STRUCTURAL AND FUNCTIONAL LOSS OF WETLANDS IN MONTANA:

RETHINKING COMPENSATORY MITIGATION STRATEGIES FOR THE NATION

by

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DEDICATION

I would like to dedicate this paper to my Grams - for teaching me how to love the Earth, to work *with* the land, and to never be afraid to stick my toes in the mud. Though you are no longer with me, your soul and everlasting appreciation for all living things will always guide me in pursuing my wildest of dreams and specifically in being a steward to the environment.

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GLOSSARY

To facilitate an understanding of the shortcomings in wetland mitigation, it is important to provide clear, specific language on the main concepts surrounding mitigation strategies. These vital terms are defined below.

TERM	DEFINITION
Credit	A trading medium that is used to represent ecological gains within a wetland mitigation bank site. Credits are most commonly measured in functional units, acreage, or habitat units.[1]
Contributing basin	The drainage area, including both surface and ground water, of a given wetland or aquatic resource.[2]
Bank site	The physical geographic location or acreage that is established, restored, or preserved for the purpose of providing credits.[3]
In-kind compensation	The restoration, enhancement, preservation, or creation of a wetland type similar in function and structure to that of the original impacted wetland.[4]
In-lieu fee program	A program that supports the restoration, enhancement, preservation, and/or restoration of aquatic resources through governmental or non-profit funding to fulfill compensatory mitigation requirements.[1]
Out-of-kind compensation	The restoration, enhancement, preservation, or creation of a wetland that is considered a different type than the originally disturbed wetland.[4]

[1] (Thompson et al. 2013).
[2] (Hruby et al. 2009).
[3] (EPA 2015c).
[4] (Environmental Law Institute 2002).

TERM	DEFINITION
Potential credit	The credits that a mitigation bank expects to provide once approved. These credits are not yet available for use to provide compensation for wetland impacts.[1]
Released credit	Those credits that are available and approved by USACE for mitigation projects that are already underway.[5]
Service area	The designated geographic area in which a bank or in-lieu fee program can provide compensation for wetland impacts.[6]
Umbrella bank	A regional bank with numerous bank sites that are sponsored by a single entity.[4]
Universal credit	Each credit at a specific bank represents the same unit regardless of wetland habitat type of function.[1]
Watershed approach	An analytical framework that considers ecological processes throughout the entire watershed in which the impacted wetland exists.[3]
Watershed plan	A document that provides both management and assessment information for an area that has been geographically defined as a watershed – this plan includes resources related to development, implementation, action, and the participants involved.[7]
Wetland mitigation bank	A resource area with a wetland, stream, or aquatic resource that has been established, restored, enhanced, or preserved to fulfill compensatory mitigation requirements.[3]

[5] (TNC 2023)
[6] (Thompson et al. 2013, EPA 2015c).
[7] (EPA 2008)

ABSTRACT

Wetlands provide vital services that contribute to the health and well-being of humans. Yet, throughout the history of the United States, these ecosystems have been disturbed, drained, filled, and destroyed in the midst of urbanization and land conversion. Despite the nation's longstanding goal of no net loss of wetlands, there continues to be a need for improved standards and guidance for compensatory mitigation of wetlands today. Current legislation surrounding compensatory mitigation emphasizes a watershed approach but fails to use clear language in defining a 'watershed', which has allowed for the local loss of wetland functions and services. Therefore, to highlight the shortcomings of compensatory mitigation regulations, I analyze current and proposed mitigation options in the Missouri Headwaters HUC-6 located in Montana by primarily using data from the Regulatory In-Lieu Fee and Banking Tracking Information Systems (RIBITS). Additionally, I compared the Upper Missouri Mitigation Bank in Twin Bridges, Montana to the proposed Indreland Audubon Wetland Preserve in Bozeman, Montana. Through this comparison, I found that current compensatory mitigation legislation is allowing for the consolidation of impacted wetlands across Montana into a few, scattered mitigation sites across the state. Limitations in mitigation options are leading to the permanent loss of functions of the original wetlands in their immediate environments and watersheds. These results demonstrate the need for a more localized watershed approach. Accordingly, I recommend that Gallatin County officials set aside land for wetland mitigation as soon as possible, as urbanization and inflation will only continue to increase the cost and value of land, and thus the cost of wetland credits. Ultimately, a redefined wetland approach is needed across the nation to ensure that wetlands impacts are being properly mitigated and that the goal of no net loss is being met.

INTRODUCTION

WETLAND LOSS ACROSS THE NATION

Despite the numerous services that wetlands provide to maintain human well-being, these ecosystems continue to disappear rapidly throughout the United States. The National Wetlands Inventory (NWI) estimates that less than half of the nation's original wetland acreage remained by the early twenty-first century compared to the 344 thousand square miles that once existed before the seventeenth century (Dahl 1990; EPA 2013a). Although some wetland loss can be attributed to natural causes, such as upstream erosion or severe storms, most of the disruption and destruction to these aquatic resources can be linked to anthropogenic actions. Land conversion (i.e., urban development and agricultural practices) and hydrologic alterations (i.e., filling or draining riparian areas, diversion of water flow, dredging, etc.) stand as two of the most devastating threats to wetlands in the United States (EPA 2001; Xu et al. 2019). Impacts such as these should be regulated under federal, state, and local statutes that enforce the protection and preservation of these ecosystems. Yet, the continued loss and destruction of wetlands indicates that the current state of wetland protection and regulation seemingly does not align with the intent of the Clean Water Act (CWA) and subsequent legislation.

Wetlands differ in soil composition, climatic influences, water chemistry, vegetation, hydrology, and most importantly, levels of human disturbance (EPA 2015a; Lomnicky et al. 2019). The non-uniformity of influencing features makes each wetland unique not only in its appearance and biotic inhabitants but also in its function. Over time, revisions to wetland delineation methods have attempted to account for ever-changing variability in wetland characterization. Despite these improvements, delineating a wetland ecosystem for permitting purposes remains complex and challenging. Even with strict criteria in place to identify the

boundaries of these ecosystems, it is still critical to consider that wetlands provide vital ecological functions that support systems at multiple scales. Since wetlands are usually categorized as Critical Transition Zones, they cannot be thought of as independent systems in many cases, as they are often the intermediaries in a hydrologic gradient between upland and open-water ecosystems (Mitsch and Gosselink 2000; Wakeley 2002). Therefore, wetlands play key roles in the functionality and health of much larger watersheds, which insinuates that the disruption or destruction of a wetland inevitably leads to loss of function and stability outside of the delineated boundaries. Furthermore, it is crucial to acknowledge that the loss of these functions will involve a coupled loss of services that sustain the well-being of humans (Kleindl et al. 2018).

To adequately consider the needs of the watershed that the impacted wetland lies within, current regulations emphasize a 'watershed approach' that requires compensatory mitigation projects to exist in locations where functional restoration will be ecologically relevant (GPO 2008). The Ramsar Convention's Scientific & Technical Review Panel (STRP) defines 'ecological relevance' as the ability of an indicator or measure to predict future ecological change (Ramsar Convention STRP 2012). Determining ecological relevance of measured or expected biological responses is crucial in being able to predict both risks to a wetland ecosystem and the success of the proposed restoration project (Pascoe 1993). The watershed approach basically demands that permitting authorities identify and assess the service area (i.e., watershed, ecoregion, geographic area) where the mitigation bank or in-lieu fee program will be authorized as appropriate compensatory mitigation for wetland loss or disturbance. It is important to note, however, that watershed scales are appropriately sized to ensure that compensatory actions will offset adverse environmental impacts within that entire service area,

(GPO 2008). This means that there is no set scale for the watershed or geographic area that is considered in mitigation projects.

Watersheds are delineated by the U.S. Geological Survey (USGS) using a national system of hydrological unit codes, or HUCs (USGS 2018). The HUCs are arranged in a Water Boundary Dataset (WBD) that uses six hierarchical levels, with each level corresponding to a code that builds from the 'parent' HUC in a preceding level (Table 1). The average square miles[8] of each HUC level is depicted in Table 1, but it should be noted that the size of HUCs at any level can vary significantly by as much as 10 times the average (Omernik et al. 2017). The drainage areas within the WBD dataset are nested within each other so that larger drainage areas are made up of multiple smaller drainage areas – essentially, the smaller the code, the larger the contributing basin (Subcommittee on Spatial Water Data 2017). Within this system, a HUC-2 (region) is the largest drainage area, and a HUC-12 (sub-watershed) is the smallest drainage area. Because USGS determined that watersheds fall within the fifth level of the hierarchy (or HUC-10), this is often the service area size that is considered in a 'watershed approach' for compensatory mitigation projects. However, there is evidence that wetlands play critical roles in much larger drainage areas, such as a HUC-4 (subregion), HUC-6 (basin), or HUC-8 (subbasin) (EPA 2015b). In many cases, the USACE has even determined that impacted wetlands more appropriately fall within these levels when considering service areas (USACE and EPA 2009). With such great variability in definitions of watersheds and their size, it is difficult to apply mitigation at a consistent watershed scale. Thus, regulatory legislation consequently loses its effectiveness in adequately protecting these resources by allowing for confusion and mismanagement to occur.

[8] Since all mitigation efforts follow U.S. based regulatory guidance, all measures are in imperial units.

Table 1: The six levels of hydrological units (HUs) and their respective size as outlined in the Water Boundary Dataset by the U.S. Geological Survey (USGS 2021; Jones et al. 2022).

Hydrological Units					
Name	**Level**	**Digits**	**Average size (square miles)**	**Approximate # of HUs in the U.S.**	**Code examples**
Region	1	2	177,560	22	10 Missouri
Subregion	2	4	16,800	245	1002 Missouri Headwaters
Basin	3	6	10,596	405	100200 Missouri Headwaters
Subbasin	4	8	700	~ 2,400	10020008 Gallatin
Watershed	5	10	227	~ 19,000	1002000809 Upper East Gallatin River
Subwatershed	6	12	40	~ 105,000	100200080904 Bozeman Creek

WETLAND MITIGATION CHALLENGES IN MONTANA

Among many states that have experienced accelerated wetland loss due to rapid urbanization, the State of Montana specifically offers insight into the undeniable faults of the current compensatory mitigation legislation and guidance for impacted wetlands (MDT 2010). Wetland mitigation shortcomings in Montana are evident in the recent wetland loss that has occurred in Gallatin County due to urbanization and development. Gallatin County, and specifically the city of Bozeman, are among the fastest-growing areas in the state. According to the Gallatin Local Water Quality District, less than 38% of the original wetlands in Gallatin County remain today due to influences from both agriculture and development (GLWQD 2016). Gallatin County is located within the Missouri Headwaters HUC-6 basin and is within the service area of the Upper Missouri Mitigation Bank. This bank is the only wetland mitigation

bank with available credits in this basin and the closest in-lieu fee program with available credits is located in another HUC-8 service area. This leaves responsible parties with two options: (1) to purchase credits from the mitigation bank in Twin Bridges, located 80 miles away and 3 HUC-10 watersheds away from Gallatin County; or (2) to obtain a permit for permittee-responsible mitigation (Nixon 2020). Those responsible for filling or disturbing federally protected wetlands in Gallatin County are more commonly choosing the first option, which means that wetlands lost in this area are being replaced in Twin Bridges (SAS 2022). With the Upper Missouri Mitigation Bank located in an entirely different river drainage basin, wetland affects in Gallatin Valley are not being appropriately mitigated in the entirety of their respective watershed when credits are purchased at this bank. The wetlands in the Gallatin Valley provide flood abatement, water filtration, wildlife habitat, and many other valuable services. When local wetlands are replaced with constructed wetlands in Twin Bridges, many HUC-8 subbasins away from the original impacted wetlands, those services are shipped away as well (Figure 1).

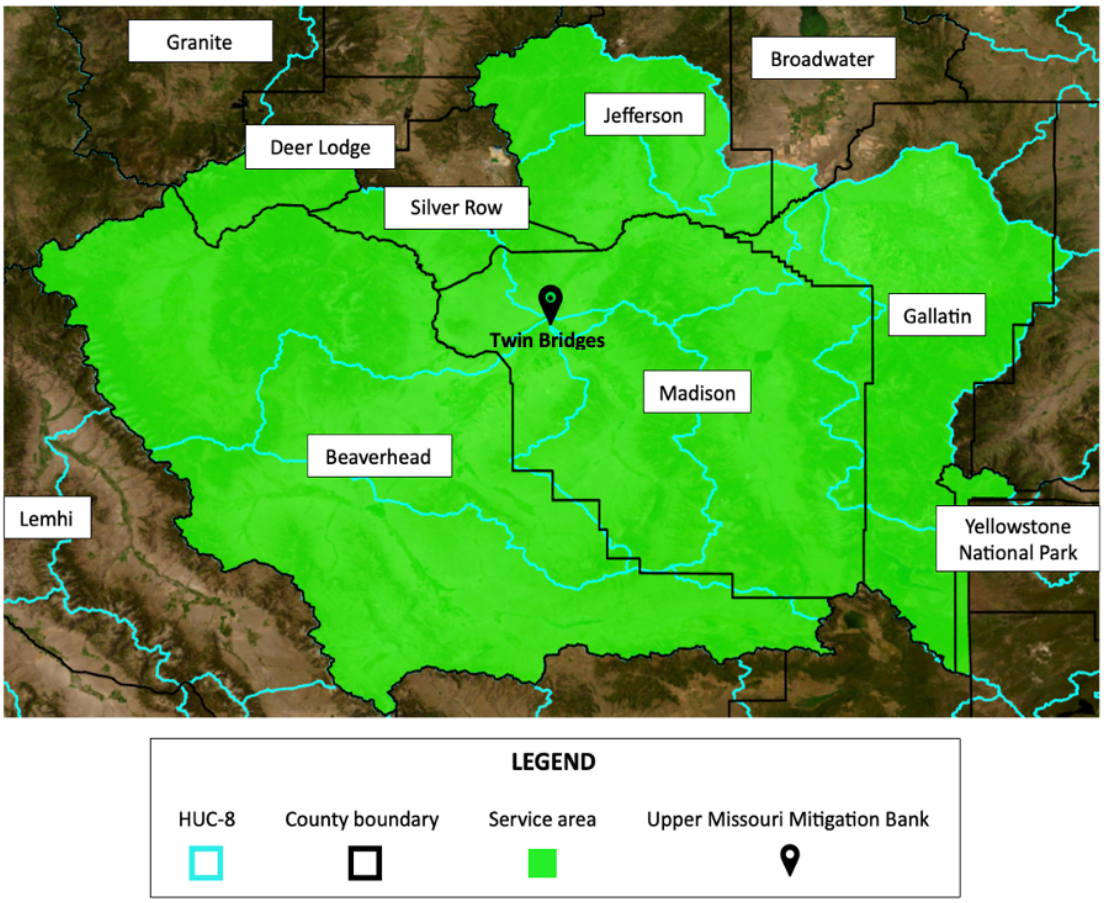

Figure 1: The location of the Upper Missouri Mitigation Bank in Twin Bridges, Montana in relation to Gallatin County, Montana. The green service area outlines the Missouri Headwaters HUC-6 basin (USACE 2023a).

Compensatory mitigation legislation maintains that wetland protection is the priority, but regulating agencies are granting clemency for actions knowingly contributing to the functional and structural loss of wetlands in Montana and beyond. The loss of wetlands within Gallatin County supports the obvious need for innovative approaches that will accommodate both economic growth and the local protection of aquatic resources. To ensure that wetland loss is being adequately restored within close proximity to wetland impacts, I argue that compensatory mitigation strategies need be reconsidered. Ultimately, by redirecting the goals of compensatory mitigation, in Montana and throughout the entire nation, the overarching goal of no net loss of

wetlands can be achieved. To reinforce the need for these modifications to current compensatory mitigation legislation, I aim to answer the following question:

> What is the best way to use the 'watershed approach' to define site/service area selection given the vague definitions of a watershed that exist in current wetland legislation?

Here I will analyze the existing mitigation options available in Montana and use the proposed Indreland Audubon Wetland Mitigation Bank within the Bozeman, Montana city limits as a case study to address this question.

THE HISTORY OF FEDERAL WETLAND LEGISLATION & REGULATION

ESTABLISHING A NO NET LOSS MINDSET

The U.S. Congress passed amendments to the Federal Water Pollution Control Act of 1948 to better protect and restore waterways in the United States – these amendments became commonly known as the CWA of 1972 (EPA 2013b). Among these amendments was the creation of Section 404(b)(1) of the CWA, which established a program to regulate the discharge of dredged or fill materials into wetlands and similar bodies of water using a permit review process (Kusler and Opheim 1996). The U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA) are the two federal agencies that largely oversee federal wetland regulations and their permitted impacts. In 1990, the USACE and EPA signed a Memorandum of Agreement (MOA) that explicitly allocated their distinct roles and intent to implement the objectives of the CWA Section 404(b)(1). The two agencies agreed to address mitigation in a specific, sequential order so that their actions would adhere to the goals of the CWA Section 404 when dealing with wetland disturbance (EPA 2015c). The mitigation

sequence states that impacts must first be *avoided* – if this is not an option, unavoidable impacts must be *minimized* as much as possible to limit adverse effects on a wetland. All the minimized, unavoidable impacts on wetlands then require *compensatory mitigation* to replace all wetland and aquatic resource functions lost in a given watershed (EPA 2008).

In addition to Section 404, a goal of 'no net loss' (NNL) of wetlands was introduced during the National Wetlands Policy Forum of 1987 and was later incorporated into the CWA as an administration policy (Sibbing 2004; Ruhl and Salzman 2022). The original aim of the NNL policy was to ensure that degradation and destruction to a wetland system is met with a restoration project that adequately restores that area to its previous condition or a wetland of similar structure and functionality is created in its place. The Compensatory Mitigation for Losses of Aquatic Resources (2008), now commonly referred to as the Compensatory Mitigation Rule (CMR), was created to outline the performance standards and criteria that must be met to abide by the objectives of Section 404 and the NNL policy. The CMR focuses on the following methods of acceptable compensatory mitigation actions: (1) permittee-responsible compensatory mitigation; (2) mitigation banks; and (3) in-lieu fee mitigation (GPO 2008). The USACE typically prefers that mitigation banks or in-lieu fee programs are the chosen methods of compensatory mitigation since these options are regulated by the agency and therefore may reduce the chances of a failed mitigation project (USACE 2008). Essentially, compensatory mitigation is a crucial tool that allows for land development to occur while still achieving the long-term national objective of NNL of aquatic resources and their functions (Ruhl and Salzman 2022).

The CMR additionally declares that compensatory mitigation cannot substitute the preceding mitigation steps of avoidance or minimization, regardless of the quality or amount of

the chosen mitigation action (GPO 2008). Yet, wetland loss across the nation serves as evidence that the first two steps in the mitigation sequence are often ignored. In fact, the USACE is well-known for approving most §404 permits that are submitted for projects affecting wetlands and many of these permits are even expedited through a general permit process (Murphy et al. 2009). According to the USACE, the number of permits denied nationwide is less than 1% of total permits submitted for approval (USACE 2023c). The regulatory agencies claim that mitigation actions require the restoration of a wetland to its original state, but there is little evidence to suggest that mitigation projects are adequately restoring the functional and structural value of these ecosystems – which ultimately implies the same loss for the greater watershed area of each lost or disturbed wetland.

A TRANSITION IN MITIGATION PREFERENCES

The MOA signed by the USACE and EPA in 1990 explicitly states that compensatory actions "should be undertaken, when practicable, in areas adjacent or contiguous to the discharge site (on-site compensatory mitigation)" (EPA and USACE 1990). This method of compensatory mitigation is commonly referred to as 'on-site, in-kind' mitigation. Before the development of the CMR in 2008, this form of permittee-responsible mitigation was often acknowledged as the more preferred form of compensation for wetland impacts in comparison to 'off-site, out-of-kind' mitigation[9] (EPA and USACE 1990). With great uncertainties surrounding the success of wetland creation or reconstruction, it was believed that on-site, in-kind mitigation would increase the likelihood of success in restoring lost or disturbed functions of aquatic resources.

Even though the USACE §404 permitting process has largely remained the same since it was established in 1972, federal guidelines for permitting no longer claim that on-site, in-kind

[9] Off-site, out-of-kind mitigation includes utilizing wetland mitigation banks and in-lieu fee programs.

mitigation should be preferred or granted automatic approval (National Research Council 2001). In 1990, the Florida Department of Natural Resources released a study that brought attention to the limitations of on-site, in-kind mitigation practices. Since this form of permittee-responsible mitigation did not involve the management or restoration of the larger watershed in which the altered wetlands were located, long-term benefits were not being provided for the larger aquatic ecosystem (Liebesman and Plott 1998). To improve mitigation methods, the EPA and USACE jointly released the Federal Guidance for the Establishment, Use and Operation of Mitigation Banks in 1995. This document was centered on the idea that on-site, in-kind permittee-responsible mitigation held a higher risk of failure in restoring functional and structural losses of aquatic resources (Liebesman and Plott 1998). In comparison, it was believed that mitigation banks and in-lieu fee programs could be applied to larger, contiguous wetland ecosystems that would provide more of a buffer to prevent failure. Moreover, banks and in-lieu fee programs were thought to involve more scientific expertise, thus reducing the uncertainty of successful restoration of temporal loss of functions (EPA and USACE 2015).

MITIGATION BANKING, IN-LIEU FEES, AND THE CREDIT SYSTEM

In the past two decades, both mitigation banks and in-lieu fee programs have become increasingly important tools in working toward a no-net-loss of wetlands because both of these options emphasize a watershed approach. Additionally, both of these options are considered attractive to §404 permit holders because there is a transfer of liability for the success of the project from the permittee to a third party bank owner or sponsor (EPA 2015d). When selecting a mitigation site, federal and state agencies attempt to prioritize wetlands and streams performing multiple functions that are significant to a larger watershed. In many cases, it has been deemed most beneficial if the mitigation site is located within the same HUC-10 watershed so that losses

can be offset as locally as possible (NHDES 2021). However, in states that have few mitigation banks or in-lieu programs, using mitigation sites located in the same HUC-10 as an impacted wetland very quickly becomes an unachievable goal. Moreover, the value of banks and in-lieu fee programs are defined in terms of 'credits' that can provide ecological functions to disturbed wetlands. Ecological assessment techniques are required in order to determine how many credits a mitigation site has to offer (EPA 2015d). Credits are commonly measured in terms of acreage or functional units and these credits must be approved by the Interagency Review Team (IRT) (Thompson et al. 2013). The IRT sets specific performance standards that bank sponsors and owners must meet to earn credits, which will be released periodically during the establishment period of a bank or in-lieu fee program as the performance standards are met. It should be noted that the establishment period of bank typically lasts for 10 to 12 years, so it can take a great deal of time for these mitigation options to be operational (Thompson et al. 2013).

In addition to a transferal of liability, permittees choose to purchase wetland credits to potentially save money by paying a one-time fee, which reduces the amount of time to get a permit approved since USACE values mitigation banks as established ecosystems and maximizes the development or project site since a wetland does not have to be created on or adjacent to the site (Fenstermaker 2022a). Despite multiple benefits to the credit system, the drawbacks should be considered as well. Since mitigation banks and in-lieu fee programs can be appealing options to permittees, it is not rare for a mitigation bank to sell out of credits quickly, making compensatory mitigation options quite limited in some areas. An additional limitation to mitigation sites in particular is that banks only have but so many potential credits that can be produced through the enhancement, creation, preservation, or restoration of wetlands on site. Once all of the credits have been released and purchased from that bank, the site can no longer

be used as a compensatory mitigation option. Further, the cost of credits can be incredibly expensive.

Generally, factors such as wetland function, credit demand, impact activity, the availability of alternative compensation methods, service area size, and the location of a bank or in-lieu fee program determine the cost of a credit (Environmental Law Institute 2002; Fenstermaker 2022a). Although the wetland mitigation credit market is everchanging, the valuation of the credit market in the United States has been estimated using the number of approved credits reported in the USACE-established Regulatory In-Lieu Fee and Bank Information Tracking System (RIBITS). This valuation exceeds $100 billion, which illustrates the importance of wetland mitigation in recent years (Coleman 2015, Fenstermaker 2022a). Wetland credits can vary drastically in cost from state to state, with the average cost of most credits falling in the range of $12,500 to $360,000 (Table 2) (MBG 2022; Fenstermaker 2022a). It is important to note that an acre does not equal a credit. Rather, the value of each wetland credit is often determined by the quality and functions of the impacted wetland and the mitigation wetland within the bank, ranging from 0-1 (Fenstermaker 2022b). For example, a wetland that has been deemed low in quality and functions may receive a rating of 0.2. If the hypothetical cost of a wetland credit has been calculated to cost $100,000/credit for that given area, the credit cost would then be multiplied by the rating for that wetland ($100,000 × 0.2) to equate to a cost of $20,000 per credit to mitigate that wetland ecosystem. Even though this is a common method of determining wetland value and subsequent credit cost, some banks and in-lieu fee programs use other characteristics and factors to determine costs. Regardless, many banks and in-lieu fee programs will not determine credit costs until a functional assessment has taken place for the wetland of interest.

Table 2: A general list of wetland credit cost ranges from various states throughout the United States (Dana et al. 2020; MBWSR 2022; MBG 2022; Fenstermaker 2022a; Weaver 2023). For states that further break down wetlands into habitat types or ecological characteristics, the cost of specific habitats is included.

State	Credit cost
Texas	$12,500 - $22,500
New York	$90,000 to $100,000
Louisiana	Coastal wetlands: $60,00 - $100,000 Non-coastal wetlands: $20,000 - $40,000
Iowa	Forested wetland: $65,000 - $95,000 Emergent wetland: $35,000 - $65,000
Washington	$150,000 - $300,000 Salmon-bearing stream: $500,000+
Florida	$30,000 to $500,000
South Carolina	$2,500 - $10,000
Minnesota	$13,000 to $99,000
Montana	$90,000 to $120,000[10]

When looking at Table 2, it is crucial to know that these ranges are not definitive, as they are always changing based on project characteristics, market prices, competition between sponsors, scalability of a project (i.e., using a HUC-6, HUC-8, or HUC-10 watershed scale), and perhaps most importantly, land values (Weaver 2023). This table is merely meant to provide an insight into the general credit system for wetland mitigation options. Banks and in-lieu fee programs can be private, public, or non-profit, and while investing in these mitigation options can be lucrative for sponsors, there is a great deal of risk associated with investment (Spanjer

[10] This cost range is highly variable and only based on available information on ILF credit costs in Montana.

2018). Beyond the potentially high cost of the credits, many states require that credits be further broken down into certain habitat types (i.e., upland wetlands, forested wetlands), where a credit can only be used for the same type of wetland habitat that is disturbed. On the other hand, some states have established their credits as universal, meaning that they represent the same amount of value regardless of habitat type or wetland function. The generality of universal credits can make them more appealing to permittees, causing the demand for this credit type to increase the average cost (Thompson et al. 2013). In addition to categorization of credits, utilizing mitigation banks can also result in the consolidation of wetlands from a broad geographic area (i.e., a HUC-6 basin) to a relatively small wetland ecosystem (Steinhoff 2008). Combining wetland types can lead to a loss of ecosystem diversity across a watershed, which is largely the case in the State of Montana.

THE REALITY OF WETLAND BANKS IN MONTANA

Of the three compensatory mitigation options outlined in the CMR, the purchase of credits from a mitigation bank is a commonly chosen method to mitigate wetland impacts throughout Montana. As previously mentioned, to track mitigation credit availability for both mitigation banks and in-lieu fee programs across the United States, the USACE established RIBITS. Within the State of Montana, the RIBITS system currently recognizes twelve §404 wetland mitigation banks and one Montana Department of Transportation (MDT) wetland mitigation bank – many of which are operational and some that are still pending USACE approval or have withdrawn from the program (Table 3) (USACE 2023a). The service area size for all of the mitigation banks recognized in the RIBITS system is a HUC-6 basin.

Table 3: Available information on wetland mitigation banks in Montana according to the U.S. Army Corps of Engineers Regulatory In-Lieu Fee and Banking Information Tracking System (USACE 2023a).

Name	Bank status	Year established	Available credits (as of November 2023)
MDT Umbrella Bank[11]	Sold out[12]	2012	0
Upper Yellowstone Mitigation Bank	Approved	2011	6.22
Upper Missouri Mitigation Bank	Approved	2013	65.62
Upper Clark Fork - Wetland	Approved	2006	140.99
Missouri-Sun-Smith Bank	Withdrawn[13]	2016	N/A
Running Colter Ranch	Withdrawn	2012	N/A
Middle Missouri River Bank	Approved	2012	3.37
Lower/Middle Yellowstone UMBI (Schwarzkoph-Waage)	Approved	2014	-3.96
Lower/Middle Yellowstone UBMI (Ringling Ranch)	Approved	2014	0
Lower/Middle Yellowstone UBMI (Big Horn)	Pending	N/A	N/A
Lower/Middle Yellowstone UBMI (Crooked Arm Coulee)	Pending	N/A	N/A
West UMBI (South Fork Smith River Bank)	Pending	N/A	N/A
Indreland Audubon Wetland Preserve	Pending	N/A	N/A
Total credits available for purchase in Montana			212.51

[11] The MDT mitigation bank is the only bank on the list that is a 'single client' bank type. The rest of the banks are 'private commercial'.
[12] A 'sold out' status implies that the mitigation bank sold all of their available credits and is no longer operational.
[13] A 'withdrawn' status implies that the mitigation bank is no longer offering credits to mitigate wetland impacts because they did not maintain performance standards.

The primary mitigation bank sponsors that have established, enhanced, or restored bank sites in Montana are Eco-Asset Management (EAM) and MDT. EAM is a consulting group that works to evaluate and develop conservation banks throughout the western states in an effort to address human impacts to aquatic resources (EAM 2015a). Of the mitigation banks listed in Table 3, EAM is the primary sponsor for nine of the banks in Montana but only five of these banks are approved and operational (USACE 2023a). It is important to note that even some of the approved banks do not have credits readily available. MDT has various mitigation sites (or wetland reserves) located throughout the state, but the credits established from these sites are dedicated solely toward MDT construction of transportation infrastructure (i.e., highways, medians, ditches, etc.) (MDT 2010). Basically, these credits are not sold to other parties that are responsible for wetland impacts like those from other mitigation banks. As a result, the approved mitigation banks with credit availability or potential credit availability only span half of the sixteen HUC-6 basins in the state (Figure 2) (USACE 2023a).

Consequently, this consolidates impacted wetlands across the state into a few, scattered mitigation sites. As highlighted in Section 332.3(b) of the CMR, a mitigation bank must be in the same geographic area where the permitted impacts occur to ensure the successful replacement of lost functions and services (GPO 2008). With this being the case, using mitigation banks as a compensatory mitigation option is extremely limited in many areas of Montana. Furthermore, by using a HUC-6 basin service area, those responsible for unavoidable impacts are often required to purchase credits from mitigation banks outside of the HUC-10 watershed of a disturbed wetland (Nixon 2020). Thus, the functions of the original wetland are lost to their immediate environment and HUC-10 watershed forever (SAS 2022).

Figure 2: The distribution of mitigation banks with available credits or potential credits across the various HUC-6 basins, HUC-8 subbasins, and HUC-10 watershed boundaries within the State of Montana (Pankoff and Pitts 2023).

THE UPPER MISSOURI MITIGATION BANK: DOES IT MEET THE NNL POLICY?

EAM established the Upper Missouri Mitigation Bank located in Twin Bridges, Montana in 2013 to serve as both a wetland and stream mitigation bank within the Missouri Headwaters HUC-6 basin (EAM 2015b). According to the USACE RIBITS system, this is the only approved mitigation bank or in-lieu fee program to exist in that specific HUC-6 that has credits available to purchase by permittees (Nixon 2020; USACE 2023a). As a result, this means that all wetland impacts that take place within the Missouri Headwaters HUC-6 basin can only be mitigated

using the following options: (1) to purchase credits from the Upper Missouri Mitigation Bank in which the identified wetlands within that site will be mitigated; and (2) to carry out a permittee-responsible mitigation plan that has been approved by the USACE. As previously mentioned, the latter option is not considered the preferred method by regulating agencies. With a HUC-6 sized service area, this mitigation bank serves the following counties: Beaverhead, Deer Lodge, Gallatin, Jefferson, Madison, and Silver Bow (Figure 1). EAM claims to have established this mitigation bank due to a rise in development activities that were affecting the natural resources in this basin (EAM 2015b).

Within this mitigation site, EAM states that there are approximately 750 acres of wetlands and more than 40 miles of degraded river, stream, and slough terrain (EAM 2015b). The stream/riparian features include the headwaters of the Jefferson River, which is a prominent feature of the Missouri River basin. For this reason, mitigation efforts for this bank site included a great deal of stream restoration, including improvements in bank erosion, channel width, and thermal pollution (EAM 2015b). Since the establishment of the mitigation site in 2013, EAM has provided very few updates on the progress of mitigation within the Upper Missouri Mitigation Bank site. In describing the specifics of the first stages of their USACE-approved mitigation efforts, EAM emphasized their plans to create new meanders, stream reaches, and riparian buffers, all of which would provide stream credits as mitigation efforts were carried out (EAM 2015b). Comparatively, this outline briefly mentioned wetland mitigation plans, including the enhancement of roughly 600 acres of wetlands that existed in a channel migration zone of the Jefferson River and the restoration of 150 additional acres of floodplain wetlands that existed within the mitigation site (EAM 2015b).

The extensive summary of proposed mitigation efforts for stream impacts in comparison to wetland impacts provides evidence that one type of aquatic system was prioritized over another within this bank site. This can also be inferred from the mediocre number of credits that have been reported in the RIBITS system as released or available for wetlands in comparison to streams (Table 4). On top of that, all of the potential stream credits have been released by USACE, while less than half of the wetland credits have been released (USACE 2023b). The CMR states that an IRT should reserve a significant portion of the total credits for a site until that mitigation bank has fully achieved all performance standards that were originally approved by USACE (GPO 2008 sec. 332.8). The Upper Missouri Mitigation Bank has met all performance standards for stream restoration, enhancement, and preservation within the site. However, a 48.3% release of wetland mitigation credits after a 10-year period implies that the bank has a long way to go before meeting the originally outlined ecological objectives and performance standards for on-site wetlands. In a study analyzing long-term compliance with performance standards, two researchers found that compensation sites show significant signs of decreased compliance and performance between 8-10 years after initial construction of a site (Van den Bosch and Matthews 2017). Perhaps it is time to assess compliance at the Upper Missouri Mitigation Bank. Since this mitigation bank is one of the few options available for mitigation of wetland impacts in a rapidly growing service area, it is imperative that this bank is meeting its performance standards now more than ever.

Table 4: A summary of the withdrawn, available, and potential stream and wetland credits generated by the Upper Missouri Mitigation Bank in Twin Bridges, Montana (USACE 2023b). The value of these credits is based on acreage and not function.

Credit Type	Available Credits	Withdrawn Credits	Released Credits	Potential Credits	Percent Released
Stream	121,872.25	22,985.97	144,858.22	144,858.22	100%
Wetland	65.6165	33.4835	99.1	205	48.3%

The majority of the wetlands within the bank site are considered floodplain wetlands (EAM 2015b). The primary function of this wetland type is an increased flood storage capacity, but floodplains also aid in groundwater recharge and provide vital wildlife habitat (FEMA 2022). Although these are important ecosystem services to restore, they are not the only ones being lost within the HUC-6 service area. According to the RIBITS system, the wetland credits generated from mitigation at the Upper Missouri Wetland Bank site are approved to mitigate for palustrine emergent (PEM), scrub-shrub (PSS), and forested (PFO) wetland habitat types (USACE 2023b). Even though these wetland subclasses may occur adjacent to riverine systems, they do not fall within the Cowardin 'riverine' class like floodplain wetlands (Federal Geographic Data Committee 2013). In a 2004 assessment of wetland types in the Gallatin Valley, researchers found that two of the most dominant wetland habitat types in this HUC-8 watershed were wet meadows (being the most dominant) and marshes, both of which fall within the Cowardin wetland class of 'palustrine emergent (PEM)' (English and Baker 2004). Wet meadows and marshes provide a wide and unique array of wetland functions that include: collection of runoff; reduction of seasonal flooding; removal of excess nutrients; food supply for many amphibian, insect, bird, reptile, and mammal species; groundwater recharge; sediment filtering; fish and wildlife habitat and breeding grounds; water quality improvement and so many more (EPA 2015e). Despite floodplains being similar aquatic systems, they do not provide the exact same wetland functions as wet meadows and marshes. Therefore, many of the functions of these two wetland types are forever lost in the Gallatin Valley when only floodplains are restored and enhanced in Twin Bridges. Just examining wildlife habitat alone, it is untenable for many of the species that depend on local wetland habitat to migrate and relocate to different wetland types a great distance away.

It may be possible that the Upper Missouri Mitigation Bank meets the goal of NNL of wetland acreage, but it is not likely that a mitigation bank can achieve a NNL of wetland function when that bank is not providing compensatory mitigation for the same wetland type as the original impacted wetlands. Wet meadows and marshes are being disturbed or altered in Gallatin County, but floodplains are being restored in Twin Bridges. Although the HUC-6 service area of the Upper Missouri Mitigation Bank technically falls within CMR requirements of a watershed approach, it is allowing for mass consolidation of one major wetland type in one location. The watershed approach, as applied in the Upper Missouri Mitigation Bank, arguably does not prove to be fully effective and ecologically relevant in this specific case, as the ecosystem services and functions of wetlands are not consistent throughout the entire service area.

PROPOSED INDRELAND AUDUBON WETLAND MITIGATION BANK

To localize wetland mitigation efforts to the Gallatin Valley, the Sacajawea Audubon Society (SAS) began the process of establishing a wetland mitigation bank in Bozeman, Montana in 2021. After being gifted 32.4 acres of wetland property in late 2018, and then purchasing an additional nearby plot of land in early 2019, SAS decided to initiate a Wetland Preservation Project (WPP) in which this area would become their first project (SAS 2021). The entire mitigation site is approximately 40 acres in total and has since been deemed the Indreland Audubon Wetland Preserve (IAWP). The proposed bank will include creation, preservation, and enhancement strategies to gain credits – 5.1 acres of sedge meadows and scrub-shrub willow habitat will be created on the north parcel of land; 5.5 acres of an existing alder-dominated wetland will be preserved; and roughly 19.6 acres of various aquatic resource habitat (i.e., open

water, forested wetlands, marsh, sedge meadow) will be enhanced in the south parcel (Figure 3) (USACE 2021). In establishing a wetland bank at the IAWP, SAS intends to not only restore and enhance critical wetland functions, but they also aim to create financial incentives by returning funds spent on mitigation to the local community (SAS 2021). Essentially, as the Gallatin watershed community uses this mitigation bank, SAS will be directly putting that money back into further preservation and enhancement efforts.

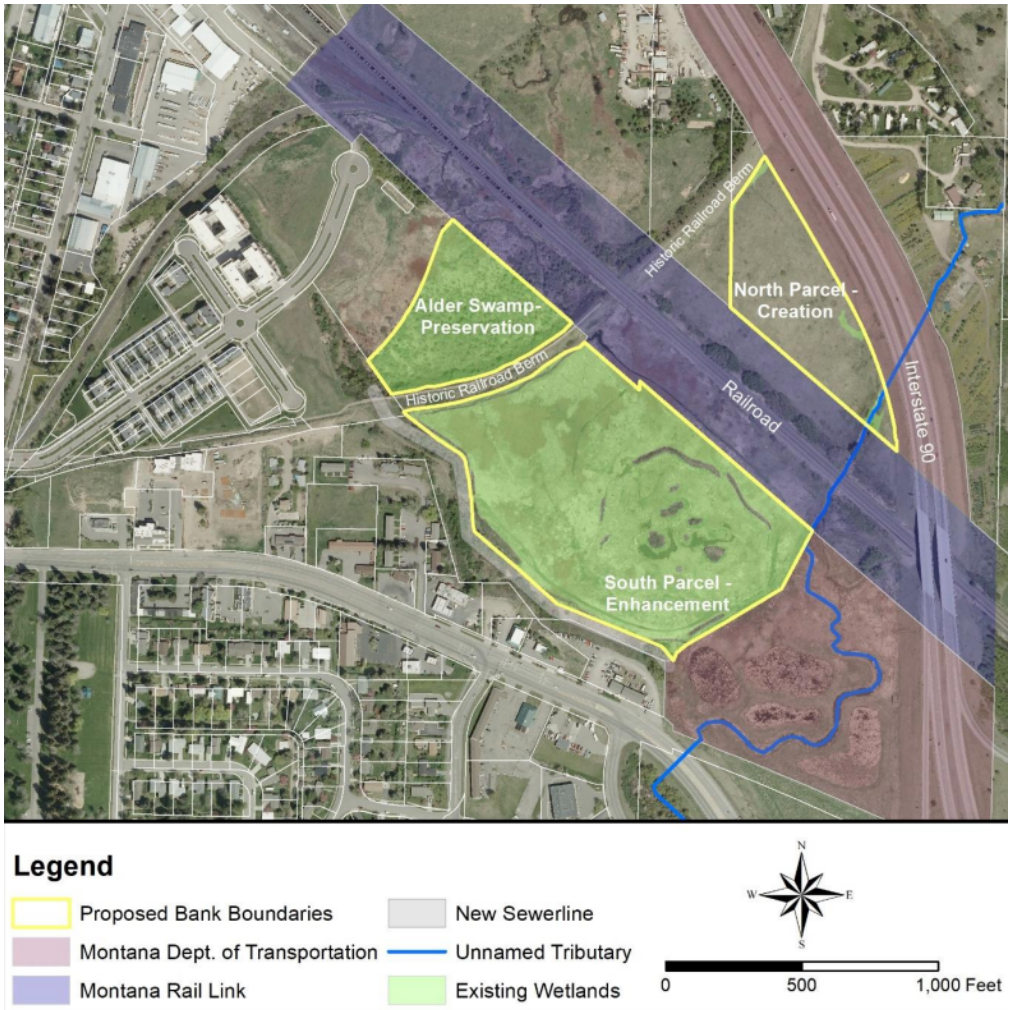

Figure 3: A design map of the proposed Indreland Audubon Wetland Preserve, where the Sacajawea Audubon Society aims to establish a mitigation bank within the Gallatin HUC-10 watershed (SAS 2021, USACE 2021).

In comparison to the HUC-6 basin service area size used at the Upper Missouri Wetland Bank, SAS proposed that that service area for the IAWP mitigation bank would be limited to the Gallatin HUC-8 subbasin (Figure 4) (USACE 2021). This would make the IAWP service area approximately 1,753 square miles in size, whereas the Upper Missouri Mitigation Bank's service area is 13,334 square miles – an area 7.6 times larger than the IAWP, containing seven HUC-8 subbasins (USACE 2021). By reducing the service area size to a HUC-8 subbasin, there is a much higher likelihood that the ecological functions and services provided by impacted wetlands in Gallatin County will remain in that local watershed (Murphy et al. 2009; Van den Bosch and Matthews 2017). SAS also proposed to use functional units instead of wetland credits to track mitigation needs for the IAWP site to further ensure that wetland losses within the county do not equate to functional losses (USACE 2021). Despite the IAWP site being approved by USACE two years ago, the mitigation bank is still pending in the RIBITS system as SAS continues to actively restore and enhance wetlands on site (USACE 2023a). The majority of restoration construction for the IAWP has been pushed to the fall of 2024 due to roadblocks with lease agreements (SAS 2023). Since the wetland mitigation plan cannot be finalized until all lease agreements are rectified and site inspections have been completed, the exact credit availability of the mitigation site has not yet been calculated (SAS 2023). Consequently, SAS fully intends to solidify all mitigation plans in the next few months so that the IAWP will be up and running soon and wetland mitigation will be localized in the Gallatin Valley.

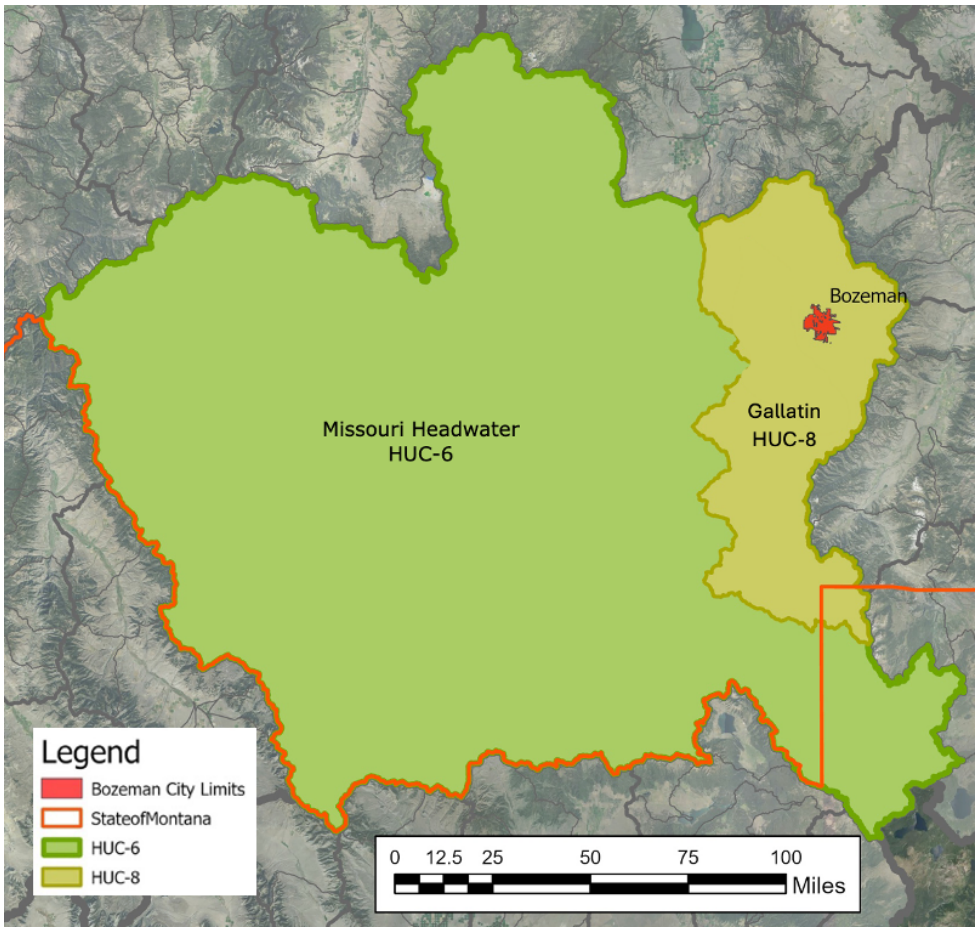

Figure 4: Map of the Missouri Headwaters HUC-6 basin service area compared to the Gallatin HUC-8 subbasin (Pankoff 2023). Bozeman city limits are included for the purpose of scale and size comparison of service areas.

DISCUSSION & CONCLUSION

LOCALIZING THE WATERSHED APPROACH

Selecting a mitigation site that will adequately compensate for the functions and services that are lost to an affected wetland is a complex process that involves innumerous socioecological considerations. Common challenges that could arise from inadequate and unsustainable mitigation site selection may include increased flooding events; fragmentation and loss of habitats; eutrophication due to improper nutrient filtration; a decline in water quality; increased erosion along river and stream banks; diminishing biodiversity of aquatic and

terrestrial flora and fauna; decreases in amount of carbon sequestered, etc. (Hruby et al. 2009). Unfortunately, a deterioration in wetland functions has become a common occurrence across the United States due to poor site selection when using the watershed approach. The primary goal of the watershed approach is to ultimately offset losses of aquatic resources by restoring their functions within the same watershed as the impacted site, but the CMR fails to define the boundaries of a watershed scale. For this reason, regulating agencies have granted approval for projects using service areas that are too large and allow for mitigation that does not fully restore functional losses of disturbed wetland systems.

To ensure that thorough restoration occurs, meaning that both the structure and function of wetlands are being re-established within the watershed and local community of the original wetland, current legislation needs to be refined to include transparent language surrounding the watershed approach. At the very least, modifications should include: (1) an explicit definition for both a wetland and watershed that is inclusive of variability across space; (2) a stricter sequence of implementation that does not allow mitigation to be de facto; and (3) a redefined watershed scale that considers and focuses on the local loss of wetland functions. In a Regulatory Guidance Letter (RGL) released in 2019, USACE stated that service areas for mitigation banks and in-lieu fee programs that are operating in the same USACE district and providing mitigation credits for similar aquatic resource categories should be based on the same geographic area and therefore have similar service area sizes (USACE 2019). However, service areas vary considerably in size and type (i.e., watershed, ecoregion, geographic area) within the same USACE district or within a given state (Womble and Doyle 2011). A HUC-8 subbasin or HUC-10 watershed service area size may not always be appropriate for mitigating impacts. Studies show that the likelihood of meeting the national goal of NNL is notably strengthened when wetlands are restored, enhanced,

preserved, or created closer to the original impacts (Murphy et al. 2009). This suggests that a more localized watershed scale plays a pivotal role in ensuring the successful restoration of wetlands and their functions within a broader area. Clarifying important terminology would further guarantee that regulating agencies can effectively monitor the compliance of mitigation activities.

COSTLY LAND PRICES EQUATES TO COSTLY CREDITS

From 2000 to 2018, the Gallatin Valley population increased by 64% and city officials project that the county will continue to grow at a rate of 2.75-3.1% each year (Craighead 2021). As more people move to Gallatin County, the average price of land will continue to rise as availability dwindles. In the last three years alone, the median price for Bozeman land rose tremendously and has been documented as an increase of 129.9% (Fagan 2023a). The median price of land in all of Gallatin County is even higher, with increases as high as 210.7% in the same time frame (Fagan 2023b). Growth may be inevitable for this county and many others throughout the United States, but it is of the utmost importance that wetland protection is prioritized among the developmental surges that accompany a rise in population. Urbanization directly impacts wetland ecosystems by causing habitat loss, hydrologic changes, altered water quality, capped soils, and increases in suspended soils among other disadvantages (Amanda and Horner 1997). Ultimately, the urbanization of areas such as the Gallatin Valley places an immense strain on the many functions that wetlands provide to their surrounding community, as well as heightens the unlikelihood of complete ecological restoration.

In addition to the direct pressures that urbanization place on the ecological functionality of wetlands, increases in land value, performance demands, and technological costs are all factors that drive up the price of wetland mitigation bank credits (Environmental Law Institute

2002). As more land is developed in Gallatin County, there is going to be a greater need for localized compensatory mitigation options to sufficiently restore lost wetland functions. Estimates of a rapidly increasing population growth rate, alongside increases in the average cost of land, call for the purchase of more land within the Gallatin HUC-8 subbasin. Having land solely designated for mitigating impacts to local wetlands will decrease the probability of functional losses that occur when wetlands are restored in Twin Bridges. Furthermore, since land value and mitigation demand so strongly impact the cost of mitigation credits, it is important that land is purchased within Gallatin County as soon as possible. Otherwise, a significant increase in credit cost could easily make mitigation within a smaller service area an unrealistic option for many permittees developing land. This situation is not unique to Gallatin County, as many locations could benefit from purchasing land to be set aside for wetland mitigation before costs become too unbearable.

Although the IAWP is not yet a functioning wetland mitigation bank, the proposed work of the SAS organization to localize mitigation efforts to the Gallatin HUC-8 service area shows tremendous hope for the future of wetlands in Gallatin County. Since the IAWP is in northeast Bozeman, mitigation completed at this site ensures that wetlands of the same or similar habitat type will be restored within the immediate Gallatin River watershed. In addition to localizing mitigation efforts with the establishment of a mitigation bank in Gallatin County, it is critical that city officials also prioritize wetland preservation to reduce the number of impacted wetlands that require mitigation services. Ultimately, having a redefined watershed approach that strongly considers the local loss of wetlands within a smaller-scale watershed will allow humans to be more prepared for wetland impacts and lessen the risk of losing important ecosystem services. Without making changes to current wetland mitigation legislature, we would instead be

permitting the continued loss of vital ecosystems across the United States and complying with a disregard for the national goal of NNL.

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