operation?
    f. What were your goals with succession planning for your business?
    g. What format of succession planning worked for you? Extension agent, local organization, or an online platform?

4. Mediators/ Facilitators
    a. What are common themes in succession planning mediation?
    b. What are the best strategies to facilitating succession planning conversations with landowners?
    c. How do you get individuals to the table?
    d. What do you do about people who don't want to come to the table?
    e. Pertaining to Succession planning, what does the final product look like?
    f. What resources have been helpful in your work with succession planning?
    g. What resources do you think are missing?

5. Land Trusts
    a. What does (land trust organization) do and what are your goals within your work?
    b. Are most of your conservation easements donations or bought by MLR?
    c. Have bargain sales been incorporated into succession planning?
    d. Does [organization] have members/farmers/ranchers approaching [organization] looking for succession planning help?
    e. Have you noticed conservation easements being a tool for succession planning?
    f. How does your organization get received based on location in Montana east vs. west?
    g. How do you navigate conversations? Are you noticing the need for more soft skill training?

References

Kreuger, R.A., and M.A. Casey. 2009. Focus groups: A practical guide for applied research. New York: SAGE Publications.

Land For Good. (2021). What is farm succession? Message posted to https://landforgood.org/resources/faqs/farm-succession/

Prokopy, L.S., J.S. Carlton, T. Haigh, M.C. Lemos, A.S. Mase, and M. Widhalm. 2017. Useful to usable: Developing usable climate science for agriculture. Climate Risk Management 15: 1–7.

One Montana. (2022). Retrieved October 2022, from https://www.onemontana.org/

Oregon State University. (2010). Snowball Sampling. Accessed on https://research.oregonstate.edu/irb/policies-and-guidance-investigators/guidance/snowball-sampling

Sommer, E. (2017). Montana agriculture keeps growing. Retrieved Nov 3, 2022, from https://www.usda.gov/media/blog/2015/02/19/montana-agriculture-keeps-growing

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Appendix B

Landowner Email Prompt, OneMontana
7/18/22

Hello _____,

My name is _____, and I am a University of Montana graduate student working with One Montana researching their proposed LEARN project, which focuses on providing tools, resources, and case studies to help prepare and support private landowners to sustain profitable working lands and prepare for succession. **One Montana works to create a robust and vibrant future for the people and communities of Montana by bridging the gap between urban and rural experiences and connecting people to each other, to resources and expertise. (Leave out this part if they are on the board of 1MT) **

We researched available tools, reviewed different formats for distribution, and considered the practicality of this project. We are now in our next stage of research, which entails talking to landowners, farmers, and ranchers about their experience with succession planning and land transitions. Would you have the time in the next week or two to provide some insight on this topic? Please let me know. I can also send you the questions ahead of time so that you are prepared, or you could simply answer them in an email format if you would prefer.

Thank you,

_____

Portfolio Component 3

Understanding Floodplain Management and Restoration in Missoula County, Montana

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May 2023

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Executive Summary

Flooding is the most common natural hazard to impact human lives in this century, and it is projected to increase in both severity and frequency due to climate change (The Nature Conservancy, 2021). Here in Montana, we are expected to experience this trend of more frequent and severe flooding events, while paradoxically witnessing a continuing trend of aridification. In recent decades, Nature-based approaches to flood management have received growing attention. As a Baucus Climate Scholar, I was tasked with researching the State of Washington's Floodplains by Design program, and determining if such a program could be implemented in Montana. The research consisted of interviewing 14 stakeholders representing a variety of different groups in Missoula County to identify: what needs exist in regards to floodplain management and restoration in Montana; at what scale could an initiative be successfully implemented; and what tools could be borrowed from the Washington program here in Montana. This report discusses background information, the methodologies utilized for research, interview findings, recommendations, and questions that remain after completing interviews. Upon concluding my research, the following recommendations should be considered if implementing a Floodplains by Design program in Montana:

(1) *A Floodplains by Design program in Montana may see the most success as a county-wide pilot program:*

There are important differences in the existing needs as well as the political landscape between Washington and Montana that would impact the adoption of a Floodplains by Design program. Western Washington, where the majority of Floodplains by Design projects have been implemented, has a history of frequent flooding events as well as a higher population density and related infrastructure, thus there existed a greater need to address the issue of flooding. Since 2013, the Floodplains by Design program has received significant funding from the Washington State legislature, which is made possible by a supportive state government as well as a larger state budget. The existing needs, the priorities of the state government, and the overall size of the Montana state budget led me to conclude that a statewide

initiative would not receive the support seen in Washington. In considering the prospect of implementing such a program in Montana, I conclude that a pilot program in Missoula County would have the most success, due to The Nature Conservancy's historic presence in the Blackfoot Valley, a favorable county government, and the significant cost of implementing floodplain restoration projects or easement purchases.

(2) There is a need to update floodplain policy:

Regarding the needs and concerns expressed by stakeholders over the course of interviews, the most frequently discussed topic that emerged was regarding the changing population trends in the state. Many felt that proactively addressing the increase in population and related development near floodplains through regulatory action would be the most effective tool in mitigating future flood damages and maintaining the natural function of floodplains. It was also evident that current floodplain regulations on a local level are complex and vary based on city and county policy and FEMA standards. Several interviewees were supportive of an updated county floodplain policy which uniformly restricts development and considers risks to the environment as well as human life and infrastructure in its regulations.

(3) *Beyond Local Policy*:

Beyond updating local policy, several stakeholders expressed interest in implementing floodplain restoration projects throughout the County. Interviewees identified several areas in Missoula County where the potential for collaboration on floodplain restoration or policy advocacy projects existed. Many interviewees felt that an increase in communication between organizations could advance certain projects in line with the goals of Floodplains by Design.

Additionally, several stakeholders were advocates of a channel migration zone easement program. This form of easement has been utilized in Washington's Floodplains by Design program to prevent

channelization and development within channel migration zones. In taking into account the natural movement of rivers and streams, channel migration zone easements are more adaptable to the natural changes in river channels than current regulations that rely on FEMA floodplain maps to enforce regulations. In lieu of regulatory action, these easements are an effective and proactive means of preventing future development along river channels.

Considering the level of interest in collaboration on Floodplains by Design projects, the existing need to address concerns over development, and the need to prepare for flooding and drought conditions, a Floodplains by Design program could be impactful in Missoula County. Such a program could encourage more responsible development and improved water management. Additionally, in utilizing nature-based restoration projects it could reduce flooding severity and related damages to infrastructure, and increase drought resiliency through improvements to water management and irrigation infrastructure. If The Nature Conservancy chooses to move forward with a Missoula County Floodplains by Design Pilot Program, a recommended next step would be to convene a working group to increase communication and promote collaboration on identified restoration projects or policy initiatives.

Introduction

The flooding of rivers poses a risk to humanity and our related infrastructure, and due to climatic changes, this risk is expected to increase over the coming decades. Flooding is the most common natural hazard to impact human lives so far this century, with an estimated 25 percent of the world population living within an inundation zone currently (Smith, et al. 2021). Additionally, climate change is increasing the frequency and intensity of extreme rainfall events, such that climate projections expect '100 year' floods to at least double in frequency by the end of the century (The Nature Conservancy, 2021). As more research has shown that widespread channelization of rivers has inhibited the natural function of floodplains and contributed to greater intensity of flooding events, people have begun to look to 'nature-based solutions' to reduce flood damage, restore normal function to water systems, and replenish aquifers (Parker & Andres, 1976).

In many regions of the US, the frequency and intensity of extreme flooding events has already been noticeable. In the Pacific Northwest, the interaction between warming temperatures, changes in seasonal precipitation patterns, and the region's snowpack are increasing the frequency of flooding (Tohver et al. 2014). As research was beginning for this project, significant rains and rapid snowmelt in the vicinity of Yellowstone National Park caused an extreme flooding event, with the Gardiner River reaching a peak flow four times greater than average and causing widespread damage to private property and infrastructure both inside Yellowstone National Park, and throughout the floodplains of the Yellowstone, Gardiner, and Lamar Rivers (Yellowstone Volcano Observatory, 2022). While Montana is projected to experience more frequent and severe flooding events in the coming decades, extreme heat, diminishing snowpack, and changing precipitation trends have led to prolonged drought conditions in the Northern Rockies and Upper Missouri River Basin (Martin et al. 2020).

Since 2013, The Washington State legislature has appropriated money towards the Floodplains by Design (FPbD) program, an initiative focused on implementing 'nature-based solutions' to flood mitigation and habitat restoration. Broadly speaking, Washington State's Floodplains by Design initiative has been a public private partnership between the State Department of Ecology, local, county, and tribal governments, The Nature Conservancy, and local stakeholders. Its overall purpose is to promote and fund floodplain restoration projects that lower the risk of flooding and flood related damages to landowners and agriculturalists, while also improving water management, providing critical habitat for fish species, and supporting normal ecosystem function overall.

The history of how the FPbD initiative moved from a conceptual idea to a legislatively funded program is notable. The program began with The Nature Conservancy leading site-scale projects in Skagit Bay, WA, with an initial focus on salmon habitat restoration. Initially, flood management was a secondary benefit to the restoration of salmon habitat. As the Floodplains by Design program evolved in its scale and focus, The Nature Conservancy pivoted from primarily leading projects, to filling the role of coalition builder– working with the State Department of Ecology to coordinate and distribute funds to projects run by local, county and tribal governments, often supporting collaborations involving diverse stakeholders.

Floodplain by Design projects have focused on a range of objectives including revegetation of floodplains, restoration of fish habitats, infrastructure improvements such as levee and dike setbacks, and road relocations that also restore historic floodplains. These projects have been carried out with the overall goal of increasing community resilience and improving ecosystem function in floodplains. Several restoration projects completed in Washington state have been designated agricultural resilience projects, with the goal of reducing crop damage and loss due to flooding, while improving access and the supply of water for irrigation.

Beginning in the spring of 2022, The Nature Conservancy Montana tasked their Baucus Climate Scholar Fellow with researching the viability of implementing a FPbD program in the State of Montana. The objectives of the research were to broadly identify what the needs are in Montana regarding floodplain management, identify which aspects of the Washington State FPbD program might be applicable in Montana, and identify what challenges might be faced in implementing an analogous program in Montana. In the summer of 2022, over the course of several months, informal interviews exploring these research objectives were conducted with a variety of different stakeholder groups, including: water conservation groups, land trusts, local government floodplain administrators, industrial representatives, and ranchers.

This report provides a synthesis of and discussion about the content of the interviews conducted during the research. This discussion includes stakeholder needs, insights, common themes, and challenges regarding the implementation of a FPbD program in the State of Montana.

Research Study Objectives

The objectives of this study were to: (1) describe the Washington State FPbD program, (2) understand stakeholder needs regarding floodplain management in Montana, (3) determine aspects of the program which may address needs in Montana, (4) determine aspects of the program which are less relevant to the State of Montana, and (5) consider what challenges might be present in implementing an analogous program in the State of Montana.

Methods

To accomplish these objectives qualitative 'individual in-depth' interviews was selected as an ideal format of engaging stakeholders in meaningful discussion about the needs they observe regarding floodplain regulation and restoration (DiCicco-Bloom & Crabtree, 2006). Over the course of the research, qualitative data were collected from 14 interviews with a range of different stakeholders, including: water and land conservation groups, Missoula County and City government planners, a rancher from the Blackfoot Valley, a professor of water law, and a civil engineering firm representative. All interviewees, but one Nature Conservancy Washington representative, were from the State of Montana. The list of organizations interviewed can be found in Appendix A. Of the various organizations interviewed, the group with the highest representation was water conservation non-profit organizations. By using a qualitative approach to gathering data, I was able to establish a preliminary understanding of environmental and stakeholder needs regarding floodplain management in Montana. This basis of understanding has informed the report's recommendations for a Floodplains by Design program.

Interviews for this report were conducted primarily over the phone, except for a small number of Zoom calls. All interviews except for two were conducted on a one-on-one basis between the research fellow and the interviewee during the months of June through October 2022. Interviewees were asked some or all of the standardized questions (Appendix B), depending on time constraints and the direction of the conversations. Certain interview questions were added or subtracted from the standardized questions based on the background and relevance of each stakeholder interviewed prior to the interview taking place. Interviews on average lasted 40 minutes, with some lasting as long as two hours, and others as short as 20 minutes.

The initial interview participants were primarily recommended by The Nature Conservancy, and subsequent participants were identified either through The Nature Conservancy contacts or snowball

sampling at the conclusion of each interview. Snowball sampling is a technique in which research participants or interviewees are asked to assist researchers in identifying other potential subjects (Oregon State University, 2010). After preliminary research, the scope of the potential program was modified to explore the idea of a county-wide pilot program in Missoula County, and subsequent participants were selected to correspond to that scale. The information gathered over the course of the research interviews was first edited and reviewed to note major themes and takeaways, then organized by their stakeholder group for subsequent analysis. Interviews were organized into one of the following stakeholder groups: Water conservation representative, land conservation representative, government representative, development representative, agriculture representative, or water law representative. Permission to record or transcribe exact interviews was not requested by the interviewer.

Interview Findings

Interviews were used to inform research objectives two through five. Notable interview findings include the following:

(1) *Washington and Montana are different in several important ways:*

Western Washington, where the bulk of FPbD projects have been undertaken, is an area prone to flooding. In any given year, there is a greater than 80 percent chance that ten or more flood events will happen across the state (Washington State Department of Ecology, 2022). In western Washington, a '100 year flood', is actually likely to occur around once every four and a half years on at least one river draining into the Puget Sound (Jones, 2022). Additionally, two thirds of the population of the state live within the Puget sound region. The propensity of flooding in western Washington, coupled with the significant population centers in the Puget Sound watershed created an ongoing need to address flooding and flood related damage, and an opportunity for nature-based solutions such as The FPbD initiative to receive interest.

Beginning in 2013, FPbD received funding from the Washington State Legislature. In the 2021-2023 bi-annual state budget, FPbD received 50.9 million dollars, which has been distributed across numerous impactful projects. A supportive state legislature, and large state budget may be factors in the likelihood of the FPbD program receiving funding in Washington state. It seems unlikely in the current political landscape of Montana that a FPbD program would receive funding on the level seen in Washington State. This combination of identified need, supportive state government, and larger budget are three key distinctions between Washington and Montana which should be noted when considering implementing a FPbD Program in Montana.

One factor that is similar between Washington and Montana is a widespread conservation ethic and interest in wildlife protections. During the early stages of Washington's FPbD, the initiative was primarily focused on improving salmon habitat, with flood management being a secondary benefit of restoring riparian habitat and function. Several interviewees had remarked that improving fish habitat could be a successful argument for restorative or conservation actions under the FPbD program.

(2) Adapting FPbD for Missoula County:

One issue facing Missoula County residents that nearly every stakeholder group mentioned was an influx of people and a related increase in development in recent years. Many regarded development within floodplains to be the biggest challenge in preventing future property damage from flooding events, and maintaining a natural, functioning floodplain. The need to proactively prevent further development in floodplains through policy or easements was brought up by several interviewees as a potential aspect of a FPbD Montana pilot program.

In addition to concerns over development and flood management, increasing drought resilience was also brought up as a potential goal of a Montana FPbD program. Warming temperatures, diminishing snowpack and early spring runoff have contributed to frequent drought conditions in recent decades, creating a need to address water management and drought resilience. Many of the tools that could be utilized to address this need are in line with the FPbD program, including: improving water management practices and irrigation infrastructure, nature-based restoration projects, and channel migration zone easements.

It was clear from several conversations with conservation and government stakeholders that there is room for greater collaboration between organizations, including local government. More routine communication amongst local conservation and water groups, local government, and the public could help identify areas in need of restoration work, garner support for greater floodplain regulation, and improve the success of implementing a county-wide pilot program. Several interviewees mentioned their organization would consider collaborating on a range of initiatives, including efforts to improve floodplain policy, floodplain restoration projects, and pushing for a channel migration zone easement program. I learned through conversations with The Nature Conservancy employees involved in Washington's FPbD initiative that their program saw success in breaking down the silos of different funding sources and interests, and connecting and coordinating other organizations and local governments towards the goal of floodplain management. It is apparent from conversations with stakeholders in Montana that filling such a role in Missoula County could contribute to significant progress in improving and preserving the ecological integrity of local floodplains.

(3) *Floodplain policy:*

Throughout many of the conversations, the topic turned to what forms of development are permitted within a floodplain. The subject of FEMA regulations, and what development is permitted can be complex for landowners and organizations alike. Regulations based on FEMA maps are influenced by how current and accurate the maps are. Furthermore, FEMA regulations are based on a mandate to protect people and their infrastructure, not the environment. The resulting system of regulations varies between local governments and is not required to consider ecosystem health in its regulations. While the Missoula County representatives interviewed discussed their commonly used tools to dissuade unsafe development in floodplains, their authority was limited by their permit based and complaint enforced regulatory structure.

(4) *Channel migration zone easements:*

Several interviewees advocated for an increased use of channel migration zone easements. While a common perception of these easements is that they restrict land use in areas where land use is already highly regulated, they are a useful and adaptable incentive for the conservation of private property and are regularly implemented in the Washington State FPbD Program. The agreement not to interfere with the natural process of erosion and deposition within the historic channel migration zone, as opposed to the use of FEMA floodplain maps for regulation, accounts for the natural channel movement over time and encourages normal ecologically healthy riparian areas. Under local and federal regulations there is still a range of actions that landowners can take within privately owned floodplains; these easements are excellent tools to preserve natural floodplain functions and channel migration processes. Additionally, while they restrict development actions within the floodplain, these easements traditionally allow landowners to retain all land use rights on the remaining property. These easements have been growing in use over the past decade, and have been observed to be broadly beneficial to ecosystem function and wildlife, and effective at reducing flood severity

and related damages. The Nature Conservancy has previously partnered with Montana Aquatic Resource Services (now Montana Freshwater Partners) on the purchase of a channel migration zone easement on the Yellowstone River, and research has been conducted on the impact and efficacy of this project.

Recommendations

After analyzing the interviews, a FPbD Program in Missoula County could incorporate the following approaches:

(1) *A FPbD program in Montana could see more success as a county-based pilot program, potentially in Missoula County.* Given The Nature Conservancy's historic relationships and existing presence in the Blackfoot Valley, and a favorable County government, coupled with the amount of time and money necessary for initial pilot projects, Missoula County would be an ideal area to pilot a FPbD program.

(2) Organizing a campaign to promote regulations that create uniform restrictions throughout floodplains in the county. Currently there is a range of development activity that can take place in a floodplain including agricultural activities, and development of approved structures. The complexity of FEMA regulations and related insurance in mapped and unmapped flood zones leaves restrictions variable throughout the county. In the face of growing populations and development, preemptively implementing restrictions which limit permitted activities such as channelization and prevent future development in floodplains would go a long way to reduce future flooding severity and damage.

(3) Collaborative restoration work. Throughout Missoula County there are several groups that are engaged in floodplain restoration. Increased communication and collaboration with local groups to promote natural floodplains could lead to higher community engagement and more effective

improvements to and management of floodplains. It is apparent from my conversations that a number of stakeholders in Missoula County might support collaborating on restoration projects along the Clark Fork River. Several stakeholders also expressed interest in collaboration on initiatives aimed at overhauling floodplain policy in the County.

(4) *Channel migration zone easements.* Throughout interviews with stakeholders from local government, there was an interest in supporting The Nature Conservancy in purchasing channel migration zone easements in the county. There exists a growing body of science that shows their efficacy in reducing flood severity, and preventing property damage, and their success can be observed in states with analogous easement programs, including Colorado, Vermont, and Washington's FPbD program. The research which has been conducted on The Nature Conservancy's channel migration zone easement held on the Yellowstone River could be used to inform a future channel migration zone easement program.

(5) Drought resiliency. Several interviewees expressed concern over the increasing frequency of drought conditions in Montana, often noting that it was an issue that is more apparent in their daily lives than flooding. Incorporating projects that improve water management and irrigation infrastructure would be in line with the goals of Floodplains by Design and would benefit many residents of Missoula County. Additionally, funding for improved water management is frequently available from federal programs such as the Department of the Interior's waterSMART grant.

(6) *Next steps.* If The Nature Conservancy chooses to move forward with a pilot program, a recommended next step would be to establish a working group focused on identifying areas of collaboration amongst local conservation organizations and local government. There were several specific projects and initiatives that interviewees had noted they might be willing to collaborate on, and convening a working group would help reach consensus, explore additional

funding sources, and ultimately advance these projects. While funding remains a significant factor in implementing projects related to FPbD, several interviewees mentioned the Department of the Interior's 'waterSMART' grant program as a potential funding source. The 'waterSMART' program provides a 50/50 cost share to projects aimed at conserving water use, or protecting endangered species, both of which are prospective outcomes of a FPbD program.

Remaining Questions

Over the course of research analysis, there were several questions asked by either interviewees or me which should be answered if The Nature Conservancy chooses to move forward on this program. The following questions remain:

(1) *Where will funding come from?*

If The Nature Conservancy decides to pursue a FPbD pilot, helpful strategies for identifying funding sources for floodplain restoration and easement programs can be found in other states with lower population sizes and smaller state budgets, such as Vermont's River Corridor and Flood Management Program. One funding source which could be applied to many of the initiatives in this program is the US Department of Interiors 'waterSMART' grant program, which is applicable to many of the projects within the scope of a FPbD program. Regarding channel migration zone easements, at least one government representative was interested in identifying funding sources in support of an easement program. Still, to pursue floodplain restoration projects and easement purchases will necessarily require significant funding for its success.

(2) *Where are the gaps in current floodplain regulations?*

There is a need for greater clarity on where the gaps are in protections for riparian areas regarding which regulations significantly constrain what you can do in floodplains, and how they

are applied in each county. Further research into these regulations will help a FPbD program identify the most beneficial projects.

(3) *Political opposition?*

The stakeholder groups selected for this assessment are predominantly groups whose professional identity and interests center around floodplain regulation, floodplain restoration, or US water law in western states. Due to this bias, there is still a need for further analysis of other stakeholder groups and missoula county residents who would be more likely to oppose an increase in regulation of any kind, and particularly of regulations impacting property rights, in order to identify the opportunity for coalition building, as well as identifying political opposition to greater floodplain regulation or restoration work.

Conclusion

The information discussed in the report summarized common themes and key takeaways that came up over the course of research. The objectives defined in the outset of my research were to identify the needs in Montana (specifically Missoula County), determine which aspects of the Washington State program were most applicable, and what potential challenges might arise in implementing such a program. To these ends, I learned that most interviewees feel Missoula County needs to address the increase in development in the State as it pertains to floodplains. Given the widespread concern over Missoula's growing population and increasing development, supporting actions to ensure that development is done right, or not at all when considering floodplains is a broadly supported next step. Furthermore, I learned that several tools utilized in Washington's FPbD program projects could be

applied here in Missoula County including channel migration zone easements and riverbank restoration. The biggest challenge to implementing a FPbD program in Montana is funding availability. It is unlikely that a Montana program could see the level of state investment that is seen in Washington and so identifying funding sources such as the *'waterSMART' grant* for projects under this initiative would be essential to moving forward.

Throughout the interviews, it was refreshing to engage with community members who often expressed a willingness to work together on various aspects of this initiative if it were to proceed. There was a broad consensus that actions should be taken to protect and restore the natural character of our floodplains. Many interviewees expressed a willingness to collaborate on several initiatives related to this objective and it appears communication across organizations and levels of local government could benefit the program's implementation.

In conclusion, a pilot FPbD program in Missoula County could see success. There is a need in Missoula County to address some of its growing pains and ensure that development in or near floodplains is restricted and ecologically responsible. There is interest among local organizations and there are several projects which groups are willing to collaborate on. The ethos of FPbD and its call for nature-based solutions to protect fish habitat, reduce flood hazards, and increase resilience to drought and climate change would likely be embraced in Missoula County, if The Nature Conservancy chose to pursue this.

References

DiCicco-Bloom, B., & Crabtree, B. F. (2006). The qualitative research interview. *Medical Education*, *40*(4), 314–321. https://doi.org/10.1111/j.1365-2929.2006.02418.x

The Nature Conservancy. (2021, June 22). Rivers Run Through It: Study Highlights Rising Global Risk of Freshwater Flooding. *The Nature Conservancy*. Retrieved May 1, 2023, from https://www.nature.org/en-us/newsroom/study-highlights-rising-global-risk-freshwater-flooding/

Oregon State University. (2010, September 14). *Snowball Sampling*. Retrieved May 1, 2023, from https://research.oregonstate.edu/irb/policies-and-guidance-investigators/guidance/snowball-sampling

Jones, J.L. (2011, November). Popular Myths about Flooding in Western Washington. *United States Geological Survey*. Retrieved May 1, 2023, from https://pubs.usgs.gov/fs/2011/3146/pdf/fs20113146.pdf

Martin, J. D., Pederson, G. T., Woodhouse, C. A., Cook, E. R., McCabe, G. J., Anchukaitis, K. J., Wise, E. K., Erger, P. J., Dolan, L., McGuire, M., Gangopadhyay, S., Chase, K. J., Littell, J. S., Gray, S., St George, S., Friedman, J., Sauchyn, D. J., St-Jacques, J., & King, J. R. (2020). Increased drought severity tracks warming in the United States' largest river basin. *Proceedings of the National Academy of Sciences of the United States of America*, *117*(21), 11328–11336. https://doi.org/10.1073/pnas.1916208117

Parker, G., & Andres, D. (1976). Detrimental effects of river channelization. *IN: RIVERS '76, PROC. SYMP. ON INLAND WATERWAYS FOR NAVIGATION, FLOOD CONTROL AND WATER DIVERSIONS; 3RD ANNUAL SYMP. OF THE WA*, *2 , New York, Am. Soc. Civ. Engrs., 1976*, 1248-1266.

Smith, M.P., Ricker, M., Prütz, R., Anand, M., Lehner, B., Flörke, M., Wimmer, F., Mann, H., Weller, D., Mucke, P., Pfliegner, K. (2021): Global assessment of current and future river flooding and the

role of nature-based solutions for risk management. Summary Report. The Nature Conservancy. Berlin. Retrieved May 1, 2023, from https://entwicklung-hilft.de/wp-content/uploads/2021/06/Summary-Report_Global-Riverine-Flood-Assessment.pdf

Tohver, I., Hamlet, A. F., & Lee, S. (2014). Impacts of 21st-Century Climate Change on Hydrologic Extremes in the Pacific Northwest Region of North America. *Journal of the American Water Resources Association*, *50*(6), 1461–1476. https://doi.org/10.1111/jawr.12199

Washington State Department of Ecology. (2023). Floods & floodplain planning. *Washington State Department of Ecology*. Retrieved May 1, 2023, from https://ecology.wa.gov/Water-Shorelines/Shoreline-coastal-management/Hazards/Floods-floodplain-planning

Yellowstone Volcano Observatory. (2022, December 12). How the 2022 Yellowstone flood affected a monitoring site on the Gardiner River. *United States Geological Survey*. Retrieved May 1, 2023, from https://www.usgs.gov/observatories/yvo/news/how-2022-yellowstone-flood-affected-a-monitoring-site-gardner-river

Appendix A

List of organizations interviewed:

Missoula County Water Quality District

Trout Unlimited

Clark Fork Coalition

Five Valleys Land Trust

The Nature Conservancy Washington

Blackfoot Challenge

Mannix Family Cattle Ranch

Montana Freshwater Partners

City of Missoula Government

Missoula County Government

Montana Floodplain Managers

WGM Group

Alexander Blewett III School of law, University of Montana

Appendix B

Interview questions:

1. *Conservation non profits*:
    a. What do you see as the biggest issue regarding floodplain management in Montana right now?
    b. What role does your organization play in floodplain management or restoration?
    c. What are your limits to floodplain management?
    d. Does your organization face any challenges regarding floodplains or their management?
    e. What are your organizations most significant priorities or needs when it comes to management?
    f. Do you have any needs that are underserved or unmet?
    g. Are there any actions you could think of to address those needs?
2. *Government planners:*
    a. What is your government's (city or county) role in floodplain administration?
    b. What is its jurisdiction?
    c. As a planner with the city, can you describe your work to me, and how it relates to floodplain administration?
    d. What challenges does the city face in managing floodplains efficiently?
    e. Are there any limits in your eyes that prevent the city gov't from more meaningfully managing waterways in Missoula county? Inefficiencies?
    f. What actions in your eyes would be the most beneficial thing for a conservation non-profit such as the nature conservancy to do to improve the function of our floodplains in town?
3. *Engineering/ development:*

a. In what ways do floodplain regulations impact your work?

b. How often and in what ways do floodplain regulations come up over the course of planning a new development?

c. Do you find these regulations to be effective against degradation or adverse impacts to the water system?

d. Are there ways that you see floodplain regulations could be improved to more efficiently protect water systems?

4. *Ranchers*:

    a. This may be obvious, but: As a landowners and Rancher, How do you manage your properties' water?

    b. What is the water primarily used for?

    c. What are the top priorities for water use?

    d. What are your biggest needs regarding wate for a successful operation?

    e. Are you at all concerned with flooding?

    f. Drought seems to be the biggest concern regarding water use, I'm curious what strategies you might be using in order to conserve and store water?

    g. Are there any floodplain restoration efforts that have been undertaken at your property, and could you explain them?

5. *Law professor:*

    a. What do you see as the biggest issue regarding floodplain management in Montana right now?

    b. What historically has been the county's role when it comes to floodplain administration here?

c. What has been their stance towards development, policies towards controlling the river, general stances towards the balance between leaving the river be, and controlling its floodplain for the benefit of the city surrounding it?
d. What is the extent of local governments regulatory ability, what are the most common tools they can use, what issues or roadblocks do local gov's encounter when attempting to regulate floodplain development?
e. What legal strategies are there to help support a natural floodplain in the face of development?

Portfolio Component 4

Comparative Analysis of Research Assistantships with OneMontana and The Nature Conservancy

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Over the course of the Spring and Summer of 2022, I assisted the organizations *OneMontana* (1MT) and *The Nature Conservancy* (TNC) in assessments into proposed policies for each group respectively. For the Nature Conservancy, I conducted a situational assessment into floodplain policy. For OneMontana, I conducted a stakeholder assessment in support of a landowner resource program. The two assessments completed over this period of time ultimately constituted the bulk of work for my practicum in Natural Resource Conflict Resolution. Though the purpose of the two initiatives my assessments were in support of were different in their scale and focus, the process of information gathering and assessment were similar. Having completed these assessments concurrently over the course of the year, I am presented with a unique opportunity to reflect upon the process of conducting a needs assessment within the context of different organizations and topics. Beyond examining the similarities and differences between these two assessments, I will be reflecting upon the process itself, assessing the utility of needs assessments in supporting stakeholders in communicating needs, and possible solutions to complex issues.

In the Spring of 2022, I began assisting two organizations, One Montana and The Nature Conservancy Montana, in conducting assessments of two prospective programs. One Montana sought to expand upon their existing Landowner Education and Resource Network (LEARN) program to improve access to succession planning tools for farmers and ranchers in the state. The Nature Conservancy (TNC) sought to understand the viability of implementing a program analogous to their Washington state branch's "Floodplains by Design" program, which centered around floodplain restoration and conservation projects. Though these programs differ in goals and content, the processes of information gathering, analysis, and synthesis were similar. Through my work with these two organizations I gained experience arranging, designing, conducting, and synthesizing information from interviews with a range of stakeholders into summary reports.

One Montana established their LEARN program with the goal of providing tools, resources and case studies to support private landowners in sustaining profitable working lands and preparing for succession. By the time I began my research, One Montana had identified that numerous tools and resources currently existed to assist landowners in succession planning. However, barriers remained that limited the number of landowners that were accessing these resources. One Montana sought my assistance to help understand the barriers that landowners experience in accessing succession planning resources, and to identify and consolidate available resources for succession planning into a single location.

For over a decade, TNC Washington has been involved in the Floodplains by Design (FPbD) program. Initially a sight scale salmon habitat restoration program, by the time I began research for TNC, it had transformed in its scale and goals to become a regional floodplain restoration program, with the objectives of reducing flooding and related damage to infrastructure, as well as improving habitat for wildlife across the state of Washington. To better understand Washington's FPbD program, and identify stakeholder needs in Missoula County to assess the benefits of a FPbD program, TNC enlisted my help in conducting a situation assessment in Missoula County.

Differences in organizational culture support and structure:

Between the two experiences I've had working with 1MT and TNC, some of the most notable differences lie in the management structure, and social dynamics of each project. Broadly speaking, my work with TNC was more solitary, as I was the sole worker on the project and reported to a singular manager for the majority of my experience. In contrast, I was a member of a two person research team at 1MT, and we reported to a management team of two. This differing research team structure of solo versus a small

team led to several differences in dynamics. In reflection, I found that there were several benefits to working within a small team when compared to working by myself.

Working within a team provided a degree of structure that allowed for social interactions and affirmations which ultimately made us more efficient. The opportunity to have frequent and brief check-ins with coworkers throughout the workweek, despite taking up space in our workdays, allowed us to constantly clarify the direction and goals of our research. Often conversations around minor questions about the process and content of our interviews allowed me to affirm I was on the right track. Additionally, informal meetings allowed us at times to commiserate about common issues that came up throughout our interview process, which then allowed us to exchange advice around tools that have led to more meaningful and insightful interviews. I find that this aspect of teamwork was immensely helpful, though it can at times be hard to quantify. On a personal level, I find I operate best when I am able to frequently ask questions and gather information to ensure I am on track with my work– so being a member of a small team where our managers were open and available for brief conversations allowed me to feel comfortable and competent throughout the process.

When working alone and reporting to a singular manager, I was more inclined to temper my questions for the sake of efficiency, and out of recognition that my manager was dealing with a significant workload beyond my project. This in turn provided both an opportunity for personal growth, and a greater degree of uncertainty. While it did provide the opportunity for me to practice self directed leadership and prompt me to think more deeply about the direction I wanted the research to take, in practice it often slowed down the progress I made in my research. In recognizing that as a worker I thrive when I am able to freely ask clarifying questions, the inability to do so often caused me to procrastinate on work objectives. I consider this to be a beneficial experience that has allowed me to recognize that

self-directed work in which I am solely responsible for my tasks and objectives is an area where I can grow considerably. At the same time, I found that my need for more hands-on guidance and conversation as a worker was not consistently being met. In reflection, I believe that the level of openness I perceived from my team and management with 1MT was a result of the initial structure they provided during the information gathering process, and their routine communications that engaged with the work I was doing. While there were routine check-ins with TNC, our communication was often brief, and my manager did not often inquire about the specifics of my work, but rather offered to help in a very general sense– because of these vague offers of support without specific objectives or goals from management, I often felt unsupported as I made my way through the new and unfamiliar process of conducting a needs assessment.

Ultimately, the largest opportunity for my experience with TNC to have been improved would have been through greater support in the form of hands-on mentorship with river management and water resources experts within the organization. Had my management had the capacity to spend more time working with me one-on-one, this would have provided greater opportunities for me to develop an understanding of the complexities of river management and the Floodplains by Design program before beginning my research. I would also like to recognize that this was the original structure of my fellowship with TNC, however unforeseen changes to staff led to me being assigned to a different employee within the organization. The two employees I was initially intended to work with, Sierra Harris and Nathan Korbe, were by all accounts both experienced in river conservation, and invested in the Floodplains by Design program in particular. Despite this unexpected staff change, I found my experience to be largely positive and allowed me to grow in a range of different competencies. In particular I gained valuable experience in data organizing and tasks management, as well as soft skills related to conducting interviews and connecting with interviewees.

The effect of different contexts on the process:

Another key distinction around my work with OneMontana and The Nature Conservancy lies around the context of their respective research objectives. In the case of OneMontana, I was tasked with adding to a body of research that had existed within their organization around the immediate issue of succession planning in the United States. The scale of the generational transition in agriculture currently underway, the current available resources, and the limited cases of successful land and business transitions within local communities have all contributed to this being a very immediate issue to be addressed. The existing need for greater assistance for landowners meant that the research I contributed to carried a different weight when compared to the assessment I conducted for the Nature Conservancy. In the case of The Nature Conservancy, I was tasked with investigating the potential of implementing a policy which saw success in a different US state, and so my assessment focused on identifying how it might address the needs of landowners, NGO's, and government planners here in Montana. The key distinction was that my assessment focused on information gathering to identify potential problems or grounds for collaboration, without a clear and immediate issue. The difference in context between the two had several impacts on the work I was doing.

Given the gravity of the context around succession planning, I had begun my research with OneMontana with a small number of clearly defined goals for my information gathering. The organization sought to identify available resources to assist landowners in land and business transitions, and to understand how they could compile these resources to assist the largest number of landowners through the process. This clarity allowed us to design several sets of interview questions for different stakeholder groups that needed little adjustment over the course of our research. Additionally, the process of assessing and

reporting on our findings was made easier by our interview notes often being related to a small number of topics.

In the case of my research for TNC, I was tasked with understanding how the Floodplains by Design program operated in Washington, and how it could be adapted for Montana. Ultimately I felt this assessment led me to investigate a wide array of criteria that could be unified under the label of "water conservation". The absence of urgency in Montana, the scale of the Washington State program they sought to emulate, and the difference in needs here in Montana had several impacts on the needs assessment process. In contrast to the interview questions designed for 1MT, I found that my interview questions evolved over the course of my research for The Nature Conservancy as the range of actions that could be applied to Montana's context became clearer. Additionally, I was often left with the feeling that my research could go on indefinitely. The range of stakeholders and the complexity of river management in America requires a significant amount of research to understand the subject well enough to make appropriate recommendations. In reflection, this difference in clear objectives and streamlined interview design is due in large part to the fact that I had an existing body of research to build off of with 1MT, whereas I was starting from scratch with my research into the Floodplains by Design program.

Further reflection and key takeaways:

I found the process of conducting assessments for both organizations to be informative and rewarding. Having the opportunity to speak with such a wide array of professionals in both subjects has allowed me to understand both succession planning and river conservation in a way that cannot necessarily be gleaned from class or text. Learning about an issue from the backgrounds and life experience of

stakeholders provided me with an understanding of the complexities surrounding each issue. One of my biggest takeaways from conducting these assessments was the importance of the role I inhibited. To conduct a situation assessment around an issue is to be given the unique opportunity to bridge gaps in communication. It appears that there just aren't enough opportunities for a diverse group of stakeholders to sit down and realize they are having the same problems, or that they are considering the same solutions. In conducting these assessments, as the assessor I have the opportunity to sort of communicate for these stakeholders, and bridge gaps to promote solutions that interviewees themselves have proposed.

If I were to go through these experiences again, there are several things I would do differently. More than anything, I found the most impactful practice throughout this process involves organization. Establishing organizational systems around contact information, information gathering and analyzing, keeping objectives and hours up to date go a long way in making the information gathering and analyzing process easier and more efficient. I found that I was constantly struggling against my own unstructured nature to keep my information organized and my objectives up to date. There were periods of time where I found myself failing to organize my research adequately, and I ultimately experienced the consequences when I began analyzing my data. Had I prepared myself before beginning with greater structure to organize information into, and persistently arranged information as I gathered it in my interviews, I would have cut down on time spent looking for data and reviewing interview notes. Moving forward, creating systems to plan my work and consistently organizing my data throughout the assessment process is the biggest area of growth for me.

In the future, I plan on adjusting the way that I record interviews. One of the biggest challenges I experienced throughout my interviews was remaining present in conversation with my interviewee,

while taking notes and recording key takeaways from our conversation. There was a constant balance being struck between the two acts, and on several occasions, I felt interviews fall short of their full potential because my attention was not focused on the story the interviewee was telling me. After several discussions held in our practicum class, I found that if I were to do this again, I would record my conversations and transcribe them after for analysis.

As I reflect upon these two experiences, I find that the opportunity they both provided me to learn about the needs assessment process is what I valued most about them. Throughout this work I've had the space to put theoretical knowledge from school into practice. Through experiencing the assessment process, I've been able to work through common challenges and identify what actions and organizational structures allow me to work efficiently. Beyond that, I've had the opportunity to understand myself better. In carrying out interviews with a wide range of people across the state, I've learned more about my own personal style of interviewing, how I hold conversations, and really where I fit into the picture as an east coast transplant trying to help address complex issues in a foreign land.

To me these experiences also reflect the benefits of being open to new experiences. I had sought out work experiences that were in line with the NRCR practicum requirements without any specific expectations about what type of work I would necessarily be doing. That both experiences I had over the summer ended up revolving around a similar process of information gathering and conducting assessments was entirely unplanned. Upon completing these projects I now know that many aspects of this type of work appeal to me in a professional and personal way. I am so grateful for the opportunity to listen to the stories of so many Montanans with the hope that I can assist them through amplifying their concerns and needs to organizations and their surrounding communities.

Portfolio Conclusion

I came to the University of Montana to expand my knowledge of environmental policy and justice, conflict resolution, and community activism. To that end, the Environmental Studies and Natural Resource Conflict Resolution programs have provided me with ample education in each of those subject areas. Having taken a range of classes on conflict resolution, environmental justice, policy analysis, and ethics, I've been provided a more concrete framework to understand environmental issues, and design more effective actions to combat them. Over the course of my education in the Natural Resource Conflict Resolution Program, I've learned about the multiplicity of tools and concepts that can be utilized to design an effective collaborative process.

Furthermore, both programs have provided for me the opportunity to plug into local issues that relate to both public policy and conflict mediation, and contribute to meaningful and positive change in Montana. These work experiences have been compiled into my portfolio, and have provided me with the knowledge, skills, and processes to consider environmental policy, social equity, and the deeper social and political dynamics at play in my professional areas of interest. My education in the Environmental Studies and Natural Resource Conflict Resolution programs has prepared me well for a world that is increasingly willing to identify and address the intersectionality of environmental and social issues.

The research and knowledge I've gained through the literature review component has broadened my understanding of the utility, benefits, and limits of the use of conservation easements in private land conservation. Additionally, over the course of research for my review I have gained greater understanding of how easements affect local water resources, and how they can be designed to address complex resource issues.

My second portfolio component offers a reflection that highlights the wonderful experience I had working with OneMontana. I found the experience of working on a small research team to be incredibly rewarding. It allowed me to understand the impact that having co-workers and a multi-person project team can have on time management, personal accountability, and problem solving. Moreover, this work experience allowed me to learn from first hand experiences about the significance and complexity surrounding agricultural land and business transitions in America. Additionally, this research allowed me to gain experience contributing towards public policy by means of improving non-governmental resources for landowners.

The experience of working on that research team to conduct a situation assessment was contrasted by the work I did simultaneously for The Nature Conservancy. During my research into the Floodplains by Design program, I conducted research individually, and reported to a singular manager. More than anything this experience provided me with an understanding of the level of organization needed to be successful when conducting research. In addition to the growth that I experienced conducting a situation assessment, the conversations I had over the course of my research gave me a greater understanding of floodplain policy, floodplain restoration, drought management, as well as learn about western water rights.

My time working with The Nature Conservancy and OneMontana benefitted me professionally in several ways. Both final reports offer examples of my work conducting situation and stakeholder assessments which showcase my ability to gather information through interviews, and synthesize what I've learned into comprehensive organizational reports. In addition to exemplifying my writing competency, the two reports provide insight into the background and contextual knowledge I gained of conservation easements, succession planning, and water resource conservation both nationally and in Montana. In

working with both organizations I was given a large degree of autonomy, through which I developed a greater understanding of common challenges, and helpful practices when designing, conducting, and analyzing interviews. I found in particular that remaining organized throughout the information gathering process was critical to an easier and more effective analysis when writing my final report. Additionally, I found frequent reflection upon my work plan and project objectives allowed me to identify next steps when work progress had slowed down.

In completing the fourth component of my portfolio, I was able to take the time to analyze and consider what aspects of my work with OneMontana and The Nature Conservancy I found negative, beneficial, and areas for me to continue to grow in going forward. Upon completing the reflection, I gained greater clarity about myself as a worker. For example, I gained greater awareness that I enjoy the social support and connections involved in working on a team, particularly when compared to the individual research experience I had with The Nature Conservancy. Developing this self-awareness around my own work habits is valuable information as I move on from graduate school and reenter the workforce with an awareness that I thrive in a position that involves working on projects with others. The completion of this reflective paper gave me the opportunity to pull greater meaning from each work experience beyond the work description and organizations

Working on this portfolio has given me the opportunity to apply the concepts taught to me throughout my graduate education, as well as the opportunity to learn more about a variety of tools utilized in private land conservation. These experiences have provided me with a range of skills and background knowledge that will contribute to my success in the future. My goal upon leaving graduate school is to find myself in a position where I am able to facilitate multi-party natural resource disputes. I hope to be able to provide these facilitation services while remaining employed by either a government resource

management service such as the US Forest Service or Fish and Wildlife Service, or a non-profit focused on land and resource conservation such as The Nature Conservancy, or a local land trust. Regardless of what organization I ultimately work for, I am excited about the possibility of applying my education in public policy, environmental justice, and conflict resolution in the future in order to resolve disputes, and promote more equitable resource management. Wherever I may end up, I feel more prepared to more deeply understand the issues impacting the community and landscape around me, and more prepared in how to address them.