We Were Here: a waypoint for library workers in a changing climate circa 2023 CE & 1.47 ± 0.09 °C above the preindustrial average

by

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Abstract

The contemporary practice of librarianship and the discipline of Library and Information Studies (LIS) have both begun to reckon with the threat that a changing climate poses to vocational and cultural continuity. The vocation's subjects, culture and information, have already been transformed in recent decades through mass digitization and integration into planetary-scale information and communication technology (ICT) infrastructures. Now the effects of anthropogenic climate change are increasingly felt throughout the full domain of terrestrial activity, impacting cultural knowledges, communities, and the libraries that serve both. Articulating a proportionate vocational response has, thus far, proven challenging. This thesis attempts to contribute to the emerging discourse taking place at the intersection of cultural memory work and climate change by offering narrative and integrative literature reviews. The first presents a history of the vocation's understanding, as represented in scholarly and professional library discourse, of the library's role and responsibilities in addressing climate change from the late 20th century to the present. The second synthesizes research from multiple disciplines to determine how contemporary librarianship is implicated in the causes and impacts of ongoing climate change, situating and scoping the work within the locale of Treaty 6 Alberta. These reviews serve to lay the groundwork for introducing the Mitigation Adaptation Community Knowledges (MACK) Compass, a conceptual framework for assisting library practitioners and scholars developing locally relevant strategies and tactics for climate action within the unique context of their own work or organization.

Keywords: libraries, archives, cultural memory, climate change, literature review

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First and foremost, my gratitude extends to the land and the parents that raised me. The asiniskaw sipisis-stoney creek valley, my mom, my dad— they are responsible for beginning my life and for everything that comes after.

The work that I am currently undertaking, of which this thesis is a part, is fundamentally indebted to the Tr'ondëk Hwëch'in Nation, stemming from an encounter with their history, as told on their homeland by the staff of the Danoja Zho Cultural Centre.

My close friends made it possible to pursue and continue this line of inquiry. Sam, Tom, and my siblings. Coda and Naga. The North Saskatchewan River valley and my little garden out front.

I am fortunate to have been able to follow the groundbreaking work of the initial leaders in climate librarianship and archivism, including Heidi Abbey, Rebekkah Smith Aldrich, Monika Antonelli, Bradley Bishop, Lois Evans, Beth Filar Williams, Ben Goldman, Matthew Gordon-Clark, Dan Grace, Mandy Henk, Lisa Nathan, Amanda Oliver, Barbara Sen, Luanne Sinnamon, Beth Patin, Eira Tansey, Shari Veil, and Jan Zastrow, though by no means is the field limited to these individuals.

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Introduction

I. Survey

> *"Every fraction of a degree matters. It matters for the types of heat waves that we have in summer, and the implications that has for vulnerable parts of our community. It matters for ecosystems, whether fish can breed or not, whether the right prey species is available in the right season for species to flourish."*
>
> - Samantha Burgess, British deputy director of the Copernicus Climate Change Service (as cited in Mortillaro, 2023)

> *"When the last tree is cut, the last fish is caught, and the last river is polluted; when to breathe the air is sickening, you will realize, too late, that wealth is not in bank accounts and that you can't eat money."*
>
> - Alanis Obomsawin, Abenaki filmmaker, artist, activist (as cited in Poole, 1972)

Transformative climate action. Librarianship.

Why associate these practices? From a conventional point of view they may, at best, exhibit a peripheral connection. Even so, this thesis attempts to clarify their counterintuitive relationship at a specific place and time, illuminating some of the reasons why ecological and epistemic justice may, in fact, be fundamental to each other. After all, 'conventional' perspectives led us into climate change. Perhaps it is only through unconventional relationships with our world and through different ways of knowing it that restorative paths will become visible.

Climate change or, more accurately, the global climatic shift caused by an industrialized colonial extractive infrastructure is now shaping the present and future of the entire planetary system. While Earth's climate has changed many times over the course of its >4 billion year history (Hessler, 2011), the present changes in global climate are markedly different from previous changes by several measures (IPCC, 2007). Rapid environmental changes at much smaller scales have historically been responsible for "large-scale human crises" (Zhang, et al., 2011) and all human activity will be affected by this planetary-scale process. The easy answer to the question

of why librarianship might be associated with climate change is that library practice and thought must take climate change into account simply because every contemporary endeavour now exists in this context, whether or not it is acknowledged.

Yet the nature of librarianship, as a tradition of cultural knowledge and memory practice that asserts specific guiding ethical principles (ALA, 2006a; IFLA, 2012; ALA, 2024b), demands a deeper examination of its purpose, obligations, and capabilities in light of these same principles. In Part One of this thesis, I will demonstrate how accounting for climate change is causing a radical re-examination of library theory and practice. The vocational paradigm is moving beyond questions such as "what does climate action look like in libraries?", valuable though they may be, instead confronting librarianship with the question: "what should libraries look like within a world experiencing climate change?" My writing occurs in the midst of what I propose is the third wave of the scholarly and professional discussion concerning climate change, one which is characterized by this vocational reorientation. Using a narrative literature review, Part One documents the decades-long process of reorientation as library scholars and practitioners are forced to consider dynamics and relationships that extend well outside the comfortable structures imposed by texts, collections, and institutional walls. This summary covers the professional and scholarly discourse that advocates for climate action and proposes possibilities for incorporating it within library practice. As stated, three sequential, yet overlapping, waves of 'climate librarianship' become apparent in this survey, each beginning the transition into a new wave as exigent lines of inquiry lead to disquieting material implications.

The first wave takes place from the mid-90s to the mid-2000s. During this initial stage, academic library and information studies (LIS) journals and professional trade publications keep climate change safely ensconced within the library's traditional domain: the collection, as one topic of knowledge among many, perceived and mediated through the lens of traditional library values like neutrality. Yet while the contents of collections, such as books and documentary records, remain a part of the emerging body of climate change-focused literature, librarians begin to recognize that rising sea levels and changing climatic conditions will affect collections themselves, signalling the end of this period. The collection is considered the site of activity until the material implications for collections are understood.

This leads to the second wave: literature that advocates for actually taking climate action institutionally. During this phase, the scope is contained within the traditionally defined infrastructure of libraries themselves. Suggestions often take the form of modifying conventional facilities and operations to reduce energy use and greenhouse gas (GHG) emissions, as well as other minor adjustments or additions to library practice. This second wave of climate librarianship, occurring from the mid-2000s to the mid-2010s, transitions as global GHG emissions and average annual temperatures continue rising, followed by an increasing visibility of the attendant impacts. This results in a growing awareness of the consequences for the continuity of libraries themselves— not to mention the communities and cultural record that they serve. The institution is considered the site of activity until the material implications for the institution itself are understood.

This sets the stage for the third wave, which extends to the present day. This wave exhibits a crisis of vocational identity and period of mourning. There are calls for a complete transformative reinterpretation of librarianship. In the context of climate change, library scholars and practitioners are undergoing a process of sense- and meaning-making (Sinnamon, et al., 2023) as they determine how to implement this transformative change in concrete and material ways.

In addition to this core of climate change-focused library literature, the review draws on three related themes from scholarly and professional writing to complement its findings. The first of these is ‘green’ or ‘sustainable’ librarianship, the second is disaster response in libraries, and the third is discussion of the Anthropocene and the significance it holds for cultural memory work.

These three adjacent themes and the three waves of climate librarianship itself—collection-based, institution-based, and transformation-based—are united by threads woven throughout the logics and practices of contemporary librarianship. If transformation is necessary, there is an imperative to learn from epistemic silences, unstated assumptions, and unintentional absences equal to or greater than merely summarizing what *is* being said within the literature. These ideological influences, such as colonialism and neoliberalism, constitute the vocational

episteme. Understanding this episteme, the contextual circumstances present in a "given culture and at any given moment, … that defines the conditions of possibility of all knowledge" (Foucault, 1970) and "carefully trac[ing] out the lineages that brought current conditions into being" (Donald, 2010) is necessary for determining the fault lines or points of leverage that may allow for a reorientation of library theory and practice towards transformative climate action. In support of this transformation, Part Two of this thesis works to elucidate these lineages and conditions through a broader integrative review that situates its discussion through relationship and place in order to determine how librarianship is connected to the causes and impacts of climate change and, therefore, can pursue mitigation of those causes and adaptation to those impacts.

II. Terms & Conditions

> "*On what terms can we speak? And on whose terms*?"
>
> - Dwayne Donald, amiskwaciwiyiniwak Professor and Canada Research Chair (Donald, 2010)

Unavoidably, this thesis is a colonial (by)product constructed from the perspective of its settler author, the academic setting that its production took place in, and the institution that it is oriented towards. In order to account for this, the reader is asked to consider the knowledges and ways of knowing that are legitimized and excluded by this bias as part of a settler colonial episteme. While I have tried to signpost these influences, or even resist them where possible, my own indoctrination and the need to develop a thesis that meets certain standards gives shape to this research as much as—or more than—my own aspirations for it. This is further complicated by the colonial process that this thesis is chiefly concerned with: so-called anthropogenic climate change.

How are ethics to be discussed in these conditions? If the vocation is to move towards transformation, the settler-colonial episteme must be accounted for. Foucauldian discursive theory posits that, similar to the transition between waves of climate librarianship, episteme and its resultant ideas and practices contains inherent paradoxes, inconsistencies, and contradictions,

unanswered questions that may be recognized and exploited to open up possibilities for intentional change (Foucault, 1972; Foucault, 1978). This is not guaranteed, however, and the immense difficulty of this project hovers on the edge of human capacity. Perhaps it is, as Donna Haraway suggests, unthinkable (Haraway, 2016).

How do you think the unthinkable? How do we know the unknowable? Call them common organizing forces (Todd, 2016a), more-than-human hyperobjects (Morton, 2013), or perhaps, once upon a time, gods, the limits of conventional thought and knowledge become apparent when we think our own episteme or the planet's atmosphere using the same methods and habits by which we think things that are more cognitively manageable.

Put another way, decolonization and climate change are both "wicked problems" (Lehtonen, et al., 2018) that frustrate simple solutions. Their complexity and interconnected natures may be best addressed by epistemes that embrace complexity and interconnectedness as well. Though epistemes that legitimize knowing through reduction, separation, and linear causality have their uses, a side effect is the tendency to view objects of study in isolation rather than as part of an interrelated network, thereby increasing the likelihood of negative externalities like GHG emissions and environmental degradation—whether ecological or informational.

In fact, Dwayne Donald describes colonialism as an "extended process of denying relationship, whether it be with the places where we live, or our head and our heart, or people who look different than us" (Donald, 2010) and Kyle Whyte stresses that it is the violent disruption of "human relationships with the environment" in particular which defines settler colonialism (Whyte, 2018). Therefore, as a first step in addressing my settler episteme I intend to be mindful of estranged relationships while attempting to acknowledge, honour, and reaffirm relationships throughout this thesis. To this end, I am writing from a frame of reference known as ethical relationality (Donald, 2012). Indigenous librarians such as Sandra Littletree, Miranda Belarde-Lewis, and Marisa Duarte propose ethical relationality as a reparative methodological tool which may open up the possibility of establishing a relationship between an Anglo- or Euro-centric episteme and Indigenous ways of knowing (Littletree, et al. 2020).

Ethical relationality is a framework in which relationship is a verb (hooks, 2000; T. Ball, Michif, personal conversation 2019), not an ossified noun, a living process that we enact with good intentions— respect, reciprocity, and responsibility (Littletree, et al. 2020) or even radical love (hooks, 2000; Todd, 2016b; Loyer, 2018) if we are capable enough. These intentions call on us to be mindful of those we are knowing from and with, not unlike the established ethics of scholarly citation directs us to do as well, but in as expansive a sense as we are able. To whom am I accountable and for what am I responsible? These questions are asked in ecological, epistemological, pedagogical, ethical, social, moral, and legal senses, among others (Todd, 2016a).

In pursuit of these lines of inquiry, ethical relationality centres difference (Donald, 2010). Instead of assigning value on the basis of similarity, a homogenizing sympathetic "we are all the same" perspective, ethical relationality appreciates diversity as a necessary and healthy part of an ecosystem (Donald, 2014; Martín-López, 2021) guiding us to think difference positively (Braidotti, 2002) while empathically keeping in mind the ways in which this difference interacts. This perspective is fundamental for understanding how we are positioned by our epistemes relative to each other in a way that refuses to erase the disparate contexts, influences, and outcomes acting on each of us, nor absolves us of our roles in causing, supporting, or resisting these conditions. Ethical relationality considers these disparities the essential foundation of a truly shared understanding (Donald, 2012) which opens possibilities for establishing or reestablishing a mutual epistemic relationship and may assist in the identification of epistemic inconsistencies.

My grasp of ethical relationality is further informed by the Nehiyaw Cree word

[it has good intentions] [extra-human relations]

(Donald, 2014; Loyer, 2018), a concept arising directly from the relationship between Indigenous people and their land, amiskwaciwâskahikan-edmonton in Treaty Six Alberta, Canada, where I have the privilege of writing this thesis from. In engaging and knowing with this concept, I take sole responsibility for any inadequacies in its interpretation, application, and communication and I do not intend to speak on behalf of any Indigenous individuals, communities, or ways of knowing during the course of this thesis. Instead I am attempting to think with and from this place while relating my understanding to you. It is my understanding that miyo wâhkohtowin affirms that ethical relationality applies to relationships between humans, non-humans, and more-than-human entities (Donald, 2014; Loyer, 2018). It is these relationships and the extended ways of knowing (Clark & Chalmers, 1998) they enable that create the conditions for culture: communal memory and cognition. Cultures are collaborative systems of supporting, distributing, storing, and altering patterns of knowledge amongst multiple subjects, facilitating durations and distances inaccessible to each subject individually (after Clark & Chalmers, 1998; Crosby, 2004; Cruikshank, 2005; Rowlands, 2010). Repetition, iteration, and systematization of knowledge patterns involves all participants in a communal cognitive process which upsets human exceptionalism. Acknowledging this "liquid flow of shared consciousness within Creation" (Doug Williams quoted in Sheridan & Longboat, 2014) is a re-cognition of relationship between us and the nonhuman world, facilitating the restoration of ecological relationships to cultural processes.

This definition of collective knowing also works against the colonial episteme by interrupting the primacy of written text as a knowledge carrier, a key feature of the systematic delegitimization of Indigenous ways of knowing in the academy (Loyer, 2018). This enables a move towards epistemic diversity in cultural memory and knowledge work, which is as critical for cultural ecosystems as it is for ecological ones. Culture in this sense is a multimedia intelligence that may involve rhythmic and tonal sounds, representational and abstracted visual symbols, sensable patterns of movement, varying textures[1], arrangements of smells and tastes, and technological aids to form inter-subjective cognitive networks in addition to the synaptic gaps and

[1] Quechuan khipu, braille, traffic rumble strips, etc.

electrochemical nervous signals that are used within individual organisms. The potential for insight is present in any and all of these formats.

Furthermore, as miyo wâhkohtowin makes clear, culture can be multispecies, a collective remembrance held in distributions of plants like the three sisters—maize, beans, and squash—that are vital to Indigenous agriculture on Turtle Island, or in behaviours of companion species like the qimmiit. It can be multi-elemental, taking place in animate or inanimate carbon, silicate structures, or memorized in calcium carbonate statuary. Even within the colonial episteme, its preeminent creation myths—Eve, Newton, and their apples (Stukely, 1752; Watts, 2013)—are tacit acknowledgements that cultural and cognitive processes can take place in our relationships with non-human subjects like trees.

Finally, the multigenerational aspect of culture—wherein memories or thoughts may surpass the duration of the individual organisms or community that initiated them via methods such as oral storytelling or writing systems—is highly relevant to the climatic and geological timescales that are necessary for determining climate action (Lyon, et al., 2022).

Ultimately, this is all to say that culture makes it possible to think beyond our own limits by thinking with each other, attempting to make sense through collective cognition and giving us a shot at comprehending hyperobjects. I am thinking with those that I've cited and many whom I have not, human and nonhuman, or cannot because I am incapable of recognizing them. You are thinking with me at this moment. We can think of libraries as one codified form of cultural relationship between community members and knowledges, allowing our thoughts to pass between us across distance and time to think thoughts inaccessible to an individual mind. Whether libraries are facilitating an *effective* communal cognition of climate change is another question and one of the primary concerns of this thesis.

Libraries and other cultural memory institutions also offer another helpful characteristic for thinking about immense common organizing forces: they are generally conceived as places (Duranti, 1995; Bisbrouck, et al., 2011; Dick & Lar-Son, 2023). Whether this refers to the concept of the third place (White & Martel, 2022), to the built social infrastructure they represent

(Klinenberg, 2018), or to the physical sites hosting digital collections, their situated nature offers an invaluable reference point. This is because place provides a materially-based initial relationship, locating cultural knowledges geographically and temporally to circumvent a colonial solipsism that devises futures divorced from our environment and our past (Donald, 2010; Sheridan & Longboat, 2014). Furthermore, knowledge itself is inseparable from place. It is drawn directly from our umwelten, a word in the language of my father's ancestors meaning the lifeworlds that we each subjectively construct and experience from the "objects, artifacts, sounds, smells, visual and tactile phenomena, activities, events" (McCreadie & Rice, 1999), and any other sensable entities or changes present within our environment (von Uexküll, 2010).

And, as I allude to in my earlier discussion of culture, knowing extends recursively back into environment, circulating in analogous or abstracted altered forms such as a written note, association with a fragrance, digitized calculation, pigment on stone, or a personal landmark, remaining retrievable to its original subject or becoming incorporated into an inter-subjective cultural relationship. Knowledges are subjective systems of storing, accessing, altering, and (re)combining patterns of phenomena gleaned from our umwelten. While these systems may exist within the cells of an individual organism's brain and other anatomical structures and processes, including behavioural patterns of doing such as practice or procedural memory, the systems may also be altogether external to our anatomy (after Clark & Chalmers, 1998; Crosby, 2004; Cruikshank, 2005; Rowlands, 2010). Knowledge arises within the material conditions in which it was known and which were used to know it, the precise relationships between environment, anatomy, and subjectivity with which knowing took place.

Cultural traditions that have acknowledged the importance of contextualizing knowledge with place extend into time immemorial (Basso, 1996; Cruikshank, 2005; Watts, 2013; Sheridan & Longboat, 2014; Donald, 2021) and the role that located knowledge, or the perceived spatial and temporal proximity of climate impacts, plays within knowing is also increasingly understood by climate science communication, education, and threat construal research (Akerlof, et al., 2013; Shome & Marx, 2009; Trope & Liberman, 2010; Ejelöv, et al., 2018) as one of the most effective means at our disposal to cognize a changing climate and to motivate preparation for it (Adger, et al., 2013).

In addition to this facility for thinking climate change, understanding the library in and as place supports ethical relationality, crystallizing the relationships and conditions responsible for creating "how and why I know what I know" (Todd, 2016b) by connecting this knowledge to both the material conditions and historic divides (Donald, 2010) that exist here and now, "outside the narcissism and supersaturated temporality of the nanosecond present" (Sheridan & Longboat, 2014) through a narrative gravity that bridges our self (Dennett, 1992) with others', a similarity in umwelten strong enough to serve as an epistemic commons amongst subjectivities and concrete enough to preserve difference.

For these reasons, I will be scoping Part Two with a guiding regional case study. The historical, ecological, socioeconomic, geological, and material characteristics that intersect in amiskwaciwâskahikan-edmonton, Treaty Six Alberta inform an understanding of what has led to a changing climate, who is facing the most immediate and severe impacts of climate change while having done the least to cause it, and how librarianship is connected to these conditions and to climate change itself. This is necessary as a foundation for meaningful speculation about how librarianship may be practiced differently in alternative futures (Donald, 2012).

At minimum, writing from what is known for now as Alberta, Canada, the historical and contemporary sociopolitical conditions require any transformative analysis to centre decolonization, the return of Indigenous lands, lives, and sovereignties (Tuck & Yang, 2012). Not only are Indigenous communities subject to greater risks from both the industrial causes and impacts of climate change (Mitchell & D'Onofrio, 2016; Waldron, 2018; Whyte, 2019; Waldron, 2021), the processes that deprived Indigenous nations such as the Nehiyaw Cree, the Niitsítapi Blackfoot Confederacy, the Dene, the Hohe Nakota Assiniboine, the Îyârhe Nakoda Sioux, the Nahkawininiwak Saulteaux, and the Otipemisiwak Métis [and Black communities] of their land and culture extended to Indigenous non-humans and more-than humans (Crosby, 2004). This settler-colonial terraforming was and is deeply entangled with climate change (Lewis & Maslin, 2015). It was initiated by the same society whose industrialization began climate change. Both processes were predicated upon land expropriation and resource extraction, whether foreign or domestic (Polanyi, 2001; Osborn, 2003; Patriquin, 2004; Malm, 2016; Berg & Hudson, 2023)

and they produced and persist into our present (Parsons, 2023). Furthermore, the same logics that rationalize colonization and climate change devalued and attempted to erase Indigenous ways of knowing in spite of their capacity for “overcoming the combined challenges of climate change, food security, biodiversity conservation, and combating desertification and land degradation" (Shukla, et al., 2019).

This systematic epistemicide devalues media formats like oral histories, spiritualities and philosophies outside of a lineage of ‘classical’ European civilization, alternative governance models, and gendered cognitions such as emotion, despite the fact that ecological grief and anxiety are “reasonable and functional responses to climate-related losses” (Cunsolo, et al., 2020) and offer a means “to deal with distant and unknown threats that require more expansive and flexible solutions” (Mayiwar & Björklund, 2023).

A therapist shared a method with me for working with this ecological anxiety. In your immediate surroundings you focus on: five things you can see, four things you can touch, three things you can hear, two things you can smell, and one thing that you can taste. Being able-bodied, I have access to this exercise. I gather that the order can vary, but the important part is that you use your embodied senses to connect to where you are. Your body secures your self in place.

147 years after Treaty 6 was signed and the Dominion Lands Act legalized a theft of land that I have benefitted from, the same land where I am writing from. 2023 CE, by the Gregorian calendar. It is November 11th, a time we have literally set aside to remember together, during the long tail of a global pandemic that many seem dedicated to forgetting.

Last winter, I heard the coyotes at night, playful yelps emanating from the dens they make in urban golf courses that close for the season. At work in the public library, I noticed fingers and toes stolen by the cold, taken from the record number of people denied housing by our current way of life, most of whom are visible minorities or Indigenous. I conducted the research for this thesis from the warmth of stable housing.

In the spring, the first four blossoms that I saw in the garden were prairie crocus (Indigenous), Nanking cherry, apricot tree, and then the dandelions (all settlers). The earth remained unseasonably dry to the touch, cracking open here and there. Days were punctuated by the siren

of the public notification system on our phones, the sound warning us of another nearby wildfire. The smell of smoke became familiar. The sun, a flat red disc.

This past summer, partially due to the effects of the El Niño Southern Oscillation (Becker, 2023), the global average temperature anomaly approached 1.5 °C above the pre-industrial level (C3S, 2023), giving the world a taste of what seems to be the absolute best case scenario that our political apparatus can offer and one that seems increasingly remote. In this heat, the intercontinental boreal forests directly to the west and overseas in Siberia burst into flame, a leviathan plume of cinder and ash drifting to the eastern edge of the continent, and then across the Atlantic Ocean to where the spark ignited two centuries ago.

I took notice of these things throughout the year and kept the memories on a phone that was assembled by workers in the employ of a Taiwanese corporation known as Pegatron. It has committed several labour abuses in the People's Republic of China, including unpaid overtime and illegal student work programs (Battacharya, 2016; Wang, 2020). It is conceivable that I am related to some of these workers or executives through my mother's side of the family though, given the numbers involved, the odds are slight. It has been generations since my ancestors crossed the salt to settle here.

This is how I attempt to think the unthinkable: through ethical relationality, my body rooting my self in place and place situating my relationships.

III. Research Questions

RQ1. What is the current understanding, in scholarly and professional library discourse, of the library's role and responsibilities in addressing climate change?

RQ2. In what ways is contemporary librarianship implicated in ongoing climate change, its causes, and its impacts?

Part One: Literature Review

I. Libraries

> *"What does all this mean to librarians?"*
>
> - Mandy Henk, librarian, writer, and advocate (Henk, 2014)

The library institutions that have exerted the most direct influence on me are the local municipal library in the small town where I grew up, the Edmonton Public Library, and the School of Library and Information Studies at the University of Alberta where I've undertaken my Masters degree.

Whether unintentionally soaking in the concept as a child by the sunlit, south facing windows next to where the fantasy genre was shelved, or intentionally practicing and studying the concept in workplaces and classrooms both physical and virtual, these are the three institutions where I learned the most about "a collection of books, and possibly other materials and media, […] accessible for use by its members and members of allied institutions" (Library, n.d.) and often paired with a lending model for sharing the contents of that collection with the membership. This definition or a similar enough one would most likely be conjured by the majority of people in Treaty 6 upon hearing the term 'library'.

In this way 'library' is a part of the local episteme, a cultural format constituted by a particular practice of supporting, distributing, storing, and altering knowledges amongst the community as well as an embedded rationale for why the practice is enacted in this specific way. This particular expression of 'library' is a facet of Treaty 6 culture which serves as a starting point from which to answer RQ1: What is the current understanding, in scholarly and professional library discourse, of libraries' role and responsibilities in addressing climate change? since it is the concept that is being addressed in the following review of vocational literature, though writers may further distinguish between public, academic, or other kinds of library.

During the course of this review undertaken to answer RQ1., when I refer to the *vocation*, I mean the overall theory and practice of librarianship. When I refer to the *discipline*, I mean library and information studies (LIS), academic and scholarly theorizing and writing about the vocation. When I refer to the *profession*, I mean theorizing and writing about the vocation for, and often by, practicing librarians and library workers though they may be thinking and writing about the vocation. When I refer to library *practice* I am invoking the abstracted sense of the norms and conventions guiding library work, with *work* referring to the specific day-to-day labour that individuals may carry out in support of the vocation and institution. Whenever I refer to *cultural knowledge* and/or *memory*, I am alluding to the whole Galleries Libraries Archives Museum (GLAM) sector and, further, inviting consideration of the full weight and scope implied by the terminology.

Returning to the intersection between climate action and librarianship, the three waves of climate librarianship provide a compelling example of the relationship between a community and cultural knowledge. Ironically, the so-called Anthropocene seems actually to have confronted many with the hubris of anthropocentric thinking which centres human individuals, organizations, or societies because, despite its anthropogenic origins, the rapidly changing global climate demands an understanding that human actions occur within its context. Something about the prevailing epistemic conditions briefly obscured the reality that the human species in its entirety takes place within conditions governed by the Earth's climate, though it may seem obvious when stated so plainly. It was inevitable that the ecological change wrought by industrialized colonialism would trigger an attendant epistemic change.

Not only is this evident in the development and popularization of the term 'Anthropocene', the ontological turn in anthropology (Todd, 2016a), and posthumanist discourse (Braidotti, 2013; Morton, 2013), it is also apparent in microcosm through the three waves of literature addressing climate change and librarianship. In the trajectory from considering climate change to be one tidy, discrete topic among many contained within conventional library collections and practices during the first wave, through the growing understanding that the second wave came to, wherein the library itself was discovered to be entangled in climate change's causes and impacts, to

encountering the limits of existing systems—library included—as the transformative third wave emerges, we can see this epistemic reckoning taking place.

This dawning realization is echoed in the adjacent relevant discourses: green or sustainable librarianship, disaster response in libraries, and cultural memory work in the Anthropocene. It prefaces the destruction of the comfortable silos and categories with which contemporary cultural knowledge institutions have been constructed. The knowledges held in the library do not exist apart from those who know them, and the knowers are inseparable from their environment.

II. Methods

The literature for this review was collected in the following way. First, by pure happenstance. During a trip I unintentionally came across a clear lesson elucidating the difficulty and necessity of maintaining cultural continuity during overwhelming ecological and social change, entirely thanks to the history kept and shared by the Tr'ondek Hwëchin at their cultural memory institution, the Dänojà Zho Cultural Centre. Thereafter, I enrolled in the University of Alberta's Master of Library and Information Studies (MLIS) and Digital Humanities program.

Upon beginning my studies, I initiated my formal search via the coursework available to me and through the University of Alberta Libraries Elton Bryson Stephens Company (EBSCO) Discovery Service search interface, a proprietary product provided by a subsidiary of America's 196th largest privately held corporation—2023 revenue $3.1 billion (EBSCO, n.d.). Within the EBSCO interface, I used the following search terms:

> "climate change" OR "global warming" OR "greenhouse effect"
> AND
> librar* OR archiv*
>
> *n*=34,021

These search terms were repeated in the following databases:

- Library and Information Science Source
- Library & Information Science Abstracts (LISA)

and in the official website search interfaces of the following publications:

- Library Journal
- School Library Journal
- American Libraries
- Journal of Critical Library and Information Studies
- Canadian Journal of Information and Library Science
- Journal of Information Ethics
- in the library with a lead pipe open access journal

Many of these sources are much less accessible to the non-academic population, so a secondary search was performed with both Alphabet Inc. and the Internet Archive's scholarly search engines using the same search terms.

These results were critically reviewed to ensure that articles fell directly inside the discourse of the LIS discipline or library and archival professions. Redundant and irrelevant results that did not address library theory and practice were excluded. Searches were re-performed periodically (every ~3 months) given that new literature continues to be written in this emerging field.

The informal process that initiated my studies continued in the form of trawling citations and "browsing the stacks" both literally and metaphorically. This was necessary because of the imperfect and siloed nature of academic publishing licenses and opaque proprietary search engines that frequently omitted relevant results for unclear reasons.

n=221

III. First Wave: Collections late ‘90s to ~2007 CE

The late 2000s was a watershed moment in the vocational and cultural understanding of climate change by several measures. 16 years before present (YBP), 19 years after the Intergovernmental Panel on Climate Change (IPCC) was established, 10 years after the Kyoto Protocol was adopted by 192 parties, and 0.81 degrees Celsius above the pre-industrial average (C3S, 2024) climate change began to be widely and directly addressed in both academic LIS and mainstream library trade publications (Line, 2006; Hecker, 2007; Meyer, 2008) and gatherings, like the 2008 ALA conference programme “Earth, Wind & Fire @ Your Library: Changing Climate and Changing Lives” (ALA cited in Antonelli, 2008). In her literature review of the “green library movement”, Marika Antonelli made a prediction that “2007 be remembered as ‘the tipping point when public understanding of the existential threat of climate change reached critical mass’” (Bryan Walsh quoted in Antonelli, 2008). It is the year that An Inconvenient Truth wins the Academy Award for Best Documentary Feature, and its creator Al Gore is subsequently awarded the Nobel Peace Prize alongside the IPCC. However, within anglophonic countries, this year also sees the beginning of a period of declining public belief in the seriousness of the climate crisis (Environics, 2015; Poortvliet, et al., 2020).

Prior to 2007, climate change is almost solely mentioned within the library domain’s academic and trade publications in the context of reader’s referral, including book reviews, lists of resources—both print and digital (Raeder, 1997; Sapp, 1998; Maxwell, 1998; Gilbey, 1999; Stevenson, 1999; Jobe, 2001; Vaughan, 2001; Jobe, 2002; Galbraith, 2002; Keiser, 2002; Eberhart, 2003; Kaag, 2003; Sapp, 2004; Berger, 2005; Hoffert, et al., 2005), and interviews with the authors of said books (Williams, 2004; Sapp, 2005).

In this first wave of climate librarianship, when the connection between the vocation and climate change is made, the library is understood to be responsible for facilitating climate action through the contents of its collection, and particularly those knowledge media that are traditionally associated with librarianship and, more generally, archival practice, i.e. books and documentary records. This interpretation of its role supports an information deficit model of scientific communication or literacy, wherein publics become informed about a given issue—in this case,

climate change—via a one way flow of information from experts in the field (Sudolvsky, 2017). Collections are assumed to contain authoritative texts written by these experts. In the case of multiple authorities, accurate and/or scientific knowledge is expected to outcompete false and/or unscientific knowledge. This is reflected in the inclusion of climate denying or skeptical texts, presenting them as necessary balance to "alarmism" (Galbraith, 2000) or, disturbingly, even projecting these opinions (Beall, 2002) onto work that actually highlights the anthropogenic nature of climate change (Collier & Webb, 2002; Ruiz de la Torre, 2005) in order to perform the traditional core value of neutrality through "balance".

The focus on collections does extend to articles and line items about librarians and archivists who are responsible for repositories of climate change research data (About, 1990; Duling 2006; CLIMATE, 2007) and these particular articles are an initial step towards making the infrastructure and labour enabling library collections more visible.[2] Ultimately, all of this writing fits comfortably within the existing conventions of what libraries are understood to do, both in terms of how publics and professionals commonly conceive of the institution.

This conventional approach to librarianship and climate change is also expressed in the primary exception to the collections-based discourse during this period: an occasional recurring topic in the American Library Association's (ALA) Newsletter on Intellectual Freedom, edited by Judith F. Krug, wherein climate science is discussed in the context of the titular vocational core value, Intellectual Freedom. This writing frames the climate denial and disinformation perpetrated by the George W. Bush administration of the United States as an issue of censorship, discussing instances of government officials censoring reports and misrepresenting scientific understanding of climate change (ALA, 2004; ALA, 2005), direct and indirect censure of federal scientists (ALA, 2006b), the closure of libraries housing atmospheric and environmental records (ALA, 2007a; ALA, 2007d), and the state-level censorship of climatologists (ALA, 2012) through this lens— although the vocational compulsion to perform 'balance' is present in the last example, a one-to-one comparison between a case where a climate scientist was fired from an existing position by the state of Georgia and a clarification made by the Governor of Oregon that a

[2] The article on Finnish librarians in the Arctic contains some disciplinary foreshadowing stating that "Arctic Research is the canary in the coalmine" and briefly touching on the librarians' collaboration with Indigenous Arctic peoples such as the Sami (Duling, 2006).

self-appointed “state climatologist” who denied climate change had never actually held that position with the state of Oregon (Hines, 2007).

The stance against censorship further manifests in related actions taken by the ALA that were summarized in the Newsletter, including Senate testimony (ALA, 2007b), public statements, and the organization of aligned First Amendment groups (ALA, 2007c), all of which contributed to the re-opening of the threatened libraries (ALA, 2007e; ALA, 2008). Viewing this history from both the present and from Canada positions this relatively brief yet effective engagement as somewhat radical, an approach directly addressing the information asymmetry of public climate change knowledge that has lain dormant until relatively recently (EDGI, n.d.; Open, n.d.; Walker, et al., 2018; Tansey, 2019). These actions hold further relevance because many of the same events were repeated in Canada shortly afterwards by the Stephen Harper administration. However, in this case, the Canadian library sector failed to prevent these domestic closures. Nor has the censure of government scientists that was initiated by the Harper government subsided during the subsequent Justin Trudeau administration (O’Hara, 2010; CBC News, 2012; DemocracyWatch, 2018; Owens, 2018).

This period of vocational assertion and understanding of climate science censorship would come to a close as the vocation’s discussion of climate change opened in other ways. In 2006, Maurice Line, a prominent figure in British LIS, pointed out that a significant number of the collections held by national libraries are located in coastal cities and are therefore at risk of being under water by the end of the century (Line, 2006).

IV. Second Wave: Institutions ~2006 to ~2019 CE

This heralds a shift in the way that climate change is discussed in a library context as the potential impacts upon the material aspects of the institution demand consideration (Line, 2006; Hecker, 2007; Meyer, 2008; Gordon-Clark & Shurville, 2010). While the content of collections, such as environmental records and books about climate change remain important, suggestions for limiting the vocation’s contribution to disastrous levels of global warming begin to enter the discourse.

Meyer's early article "Global Warming's Library Challenge" (Meyer, 2008), typifies this shift and the resulting second wave of climate librarianship literature, which centres the institution itself, its material infrastructure, its facilities, and its operations. Several themes emerge in this article and other climate-focused library writing during this time.

First, while the conventional concern for collections remains, the discussion now turns to the ways that climate impacts directly threaten those collections, including the aforementioned rising sea levels (Line, 2006; Gordon-Clark & Shurville, 2010) as well as less dramatic impacts like increased humidity and heat (Meyer, 2008). Librarians and archivists are called upon to consider everything from "ongoing pressures to maintain a suitable collections storage environment" (Meyer, 2008) to the wholesale relocation of coastally located national libraries and archives (Line, 2006; Gordon-Clark & Shurville, 2010). This is often connected to a stated aspiration to secure the collection, or even the human record, "for future generations" (Meyer, 2008), a sentiment mirrored in sustainable librarianship literature (Jankowska & Marcrum, 2010), the first of the three relevant and related vocational themes.

Both climate-focused LIS literature and sustainable librarianship literature further connect with conventional library practice by continuing to base initiatives in the information deficit model and the provision of more information about climate change and sustainability. Reflecting the second wave's shift in scope, in addition to community members, institutional staff begins to be discussed as an appropriate audience for these educational initiatives, which are typically framed as supporting a literacy—science literacy, eco-literacy or sustainability literacy— (Antonelli, 2008; Jankowska & Marcrum, 2010; Miller, 2010; Abbey, 2012; Grace & Sen, 2013) to further cement the connection with a traditionally text-centric library practice. Suggestions for improving these literacies include programming, such as courses, panel discussions, community cafes, and book recommendations (Antonelli, 2008; Meyer, 2008), as well as publicized organizational statements of intent such as press releases and strategic plans (Antonelli, 2008; Abbey, 2012) intended to signal and explain that library workers and community members should care about the environment, as well as that libraries themselves are concerned about the environment to external stakeholders.

As part of this literacy paradigm, many of these articles include explanatory paragraphs for scholarly and professional library audiences introducing basic concepts from climate change science and sustainability. Meyer writes an exemplary passage: "Fossil fuels are a primary contributor to global warming. One way to reduce greenhouse gases added to the atmosphere is to reduce resource consumption" (Meyer, 2008). Concepts such as energy efficiency, ecological or carbon footprints (Antonelli, 2008; Jankowska & Marcrum, 2010), and alternative or renewable energies receive similar treatment and largely serve to frame potential action as the reduction of an institution's impacts on the environment (Antonelli, 2008; Jankowska & Marcrum, 2010).

Sites to address these institutional impacts include operational infrastructure and practices, such as the purchase of energy efficient equipment or fleet vehicles and the promotion of telework and telecommuting to reduce the transportation required by in-person meetings (Line, 2006; Meyer, 2008). The impacts of facilities' energy usage and emissions are also a prominent area of concern in the climate-focused and sustainable librarianship literatures, and methods of reduction are primarily proposed through 'green' buildings (Abbey, 2012) that adopt sustainable standards for new construction, such as the Leadership in Energy and Environmental Design (LEED) certification (Antonelli, 2008; Meyer, 2008; Jankowska & Marcrum, 2010; Abbey, 2012). There is one other method of note for reducing carbon footprints proposed at this time: replacing print content with digital content. This is primarily explored by a single researcher, Gobinda Chowdhury (Chowdhury, 2010; Chowdhury, 2011), and is not commonly considered as an option in the rest of the literature.[3] These impact reduction initiatives are complemented and supported by an emphasis on auditing, benchmarking, and measuring progress in the reduction of waste, energy use, and/or emissions (Jankowska & Marcum, 2010; Abbey, 2012).

The final key action raised by Meyer's article is a well-rehearsed disaster plan (Meyer, 2008). This invites the second intersecting vocational theme, disaster planning for libraries, into conversation with climate librarianship. The development of disaster planning within the

[3] In fact, within the 2nd wave of librarianship, digitization typically appears in order to criticize its characteristics from the perspective of energy use and adaptive capacity (Hovde, 2010; Wolfe, 2012).

vocation was a theme that cohered around the growing need to develop formal institutional strategies for responding to the short-term crises and emergencies (Kahn, 2003; Green & Teper 2006, Kuzyk, 2007), such as natural disasters, that were increasingly seen to affect libraries. As with climate librarianship, much of the focus in the literature at the initial stage revolved around the collection, centering the protection of the materials held therein (Kahn 2003; Green & Teper, 2006).

Interestingly, there is a distinct absence of the term "climate change" or "global warming" within this early writing on disaster planning for libraries. While some of the writing is disaster-agnostic, referring to several categories including natural disasters, almost none of them actually mention climate change at this point in time (Kahn, 2003; Green & Teper, 2007; Kuzyk, 2007; Wong & Green, 2007; Celedón, et al., 2012; Veil & Bishop, 2012; Bishop & Veil, 2013; Veil & Bishop, 2014; Scholl & Patin, 2014), framing the discussion at a remove which is also characteristic of media discussions that ignore the relationship between specific disasters and the increasing frequency or severity of these disasters arising from climate change. Celedón, et al., 2012, at least, are discussing response to a Chilean earthquake specifically, so their omission is understandable. Even so, Green & Teper, 2006 and, later, Halsted, et al, 2014. cite Hurricane Katrina as an inciting event for the discipline to seriously explore disaster planning in greater detail. Even at the time, the severity of Hurricane Katrina had already been linked with the impacts of climate change and its effects on sea surface temperatures and water vapour (Trenberth, et al., 2007). In fact, Meyer also references Hurricane Katrina in her article on climate action within libraries (Meyer, 2008). Still, during this period, the sole exception to this omission of climate change in texts discussing disaster planning for libraries is The Librarian's Disaster Planning and Community Resiliency Workbook and, bizarrely, it only lists climate change as a hazard in the states of New York, Hawaii, and Wisconsin (New Jersey, 2013). Despite this dead angle, there *is* obviously a great deal of immensely valuable information relevant to libraries preparing for climate impacts within this body of literature. The inconsistent acknowledgement of climate change does also extend into sustainable librarianship literature: Antonelli, 2008 and Abbey, 2012, mention climate change, whereas Jankowska & Marcrum, 2010 do not.

While the writing during the second wave of climate librarianship outlines useful first steps, they have proven insufficient to address climate change even as they continued to be presented in disciplinary (Kornfeind, 2022) and professional writing (Lawton, 2020). Eira Tansey posits that while these kinds of actions "may be psychologically easier to tackle [...] a changing climate inevitably raises disturbing questions about risks to human safety, collections, livelihood, and operational continuity" (Tansey, 2015). At this point in the second wave, reflecting upon the broader sociocultural implications of a failure to stop climate change is rare outside of a few exceptions (Hecker, 2007; Hovde, 2010). These exceptions share an additional commonality in the form of, ironically, a prominent fear of peak oil (Hecker, 2007; Antonelli, 2008; Slone, 2008; Librarians, 2009; Hovde, 2010), the theoretical point at which viable oil supplies begin to decline, either due to actual resource depletion or market forces. During the 2nd wave, the topic of peak oil motivates a rare departure from the typical suggestions for institutional climate action, with Antonelli referring to an emerging "post-peak-oil type library service" (Antonelli, 2008) that includes food security, community gardening, and tool libraries. The LIS literature discussing peak oil typically uses more dramatic language—"an unblinking look at the deterioration of the world ecosystem upon which all life depends" (Hecker, 2007)—than contemporaneous climate librarianship literature. This line of thinking represents a vocation straining to move beyond 'business as usual' in order to consider global changes and deep time (Hecker, 2007; Hovde, 2010), a motif which will more fully emerge within the last discursive theme to intersect with climate librarianship: the Anthropocene.

Prior to that, towards the end of the second wave of climate librarianship, many of the preceding institutionally-focused discussions and suggestions were collected and summarized into book-length texts on 'green' libraries, published by the ALA and Litwin Press (Miller, 2010; Antonelli & McCullough, eds., 2012), even down to the infrequent use of the terms 'global warming' or 'climate change', which are largely restricted to brief mentions and appended resource lists. The vocation's adoption of the 2nd wave's themes was observable as large organizations like the ALA formalized initiatives such as the Sustainability Round Table (SustainRT), spinning it out from the earlier Social Responsibilities Round Table's Task Force on the Environment (TFOE) in 2013 (ALA, 2013).

At the same time, there is a trickle of writing that begins to problematize and critique these normative approaches in the 2010s, again widening the scope of the discourse by taking up the threads introduced within peak oil librarianship to extrapolate the material consequences for libraries in broader contexts.

Although there are other early concerns about the carbon intensive norms engendered by contemporary knowledge work, such as “the humanist scholar's traditional trip to […] libraries in other countries to consult documents” (Line, 2006), this period in the second wave represents a deeper and wider troubling of these norms beginning with an early open-access article recognizing that libraries no longer exist in a stable environment, in both the vocational and ecological senses of the term.

The writer, Karen Munro, suggests that the vocation move from a paradigm of sustainability to one of resilience, introducing several concepts, including diversity and social capital, that will become increasingly important in the field (Munro, 2011). From this point on ‘resilience’ is increasingly invoked within the vocation (Celedón, et al., 2012; Grace & Sen, 2013; Veil & Bishop 2012; Veil & Bishop, 2014). While the cause driving this new term is unclear, and may simply come down to its extradisciplinary popularity, it is tempting to attribute some of the shift to a failure of earlier efforts to mitigate climate change. As the visibility of climate change is heightened by its impacts, perhaps it is thought that making infrastructure ‘resilient’ signifies a more proactive, tenacious stance than making it ‘sustainable’ does.

In 2012, Mark Wolfe complicates the narrative of ecological impact reduction by raising the spectre of Jevon’s Paradox and its application to an archival paradigm, pointing out that a sole focus on efficiency improvements within a system can actually “increase overall usage of a resource instead of decreasing it” (Wolfe, 2012), a common industrial economic pattern that can be seen in office paper usage, in computing ICT energy use (Lange, et al, 2020), and in emissions produced by Albertan tar sands facilities over the last decade (AER, 2021). Even as efficiency is improved, a growth paradigm—whether expressed economically or as the conflation of a collection’s quality with its size—leads to increased overall demands for labour, resources, and time. Wolfe points out that green technologies alone are insufficient to minimize

impacts upon the environment or the workforce and that behavioural changes are a key component in developing a sustainable archival practice (Wolfe, 2012).

Related to this, in his ongoing research into digital information services, Chowdhury further observes tension in a sustainability paradigm which emphasizes balancing three pillars: economy, equity, and the environment. Chowdhury points out that an overemphasis on the economic dimension of sustainability might circumscribe the other two by encouraging decision makers to find an 'efficient' balance between sources of energy or labour with a low financial cost and high environmental or social costs (Chowdhury, 2013; Chowdhury, 2014).

An epistemic influence informing this efficiency mindset is highlighted in 2013 by Dan Grace and Barbara Sen. They take an autoethnographic approach to climate librarianship, further assessing the institution through the highly relevant lens of the community resilience concept articulated by Norris, et al., 2008. Outside of emerging disaster planning literature (Veil & Bishop, 2012; Veil & Bishop, 2014; Scholl & Patin, 2014), this marks one of the earliest pieces of writing on climate-related library work to use this concept[4] and to center community members and their needs rather than collections. The inclusion of these topics, community, resilience, and a related adaptive capacity, "social capital" (Norris, et al., 2008)—also raised earlier by Munro—along with a contemporaneous reference to social cohesion in a review of Antonelli & McCullough's publication (McDermott, 2013), foreshadow major directions in future writing on climate librarianship (Aldrich, 2018a).

Grace and Sen produce an insightful piece acknowledging the environment, and society's relationship with the environment, as the fundamental context within which all library work takes place. They critique a technocratic approach to librarianship on the grounds that, aside from "stickers on some light switches in the library asking one to consider the environment and turn lights off" (Grace & Sen, 2013) existing technologies exploit and obscure the relationships between users and the energy or resources they use[5], as well as with each other.

[4] Munro, 2011 uses a different definition of resilience which is drawn from the ecological sense of the term
[5] the authors quote Ivan Illich's contention that "high quanta of energy degrade social relations just as inevitably as they destroy the physical milieu" (Illich, 1974 as cited in Grace & Sen, 2013)

They further note "the existence of a split between the social worlds of the library worker and user" (Grace & Sen, 2013) driven partially by the increasing mediation of information technologies in library space but also by the elements that promote and justify their presence. In this way, the lens of climate librarianship brings labour and issues of professionalization into sharper focus. Grace & Sen view the default role of management as one that assumes the deployment of these technologies in these specific [alienating] configurations to be inevitable and, regardless of a "logical […] desire to calm fears over the introduction of a new technology" (Grace & Sen, 2013), by framing this insertion as a necessary or even natural evolution with no alternatives, perpetuate "the split between the library worker and the library user" (Grace & Sen, 2013), between users themselves, and between users and their environment.

The professional microcosm that Grace and Sen present draws attention to the implicit assumptions behind many of the actions introduced and embedded within this stage of climate librarianship and within the broader sustainability literature—improving efficiency, quantifying these improvements, and identifying staff, community, and external actors for unilateral direction or education. This is one of the hidden aspects of a sustainability lens "derive[d] from and … shaped by various intellectual spheres, including the business, economic, and industry sectors (e.g., 'triple bottom line,' assessment, and metrics)" (Abbey, 2012) or, put even more explicitly: "Going green is now a national issue, and patrons expect their library to respond in the same way many corporations have" (Miller, 2010).[6] These influences embedded within climate librarianship offer a limited set of perspectives, tools, and goals drawn from management practices in the private sector, suggesting limits inherent to the epistemic assumptions that they represent. Others subject 'resilience' to a similar critique by making a direct connection to individualistic neoliberal values (Nowviskie, 2015).

While Grace & Sen hint at this troubled inheritance, their paper is more concerned with the role that technology plays in narrowing or reinforcing the distance between lifeworlds of community, staff, and management within the library, impeding community relationship building and, therefore, working against the social capital necessary for community resilience. To aid in this

[6] At the time of Grace and Sen's paper, the Progressive Librarians Guild proposed an anti-corporate vocational alternative by advocating for fossil fuel divestment (PLG, 2013).

analysis, they situate conventional library technologies within “authoritarian technics” (Mumford as cited in Grace & Sen, 2013), tools which circumscribe use by channelling users into predetermined and pre-existing power relations, as opposed to Ivan Illich’s “convivial tools”, consensual technology that can be used “as often or as seldom as desired”, affording “the greatest opportunity to enrich the environment with the fruits of his or her vision” (Illich as cited in Grace & Sen, 2013). These convivial arrangements of technology—alongside relationship building in the form of outreach—are proposed as possible methods for reestablishing and accumulating social capital in order to support community resilience.

From here on out, the vocational discourse begins to rapidly shift, marking the transition into a new paradigm for climate librarianship. Wendy Highby calls upon librarians to challenge the ways that they are constrained by a traditional interpretation of neutrality, and to take on a “critical role in the processes of information production, dissemination, and interpretation […] to ensure that information is used in ways that enhance participatory democracy” (Highby, 2014) in the context of motivating climate action and addressing climate malinformation. This piece of critical librarianship appears at the same time as the landmark publication of “the first book to seriously examine the future of libraries in a climate reality-based context” (Ecology, n.d.): Ecology, Economy, Equity: The Path to a Carbon-Neutral Library by Mandy Henk. Ad-copy aside, it does a remarkable job living up to this description by elaborating on the topics of the second wave of climate librarianship and anticipating themes that will become characteristic of the third wave of climate-focused librarianship that follows.

In Henk’s text, topics that have typified the second wave are presented in greater depth than the preceding writing on climate librarianship. This can be seen in the detail that is afforded the usual primers on climate change and sustainability, which incorporates a broader discussion that loops in concepts such as ecosystem services and limits to economic growth. For the most part, these remain relatively standard types of descriptions that use an abstracted lens of quantitative figures rather than specific concrete examples, however Henk does begin the text with an exception, relating a poignant personal experience of environmental change.

Henk offers an extensive delineation of library roles and responsibilities in contemporary shared cultural environments by invoking sustainability as a core value through which librarianship can be conceptualized and evaluated in novel ways. While acknowledging the contested nature of the term, Henk ultimately focuses on its use in ecological economics over international development, proposing that integrating sustainability as a core value "requires more than just measuring and reducing environmental impact" (Henk, 2014) and suggests that the discipline of librarianship itself may both benefit from and better contribute to sustainability by "recommitting to our fundamental values and reviewing our operations to ensure that they match those values" (Henk, 2014) in light of the identity crisis brought on by digitization, austerity, and the impacts these issues have had upon the vocation itself and cultural knowledge work as a whole.

At first, the text may appear to be simply a more thorough and practical guide to analyzing existing library infrastructure from an environmental lens in the form of two tools, a sustainability plan to "structure, direct, and define successful institutional sustainability" (Henk, 2014) as well as a more granular sustainability assessment. However, in addition to these tools, Henk gives nuanced and considerate guidance in the form of both generally applicable advice, such as avoiding moral judgment during these processes in order to foster an inclusive, solutions-focused tone for evaluation and discussion (Henk, 2014), as well as more contextualized direction. For example, an introduction to using carbon footprint analysis to identify potential sites for decarbonizing operations discusses the usual logistics such as the transportation of staff, patrons, and materials, energy audits and power efficiency opportunities, eliminating waste streams and water usage where possible, but further extends analysis to material factors further up the supply chain, including deforestation for paper, mining of minerals for technology, operational costs of larger servers run by third-party vendors, and local procurement policies— with the qualification that "the environment is not going to be saved through shopping" (Henk, 2014).

Crucially, in addition to analytical tools, Henk considers the effects on labour and gives voice to the need to build the capacity for these initiatives throughout an institution's staff, complementing Grace & Sen's concerns about divisions between staff and management. Henk calls for both vertical and horizontal 'buy-in' in order to make sustainability itself sustainable

within the institution, recognizing that frontline staff and adjacent departments possess a great deal of knowledge about everyday needs and operations that may be unknown to management and that, while management may direct policy, frontline staff is ultimately responsible for actually enacting any policies or initiatives. Henk's suggestions for supporting cross-hierarchical investment range from encouraging reading groups and project teams for interested staff to the formal establishment of a system-wide committee representing all levels and areas of labour.

Again, while these might initially be seen as more detailed treatises on the existing themes of climate librarianship up to this point, in the final third of the text Henk uses the 'three pillars' of sustainability and, in particular, the equity value, to look further afield from conventional practice, laying the groundwork for a re-examination of the systems and structures that constitute the library by discussing the institution in a broader context than most prior literature. For instance, in her discussion of a system-wide sustainability committee, she introduces the possibility of including representation from other community stakeholders and sustainability groups (university, municipal, vendor) within the committee in order to magnify effectiveness and avoid redundant or oppositional climate action in the community. Henk also endorses the expression of equity through services to marginalized community members, management-labour relations, and through work to address the inequality of the public information environment via collection management and advocacy in legal areas such as copyright terms and the right of first sale. She points out that, technologically, a great deal of librarianship is "solved" (Henk, 2014). That is, technically, there exists the possibility for an average individual to access a great deal of the contemporary sum of available culture, be it artistic, scientific, or whatever they may wish. What remains a challenge is the socioeconomic obstacles to the equitable distribution of available culture, justifying a mandate to pursue "a transformation of the scholarly communications system" (Henk, 2014; p. 15) through open access and other methods in order to keep the cultural record accessible.

Henk also maps this unequal information environment onto library practice by drawing attention to the fact that the issue of sustainability within libraries is not confined to the physical library building but includes the digital information and communication technology (ICT) that is in vogue, and the varied inequitable and extractive infrastructures that these technologies are

dependent upon, such as labour exploitation and mining (Henk, 2014), paralleling and expanding upon what Grace and Sen called authoritarian technics, or others might posit as a colonial concealment of relationships between humans and with non-humans.

Ultimately, Henk places the crises confronting society, the environment, and librarianship within a historical pattern of enclosing commons, most recently in the form of neoliberal privatization, institutional austerity budgeting, and a systemic encroachment on the public domain. Examples of this encroachment given in the text are publisher consolidation, the hegemony within the contemporary scholarly communications system, as well the mere fact that libraries "serve as one of the few remaining functioning commons in an era dominated by enclosed spaces and resources" (Henk, 2014), a state which, to Henk, is exemplary of a failure to understand the role that robust commonly-held resources play in forming the foundation for health and justice within communities. Henk posits that sustainability is a concept that may address this failure by embedding a vast notion of vertical and horizontal investment within library practice, as inter- and intra-generational justice.

At the same time as she proposes this addition to the core values of librarianship, Henk also introduces an idea that will begin to resonate within the third wave of climate librarianship by quoting Bill McKibben: "We'll need to figure out what parts of our lives and our ideologies we must abandon so that we can protect the core of our societies" (Bill McKibben quoted in Henk, 2014). In this way, transformation is not solely a matter of taking on greater responsibility and scope, but involves elements of shedding atrophied and dysfunctional traits as well.

As the decade enters its second half, the vocational discourse begins to evolve.

In 2015, a brief reference to "drastic changes in climate around the world" (Chauhan, 2015) appears in a paper on green initiatives in Indian libraries and the first dedicated English-language article authored by a library professional outside of North America, Europe, and Australia specifically on the topic of climate change and librarianship appears in the visible academic record (Ebunuwele, 2015), though it is no longer available through 'legitimate' channels like the EBSCO Discovery Service.

A vocational transition in gravity and tone is aided by significant work reflecting Munro's earlier assertion that a stable context for cultural memory work is an increasingly remote possibility. While still falling under a climate-agnostic disaster response approach two pairs of researchers, Shari Veil and Wade Bishop as well as Hans Scholl and Beth Patin, begin theorizing the characteristics of successful crisis-response in public libraries (Veil & Bishop, 2012; Veil & Bishop, 2014) and of "resilient information infrastructures" (Scholl & Patin, 2014) by drawing on the adaptive capacities from the community resilience model (Norris, et al., 2008) and applying them to how information institutions and infrastructures have performed during historical emergency situations.

On the archival side of the vocation, Eira Tansey publishes the first literature review summarizing a comprehensive breadth of the impacts, both short- and mid-term, that climate change is likely to have upon American archival repositories (Tansey, 2015). Similar to Henk, Tansey sees sustainability as a value that can be embedded directly within cultural memory work and, like Munro, Grace, and Sen, invokes resilience as a useful frame as well. In taking the adaptive perspective, Tansey places an emphasis on preparing for the apparent inadequacy of reducing society's GHG emissions. Recognizing that there is a great deal of existing archival writing on threats to collections in the form of short-term disaster management as well as climate impacts on immovable heritage sites within broader cultural memory research, Tansey finds that archives typically remain underprepared in several senses. Aside from the aforementioned heritage sites, Tansey found almost no discussion of how changing climatic conditions stand to impact archives, very few institutions evidencing an "emergency plan with trained staff prepared to execute it" (Tansey, 2015), and a significant and widespread gap in adaptation planning, not only within archives but within the institutions and communities of which they are often a component part. She further points out that even within the well-established themes, "positioning disaster preparation along one single aspect of professional functions leaves it vulnerable to marginalization" (Tansey, 2015) and removes it from the everyday practice and experience that make an effective disaster plan actionable. Tansey highlights that exploratory work is being done by organizations such as Archivists Responding to Climate Change (projectARCC), the National Archives and Records Administration (NARA), the Smithsonian Institution, and the Disaster

Planning and Recovery Subcommittee of the Regional Archival Associations Consortium, though at the time of her writing, this work was mostly limited to public statements of intent. Her recommendations include assessing archival institutions' climate adaptation plans, their existing losses sustained due to climate impacts in addition to any resulting financial coverage from FEMA or insurance companies, and the "current state of regional and national coordination of cultural heritage emergency response organizations" (Tansey, 2015).

Within the piece, Tansey frequently alludes to collaboration with libraries and museums. In an earlier review of sustainable archival literature, Heidi Abbey had also connected these institutions with archival work through the framing of the Libraries, Archives, and Museums (LAM) sector (Abbey, 2012), sometimes expanded to include galleries (GLAM). While a full accounting of climate-focused GLAM discourse is outside the scope of this review, it is worth highlighting that 2015 is a landmark year for relevant scholarly discourse in cultural memory work overall. Not only do dedicated texts analyzing climate change from the perspective of other cultural memory institutions (Harvey & Perry, eds., 2015; Newell, et al., eds. 2016) appear around this time, as well as a special issue of Forum Journal focused on the preservation of cultural heritage during climate change (Mayes, et al., 2015), but 2015 is also the year that Elizabeth Merritt and Bethany Nowviskie popularize deep time in cultural memory discourse through two seminal talks. In "The Ten Thousand Year Collection", Merritt echoes and directs the sentiments of both Munro and McKibben, stating that existing "… organizational structures, economies, programs, collections… evolved to fit an environment that is changing rapidly. We need to identify our core business—whether you consider that to be preserving collections, creating new knowledge, or helping people learn—and question… every assumption you have about what a library is: What is essential, and what is merely tradition?" (Merritt, 2015) Nowviskie's talk, "Digital Humanities in the Anthropocene" (Nowviskie, 2015), highlights the difficulty and the stakes involved in aligning cultural memory work with adaptation on geological timescales by introducing the final adjacent vocational theme with relevance to climate librarianship: cultural memory work during the Anthropocene. In so doing, Nowviskie stakes out an argument for a disciplinary exploration of the fundamental questions that McKibben and Merritt ask us to consider.

As the 2nd wave begins the shift into something else, an increasing number of cultural memory organizations begin to publicly endorse the second wave's values of sustainability and climate action. The same year as Tansey, Merritt, and Nowviskie's work is published or presented, the ALA releases a Resolution on the Importance of Sustainable Libraries which, rather than being solely focused on sustainability, extends the aspirational terminology into resilience and regenerative action. The Resolution specifically cites the IPCC and flags anthropogenic climate change as a central concern for libraries, encouraging proactive work amongst library workers and decision makers and referencing the role that libraries "play in wider community conversations" (ALA, 2015). Cascading levels of organizational influence can also be seen in the UN announcement of the Sustainable Development Goals at the end of the same year (UN, 2015), which go on to play a major role in the framing of environmental action in libraries that is promoted by the International Federation of Library Associations and Institutions (IFLA).

At this time, a librarian in the Mid-Hudson Library System and member of ALA's Sustainability Round Table (SustainRT), Rebekkah Smith Aldrich, emerges as a prominent figure advocating for climate action in the profession, initially appearing in articles covering the ALA's Resolution. Aldrich played a major part in bringing the resolution forward (Miller, 2015) and she remains a fixture in North American climate librarianship, writing a regular column on sustainability for the major trade publication Library Journal, and two texts on "sustainable thinking" (Aldrich, 2018b) and "resilience" (Aldrich, 2018a) for the ALA book imprint, as well being instrumental in establishment of the New York Library Association (NYLA) Sustainable Libraries Initiative in 2015, which the ALA formally partnered with in 2018.

Following the ALA Resolution, major library and archival organizations continued to release public statements. In 2016 the Society of American Archivists released a position brief on the intersection between archival work and the environment (SAA, 2016) and, spurred by a change in the American presidency and another wave of politically-driven malinformation, the ALA makes another statement on Global Climate Change and a Call for Support for Libraries and Librarians in 2017 before finally, on May 14th, 2019, adopting sustainability was as a Core Value of the ALA (Morales, 2019). This represents the culmination of the 2nd wave, ultimately validating Henk's proposal in 2014.

V. Third Wave: Transformations, ~2016 CE to present

Taking place in the last years of the 2010s, the ALA's formal adoption of Sustainability as a Core Value, as well as the other public statements made by a variety of cultural memory organizations, reflected what appeared to be a surge in the global movement for climate action. Even in Treaty 6 amiskwaciwâskahikan-edmonton Alberta, a locus of climate denial due to an array of social, political, economic, and cultural factors, the grounds of the provincial legislature filled to capacity during rallies, both in the presence of activist-celebrities like Greta Thunberg and without. For a moment, progress finally seemed inevitable. Another potential tipping point, if you will.

Those years simultaneously marked the beginning of the 3rd wave of climate librarianship, moving from institutional to transformative thinking. All of the unanswered questions and troubling implications left unresolved by the 2nd wave combined with a climate that continued to change, its attendant impacts steadily becoming more apparent, despite three decades of its presence in the discourse of librarianship. It has become increasingly clear to library scholars and professionals that

> "*... the way 'we've always done things' is not sustainable for the well-being of our communities. We need to seek out those patterns that are emerging to systemically change the policy landscape of our society, economy and the environment…*" (Aldrich, 2020)

and enact a librarianship that supports or facilitates the necessary systemic changes.

During this period, the dialogue between mainstream and critical climate librarianship becomes more direct. While norms are questioned very early on, such as Line's notion that travel "to national and other research libraries in other countries … will no longer be an automatic right" (Line, 2006), the 3rd wave of climate librarianship integrates the critiques and outstanding questions about the way the vocation has always done things, including sustainability, and places them in direct conversation, beginning with the terminology itself.

For example, in 2016, as a direct response to the 2015 ALA Resolution on the Importance of Sustainable Libraries, Civallero & Plaza point out flaws in 'sustainability' premised on

sustainable growth. While this is alluded to earlier in Wolfe's discussion of Jevon's Paradox, Chowdhury's concerns about the tripartite framing, and Henk's admonition that we cannot shop our way out of an ecological crisis, Civallero & Plaza suggest that the ambiguity of sustainability actively impedes meaningful action by facilitating 'greenwashing'. Expanding on Henk's introduction to the concept of limits to growth, they submit that a degrowth approach, intentionally reducing "the levels of production and consumption" (Civallero & Plaza, 2016) in the pursuit of novel ways to maintain or increase individual, communal, and environmental well-being is a necessity, not an option, for climate librarianship (Civallero & Plaza, 2016). While disagreeing about the utility of the term 'sustainability', Civallero & Plaza ultimately end up in a similar place as Henk, concluding that libraries can only address the broader context in which they are implicated by becoming activist institutions committed to resisting inequity before offering one final provocation by suggesting that libraries do not need to limit themselves to a "cultural sphere" (Civallero & Plaza, 2016).

In addition to appearing in critical librarianship journals like Progressive Librarian (Civallero & Plaza, 2016; Harger, 2019), challenges to the existing interpretation of sustainability appear elsewhere as well. Earlier, Tansey alluded to the fact that archival writing often uses the term sustainability to refer to financial and staffing sustainability, divorced from any environmental concerns (Tansey, 2015) and other scholars continue to draw attention to this decontextualizing tendency within the cultural memory sector's use of the term (Pendergrass, et al, 2019). While the mainstream deliberation of the terminology is much gentler, both the ALA and Aldrich's inclusion of resilience and regenerative work—as well as later calls for a 4th cultural pillar of sustainability in addition to the environmental, social, and economic aspects (Brunvand, 2019; Matthiasson & Jochumsen, 2022)—can be said to tacitly acknowledge the limits of the conventional sustainability concept that had been typically used in librarianship up to this point. Additionally, speaking in 2015, Bethany Nowviskie had already begun to raise a few of the emerging trenchant critiques of resilience (Nowviskie, 2015).

The significance that both of these terms, sustainability and resilience, hold for the ethics of librarianship (Burgess, 2017) and its practice (Smith Aldrich, 2018a; 2018b) invites continued vocational contemplation and engagement. Rebekkah Smith Aldrich's texts on each concept

(Smith Aldrich, 2018a, 2018b) are two prominent sites, inviting reflection from other cultural memory scholars (Goldman, 2019) as they discuss the meaning that climate change holds for general librarianship. Familiar definitions such as the triple bottom line return alongside solutions dependent upon social, infrastructural, and environmental stability, in addition to new insights and directions. Smith Aldrich emphasizes proactive outreach efforts and initatives that "empower, engage, energize" and elaborates on a concept briefly raised earlier in the discourse, social cohesion (McDermott, 2013), and its importance for resilient communities. Like Civallero & Plaza, Smith Aldrich gestures at directions beyond cultural services, proposing Maslow's hierarchy of needs as an assessment aid, which can highlight the less-visible adaptation services that libraries provide and outline further gaps in service that might be met (Aldrich, 2018a).

Amid this exploration of guiding values and goals, subtler aspects of the first two waves of climate librarianship persist, such as the obscured connection to climate change. A great deal of writing on disaster management from the late-2010s to present still does not explicitly mention climate change (Stricker, 2019; Mardis, et al., 2021; Stricker, 2022) or only does so via tangential citation (Liu, et al., 2017; Tu-Keefner, et al., 2019; Patin, 2020a; Patin, 2020b) or brief discussions of "adverse weather events" (Bengtson, 2021). Papers on disaster response in libraries that meaningfully engage with climate change remain scarce (Stross, 2017; Yelvington, 2020; Flaherty, 2021), with one of the rare examples having been written by an astute undergraduate (Yelvington, 2020). The first major disaster planning text to directly link the two doesn't appear until 2022, when Mary Grace Flaherty writes "…that many of our disaster challenges can be tied to our changing climate" (Flaherty, 2021) and advocates for mitigative soft infrastructure such as "discussions or programs on climate change, … dependence on fossil fuels, resilient building practices" (Flaherty, 2021) to be considered a component of proactive institutional disaster planning in addition to hard infrastructure such as the construction or renovation of facilities.

This hesitancy to recognize climate change even occurs within the same space as transformative advocacy. One of the major events that can be said to delineate the 3rd wave of climate librarianship, a colloquium on Libraries and Archives in the Anthropocene held in May 2017 (Litwin, 2017), hosts a presentation wherein the speaker advocates for an active avoidance of the

term climate change, stating that information workers have "lost another rhetorical battle and should concede the phrase 'climate change'" (Templeton, 2017) right alongside talks that propose complete vocational reappraisal and action.

Expressions of this ambivalent tension are common. Smith Aldrich calls for "wartime mobilization"— a perspective shared in non-LIS literature as well (Klein, 2020)— in an article that otherwise primarily serves to reiterate the same list of actions that Meyer called for more than a decade prior (Lawton, 2020). It is also evident in the evolution of public statements and press releases. Not only does the focus of these statements shift from sustainability to climate change specifically (EIFL, et al., 2022; ALA, 2022) but transformative 'climate justice' terminology (BCLA, 2020; ALA, 2022; BCLA, 2023) begins to be regularly invoked, even alongside normative solutions such as energy efficient facilities, renewable energy sources, electric vehicles, and ethical carbon offsets (ALA, 2022). Though institutionally-focused writing persists (Graham-Clare, 2022; PressReader, 2023) the vocation's oscillation between familiarity and the unknown is conspicuous.

Still, the colloquium on Libraries and Archives in the Anthropocene, hosted by projectARCC and Litwin Books, is a pivotal event, not only as a vocational intersection with the themes of the Anthropocene, but in climate librarianship overall. The transformative questions beginning to populate climate librarianship are buoyed by the expansion and intervention of Anthropocenic scholarly discourse (Litwin, 2017; Nowviskie, 2018), which continued to filter in from geological science, through the arts & humanities disciplines, and then into LIS itself after Nowviskie's initial introduction. In light of the debate around 'sustainability' and 'resilience', it makes sense that the term 'Anthropocene' itself is almost immediately the subject of disciplinary critique (Tansey & Montoya, 2020; Almeida & Hoyer, 2020; Stuchel, 2020; Radio, 2020) for its silences, which obscure the causal role played by extractivist colonial capitalism and other kyriarchies by broadly ascribing an anthropogenic cause to climate change and other ecocidal processes. Using similar language to the ALA Resolution in 2015, one speaker, Rick Prelinger, refers to the event as "the beginning of a long process" (Prelinger, 2017) that directly confronts the existential queries and anticipated scale of change, summed up by Jan Zastrow as the

recognition of “a philosophical disconnect in preserving the past for future generations when there may be no human future” (Zastrow, 2019).

Resolving this disconnection necessitates a transformative re-evaluation of the vocation, what has been referred to as a sense- and meaning making process (Sinnamon, et al., 2023)— of which this thesis is a small part. Sometimes this process takes the form of familiar approaches like taxonomic cataloguing of climate librarianship initiatives (Foggett-Parker, 2023) or ontological organization in the information science sense of the term (Evans, 2021; Evans, 2022). Early on in the third wave a great deal of vocational sensemaking is done, as one might expect, through books. While occasionally present in some early writing (Hovde, 2010), particularly of the peak oil flavour, during this period library workers and writers frequently invoke dystopic or post-apocalyptic science fiction (Scranton, 2017; Highby, et al., 2020a, 2020b; Melissa Hubbard, quoted in Hobart, 2019; Winn, 2020) as a way to make sense of what LIS—and cultures around the world—stand to lose and how they may change. Other familiar, yet innovative, echoes of established paths in librarianship can be seen in initiatives such as the West Vancouver Memorial Library Climate Writer residency (West, 2021) and proposals to orient collections, services, and programming to support ‘survival literacy’ (Shaw, 2017) which echoes the earlier “post-peak-oil type library service” (Antonelli, 2008).

There is still a persistent interest in collections, whether in the form of evergreen reader’s advisory (SustainRT, n.d.) and perennial book reviews in academic and trade periodicals like Library Journal (Tench, 2020) and the Electronic Green Journal (Lowe-Wincentsen, 2022), or relating instances of activist documentation and archiving (Hoyer & Almeida, 2017; Magier, 2017; Hobart, 2019), and environmental and climatological records (Hobart, 2019; Dominy, 2021). The threats posed by climate impacts to collections are also further explored (Mazurczyk, et al. 2018; Hobart, 2019; Verticchio, et al., 2023; Woodham, et al., 2023), including work that focuses on Canadian archives specifically (Oliver, 2021).

Running parallel to these recognizable threads from the earlier waves are more wholly transformative motifs, less familiar to conventional library practice. A sort of vocational mourning emerges (Scranton, 2017; Nowviskie, 2019; Stuchel, 2020; Winn, 2020), exemplified

by a keynote given by Roy Scranton, who proposes that our cultural task is now "learning how to die, not as individuals, but as a civilization" (Scranton, 2017) or, put more vocationally, a necessary deaccession of the "parts of our lives and our ideologies" (Bill McKibben quoted in Henk, 2014) which have been driving accelerated extinctions. Some of these suggestions resemble a sort of collective apology or accountability to the future (Kubit, 2017). Others call for incorporating palliative practices (Winn, 2020) and intimate contemplation of everyday actions and internal experiences (Filar Williams, 2017; Filar Williams, 2023) into cultural memory work, or striving to become "living" repositories, decentering texts in favour of the imaginative, embodied, and emotional knowledges of marginalized communities (Hoyer & Almeida, 2017; Magier, 2017; Almeida & Hoyer, 2020).

Reflection in these registers reverberates throughout the scholarly and professional sides of the vocation, informing open speculation about "reimagining approaches to collecting" (Hobart, 2019) and other ingrained habits that have formed within cultural memory work. This sees the vocation wrestling with the inadequacies of conventional knowledge practice and its failure to communicate the serious nature of climate change, or translate an awareness into meaningful action, or both.

Several potential approaches to address this failure arise in addition to minor examples like the call to abandon the term 'climate change' (Templeton, 2017). There are pains taken to point out the ways that traditional library practice has actually placed constraints upon knowledge—such as when academic libraries silo archival knowledge from those without academic credentials (Almeida & Hoyer, 2020; Shelley Streeby, quoted in Hobart, 2019)—and, in light of these limits, library and archival workers propose incorporating new modes of communicating climate and ecological knowledge, such as learning through making, arranging interactions with experts rather than impersonal lectures (Nemo, 2019), and even including religious (Cahalan, 2017) or spiritual components such as "hosting rituals developed by environmental healers" (Brunvand, 2020) long excluded from secular cultural institutions.

The vocation begins to delve further into evolving explorations of the contemporary political and socioeconomic conditions (Ellenwood, 2020) that have legally and materially impeded climate

knowledge and action. Often, this leads to proposals for a proactive or, again, activist practice following the recommendation made by Henk, Highby, Civallero, and Plaza. To scholar-practioners like Nora Almeida, Jen Hoyer, and Amy Brunvand this means taking a greater role in facilitating civic engagement (Almeida & Hoyer, 2020; Brunvand, 2020). The establishment of the Environmental Data and Governance Initiative (EDGI) (Walker, et al., 2018) in response to the Trump administration's purging of environmental information and the Open Climate Campaign (Open, n.d.) in response to the inaccessibility of scholarly publishing recalls the early period of action against the Bush administration during the first wave, but then moves further to pivot from preserving data to developing ways to make it, and the decision making that it supports, "more accessible and… more accountable through new social and technical infrastructures" (Walker, et al., 2018).

With respect to the legal infrastructure undergirding and magnifying the ways that academic institutions silo climate science, there is increasing concern about how academic publishers wield copyright to circumscribe potentially important mitigative knowledge by paywalling the distribution and use of peer-reviewed—and often publicly funded—scientific research (Berger & Carey, 2017). Furthermore, the effect of these laws upon material knowledge is critiqued due to the probable need to relocate vulnerable collections and repositories both within and across borders either physically or digitally. Corporate copyright is frustrating these proactive adaptation efforts by limiting redundancy, relocation, or both, ultimately impeding collective remembrance and endangering global heritage (Dryden, 2023) to the point where the most prominent mainstream international cultural memory organizations released an open letter to the World Intellectual Property Organization (WIPO) in 2020 asking for exceptions to national copyright regimes to be made for preservation copies in the name of safeguarding culture (EIFL, et al., 2020). Rather than safeguarding the ability of authors to receive compensation for their work, copyright law has become a form of soft censorship that materially limits the ability of communities to access and use knowledge.

Eira Tansey has discussed how this information asymmetry is even present within frameworks that purport to facilitate transparency, since the distribution of information is also shaped by the technological tools chosen to present it, for instance, those that make oil and gas infrastructure

‘visible’ to the public. Tansey explains that a “just add technology” theory of transparency is as ineffective as a “just add information” theory has been for scientific communication (Tansey, 2019). Other researchers emphasize the danger that the “inherent ephemerality of the web” poses to the scientific record of climate change information in the absence of robust redundancy and back up procedures (Rockembach & Serrano, 2021).

Uniting the critique of intellectual property and its enclosure of culture (Henk, 2014), there is a growing discussion of the ways in which capitalist logics and infrastructure are manifested within these technological tools and the forms of cultural memory practice that they enable, reflecting concepts like “the medium is the message” (McLuhan, 1964) or “procedural rhetoric” (Bogost, 2007). Wolfe extends a continued interest in Jevon’s paradox (Wolfe, 2017) to draw attention to the way that a growth imperative has justified unethical and unsustainable overcollection, failing to solve persistently “underleveraged collections” (C.S. Weber quoted in Hobart, 2019) and resulting in “widely replicated collections of so little value that they are being literally discarded” (Brunvand, 2020) in the headlong rush to digitize materials. Though Chowdhury had discussed the potential environmental benefits of digital collections earlier in the 2nd wave, the way that digital computation and storage interacts with this trajectory towards unlimited growth and is compounded by other vocational conventions leads to a great deal of scholarship troubling the practical sustainability of this infrastructure from the perspective of climate action and knowledge work (Goldman, 2018; Pendergrass, et al., 2019; Zastrow, 2022; Evans, 2021; Evans, 2022; Oliver, 2023).

Conventional expectations that digital collections and, therefore, their servers must always be on, always available, instead of supported through on-demand access strategies lead to significant material and energy costs, as does expectations of ‘permanence’, which “assumes a goal of zero change or loss in digital collections over time” (Pendergrass, et al., 2019) despite the impossibility of this goal given that “current storage technologies are about a million times too unreliable to keep a Petabyte intact for a century” (David Rosenthal quoted in Pendergrass, et al., 2019) and therefore require digital preservation models predicated on keeping a number of copies distributed over a wide geographic area for the purposes of backups and verification (Pendergrass, et al., 2019), literally multiplying the material and energy cost of each item though,

following Jevon's Paradox, this is rendered imperceptible at the use level. These norms also impose greater demands on labour due to associated needs for maintenance, format migration, periodic verification, and the formal chains of custody necessary to legitimize and verify the authenticity and provenance of crucial documentation, particularly government records.

Another key issue in sustainable digital information work has been that of deferral at the organizational level. The perception that sustainable practice falls outside the responsibility or jurisdiction of digital records management and archival organizations or departments is common within Canada (Evans, 2021), as well as the cultural heritage sector globally (Paschalidou, et al., 2022), even when parent organizations are formally committed to sustainability.

On a societal level, Kathleen Oliver outlines in detail how this reduced visibility and deferred responsibility interacts with racism, resulting in the externalized costs of producing and manufacturing these technologies 'affordably' falling upon marginalized communities (Oliver, 2023).

Further issues include unacknowledged byproducts, "media carcasses, … physical remains of the original analog medium, … obviated by digitization" (Linda Tadic quoted in Hobart, 2019) creating further waste and requiring further energy to dispose of. In the wake of these challenges, scholars plead for "paradigmatic shifts" in appraisal, permanence, and availability (Pendergrass, et al, 2019), both in order to re-evaluate the assumptions inhered within digital preservation but also to question the "absolutism and the idealism that the term, permanence, implies" (James O'Toole quoted in Pendergrass, et al., 2019) to be the end game of cultural memory work. Others question whether utilizing complex, delicate, and energy intensive temporal resistance systems that work directly against environmental conditions "reinforce[s] the dialectic between people and nature" (Tansey & Montoya, 2020) thereby creating another site to deny relationships between humans, non-humans, and the conditions that govern them.

This need to reconsider cultural perpetuity in the context of deep time (Merritt, 2015; Nowviskie, 2015) and reestablish an epistemic relationship with ecology is complicated by the significant uncertainty surrounding which knowledge media or characteristics will be most adept at

navigating the direct and indirect impacts of climate change. Due to the episteme of conventional librarianship, many institutions overemphasize collecting “materials from the Western canon, which creates a documentary monoculture” (C.S. Weber quoted in Hobart, 2019), a dangerous state for an ecology heading into a potential evolutionary bottleneck (Helena Norberg-Hodge quoted in Brunvand, 2020). Instead, many propose diversifying media collections (Prelinger, 2017; Zastrow, 2017; C.S. Weber quoted in Hobart, 2019; Zastrow, 2018; Zastrow, 2019) to address this uncertainty, or implementing innovative collections (Irons & Percoco, 2017; Kubit, 2017; Mickiewicz, 2017; Nowviskie, 2019; Rupchan, 2023) to creatively resist the limits of conventional librarianship and knowledge practice. These novel collections build upon the recognition that knowledge is contained within non-textual forms such as cultural heritage sites and ecological records (Holleson, 2018) and proposes bringing together other atypical knowledges to trouble the nature/culture divide, including the recently established Library Field project in New York (Library Field, n.d.) which seeks to hybridize public libraries and public parks, the Norwegian Future Library, a project consisting of trees slated to become bound texts in the year 2114 (Mickiewicz, 2017), community gardens and the seeds of plants that will never become books at all (Banks & Mediavilla, 2019; Rupchan, 2023), in addition to other wholly non-human and anthropomarginal entities (Radio, 2020), even microorganisms living invisibly in the typical media where the vocation considers knowledge to be kept (Stuchel, 2020). In recent years, digital and print texts have been published collecting writing that attempts to begin the process of conceptualizing how land, as fundamental material, can be integrated with librarian practice as a restorative educational knowledge environment and shared social relationship (Tench, 2022; Pieck, 2023; Zvyagintseva & Greenshields, 2023). Other librarians look to the knowledge creation enabled by re-engaging citizens with the scientific process as a way to reconnect them to the knowledges kept in their observable world (Byrd, et al., 2022; 2023).

The re-cognition of new and diverse knowledges and collections takes place in parallel to a growing body of work that represents wider discussion of, and collaboration between, the communities involved in climate librarianship. Following the 2nd wave’s lost initial 2015 paper, more work emerges from global voices in the 3rd wave to disrupt Anglo- and Eurocentrism. This research engages with many of the existing concerns of climate librarianship including the work of initial sensemaking, as surveys and interviews are conducted to determine the attitudes of

library patrons and students in Nigeria (Alabi, 2020; Adetayo, 2023) and Pakistani (Khalid & Batool, 2020) and Zambian (Chewe & Banda, 2021) librarians on the topics of climate change and other environmental issues. Arnold Mwanzu, Emily Bosire-Ogechi, and Damris Odero undertake an examination of climate action in Kenyan academic libraries, finding a developing practice of environmental initiatives such as sustainability positions and low impact construction and design that includes rainwater harvesting and tree planting programmes (Mwanzu, et al., 2023), though somewhat limited by stakeholder buy-in, both from the community patrons and from "challenges root[ed] in the management goodwill" (Mwanzu, et al., 2022), a state of affairs harkening back to Grace & Sen's work.

Global collections-focused research covers the documentation of environmental activism movements in India (Magier, 2017) and detailed legal and regional analyses of climate impacts on cultural memory institutions, like that of rising sea levels on the archives of the Republic of Kiribati (Woodham & Gordon-Clark, 2023) and the risks posed by increased flooding to South African archives in Mpumalanga Province (Netshakhuma, 2021) and the South African National Parks (SANParks) system (Netshakhuma & Khadambi, 2023). The South African studies arrive at conclusions that mirror those of both the library disaster response literature in general and Amanda Oliver's work, which focused specifically on how climate adaptation has been taken up within Canadian archives (Oliver, 2021). These studies found an overall absence of planning, and recommended the development of a comprehensive "archives disaster management plan" that takes the increasing frequency and severity of climate impacts into account.

There are also sophisticated technological analyses complementing the efforts of the EDGI (Walker, et al., 2018) by encouraging web archiving "climate change data and websites" in order to gird against potential politically-driven digital information losses in Ibero-America (Rockembach & Serrano, 2021) and offering perspectives on the implementation of entirely new library infrastructures, such as the deployment of a solar-powered off-grid SolarSPELL digital library in Fiji (Gómez Zermeño, et al., 2022).

And, though sometimes still mediated through American perspectives (Kornfeind, 2022), collections of climate librarianship initiatives or relevant sustainable librarianship strategies (Hauke, et al., eds., 2018) from around the world are published.

Simultaneously, just as the climate librarianship discourse broadens with the addition of perspectives from outside of North America, Europe, and Australia, there is a complementary theme that emerges, pushing back against earlier calls in sustainable librarianship to "think less in terms of places and more in terms of spaces" (Jankowska & Marcrum, 2008) and re-embed librarianship within community as a "specific, culturally situated place" (Almeida & Hoyer, 2020) with a locally relevant practice. While there are potential climate action benefits stemming from the utilization of virtual spaces that are ambiguously located, Rebekkah Smith Aldrich also emphasizes that reconnecting the people living within the community served by the library to each other is critical for social cohesion (Smith Aldrich, 2018a) as climate impacts intensify and community demographics change due to increasing displacement and adaptive migration (Goldman, 2019). Amy Brunvand posits that a resituated practice may also more effectively connect communities to their knowledges, motivating behavioural changes towards climate action (Brunvand, 2017; Brunvand, 2020) and leveraging that into material change by supporting citizen activism through the library (Almeida & Hoyer, 2020; Brunvand, 2020). This line of inquiry is extended by Danielle Marie Bitz, who asks the vocation to consider how institutions or professional roles would have to mutate within each city and region, if space were to be made "for the diversity of knowledges created through relationships and reciprocity" to enable both traditional and new locally relevant ways of learning, knowing, and researching (Bitz, 2023).

A library exists to benefit its unique community after all and there is a growing understanding that this includes the community members that staff the institution. Earlier paragraphs touched on methods by which institutional management sought to educate library workers in ecoliteracy during the second wave, demands on staff stemming from digital overcollection, and how sustainability in the operational sense has often been considered a part of, or outright replaced, environmentally sustainable librarianship. Operational sustainability does include 'human resources', though the terminology serves to distance staff from decision makers in management. But recently, understanding climate action through the lens of labour has begun to permeate the

vocation, primarily thanks to the framing of a Green New Deal. The 2023-2024 ALA President, Emily Drabinski, ran on a platform centering organized labour and a Green New Deal for libraries, which proposes societal scale emissions mitigation founded upon a robustly funded civil sector and the creation of jobs and infrastructure funded by national governments (Drabinski, 2022). Eira Tansey has since written a proposal extending the Green New Deal into archival work, pointing out that both climate impacts and chronic labour shortages pose threats to archival maintenance, continuity, and existence (Tansey, 2023).

The view towards taking better care of library workers and nurturing capacity for climate librarianship practice also extends to proposals (Finn, et al., 2020) and committees (iSchools, n.d.) calling for better training that surpasses ad-hoc on-the-job ecoliteracy initiatives, resulting in new vocational offerings for both disciplinary and professional settings (UBC iSchool, 2024; CLIR, n.d.; LJA, n.d.; Tohatoha, n.d.; Webjunction, n.d.)

More than ever, support for transformative action is evident across the vocation, a broad alignment on what needs to happen, if not the how as of yet.

This is even the case at the level of major mainstream regional, national, and international library organizations, who have recognized climate change as an emergency (BCLA, 2020) and begun to advocate for action, grounded in climate justice, “at the scale that is necessary” (ALA, 2022; BCLA, 2023). Many of these organizations have elected successive presidents who included climate action in their platforms and public statements (Wong, 2021; Pelayo-Lozada, 2023; ALA, 2024; IFLA, 2021). The ALA has launched initatives, such as Resilient Communities: Libraries Respond to Climate Change, a pilot program that “funded film screenings, community dialogues and related events… [and] the creation of a suite of free programming resources about the climate crisis” (ALA, n.d.). The International Federation of Library Associations’ (IFLA) announced that it was upgrading its Environment, Sustainability, and Libraries special interest group to a full ‘section’, granting a greater degree of legitimacy and organizational support to library work in the area (ENSULIB, 2020). Library associations around Canada have struck Climate Action Committees. (BCLA, n.d.; CFLA-FCAB, n.d.; OLA, n.d.)

Dedicated publications appear frequently— two of which are guest edited by Eira Tansey—including a follow up to the Libraries and Archives in the Anthropocene colloquium in the Journal of Critical Library Studies (Tansey & Montoya, eds., 2020), as well as special issues of Records Management Journal (Demb & Tansey, eds., 2021), the Nordic Journal of Library and Information Studies (Graminius, et al., eds., 2023), and Comma, the International Journal on Archives (Tector, et al., eds., 2023). ALA Editions, Library Juice Press, and others have published several books in recent years that cover a wide variety of environmental and environmentally-based practices (Pun & Shaffer, eds., 2019; Tanner, et al. eds., 2021; Zvyagintseva & Greenshields, eds., 2023).

Similarly, academic and professional gatherings on the topics of climate librarianship occur frequently, both in-person and, increasingly, in virtual or hybridized formats (Hobart, 2019; ALIA, n.d.; CAPAL, n.d.; CLIR, n.d.; ENSULIB, n.d.; IAMSLIC, n.d.; IFLA, n.d.).

The vocation is on the verge of deconstructing and rebuilding the fundamentals of librarianship, from collection to community services, inevitably leading to radical reimaginations of what library and archival institutions and practices might look like—might have to look like—in the context of climate change (Larsen, 2017; Almeida & Hoyer, 2020; Stuchel, 2020; Gómez Zermeño, et al., 2022).

These reimaginations may be practical, investigating libraries and archives as sites of community knowledge creation to discern whether crowdsourced digital mapping programming might offer disaster recovery benefits (Hamalainen, 2017) or questioning whether cultural memory institutions should maintain a professional distinction at all rather than recognizing community members as archivists (Almeida & Hoyer, 2020). Others are more theoretical: Should cultural memory institutions remain anthropocentric? Might collections and repositories be said to be knowing entities as well (Stuchel, 2020)? Should we be considering non-humans (Radio, 2020) such as the atmosphere, forests, (Leahy, 2020) and decaying entropic agents like dust as (Stuchel, 2020) community members and potential users of our collections? Or as co-stewards of the collection?

The 3rd wave was complicated by COVID-19. My experience of climate activism in Alberta saw it fall off in mainstream support after a peak in 2019. Other crises were understandably prioritized—perhaps it was a similar moment to 2007, the year before the Great Recession, wherein public concern shifted to threats that are construed as more immediate and concrete, pandemics or the affordability of basic needs like food and housing.

Yet in librarianship, discussion and action has exploded during this time. It has been my privilege and its own sort of fierce joy to have witnessed this recent phase come into flower, especially with so much of this movement coming from northwestern Turtle Island. Though I have oscillated between hope, frustration, and despair I believe that the profession is increasingly aware of the stark reality of climate change and is coming to terms with this reality as fast as an entire vocation and associated bureaucracy is able. Librarianship is on the cusp of an exciting pre-Cambrian moment of potential.

VI. Opportunities

This potential diversification offers myriad opportunities for climate librarianship. Yet, before contemplating the future paths that may be taken, it might be wise to take this opportunity and conclude the vocational literature review by reflecting on major questions and gaps that remain underaddressed at this point in the 3rd wave of climate librarianship. Ethical relationality calls us to attend to the relationships and differences present or ignored in the literature. What are the strained vocational relationships that must be repaired?

VI.i. Managerialism

Some of the most obvious estrangements in the preceding literature arise from the way epistemic and organizational assumptions have arranged people in and around cultural knowledges and memories, within our formalized institutions and practices themselves.

To start, compartmentalizing disaster planning (Tansey, 2015), sustainability (Evans, 2021; Paschalidou, et al., 2022), or climate action into specific departments or teams can disrupt how

shared ecological responsibilities are understood within an organization. This also poses difficulties for collaboration. Similarly, when agency is scoped away from frontline workers by an institutional[ized] expectation that management is solely in charge of setting direction, it can undermine the sense that climate action is one's 'job' unless explicitly told that this is the case, inhibiting motivation in and responsibility for this area. While differences are a "necessary, important, and healthy" (Donald, 2014) part of an ecosystem, arbitrarily constraining interaction or preventing mutual influence between different components simply creates separated monocultures.

A management-based organizational structure may cause friction in other ways. Frontline workers can be distanced from management[7] (Grace & Sen, 2013) when on-the-ground experience and frontline knowledge is not solicited or is even disregarded outright in order to impose top-down solutions that do not take everyday, frontline conditions into account, failing to allow for nuance and specificity and further alienating professional relationships. Without a mutual understanding between decision making and decision executing, imposed solutions can be seen as inconvenient and onerous contributions to an ever-growing list of what library and archival workers are expected to do. In some cases it may breed outright resentment when management boasts of 'doing more with less'. Changes in management, either internally or at the level of parent institutions, can also frustrate the continuity of climate librarianship initiatives. When management, or governance bodies like library boards, understand how their institution is interrelated with its environment they can obviously lend a great deal of valuable organizational support to climate action initatives within the library, yet the inverse can also be true (Miller, 2015) and planning for the whims of future management and board members adds another layer of complexity to climate action planning in libraries.

Further disaffection may arise in how the separation between a library and its community is framed, whether in terms of the distinction between staff and patrons (Almeida & Hoyer, 2020) or how the library itself is conceived as in some way removed from its environmental context.

[7] the emergence of a potential gulf between management and staff (Grace & Sen, 2013; Ortega, 2017; Glusker, et al., 2022; Soehner & Roe, 2022; the online backlash to Soehner & Roe, 2022, i.e. Farkas, 2022; and the response to the backlash, Editorial, 2022; Palichuk, 2024; Zoledziowski, et al., 2024) is an important trend for those interested in climate librarianship to keep an eye on

The latter has resulted in climate and sustainability librarianship that "tends to look inward at how the library and librarian are already arranged" (Oliver, 2023) for opportunities to act, rather than looking outward to the infrastructure and society of which they are a part. This limited vision is also evident in library disaster planning which, historically, has typically oriented itself towards incidents and hazards taking place within library facilities, rather than to prepare library continuity-of-service plans for their occurrence within the wider community (Patin, 2021).

Not only should the organizational structure itself be challenged on the grounds that it impedes climate action, but the logics dictating it, as management-based decision making poses further difficulties for climate action. These difficulties are symptomatic of epistemic inheritances, forms of legitimizing knowledge and coordinating systems, organizations, and institutions that are standard in conventional knowledge practice and deserve just as much scrutiny as every other area of the vocation during a period of transformative climate action.

At minimum, the idea that certain individuals—or a class of individuals—in possession of superior training and expertise in a set of generic business management techniques that bestow universal efficacy in the leadership of organizations, justifying the operation of "public institutions and society as corporations" (Klikauer, 2015), is in tension with the democratic values that librarianship claims to hold dear.

The divisions fostered by this kind of knowledge hierarchy are further reflected in the epistemic and relational distance, often reinforced by conventional library practice, between knowledge authorities like academics or scientists and 'everyday' community members (Hajer, 2012). This gap was exploited by fossil fuel interests to create the illusion of uncertainty about climate change (Oreskes & Conway, 2010; Bugden, 2022). Additionally, the intellectual insularity of the academic and scientific communities has been leveraged within a widespread populist mistrust of elitism, affecting public perception towards bodies of knowledge that are categorized as such. Similar manipulation is now affecting intermediary knowledge professions, such as journalists and school teachers, to politically discredit them (Nesbitt, 2024). Nor are librarians exempt, as recent events in the United States and Canada are making clear (Kingkade, 2023; Bendery, 2024; Gee, 2024; Levesque, 2024). This separation from the processes of knowledge creation and

distribution can be said to be one of the primary impediments to climate action. Reestablishing a connection to these processes is, perhaps, a task that libraries are uniquely suited for. However, the question of how to reconnect community to cultural production and knowledge work, to deconstruct the barriers to access being produced, remains an area that must be intentionally and rapidly developed within library practice. There are further hints of this top-down structure at work at the international level, with disciplinary surveys of African librarians (Mulumba & Nakazibwe, 2017) and Nigerian students (Adetayo, 2023) highlighting the limited efficacy of directives like the UN Sustainable Development Goals to communicate the value of climate action at the level of community.

Finding more effective ways to communicate and reciprocate across these social divides than what managerial hierarchy offers is critical given that a key recurring theme in relevant library disaster response (Stricker, 2019; Patin, 2020a; Patin, 2020b) and community resilience (Mardis, et al., 2021; Baja, 2022; Ciriaco & Wong, 2022) literature is the invaluable nature of trust. This trust is crucial for community members to feel safe and comfortable accessing the recovery resources and services that libraries and other public institutions might provide during and after emergency situations. A major concern for adaptive climate librarianship is determining how this trust can be maintained or increased while undertaking institutional climate action-driven transformation, in order to circumvent the politicization of climate action and prevent the perception that library budgets are "ghoulishly profiting" off of climate impacts (Burgess, 2017).

While "a top down mechanism to create a foundation" (Smith Aldrich quoted in Miller, 2015) for climate action can be useful as part of encouraging vocational or organizational understanding, within the context of disaster and emergency response on the Canadian prairie, top-down decision making was found to be "largely reactive… with reduced institutional evolution" (Sauchyn, et al., 2020).

As evidenced by the efficacy of emergency response approaches like the Incident Command System (ICS), clearly delineated responsibilities and hierarchies are not without their merits in specific crisis situations with precisely communicated timelines and jurisdiction. However, this organizational model is less applicable or even achievable in sprawling situations that require

proactive, careful, and complex long term planning and wholesale transformation within an ecology of actors and influences.

When management perspectives are shunted into these situations, a homogenizing logic proposing that systems "have more similarities than differences and … the performance … can be optimized" (Klikauer, 2015), regardless of difference or context, is a hindrance. Differences in context and values are a root cause in discrepancies between climate action that is considered rational and effective at the level of governance and policy and those that are considered to be meaningful and desirable by communities and individuals on the ground (Adger, et al., 2013). Along these lines, there is currently a gap in climate librarianship literature representing rural and remote libraries.

The limits of conventional management are made clear by other constraints as well. Although business-style leadership and management writing often cites tropes such as 'big picture thinking', 'satellite view', or being 'up on the balcony' to describe its 'value proposition', the fact is that the typical scope and timeframes encouraged in management-driven planning are infinitesimal compared with the scale and durations of climate change "because what they [call] long-term planning often was only looking three or five years into the future" (Elizabeth Merritt, quoted in Bothwell, 2018) and, in the public sector, management is incentivized and encouraged to save money for taxpayers in the short term rather than invest for the long term (Miller, 2015). This has led to adaptive literature primarily focusing on rapid-onset natural disasters rather than the impacts of slowly changing climatic conditions, with a few exceptions (Line, 2006; Gordon-Clark & Shurville, 2010; Tansey, 2015; Mazurczyk, et al., 2018; Woodham & Gordon-Clark, 2023).

Other management value propositions, such as optimization and efficiency, are just as problematic. These approaches are often apparent in climate librarianship, especially during the 2nd wave, manifesting in actions that focus on reducing the ecological impacts of existing facilities, operations, and systems through the pursuit of energy efficiency. Optimization and efficiency gains are accomplished by directly or indirectly utilizing measurement tools and techniques to acquire quantitative data—deemed to be 'scientific' or 'objective' by the colonial

episteme—about a given system and interpreting the collected data 'rationally' to enact that optimization. This has justified the installation of surveillant measurement tools and techniques into "all organizations, public institutions, and society" (Klikauer, 2015) as well as the environment (Bryant & Wilson, 1998; Luke, 1999; Gray & Bebbington, 2000) while delegitimizing organizational knowledge that cannot be easily measured or is unfamiliar to managerial practice. This organizational tendency towards prioritizing tools and techniques to measure quantified data and employing individuals predisposed towards quantified data and perceived as having the requisite skills for interpreting and applying it, creates a feedback loop wherein the increasing volume of data collected in this way requires acquiring more of these tools, techniques, and 'qualified' individuals to make any sense of it, perpetuating a system whereby data and information that is easier to measure is valued over less easily quantifiable knowledge. More succinctly and colloquially, 'what gets measured, gets managed'.[8]

Yet an abundance of quantified data does not guarantee effective governance, no matter how 'objectively' it is presented. Earlier literature discussed issues with the sole pursuit of efficiency (Wolfe, 2012). Another important point to consider is that corporate management structures in fossil fuel companies were actually pioneers in measuring greenhouse gases (Franta, 2018) and thereafter did the opposite of managing emissions, unless management is taken to mean facilitating. Oftentimes the complexity and quantity of accumulated scientific data was instrumental in organized climate malinformation, these characteristics exploited to promote the perception of scientific uncertainty (Oreskes & Conway, 2010; Howe, 2014). At other times the mere practice of collecting environmental data has been used to maintain and legitimize continued harmful industrial activity (Dubé, et al., 2022; Dunbar-Hester, 2023).

Furthermore, measurement alone fails to address whether the variable being tracked is a valid metric at all from an ecological perspective. An instructional example can be gleaned from the case of Menominee forest management contrasted with settler forest management in Wisconsin. Whereas settler forestry management emphasized variables like "maximum sustained economic return or maximum sustained yield" (Trosper, 2007) the Menominee "prefer[red] the safety of a

[8] there is a potential to explore the role that a dissectionary episteme and its trajectory from categorization > quantification > digitization lends itself to accounting and commodification as a part of the legitimizing technepistemology of colonial capitalism ("What gets measured, gets managed."), but I defer that to future research.

large and diverse growing stock" (Trosper, 2007) eschewing a monoculture with a rapid growth rate in favour of a mix of species that provided biodiversity and other ecosystem services in addition to lumber. From the perspective of settler forestry practices, the Menominee forest was not effectively maximizing timber production. From the perspective of Menominee forestry, the settler practices did not account for a sufficient number of species or benefits.

'Optimizing' can also be interpreted as 'gaming' or "cheating" (Seville, 2011) metrics-based approaches like the LEED system, in which it has been suggested that decision makers opt for easy "points that can be won through simple purchasing decisions" (Frank, et al., 2012) rather than designs that incorporate more technical effort or labour—though this is contested (Mehdizadeh, et al., 2013)—in order to optimize financially, through the tax incentives and greenwashing opportunities that come with higher levels of certification, rather than ecologically.

Finally, optimization and efficiency are characteristics that are actually in tension with climate adaptation. Efficiency and redundancy, an attribute supporting resilience in communities (Norris, et al., 2008) and information infrastructures (Scholl & Patin, 2014), are almost mutually exclusive characteristics. And, as the climate changes, infrastructural and organizational preparation will necessitate de-optimizing systems in order for them to perform in a broader spectrum of possible climatic conditions and impacts (Chachra, 2023).

It is not that measurement and efficiency are uniformly at odds with acting environmentally, so much as they should be viewed as one set of tools with specific limitations and affordances that must be complemented by a diversity of approaches. One of the difficulties of implementing community-level relevance into climate initiatives has been ascribed to the preponderance of quantitative approaches which does not always mesh well with "methods for studying culture [which] tend to be qualitative" (Adger, et al., 2013).

Ultimately, a fruitful direction for disciplinary research and professional experimentation is the implementation of alternative organizational models that better reflect core library values, like that of polycentric governance, highlighted by Elinor Ostrom as a potentially effective way to coordinate climate action across multiple levels (Ostrom, 2009) since, by limiting action to the

realm of quantifiable efficiency gains and perpetuating alienation, the characteristics embedded within climate librarianship by managerialism curtails the vocation's ability to take effective and equitable climate action. There have been limited efforts to incorporate polycentric governance into international climate frameworks such as the Paris Agreement (Beck & Mahony, 2018), however these efforts have not yet filtered down from the state level of policy. Questions about the practice of polycentric governance and related issues arising from decentralization, fragmentation, and the complex reality of inequitably distributed power, agency, sovereignty, and material resources remain.

VI.ii. Environmentalism

Equity raises another legacy influencing climate librarianship that is worth examining in greater detail. Aside from the brief critiques of sustainability and resilience (Nowviskie, 2015; Civallero & Plaza, 2016), climate-focused vocational discourse has yet to deeply investigate the dark side of, as Heidi Abbey put it, how its "professional ethics, values, and practices … [have] been influenced by the American environmental movement" (Abbey, 2012).

Climate librarianship shares a great deal of overlap with a longer lineage of 'green' or 'sustainable' librarianship and archival practice, discussed at length and more ably reviewed by others scholars (Antonelli, 2008; Jankowska & Marcum, 2010; Antonelli & McCullough, eds., 2012; Abbey, 2012; Garner, et al., 2021; Kamińska, et al., 2021). Abbey gives a brief yet thorough summary of the chronology and intellectual lineage of the 'green' movement in cultural memory practice, connecting it directly to the earliest iterations of the American environmental and conservation movement and its figureheads, such as John Muir and Henry David Thoreau (Abbey, 2012), before identifying the late 1960s and early 1970s as the time during which the Special Libraries Association (SLA) began the earliest formal initiatives to take the environment into account: the SLA Natural Resources Division and the SLA Environmental Information Division (Abbey, 2012). This occurs contemporaneously with the birth of the modern American environmental movement, following the publication of Rachel Carson's landmark work of nonfiction, Silent Spring (Carson, 1962), and the US public's newly mediated televisual

confrontation with the Santa Barbara Oil Spill and the Cuyahoga River's combustion in 1969.[9] This saw the establishment of the US Environmental Protection Agency in 1970, the same year that the first Earth Day was held, and the United Nations Conference on the Human Environment and publication of the influential report, The Limits to Growth in 1972.[10] From there, both Abbey and other writers of lit reviews (Antonelli, 2008; Jankowska & Marcum, 2010) trace the earliest professional discussion of the connections between libraries and environmentalism to articles published near the end of the 20th century (Watson, 1991 as cited in Antonelli, 2008), after which the literature in this review begins to appear. Are there problematic aspects of American environmentalism that the vocation stands to inherit if they remain unexamined?

As a modern concept, sustainability originally arose in the domain of resource extraction (Kamińska, et al., 2022). Following this, one of the most persistent features of 'green' or 'sustainable' librarianship has been its use of the "triple bottom line" which cites three fundamental concerns: environment, economy, and equity, alternatively framed as planet, profit, and people (ALA, 2006c; Jankowska & Marcrum, 2010; Abbey, 2012; Henk, 2014; Aldrich, 2018b; Shaffer, 2018). This framing is taken directly from the sustainable development sphere (CONCERN, Inc quoted in ALA, 2006c; Henk, 2014), of which "virtually all proponents uphold a managerial vision of social change" (Sunderlin, 1995).

While recognizing that impoverishment and deprivation are fundamental challenges, viewing 'the economy' and 'growth' as solutions without a better vocational understanding of how these abstract concepts are produced, understood, and applied places economy, or worse, profit, on an equal level to the planet and people, as if an economy were not a distributive relationship that emerges between entities and their environment. As highlighted by the disciplinary scholars and professional practitioners who have discussed Jevon's paradox (Wolfe, 2012), ecological economics (Henk, 2014), degrowth (Civallero & Plaza, 2016), and doughnut economics (Antonelli, et al., 2022), a narrow or poor understanding of what economies are and why economic growth might be considered desirable or not is a necessary precondition for integrating

[9] The Cuyahoga had actually caught fire several times previously, but had only been witnessed by locals at those times

[10] Interesting to note: The Limits to Growth report was a model-based analysis, an approach that would also rise to prominence with climatological research using computer-aided modelling to forecast future states of global climate in an early application of 'Big Data' techniques

it within climate librarianship. Otherwise, the discipline risks “responding in the same way many corporations have” (Miller, 2010) and repeating mistakes made in the pursuit of growth and a specific construction of financial viability.

Even leaving aside the disproportionate responsibility that corporations, particularly fossil fuel corporations, have in directly causing climate change, these mistakes are particularly evident in corporate knowledge practices on environmental topics, which Part Two of this thesis will address further. This malpractice includes the fossil fuel industry’s early knowledge of climate change (Franta, 2018) and its subsequent obfuscation and outright censorship of this information. Similar behaviour is not limited to this industry either, as both related and relatively unrelated industries have been both hesitant to publicize the impacts of climate change upon their business operations or have actively concealed them “due to concerns about company stock value or legal liability” (Sauchyn, et al., 2020).

In addition to concealing information, private business also responded to the American environmental movement by developing techniques of propaganda into promotional marketing (Robert Brulle as cited in Westervelt, 2020a) and what is currently known as ‘public relations’ (Aronczyk & Espinoza, 2022) using the immense financial resources reaped from causing climate change to ultimately shape the narratives guiding the American environmental movement. This well-documented, institutionalized effort included innovations such as ‘astroturfing’ (Christine Arena as cited in Westervelt, 2020b), corporate philanthropy, advertorials, and ‘issue advertising’ to exploit estranged knowledge relationships and manufacture a false debate over climate science and environment harms directly within the public arena (Oreskes & Conway, 2010), bypassing conflicting knowledges produced by academia, scientific research, and sometimes even intermediary professions like journalism that, despite significant flaws, were at least shaped to some degree by goals beyond a corporation’s bottom line. Far from democratizing scientific knowledge production and distribution, these methods allowed public relations executives and marketing campaigns, on behalf of the fossil fuel industry, to manipulate cultural values like ‘free speech’ (Westervelt, 2022) and ‘fairness’ in service of corporate communications rather than the rights of individual citizens while, simultaneously, shifting the responsibility for causing and managing the consequences of

corporate behaviour to individuals and their choices, whether in the public sphere of information or the physical environment.

This exertion of structural power—"the power to create the alternatives from which people choose" as opposed to tactical power, the power to choose between existing alternatives and make one of them win (E.R. Wolf as cited in Oreskes & Conway, 2023)—produced a great deal of the contemporary knowledge environment, framing how publics fundamentally perceive and conceive environmental problems (Aronczyk & Espinoza, 2022). It is visible in how 'neutrality' and 'balance' is practiced using false equivalences in intermediary knowledge professions like journalism to give equal weight to 'both sides' (Westervelt, 2020c; Aronczyk & Espinoza, 2022), in popular knowledge of the carbon footprint concept (Kaufman, 2021), in the legally enshrined First Amendment rights of American corporations, and the current state of greenwashing corporate behaviour (Aronczyk, et al., 2024). A combination of public relations and well-worn tactics like consumer choice advocacy and corporate philanthropy have received updated packaging in the symbolic adoption of additional guiding environmental, social, and governance (ESG) values and 'corporate social responsibility' indexes for private investors which have been found to do little to change firm behaviour (Heath, et al., 2021) or change the planet's ecological trajectory so much as move harmful activities closer to marginalized communities (Parsons, 2023) in developing nations with less regulation (Hoang, 2022). This is a thoroughly poisoned well and climate librarianship must reexamine its own environmental and ethical practices in light of these influences.

Another set of influences on the American environmental movement that climate librarianship has been even more reticent to discuss is that of white supremacy.

Though there are acknowledgements of "the relationship between climate change and white supremacy" (Hobart, 2019) and environmental racism (Elzi, 2022), as well as an increasing use of the term 'climate justice' (ALA, 2022; BCLA, 2023; Godden, 2023), reckoning with this lineage of racism cannot be done without an understanding how and why it is present within the American environmental movement itself, beginning with its originators like John Muir and his eugenicist friends and contemporaries (Cagle, 2019; Fears & Mufson, 2020). Within sustainable

and climate librarianship literature, this strain can be seen early on, in references to a "swollen human population" (Hecker, 2007) that veer uncomfortably close to a Lovecraftian repulsion while fundamentally ignoring who is using what and how, ecologically speaking, and the frequent and uncritical citation of James Kunstler (Hecker, 2007; Antonelli, 2008; Hovde, 2010; Brunvand, 2020) who has threaded prejudice towards black communities and culture throughout his writing (Potts, 2017; Kunstler, 2018).

Less explicitly, it arises at a remove as well, in adjacent knowledge practices such as informatics, where a recent paper discussed the benefits, from an emissions standpoint, of using large generative neural networks over people for cultural work such as writing and visual art (Tomlinson, et al., 2023), and information ethics, such as when a prominent philosopher expressed a "terrible hope" that a "small, effective, and well-intentioned slap from Mother Nature" will occur (Floridi, 2023).

If it were possible to express these sentiments apolitically, they might be written off as the work of academic edgelord provocateurs, however a key insight of critical environmental justice studies has been a focus on the ways that specific bodies, communities, lands, and cultures (Pellow, 2016) are devalued. Who, precisely, is seen to offer less to culture than an algorithmic chatbot? To whom should an effective slap be dealt? To whom have such catastrophes actually occurred already?

Combined with cultural narratives of crisis (Whyte, 2020), this racism and devaluation leads to ecofascism, as prominent environmental activists and advocates, some of whom are cited in library and archival literature, express views that call for a suspension of democratic values (James Lovelock quoted in Hickman, 2010) and social justice (Jonathan Logan as cited in Whyte, 2020). The 21st century alone offers several precedents wherein crisis narratives have "led to increased securitization, militarization… giv[ing] free reign to nation-states to use the criminal justice system and the military to minimize the 'threat'" (Wonders & Danner, 2015). In the context of climate change, ecofascist narratives will frame the threat as stemming from bodies, communities, and cultures that are racialized, gendered, and otherwise marginalized rather than the fossil fuel companies and lifestyles that are directly responsible (Whyte, 2014).

In equal measure to addressing the inaction of the state, taking ethical, equitable climate action means resisting the state-sanctioned violence that categorizes some climate tragedies as acceptable or unavoidable, some lives as less valuable or acceptably sacrificable, and it is incumbent upon climate librarianship to develop strategies for anticipating and countering the methods by which authoritarian entities may use knowledge and information to facilitate this violence.

These aspects of the American environmental movement are reflective of the Anglo- and Eurocentrism present within the vocation overall (Hobart, 2019). Countering them will, in many ways, be contingent on the ability of the vocation to cultivate diversity within itself and create room for people and perspectives that perceive climate action outside of this colonial lineage and the limited perception of cultural knowledge and environmental relationship that it imposes on both.

As discussed, there are library scholars and professionals taking initial steps to learn, theorize, and repair the colonial disruption between human and ecological cultures (Stuchel, 2020; Radio, 2020; Leahy, 2020; Gómez Zermeño, et al., 2022; Banks & Mediavilla, 2019; Tench, 2022; Rupchan, 2023; Library Field, n.d.), however there is an unresolved line of inquiry. As a settler who came of age during the continued assertion and begrudging, yet increasing, acknowledgement of Indigenous sovereignty across Turtle Island, it is hard not to see some of this academic literature as a rediscovery of knowledge that already occupies central importance in many Indigenous ways of knowing without sufficiently acknowledging this pre-existing heritage. This critique has already been levelled against some of the Anthropocenic discourse (Davis & Todd, 2017) and the ontological turn in academia (Todd, 2016a). Climate librarianship cites Maslow's hierarchy of needs without referencing the Niitsítapi philosophies that influenced its development (Aldrich, 2018a) and it isn't until 2019 that climate librarianship literature acknowledges the role that colonialism plays in climate change and the so-called Anthropocene (Tansey & Montoya, 2020; Radio, 2020). And though it is obviously a massive undertaking requiring great care, presenting the inclusion of Indigenous thought in librarianship primarily as a difficulty (Brunvand, 2020) has problematic implications. Although Indigenous practitioners

and perspectives are evident relatively early on (Lesure, 2014), written scholarship (Bishop, 2019; Bitz, 2023) and disciplinary engagement with this scholarship is rare.

Simultaneously, resisting tendencies towards extractive research (Gaudry, 2011), pan-Indigenization, and fetishizing Indigenous cultural knowledges within settler academia overall, climate librarianship, and the third wave's theme of re-localizing the library specifically is crucial. While settler librarianship and epistemes, often associated with mobility and universal applicability, have a great deal to learn by localizing, confining Indigeneity to locality and place does a disservice to the full dimension and diversity of Indigenous ways of knowing (Cameron, 2012). The vocation must "sit down, be quiet, and listen" (Nixon, 2014) to ensure that past mistakes are not repeated and put serious effort into creating space for Indigenous scholars and knowledge keepers.

Part Two: Towards a Locally Relevant Climate Librarianship Framework

I. Situating Complicity

Instead of allowing pre-existing conditions to invisibly construct 'the way it's always been', reifying existing power relations, we must gain a greater understanding of the historical differences that led to this moment. This is a precondition for meaningful speculation about viable paths that lead into different futures (Donald, 2012).

Part One of this thesis covered a scholarly and professional trajectory placing librarianship on the cusp of a transformative moment. Yet the sheer variety of potential directions for transforming the library—be they ethical, epistemological, technological, institutional, or otherwise—pose their own difficulty. These myriad paths are compounded by the overwhelming vastness of the planetary ecosystem, deep geological time, the incredible complexities of a process influenced by ecological, economic, and sociopolitical forces, and the scale of what meaningful action looks like at this stage of late capitalism and early climate change. Climate change is often referred to as the greatest challenge of our time, globally and collectively, so the question of what is possible and meaningful for an institution—or even a vocation—to accomplish is a difficult one. Where does librarianship, or even cultural knowledge and memory work as a whole, fit in? What are concrete, practical, and effective ways to transform library systems to enable climate action? As Hari Sahavirta, the chair of the Environment, Sustainability, and Libraries (ENSULIB) Section of IFLA wrote a few years back: "...there is still a need to clarify the concept of the sustainable library" (Sahavirta, 2021), and this applies to climate librarianship too.

With respect to addressing climate change, the Intergovernmental Panel on Climate Change (IPCC)[11], an elected group of scientists charged with advancing knowledge about climate change and assessing the "risk of human-induced climate change, its potential impacts and options for adaptation and mitigation" (IPCC, 2013). This categorizes effective climate action in two ways:

[11] there are ongoing criticisms about the governance of the IPCC and the nature of scientific knowledge reported (Chakraborty & Sherpa, 2021), including conservative models (Biello, 2007; Hanson, 2010) and industry influence (Borger, 2002; Jones, 2021; Almendral, 2023), however a full accounting and critique is outside of the scope of this thesis; given the organization's international and consensus-based approach, it is determined to be a 'good enough' source of authority on the scientific knowledge of climate change for now, rather than a perfect one

1. Mitigation, “anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases” (IPCC, 2001), that is, actions taken to limit and capture the atmospheric GHGs that cause climate change, and
2. Adaptation, “Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC, 2001). Put simply, actions taken to account for the climate change-driven impacts that we are already experiencing and are ‘locked in’ thanks to the persistence of GHGs in the atmosphere.

The crucial measures of effective climate librarianship, in this case, are whether or not a library initiative is contributing to a reduction of the *causes* of climate change or preparing for its *impacts*. These two directions, covering both intervention and survival, give structure to transformative climate librarianship, leading to the research question guiding Part Two:

RQ2: In what ways is contemporary LIS and library practice implicated in ongoing climate change, its causes, and its impacts?

This question creates the basis of an orientational framework for climate librarianship, a simple tool that I’ve developed to interface Mitigation and Adaptation with the concerns of the vocation: the MACK compass, wherein MACK is an acronym for

Mitigation
Adaptation
Community, and
Knowledges.

The latter two elements, Community and Knowledges, are drawn from a streamlined definition of libraries inspired by ethical relationality (Donald, 2014; Littletree, et al., 2020), that moves beyond the conventional definition of librarianship cited in Part One.

li·brar·y, verb
: *an ethical relationship between a community and its cultural knowledges*
(modified from Law, 2019)

Community and knowledge are chosen because, while they still map onto conventional understandings of librarianship, they are general enough that they do not necessarily prescribe or assume the infrastructure and media through which this relationship is established. The nature of the ethics involved is intentionally left ambiguous. While I look to respect, reciprocity, and responsibility (Littletree, et al., 2020), IFLA, CFLA, the ALA, and the Edmonton Public Library (EPL) propose their own core values and, doubtless, the reader brings their own as well.

The MACK compass sites climate librarianship at the confluence of these four elements: Mitigation, Adaptation, Community, and Knowledges. This framework is intended to be straightforward enough to connect climate action between macro- and microscales, and flexible enough to be useful in different local and institutional contexts. For this reason, definitions of community are also left relatively vague. Community could be a kinship network, a municipality, a discipline or profession, an activist group, a neighbourhood, anything from "an entity that has geographic boundaries and shared fate… [to] complex amalgams of formal institutions and sectors in larger geo-political units" (Norris, et al., 2008). Communities are complex, contested, and diverse, being fluid collections of individuals that narrativize themselves and others based on networks of meaning influenced by cultural, sociopolitical, environmental, and even personal idiosyncratic factors. And though I have offered my own definitions of culture and knowledge in the Introduction, I have attempted to keep the framework open enough for other commonly understood definitions of culture or knowledge. I invite readers of this thesis to project personally or contextually relevant meaning onto this intersection. Ultimately, these elements should be defined using personal and local relevance. What communities do you serve? What are the cultural knowledges that you can access and provide access to? How would they be connected in an ideal world?

As outlined in the Introduction, this thesis advocates for contextualizing its discussion of climate librarianship through place, due to the fundamental role place plays in producing ways of knowing, its alignment with ethical relationality, the scoping it lends to analyzing the vast interrelated causes and impacts of climate change, and its adeptness at supporting both pro-environmental mitigation behaviours (Adger, et al., 2013) and construal of the threats posed

by climate impacts (Poortvliet, et al., 2020) to facilitate successful adaptation. For these reasons, where possible, this thesis will situate the knowledge it presents within the city of amiskwaciwâskahikan-edmonton, in the land surrounding it, or otherwise as closely as the literature allows, since it is here that I have the most direct experience with community, cultural knowledge, and contemporary library practice arising therein.

ᐊᒥᐢᑲᐧᒌᐋᐧᐢᑲᐦᐃᑲᐣ amiskwaciwâskahikan-edmonton is Turtle Island-North America's northernmost populous urban area of over a million residents. It is located on the unceded, rightful, and ancestral territory of the pâhpâstêw Papaschase nation and within the homelands of the Nehiyaw Cree, the Niitsítapi Blackfoot Confederacy, the Dene, the Hohe Nakota Assiniboine, the Îyârhe Nakoda Sioux, the Nahkawininiwak Saulteaux, and the Otipemisiwak Métis. It currently sits within the political boundaries of Treaty 6 and the colonial jurisdictions of Alberta and Canada, having been stolen from the pâhpâstêw Papaschase nation in 1888 shortly after the Treaty was signed. The city's human population has been recently assessed as 6.4% Indigenous, with 37.1% of the remaining settler and newcomer populations identifying as visible minorities (CoE, 2016). The colonial episteme is similarly dominant. These conditions are a direct result of the genocidal policies practiced by the Canadian state, including starvation (Daschuk, 2013), incentivized migration, coerced displacement, and the erasure and oppression of Indigenous cultural practices (TRC, 2015).

Climatically, amiskwaciwâskahikan-edmonton has historically sat in the hemiboreal range of the Dfb humid continental climate region according to the Köppen-Geiger classification schema (Beck, et al. 2018). This classification (Peel, et al. 2007) is defined by the absence of both an oceanic moderation effect and dry season (relative to the rest of the year), an average temperature during the warmest month of 17.7°C and -10.4°C during the coldest month, and a relatively warm summer, where the average temperature of the hottest month is greater than 10 but does not exceed 22°C (17.7°C) and extends for 5 months (Environment, 2024).

The immediate vicinity consists of fairly level topography, river valleys aside, situated within what was once an aspen parkland biome, though a large portion has been converted to urban and monocultural agriculture biomes at this point in history. Aside from these colonially terraformed

environments, aspen parkland is typically dominated by the eponymous aspen forests, as well as fescue prairies, ravines, and wetland marsh areas (Agriculture, 2013). Like many communities, the city is situated on the banks of a glacier-fed riverine system, in this case the kisiskâciwanisîpiy north saskatchewan river, the source of which lies in the Rocky Mountain range to the west.

These are limited descriptors. They say nothing of the stark symmetry of sundogs in a clear winter sky, first love in late spring, the delicate percussion of aspen leaves in an autumn wind, the awe felt in the presence of thunderheads, towering migrations that crowd the horizon on occasion during the summer months. The experience of growing up in a place where you could see the weather coming from a hundred miles off.

II. Cause

> "*Canada, the most affluent of countries, operates on a depletion economy which leaves destruction in its wake. Your people are driven by a terrible sense of deficiency.*"
>
> - Alanis Obomsawin (quoted in Poole, 1972)

Returning to RQ2: how is contemporary LIS and library practice in this place, amiskwaciwâskahikan-edmonton, implicated in ongoing climate change, its causes, and its impacts? And, following from the earlier definition of librarianship, how is this complicity produced by the community and cultural knowledges that it connects?

Though the point along the kisiskâciwanisîpiy-north saskatchewan where amiskwaciwâskahikan-edmonton sits has served as pehonan (Donald, 2014)—a gathering place—since time immemorial, the turn-of-the-century growth of the city was driven by aspects of the colonial extractivism that drove climate change, including the agricultural settlement and land-use changes encouraged and legitimized by the Dominion Lands Act for the benefit of people like the German side of my family, the Klondike Gold Rush that would apocalyptically affect the lives of the Tr'ondek Hwech'in in the north, the completion of the Calgary &

Edmonton branch off the Canadian Pacific railway built by migrants like my 公公's father, and extensive coal mining.

Following the passing of the Public Libraries Act in 1907 and the founding of the University of Alberta in 1908, the establishment of amiskwaciwâskahikan-edmonton's major library institutions cannot be considered wholly distinct from these processes. At the outset, settler cultural knowledge institutions like libraries and universities represented permanent 'civilized' settlement in the British Commonwealth (Augst, 2001; Garrison, 2003; Pawley, 2006; Babiak, 2013; Weymouth, 2023). These institutions were literally created to establish "an abiding place in the wilderness of the west for the few white men who lived here… into whose hands King Charles II gave the whole country of western Canada" (George M. Hall cited in Babiak, 2013), as it was put in the first annual report of the Edmonton Public Library and the Strathcona Public Library. In addition to what their establishment signified, the knowledges that were housed within and facilitated by these institutions supported and were supported by the exploitation of the land and its Indigenous inhabitants.

After felt top hats fell out of fashion in the mid-19th century, the colonial extractive gaze and its corporate limbs turned away from beaver pelts to a new source of surplus value in the region. Almost half a billion years before present (YBP) and extending until the previous mass extinction event on Earth, an ocean became the land currently referred to as Alberta. Generations of marine algae, corals, plankton, bacteria, and flora lived and died over this time, gradually changing through anoxic geological processes into light hydrocarbon molecules that collected in a sedimentary basin beneath the developing land (Porter, et al., 1982; Creaney, et al., 1994). Indigenous peoples knew of these materials and made use of them prior to the arrival of settlers (Finch, 2009), but where they had worked with attributes such as the material's waterproofing characteristics, settlers sought its combustibility, valuing these ancient remains for the high densities of energy they provided in a relatively stable and fluid form, alongside other benefits which aligned with the needs and affordances of industrializing colonialism's technologies, infrastructures, consumer desires (Melsted & Pallua, 2018), and the political goals of its oligarchic class (Malm, 2016), since these hydrocarbons required less human labour to extract

than the dominant fossil fuel of the day, coal, which was increasingly subject to disruption from organized labour in the early 20th century.

So when the first productive oil well was struck in western Canada one hundred and twenty-two years ago (Finch & Webber, 2014), the industry's benefits accrued to the colonial project and disproportionately to a select few of its human practitioners, despite the fact that the history known by Indigenous signatories to Treaty 6[12] outlines expectations that the sharing of land agreed upon only extended to the "depth of a plow" (King, 2022).

The knowledges produced by the University of Alberta and facilitated by its library system were integral to the viability and continuity of this industry. Though the hydrocarbon cemeteries tapped by western Canada's first oil well and, later, its first major oil field lay to the south, they had northern relatives. Sixty-six million YBP, the mountains along the western edge of the continent were born from a very physical subduction relationship between three tectonic plates, pushing some of the hydrocarbons and proto-hydrocarbons created in the earlier processes to migrate north, making a new home in the porous sandstone located under what is currently Treaty 8 (Zhou, et al., 2008). One hundred and ten years ago these areas were surveyed as the "Tar Sands District", an "admirable oil-generating formation" (T.O. Bosworth quoted in Taylor, 2019) and, just over a century ago, an engineering professor at the University of Alberta developed a hot-water extraction process to separate bitumen from the sandstone (Taylor, 2019). Another University of Alberta professor in geology proposed a search for oil and gas deposits near where ancient coral reefs had grown leading to the discoveries that began the conventional oil boom in Treaty 6 Alberta seventy-seven years ago, and hydraulic fracturing in the Pembina Fields six years later (Pemberton, et al., 2016).

As oil and gas extraction became central to the colonial economy, the University moved in lock step, with its Business and Engineering schools in particular serving as major sources of knowledge production and distribution for the industry. Indeed, the proportion of institutional research investment allocated towards oil-and-gas-related knowledge production has led to the

[12] to say that the spirit and intent of Treaty 6 is contested by Indigenous signatories and the colonial Canadian government is a vast understatement and outside the scope of this thesis; for more information the research conducted at the Yellowhead Institute is a good place to start

characterization of the institution as a “petro-university” (Adkin & Cabral 2020; Adkin, 2021). Naturally, business and engineering alumni often maintain close ties with their alma mater, further attempting to shape the institution through financial endowments and social pressures (Kent, 2018). Positions on the University Board of Directors are regularly filled by executives from the industry, a situation further exacerbated in 2019, when a newly elected provincial government installed fossil fuel sector and adjacent executives to post-secondary institutions’ governance throughout the region, including the University of Alberta’s (Bellefontaine, 2019b; Adkin, et al., 2022).

The continuity and contemporary state of the city’s public library system was also made possible by extractive industrialists. Its first major dedicated central branch was supported, the same as most settler libraries on Turtle Island, by funding from Andrew Carnegie, an American steel magnate (Babiak, 2013). Its second was intimately tied to the local oil and gas industry. The 1947 Leduc No. 1 discovery counted Stanley A. Milner as an investor. In the 1950s, as Sun Oil developed the oil sands, Milner started two oil companies with his brothers, before being elected to Edmonton City Council and joining the board of the Edmonton Public Library during the 1960s. During his tenure, Milner advocated for a new central branch, which was opened in 1967 for the colonial state’s centennial and renamed after him in 1996. He was one of the many oil executives who sat on the Board of Governors of the University of Alberta, including as its Chairman (AOE, n.d.).

This brief sketch outlines some of the conditions that produced this moment in the history of amiskwaciwâskahikan-edmonton and its cultural knowledge institutions. The gravity of these burial grounds and the characteristics of the remains collided with industrializing colonialism to pull a whole nation into its orbit and shape its ways of life. Like hydrocarbon in sandstone, the industry has permeated regional cultural identities, evident in the names of sports teams and neighbourhoods, carbon-intensive lifestyle norms, political and personal sentiments, feeding back into its cultural knowledge institutions, shaping them in turn and typifying the non-linear relationship between cultural and material environments.

II.i. Emissions

Leaving aside their role in facilitating colonial knowledges, regional libraries create greenhouse gas emissions through their facilities, operations, and the regional and global built infrastructure within which they are embedded (Elliot, 2023). This means that, overall, library emissions are typically very similar to the community's GHG emissions since there are no aspects of librarianship that create a disproportionate amount of emissions relative to the community that it takes place within. In the case of amiskwaciwâskahikan-edmonton, emissions stem primarily from manufacturing industries and construction, followed by transportation and providing heat and power to commercial and residential buildings (Stantec, 2019). These sources are related to the region's cold climate, its culturally normalized carbon-intensive lifestyle, and the infrastructure that supports this lifestyle. Currently, 63% of the region's overall end-use energy and electricity generation comes from the combustion of fossil fuels (AESO, n.d.). Though the municipal government has made steps towards institutionalizing climate action, they are largely symbolic at this point lacking any method to "formally assign and communicate roles and responsibilities for climate strategies relating to policy and procedure development, decision-making, monitoring and evaluation, and budget and financial reporting" (Mohatarem, 2024) or benchmark progress. Despite being one of the first municipalities to incorporate a carbon budget into planning, the remaining quantity of emissions the city has to meet its share of the Paris Agreement, a 50% chance of limiting global warming to 1.5 degrees (Paris, 2015), as actioned so far, Edmonton has 155 megatons left and will not meet this commitment.

This municipal context is inseparable from the wider regional one. Alberta produces an enormous amount of GHG emissions. Again, while climate and a widely dispersed population play some role in energy consumption, the real culprit is that the culture, society, and economy is structured around fossil fuels. Operations based in the northern tar sands which undergird a great deal of the regional economy produce emissions remarkable even in the primary industry responsible for global warming, an industry which forms a large portion of the regional and national GDP. Alberta as a whole emits 38% of the nation's overall GHG contributions (ECCC, 2024), with the fossil fuel industry responsible for 31% of Canada's overall GHG emissions. A single Albertan company, Suncor—formerly known as Sun Oil—, has produced over 3000 Mt of

CO2-equivalent alone (Carbon, n.d.), as well as being consistently responsible for other forms of pollution and workplace fatalities.

On a planetary scale, in 2021 Canada was responsible for 14.3 tonnes per capita or 545.63 million tonnes (MT) overall, 1.47% of the global total, dropping from 2.23% in the year 2000 and well down from 33.07% in 1945, but typically falling around 2-2.5% of annual emissions during the 20th century (Ritchie, et al., 2023). Yet Canada holds less than 0.5% of the world's population, emitting between 3 and 5 times more than a 'fair' share of an increasingly indefensible volume, 33.57 billion tonnes of GHGs as of 2020, compared to 1.5 trillion tonnes of total emissions since 1751 (Ritchie, et al., 2023). About 2% of the cumulative emissions that have caused climate change (Ritchie, 2019).

Canada's responsibility is in actuality even higher, even leaving aside the technicalities of accounting for Scope 3 emissions.[13] Given the colonial distribution of global resources and infrastructure, there are communities like Edmonton, Alberta, and Canada, that have built a standard of living predicated on causing climate change and simultaneously perceive their quality of life to be similarly contingent.[14] These communities have normalized carbon intensive lifestyles with enormous material and energy inputs that have been obscured and distanced through globalization, extending the cycle of colonialism by offshoring the emissions associated with this specific way of life by moving supply chains into other jurisdictions during the late 20th century (Parsons, 2023). The levels of material consumption associated with producing a standard of living in this specific way threatens potential solutions and elements of the energy transition (de Blas, et al., 2020; IEA, 2021; Riddle, et al., 2021) and has further implications for

[13] Briefly, Scope 1 emissions stem from sources that an organization owns or controls directly, for example from burning fuel in an organization's fleet of vehicles, Scope 2 emissions are emissions that a company causes indirectly and come from where the energy it purchases and uses is produced, such as the emissions caused to generate the electricity that is used in library facilities would fall into this category, Scope 3 emissions are not produced by the library itself, nor are they the result of activities from organizational assets, but by those that it is indirectly responsible for up and down its value chain, like the emissions created by the use of its collections (Allwood, et al., 2015). National and industry emissions inventories do not typically take scope 3 emissions into account.

[14] Standard of living is a quantitative "construction based on the… consumption of a one-person household taken as a measure of his or her economic well-being" (Ponthieux & Meurs, 2015) often associated with GDP per capita and used as a stand-in for quality of life since it is easy to measure, whereas quality of life is a more nebulous metric associated with satisfaction, happiness, and other more recognizably subjective qualities.

other environmental crises, such as the biodiversity crisis and peak resource usage (Rockstrom, et al., 2023).

Relative to the other half of climate action—adaptation—mitigation is somewhat simple: preventing these GHGs from accumulating in the atmosphere, whether proactively or by capturing them after the fact. Though reductive, there is essentially one metric determinant of success. Yet it is critical to recognize that emissions are disproportionately caused by specific communities, as well as specific demographics within those communities, such as the wealthy (Gössling & Humpe, 2023). Responsibility for climate change is not equally distributed (Kenner, 2019) and, since 1990, disparity in emitting GHGs has grown with global economic disparity overall (Chancel, 2022).

II.ii. Informations

"*Mobil sought to foster a dialogue by expanding the spectrum of views, opinions, and facts and by alerting people to the dangers that threatened the economic health of our nation.*"

- Herbert Schmertz, American head of Mobil Oil company's public affairs (as quoted in Aronczyk & Espinoza, 2022)

"*Climate change is real, but we do want that presented to our children in a balanced way.*"

- Adriana LaGrange, Canadian Alberta Minister of Education (Canadian Press, 2020)

This is pertinent because regional climate malinformation narratives typically shame the other countries in the global supply chain that maintains the industrialized colonial standard of living, particularly the People's Republic of China, for not doing their part in mitigating GHG emissions, using this as justification to delay action within Alberta and Canada. This is the other causative element that climate librarianship must mitigate: the climate denial or delay

malinformation that has played a central role in continuing climate change which, as a form of cultural knowledge, should be directly addressed by climate librarianship.

Climate malinformation is an umbrella term meaning the censorship or devaluation of accurate climate change knowledges and the distribution of false or technically accurate but misleading climate change knowledges, covering both disinformation—intentional deception—and misinformation—accidental dissemination (Armitage & Vaccari, 2021). It has evolved from the moving goalposts of climate denial (Rahmstorf, 2004; Mann, 2012) to contemporary strategies of delay (Lamb, et al., 2020) as the reality of climate change becomes increasingly observable.

Neither is mitigating climate malinformation simply a matter of collecting more or 'better' climate science data. Scientific understanding of GHGs and their effects on the Earth's climate began in the mid-19th century (Foote, 1856; Tyndall, 1859; Arrhenius, 1896). The consequences of the industrialized production of GHGs was present in popular discourse by the early 20th century (Molena, 1912; Coal, 1912), as scientific research continued to confirm the results (Callendar, 1938). In the decade directly following WWII, scientists realized that the greenhouse effect was already observable and by the 1950 and 60s were making serious warnings directly to both the fossil fuel industry and the American government (Franta, 2018; Keeling, 1960; Teller, 1960; United States, 1965).

Both industry and government commissioned further studies (MacDonald, et al., 1979; Supran, et al., 2023), which all came to the same findings on the physical science, (Franta, 2018; Speth, 2021) though industry actors like Shell and Exxon did not make these findings public (Dembicki, 2022).

During the 1980s, further research was conducted to minimize uncertainty and, despite the wait-and-see approach advocated by some economists, by 1988 mainstream global acknowledgement of anthropogenic climate change seemed to finally have created the conditions for action towards a steady, yet gradual, transition. This is due, in part to an unprecedented heat wave, 1988 being the warmest year on record up to that point.[15] In that year, climatologist James

[15] It is no longer even in the top 20.

Hansen testified to the U.S. Congress, Republican presidential candidate George H.W. Bush vowed to fight “the greenhouse effect with the White House Effect" during his campaign, and the Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organization (WMO) and the United Nations (UN). By 1995, the IPCC had unequivocally stated that human activities are affecting the global climate in its review of the literature and in 2004, another literature review determined the famous 97% consensus (Oreskes, 2004), a figure rising to greater than 99% in more recent meta-analyses (Lynas, et al., 2021).

Increased monitoring and data collection alone has failed to facilitate better climate governance and prevent fossil fuel extraction. Often the complexity and quantity of accumulated scientific data has been instrumental in organized climate malinformation, these characteristics exploited to promote the perception of scientific uncertainty (Howe, 2014; Oreskes & Conway, 2010). At other times the mere practice of collecting environmental data is used to maintain and legitimize continued harmful industrial activity in Alberta and elsewhere (Dubé, et al., 2022; Dunbar-Hester, 2023). Despite the growing scientific evidence and consensus in support of climate change alongside public *awareness* of the issue, public *opinion* on whether its cause was anthropogenic and whether its impacts would be serious began trending downward in the first decade of the 21st century, a cultural tendency observed not only in the United States (Gallup, n.d.), but also in other colonial Angloethnic states such as the UK, Australia (Angus Reid, n.d.; Poortvliet, et al., 2020), and Canada (Environics, 2015). This historical trajectory disproves the information deficit model upon which conventional librarianship relies (Poortvliet, et al., 2020).

Due to the cultural and socioeconomic factors outlined earlier, Alberta is the site of a well-organized and resourced climate malinformation hub that has contributed to these trends. In fact, actors from the province’s corporate and political establishment that are incentivized towards climate malinformation often wield a great deal of authority over and within regional knowledge institutions. Out of 153 direct appointments that the ruling United Conservative Party made to the governing boards of post-secondary educational institutions in the province, 99 had affiliations to oil and gas companies with more than 1 in 4 having “important links to the oil and gas sector” (Adkin, et al., 2022). Malinformation entities in the region may be state-based, such as the provincial government’s Canadian Energy Centre propaganda office (Bennett, 2019). They

may also be based in the profit-driven or non-profit private sector, including groups like Pathways Alliance (Aronczyk, et al., 2024) and EthicalOil.org (Clark, 2011) respectively. There are often attempts to embed them in regional cultural knowledge institutions, like the so-called Friends of Science and its Science Education Fund at the University of Calgary (De Souza, 2011). Sometimes all three areas collaborate on climate malinformation (Bellefontaine, 2019a; UCP, 2019; Vivian, n.d.; Allan, 2021). The malinformation produced and distributed by these entities circulates colonially amongst political and corporate entities, requiring no translation within the Anglosphere and less within countries in which English is the *lingua franca*.

II.iii. Axioms

"*... the safety net against bad ideas is always better ideas, more debate and more intellectual freedom to oppose those bad ideas. This is especially true for those on the margins of social power, as many have argued before me. The constitutional right to free expression protects the freedom of marginalized minorities and their allies to challenge inequality and discrimination.*"

- Alvin Schrader, Canadian Professor Emeritus of the School of Library and Information Studies at the University of Alberta (Schrader, 2020)

"*Librarians and other information workers are strictly committed to neutrality and an unbiased stance regarding collection, access and service. Neutrality results in the most balanced collection and the most balanced access to information achievable.*"

(IFLA, 2012)

"When I came back to the United States I decided that if you could use propaganda for war you could certainly use it for peace. And propaganda got to be a bad word because of the Germans using it, so what I did was to try to find some other words, so we found the word 'counsel on public relations'."

- Edward Bernays, the American "Father of Public Relations", speaking in Curtis, 2002

The colonial episteme undergirding contemporary science, governance, and librarianship has, at best, proven inadequate to averting climate change and resisting climate malinformation and, at worst, its values have been instrumental in the continued dissemination of climate malinformation and justification of climate change.

Former Canadian Library Association president Ken Roberts put it this way:

> "*We are the only profession whose value to society resides in a faith that people have the ability to make personal decisions that are good for them when – and if – they also have free and open access to all of the information that they need. Our belief in the ability of people to form their own opinions trumps everything that we might personally think. This, to me, makes us remarkable.*" (Roberts cited in Schrader, 2020)

And yet, within the context of climate science, not only has the vocation failed thus far to facilitate free and open access to all of the information that community members need, simply making more information available is based on a flawed and reductive model of decision making and behavioural change (Allen & Crowley, 2017). Even when individuals possess a great deal of knowledge about climate science, they integrate this knowledge with other cultural influences drawn from "the communities on which they are most dependent for social and physical resources" (Allen & Crowley, 2017).

While it is beyond the scope of this literature review to critically and exhaustively revisit the philosophical underpinnings of the information deficit model, a brief discussion of the interaction between library values and climate malinformation is illuminating. In particular, there are four common themes drawn from the publicly endorsed core values of several organizations which exert significant influence on the local expression of librarianship, including the American Library Association (ALA), the University of Alberta, the Canadian Federation of Library Associations (CFLA), the International Federation of Library Associations and Institutions (IFLA), and the Edmonton Public Library:

1. the vocational stance against censorship,
2. a complementary duty to platform all views,
3. a performance of neutrality or balance, and
4. the application of neoliberal values in the knowledge and information environment.

Table. 1. Anti-Censorship in Vocational Values:

Anti-Censorship Axiom	**Organization**
“Librarians and other information workers reject the denial and restriction of access to information and ideas most particularly through censorship whether by states, governments, or religious or civil society institutions.” (IFLA, 2012; CFLA-FCAB, 2018)	International Federation of Library Associations and Institutions (IFLA) Canadian Federation of Library Associations (CFLA-FCAB)
“Library workers encourage people to cultivate curiosity and form ideas by questioning the world and accessing information from diverse viewpoints and formats without restrictions or censorship.” (ALA, 2024b)[16] “To this end, in accordance with their mandates and professional values and standards, libraries provide, defend and promote equitable access to the widest possible variety of expressive content and resist calls for censorship and the adoption of systems that deny or restrict access to resources.” (CFLA-FCAB, 2016)	American Library Association (ALA) Canadian Federation of Library Associations (CFLA-FCAB)
“Unfiltered, uncensored and judgment-free, we are excited by ideals, ideas and conversations. …” (EPL, n.d.)	Edmonton Public Library (EPL)

Censorship is, perhaps, the most easily identifiable malpractice within contemporary culture. The suppression of knowledges inhibits choice and access to areas of collective thought. When it is committed by a small group of powerful individuals it can be clearly read as maladaptive authoritarianism. Recently, this value has been expressed through the professional dedication to fighting book bans.

Within the political and legal jurisdictions governing amiskwaciwâskahikan-edmonton, Treaty 6 alberta, canada, other illustrative—though by no means comprehensive—examples of censorship can be seen when it comes to the domain of climate change and the fossil fuel industry.

In 2002 and 2006, the Alberta government shut down public criticism of the fossil fuel industry: first, by facilitating the firing of the medical officer of health for the Palliser Health Authority,

[16] In 2024, the ALA updated its Core Values (ALA, 2024c). This thesis contains language from both before and after this update, to reflect all of the axioms converging at this point in time.

Dr. David Swann, after he stated that "Alberta should work with other provinces to meet environmental targets set by the international Kyoto" (Mackay, 2002; Mahoney, 2002) and then by being involved in the pursuit of charges against Dr. John O'Connor for drawing attention to potentially elevated rates of cancer in a community downstream from the oil sands (Appel, 2021). More recently, in 2020, the Alberta government passed a law, the Critical Infrastructure Defense Act in direct response to anti-pipeline protests (Alberta, 2020) that was found to violate the fundamental freedom of expression, among others, outlined in the Canadian Charter of Rights and Freedoms (MacVicar, 2022) and redacted research conducted by provincial government scientists on snowpack pollution stemming from mountaintop removal coal mining in the Rocky Mountains (Weber, 2023). And, while it is not a clearcut example of government censorship, the Premier of Alberta has arguably impacted free speech in public policy, objecting to federal level use of the words "just transition" on the grounds that it is "extreme environmental language" (Fedor, 2023) and resulting in a terminology change to "sustainable jobs".

For its part, as mentioned in Part One, the federal government of Canada has restricted government scientists' discussion of publicly funded research involving climate research for at least a decade (CBC News, 2012; DemocracyWatch, 2018; O'Hara, 2010; Owens, 2018). Though unrelated to climate change, it is worth noting that the speech of employees at Library and Archives Canada (LAC) was also curtailed with the drafting of a new Code of Conduct in 2013 (Thorkelson, 2013). During the same period, the federal government closed over 40 libraries, including a significant number of facilities holding environmental knowledge for Environment Canada, Parks Canada, and the Department of Fisheries and Oceans. In the process it is likely that many materials were permanently destroyed given reports of "dumpsters full of books" (CBC News, 2012; Dudley, 2014; Thorkelson, 2014a; Thorkelson, 2014b). Additionally, the pervasive chilling effect on Indigenous and environmental movements by surveilling and overpolicing them via the RCMP (Crosby & Monaghan, 2018; Millar, 2019) can be considered related to these state censorship apparatuses as well.

While Canadian librarians spoke out about the 2013 Code of Conduct and the predecessor to CFLA, the Canadian Library Association (CLA), spoke out about the library closures (Mertl, 2014; Nikiforuk, 2014) there is no record of Albertan institutions having done so, nor is there any record of any attempt to address the other examples of censorship at all. This difference in response gives the appearance of bias, as if censorship should only be resisted in order to protect libraries and associated jobs, rather than for the good of the whole community.

Moreover, one might consider the fundamental value of resisting censorship. As Alvin Schrader puts it, "distrusting the 'wisdom' self-proclaimed by those who believe they should decide for you what you can say, and hear, view and read, play with, and have access to, and what you can't – however well-intentioned they might think they are being" (Schrader, 2020) is crucial. In other

words, the vocation recognizes the dangers of a powerful few asserting influence or making choices about what knowledges are available. From this perspective, there appears to be an institutional dead angle in two forms. First, corporate censorship. The IFLA/CFLA statements on censorship do not mention the private sector. Yet, what is the difference between a state and a corporation with the political power and financial resources of a state?

In 2022, the fossil fuel industry made a record profit of nearly $200 billion, and a revenue of $4 trillion (Reuters, 2023b), with the top 10 responsible for $2.24 trillion (Mandel, 2023), putting it alongside the GDP of the 5 largest national economies in the world, ahead of India and somewhere around Japan or Germany (IMF, 2022). Exxon itself made a record $56 billion profit (Reuters, 2023a), which alone would put it somewhere around the 90th biggest economy in the world, and a $413.68 billion dollar revenue (Macrotrends, n.d.) which puts it just ahead of South Africa and just behind Vietnam as the 39th biggest economy in the world, give or take (IMF, 2022).[17]

Not only is access to information about these companies' business practices highly asymmetrical—even considering annual reports to shareholders or mandated disclosures to regulators (Tansey, 2019)— there are numerous examples of these companies outright censoring or concealing information on climate science and policy that they are in possession of (Oreskes & Conway, 2010; Franta, 2018) including a Imperial Oil Report on Solutions from 1991 that determined a carbon tax would be an effective measure for mitigating climate change (Imperial, 1991).

In addition to its failure to address corporate censorship, the vocation's second dead angle is a perceptual bias whereby librarianship recognizes the dangers of restriction, but not the consequences of a surplus. Further research disentangling the roots of this bias may be useful, in order to ascertain whether it is seated in a scarcity-based episteme, or the infinite growth mythology of contemporary capitalism, both, or neither. Either way, this aspect of vocational axiology fails to recognize that propaganda, the overavailability of false information, poses potentially equal or greater danger to its lack. Examples of propaganda include when government employee Dr. Preston McEachern, Section Head of Science, Research and Innovation at Alberta Environment falsely, repeatedly, and publicly accused Drs. Peter Lee and Kevin Timoney of lying (Timoney & Lee, 2010) in a 2009 paper they had written which concluded that "physical and ecological changes that result from oilsands industrial activities" were "detectable" (Timoney & Lee, 2009). In the same year, after the publication of a paper finding "that heavy metals, including lead and mercury, are being released from oilsands facilities into the air and water of northern Alberta" (Kelly, et al., 2009), the Federal Environment Minister, Jim Prentice, claimed that he had been told by "federal scientists" that such pollutants were naturally occurring

[17] While revenue is not strictly a 1:1 comparison to GDP, it is a close enough quantification of capital to provide a useful benchmark.

and Alberta Environment Minister Rob Renner stated: "Common sense says that if you dig a hole in the ground, in the immediate vicinity of that hole you may have some disturbances. Everything that you do in this world has some impact. What we have to do is determine what are the levels at which we need to have some concern, and my scientists are telling me that the amount of compounds that can be detected in the Athabasca River at this point in time are not a concern and are at insignificant levels." (Canadian Press, 2010) Both politicians declined to name which scientists they were referring to or offer any further proof for their statements. 10 years later, the Alberta government, inspired by the research of a blogger named Vivian Krause, would outright open a propaganda office following a leadership candidate's campaign promise to create an "energy war room" to promote the Albertan oil & gas industry internationally (UCP, 2019). Upon election, the United Conservative Party announced the establishment of the Canadian Energy Centre Limited, with an inaugural budget of $2.84 million and an annual budget of $30 million (Bennett, 2019) though this was later decreased (French, 2022). Despite its public funding, as a private corporation, the CEC is not subject to FOIP laws—another form of censorship (French, 2022). It has been subject to a number of controversies during its continued operations. Additionally, the Government has exerted "ideologically motivated" influence on the public K-6 curriculum (Lowan-Trudeau, 2022) mirroring neighbouring Canadian provincial governments with similar economic ties to "align with the interests of fossil fuel industry actors" (Eaton & Day, 2019) despite a majority of Alberta youth indicating that they were worried about climate change (Leger, 2020). Federally, the government adopted the climate malinformation term "ethical oil" to describe the Canadian fossil fuel industry during the Harper years (Chase, 2011).

What is the responsibility that regional libraries have to act in these cases of malinformation? If resisting censorship is necessary to prevent the undue influence of power over knowledge, it is clearly valid to be concerned about state censorship, but it follows to also be concerned about corporate censorship if said corporation wields similar power to that of a state. If state censorship is a concern, it is worth considering state propaganda as another way in which knowledges are manipulated by the powerful. And if both state propaganda and corporate censorship are concerning then corporate propaganda bears consideration as well, such as promoting the 'dangers' of climate action when your company has a clear understanding of the consequences of inaction.

In a series of ongoing climate liability lawsuits, this exact category of corporate propaganda has been defended on the grounds that it was constitutionally protected, that these "ads, op-eds and public appearances discouraging climate action … [were] political speech… protected by the first amendment" (Westervelt, 2022). In this light, the conventional practice of both freedom of expression and its vocational corollary, a duty to platform "all views" that are expressed, deserves scrutiny as well.

Table 2. 'All views' in vocational values:

Free Expression/"All Views" Axiom	**Organization**
"Libraries have a core responsibility to safeguard and facilitate access to constitutionally protected expressions of knowledge, imagination, ideas, and opinion, including those which some individuals and groups consider unconventional, unpopular or unacceptable. To this end, in accordance with their mandates and professional values and standards, libraries provide, defend and promote equitable access to the widest possible variety of expressive content and resist calls for censorship and the adoption of systems that deny or restrict access to resources." (IFLA, 2012; CFLA-FCAB, 2018) "… subject only to the Constitution and the law, to have access to the full range of knowledge, imagination, ideas, and opinion, and to express their thoughts publicly. Only the courts may abridge free expression rights in Canada." (CFLA-FCAB, 2016)	International Federation of Library Associations and Institutions (IFLA) Canadian Federation of Library Associations (CFLA-FCAB)
"The First Amendment mandates the right of all persons to free expression, and the corollary right to receive the constitutionally protected expression of others. The publicly supported library provides free and equal access to information for all people of the community the library serves." (ALA, 2006a) "Libraries should provide materials and information presenting all points of view on current and historical issues. Materials should not be proscribed or removed because of partisan or doctrinal disapproval." (ALA, 2006a)	American Library Association (ALA)
"... We champion the right for all ideas to be heard." (EPL, n.d.) "That means we make all kinds of material available to people, because we believe you're free to access and develop your own informed opinions and ideas." (EPL, n.d.)	Edmonton Public Library (EPL)

“The materials in your library are selected to offer a diverse, balanced and high-quality collection representing all viewpoints.” (EPL, 2020)	Edmonton Public Library (EPL)

Reality necessitates that this stance will always remain aspirational. No library has infinite staff, storage capacity, and resources. Curatorial choices are always made. From daily tasks like weeding to barring illegal content, libraries are constantly negotiating how to compromise this value. But leaving this aside, an aspiration towards providing all possible views says nothing about the role that capital has in producing a ‘view’ in the first place. In our current system, information availability and accessibility are both determined by capital.

On one hand, a book doesn’t get published, an academic doesn’t get funding, an ad campaign is not created, without financial backing. Returning to the late-2010s as a period marked by declining public understanding of the reality of climate change in the English speaking world, what happened in the years leading up to it? In 2005, “Exxon Mobil channelled more than $8 million to forty different organizations that challenged the scientific evidence of global warming… includ[ing] probusiness and conservative think tanks,… ‘quasi-journalistic outlets’… and even religious and civil rights groups.” (Oreskes & Conway, 2010) From 2003 - 2010 (7 years) $558 million was spent on massive campaign to “manipulate and mislead the public about the threat of climate change” by funding a network “including advocacy organizations, think tanks, and trade associations” (Brulle, 2014). A potential example of what a single node in this network might look like, two individuals, Charles and David Koch, owners of a refinery that primarily processed crude from the Alberta oil sands, put $225 million into fighting climate reform over 3 years, from 2005 - 2008 (Greenpeace, 2010). By way of comparison, according to the Allan Inquiry, the money that went to *all* Canadian-based charities for literally anything the Inquiry defined as an “environmental initiative” during the 16 years spanning 2003-2019 was $925 million (Allan, 2021). The oil industry funded organizations like Friends of Science, EthicalOil.org, Canada Action, Fuelling Canada, the Canadian Coalition for Responsible Environmental Solutions, and the Citizens’ Alliance for Responsible Energy, and ‘contrarian’ denialist researchers like William Nierenberg, Frederick Seitz, Robert Jastrow (Oreskes & Conway, 2010), and Patrick Michaels (Dembicki, 2022). By her own admission, Vivian Krause, whose research inspired the Alberta government’s inquiry into environmental groups and its propaganda office, made more than 90 per cent of her 2012 income from speaking engagements paid for by the Canadian fossil fuel and mining industries (Krause, 2013).

And, on the other hand, individuals have been afforded limited access to accurate, vetted information. Social media content is free whereas peer-reviewed articles or journalistic institutions with higher standards have paywalls or outright exorbitant subscription costs. Social media provides a telling example of how ‘all views’ on climate change fare under capitalism. In the period following Elon Musk’s buyout of Twitter, the company’s sustainability department

was shuttered and the hashtag #ClimateScam began regularly appearing as the first result when searching "climate" on Twitter despite "no evidence there are more posts with 'climate scam' than 'climate emergency' or other terms, or that they are getting more engagement" (Milman, 2022). Meanwhile, Facebook suspended over 200 Indigenous and environmental pages days before an event to support the land defenders at Wet'suwet'en (Rosane, 2020) while simultaneously hosting pro-fossil fuel ads that were viewed over 431 million times (Egan, 2021). Using a moderation algorithm intended to reduce climate denial, Facebook ended up restricting content from climate scientists by flagging it as 'political' while promoting climate denial content so long as it was categorized as 'opinion'. This performance resembles the balance and neutrality language that the vocation uses in its value statements and flawed applications of which appeared during the first waves of climate librarianship outlined in Part One. But these values and actions say little about what proportions are being balanced or how neutrality is achieved in a knowledge environment weighted by capital.

Table 3. Balance and neutrality in vocational values:

Organization	**Balance/Neutrality Axiom**
"Librarians and other information workers are strictly committed to neutrality and an unbiased stance regarding collection, access and service. Neutrality results in the most balanced collection and the most balanced access to information achievable." (IFLA, 2012; CFLA-FCAB, 2018) "Librarians and other information workers distinguish between their personal convictions and professional duties. They do not advance private interests or personal beliefs at the expense of neutrality." (IFLA, 2012; CFLA-FCAB, 2018)	International Federation of Library Associations and Institutions (IFLA) Canadian Federation of Library Associations (CFLA-FCAB)
	American Library Association (ALA)
"... We stand up for ideas but don't judge or discriminate. …" (EPL, n.d.) "The materials in your library are selected to offer a diverse, balanced and high-quality collection representing all viewpoints." (EPL, 2020)	Edmonton Public Library (EPL)

Science historian Naomi Oreskes frames the varying interpretations of balance as giving equal weight to all perspectives rather than accurate weight to all perspectives (Oreskes & Conway, 2010). In a vocationally passive stance, this means that balance, in its current practice, favours minority views that have monetary backing. Put another way, libraries provide balance proportional to the availability dictated by capital, instead of balance proportionate to evidentiary support and consensus. The vocational interpretation of balance stems from a desire to perform neutrality and objectivity which has been posited as one of the characteristics of the disconnection between scientific knowledge and climate action (Oreskes & Conway, 2010; Glavovic, et al., 2022).

These values have either been thoroughly co-opted or were fundamentally flawed to begin with. Melissa Aronczyk and Maria Espinoza posit that the initial problem with climate science was not necessarily the debate manufactured by fossil fuel interests within public opinion and intermediary knowledge professions, so much as the idea that "we think debate is necessary in order for our democratic system to function" (Aronczyk & Espinoza, 2022). Private sector propaganda, a.k.a. public relations, was able to epistemically camouflage itself in democratic values such as free speech and balanced debate in order to normalize political mechanisms of advocacy and the promotion of information to their own benefit. Techniques for surveying and collecting public knowledge and opinions are normalized, as is the practice of extracting specific information from these processes that are deemed useful to the corporation, processing them, and promoting the results in a way that is "palatable, tangible, and rational" (Aronczyk & Espinoza, 2022). While this process, what anthropologist Kim Fortun termed the "informating" of environmentalism, may sound aligned with the accessibility values of LIS, this means that physical conditions and processes within an environment are rendered into an 'issue', a problem of information which the 'right' information can rectify, constructing epistemic conditions that determine the legitimacy of additional information for 'solving' the issue (Kim Fortun as cited in Aronczyk & Espinoza, 2022), regardless of utility or accuracy.

Table 4. Neoliberalism in vocational values:

Neoliberal Axiom	**Organization**
"Librarians and other information workers reject the denial and restriction of access to information and ideas most particularly through censorship whether by states, governments, or religious or civil society institutions." (IFLA, 2012; CFLA-FCAB, 2018)	International Federation of Library Associations and Institutions (IFLA) Canadian Federation of Library Associations (CFLA-FCAB)
	American Library Association (ALA)

“That means we make all kinds of material available to people, because we believe you’re free to access and develop your own informed opinions and ideas.” (EPL, n.d.)	Edmonton Public Library (EPL)
“EPL promotes Intellectual Freedom by encouraging you to take responsibility for your own ideas and values, while respecting the rights of others to make free choices and have different opinions.” (EPL, 2020) “We’re a marketplace of ideas.” (EPL, 2020) “As a marketplace of ideas, EPL provides a wide range of materials and we want you to use them freely and develop your own informed thoughts and opinions.” (EPL, 2020)	Edmonton Public Library (EPL)

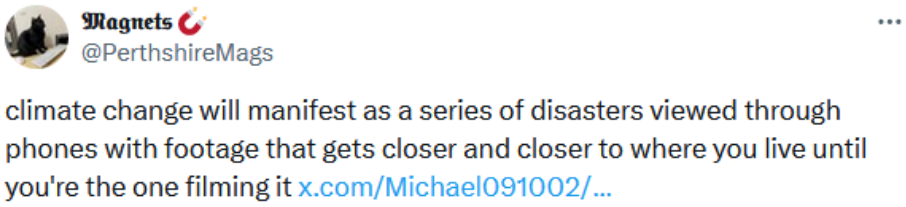
The preceding discussion conveys that a “marketplace of ideas” (EPL, 2020) is in no way a desirable state. While being present in some form in each level of organizations’ statements, this neoliberal logic is most blatant in that of the Edmonton Public Library. This is part of an overall neoliberal trajectory for Canadian public knowledge-producing institutions (Carroll, et al., 2018) and, as a purportedly value-driven cultural knowledge institution, it is important to determine what differentiates libraries from other information institutions, such as corporations in publishing, tech, or telecommunications and whether library praxis should remain distinct from private sector epistemic and axiomatic logics that have facilitated continued economic and emissions growth.

Consider the ways in which library information literacy pedagogy resembles the knowledge equivalent of a carbon footprint. While it is conventionally viewed as a method for empowering the individual, seen another way it is another form of downloading the responsibility of corporations to stop polluting and lying onto community members with limited capacity, shifting the burden to a populace that is underpaid, overworked, precariously employed and yet somehow making more profit for fewer people than ever. Even a critical information literacy focused on ‘learning the systems' is different from developing methods to resist these systems collectively and institutionally.

It is not that these vocational values are wrong necessarily, only that they are, at times, unevenly and narrowly applied. Finding methods by which local librarianship can meaningfully enact ethical cultural knowledge and memory practices within this structural context is one of the most effective actions that it could take to mitigate the growing severity of what we are facing, given how reliant the regional fossil fuel industry is upon broad cultural support.

These are the causes that must be addressed by climate librarianship. The MACK compass orients the vocation towards **Mitigation**, by developing praxes aimed at lowering GHG emissions in the **Community** served by the library, and praxes that work with **Knowledges** to counter and nullify climate malinformation and the justification of continued GHG emissions, eliminating these causes at the source or negating their harms post-production.

III. Effect



@PerthshireMages, Twitter user (PerthshireMags, 2022)

In order to exist in any meaningful way, a library requires both a collection of cultural knowledges and a community to access it. Yet the impacts of climate change threaten the continuity of both and, due to the decades of inaction caused by climate malinformation, "regardless of our best efforts, losses due to a changing climate will be incurred" (Nelson, 2011) since the sheer quantity of GHGs that have been emitted in a relatively short time and their persistence in the atmosphere has 'locked in' some degree of climate change.

Communities and cultural knowledge sites in Treaty 6 Alberta are now experiencing the effects of this climatic shift and while "governments and businesses have begun to assess climate risks and develop adaptation strategies" there are major gaps in "sector-specific plans and policies" (Sauchyn, et al., 2020), impeding holistic societal adaptation to these risks and leaving some demographics, communities, and sectors more vulnerable than others (Sauchyn, et al., 2020). To finish answering RQ2, determining how contemporary LIS and library practice is implicated in ongoing climate change, the next step is assessing what climate impacts are likely to affect the libraries, communities, and cultural knowledges in amiskwaciwâskahikan-edmonton and the surrounding region. Moreover, as an inherently temporal practice, for how long must the vocation prepare to serve cultural knowledges and memories within these conditions?

Regarding the latter question, in its most recent Assessment Report, the IPCC draws a distinction between "risks in the near term" that emerge in this decade out to 2040, and mid- to long-term

risks that extend past 2040 until 2100 (IPCC, 2023). The end of the century, however, is a relatively arbitrary cutoff given the scale of issues that unabated climate change may create well before then and, since the continued "habitability of some regions of the earth" (Lyon, et al., 2021) is in question on longer time scales, some researchers have firmly stated that "governance and policy must be framed beyond 2100" (Lyon, et al., 2021), beginning work to model emissions scenarios out to 2300 and 2500 for the benefit of decision makers. Other researchers suggest that the decisions that are being made now will have repercussions for 10,000 years (Clark, et al., 2016). And, although the contemporary changing climate has no known precedent in the historical or geological record, some findings indicate that there are "long term stabilizing feedbacks in the climate system" on the order of ~100,000 years (Arnscheidt & Rothman, 2022).

This leads to a vulnerability in the present digital knowledge monoculture, the fragility of digital storage media, its primary value proposition to cultural knowledge and memory being access and use, rather than durability. While the discipline seemed concerned about this at the end of the 20th century (Kuny, 1998; Brand, 1999) the intervening decades saw these concerns quieted, despite no evident reason to do so. Digital storage media does not typically last longer than two decades—at the outside (Erickson & Lunt, 2015; Lunt, 2011)—hence the need for archival practices like 'lots of copies keeps stuff safe' (LOCKSS) and migration procedures. There is one commercially available digital media format with a significantly longer theoretical lifespan, the M-disc, though it is not in common usage outside of the Utah state government.

The delicate nature of a digital monoculture is further complicated and complemented by an excellent case study in the limits of siloed diversity without interconnectedness. Digital format obsolescence, as storage hardware transitions from "Digital Linear Tape to PATA hard drives to SATA hard drives to SSDs" (Kahle, 2022) in parallel to the peripheral equipment that conveys the media, moving from reel-to-reel to cassette decks to optical disc drives, alongside cable formats like universal serial bus (USB)-A, USB-C, micro-USB, lightning connector, etc. and software file types (Bollacker, 2010; Kahle, 2022) makes preserving digital information more complex and difficult. Without interconnectedness, or interoperability, this diversity becomes a series of dead ends without anywhere to go, the 'walled garden' trope where each format, rather

than contributing to a whole, is simply a monoculture within a proprietary ecosystem (Doctorow, 2024).

Even the benefits of digital knowledge, the affordances, the ease of reproduction, the ephemerality and malleability, these characteristics become drawbacks in a monocultural media setting. When soundtracks can be changed at the whims of licensing (Broderick, 2024), images can be altered pixel by pixel or generated wholesale (Sayegh, 2024), search results and social media feeds change second-to-second and person-to-person based on black boxed processes, the durability of shared and subjective meaning is altered. The overwhelming quantity of material on offer obscures this malleability behind the Internet's symbolic performance as the sum total of human culture. Digitization has normalized collections wherein their contents can be altered or disappear seamlessly. In 10 years, 38% of the webpages that existed in 2013 are gone (Chapekis, et al., 2024). How do these qualities sit within the context of preservation during climate change, especially given an increasingly centralized ownership and management of the infrastructure.

Libraries and the knowledge infrastructures that they contain, such as books, should and do offer alternatives to their communities. However, the vocation has its own vulnerabilities in the form of aging public infrastructure, as many libraries in the northwest of the continent are often in need of funding for basic repairs and maintenance (Sax, 2021), let alone upgrades to prepare them for climate impacts. Within Treaty 6 specifically, there is very little data about the state and age of library buildings outside of amiskwaciwâskahikan-edmonton despite the fact that in the region and in neighbouring regions, they are affected by climate impacts and natural hazards.

A similar gap in the data persists throughout cultural knowledge and memory practice in Canada. In assessing archives' preparation for climate impacts, Amanda Oliver found neither a complete list of Canadian archival institutions, nor consistent nationwide availability of floodplain data and flood maps (Oliver, 2021). Provincial library associations have begun benchmarking assessments to determine the scope of these impacts, but work is in its early stages.

To identify what climate impacts are likely to arise during these periods, despite the highly variable and interconnected nature of climate change, the situated scope granted by focusing on

location is one of the benefits of the place-based focus of this thesis. The following summary combines this with one other set of temporal categories useful for thinking through these impacts: the speed at which they will occur in local environments (IPCC, 2019a; IPCC, 2019b).

III.i. Slow

The first category is slow-onset climate impacts: gradually changing overall conditions such as the increasing temperatures and sea level rise which vocational literature has occasionally referred to. In the landlocked region of Treaty 6 Alberta, deglaciation and loss of biodiversity are other serious slow-onset impacts, as well as changes in historical patterns of precipitation, a shift which is related to other slow-onset impacts like land degradation or even desertification (IPCC, 2019a).

In a business-as-usual scenario[18] that uses the time horizon of 2100, the average annual temperature in amiskwaciwâskahikan-edmonton would rise 5 - 7 °C, from 4.2 °C to 9.2 - 11.2 °C (IPCC, 2013). By 2500, if we managed to peak emissions around 2080 (Van Vuuren, et al., 2011), temperature averages would still approach 'very strong heat stress'—greater than 38°C—during summer months (Lyon, et al., 2021), rendering the conditions during 2021's heat dome event the seasonal norm rather than the exception. Under the business-as-usual scenario, annual precipitation would increase by around 10%, from 455.7 mm/year to 501.27 mm/year, influencing a 20 - 30% increase in average riverine flow per year as we approach the end of the century (IPCC, 2013). These annual averages are only half the story, as climate models forecast extreme precipitation increases in the fall and decreases mid-winter, even if emissions begin to decline late in the century (Lyon, et al., 2021). An overall decrease in snow and ice coverage during the early and mid-winter is expected thanks to the rising temperatures and the decreasing midwinter precipitation (Lyon, et al., 2021), accompanied by an increase in the intensity and frequency of future droughts and soil moisture deficits (IPCC, 2013) especially during the late summer and early fall (Anderson & Radić, 2020). Though perhaps counterintuitive, these

[18] Scenario forecasting includes the Resource Concentration Pathways (RCP) and Shared Socioeconomic Pathways (SSP) used by the IPCC. RCP8.5 is considered a worst case scenario with zero mitigation, RCP6.0 is considered a 'realistic' low mitigation scenario where emissions peak and begin to fall in the last quarter of the century (Van Vuuren, et al., 2011). Intermediate scenarios are considered to be increasingly likely.

impacts would stem from greater rates of evaporation and transpiration in the higher temperatures and a reduced summer riverine flow (Bush & Lemmen, 2019) caused by the loss of the glaciers and icefields that birth the headwaters of the continent, originating kisiskâciwanisîpiy north saskatchewan, as 70 ± 10% of their total glacial volume, relative to 2005, disappears over the next decade and a half (Clarke, et al., 2015).

These slow-onset impacts hold dire consequences for the infrastructures that facilitate culture, globally and regionally. Canadian archivist Amanda Oliver found that "all Canadian archives will be impacted by projected changes in both annual mean temperatures and precipitation to the year 2080" (Oliver, 2021), conditions which also apply to libraries and other cultural knowledge institutions—a likelihood acknowledged at least as far back as the 2nd wave of climate librarianship (Meyer, 2008). These changes pose challenges for institutions reliant upon energy intensive climate control equipment (Tansey & Montoya, 2020) by increasing usage and the associated expenses. An earlier report on American archives came to similar conclusions about the widespread nature of these impacts, finding that "98.8% of archives were likely to be affected by at least one climate risk factor" (Mazurczyk, et al., 2018), including temperature and precipitation changes, as well as sea level rise.

Being landlocked, Treaty 6 will not be directly impacted by rising sea levels. However, there are enough libraries and archives, around the world and in neighbouring regions, that will be seriously affected that it bears mentioning. This includes many national archives (Line, 2006), particularly those in the equatorial Pacific (Gordon-Clark & Shurville, 2010; Gordon-Clark, 2012) like the Republic of Kiribati (Woodham & Gordon-Clark, 2023) and Tuvalu, which is projected to be the first nation to disappear if climate change is allowed to continue on its current trajectory. This has led to Pacific communities like the Tuvalese pursuing state-of-the-art measures to preserve their cultural memories and heritage. Tuvalu is intent on becoming the First Digital Nation, pursuing a holistic digital initiative to document "its land, archive its rich history and culture, and move all governmental functions into a digital space" (About, n.d.) in a bid to move beyond labels like the 'first climate refugees' and chart a course away from climate "consequences [that] are socially constructed and managed by powerful forces" (Farbotko & Lazrus, 2012) outside of their community. Other coastal communities, such as the province of

Bali in Indonesia (Widiadana & Erviani, 2011), Aruba in the Atlantic (Adams, 2024) and, closer to Treaty 6, Inuvialuit peoples in the Northwest Territories (Inuvialuit, n.d.), have pioneered digital archives to preserve their cultures. Yet digital cultural systems are not immune from climate risks either. In the continental United States alone, a significant portion of internet infrastructure, including "~4.1k miles of fiber conduit… and over 1.1k colocation centers" (Durairajan, et al., 2018), may be compromised by rising sea levels within a decade. The rise of extreme temperatures may also have further negative effects on digital storage, increasing hard drive failure rates in data centers (Pinheiro, et al., 2007; Sankar, et al., 2013).

III.ii. Rapid

These slow onset events are distinguished from, but not unrelated to the second category, "shifts in climate variability and the occurrence of extreme weather events, which are associated with natural hazards such as floods, drought, and wildfire" (Sauchyn, et al., 2020), also known as rapid-onset impacts, or natural disasters, or emergencies. When it comes to rapid-onset impacts, probabilities can be assessed by climate modelling but specific instances cannot be predicted.[19]

As discussed within Part One, library literature does include a far more comprehensive discussion of rapid-onset impacts (Patin, 2020a, 2020b; Liu, et al., 2017; Stross, 2017; Tu-Keefner, et al., 2019; Yelvington, 2020; Flaherty, 2022), since they are typically the most immediate and visible climate risks that libraries must prepare for. Several catastrophic and anomalous regional events have already taken place in the past decade, including two of the costliest insured disasters in Canadian history, the southern Alberta floods in 2013 and the Fort McMurray wildfires in 2016 (Sauchyn, et al., 2020), as well as a novel and record-breaking heat dome in 2021 (White, et al., 2023), and the record-breaking circumpolar boreal wildfire season in 2023 (CAMS, 2024).

The changing character of wildfire season is, perhaps, the most dramatic example of rapid-onset climate impacts for amiskwaciwâskahikan-edmonton, Treaty 6 Alberta, and northwestern Turtle

[19] Though there is an emerging field, attribution science, that uses modelling to retroactively assess whether GHG emissions and climate change altered or contributed to specific events. (Swain, et al., 2020)

Island Canada. Seasonal wildfire, including both forest and grass fires, has burned an increasing amount of the land over the last few decades (Sauchyn, et al, 2020) and will continue to be a part of life here, forcing human communities to learn or relearn ways of living with its cyclical emergence, especially as climate change has and will continue to increase the risk of wildfire in the future (Sauchyn, et al., 2020) in a number of ways.

Wildfires arise from an ignition source and fuel. There are two major sources of wildfire ignition. One is human activity, either intentional or accidental. The other, lightning strikes, are projected to increase in number "by about 12% for every degree of rise in global average air temperature" (Romps, et al., 2014). Climate change improves the suitability of regional non-human communities, such as forests and grasslands, to fuel wildfires. Slow-onset impacts like higher temperatures and soil moisture deficits desiccate these communities, allowing fires to "start, spread, and burn more intensely" (Sauchyn, et al., 2020) as their suitability as fuel serves to incubate rapid and uncontrollable wildfire growth. This intersects with conditions, sometimes referred to as fire weather, that are often given as the 30-30-30 crossover rule, referring to an ambient air temperature $\geq$ 30 °C with relative humidity $\leq$ 30% and open wind speed $\geq$ 30 km per hour. Climate change is resulting in fire weather becoming more common, particularly in the spring and in the northern boreal forests of the region, during a fire season that is longer (Sauchyn, et al., 2020). Through the smoke they create, the increase in wildfires is also creating significant seasonal decreases in air quality, domestically and internationally (Mertz, 2023).

Despite the predicted increase in the overall volume and intensity of precipitation for the region, there are almost no scenarios where it would be enough to offset these conditions (Sauchyn, et al., 2020) and, furthermore, these changing precipitation patterns are associated with their own rapid onset events. The climate region that amiskwaciwâskahikan-edmonton is a part of is a hydroclimatically diverse continental system. Historically, some communities in Treaty 6 have experienced droughts at the same time as other communities experienced flooding. New extremes in precipitation patterns would characterize the region as climate exacerbates the frequency and/or severity at both ends of the spectrum (Sauchyn, et al., 2020).

Again, while it is impossible to predict the precise details due to the variety of complex interconnecting factors involved, this pattern is likely to materialize as both summer and winter storms, flood, and drought. Lacking the stabilizing effect of glacial and alpine snowpack, as regional precipitation becomes more likely to fall as rain (Sauchyn, et al., 2020), the risk of spring overland and mountain runoff flooding in the region increases (Sauchyn, et al., 2020) while summer streamflow decreases (Fountain & Tangborn, 1985; van Tiel, et al., 2020), possibly by more than half as the 21st century comes to an end, compared to the 1981 - 2010 average (Chernos, et al., 2020). This loss of summer streamflow would contribute to the opposite end of the rapid-onset hydrological spectrum: drought. As higher temperatures, drier soil, and annual variations in rainfall interact, dry periods would become more severe, increasing the risk of both seasonal and multi-year droughts, with the latter referred to as "the worst-case future scenario for the Prairie provinces" (Sauchyn, et al., 2020).

Both physical and digital knowledge infrastructure would be affected by rapid onset impacts. Some have been covered, beginning with early discourse on strategies to protect materials from natural disasters in a general sense (Kahn 2003; Green & Teper 2006; New Jersey, 2013), however it is only in the last decade that archivists have begun determining the direct material threats to geographically specific collections, where it was discovered that more than 1 in 5 American archives risk being flooded during storm surges (Mazurczyk, et al., 2018). Earlier writing highlighted the massive losses that academic libraries experienced from flash flooding in Hawai'i and Hurricane Katrina (Tansey, 2015).

Regionally, wildfires are already regularly impacting cultural memory institutions and ICT infrastructure. One of the buildings that was razed to the ground in Lytton in 2021 was the Lytton Chinese History Museum, along with its archives and library (Correia, 2021). After the 2016 Fort McMurray Wildfire, the Wood Buffalo Library was closed for almost 2 months and lost ~$100,000 worth of materials to smoke damage and checked out items that disappeared in the chaos of the fires and evacuation (TransCanada, 2017). At the same time, digital information and communications infrastructure in the area was under threat (Dobby, 2016), and these wildfire-driven disruptions continue to occur in Alberta (Posadzki, 2023) and across broad swathes of the continent (Anderson, et al., 2020). Floods are a regional danger as well,

inundating the Calgary Central Public Library with over a metre of water in 2013, causing the loss of almost 20,000 items (White, 2013a; 2013b), and severely damaging the library nearby in High River (Makrugin, 2017). Heat waves may also pose significant challenges in the future, potentially causing data centres to overheat (Swanson, et al., 2021) or, as was the case in the United Kingdom in 2022, affecting services through the preemptive measures taken. Multiple Google and Oracle cloud servers were taken offline to avoid long term damage (Quach, 2022).

The increased stresses caused by slow onset gradual changes in environmental baselines and rapid-onset impacts representing shifting extremes will, if left unmitigated, combine to wreak immense interconnected cascading impacts within the human and non-human systems which exist within this context, challenging the possibility of 'managing' or adapting to the new conditions (Sauchyn, et al., 2020).

III.iii. Related

In Treaty 6 Alberta, these indirect impacts would affect everything from the most basic needs to the most complex infrastructure, in addition to reverberating through regional and global networks in unpredictable ways. The cumulative effects on human and non-human beings can be difficult to predict due to the variety of intersecting factors, the myriad connections within the ecosystem, and the inherent uncertainty of the degree to which we will mitigate our emissions.

However, when needs as fundamental as the air we breathe are impacted by climate change it is certain that there will be further consequences. Human health suffers when breathing in particulate matter from wildfire smoke (D'Evelyn, et al., 2022). Rising indoor CO2 levels can compromise our ability to think (Karnauskas, et al., 2020). These effects alone conjure any number of cascading impacts.

Or, turning to water, it can be expected that human and nonhuman freshwater needs would increase commensurate with rising temperatures. Yet, as discussed, a major source of water in Alberta is alpine runoff from glaciers and the spring melt of snowpack (Alberta, 2019). By 2100, it has been estimated that 1 in 4 Albertans may experience water shortages stemming from the

loss of the glaciers alone, particularly during late summer (Anderson & Radić, 2020). This would be compounded by increasingly limited surface and groundwater availability as well as diminishing quality in the sources that remain, as extreme rainfall events, floods, and changes in riverine flow pull more particulate matter and other pollutants into the watershed (Sauchyn, et al., 2020). This will all be a microcosm of vanishing freshwater access around the world as rising sea levels and changing weather patterns, to say nothing of human pollution, compromise coastal and inland freshwater sources globally (Brosig, et al., 2019).

This, in turn, affects another basic need: food, where human need is inseparable from nonhuman requirements. 19% of gross agricultural production in Alberta relies upon irrigation, forming the largest use of water provincially—60 to 65% of all water usage (Alberta, 2019)—thereby extending the network of impacts into food security, particularly when taken in context of the drought cycle and impacts on soil quality, thanks to the increased risk of soil erosion, salinization, desertification, and degradation (Wheaton & Kulshreshtha, 2017) and the fact that during "germination and reproduction [plants] are highly sensitive to moisture and heat stress" (Champagne et al., 2012) which raises grave concerns about the pathways by which climate change will affect the production, processing, distribution, preparation, and consumption of food (Schnitter & Berry, 2019). This will affect locally grown and traditional 'country' food sources severely, particularly in the north (Schnitter & Berry, 2019; ECCC, 2023), impacting their availability, accessibility, and utilization (Settee, 2020) with further unpredictable results as the "nutritional content of some agricultural crops" changes in the presence of higher concentrations of atmospheric CO2 (Schnitter & Berry, 2019). While some crops such as wheat, barley, and timothy may benefit from changing conditions such as extended growing seasons, hotter weather, and atmospheric CO2 concentrations in the near or mid-term, they may suffer in the long term. Other crops such as canola, corn, and soybeans are predicted to be negatively impacted in all timeframes (Sauchyn, et al., 2020) without immediate transformative climate change mitigation.

These declines in air quality, water availability, and food security—not to mention the natural hazards outlined previously—will be felt within our communities and, in many cases they already are. As these effects increase, so would the attendant impacts on human mental and

physical health (Schnitter & Berry, 2019) increasing stresses upon healthcare and other local infrastructure created in order to support human health and life as they experience greater demand and increasing operating costs, leading to an expansion of existing gaps in access (ECCC, 2023) if nothing is done.

Both slow-onset and rapid-onset changes would, in various combinations, also place greater literal stresses on these institutions, affecting the structural integrity of buildings and their foundations, including library and archival buildings themselves (Meyer, 2008; Sax, 2021), the capacity of wastewater and stormwater drainage systems, and the reliability of other forms of critical infrastructure such as electrical grids, telecommunications, and transportation, from inland road- and railways like the seasonal ice roads north of Treaty 6 Alberta to ports in neighbouring coastal regions (Swanson, et al., 2021).

From here, we can trace the cascading impacts outwards. The disruption of transportation infrastructure gestures to larger disturbances in the industrial production of goods manufactured within the contemporary economic system, an overwhelmingly complex and interconnected globalized endeavour. To return to the fundamental need for food as an illustrative example, climate impacts on other regions and on connective supply chains will disrupt availability in unforeseen and unintended ways, with "implications for Canadian food security, including food supply and food safety" (Schnitter & Berry, 2018). The IPCC found that "... for every degree of global warming, the world's yield of wheat will fall six per cent, corn by 7.4 per cent, and rice and soybeans both by a little more than three per cent each" (IPCC, 2019a) yet these four crops alone provide the majority of the human species' current caloric intake (IPCC, 2019a). Existing vulnerabilities can already be seen in how national food supply chains and prices were affected by the COVID-19 pandemic, exacerbating existing inequalities, weaknesses, and precarities in the colonial capitalist infrastructure (Hobbs, 2020).

The impacts upon knowledge infrastructure would both be caused by, and further cause, interconnected disruptions. Outside of being directly affected by rapid- and slow-onset impacts, digital technologies are particularly vulnerable to power grid failures caused by wildfires (Dobby, 2016; Anderson, et al., 2020; Posadzki, 2023), winter storms, or high winds (Swanson,

et al., 2021) damaging utility lines and other infrastructure. In turn, either or both of these outages would create their own knock-on impacts given what Sarah Demb has referred to as "the almost naïve inability of most … to truly conceive of the impact [...] and implications of long term or permanent loss of the power grid and information networks almost all of our work and lives now depend upon" (Demb & Tansey, 2020).

Another critical cascading impact affecting digital ICT infrastructure, as well as many other aspects of culture, is the aforementioned effects and interruptions in the supply chains needed to manufacture, maintain, and distribute the necessary components, equipment, and infrastructure. Previews occurred during and after the Covid-19 pandemic and the impacts of climate change have the potential to exacerbate these disruptions, hints of which have been present in chip shortages over recent years, a metaperspective which is relatively underexplored in LIS literature (Pan, et al., 2022) at this point in time. Both ongoing drought conditions and the "once-in-a-lifetime" 2021 drought event in Taiwan foreshadowed how chip manufacturing and its water usage might be affected long term or increase regional tensions if left unaddressed (Hale, 2021; Asia Pacific, 2023).

These cascading impacts are serious enough that some archival, informatics, and information studies scholars have raised the idea of preparing cultural knowledge systems for a complete collapse of these infrastructures (Hecker, 2007; Tomlinson, et al. 2013). While some of this discussion was partially driven by the fear of peak oil in addition to climate change, a prediction which failed to take into account our desire and ability to exploit unconventional oil sources, concepts like "collapse informatics" (Tomlinson, et al, 2013) posit that truly sustainable sociotechnical infrastructure is a "strategic design problem" which should be addressed now, during the proverbial age of milk & honey, explicitly developing systems for deployment, utilization, and maintenance during a future defined by scarcity. Similar concepts such as 'minimal computing', 'computing within limits', and 'permacomputing' have also arisen over the past few years, indicating a high degree of concern among scholars and practitioners. Archivist Jan Zastrow raises a complementary point, hypothesizing a shift in professional memory work that is not solely reliant on digital infrastructure, better incorporating preliterate traditions including pictographic and mnemonic aids (Zastrow, 2018).

These cascading impacts thoroughly disprove the nature/culture illusion, outlining potential impacts that extend 'beyond' the ecosystem that meets our needs to disrupt the systemic economic intermediaries that communities, both local and distant, rely upon to produce and distribute the specific forms in which these needs are currently met, which serves to gesture towards another arena of socioeconomic impacts.

As discussed, fossil fuel extraction is deeply embedded in Alberta. This has created a complex web of economic interdependence, affecting both the settler communities and Indigenous nations in Treaty 6. Despite the need to transition away from fossil fuels and resource extraction in order to create viable and sustainable long-term ways of life, day-to-day survival within the contemporary economic system is often premised upon capital created by these industries. Even though the surplus profit and power that the fossil fuel industry produces has been inequitably distributed, its sheer scale, combined with its centrality to contemporary infrastructure and the demand for its products—coerced, subsidized, and perceived though that demand may be—has meant that even the distributed byproducts of profit and power necessary to maintain widespread perceptions of legitimacy are enough to support individual and communal lifestyles across wide swaths of Treaty 6 Albertan society, especially given the limited monocultural ways of life that have been imposed by globalized capitalism.

On-reserve Indigenous communities in the region often have benefit agreements with industry that allow access to community investment funding which supports vital initiatives like cultural camps and language programming. With limited economic opportunities, many Indigenous Nations have no other source of revenue to support the resources and infrastructure needed to maintain cultural traditions or provide programming and services that support potential escapes from cycles of exploitation and impoverishment.

However, the necessity of ending the historical period of fossil fuel extraction is only further justified by considering the impacts of climate change on the extractive economic pillars of Treaty 6 Alberta. Sectors like fossil fuel extraction and forestry are not magically exempt from slow- and rapid-onset climate impacts, as has been evidenced by the wildfires, coastal storm

surges, and hurricanes that have disrupted extraction and refining operations domestically and internationally (Bloomberg, 2024; Somasekhar, et al., 2024) and the landslides that disrupted the construction of the Trans Mountain twinning (Slepian, 2021). With vital infrastructure such as the northern ice roads at risk and more than 40% of commercially recoverable reserves under threat, the oil and gas industry itself faces an "existential risk" (Nichols & Clisby, 2021), same as the rest of human infrastructure. This is, perhaps, even more obvious when considering the wildfires and drought that threaten the "continued viability" of the regional forestry sector (Brecka, et al., 2020). Up to this point in history, these economic harms have typically fallen upon the members of the community rather than those making up transnational corporations, but these organizations can only buy exceptional resilience for so long. The choice within these industries is not, as is often framed, between economy and the environment, but whether or not these industries come to an end intentionally and equitably, minimizing the costs that stranded assets will place upon the sector's most precariously employed workers and community members living in poverty, or chaotically and violently by the increased stressors that climate change places upon their infrastructure.

Furthermore, in proposals for creating a more resilient regional economy, many throughout the constrained political spectrum have paid lip service to economic diversification. However, major sectors that have been proposed for this diversification, such as agriculture and tourism (Alberta, n.d.), stand to be directly and drastically disrupted by climate impacts. The effects on the non-human participants in the regional agricultural sector has been discussed but, in monetary terms, these harms resulted in damages approaching $3 billion during 2001-2002 and $1 billion in damages in 2014, caused by drought and flooding respectively (Sauchyn, et al., 2020), during a cooler and wetter norm than we are slated to have by the end of the century without immediate and massive mitigation. Again, while there are issues and opportunities facing regional agriculture on "both [the] supply and demand side" (IPCC, 2019a) and changing conditions may create some short- to mid-term benefits for the sector, overall the changes contribute to the economic uncertainty of the region at best.

With respect to tourism, in a literal and promotional sense, Treaty 6 Alberta's most visible global attraction is the mountain parks at its western edge. Though it is an indescribably reductive and

instrumental way to view these crucial more-than-human corridor biomes and the nonhuman and human communities that rely upon them, from an economic perspective the industry that they support will be subject to upheaval as wildfire season and declining alpine snowpack take their toll. Combined with the ENSO variation, a.k.a. El Niño, the winter of 2023-24 and its historically low snowfall impacted ski resorts (Hamilton, 2024). Simultaneously, the risks of rockslides and avalanches are increasing as conditions continue to warm faster than the global average at alpine elevations (IPCC, 2019b; Jakob, 2021).

And yet there are deeper levels to the threat that climate change poses to culture, knowledges, and memory.

Earlier I briefly mentioned an invisible way that climate change will affect knowing through the effects of indoor CO2 concentrations on human cognitive abilities (Karnauskas, et al., 2020) in addition to the impacts on built knowledge infrastructure. This alludes to the much more visible changes that climate change's effects on place, out of doors and in our environment, will exert fundamental epistemic pressures upon the cultures that arise in these places.

As I have outlined in the introduction to the thesis, culture and knowing is inseparable from place and as familiar places are transformed by the impacts that I've outlined, this will inevitably "change cultures and communities, often in ways that people find undesirable and perceive as loss" (Adger, et al., 2013), in uncountable and diverse ways. What would the loss of the boreal forest do to cultures in Treaty 6? How would increased drought threaten agriculture or "pastoralism as a cultural phenomenon…" (Adger, et al., 2013) given the importance that settler Albertan culture places upon its western, pioneering frontier mythology, problematic though it may be? How might decreased snow and ice cover be felt through the attendant loss of winter culture and recreation— not to mention feelings of "dislocation from place" (Adger, et al., 2013) as weather, seasons, and culturally significant habitats and iconic landscapes are lost or transformed?

At a certain point the precise cascading interactions on human and nonhuman communities become difficult or impossible to determine. Something as simple as movement, for instance, is

both one of the oldest adaptations to a changing environment and, within a complex web of relationships, an impact. As climatic conditions migrate outside of their normal regions and ranges, biomes and peoples, both human and nonhuman, will follow.

In simplistic terms, though perhaps useful for purposes of illustration, by 2100 the present-day climate south of Treaty 6 would move northwards (Issawi, 2018) while, for its part, the historical climate north of Treaty 6 would likely be coming to an end, rendered unrecognizable following the loss of permafrost, snow, and ice coverage. Climate impacts, in particular water availability and wildfire would "facilitate rapid vegetation change" (Stralberg, et al., 2018) and while the fact that grassland and parkland biomes share many species and typically allow for a high degree of mobility—though obviously impeded by some human infrastructure such as roads and fences—potentially allowing non-humans to find a new balance so long as this mobility is aided or encouraged, it also creates further uncertainty in the prediction of future ecosystems.

The aspen stands that give the local biome its name seem to be outcompeting grasslands in the short-term, however in the long term they are expected to stop expanding in a best-case scenario, or be entirely eliminated from these latitudes in favour of grasses like Northern Fescue or other hardier drought-tolerant species like June grass and needlegrass in the hottest and driest projections (Schneider, 2013). Under extreme scenarios, by the end of the century the regional boreal forest would be eliminated except for a few lonely high altitude fragments possibly holding out in the Caribou Mountains (Sauchyn, et al., 2020). Whereas, due to a potential observed resilience amongst peatland biomes, "the future northern Alberta landscape may be comprised of a mosaic of peatlands and upland aspen forest, a novel ecosystem that is not represented in Alberta today" (Nixon, et al., 2015). In a survey of 90% of the known species of plant within Alberta, almost 1 in 4 are projected to lose the vast majority (>80%) of their present-day suitable habitat in provincial borders, while 1 in 3 were projected to significantly increase the same. Traditional foods like gooseberries, chokecherries, saskatoons, and strawberries are becoming increasingly scarce. Mountainous plant species face the greatest pressures, whereas species like Giant Knotweed, Salt Cedar, and Alkali Swainsonpea from further south stand to monopolize increasingly sparse resources (Nixon, et al., 2015).

The disappearance and migration of less mobile entities will dictate the movement of those with greater individual mobility. Following the expansion of the growing season, white-tailed deer are already increasing in range (Dawe & Boutin, 2016), followed by their predators, which may place further stress on Indigenous caribou herds (Laurent, et al., 2021), already endangered from the loss of habitat to industry. Similarly, following the trees in which they live, boreal songbirds like the Tennessee Warbler would become extremely vulnerable as their hosts disappear, even as some deciduous and grassland songbirds expand their range and numbers (Nixon, et al., 2015).

The distribution and health of many, if not all, of Indigenous or localized species will be affected by the encroachment of new or invasive species (Bajwa, et al., 2020; Alkishe, et al., 2021; ECCC, 2023), creating interconnected impacts, such as reduced agricultural yields, or the pine beetle infestations affecting forest ecosystems and fire regimes (ECCC, 2023; Sauchyn, et al., 2020), or pandemic. The arrival of novel viral and infectious species (Trebicki, 2020) has significant consequences for other nonhumans, indirectly affecting human systems and, in the case of zoonotic diseases like COVID-19, directly impacting human communities as well (Beyer, et al, 2021; Carlson, et al., 2020). Changing temperatures, precipitation, and zoonotic patterns would carry diseases outside their historical latitudes in the tropics and may reawaken their ancestors, as paleoviruses frozen in the permafrost thaw in a melting Arctic (Alempic, et al., 2023). A key variable in these vector-borne migrations will be the human element (McMichael, 2015; Flahault, et al., 2016; Brosig, et al., 2019; ECCC, 2023).

Again, being landlocked, Treaty 6 Alberta will not directly experience sea level rise, but it will be affected by the climate refugees so displaced particularly, despite everything outlined so far, as a sparsely populated region with a comparatively moderate climate—at least when contrasted with the impacts predicted for equatorial and polar regions—and a relatively stable political system for now. Migration from other climate-stressed and destabilized regions of the world seems likely.

Myriad communities and individuals will cross often-arbitrarily determined international boundaries in addition to those suffering displacement within these borders (Rigaud, et al., 2018). As changing proximity causes global cultures and communities to relate in new ways this

will interact with unknown social consequences driven by basic climatic changes such as increasing temperature, which alone "can impact social evolution and sexual selection" (Blumstein, et al., 2023), and other coinciding ecological changes to catalyze further antagonism or cooperation (Blumstein, et al., 2023). These ecological changes may alter the ways we socialize, affecting social "structure, parental care, …mating patterns, … the composition and size of social units" (Blumstein, et al., 2023) with vastly differing effects amongst different populations and locales depending on their history, whether natural (Blumstein, et al, 2023) or, as must be recognized as ultimately inseparable, cultural, since a community's interpretation of, or "response to[,] every dimension of global climate change is mediated by culture" (Adger, et al., 2013). Both pre-existing and novel social relationships may support "flexible responses and acclimation to environmental change" (Blumstein, et al., 2023) yet both will also be destabilized by the fundamental physical stresses caused by limited resources, decaying infrastructure, transformation, loss, or fragmentation of habitat, and emergent natural hazards (Blumstein, et al., 2023) in addition to the communal political responses to these real and perceived scarcities and threats.

The geopolitics of the future adds yet another veil of complexity, obscuring prediction based on the difficulties of understanding how human social groups will behave within these interrelating conditions as migration (Rigaud, et al., 2018), policy responses, new legal and governance structures (Paris, 2016), lateral and asymmetrical competition, astroturfed and genuinely grassroots political movements, and emerging regional and international conflicts (Brosig, et al., 2019) or alliances arise in response to the network of systems and relationships impacted by climate change.

Once again, using basic needs such as water and food as a touch point, transboundary freshwater sources like the Indus, Mekong, and Nile rivers may become the focal point of territorial disputes (DoD, 2021). Along these lines, the province of Alberta shares water rights with Saskatchewan and Manitoba before rivers like the kisiskâciwanisîpiy-north saskatchewan drain into the Wînipekw-Hudson Bay (Prairie, n.d.). Though located within the same nation at this point in history, there is no guarantee that this will not be the site of future tensions given Alberta's historical approaches to national cooperation and tenuous system of licensing water rights,

especially in a context of declining regional water availability. Additionally, as agricultural production and fisheries decline in some regions, resulting food shortages would understandably contribute to civil unrest and political instability in those regions as well as interdependent ones (DoD, 2021) and these sorts of supply chain disruptions and others could also exacerbate conflicts and tensions (DoD, 2021) at multiple scales of community and governance.

The question of the political response to all of these impacts is unsettling. Whether expressed by politically active populations or political oligarchs, cultural values driven by scarcity-based economic models and outgroup fears—typified by concerns about "shifts in the regional balance of power" and "mass migration events" (DoD, 2021)—motivate specific forms of preparation such as securitization and militarization (Wonders & Danner, 2015) that authoritarian entities may undertake as climate change accelerates, orienting responses towards exerting control over vulnerable populations rather than GHG-emitting entities. State military departments, such as the US Department of Defense, are already writing reports anticipating an increase in competition over regions and resources, the "number and severity of humanitarian crises", geopolitical conflicts, and failed states (DoD, 2021) and these risk and crisis narratives (Whyte, 2020) express a ''fortress mentality'' (White, 2014) that trends towards eco- or nakedly expressed authoritarianism.

III.iv. Different

"*The future is already here – it's just not evenly distributed.*"

- William Gibson, American-Canadian writer (apocryphal)

This disquieting trajectory towards state-based authoritarian policing and enforcement is entangled with an axiom that is essential to understanding and preparing for the impacts of climate change and other environmental disasters caused by industrialized, extractive colonialism.

In the same way that we must consider that the responsibility for causing global climate change is widely and unequally distributed, although the transformation of the Earth's climate will affect

us all, as made clear by the place-based focus on what is currently known as Treaty 6 Alberta, there are differences in how the effects will be felt. Neighbouring northern and coastal areas will change even more drastically and rapidly (Cameron, 2012; Canada, 2023) than Treaty 6 thanks to a higher rate of warming and sea level rise—even within a nation that is itself warming twice the global average overall (ECCC, 2019). Differences are also present between urban and rural areas in Treaty 6, such as the issues created by an urban 'heat island' effect as opposed to those stemming from a lack of infrastructure in rural areas.[20]

Libraries, embedded as they are at the local level within communities, possess a relatively unique capacity among public institutions to tailor their responses to these differing conditions. Yet, while there are a great many qualities of, for instance, rural and remote communities that are highly useful in managing climate impacts, such as "strong informal economies, social networks and connections to place" (ECCC, 2023) these communities are also less-insulated from those same impacts and usually have "fewer financial resources and institutional capacity than urban areas" (ECCC, 2023), an economic divide which alludes to a far more profound dimension of inequality.

Ultimately, while differences in climate impacts are, to some extent, a result of regional and spatial variations in climate and weather, geographic location is only partially responsible for vast differences in "the potential loss of life, injury, or destroyed or damaged assets" (UNDRR, 2015), the risks which threaten different communities facing the same or similar climate impacts. These divergent capacities and vulnerabilities are produced by many of the same distinct social, economic, historical, and cultural conditions (Waldron, 2018) that initially caused climate change and, simultaneously, serve to structurally maintain the material and political inequalities that continue to reproduce these inequitable outcomes. Although there are a great many intersections of culture and history that dictate the nature of these differences within so-called Canada, settler-colonialism and its impacts on the Indigenous inhabitants of Turtle Island produces a fundamental faultline delineating the injustice of climate change.

[20] The rural infrastructure gap echoes the deficit within climate librarianship literature that covers remote and rural libraries and their communities.

In addition to influencing where different communities are located, through encouraged settlement or enforced relocation, these conditions and manifestations of power often dictate how material resources are allocated between and within these communities, as well as whether harm is even perceived— all too often as a function of who makes up these communities. As public institutions dedicated to equitable service (IFLA, 2012; CFLA-FCAB, 2018; ALA, 2024b) libraries must ensure that any climate action undertaken within the vocation accounts for these inequalities and prioritizes community members facing the most severe harms of climate change.

These inequalities may manifest as subtly as the lack of access to ecologically beneficial characteristics like tree canopy coverage and greenspace—both of which moderate urban heat islands among other advantages—in impoverished and racialized neighbourhoods (Conway & Scott, 2020; Landry, et al., 2020), or obviously, through a greater proximity to immediate harm. Directly north of Treaty 6, the legacy of colonialism and fossil fuel extraction has exposed Indigenous communities to oilsands pollutants (McLachlan & Riddell, 2014; Willms, 2022; Zhan, et al., 2023), reflecting similar circumstances faced by Indigenous and Black communities in other regions of so-called Canada (Waldron, 2018; Tuncak, 2020) and around the world (Pellow & Brulle, 2005; Nixon, 2011; Parsons, 2023) as colonialism and white supremacy inflicts co-location with industrial pollution and environmental hazards. Yet, even when settler and Indigenous communities face similar probabilities of experiencing climate hazards like flooding, because colonialism has produced higher "socioeconomic vulnerability… on reserve lands" (Chakraborty, et al., 2021) there are greater overall risks for Indigenous communities as well as, oftentimes, Black and otherwise racialized communities. This material deprivation affects other rapid-onset impacts and is frequently reimposed over pre-existing historical inequalities, as seen in the practice of 'power grid redlining', wherein utilities cut power to impoverished and racialized neighbourhoods (Calma, 2019; Kowalski, 2020) during temperature extremes, and wildfire response, since many Indigenous communities can lack the financial capacity to maintain fee-for-service payments to access firefighting services (Barrera, 2015), let alone their own fire departments. In turn, these circumstances produce immense barriers to obtaining insurance coverage for Indigenous people (Wong & Reith, 2023) which vastly reduces their adaptive capacity in the current economic system. Regional slow-onset changes like

“increasing temperatures, changes in the amount and timing of snowpack, and receding glaciers, reduced runoff and water availability” and cascading effects such as food security, health and wellness issues (McNeeley, 2017) are similarly magnified, as the lack of access to basics like clean drinking water, other material infrastructure, and resources for assessment, planning (McNeeley, 2017), advance preparation, and recovery facilitates dependency on “outside partners… universities, government agencies, and private consultants” (McNeeley, 2017) to meet these needs, further redistributing capacity and resources away from the community and towards settler entities, a method for undermining Indigenous sovereignty characteristic of ongoing colonialism. What little material value can be gleaned by Indigenous communities within these colonial systems is threatened by climate change. For example, in order to access capital, Indigenous nations in Treaty 6 often lease their legally recognized lands to agricultural tenants, creating a source of revenue at the cost of some oversight and agency over these lands. As outlined, these particular revenue sources are vulnerable to cascading climate impacts affecting the agricultural sector (Sauchyn, et al., 2020).

Indigeneity, as well as ethnicities affected by economic and environmental racism, intersects with age, gender, sexual orientation, and diverse physical or mental capabilities, becoming entangled in socioeconomic characteristics like relationship and citizenship status, poverty, and housing precarity. People at these intersections experience heightened vulnerabilities to climate impacts that are produced by the historical, political, and epistemic conditions surrounding them. Using heat waves as an example relevant to the urban environment of amiskwaciwâskahikan-edmonton and its associated heat island effect, local neighbourhoods with high proportions of families speaking a non-English language at home, renters, lone parent families, high unemployment, low household incomes and education levels were identified as particularly at risk (Abraham, et al., 2022). During the 2021 heat dome, 61% of the deaths in the neighbouring province of British Columbia occurred in low-income neighbourhoods (ECCC, 2023). A granular approach to countering these structurally produced vulnerabilities and supporting those affected is crucial in a place like Treaty 6 Alberta which possesses a colonial history and serves as a growing destination for newcomers, who make up a significant portion of the community and its workforce (Sauchyn, et al., 2020). In addition to the vocation’s stated commitment to provide services that address these inequities (IFLA, 2012; CFLA-FCAB, 2018;

ALA, 2024b), libraries are well positioned to learn the unique needs and capacities that arise from the specific demographics present in their communities.

That being said, a distributive justice perspective also fails to take into account the way that "the environment is experienced in specific ways by different bodies" (Waldron, 2018). This can be a result of characteristics arising from human biological processes and anatomy. Returning to heat waves, additional indicators of vulnerability that have been proposed (Norton, et al., 2015) include neighbourhoods with a high proportion of elderly and very young citizens, large numbers of aged care facilities, or those where elderly people live alone. Of the 619 fatalities caused by the 2021 heat dome in BC "67% were over 70 years old" (ECCC, 2023). However, diverging experiences of ecological impacts are also a function of structured determinants of health (Waldron, 2018) affecting people along intersections of ethnicity, racialization, class, gender expression, sexual orientation, physical and cognitive ability, and other demographic and social dynamics (Waldron, 2018) at anatomical, cognitive, and genetic levels. This is a nexus where infrequent or precarious access to basic human needs combines with increased exposure to pollutants and hazards within an overall context of intergenerational trauma, communal oppressions, and the ways that a society accommodates or does not accommodate some bodies based upon how they are valued or devalued, positioning those bodies in relation to each other through intentional and unintentional exertions of power (Waldron, 2018). Tolerance for heat may change with age, but the fact that "persons with disabilities face greater climate risks, including increased fatality rates from extreme weather events" (ECCC, 2023) is a result of political decisions. Although they are frequently invoked, the relationships that frontline staff develop with the community members that they serve, face-to-face and day-to-day, cannot be understated in this context. The trust afforded in these interactions can facilitate knowledges that may either complement statistical data or extend far deeper than it may permit, and it is a relative rarity amongst public institutions at this point in time.

Finally, cultural and spiritual impacts are unequally felt by different subjects. While climate change is a global phenomenon, "the impacts are experienced most acutely in place; as such, a sense of place, place-attachment, and place-based identities" (Cunsolo, et al., 2012) will predispose identities, ethnicities, and cultures with less-mediated epistemic connections to

environmental materiality and the land that they inhabit to more intense and intimate sensations and interpretations of ecological change than those that distance—or perform distance—from place, environment, and land, affecting individual and collective psychology, mental health, and spirituality on a profound level. Though they are often framed as secular, as cultural institutions libraries do incorporate characteristics that may connect to these valences of human experience as well. Weekly early literacy programming or topical speaker series are, in a way, forms of ritual. Shared experiences, such as regular climate grief circles, are not that far off.

The concept of ecological grief (Cunsolo & Ellis, 2018; Cunsolo, et al., 2020b) and other cultural impacts that "[arise] from the loss—or anticipated loss—of a valued place, ecosystem or species" (Benham & Hoerst, 2023) were briefly discussed earlier. It might seem obvious, but these impacts are closely tied to an awareness that something is being lost, and between the immeasurably greater duration of time that Indigenous cultures have spent creating meaning and identity with these more-than-human entities and their colonially enforced proximity to destructive ecological changes (Waldron, 2018) such as the tar sands, Indigenous communities are simply more likely to be aware of changes and absences, even aside from any specific epistemic and cultural characteristics that may lend people a greater intimacy or kinship with the land and the non-human entities that have shared it (Cunsolo, et al., 2020a). This is another facet and extension of the intergenerational trauma that colonialism, the Canadian state, and settlers have visited upon Indigenous knowers and ways of knowing. While many urban and settler communities may be aware of the disappearance of charismatic megafauna and ecological entities such as polar bears and glaciers, their cultures may mediate the experience of this loss differently. This is not to say that ecological grief is only expressed by Indigenous peoples. Evidence from other places suggests that it may also be present within farming (Cunsolo & Ellis, 2018) and rapidly urbanizing communities (Alam, 2018) in the region where there are strong and direct experiences between community members and the land that they inhabit (Benham & Hoerst, 2023).

However it should be no surprise that, in the exact same way that climate impacts are unequally distributed amongst people, they are unequally distributed amongst epistemes and ways of knowing as power produces vulnerabilities for Indigenous and racialized cultural knowledges.

The library and archives of the Lytton Chinese History Museum (Correia, 2021) represents the exact kind of community archive that, lacking resources and support networks, is likely the most vulnerable compared to relatively well-funded cultural institutions that are more visible to national and regional adaptation or preservation initiatives. Researchers have acknowledged that these institutions may not even appear in the vocation's climate vulnerability surveys that have been undertaken thus far, because "the data set that the researchers used… compris[ed] mainly wealthy institutions" (Yeo, 2018) rather than smaller repositories that lack the staffing or funding to maintain more visibility.

Though it occurred far from Treaty 6, contrast these circumstances with another example. During Hurricane Harvey, while the impacts disproportionately burdened households experiencing intersections of lower socioeconomic status and racialization (Collins, et al., 2019), data centres serving Houston's fossil fuel industry preserved industry data with amenities like two weeks of backup fuel, first-priority contracts with area fuel providers, and onsite living quarters with ready-to-eat meals, potable water, showers and bedding for the staff required to run the site during hurricanes (Netrality, n.d.).

Not only do these inequalities decrease access to resilient knowledge infrastructure, but they also limit access to the basic everyday information and communication technologies that other adaptive capacities are reliant upon (Marshall, et al., 2022; Auditor, 2023), yet another manifestation of colonial violence inflicted along racialized and gendered lines. In this way Indigenous and Black cultures and communities, and the women, feminized, gender non-conforming, physically and neurologically divergent, elderly, poor and working class within them in particular, are devalued to the point of disposability and sacrificability (Juskus, 2023) from the state's point of view (Waldron, 2018).

In 2020 the federal government announced a Universal Broadband Fund to ensure "98% of Canadians [are] connected by 2026 and 100% by 2030" (Innovation, n.d.). Despite this funding, the Auditor General of Canada found that, even as 90.9% of Canadian households overall have access to the internet, as of 2021 "connectivity in rural and remote communities lagged at 59.5%, and at 42.9% in First Nations reserves" (Auditor, 2023) a situation forcing some rural and

Indigenous communities in the region to procure their own infrastructure over the years (Clearwave, n.d.; O-NET, n.d.). These community-level models compensate for the failures of the privatization of Canadian telecommunications. In the 20th century, for instance, Alberta Government Telephones (AGT) was sold off to become Telus, one of three oligopolistic ICT corporations in Canada that have been ineffective at providing an equitable distribution of ICT infrastructure across Treaty 6 and Canada as a whole. The fact that the CEO of one of these entities, Bell Communications Enterprises (BCE) Inc., enjoyed high-speed fibre optic broadband internet access through Bell Fibre at his cottage on Pemichangan Lake while this service was unavailable for the surrounding area, "officially one of the poorest in Quebec" (LeBlanc & Martin, 2021), is telling. BCE is also the company that is responsible for the Alberta SuperNet, a public-private partnership that was intended to bridge part of the digital divide more than two decades ago and has been criticized by Alberta's auditor general for service outages, as well as a lack of transparency and oversight (Bellefontaine, 2018). That being said, it does service the province's libraries, making them a substitute for last mile connectivity in many rural and remote communities.

Under these corporations, Canada consistently ranks among the top 10 most expensive jurisdictions in the world for wireless data (HelloSafe, n.d.). The dangers of these kinds of oligopolistic trusts is long established and yet, there is not a single sector of the information industry that is uncontrolled by a small cabal of corporations. This can be seen in the three telecommunications companies dominating the Canadian context, Telus, BCE Inc., and Rogers, as well as globally dominant technology and media conglomerates, such as Alphabet Inc., Meta, Microsoft, Apple, Amazon, Comcast[21], Disney, Warner Discovery, Paramount Global, and Sony. And even as these oligopolies define the global cultural environment, library practice is similarly constrained. The book publishing sector is controlled by the 'Big Five', all of which are subsidiaries of massive multinationals: Hachette (Lagardere), HarperCollins (NewsCorp), MacMillan (Holtzbrinck), and Penguin Random House (Bertelsmann SE & Co. KGaA). The publishers that academic and other special libraries rely upon are similarly constrained by the RELX plc., Springer, Taylor & Francis, Wiley-Blackwell, and Thomson-Reuters. The primary

[21] as the largest US ISP, Comcast is not only a horizontal near-monopoly, but now a vertical one as well, which is an increasingly common structure and ambition for these entities

company that contemporary North American libraries rely upon for the distribution of digital content, including ebooks, audiobooks, and streaming movies is OverDrive, Inc., which enjoys more than 90% marketshare (Noorda & Berens, 2023). The risks posed by this private consolidation are numerous, particularly when it comes to digital ICT. In Canada this is exemplified by the Rogers outages in 2021 and 2022, which resulted in a quarter of Canada losing internet connectivity and affecting little things like emergency services, debit card transactions, various levels of government, traffic signals, and the Niagara Health System. Yet, the following year, the federal government's Canadian Radio-Television and Telecommunications Commission (CRTC) allowed Rogers to buy the fourth largest telecommunications company in the market, Shaw Communications Inc. (CRTC, 2022).

During rapid-onset impacts, the silos imposed by these corporate structures often directly impede resilience. It was found that, even when a natural disaster damages a significant amount of wireless infrastructure, "customers would have been largely unaffected had they been allowed to roam during the emergency and connect to any available resource rather than remaining tied to a single network" (Venema, et al., 2017). During the 2023 wildfires, Telus and Rogers failed to consistently distribute provincial emergency alerts (Wong, 2023). That being said, after Hurricane Katrina, library workers "with institutional email addresses became unreachable as institutional servers went down; those with Gmail, Hotmail, or Yahoo addresses were easier to reach" (Tansey, 2015), so determining the right balance to strike for libraries to maintain resilient knowledge infrastructure for themselves and for their communities, in the face of rapid-onset climate impacts, remains an important line of inquiry.

When it comes to slow-onset impacts and long term adaptation, there remain questions about whether these entities possess a particular facility for preserving cultural knowledge at all, outside of their own narrowly defined interests. Recent history is littered with instances showcasing the maladaptive logic that guides private corporations' documentation of cultural and historical records. While they are capable of committing a great deal of resources to resilient records management in the face of climate impacts, as seen in Houston, the knowledge on those servers is not publicly accessible so it is unclear whether this information is useful to the public for, say, litigative purposes were it to become available. And if it is actually useful for legal

prosecution, communities may find that corporations have not put enough resources or effort into records management, as was the case in People of the State of New York v. Exxon Mobil Corporation when it was found that “up to seven years of emails that former ExxonMobil CEO Rex Tillerson wrote under the alias ‘Wayne Tracker’ may have been erased” (Hasemayer, 2017), rendering the utility of this data, even for these purposes, questionable. Nor is this inconsistent stewardship isolated to fossil fuel corporations. To use a single, recent example, during the course of eight US Securities and Exchange Commission (SEC) investigations and 4 other regulatory probes, it was found that JPMorgan Chase & Co. deleted 47 million records requested by the SEC “by mistake” (Weinstein, 2023).

Even with respect to something as ‘innocuous’ as the cultural record, private corporations have an inconsistent track record. As I noted in Part One, some papers included in the literature review were not available by legal means or were obscured by unthorough search engines, siloed journals, and disciplinary niches. I’m interested in knowing how the availability of the works cited in this thesis changes by the time that you are reading this. Within broader academia, an “alarming preservation deficit” amongst digital scholarly journals has emerged (Eve, 2023). In the domain of popular culture, over the last year media corporations have pursued a novel strategy in pursuit of increasing profit margins by removing works entirely from digital streaming platforms—the only legal means of accessing them—in order to decrease taxable assets and reduce licensing fees (Rico, 2023; Spangler, 2023). The history of new media like video games potentially offers an even more troubling perspective. Despite its popularity, 87% of video games released before 2010, just over a decade ago, are considered to be critically endangered, a figure rising to 97% for games released prior to 1985 (Salvador, 2023), less than 4 decades ago. This is particularly alarming as major cultural manufacturers begin to sunset physical media entirely (Whelan, 2023), leaving digital platforms an increasingly central method to access culture.

Outside of these specific cases of corporate self-interest, a financial bottom line often fails to motivate other organizational entities to preserve knowledge for the public either. A study found that 174 open access journals had disappeared from the internet (Laakso, et al., 2021). While none of these were published by large commercial publishers, it typifies the corrosive influence

neoliberal logic exerts on knowledge domains that should be kept available for the public good. However online journals run by large publishers are not immune to disappearance either (Scoles, 2018).

Aside from preservation, private corporations might be a part of knowledge adaptation if they exhibited an exceptional history of knowledge distribution. Yet their practices largely showcase limits in this area as well. In addition to the failure to build digital ICT infrastructure in Indigenous, remote, and rural communities, library users, academics, and workers are very familiar with the constraints imposed by publishers upon digital copies and the way that corporate-influenced copyright regimes prevent works from entering the public domain (Macklem, 2023). These same copyright terms inhibit the preemptive relocation of cultural knowledge and memories threatened by climate impacts (EIFL, et al., 2020; Dryden, 2023).

Nor has public government offered many alternatives, instead taking steps to uphold and expand these fragile and flawed copyright terms, whether in the extension of copyright included as part of the Canada-US-Mexico Agreement (CUSMA) free trade negotiations (Macklem, 2023) – a copyright term of 70 years after the death of the author that may be uncharitably viewed as essentially being dictated by the American Disney corporation's lobbying efforts– or the enforcement of crown copyright, which requires that Canadian citizens pay for permission to re-use and distribute government publications and research that are already publicly funded (Wakaruk, 2020), much as academic libraries do when accessing publicly funded research and legislation distributed by private academic and legal publishers like RELX.

Furthermore, there are times when these publicly funded environmental data and information resources have been unilaterally altered or deleted entirely by American, Australian, and Canadian administrations. In addition to the closure of libraries and muzzling of scientists, the Canadian state has also facilitated losses via accidental mismanagement and its inherently short-term political planning, such as in 1986, when the federal government failed to archive or publish publicly funded research into alternative geothermal energy sources in western Canada created during the oil embargo (CBC, 2022) or, more recently, when Canada's national ice core archive, invaluable to climate research (Huber, et al., 2024), was irreparably damaged after

budget cuts at Natural Resources Canada necessitated a transfer from Ottawa to the University of Alberta, where several critical equipment failures caused portions to melt (CBC, 2016; 2017).

These vulnerabilities only begin to hint at the importance of cultural knowledge and memory practices that are distinct from corporate and state-based ones. In Treaty 6 Alberta, colonial epistemicide has been the most serious threat to cultural knowledges and memories at scale. Leaving aside the effect that colonially-induced rapid environmental changes have had upon Indigenous heritage, policies from the banning of cultural practices like the potlatch and controlled burn regimes to the monstrous "kill-the-indian-save-the-child" rationale of the residential schools were deliberate attempts to destroy Indigenous languages, names, knowledges, and communal memory. These are examples of state responsibility for the violent interruption and destruction of collective epistemes, cultures, and knowledges in order to exploit and end communities that were judged to be 'less than'. This colonial epistemicide is not a flaw or byproduct of its normal functioning, it is an integral component. It is why Southern slavers passed laws banning literacy amongst the people they thought were their slaves (Willis, 2023). That is why the Nazi Party collected and destroyed books, artifacts, and other heritage resources during their campaign against European Jewish communities (Bilsky, 2020). That is why the state of Israel has targeted cultural workers and institutions during its occupation and bombardment of Palestine (Abu-Lughod, 1985; UN, 2024).

Decisions must be made from an understanding of these climate risks and the way that they are unequally distributed in order to prioritize the protection of the most endangered individuals, cultures, and ecosystems (ECCC, 2023). That being said, focusing solely on the vulnerabilities produced by colonialism and racism ignores the vast adaptive capacities and unparalleled resilience within these communities. Culture, gender, and age co-construct unique sets of capability, knowledge, and responsibility. Elders are typically crucial knowledge keepers in Indigenous knowledge systems (Rowe, et al., 2020). Women's environmental knowledges have proven integral to "farms, in households and communities, and during disaster response" on the Prairie (Sauchyn, et al., 2020) even though they are typically overlooked or ignored (Moosa and Tuana, 2014), a set of circumstances that often applies to other forms of gendered labour like librarianship and 'caretaking' professions. To cite a specific example,

amiskwaciwâskahikan-edmonton lies in the northern ranges of the Niitsitapi Blackfoot Confederacy's land and, following a gendered ecological stewardship role shared amongst many of the cultures Indigenous to Turtle Island (Dowsley, et al., 2020; Whyte, 2014), Matóómiikaamó'sitsaakii 'First Steals Woman' Latasha Calf Robe of the Kainaiwa First Nation (Blood Tribe) founded the Niitsítapi Water Protectors (Calgary, 2022) in response to the threat that coal mining posed to the eastern slopes of the Rocky Mountain range and the humans and nonhumans that live there. Despite its resources and infrastructure, the provincial government of Alberta and its environmental regulatory apparatuses were unable to recognize this threat or perceived an entirely different one when the mining sites were approved. The ecological integrity of the region hinged upon culturally nurtured capacities of the Niitsítapi Kainaiwa First Nation (Blood Tribe), its social structures and expertise.

This is exemplary of the difficulties that arise from the subjective nature of threat, perceptions of which vary by individual, community, and over space and time (Dilling, et al., 2019). Whose cultures are 'conserved'—in the short term, at least—and whose are disrupted by inaction on climate change? What communities or demographics have the power to determine climate risks and what the alleviation of those risks looks like? Even when the risks can be agreed upon, there may be major differences of opinion over how to address them, what effective preparation entails, and how to assess a successful response. And just like the distribution of risk, these differences are influenced by existing systems of power (Dilling, et al., 2019) and cultural epistemes (Adger, et al., 2013). Adaptive responses and processes ideally support community resilience but if they are scoped too narrowly to account for the interconnectedness of climate impacts they may also prove ineffective, or support the resilience of some at the expense of others, or be entirely maladaptive (Nelson, 2011) "particularly when they promote private interests at the expense of public goods such as cultural heritage or community cohesion" (Adger, et al., 2013).

Potential examples include billions of dollars worth of new irrigation networks planned for Alberta and the Canadian prairies, which may prove to be of little value if overall provincial water availability continues to decline (Canadian, 2021; Dryden & Turner, 2024; Leo, 2024), and federal subsidies for insurance in high risk flood zones (Gambrill, 2023). Adaptive policies

involving built infrastructure and financial mechanisms are typically more popular in recipient communities than more radical policies such as relocation and migration (Adger, et al., 2013)—entirely understandable given Canada's dreadful history of forced relocation—precisely because they preserve existing ways of life. Policies can be tools of equity, which is stated as a goal in official government reports (ECCC, 2023), depending on their efficacy and whether all regional communities are able to access their benefits, or they could merely be tools to maintain property values and reinforce existing power dynamics, or both. In the same way we must ask whose cultures are conserved and whose are disrupted by climate inaction, we must consider whose cultures are conserved and whose are disrupted by climate action.

Other possibilities that must be avoided are adaptation actions borne from the eco-authoritarian logics or fortress mentalities that masquerade as 'effective' or 'practical' on certain timescales or for certain groups while proving maladaptive for the species or ecosystem overall, leading to "increased greenhouse gas emissions, nature loss, additional harm to equity-seeking groups, or the reduction of climate resilience in other parts of society" (ECCC, 2023). Conversely, climate adaptation that starts from a foundation of justice, that is "mutually supportive, taking an integrated risk-based approach across all hazards and informed by the best available […] knowledge systems" (ECCC, 2023) may also holistically address "the root causes of vulnerability and potentially increas[e] equality over time" (Sauchyn, et al., 2020).

IV. Resilient

This is all to say that climate adaptation is possibly even more fraught than mitigation. Unlike atmospheric concentrations of GHGs, there is no globally relevant metric or definition of 'success' (Dilling, et al., 2019). For instance, let us return to the concept of 'resilience' that is frequently invoked around adaptive climate action both within vocational (Munro, 2011; Aldrich, 2018a) and broader Canadian public discourse (Swanson, et al., 2021; ECCC, 2023) as a goal for organizations and infrastructure. Originally taken from definitions used in physics and engineering referring to "the capacity of a material or system to return to equilibrium after a displacement" (Norris, et al., 2008), resilience is metaphorically applied in LIS (Munro, 2011), social sciences, and public policy to acknowledge and discuss how human systems, from the

individual to the societal, can "assimilate disturbances without crossing a threshold into an alternative state" (Munro, 2011) or "absorb disturbances and still retain the same structure and function, while maintaining options to develop" (Nelson, 2011), definitions which hinge on the maintenance of sameness. In addition to the criticisms raised by Bethany Nowviskie back in 2015, it is this exact issue which has prompted calls for transformation. The question becomes whether allowing the industrialized colonial system, whose structure and function caused climate change, to retain the same structure and function is a desirable state at all for the planet.

Alternatively, Norris, et al., point out that "stability (or failure to change) could point to lack of resilience" (Norris, et al., 2008), instead advocating for the pursuit of a "positive trajectory of functioning and adaptation after a disturbance [...] better conceptualized as an ability or process than as an outcome" (Norris, et al., 2008) which other scholars propose is a perspective that affords long term planning and reflection by placing an emphasis on transition and transformation (Nelson, 2011) in service of the maintenance of life rather than the maintenance of powerful systems and institutions. Rather than setting arbitrary timelines 5 or 77 years away, or banking on returning to a stable norm that industrialized colonialism has all but guaranteed is no longer possible, this frames adaptation as a direction rather than a destination. Justice, equity, and ecological harmony within a changing climate are dynamic, contextual qualities rather than goals and vocational adaptation and resilience initiatives are the methods that support them (Nelson, 2011). Following this path, the Adaptation component of the MACK Compass focuses on vocational actions that can contribute to the four adaptive capacities, or networked sets of resources, outlined by Norris, et al.:

1. Economic development which, crucially, is defined as the material basis for meeting community needs, involving both sufficient quantities of the material resources upon which the community depends, as well as equitable access to and distribution thereof (Norris, et al., 2008), rather than a reductive stand-in like GDP.
2. Social capital, a complex concept covering the availability and diffusion of both formalized and informal "social relationships, networks, and connections" (Fletcher, et al., 2020) produced by and between people, the supportive and participatory characteristics inhered to these relationships, and the shared responsibilities and commitments that they engender (Norris, et al., 2008).

3. Community competence, the methods that a community uses to collectively make decisions and then structurally aid and empower its members to effectively act on those decisions, individually or collectively.
4. Finally, of particular relevance to librarianship, Information and Communication (Norris, et al., 2008), consisting of the systems and infrastructure that enable "the creation of common meanings and understandings and the provision of opportunities for members to articulate needs, views, and attitudes" (Norris, et al., 2008) and facilitate the distribution, storage, and collaborative alteration of these meanings, understandings, and perspectives. Cultural knowledge and memory, which actually "may be the primary resource in technical and organizational systems that enables adaptive performance" (Norris, et al., 2008) falls directly within the domain of librarianship and, adding further relevance, Shari Veil, Bradley Bishop (Veil & Bishop, 2012; Veil & Bishop, 2014), Hans Scholl, and Beth Patin have already begun the work of applying the resilience framework to libraries and information infrastructures during disaster response and recovery (Scholl & Patin, 2014).

The scholarship emphasizes that these adaptive capacities are deeply interconnected and that they rely upon attributes of robustness, redundancy, and rapidity built into them. *'Robustness'* is akin to the classic stable state definition of resilience, "the ability to withstand stress without suffering degradation…" (Norris, et al., 2008) in order to resist or counter an array of possible threats and operate within a range of conditions. Limited and difficult to implement at scale, but highly useful as a characteristic in key components of a larger system. *'Redundancy'* is the capability or potential for the components of a system to be "substitutable in the event of disruption or degradation" (Norris, et al., 2008) via related qualities like transparency, to aid identification of the dys- or non-functioning component (Scholl & Patin, 2013), resource diversity, in order to avoid predicating a system "on a narrow range of resources" (Norris, et al., 2008) in the event that they become depleted or otherwise unavailable, and interoperability, wherein different components can work with and within multiple systems in order to avoid diverse, siloed monocultures. *'Rapidity'* refers to ease and speed of access and use "in a timely manner to contain losses and avoid disruption…when conditions threaten the system" (Norris, et al., 2008).

Beyond its focus on a transformative process, this community resilience framework supports the reason the MACK compass was developed overall, to find the balance between providing enough structure to offer usefulness and enough flexibility to make space for local context. Therefore, the MACK compass orients climate librarianship towards **Adaptation** by developing practices aimed at supporting the robustness, redundancy, and/or rapidity of the social, economic, and governance infrastructures in the **Community** served by the library during both rapid-onset events and over a long term trajectory, or practices that work to build the same capacities into the information and communication infrastructures that facilitate **Knowledges** and cultural knowledge systems.

V. MACK Compass

In summary: though it produces its own GHG emissions, the vocation, and its expression within amiskwaciwâskahikan-edmonton, are inextricable from a community that emits an immensely unjust and disproportionate share of GHGs, historically and contemporarily. Furthermore, it has facilitated a culture and knowledges that enabled and justified climate change. Both the operations and continuity of the regional practice are threatened by rapid-onset impacts like wildfires, slow-onset impacts like declining water availability, and cascading impacts like civil unrest, in the short-, mid-, and long-term future, from the immediate present to the year 2500 and beyond. These causes and impacts were often amplified by, and subsequently exacerbate, the effects of misogyny, colonialism, racism, able-ism, ageism, and other structural injustices.

At this point, it is common to ask: Where do we go from here?

To answer this question, I propose a vocational framework wherein the Mitigation of these causes and Adaptation to these impacts intersects with the matter of librarianship, the Community and Knowledges that it connects. The MACK compass sites climate librarianship as the relationship between these elements: **Mitigation**, **Adaptation**, **Community**, and **Knowledge**, leaving four broadly categorized but interconnected domains of opportunity that fit directly within the scope of library practice:

- **Knowledge Adaptation**, maintaining the perpetuity of cultural knowledges and knowledge systems,
- **Community Adaptation**, helping our communities to navigate the locked-in impacts of climate change,
- **Community-based Mitigation**, reducing the emissions arising from our communities that are producing those impacts and increasing their future magnitude,
- and **Knowledge-based Mitigation**, working to develop a knowledge practice or nurture ways of knowing that strengthen the connection between climate knowledge and collective climate action.

To use the conditions in Treaty 6 amiskwaciwâskahikan-edmonton as an example, a hypothetical climate-oriented library worker or organization pursuing Knowledge Adaptation here might focus on the robustness of the knowledge infrastructure within their facilities, elevating collections and ICT equipment above grade in order to reduce the risk of flooding (Venema, et al., 2017; Swanson, et al., 2021) or advocating for new branches to be sited on high ground. When it comes to wildfires, landscaping choices, the establishment of firebreaks around structures, and using fire-resistant building cladding are options. Outside of library facilities, protecting related network infrastructure from rapid-onset impacts can be achieved by burying distribution lines and exposed equipment like cabling and cell towers should have appropriate load bearing capacity to resist more intense wind and ice storms (Venema, et al., 2017). Similar actions can be taken to protect the power grid that digital ICT relies upon (Swanson, et al., 2021). Though these upgrades are outside of the scope of library service, simply knowing whether these adaptive actions have been taken or not is highly useful to support advocacy and planning efforts in and by libraries.

Or, since libraries around Turtle Island-North America have been found to provide critical information and communications infrastructure during natural disasters and since these services have historically had an improvisational character (Bishop & Veil, 2013; Stricker, 2019; Patin, 2020), Knowledge Adaptation efforts may take the form of developing an intentional institutional approach to providing information during wildfires, floods, other extreme weather events, and the evacuations that are associated with them. As discussed, during rapid-onset

events, digital knowledge infrastructure has become crucial. Many of its affordances are well suited for these situations, facilitating rapid communications and unmatched preservative redundancy. Given that many libraries in rural and remote areas of Treaty 6 Alberta are served by the provincial SuperNet, libraries can be the most accessible form of a stable connection to the internet in some communities whether or not infrastructure disruptions are even occurring. In this case, the servers are typically the most delicate and critical infrastructure components (Venema, et al., 2017) and they can be made more robust, in many cases, by simply relocating them in the manner discussed above, to mid-level floors above grade.

Libraries that combine this sort of 'backbone' information infrastructure with renewable locally produced electricity, also hold immense potential for facilitating resilient redundancies or 'deep decentralization', with public institutions or organizations able to "remain independently powered [...] in the event of grid failure" (Venema, et al. , 2017) caused by wildfires, flooding, or intense storms. Similarly, 'off grid' infrastructure that provides alternative systems for storing and distributing knowledge in the event that the primary methods are dis- or inter-rupted would benefit resilience. This might look like making freely accessible internet connections (Venema, et al., 2017) available through library infrastructure via mesh network topologies, wherein networked devices can not only connect to any available network but to each other in order to create their own network. These networks can be "particularly useful for emergency use […] allow[ing] users to communicate via text as long as wifi or Bluetooth are activated" (Venema. et al., 2017). Or it may mean facilitating "decentralized information distribution and distributed data backups [that] insure the availability of information and data even if major data centers or repositories are inaccessible" (Scholl & Patin, 2013) for the benefit of their community at the local level.

Obviously, these options raise outstanding questions about the overall institutional capacity within libraries. Budgetary pressures and growing responsibilities pose an enormous challenge for the vocation. Practicality is a concern for many, so solutions that are achievable and cost-effective must remain a part of the conversation around vocational adaptation efforts even as the realities of climate change call for transformational efforts.

Libraries need not create an entirely new ICT network whole cloth— though there might be relevant local ICT initiatives that could be supported in the community with library resources. A valuable area of research may be determining whether there are practical and affordable resilient infrastructures that libraries can support, such as peer-to-peer mesh networks using repurposed hardware, or analog options like emergency amateur radio communication infrastructure. Given the standard presence of public computers and internet access, including amateur radio equipment in rural and remote libraries is not far out-of-scope. Considering and experimenting with a diversity of unconventional options is a key area of redundancy in order to provide alternatives to "undemocratic forms of planning [,] non-choice default technologies" (Colding, et al., 2019), and the vulnerability of relying on infrastructure monocultures.

Additionally, there is a lot to gain by revisiting traditional information infrastructures in the light of climate change. Although publishing relies upon global supply chains, with enough forethought a bound volume containing writing and/or images can be quickly deployed and utilized during rapid-onset impact response and recovery efforts, perhaps for the purposes of information or, alternatively, in the form of read-along story programming to support a sense of stability amongst evacuees. It must also be said that, ultimately, a shared spoken and written language is typically the most rapidly accessible, usable, and portable cultural knowledge system or information infrastructure available. In a technocentric culture, 'soft' and analog forms of cultural infrastructure are often overlooked, yet oral methods of information and communication infrastructure are useful, critical, and— potentially— offer the only historical precedent for robust cultural continuity on geological timescales. Oral histories, such as those passed down by the Yindjibarndi, the Djab Wurrung, and other Aboriginal peoples living in what is currently called Australia, are a cultural memory which accurately describes landscapes and communities that existed prior to the inter-glacial sea level rise associated with the beginning of the Holocene at least 11,700 YBP (Benjamin, et al. 2023) and potentially describes and depicts species from these periods as well (Gunn, et al., 2011). Oral knowledge traditions are therefore one of the most robust media that libraries can include in their collections and infrastructure. This highlights that initiatives such as human libraries, skill sharing, community storytelling, spoken poetry, table top role playing games, podcasting, hip hop cyphers, and multigenerational programming may offer a great deal of utility for adaptation. However, oral information and

communication capacities are also heavily dependent upon the community's social capital (Norris, et al., 2008; Fletcher, et al., 2020) and subject to hard geographic limits. That being said, "in the end, all disaster response is local" (Stricker, 2019) and the information and communication networks within the affected community are worth prioritizing in local libraries. Different individuals and organizations will have to weigh the 'soft' social aspects of information infrastructures against the 'hard' material aspects (Scholl & Patin, 2013) based on the skills and resources available, and further recognize that 'tangible' or 'hard' infrastructure is supported by 'intangible' or 'soft' infrastructure and networks (Scholl & Patin, 2014; Marshall, et al., 2023). In some ways, informal community networks "possess a high degree of redundancy" inherently (Scholl & Patin, 2013) and organizations can further encourage "redundancy in formal and informal arrangements in staffing at leadership and professional levels" (Scholl & Patin, 2013) in order to prepare for events where one or more staff members may be unavailable. Such preparation necessarily includes regular practice (Scholl & Patin, 2013) and discussion of responsibilities, standards, and practices. The right balance between clearly understood roles and "room for interpretation" (Scholl & Patin, 2013) is also key in order to strike a balance that "provide[s] the basis for autonomous action and interaction, empowering responders to interpret practices in creative ways" (Scholl & Patin, 2013) when it comes to implementing an effective response in dynamic, changing, and often surprising or unprecedented circumstances. As illustrated in the literature covering disaster response in libraries, when there is capacity, community members often mobilize to help each other spontaneously during crises, often "form[ing] ad hoc communities of responders and volunteers" (Scholl & Patin, 2013). In these cases, soft infrastructure forms a valuable backstop to a sole reliance on digital ICT during emergencies. While these networks have their own unique limitations, precisely because they are different, relying on multiple sources and systems for knowledge during rapid-onset events can offset the vulnerabilities inhered to one. For instance, given the importance of accurate knowledge during crises (Scholl & Patin, 2013) and the flood of data created by digital ICT like social media, malinformation facilitated on these platforms can be mitigated by pre-established relationships of trust.

While the tremendous efforts and invaluable aid that many libraries have offered during past rapid onset events cannot be discounted or devalued, in the interest of strengthening vocational

capacity in this area, developing locally relevant strategies ahead of time will increase the ability of libraries to assist community members that find themselves relying on these services and better support the workers that provide them.

For a brief discussion of further directions offered by the MACK Compass, see the Appendix. It is not necessary, nor likely even possible, to fully pursue all four quadrants within one library. Certainly, they are intricately related but the usefulness of a framework is to clarify, even in a reductive way, without foreclosing subsequent complexity. The MACK compass is a navigational aid for determining where the vocation, as well as its constituent institutions and workers go from here. What next? Which areas do you, your library, and your community have the greatest needs and capacities for, as our world changes? All of these areas will be vital going forward but varying resources, capacities, interests, and contexts will determine which quadrant or quadrants are most relevant in a particular place and time.

Conclusion

The development of this framework, the MACK compass, is intended to assist scholars and practitioners pursuing librarianship during the ongoing reorientation of the vocation amid climate change. In order to develop a, hopefully, useful tool for this process, it was necessary to come to an understanding of where the vocation was coming from and where it finds itself. Retracing these steps makes it possible to meaningfully speculate how we might move somewhere else (Donald, 2012) while also conveying the path that I took, should others wish to build upon or contest this framework for climate librarianship.

To this end, Part One conducts one of the first literature reviews of LIS and professional writing that directly addresses climate change, if not the first. There are several literature reviews that cover the wider discourse of green or sustainable librarianship, however the vague nature of these terms has diffused their relevance to librarianship and the environment in contemporary practice, distributing the concept throughout a wide array of actions that are thought to reduce institutional impacts and, in the case of sustainability, may not even be applied to the ecological dimensions of library practice (Chowdhury; 2014; Tansey, 2015; Civallero & Plaza, 2016).

While an environmental perspective should inform all aspects of library practice, the lens of climate change offers a more precise scope and material circumstance against which to compare the ethics, aims, and consequences of the vocation. The resulting historical narrative of climate librarianship that is presented by this thesis assists in discerning how the vocational understanding of climate change has developed while providing a comprehensive syllabus for the vocational practitioners arriving at this intersection in the coming years. Moreover, the narrative that emerges provides a parallel qualitative analysis that complements quantitative methods (Kaminska, et al., 2022). The sociopolitical and cultural contextualization of longitudinal changes, rather than merely introducing bias, makes interpretive space beyond a measurement of increasing or decreasing use of a given keyword in order to probe for existing gaps within the discourse which have been rendered less visible and remain relatively unexplored. Though it is uncomfortable work, given the apparent limits of conventions such as metrics and managerial efficiency, the vocation must diversify approaches, otherwise characteristics inherited from the American environmental movement that limit vocational creativity, capability, and compassion during climate change may remain unseen and unaddressed. The vocation cannot arbitrarily place itself outside of the scope of transformation. This necessitates honest engagement with the vocational episteme and the assumptions that dictate how libraries are currently governed, organized, and practiced. Without this internal work it is likely that the vocation will continue to express the same cultural characteristics that led to our current circumstances.

Pardon a brief instructive tangent: Abraham Gesner, the inventor of kerosene, helped to initiate the hydrocarbon age. Despite dying penniless after having been exploited by the nascent oil & gas industry, Gesner consoled himself with the knowledge that his invention had contributed to a "long and lasting holiday for the finny monsters of the sea" (Gesner, 1861). Gesner was concerned about the whales that were being driven to extinction for their oil. This is a perfect illustration of the dangers in leaving the legacy and logic of industrialized extractive colonialism unresolved. Internal work is necessary for transformation as well (Nowviskie, 2019; Filar-Williams, 2023).

Part Two builds on the prior work outlined and the understanding developed in Part One by looking outside of the vocation as well. Though the Mitigation and Adaptation concepts drawn

from climate change science have begun to appear in other recent climate librarianship resources (WebJunction, n.d.; BCLA, 2023), by linking them explicitly to concrete aspects of library practice and, furthermore, its specific expression in a particular place and time, this thesis practices modes of knowing that are more effective for cognizing the relevance of climate change to librarianship. This case study approach follows an emergent place-based theme within climate librarianship and climate science, situating informations and knowledges that have typically been communicated in a displaced or abstracted way. By locating analysis in Treaty 6 amiskwaciwâskahikan-edmonton, it becomes possible to clarify valuable preparations and effective actions for regional library workers. The case study addresses one small area in the existing gap of spatially variable analyses that Mazurczyk, et al., 2018 identify within cultural memory practice, while also serving to highlight potential dead angles in vocational ethics and practices which may be in need of transformation. Finally, as is likely appropriate for research conducted in the domain of cultural knowledge and memory practice, the situated scope in Part Two makes it possible to loop in a regional cultural context for climate change that is somewhat rare, facilitating the elaboration of the connected, cascading impacts to a greater degree than is typical, rather than merely citing physical ones.

Yes, a changing climate will make the acquisition, preservation, and distribution of collections increasingly difficult. Yes, the facilities and operations that constitute contemporary libraries produce greenhouse gas emissions. Yet, as a counterpart to internal epistemic transformation, while the vocation's emissions and environmental harms are present in its own facilities and vehicle fleets, as is made clear by assessing an institution within the region and community of which it is a part, reducing these impacts in a vacuum is not necessarily effective, nor practical. Even if a local library system has the resources to electrify its fleet and digitize its collection, if the power and communications grid that it is embedded within are facilitated by carbon intensive infrastructures and ways of life, how much has been accomplished?

As a framework, the MACK compass extends an invitation to the vocation to recognize its own potential. While I cannot completely avoid the "consequent prefiguring of information into existing epistemologies with a distinctly hierarchical framing" (Radio, 2019), having drawn extensively from climate policy, scientific epistemes, and conventional librarianship, I've

endeavoured to gesture towards the expanded margin of action enabled by aspirational librarianship as an ethical relationship between community and cultural knowledges.

Ironically, despite its role as a cultural institution, the library has been hesitant expanding its experimentations with different cultural methods of addressing climate change, typically prioritizing and relying upon traditional linear and text-centric methods of cultural transmission. Yet, in addition to more actively addressing the fundamentally asymmetrical knowledge environment, the vocation has also maintained an economic model that is an alternative to the market. This is seldom remarked upon, despite the fact that, other than horrific loss of life, the only precedents in recent history for globally reducing emissions have been severe economic downturns. The former pathway is off the table for obvious reasons, but the latter underscores that a different economic system is vital. How did Milton Friedman put it? “Our basic function is to develop alternatives to existing policies, to keep them alive and available until the politically impossible becomes the politically inevitable” (Friedman, 1982).

Perhaps the core of librarianship isn’t a specific media format, or even information in the sense of the content necessarily, but in the experiential knowledge of the sharing model that it kept in everyday use, an ‘intuition pump’ (Moritz & Vulliez, n.d.) that has preserved an approachable and accessible way for folks to experience and think about how an alternative economic model works in actual practice, providing spaces to instantiate what Patricia Perkins refers to as commoning (Perkins, 2019). Library-as-verb. This has a resonance with Keller Easterling’s treatment of special economic zones as multiplier infrastructure, an initial spatial incursion facilitating the wider deployment of neoliberalism (Easterling, 2014). Similarly, on a much smaller scale, initiatives such as seed libraries and repair cafes have spread throughout many urban environments, often by way of their libraries, in remarkably short periods of time. If we accept institutional walls as an arbitrary delineator of rules and norms, how might special *library* zones serve as transformative economic spaces?

What might it look like for other knowledges to be better integrated into librarianship? Diversifying librarianship away from an epistemic monoculture that centers text, management, and colonialism—even while they remain present in spoken and unspoken ways—prompts

library workers to recognize that our selves, our locales, animate and inanimate non-humans and more-than-humans are just as capable of containing knowledges as bound texts and silicon chips. In this light, the sixth extinction and the steady loss of landscape and habitat should be viewed with the same or greater horror that book burning and censorship invokes in the conventional vocation. These disappearances represent a cultural loss entirely unprecedented in human history. In comparison, the commonly referenced loss of the Library of Alexandria is barely worth mentioning.

If the vocation integrates a more diverse array of epistemes, ways of knowing, media, perspectives, values, and characteristics into the vocation's technepistemology and domain than it has historically, combined with an aim to be conscientious of the communities, community members, and knowledges that experience the highest levels of risk, we are left with a foundation for understanding how cultural knowledge and memory work is currently practiced and how it must be made otherwise. While we have been too late to prevent immense injustice, committed disproportionately against Indigenous peoples and other marginalized communities (Whyte, 2019), the choice to begin centering and enacting justice in our ways of knowing and living still remains open.

While colonialism was not specifically named until the IPCC's most recent Assessment Report (IPCC, 2023), at a certain point we must ask: if the racist and authoritarian factors that enabled the rampant emission of greenhouse gases and theft of land which caused climate change were also directly responsible for violent historical sociopolitical outcomes which persist into the present day, *and* climate change will further exacerbate those same violent inequities, at what point does it make sense to separate these processes? Ultimately, the vocation must understand that colonialism is continuous with climate change. Without this lens, transformation is not possible. To use a colloquialism, structurally produced 'vulnerabilities' are a feature of colonialism rather than a bug. Contemporary mechanisms should not be considered discontiguous with the earlier historical means of displacing, depriving, and disappearing.

The only climate librarianship is a decolonial one. Epistemic and ecological justice are fundamental to each other.

The restoration of ecological dimensions to culture—or, perhaps more appropriately, vice versa—invites us to consider the Great Plains at the heart of the continent (Grace Morgan, 2020), the forest gardens on the west coast (Armstrong, et al., 2021), the Amazon basin far to the south (Whittaker, et al., 2023). From a certain perspective, these were and are anthropocollaborative food commons, medicinal commons, entities making immense contributions to the atmospheric commons. Inarguably they are also sites of cultural knowledge and memory (Kopenawa & Albert, 2013; Huber, et al., 2024). Given the unparalleled nature of these sites, why is it that libraries would try to incorporate Indigenous knowledge into themselves rather than fit into Indigenous cultural knowledge systems? How might the cultural legacy of our libraries begin to resemble not Alexandria, long lost to time, so much as these endangered ecological commons that continue to sustain the entire world as even as we harm them?

In a time of vocational uncertainty and instability, there may be understandable concern that this invitation and framework is too open-ended, that it runs too far afield from books or cataloguing. However, diversity is crucial to navigating evolutionary bottlenecks and so, as Danielle Bitz proposes, librarianship must begin to change if it is to provide space for the "ways of learning, knowing, and being" (Bitz, 2023) that are necessary to support decolonization, cultural perpetuity, and collective continuance (Whyte, 2018). The necessary changes will differ according to the unique cultural, ecological, and technological relations present within the environment of each library (Bitz, 2023). And if librarianship is an ethical practice committed to our community and its knowledge, let me quote Rabbi Hillel the Elder or Ronald Reagan or John Lewis or Emma Watson to earnestly and seriously ask the question: If not us, then who? If not now, then when?

Future work in the field of climate librarianship might consider and elaborate on the transformative directions outlined in the four quadrants of the MACK compass, which help position librarianship as a practice to mitigate the colonial episteme and material consumption that is causing climate change, while adapting to its impacts, from natural disasters to ecofascism.

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Appendix

In addition to the earlier paragraphs briefly outlining some of the potential avenues for Knowledge Adaptation, the literature reviews conducted during the course of this thesis guide climate librarianship in the region to consider:

Pursuing Community Adaptation by positioning libraries as neighbourhood "resilience hubs" (Baja, 2018; Baja, 2022), using their well-known and utilized publicly accessible facilities, existing relationship with the community, and services (Baja, 2018) to support residents in three operational stances—the everyday, in response to climate disruptions (short- and/or long-term), and recovery— by serving as a trusted hub for information and communication, but also electricity, programming oriented towards supporting those who've been impacted, and, if necessary, a staging ground for emergency services to coordinate logistics and distribute supplies (Baja, 2018). Public libraries have been referred to as "ideal locations" for resilience hubs (Ciriaco & Wong, 2022). Additionally, as resilience hubs, libraries might develop ways to meet the remaining adaptive capacities outlined by Norris, et al., 2008.: social cohesion, community competence, and economic development. This latter capacity has resonance with recent Library-of-Things-style collections. Collections which include commonly needed or used items before, during, and after emergencies could help to further support community resilience. This extends into

Community-based Mitigation, which indicates that a Library-of-Things, a.k.a. a sharing economy, is a method with a great deal of potential for addressing the high levels of material consumption within Edmonton Alberta. Shared collections of items and equipment that are rarely used, hard to store, expensive, or commonly used but only required for short terms with high reuse potential (e.g. baby clothes and toys) can serve as a demand-side mitigation strategy that "makes it easier for every sector to reduce GHG emissions in the short and medium term" (Creutzig, et al., 2022) when combined with better governance models (Mi & Coffman, 2019) without conventional, profit-based growth motivations. Furthermore, library initiatives that support returning land to Indigenous jurisdiction and stewardship will "contribute to overcoming the combined challenges of climate change, food security, biodiversity conservation, and

combating desertification and land degradation" (IPCC, 2019a) since Indigenous peoples are responsible for managing almost a quarter of the carbon sequestered in forests and at least “a third of this carbon [...] is in areas where [they] lack formal recognition of [their] land rights" (Rights and Resources Initiative, 2019).

With respect to the highest proportion of GHGs created by Albertan society, the continued political support for the corporate entities most responsible for causing climate change is best addressed by Knowledge-based Mitigation. Given the ineffectiveness of existing epistemic methods for motivating climate action, librarianship must explore other ways of knowing, including collections, discovery services, and programming that foregrounds participation, interconnectedness, and relevance in the form of temporal, spatial, and social proximity (Allen & Crowley, 2016; Poortvliet, et al., 2020) or situated perspectives (Lopez Lalinde, et al., 2022), embodied and extended cognitive models, land-based learning, citizen science, and communicating climate science in modes beyond ‘objective rationalism’, sacrifice, or doom. Emotional responses, like joy and anger, as well as empowerment, solutionism, spirituality, and aesthetics must be better incorporated into librarianship. Similarly, revisiting intellectual freedom as epistemic diversity, and doing the work to better acknowledge and platform Indigenous knowledges and knowledge systems is critical.

For interested readers, an early elaboration and introduction to the MACK Compass can be viewed online (Hackborn, 2024). Further development is forthcoming.