

What was the norm is no longer the norm: Capturing socio-ecological histories of flood resilience in Wisconsin's Driftless Area through archival news analysis

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Wisconsin's Driftless Area, an unglaciated region defined by steep river valley systems, has been plagued by chronic flooding in part due to Euro-American agricultural practices and anthropogenic climate change. The region, which has played a central role in environmental knowledge production, has a storied history of resilience practices and flood experience. To capture histories of Driftless Area flood experience and underlying socio-ecological dynamics, we performed a qualitative analysis of regional news archives from 1866 to present on flood trends, experiences, and responses. Our analysis identified hazard response trends mediated by socio-ecological factors including crisis-induced windows of opportunity for change, conflicts over structural and non-structural responses to flooding, and psychological dimensions of environmental crises. Finally, our analysis noted the key role of community flood knowledge in producing shifts towards enhanced resilience, suggesting the need for empowering flood response planning at the community scale.

Keywords: Driftless Area; environmental history; flooding; flood response; hazards; news analysis; resilience; socio-ecology; community

Introduction

Wisconsin's Driftless Area, a 22,000 km² expanse at the junction of southwestern Wisconsin and northwestern Illinois left unglaciated through the last 2.5 million years, sits at the heart of a half century of knowledge-making about fluvial systems (Knox, 1977; 1987; 2001; Trimble, 1981; 1983; 1999). But the region's most defining natural

features—the steep river valley systems that support agricultural livelihoods and local connections to landscape—are the same features that have, for generations, wreaked havoc on human communities through chronic and now, because of climate change-induced increases in precipitation, accelerating flooding. Since the onset of Euro-American settlement in the mid-1800s, Driftless residents and institutions have grappled with environmental flood hazards made worse by agricultural practices imported from flatter Midwestern and European landscapes. In light of escalating anthropogenic environmental degradation, the legacies of communities whose identities and histories have been so intertwined with hazards like flooding can provide crucial guidance for future resilience efforts. Drawing from the Driftless Area's distinct relationships with flood hazards and the key role of Driftless flooding in environmental histories, this project relies on an analysis of newspaper articles on regional flooding from 1866 to present to construct an intergenerational socio-ecological flood history.

News-based analysis of Driftless Area flooding as a case study can illustrate socio-ecological dimensions of hazard experience and guide future resilience strategies. Understanding flood response is critical for identifying broader strengths and limitations of resilience strategies, particularly in light of contemporary increases in disaster intensity and frequency from climate change (Disse et al., 2020; Bahadur et al., 2013; de Bruijn et al., 2017). Newspaper analysis offers unique insights on resilience, illuminating not only regional hazard histories and the socio-ecological relationships that shape them, but also local views of the strengths and limitations of flood responses, historical shifts in those responses, and what these shifts imply for resilience-bolstering (Chibundu & Ishak, 2013; Choudhury & Haque, 2018; Jeffers, 2014; Leitch & Bohensky, 2014).

Our investigation of Driftless Area flood news identifies historical shifts towards non-structural flood management, conceptualizing temporal changes in resilience policy through the framework of windows of opportunity. We likewise emphasize the roles of economic pressures, psychological aspects of crisis experience, and public perception of risk in determining hazard response and urge more concerted engagement with and empowerment of community-orchestrated efforts to meet flood response needs directly in light of shortcomings of institutional top-down hazard mitigation efforts.

The Driftless Area and Environmental Crisis

This project builds from a socio-ecological systems approach to understanding community relationships with flooding through newspaper-based historical analysis in Wisconsin portions of the Driftless Area. The Driftless Area (see Figure 1) is distinct among Upper Midwest landscapes; because it was unglaciated through the Quaternary period, it is composed largely of steep river valley systems (Shea et al., 2014). Largely because of this topography, Euro-American settlement favored the development of low-lying community centers along southern Wisconsin's Mississippi River tributaries, but these are prone to chronic flooding, in part due to the wide-scale conversion of pre-settlement land cover to row-crops (Dauwalter & Mitro, 2019; Galleguillos et al., 2018). Because of increasing regional precipitation associated with climate change and continuing conversion to row-crop agriculture, regional flooding is increasing and expected to intensify in coming decades (Dauwalter & Mitro, 2019; Juckem et al., 2008). In this context, the Driftless Area's post-Euro-American settlement history is intertwined with environmental hazards, making the region an ideal case study for analyzing flood threats at community scales to inform resilience efforts in and beyond the area.

[Figure 1 around here]

Historical analysis of the socio-ecology of flooding in the Driftless Area is likewise useful for gaining insights about resilience because of the region's central role in the development of environmental management practices. The region is perhaps most well known in connection with Aldo Leopold's conservation principles and programs. Leopold's experiences in the region informed his *land ethic*, the concept that conservation constitutes an ethical, rather than merely economic, imperative, shifting towards a linkage between community and ecology (Lin, 2020). In 1933, Leopold, conservationist Hugh Hammond Bennett, local community members, and the federal Soil Conservation Service (SCS) launched a groundbreaking soil conservation initiative in the Driftless Area's Coon Creek Watershed, setting precedents for practices now central to agricultural conservation, including contour planting, strip terracing, and crop rotation (Hart, 2008; Helms et al., 1996; Lin, 2020). This project was likewise instrumental in demonstrating the value of multi-scalar environmental collaboration between institutions and communities (Hart, 2008; Helms et al., 1996).

Later, the Driftless Area would become central to debates on structural and non-structural flood control, differing approaches involving engineered and land use/restoration solutions, respectively (Dixon et al., 2016). This was intertwined most notably with the multi-decadal conflict surrounding the La Farge Dam Project, an ultimately and controversially abandoned U.S. Army Corps of Engineers (USACE) flood control project on the Kickapoo River, as well as several community-orchestrated relocation efforts due to chronic flood impacts (David & Mayer, 1984; Heasley, 2014; Tobin, 1992). More recently, the Driftless Area is notable for implementation of sometimes contentious environmental management practices including dam removal and stream restoration efforts (Gottschalk Druschke & Booth, 2019; Lundberg et al., 2022; Orr & Stanley, 2006). These trends reflect the Driftless Area's rich environmental

history as a precedent-setting region, a history with enormous analytical value for exploring hazard experience and response dynamics relevant to vulnerable communities across the globe, especially those threatened by flooding.

Socio-Ecology and Flood Resilience

Community resilience amid environmental crises is mediated not only by physical trends but by social phenomena underlying individual and collective relationships with hazards. An emerging body of research addresses these complex relationships through the framework of socio-ecology (Bennett et al., 2015; Folke, 2006; Plummer, 2010). Rather than consider resilience as a strict two-party dynamic between degrading hazard and degraded community, socio-ecological lenses examine risk and response as products of complex socio-ecological systems (Bennett et al., 2015). This framework encourages holistic understandings of demographic, temporal, and spatial differences in resilience along with the systems producing these differences (Kok et al., 2016). Critically, socio-ecological analysis hinges on an understanding of the dynamism inherent to relationships between social and physical phenomena (Bennett et al., 2015; Plummer, 2010). In other words, socio-ecological perspectives offer opportunities for capturing not only complex relationships between physical conditions and social parties and how they have changed over time.

Socio-ecological analysis of environmental crises demonstrates a fundamental understanding of resilience. Resilience perspectives center on system stability and disturbance and the forces producing that continuity and change (Folke, 2006; Plummer, 2010). While resilience perspectives face criticism, in part for reinforcing discourses of human control over natural systems, they remain useful for the crisis-oriented context of our analysis (McGreavy, 2015). Empirical applications of resilience vary by discipline, but socio-ecological perspectives generally focus on adaptive processes, multi-

directional relationships between hazard and community wherein groups impacted by disturbances shift response over time through adaptive learning (Bennett et al., 2015; Faulkner et al., 2018; Plummer, 2010). Understanding hazards as continuously evolving is especially relevant to study of environmental vulnerability in light of shifting trends in disaster frequency and intensity induced by global climate change (Bahadur et al., 2013; de Bruijn et al., 2017; Smith et al., 2017).

Socio-ecological perspectives on flood resilience have identified key factors in community vulnerability and adaptive capacity that can guide future responses to flood hazards. Chief among these are bio-physical hazard conditions and the socio-economic contexts surrounding response decision-making, including community flood memory and response knowledge production, institutional management discourses, and resource allocation for response implementation (Garvey & Paavola, 2021; McEwen et al., 2016; Vitale et al., 2020). In responding to these interactions, a great deal of recent flood scholarship centers on incongruities between institutional responses and community needs-based approaches to adaptive capacity (Garvey & Paavola, 2021; Gottschalk Druschke et al., 2022b; McEwen et al., 2016). These mismatches are perhaps most visible in debates surrounding structural and non-structural flood responses (e.g., levees and flood control dams vs. managed retreat) and the question of where and by whom resilience is advanced.

Increasing prominence of socio-ecological resilience perspectives has encouraged a re-evaluation of the merits of structural and non-structural responses to flooding and the socio-political factors underlying their implementation. Non-structural, ‘nature-based’ flood responses have gained steam in impacted communities in recent decades in recognition of the need for more adaptive responses to flood hazards instead of top-down structural flood control efforts (Garvey & Paavola, 2021; Liao, 2012; Kim

et al., 2021). In other words, support for eradicating flood threats through engineered solutions has decreased in some communities that have come to value non-structural approaches and resilience strategies that allow them to persist and adapt (Garvey & Paavola, 2021; Liao, 2012; Vitale et al., 2020).

Socio-ecological research presents collaborative self-organization in impacted areas, strong linkages to landscape and community, and the translation of collective flood memory into knowledge and action as key factors that boost flood resilience (Gottschalk Druschke et al., 2022b; McEwen et al., 2016; Vitale et al., 2020). However, managing agencies across impacted areas have repeatedly failed to allocate resources to community-driven non-structural flood response, implying that they under-value processes of community-scale adaptation and participation in decision-making (Garvey & Paavola, 2021; Gottschalk Druschke et al., 2022b; McEwen et al., 2016). These findings suggest the need for closer evaluation of processes of resilience-building at community scales and outside of formal, institutional mechanisms of flood management, as we do here.

Socio-Ecological Resilience in Historical Contexts

In light of the complexity of socio-ecological resilience across spatial, organizational, and temporal scales, historical analysis of flood hazards can provide insights on specific factors that contribute to socio-ecological risk relationships and resilience-building strategies for an uncertain future. As we noted above, socio-ecological analysis requires environmental risk and response to be understood as perpetually dynamic (Bennett et al., 2015; Plummer, 2010); historical analysis of risk and response offers opportunities for capturing this dynamism to achieve several key purposes.

Historical analysis identifies factors underlying socio-ecological relationships between communities and hazards. On a physical level, historical records can be used to reconstruct past environmental crises and evaluate long-term landscape changes (Himmelsbach et al., 2015; Kemp et al., 2015; Trimble, 2008). On a social level, historical record analysis allows researchers to evaluate the role of environmental crises in shaping community identity and relationships between communities and institutions (Brázdil et al., 2014; Griffiths et al., 2017; Griffiths & Tooth, 2020). Put differently, historical analysis frameworks can reconstruct hazard histories and provide a richer understanding of the socio-ecological determinants of these histories.

Beyond offering a strict retelling of events, historical news analysis, specifically, allows for ‘reading between the lines’ on representation of events. As socially-informed products, journalistic discourses inform understandings of shifting perceptions of hazards and resilience (Chibundu & Ishak, 2013; Choudhury & Haque, 2018; Jeffers, 2014; Leitch & Bohensky, 2014). News analysis also evokes emotional dimensions of crisis experiences; while research has noted shortcomings in this area, notably the emotional devaluing of marginalized communities, news records are nonetheless valuable for producing scholarship informed by these affective dimensions^{1a} (Cox et al., 2008; Walter et al., 1995; Yell, 2012). Thus, news-based historical analysis of environmental hazards offers opportunities for deeper understandings of how hazards are perceived by communities, how crisis experiences are determined by and determine socio-ecological relationships, and how these trends shift over time.

Methods

^{1a} For considerations in managing these shortcomings, see Bernacchi et al., 2020 and Cox et al., 2008.

To construct a comprehensive record of Driftless Area flood experience to identify trends in underlying socio-ecological relationships, we developed an inductive qualitative methodology based on existing socio-ecological archival studies to retrieve and analyze newspaper articles on regional flooding and response from 1866 to present (Griffiths & Tooth, 2020; Jeffers, 2014; Taylor et al., 2015). This methodology began with an iterative search process to retrieve flood-related articles from relevant newspaper databases. We subsequently analyzed articles for specific empirical details on flood events and broader socio-ecological dimensions of flood experience.

Article Retrieval

We retrieved relevant articles on Driftless Area flooding and flood response for analysis using an iterative search process involving the development of search terms, the application of these search terms in online news depositories, and subsequent search term refinement to maximize information gleaned and article relevance. Because there were relatively few newspapers published in the Driftless Area historically, our goal was to assemble a comprehensive set of relevant articles, rather than to select among them.

We performed searches on three Internet-based newspaper archives, Chronicling America, Nexis Uni, and Badgerlink (Wisconsin's state-run online library resource), with search terms consisting of a combined location identifier and hazard/response term (e.g. "*Kickapoo River*" + *Flood** to obtain articles on floods in the Kickapoo Valley, "*Vernon County*" + *Soil* to obtain articles on soil conservation in Vernon County, etc.). Databases were selected based on institutional access, temporal coverage, and, in the case of Badgerlink, regional specificity. After each search, we skimmed retrieved articles for relevance through rhetorical analysis, applying more specific search terms selectively to fill known information gaps (e.g. "*La Farge*" + *Dam** to yield additional

records on the Kickapoo Valley USACE project). In seeking a broad array of information on regional flood experience, all retrieved articles deemed relevant were included for final analysis, while our searches were continually refined based on insights from local knowledge and ongoing regional engagement (Gottschalk Druschke et al., 2022a, 2022b).

We retrieved approximately 350 articles from 1866 to 2022 for relevance checks, paring this set down to 193 articles for final analysis (see Table 1). Relevance reductions involved excluding articles discussing flooding elsewhere, duplicate articles, articles where figurative flood-related language referred to unrelated content, and articles consisting of routine hydrological reporting. The final article set was composed of reporting from publications within the Driftless Area (46 articles), publications from elsewhere in Wisconsin (143 articles), publications from other areas of the Midwest (3 articles), and one article published elsewhere in the United States.

[Table 1 around here]

Article Analysis

Following article retrieval, we analyzed records using a code tagging scheme centered on flood risk and response dynamics. Using Atlas.ti, a qualitative analysis software, we assigned attribute tags to article quotations containing meaningful information. This methodology was likewise an iterative process, wherein articles were reviewed to identify broad patterns, these patterns were used to construct initial code sets, and new codes were added as needed to reflect new information from additional readings. Ultimately, we attributed 140 codes to 814 quotations across the article set. Codes were developed to cover several key information categories (see Table 2). First, to capture hazard histories, we developed codes corresponding to empirical details of floods, including years and locations for floods and specific impacts (e.g. bridge

washouts). Second, we developed codes to identify long-term flood impacts (e.g. regional population decline) and changes in flood dynamics (e.g. climate change impacts). Finally, we applied codes to flood management (e.g. structural vs. non-structural control) and institutional trends (e.g. federal involvement).

The final coding scheme allowed us to produce a cohesive timeline of modern Driftless Area flooding and to identify intergenerational trends in flood dynamics, resilience strategies, and institutional relationships determining flood experience and response. This analysis likewise provided an evocative view of interlocking social and physical determinants of community resilience and identity and framed specific events in regional flood history in broader socio-ecological contexts.

[Table 2 around here]

Results: A Chronology of Driftless Area Flood Experience

Our analysis revealed a history of chronic regional flooding, with flooding in 38 years since 1866. While flood risks are present throughout the journalistic record, there are key intergenerational differences in reporting on how residents approached those risks. For the purposes of this analysis, flood history is broadly divided into three periods punctuated by severe flooding producing windows of opportunity for response reformulation. First, from 1866 to the major flood of 1935, resilience-bolstering soil conservation developments produced shifts towards proactive management. Second, from 1935 through the severe flood of 1978, a period of federal intervention coincided with predominantly structural flood response, with increased investment in dam and levee schemes. Finally, following devastating 1978 flooding, a ‘structural shift’ in response corresponded to decreased emphasis on large-scale structural management and renewed focus on soil conservation, land use, and community relocation. This

chronology, along with the specific socio-ecological relationships represented in each era of news documentation, are discussed below.

1866 - 1935: Persistent Flooding and Soil Conservation

The earliest flood reported in retrieved articles impacted regional towns in 1866, with subsequent flooding reported in 1876, 1896, 1898, 1899, 1903, 1907, 1912, 1913, 1915, 1916, 1919, 1920, 1921, and 1935^{1b}. Of reported floods, those in 1866, 1899, 1907, and 1935 were noted as particularly destructive². Given the region's predominantly agricultural footprint, representations of flooding frequently focused on farm property damages³. Records from this period also note frequent damage to bridges, railroads, dams, and communication infrastructure⁴. Notably, 1916 flooding washed out bridges designed as flood-proof, while a dam supplying power to La Farge was repeatedly damaged to the extent that it was reported as being washed out "as usual"⁵. Perhaps most notable in this period, however, were early soil conservation developments to bolster resilience towards flooding and farmland degradation.

Soil degradation from intensive agriculture and flooding is reported throughout this period of Driftless Area history. The flood of 1907, in particular, was noted for its impact on soil integrity, while soil loss and associated crop damage were also reported following 1896, 1898, 1899, and 1921 floods⁶. Flood-induced soil saturation was also reported frequently, reducing yields in 1907, 1919, and 1921⁷. In response, emphasis on soil conservation emerged in the latter portion of the period, with public meetings on soil management in early 1920, followed by more sustained federal conservation initiatives in later years⁸.

A shift to a period of increased federal involvement in regional flood response through structural management is evident following devastating region-wide flooding in

^{1b} For all footnotes, please see supplemental materials document for dataset.

August 1935. Reported as the worst since 1907, this flooding produced severe population displacement and millions of dollars in damages⁹. Immediately after, regional stakeholders voiced the need to re-evaluate flood response. 1937 reports noted hesitation by state officials to implement road improvements without overhauled flood response, along with consideration by railroad operators to abandon regional rights-of-way due to repeated infrastructure damage¹⁰. In light of these pressures, federal intervention gained regional support, with petitioning for relief by Vernon County officials in 1936 and the subsequent formation of the Kickapoo Valley Flood Control Association (KVFCFA)¹¹. This group, in part inspired by recent Tennessee Valley Authority projects, petitioned Congress for intervention in 1937, having gathered approximately 5,000 local signatures¹¹. In this context, archives highlight the key role of 1935 flooding in opening the door for a new era of federally-coordinated structural flood mitigation.

1935 - 1978: Federal Involvement and Structural Dominance

Following 1935 flooding and subsequent regional support for federal flood control, increasing investment in structural flood response was reported across much of the mid-20th century, centering largely on the ultimately failed USACE La Farge Dam Project. Throughout this period, flooding continued to threaten local livelihood and development, with floods reported in 1938, 1946, 1947, 1949, 1951, 1959, 1961, 1965, 1966, 1967, and 1978 and particularly severe impacts in 1951 and 1978¹². Outside of flood impact reporting, much of the flood-related news documentation in this era revolved around federal infrastructure schemes and the conflicts surrounding them.

Post-1935 flood-related reporting generally centers on the scope of federal intervention until the development of concrete plans for the La Farge Dam Project. In 1936, U.S. Representative Gardner Withrow called for a land survey of the Kickapoo

Valley and introduced legislation to authorize a USACE flood control project the following year¹³. These efforts were followed by hearings in 1937 to identify regional flood response needs¹⁴. With survey findings suggesting the feasibility of structural management, the War Department initiated a second survey in 1939, while legislation introduced in 1940 sought funding for flood control by the SCS and USACE¹⁵. By 1945, control plans were more established, recommending a reservoir at Rockton and a levee at Gays Mills¹⁶. Following 1946 and 1947 flooding, failed efforts by Withrow, the USACE, and local officials were renewed in 1949 to include the control project in omnibus legislation¹⁷.

Policy reporting was punctuated by severe 1951 flooding resulting in \$3.5 million in damages in the Kickapoo Valley alone¹⁸. This flood was reported as the worst in local memory, and the existential nature of persistent flood threats were reflected in reports of residents “fighting to keep their community from becoming a ghost town”¹⁹. Federal intervention continued to materialize in the flood’s aftermath, with funding allocated in 1953 for dams and levees on the Kickapoo alongside a pilot program encouraging contour farming, strip plotting, and other soil conservation measures²⁰. Such measures were already being practiced regionally, with roughly half of Monroe County farms and 70 percent of Vernon County farms within the Kickapoo watershed enrolled in SCS programs²¹. Notably, the program sought not only to mitigate flooding but also to demonstrate “the feasibility of local and federal cooperation on a cost-sharing basis”²². With discussions of more exhaustive structural control ongoing, 1959 flooding produced severe impacts, killing three and destroying two-thirds of low-lying tobacco crops, while floodwaters in 1961 nearly reached records set in 1951²³.

In 1961, structural control plans coalesced around the La Farge Dam Project, a \$12 million proposal consisting of a dam and reservoir, 2,900 acres during maximum

flood stage, north of La Farge and levees near Gays Mills and Soldiers Grove²⁴. This proposal, intended to mitigate flooding and provide recreation, received Congressional authorization the following year²⁵. As construction began, flooding continued in 1965, 1966, 1967, and 1968²⁶. Notably, 1968 reports noted soil conservation's long-term value, with minimal flood damage at farms employing step terracing and stream bank reinforcement²⁷. Concurrent policy developments included state-mandated floodplain zoning for low-lying communities by the start of 1968²⁸. This resulted in substantial political conflict at least through 1974, with representatives from Ontario and Soldiers Grove criticizing the mandate as prohibitively costly and resenting exclusion from decision-making²⁸.

As flood threats persisted, the USACE continued land purchases for the La Farge Dam Project, buying out and relocating 150 families in the project area²⁹. By 1971, however, with EIS assessments and a state-ordered "intensive review" of project impacts ongoing, residents and specialists were divided on the project's feasibility³⁰. On environmental lines, critics cited impacts on rare plant species, reduced natural beauty downstream, and eutrophication concerns, while proponents argued that impacts would be minimal and predicted improved downstream trout yields from the project³⁰. Along social lines, critics argued that recreational benefits were overstated, and that project costs, which exceeded \$25 million, would only continue to rise and disproportionately burdened local communities³⁰. At the same time, supporters cited ongoing population decline and sunk construction costs, arguing that structural control and recreational cashflow were necessary in the face of existential flood threats³⁰.

In 1975, with review ongoing, the USACE again stressed the project's value over alternatives, including relocation of Gays Mills' and Soldiers Grove's downtown areas³¹. By the year's end, however, with construction partially finished, congressional

support had shifted away from project completion, particularly on the issue of eutrophication³². In December, project funding was deauthorized, with Congress directing a study of alternatives³³. Local reactions were mixed, but reporting reflects growing animosity, with one Soldiers Grove official lamenting that, “after 40 years of work, we would still be as vulnerable to flooding as ever”³³. This vulnerability would be brought starkly to the public consciousness with the devastating flood of 1978.

1978 - Present: Structural Shift and Modern Context

Following the La Farge Dam Project’s termination, a shift away from structural-dominant federal involvement was seen, with extreme 1978 flooding highlighting the need for flood control reformulation. In 1977, conservationists called for retention systems and anti-erosion measures across the Kickapoo and Coon Creek watersheds, while support for relocation in Soldiers Grove resulted in land purchases at higher ground, marking shifts towards non-structural flood control³⁴. These efforts were intensified by a 100-year flood in July 1978, which inundated towns across the region³⁵. Following the flood, federal officials, referencing Wisconsin’s 1968 zoning ordinance, denied monetary aid for reconstruction within floodplains, leaving Soldiers Grove with little option but to relocate³⁶. While relocation was initially deemed financially infeasible, HUD funding allowed construction to proceed in Autumn 1978³⁷. By 1982, with additional funding from federal solar power programs, the relocation neared completion³⁸. That year, Viola also considered relocation, although there is no indication that the initiative materialized³⁸.

While reporting shifted away from the La Farge Dam Project post-1975, with the exception of failed revival efforts in 1979 and 1981, flooding continued to dominate news discourse throughout the post-1978 era³⁹. Regional flood events were reported in 1992, 1993, 1994, 2000, 2004, 2007, 2008, 2013, 2016, 2017, 2018, and 2019⁴⁰. Post-

flood reporting also showcases increased emphasis on non-structural resilience strategies. 1992 reports expressed relocation's merits, with Gays Mills residents noting homeowners relocated outside of floodplains avoiding flood impacts⁴¹. Likewise, reporting following the Great Flood of 1993, which impacted communities across the Midwest, noted that Soldiers Grove was almost entirely spared from damages⁴². This flood reinforced the shift away from strictly structural flood mitigation, as represented in subsequent articles on policy formulation.

Articles following the 1993 flood also highlight response shifts through reporting on failures of structural flood control. In this flood, dam and levee structures in upstream communities channeled devastation downstream, producing disparate flood impacts⁴³. Calls for non-structural solutions, including wetland restoration and relocation, were reported in mid-1994, with federal specialists subsequently recommending shifts away from structural reliance⁴³. Perhaps most emblematic of the structural shift are the land-use developments at the former site of the La Farge Dam Project. In 1993, following the failure of a final lawsuit to revive the USACE project, a proposal was crafted to convert project land into a nature reserve⁴⁴. This plan, approved in 1996 and dedicated in 2001, saw federal land transferred to the state to be managed by regional officials and the Ho-Chunk Nation, the indigenous group ancestral to the land⁴⁵. This transfer faced opposition by some residents resentful over earlier USACE buyouts, but was hailed as an unprecedented moment for Indigenous peoples in Wisconsin, particularly given the presence of cultural sites in the reserve⁴⁶.

With the use of project land largely settled, reporting shifted towards flood impacts until major back-to-back flooding in 2007 and 2008, which increased focus on non-structural mitigation and the changing nature of flood risks⁴⁷. These floods, breaking intergenerational records, showcased both climate change impacts on flood

severity and the criticality of proactive non-structural response⁴⁸. Gays Mills, hit particularly hard, renewed emphasis on relocation, using grant funding to shift development to higher ground in subsequent years⁴⁹. Since this initiative, regional reporting has largely focused again on flood impacts, detailing flooding in 2013, 2016, 2017, 2018, and 2019⁵⁰.

Perhaps most concerningly, just a decade after the 2007 and 2008 floods, 2018 flooding once again shattered regional records, with residents that did not relocate in Gays Mills particularly impacted⁵¹. One report from the aftermath notes, “2016 and 2017 events are marked a few inches apart, about 3 feet up from the ground. The floods of 2007 and 2008 are another 2 feet higher... This year's surge of water didn't make the door. Instead, the high-water mark can be seen in the rafters... after the Kickapoo River went 3 feet higher than has ever been recorded”⁵². In this context, the persistence of regional flood threats is self-evident, while climate change-related flood severity increases suggest critical need for continued flood management⁵³. Ultimately, the Driftless Area's flood response needs remain, in part, unmet, while contemporary intensity increases suggest that flood hazards will continue to shape regional identity, resilience, and the socio-ecological relationships which mediate them in the decades to come.

Discussion: Socio-Ecological Insights

Drawing from the chronology of Driftless Area flooding provided by newspaper documentation, we gained critical insights on shifting flood response in regional contexts. Our analysis enhanced understanding of advantages and disadvantages of flood resilience approaches and identified socio-ecological conditions under which transformations in flood response efforts were instigated. These findings, while rooted

in regional history, offer crucial implications on resilience in other vulnerable communities. We likewise identified psychological dimensions of resilience and key roles of community flood knowledge in producing flood management shifts, suggesting needs for empowering community-led resilience strategies.

Structural and Non-Structural Flood Control

Driftless Area flood reporting identifies shifts in flood response and social factors producing them, aligning with a windows of opportunity model of resilience policy changes and suggesting a need for broader adoption of non-structural flood response efforts. Specifically, our findings suggest that severe floods and economic pressures play key roles in producing windows of opportunity for reformulating flood response, particularly as they relate to debates on structural and non-structural flood control. These insights are central to environmental historical studies in relation to the dynamism inherent to socio-ecological relationships (Bennett et al., 2015; Plummer, 2010).

For the purposes of this analysis, structural flood control refers broadly to dam and levee construction, while non-structural solutions encompass soil conservation, land use, and community relocation (Dixon et al., 2016). The growth and decline of federally orchestrated structural management is seen across modern Driftless Area history, particularly surrounding the La Farge Dam Project. Following the 1935 flood, structural response dominated forty years of regional history, from early feasibility assessments through development of USACE plans, continuing until project failure in the 1970s⁵⁴. At the same time, these plans did not entirely replace non-structural control, with soil conservation programs throughout the period showing long-term value after 1968 flooding⁵⁵. Land use was also emphasized intermittently in reporting, particularly following the 1968 floodplain zoning ordinance²⁸.

Regardless, the La Farge Dam Project's deauthorization marks a broader shift towards non-structural response. As with previous shifts towards structural dominance, post-project responses were not strictly non-structural, with dam construction throughout the period leading up to deauthorization and continued regional support for structural response afterward. Nonetheless, non-structural support was prominent following failures of some structural approaches, notably USACE project termination and levee failures in 1978 and 1993⁵⁶. Reporting likewise highlights the rise of community relocation responses⁵⁷. Following 1978 flooding, Soldiers Grove's relocation and Viola's unrealized relocation reflect shifting relationships between communities and river systems⁵⁸. These efforts were emulated in Gays Mills, with piecemeal relocation by 1992 and community-wide efforts post-2008⁵⁹. Relocation's benefits are seen repeatedly in post-flood reporting, with Soldiers Grove being lauded as a model community after largely avoiding damages in 1992, 1993, 2000, 2007, and 2008⁶⁰.

These aspects of Driftless Area flood history suggest long-term value in shifts towards non-structural or combined structural/non-structural flood solutions, particularly in light of implementation or performance failures of top-down federally orchestrated structural efforts. These findings are consistent with conclusions in other studies on flood adaptation, particularly those conceptualizing flood resilience as persistence through adaptive response despite crisis-induced structural changes in communities (Garvey & Paavola, 2021; Liao, 2012; Kim et al., 2021). Ultimately, this lends further support for additional resource allocation towards non-structural, nature-based solutions in other communities threatened by flood hazards.

Windows of Opportunity

Driftless Area flood reporting reveals not only temporal shifts in flood response but also interlocking social factors contributing to policy formulation. Records illustrate the roles of discrete and continuous events in producing socio-political will for policy change, specifically extreme floods and intergenerational economic trends, in alignment with a windows of opportunity model of resilience policy change. Flood control reformulation is seen repeatedly following severe floods punctuating regional history, most prominently in shifts around structural flood control discussed above. In 1935, devastating flooding was central to initiating federal intervention, with the newly formed KVFCAs' post-flood petitioning⁶¹. Later, 1951 flooding, reported as the worst in local memory, preceded structural control appropriations which would morph into the La Farge Dam Project following further severe flooding in 1961⁶².

Later shifts towards non-structural response were likewise mediated by severe floods, specifically highly publicized flooding in 1978, 1993, and 2008. Indeed, it is possible that vivid journalistic depiction of these floods fed into socio-ecological systems influencing policy response, expanding windows of opportunity for these shifts. While Soldiers Grove's relocation was proposed in the mid-1970s, devastating 1978 impacts were instrumental in making the proposal a reality. Retrospective reports on the relocation highlight the window of opportunity produced by this flood, with one official noting that, facing near-complete inundation, "it was either change or die"⁶³. Similar trends are echoed following dam and levee failures during the Great Flood of 1993, with increased region-wide support for non-structural mitigation⁴³. Contemporarily, extreme floods in 2007 and 2008 renewed focus on relocation at Gays Mills, particularly in light of comparatively minor impacts in Soldiers Grove⁴⁸.

These shifts suggest the key roles of severe floods in triggering reassessment of resilience strategies. This windows of opportunity phenomenon aligns with previous

findings on physical conditions and socio-economic decision-making contexts, notably community memory of crisis, as determinants of resilience approaches, but suggests that conditions of extreme hazard can, through the translation of community memory of crisis into resilience knowledge, overpower long-lasting institutional management discourses which would otherwise reinforce current resilience approaches (Garvey & Paavola, 2021; McEwen et al., 2016; Vitale et al., 2020). These trends highlight critical opportunities for promoting resilience policy change in the periods immediately following major hazard events.

Economic Pressures

Journalistic documentation of Driftless Area flooding reflects not only the roles of discrete floods, but also of intergenerational economic trends at community and regional scales, in shaping resilience strategies. The 1930s shift towards federal structural intervention, for instance, was accompanied by the threat of corporate abandonment of regional rail easements due to inaction on flooding¹⁰. Across time periods, population decline is reported as a central threat to regional viability⁶⁴. News representation of this issue often speaks on population decline in primarily economic terms, with economic revitalization central to arguments for the USACE project and, later, community relocation⁶⁵. In broader flooding discussions, discourse often centers commercial, rather than residential, decline⁶⁶. This is summarized perhaps most succinctly following 2008 flooding, with one community member remarking “Businesses...can’t take two floods in one year...If they don’t come back, it will be a ghost town”⁶⁷. This representation of commerce as the life-blood of vulnerable communities reflects the broader role of economic pressures in determining hazard responses.

Weathering, Resilience, and Amnesia

Moving beyond policy insights, broader trends in flood experience and the socio-ecological relationships determining them emerge from journalistic records. Perhaps most notable is the interplay between chronic hazards and resilience-bolstering efforts. On one hand, records reflect a long-term ‘weathering’ of communities, with repeated flooding taking profound physical and psychological tolls on residents⁶⁸. This concept of community weathering, wherein impacted residents are forced to literally weather (survive) storms across generations, but are also weathered (worn down) in a near-geological sense by these experiences, is critical for understanding the lasting impacts of chronic hazard experience. Reporting frequently touches on these impacts, both in terms of immediate recovery and future uncertainty⁶⁹. Following 2008 flooding, a regional conservation specialist summarized this weathering, remarking, “I’m not a psychologist, but folks are saying, ‘Here we go again,’ and it’s hard to deal with”⁶⁸.

These impacts are critical for understanding broader hazard response trends in light of increasing flood severity, with region-specific trends informing deeper understandings of the psychological impacts of global climate change (Bahadur et al., 2013; de Bruijn et al., 2017; Smith et al., 2017)⁷⁰. In recent reporting, residents and officials repeatedly express desperation towards the increased intensity and frequency of flooding⁷¹. In the words of one state flood control manager, “What used to be the norm is no longer the norm...the norm is much higher”⁷². This community weathering is likewise reflected in reports on regional population decline. Stemming from interlocking impacts of economic woes, flooding, and USACE land buyouts, population decline is reported as far back as 1971, with one reporter designating the Kickapoo watershed as “a dying valley”⁷³. Broadly, journalistic records reflect not only immediate flood impacts but also intergenerational community weathering in the face of unresolved risks.

On the other hand, flood reporting reflects enormous resilience towards existential threats. Records repeatedly stress residents' close ties to community and landscape and present resilience as central to local identity, even following severe flooding. As one resident, faced with hundreds of thousands of dollars in farm damages, stated in the midst of 2007 reconstruction, "We're going to survive, one way or the other...we are going to survive and be back, that's for sure. We're not going to quit"⁷⁴. Resilience was likewise represented in reporting on the Gays Mills relocation, with one resident summarizing community attachment and adaptive resilience succinctly, remarking "I'll probably have a little choke in my throat when they tear [my] building down, but I'm not afraid to move forward"⁷⁵. Sentiments extending beyond abstract resilience and reflecting adaptive knowledge production are also found throughout regional history, with one state official stating in 2013 that, "we know these rivers will have flood events again...but we have a lot of lessons learned"⁷⁶. This sentiment is consistent with findings on the role of transformative learning in producing resilience (Choudhury et al., 2021; Faulkner et al., 2018).

Driftless Area flood reporting, however, also reflects crucial distinctions between resilience and risk misperception. Articles across generations report on floodplain amnesia, a phenomenon involving shifts in public discourse away from flooding following immediate recovery (Lane et al., 2013)⁷⁷. This phenomenon relates to the socio-ecological concept of active forgetting, wherein traumatic experiences of environmental crises encourage refusal to proactively address the roots of these crises (McEwen et al., 2016). As far back as 1937, reporting called for proactive flood management, stating "The poignant lessons of the 1937 flood are fading...Next year we are likely to have another flood. Then we will begin to talk about it again and look up remedies. Between that time and the present, we will reminisce"⁷⁸. Struggling to adapt

psychologically to chronic threats is seen more recently, with reports following 1992, 1993, 2007, and 2018 floods noting residents' skepticism about the return of flooding⁷⁹. In the words of one resident in 1993, "People in the paths of disasters... believe it can't happen to them; after it happens, they believe it won't happen again"⁴². This takeaway showcases oft-neglected aspects of hazard relationships, suggesting crucial needs for proactive resilience strategies addressing risk misperception.

Conclusions: Putting Policy and Resilience in Community Context

This news-based analysis of Driftless Area flood history identifies socio-ecological and psychological determinants of hazard response and crisis experience. Our analysis revealed that flood response and resilience are mediated by combined impacts of crisis-induced windows of opportunity, competing forces of community weathering and resilience-based community identity, and risk perception. Further, we identified long-term benefits of community-orchestrated non-structural flood response measures, suggesting a need for wider adoption of these practices. To better understand the implications of these findings for future resilience efforts, these factors must be put into community context.

Seeing windows of opportunity transformations in Driftless Area flood response highlights incongruities between community needs-oriented resilience efforts and resource allocation by managing institutions that have been identified in prior scholarship (Garvey & Paavola, 2021; Gottschalk Druschke et al., 2022b; McEwen et al., 2016). These transformations reveal the key roles of community memory and locally produced flood response knowledge, rather than top-down decision-making, in creating more effective flood responses. From the 1935 petitions for federal flood control to soil conservation programs sustained by local commitment across the 20th century to

contemporary self-directed community relocation efforts, flood-impacted residents in the Driftless Area have consistently been at the forefront of overturning institutional discourses on flood management to approach proactive resilience⁸⁰ (Gottschalk Druschke, et al., 2022b).

Given managing institutions' well-established patterns of failure to appropriately value community-directed flood response, cultivating multi-scalar resilience against escalating environmental crises requires allocating resources to directly impacted communities to build resilience at the ground level, both with respect to guiding flood management and responding to flooding's psychological impacts (Garvey & Paavola, 2021; Gottschalk & Druschke et al., 2022b). Returning to the interactions central to socio-ecological study, the Driftless Area is threatened not only by the physical conditions of intensifying flooding, which render its communities precarious, but also by economic and political structures that provide insufficient resources for self-directed resilience efforts. When managing institutions fail to recognize the potential for community-orchestrated resilience, the 1971 words of one resident speaking in the midst of the collapse of La Farge Dam Project plans ring true: "We're caught in a meat grinder between two big forces. And the sad thing is, they don't care who they grind."⁸¹

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