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Water Back: A Review Centering Rematriation and Indigenous Water Research Sovereignty

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ABSTRACT: The recent Land Back movement has catalysed global solidarity towards addressing the oppression and dispossession of Indigenous Peoples' Lands and territories. Largely absent from the discourse, however, is a discussion of the alienation of Indigenous Peoples from Water by settler-colonial states. Some Indigenous Water Protectors argue that there cannot be Land Back without Water Back. In response to this emergent movement of Water Back, this review of research by Indigenous and non-Indigenous writers traces the discursive patterns of Indigenous Water relationships and rematriation across themes of colonialism, climate change, justice, health, rights, responsibilities, governance and cosmology. It advances a holistic conceptualization of Water Back as a framework for future research sovereignty, focusing mainly on instances in Canada, Australia, Aotearoa New Zealand, and the United States. We present the findings on the current global Waterscape of Indigenous-led research on Indigenous Water issues. Water Back offers an important framework centring Indigenous ways of knowing, doing, and being as a foundation for advancing Indigenous Water research.

KEYWORDS: Water Back, Indigenous Peoples, climate change, water governance, water health, water justice

INTRODUCTION

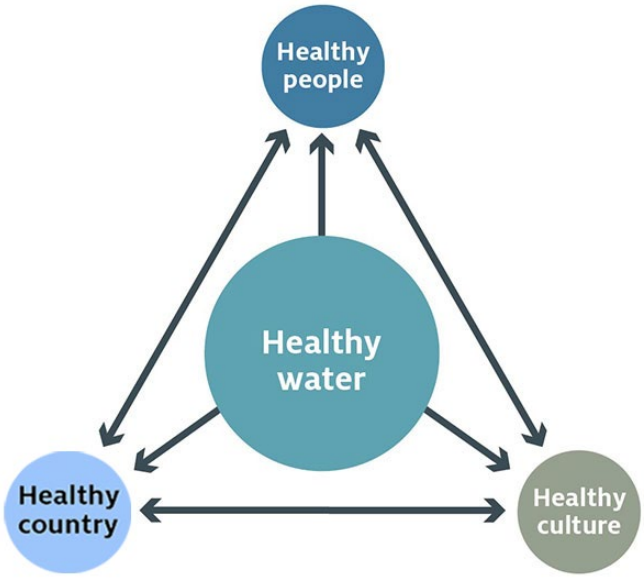
Water is life. This phrase captures not only the sacred essentiality of Water, but that Water itself is a living relation, our connection to the Lands we call home, our first medicine, and our connection to all living beings. As Indigenous Peoples, this ancestral wisdom weaves into our intergenerational scientific traditions and Water epistemologies. Indigenous Peoples and Nations, however, comprise a multiverse of wisdoms, and though we may share ways of knowing Water, our connections to Waterscapes are specific and localised, and have evolved over millennia of intimate stewardship, responsibilities, relationality, respect, reverence, and reciprocity. We also acknowledge the long history of colonial Water laws shaping Indigenous Water rights in settler-colonial states (McCool, 2006; Thorson et al., 2006; Harmsworth et al., 2016; Macpherson, 2019; Godden et al., 2020). Recent studies that broadly examine Indigenous values of, and relationships to, Water break down western silos of Water scholarship that often exclude Indigenous voices, and cross disciplinary boundaries between social and natural sciences. Indigenous voices thus carve out a unique canon of Indigenous Water scholarship which this article puts forward in what we anticipate will be the first of many comprehensive reviews. Indigenous Water research now encompasses an expansive area of Water literature, that includes, but is not limited to, cosmology and governance, colonialism, justice, responsibilities and rights, health and climate change.

Core to our thesis is the existence of numerous Indigenous ways of knowing and being with Water, an understanding of the multitude of threads that interweave and overlap across these knowledge systems, and an awareness of the opportunities for healthy Water futures through restoring inherent rights to apply these knowledges in practice. Water and Waterscapes are crucial to Indigenous Peoples' spirituality, well-being, livelihoods, and identities. As such, Indigenous rights of self-determination span cultural, political, and socioeconomic dimensions of Water (Robison et al., 2018). This message is asserted and evidenced by numerous Indigenous Water scholars; these include a Kamilaroi Water scientist from Australia and the co-authors of Moggridge et al. (2022), who together have established a research methodology for managing Water on traditional Kamilaroi Lands. Moggridge et al. (2022) highlight the urgent need for developing Indigenous Research Methodologies (IRMs) to engage Indigenous Knowledges (IK) and empower Indigenous Peoples to participate in debate around Land and Water management, and around monitoring and policy development. IRMs, as rooted in Indigenous epistemologies and ontologies, represent a helpful shift from positivist forms of research (Wilson, 2001). The protection of Water was and is bound by Indigenous natural law, stories, lore and customs, which provide a system of sustainable management that ensures healthy people and healthy Water for future generations (Lingiari Foundation, 2002). Figure 1 conceptualises these key interrelationships.

As Tewa scientist Gregory Cajete (2004: 55) writes, "Native Science reflects a celebration of renewal. The ultimate aim is not explaining an objectified universe, but rather learning about and understanding responsibilities and relationships and celebrating those that humans establish with the world". Further asserting that new pathways for knowledge co-mobilisation are emerging he notes that, "Native and Western cultures and their seemingly irreconcilably different ways of knowing and relating to the natural world are finding common ground and a basis for dialogue" (ibid: 56). This review seeks to balance the synergies, uniqueness and trajectories of these relationships with Water.

We are first and foremost relatives of Water (Nibi, Nipi, Tó, Lo, Wai, Baa', Uini, Tuu, Gali, Vaa'am, Há, Tsits, Tona, P'oe, Gali). This review's author collective represents 16 Indigenous Nations and communities across two continents and islands connected by Water. We draw our professional perspectives from diverse disciplines and practices including Water science, policy, natural resource stewardship, oceanography, biology, climate research, law, history, engineering, planning, geography, and public health. Though we select from cases and Indigenous Knowledges around the world, this review is centred around the Lands, Waters, and colonies of Canada, Australia, Aotearoa New Zealand, and the United States (CANZUS). Following the Indigenous methodological practice of storywork (Archibald, 2008), we

Figure 1. Healthy Water. The relationship and importance of healthy Water to a healthy country, healthy people, and a healthy culture.



Source: Adapted from Moggridge and Mihinui (2010) in Moggridge (2010).

approached this review through an Indigenous lens that values our lived experiences as Indigenous Peoples with diverse Water relationalities to synthesise and conceptualise our collective Waterscape of Indigenous research. While we are not representative of all Indigenous Peoples globally, we include Peoples from desert landscapes, marine environments, freshwater regions and the areas in between. We thus have knowledge of many types of Water relations. At the same time, most of the literature reviewed here was written in English and our author collective draws most heavily from the global north, where most of us received our education. This review reflects this emplacement. Future reviews by Indigenous authors from the global south with diverse linguistic positionality are warranted. Despite these limitations, we offer this body of literature and this review as a new conceptual framework for reclaiming, rematriating and restoring Indigenous Water sovereignty in research and in practice.

Indigenous Water research centring Indigenous voices grew alongside Indigenous social movements and declarations such as Idle No More, Standing Rock, Cultural Flows, and other Water Protector actions in defence of the sacred (MLDRIN, 2007; Estes, 2019; Gilio-Whitaker, 2019; Moggridge and Thompson, 2021). In the media, there are abundant news stories that track the virulent and violent Water security issues facing Indigenous Peoples (Lam et al., 2017); less well documented, however, are the resilient Water solutions and innovations by Indigenous Peoples that respond to these pressing Water crises. Despite the absence of media coverage of Indigenous resiliency, Indigenous communities have advocated on behalf of Water for generations, and a new generation of Indigenous researchers and scientists is bringing to the fore Indigenous approaches and understandings of our vast unique relationships to Water. These unique approaches to Water research have also drawn the attention of international Water scientists and of forums such as the Intergovernmental Panel on Climate Change (IPCC); they foreground Indigenous intergenerational knowledge of weather, Water, and Land as being crucial to both the understanding of historical climate changes and the shaping of healthy future lifeways (IPCC, 2021). In the first chapter of the 2021 IPCC report (2021: 243), however, we note the acknowledgement "that assessing this knowledge, and integrating it with the scientific literature, remains a challenge to be met", and most of the physical science working group chapters neglect to include Indigenous and local Knowledges in their assessment findings. We likewise foreground a critical need for Water research by

and for Indigenous Peoples. This includes acknowledging and applying the vast amount and breadth of knowledge and research that is already being done by and for our Peoples. This Indigenous Literature Review process supports Water sovereignty, reclamation, rematriation and restoration and is connected to broader Indigenous sovereignty movements that are emerging globally.

Global Water consciousness and solidarity grew in the wake of the Water Protector movement that emerged after the fight by the Standing Rock Sioux Tribe and other Tribal Nations to stop the Dakota Access Pipeline (Robison et al., 2018; Wolfley, 2018; Whyte, 2019a). Soon after, the Land Back movement began to be addressed in the academic literature; it particularly started to draw international attention in 2019, after the Yellowhead Institute, an Indigenous research think tank, published *Land Back: A Yellowhead Institute Red Paper*. The Land Back movement has catalysed global solidarity in addressing the oppression and dispossession of Indigenous Peoples' Lands and territories (Landback, 2021); however, discussions on the alienation of Indigenous Peoples from Water by the settler-colonial state have been largely absent from the discourse. Some Indigenous Water Protectors argue that there cannot be Land Back without Water Back. The Land Back movement has expressed a range of meanings of 'Back', from the literal return of physical territories to the return of Indigenous governance to shared Land to the reinvigoration of intertwined Indigenous relationships to and knowledges of Land (Longman et al., 2020; Riddle and Saddleback, 2020; Koot and Büscher, 2019). These meanings differ from place to place and from movement to movement; the parallel Water Back movement reflects this diversity, as reflected in this review. We also understand Water as inclusive of all manifestations of Water in the hydrologic cycle. There is no separateness of fresh and saltwater. Water Back as a framework and praxis allows us to reclaim our ways of knowing Water as one being, not as separated pieces of itself.

Indigenous Peoples have positioned the framing of 'Water Back', calling for the reclamation and rematriation of Indigenous Water Knowledges that are inclusive of not only rights to Water but responsibilities to Water. In one clear and central articulation of Water Back, the Pueblo Action Alliance's *Water Back Manifesto* recognises that, "Water Back is a step towards Indigenous communities declaring their independence from the US Empire. It also means removing European occupation, clarifying Water rights for Indigenous communities, the application of Indigenous feminist Water and land management practices and the resurgence of Indigenous identity" (Pueblo Action Alliance, 2021). Water Back movements do not conform to any one definition or framing. They will be – and *must be* – as unique as the Indigenous cultures, places and Water relations from which they are born. It is inevitable that they also become uniquely carved by the local and contemporary oppressive settler-colonial contexts through which they must be negotiated. As many Indigenous researchers and activists have pointed out, to turn relations into nouns or otherwise constrained definitions rarely follows Indigenous epistemologies or accountabilities: "A bay is a noun only if Water is *dead*" (Kimmerer, 2013: 55; see also Liboiron, 2021; Watts, 2013). Throughout this review we capitalise 'Water' and other names for more-than-human relations to honour their intrinsic value as living entities, recognizing their profound significance in Indigenous cosmologies and lifeways, where Water is regarded as a sentient being with agency and interconnectedness. To achieve the political intent behind these Water movements, any ideation of Water Back must not constrain our ideas and approaches to such movements; instead, it must provide a platform from which Indigenous Peoples can develop and execute effective strategies for our own aspirations in our own contexts, even as similarities can be articulated for wider-scale connections (Smith, 2012). Key to any such platform is access to both local and global Indigenous Water scholarship from which to derive insights to inform strategies that are linked at multiple levels.

For our Indigenous author team, for our communities, and within the primarily English-language, Indigenous-oriented and -produced research reviewed from CANZUS, Water Back means the return of Water and kin to Indigenous governance in a way that empowers the resurgent Indigenous Water relationships that are integral to Indigenous cultural, biological, spiritual and political sovereignty; this includes cosmogony, ceremony, access, law and policies. Water Back in this way is allowing Water to rematriate relationships with Indigenous Peoples, the Lands that are nourished by Water, and the more-

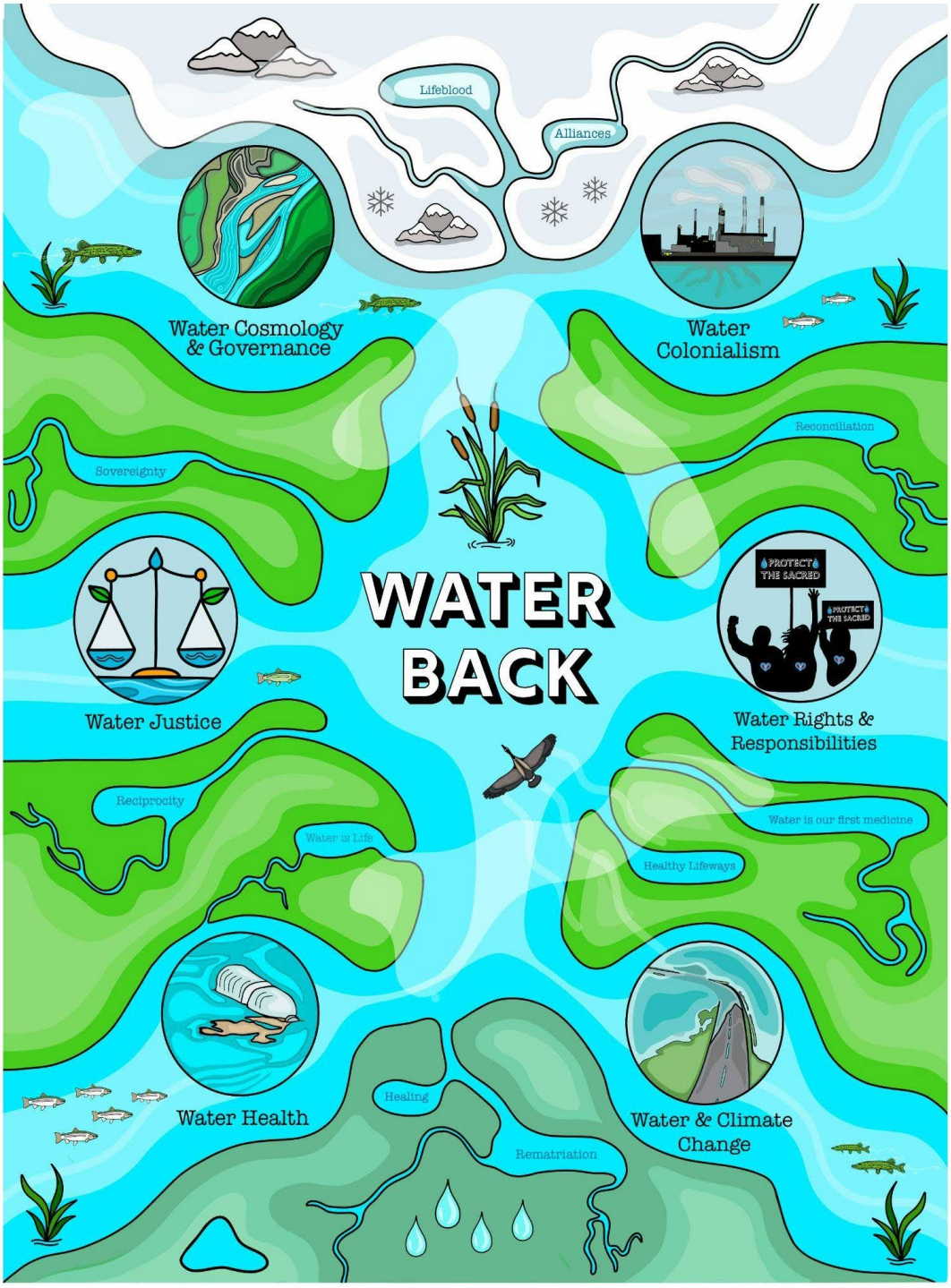
than-human relatives that live within and care for Water. Water Back is the restoration of humanity's responsibility to care for Water and the recognition of Indigenous Peoples' inherent relationships, connections, rights and responsibilities to Water.

Rematriation is a term coined to reinvigorate and inspire humanity to fulfil its duty of care for Mother Earth (Gray, 2022; Newcomb, 1995; Rematriation, 2023). It further describes the process of returning Water, Land, culture, and spirituality to Indigenous women to address the ongoing impacts of colonialism, patriarchy, and gender-based violence (Kuokkanen, 2019; Wires and LaRose, 2019; Rematriation, 2023). The term has gained prominence in Indigenous movement building through the work of the Haudenosaunee-led digital storytelling platform – *Rematriation* – founded by Kaluhyanu:wes Michelle Schenandoah (Onʌyota':aka, Wolf Clan) (Rematriation, 2023). Rematriation further aims to restore balance and promote healing within Indigenous communities by reclaiming Indigenous Knowledges, revitalising cultural practices and obligations, and supporting Indigenous leadership and decision-making power (Tuck, 2011). In the context of the Water Back movement, rematriation seeks to restore Indigenous ways of caring for Water and aligning with it as a sacred being, by returning and restoring Indigenous ways of knowing and being in relation to Mother Earth. It also refers to returning decision-making power, knowledge, and responsibility for Water to Indigenous Peoples, recognizing our significant roles in Water governance. This can involve restoring Indigenous Water ceremonies, management practices, recognizing and supporting grandmother Water keepers, and addressing the impacts of colonialism and patriarchy on our access to and relationship to Land and Water.

In response to this emergent movement, this Indigenous Literature Review aligns with the principles of rematriation, reclamation, and restoration, emphasising the significance of centring Indigenous leadership, authority, and knowledge in Water research. It traces the discursive patterns of Indigenous Water relationality across themes of colonialism, justice, health, rights, responsibilities, climate change, cosmology and governance. The review contributes to a holistic conceptualisation of Water Back to support research that advances Indigenous Water sovereignty (see Figure 2).

Water Back offers a new framework that centres Indigenous epistemologies and histories as a foundation for advancing Indigenous Water research into the next decade. While there are many articulations of Water Back, a crucial element of it is the explicit acknowledgement of the positionality of Water researchers. Research on Indigenous Waters or in Indigenous territories has all too often failed to engage or cite Indigenous scholarship; instead, it defers to studies and narratives from externalised perspectives that are glimpsed through a settler-colonial gaze/lens, consistent with what is often referred to as 'helicopter' or 'parachute' research that has led to extractionary research or incomplete narratives (Minasny et al., 2020; Dion et al., 2020). Research sovereignty refers to research that is led and conducted by Indigenous Peoples for Indigenous Peoples. It upholds the rights and responsibilities of Indigenous communities to have a voice and authority in decision making when it comes to research on our Lands, Peoples, and Water. This principle is essential for promoting the decolonization and indigenization of research, as it prioritizes Indigenous perspectives, values, and beliefs and recognizes the rights, relationships, and responsibilities of Indigenous communities. While the term 'sovereignty' originated in the context of European struggles for land, we adopt this terminology as a key determinant of contemporary Indigenous Nations' exercise of power for Water protection. Here, we establish a sovereign Water researchscape by foregrounding work that is led by Indigenous Water researchers, stewards, relatives and allies wherein Indigenous worldviews and relational accountability to communities remain embedded. Water research sovereignty allows Indigenous Nations and communities to have complete control over their Water data. Research on Water governance can be led by Indigenous scholars and may be open to non-Indigenous researchers who work alongside Indigenous governments through allyship and co-partnerships of Water research. Research sovereignty is a key principle of the Water Back movement, ensuring that Indigenous Water science, cosmology, and stories are shared and told by those who belong to the Water and who have a connection to the communities they work with and for.

Figure 2. Water Back. Conceptualisations of the different intersecting elements of Water Back movements across the six core Water themes present in the literature.



Source: Author created figure illustrated by Hawlii Pichette.

Note: While different Water Back movements may focus on only a few of the elements in the figure, all are crucial for understanding the movement as a whole.

Methods

Literature reviews are essential components of research, enabling a comprehensive understanding of existing knowledge and identifying research gaps (Jesson et al., 2011). Various approaches, such as systematic, integrative, scoping, and narrative reviews, have been utilised to synthesise literature in different fields (Tranfield et al., 2003; Torraco, 2005; Arksey and O'Malley, 2005; Rother, 2007). However, these conventional approaches do not adequately capture Indigenous perspectives and knowledge, particularly in areas like Indigenous Water research (Grant et al., 2009). This necessitated the development of a distinct methodology, as existing review types did not align with our purpose of identifying and analysing Indigenous Water research literature through a relational and collective participatory storytelling approach.

Guidelines for conducting literature reviews have been established in disciplines such as psychology (Baumeister and Leary, 1997) and social sciences (Davis et al., 2014). However, we recognized the need to draw on guidelines specifically tailored to Indigenous studies to inform our approach. By doing so, we developed an Indigenous Literature Review process that respects Indigenous Knowledge Systems and empowers diverse perspectives, enabling a more comprehensive understanding of the Indigenous research topic. By contextualising our methodology within the framework of Indigenous studies, we aim to fill a gap in existing literature review approaches and contribute to the growing body of Indigenous research methodologies (Chilisa, 2012; Drawson et al., 2017; McGregor et al., 2018).

We developed an Indigenous Literature Review process based on Indigenous Research Methods (IRMs) privileging connection, accountability, and relationality (Wilson, 2008; Smith, 2012) that led to greater representation of the research Waterscapes of the author collective's broader network of expertise and disciplinary diversity (See Figure 3). The Indigenous Literature Review Process includes four phases: (1) Building Relationships; (2) Indigenous Methods: Gathering Knowledge; (3) Indigenous Synthesis: Collective Storytelling and Analysis of Literature; and (4) Culturally Respectful Knowledge Sharing.

Building relationships

The 'Building Relationships' phase of the Indigenous Literature Review process centres around the establishment of meaningful connections between Indigenous researchers (Burchill et al., 2011). These relationships are essential to ensure that Indigenous perspectives, trust, and respect for Indigenous protocols underpin the entire literature search process. Through this phase, the focus is on bringing together Indigenous researchers who may not have worked together previously and linking them through the author writing collective. This collective approach promotes collaboration and the sharing of diverse perspectives, enabling a more comprehensive and inclusive review. Our author collective engaged in discussions (May – July 2021) to meet one another and share our expertise in Water research, as well as our diverse relationships to Water. These conversations not only included introductions in Indigenous languages but also included answering the question: "What Water do you belong to?"

This phase further signifies a departure from dominant literature review processes that tend to be individualistic in nature. Instead, it embraces Indigenous Research Methodologies (IRM) and collective approaches that align with Indigenous research sovereignty. By centring Indigenous perspectives, trust, and respect, this phase lays the foundation for a literature review process that is grounded in cultural integrity, reciprocity, and collective empowerment. Thus, throughout the Indigenous Literature Review, relationality, accountability, and respect for Indigenous protocols are paramount. In this process the author collective acknowledges and follows appropriate measures to honour Indigenous research as a ceremony. This involves demonstrating respect for local Indigenous protocols, showing gratitude, and actively engaging in reciprocity with the Indigenous communities and knowledge holders involved. By embracing an Action Research approach, which combines theory and practice, the literature review process becomes an opportunity to develop practical solutions that foster the well-being and flourishing

Figure 3. Indigenous literature review.

Source. Created by the authors via Canva.com.

of Indigenous Peoples and our communities (Fredericks et al., 2014). This approach emphasises the collective definition of issues to be addressed, the development of work processes, and the collaborative conduct of the research itself. The author collective engaged in discussions (June – August 2021) to co-define the thematic conceptualizations of the Water Back framework based on author expertise, experience, and the literature. Following IRMs, we began with the themes and issues of importance to Indigenous social movements (Smith, 2012), to our home communities and Nations (Bishop, 1999; Wilson, 2008; Reano, 2020), and we refined these as a participatory collective (Bishop, 1999; Vaioleti, 2006).

Indigenous methods: Gathering knowledge

The 'Gathering Knowledge' phase of the Indigenous Literature Review process embraces and respects Indigenous epistemologies and approaches to gathering knowledge. This entails utilising conversational and participatory methods that value Indigenous ways of knowing and understanding. By foregrounding Indigenous authorship, community research, and research questions, this phase respects and upholds Indigenous research sovereignty. It recognizes that Indigenous Knowledge is essential to the review and to authentically represent Indigenous perspectives and experiences. The process incorporated a critical examination of author positionality, emphasising Indigenous identity, accountability, and community context. In reviewing the literature, we prioritised Indigenous authorship, research done with, by, or for Indigenous social movements and communities, and studies prioritising Indigenous research questions. By actively including literature from other Indigenous authors, we sought to align with research sovereignty (See Figure 4). We carefully gathered, added, and vetted the literature based on our positionality and experiences as Indigenous Peoples, ensuring that our selection process was informed

by an Indigenous lens. This approach aimed to authentically represent Indigenous Knowledge Systems and promote the relevance and inclusivity of the review.

To gather knowledge for an Indigenous Literature Review, a comprehensive search for relevant literature is conducted, drawing from both academic databases and Indigenous Knowledge sources. This involves going beyond dominant academic sources and engaging with Indigenous community members, Elders, and other knowledge holders who possess valuable insights and wisdom. Informed by the Hunting Gathering focus group method developed by Burchill et al. (2011) we conceptualised this phase of the literature review to include the process of gathering data or information on Water research in ways that respected each author's Indigenous perspective as well as the protocols of the Indigenous Waterscapes we were engaging. In doing so the gathering approach aimed to create "a sense of purpose and a sense of community in a culturally safe environment" (Burchill et al., 2011: 35). This approach aligns with Indigenous practices of knowledge acquisition, emphasising the importance of cultural protocols, respectful engagement, and reciprocity.

We also recruited additional authors and collaborators to fill in gaps in geography or thematic expertise. This chosen method of recruitment, rather than merely reviewing more literature, is aligned with Māori scholar Linda Tuhiwai Smith's (2012) IRM strategies of connection, testimony, and networking. These processes determined not only applicable themes, but which articles were selected for review within each theme. By integrating Indigenous epistemologies, community research, and Indigenous Knowledge sources, the 'Gathering Knowledge' phase ensures a holistic and inclusive approach to knowledge acquisition. It recognizes the richness and depth of Indigenous Knowledge Systems. Ultimately, it encourages a review process grounded in cultural integrity, relationality, and the acknowledgment of Indigenous ways of knowing as vital sources of wisdom and understanding.

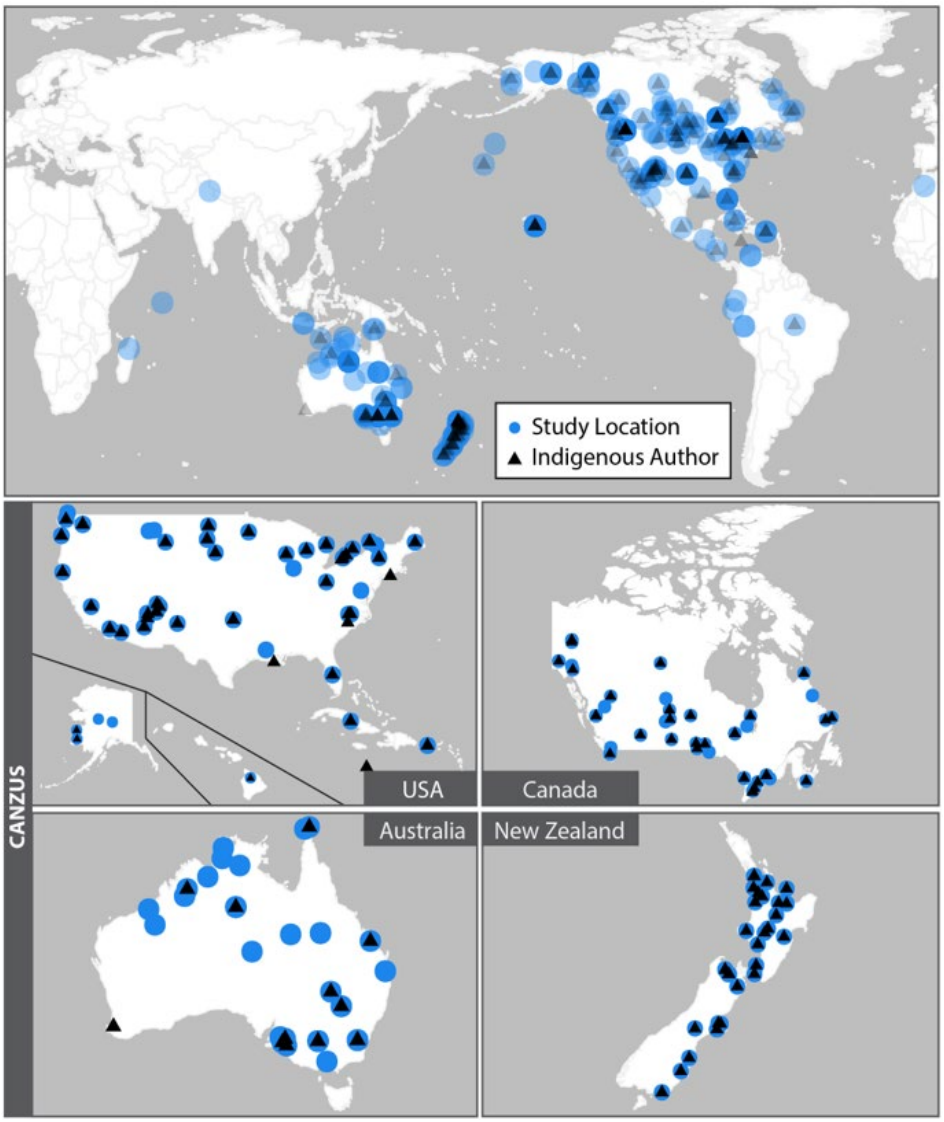
Indigenous synthesis: Collective storytelling and analysis of literature

The 'Collective Storytelling and Analysis of Literature' phase is a transformative process that involves synthesising Indigenous literature through an Indigenizing lens. This phase embraces the power of collective storytelling and analysis, recognizing the diversity and richness of Indigenous Knowledge Systems. By drawing upon multiple perspectives and experiences, the synthesis of the literature reflects a holistic understanding of Indigenous issues and realities. To analyse research on Water Back, we worked iteratively and inductively to construct themes from the gathered body of evidence on the present Indigenous issues faced across our communities. However, we acknowledge the gaps in the Indigenous Water research analysed for this review as study locations are concentrated in English accessible literature, primarily from the global north and particularly CANZUS. We reviewed 419 articles across the six dimensions of the Water Back framework (See Figure 2 and 4).

To ensure a culturally respectful and comprehensive synthesis, the collective engages in a process of Storywork analysis. This involves assessing the relevance, quality, and alignment of the literature with Indigenous principles such as "respect, responsibility, reciprocity, reverence, holism, interrelatedness and synergy" (Archibald, 2008: 140). The analysis is conducted in consultation with the collective, grounding it in Indigenous perspectives and ensuring that it reflects the unique needs and aspirations of Indigenous communities. By breaking away from dominant conceptions of a literature review and working within an Indigenous framework, this process fosters a deeper understanding and appreciation of Indigenous Knowledge Systems. Reflecting the diversity of our author's collective, our process also incorporated the Whakawhiti kōrero method developed for designing assessment tools by Māori scholars Elder et al. (2015: 2), which calls for the exchange of ideas, as well as "active discussion and negotiation". Through dialogue and collaboration, the author collective develops Indigenous-specific criteria, themes, conceptual models, and or frameworks that enable a comprehensive and culturally responsive analysis of the literature. We met monthly to discuss articles and coding of the database (September 2021-February 2023). All authors participated in a survey to develop a synthesised definition for Water Back,

Rematriation, and Research Sovereignty as articulated in the literature and presented in the review article. To ensure that, to the extent possible, Indigenous-specific local contexts, cultures, places, methods, and languages were not misinterpreted, we requested that a member of our research team from the same nation, region or language group review the article. This exchange of ideas fosters a shared understanding and ownership of the review process, ensuring that it is a collective endeavour rooted in Indigenous values and principles.

Figure 4. Water Back Research Atlas. The world map (top) illustrates the location of studies (blue) conducted by Indigenous authors and the Indigenous author's location (black).



Source: Author created based on database (See Supplementary Material).

Notes: The transparency of the study and Indigenous author location demonstrates the density of studies performed across the globe among 419 reviewed articles (see Supplementary Material). Indigenous authorship was determined based on self-identification by the reviewed article's author(s) as listed within their biographies or positionality statements included in the referenced literature and/or as documented within their publicly accessible biographies or website(s), and community knowledge from respective networks.

Culturally respectful knowledge sharing

In the process of disseminating the findings of the literature review, our primary aim was to ensure that the information is shared in a culturally appropriate manner, reflecting the collective's understanding and ensuring accessibility for Indigenous Peoples and communities. To achieve this, we engaged in ongoing reflection and evaluation of the review process, continuously identifying areas for improvement to ensure the review remains relevant and responsive to the needs of Indigenous Peoples. To identify types of knowledge sharing that would align with Water research, we hosted discussions among the author collective (August 2022 – May 2023), recognizing the value of each member's Indigenous perspective. Through these discussions, we sought to determine how the knowledge gathered in this review could be shared in a meaningful, collaborative and inclusive format.

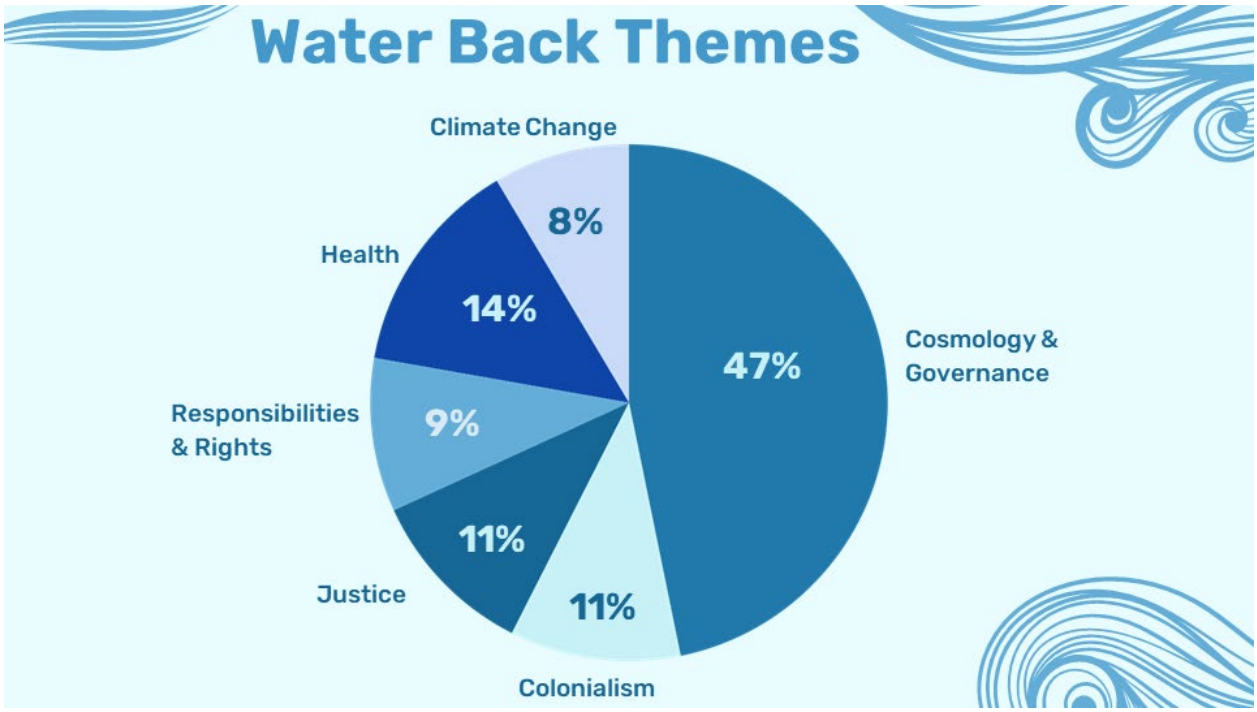
One significant outcome of our Indigenous Literature Review process was the recognition of the absence of an existing database specifically dedicated to Indigenous Water research literature. In response, we made the decision to create a comprehensive database of the Indigenous Water research literature that we reviewed. This database is accessible as supplementary material, and we are committed to its maintenance and ongoing development. Moreover, we extend an invitation for contributions from individuals or communities globally, recognizing the importance of collective engagement and shared responsibility in building a living reflection of our relationality and commitment to Indigenous Water research sovereignty.

Findings

The findings of this review article, informed by Water Back thematic analysis, shed light on the critical intersections between the Water Back movement, rematriation and research sovereignty. Through an examination of diverse literature sources, the review identifies key themes that emerged, including the centrality of Water in Indigenous lifeways, the importance of rematriation and Indigenous sovereignty, the impact of colonialism and Water injustice, and the need for collaborative and holistic approaches to Water research. These results provide valuable insights into the ongoing efforts to restore Indigenous relationships with Water and advance Water justice, highlighting the urgent need for transformative change in how Water research is conducted and by whom.

Of the reviewed articles, 62% (n=261) were authored or co-authored by Indigenous Peoples, highlighting their active involvement in Water research. The literature reviewed and database created include literature written by non-Indigenous authors where the Water research was done with or for Indigenous Peoples and or communities, but may not have extended authorship to Indigenous Peoples from the engaged Waterscape. Each article was reviewed and manually coded for the associated theme (see Supplementary Material). The analysis shows that the most prominent Water Back themes were Cosmology and Governance (47%) and Health (14%) (see Figure 5).

Figure 5. Water Back themes.



Note: This figure illustrates the distribution of themes in the literature on Indigenous Water research. The data represents the percentage of coverage for each theme within the reviewed literature. (n = 419).

Source. Author created. See Supplementary Material.

The prominence of the Cosmology & Governance theme in the reviewed literature can be attributed to its critical importance in understanding the complex relationships between Indigenous Peoples, Water, and our cultural, social, economic, and political systems. These themes are interconnected and serve as foundational elements for Indigenous Water research, as they shape Indigenous perspectives, Knowledge Systems, and approaches to Water rematriation. Scholars emphasise the Cosmology & Governance theme in the literature to address the historical marginalisation of Indigenous Knowledges and perspectives in discussions on Water governance, policy, and practice. By centring Indigenous Knowledge Systems, scholars aim to challenge the dominant western-centric narratives and frameworks that have often disregarded or undervalued Indigenous perspectives on Water. Recognizing the importance of Indigenous cosmology and governance allows for a more holistic and culturally grounded understanding of the relationships between Indigenous Peoples and Water. This approach not only respects Indigenous sovereignty and self-determination but also contributes to more inclusive and equitable Water governance. Ultimately, scholars prioritise this theme to promote Indigenization, foster collaboration, and support the revitalization and rematriation of Indigenous Knowledge Systems and practices in Water research. Moreover, examining the intersectionality of these themes provides a comprehensive understanding of the complex interactions between climate change, cosmology & governance, health, responsibilities & rights, justice, and colonialism, offering insights for reciprocal, relational, and respectful Water research practices that uphold Indigenous sovereignty and well-being.

This review highlights the vast Water Knowledges, long history and robust movement to bring Water Back into balance with Indigenous Peoples' lifeways. The next section recognises Indigenous Peoples' unique understandings and relationships to Water as a living entity through Water Cosmology and Governance. The subsequent section on Water Colonialism explores the tensions between settler-

colonial and Indigenous political relations for Water protection. The section on Water Justice then explores distributional, procedural and recognitional justice issues related to Indigenous Waters; it goes on to identify the power imbalances present in existing Water rights frameworks that prioritise settler-colonial property rights and exclusive, individual ownership of Water over collective responsibilities to Water. The section on Water Responsibilities and Rights that follows further examines Indigenous innovations in response to systemic barriers to participation in Water decision-making. In the Water Health section, we explore the biophysical impacts of Water colonialism, not only on Indigenous Peoples but on the Waters themselves and on the beings who rely on Water. The final section on Water and Climate Change explores the pressing climate crisis that is facing Indigenous Waters. This section further explores the interconnected nature of climate and Water injustice and the disproportionate burdens of environmental and climate change harms that are carried by Water and Indigenous communities. The first step in dismantling systems of oppression is rematriating Water and supporting sovereignty in Water research such that it centres the leadership and guiding insights of Indigenous Peoples, Nations and communities.

WATER COSMOLOGY AND GOVERNANCE

For decades, Indigenous researchers around the globe have articulated our relationships to Water. We have noted that these extend far beyond the need for consumption, agriculture, sanitation and other utility-based relationships (Abate and Warner, 2013; Anderson, 2010; Borrows, 1997; Craft, 2013; Deloria, 1970; Cajete, 1999). Common to Indigenous cultures and belief systems is the recognition of Water as a gift and a responsibility that is granted from the more-than-human realm. Both Indigenous and non-Indigenous ontologies and cosmologies describe the origins and ordering of the world, how the world holds together, and what our relationships to the world are. In all cases, Indigenous and otherwise, these concepts of how the world works dictate how we interact with Water and with each other. Valuing Water as a sacred gift, for instance, will result in different actions rather than knowing Water as a resource to be harnessed purely for consumption, economic gain, and exploitation. In this way, Indigenous Water cosmologies shape Indigenous Water governance (Arsenault, 2020, 2021; Borrows, 1997; Craft, 2013; Leonard, 2019; Smith, 2012).

In recent decades global acknowledgment of Indigenous Water cosmology and governance emerged alongside the phenomena of Indigenous water declarations beginning with the ratification of the Indigenous Peoples Kyoto Water Declaration at the Third World Water Forum in 2003. This unprecedented Water declaration affirmed Indigenous Peoples' relationship to Water as well as Indigenous rights to Water and self-determination (IPKWD, 2003). In subsequent years new Indigenous Water declarations have emerged across scales from local to international, affirming Indigenous Water relationality (Poirier and Schartmueller, 2012; McGregor, 2014; Taylor et al., 2016; Craft and King, 2021). In 2007, advocacy for Indigenous Water governance was further bolstered with the adoption of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Although research and advocacy on Indigenous Water cosmology and governance certainly existed before 2007 (Cushman, 2004; McCool, 2006; Thorson et al., 2006; Wolf, 2000) specific mention of Indigenous Water Knowledge was largely absent from settler-colonial state international agreements prior to the signing of the UNDRIP, which articulates protections for Indigenous Water rights and responsibilities (United Nations General Assembly, 2007). Since 2007, the need to include and recognize the value of Traditional Ecological Knowledge and later Indigenous science for addressing global environmental challenges has grown internationally (McGregor, 2014).

Many Indigenous Peoples around the world, from Aotearoa New Zealand and Australia to Africa and from Asia to North America assert that one of the most critical human priorities should be ensuring that our ways of living do not negatively impact present and future generations. Smith, Chilisa, and Borrows discuss the concept of 'relational accountability', which is based on a recognition of the

interconnectedness between people and nature and on coexistence in general (Arsenault, 2020, 2021; Borrows, 1997; Chilisa, 2012; Smith, 2012; Wilson, 2008). Just as Indigenous Peoples are acutely aware that present and future generations will be harmed by unsustainable, extractive and exploitive lifestyles, we understand that this harm extends to the natural world and to other Peoples. The sacred relationships to Water have dictated Indigenous key priorities and values of posterity, relational accountability, and reciprocity; these in turn, have shaped ancestral Indigenous Water laws that continue today (Arsenault et al., 2018; Borrows, 1997; Chiefs of Ontario, 2008; Craft, 2013). Indigenous Water cosmologies also underpin Indigenous and sustainable irrigated cultivation systems such as the Hagdan-hagdang Palayan ng Banawe, the Ifugao rice terraces in the Philippines (Acabado and Martin, 2016) and the Balinese subak, the paddy irrigation system that was developed there in the 9th century. (Roth, 2014; Lansing et al., 2014). The drive to restore relational accountability and other Indigenous values and to restore systems of Indigenous Water governance motivate a contemporary call for transformative and re-Indigenised research (Arsenault, 2020, 2021; Borrows, 1997; Chilisa, 2012; Leonard, 2019; Smith, 2012).

Indigenous Peoples in Canada and the United States have shared their relationships to Water through Creation Stories (cosmogonies and cosmologies) and more generally through storytelling (Anderson, 2010; Borrows, 1997; FNEATWG, 2016). Water is a sacred link to the Creator, to Ancestors, and to present and future generations; it is a critical element of Indigenous Creation Stories. The profound cultural significance of Water has been expressed by 11 Indigenous Grandmothers from various regions in Canada, who share a collective understanding that Water represents an eternal connection to the Creator (Anderson, 2010). Each person passes through Water right before birth, and in many cultures, Indigenous Peoples are also bathed in Water they belong to at birth and after death (Leonard, 2019; Anderson, 2010). As a sacred gift from the Creator, Water must be respected, conserved and protected for future generations in the same way that Water was cared for by our Ancestors before us (Borrows, 1997; Craft, 2013; Chiefs of Ontario, 2008; McGregor, 2014, 2015; Nelson, 2013; FNEATWG, 2016; Walkem, 2007).

Indigenous Peoples beyond North America also assert our close relationships with Water and the need to protect Water for current and future generations (Te Aho, 2011; Smith, 2012; McGregor, 2015; Taylor et al., 2016; Robison et al., 2018). In Aotearoa New Zealand, for example, Linda Tuhiwai Smith shared how Māori relate to Water as a living entity with a spirit (Smith, 2012). The Māori perspective and the resultant relations with Water led to the fight for, and recognition of, legal 'personhood' status for the Whanganui River in Aotearoa New Zealand (Ruru, 2018). In Hawai'i, the phrase "ola i ka wai" calls for the restoration of ancestral flows of Water. Native Hawaiians hold that Wai (Water) feeds Hāloa, the cosmological Elder brother of the Hawaiian people, who is also known as kalo (staple food of taro, *Colocasia esculenta*). The stewardship of Water is thus a moral obligation to support life-giving ecological kinships (Kameʻeleihiwa, 1992; Sproat, 2015).

Principles of 'caring for Water' are prevalent among Indigenous Peoples in Australia who have "an intimate connection with surface water and groundwater and how it relates to the sky and land" (Moggridge and Thompson, 2021: 1). Water, in this sense, promotes reciprocity, connectivity and stewardship, which are grounded in a holistic governance framework (Hemming and Rigney, 2014). In this way, 'caring for Water' is an Indigenous Knowledge framework that emphasises relationships and connectivity over an exclusive focus on the economic value of Water (Jackson and Palmer, 2012). Within this Indigenous worldview, Water has multiple overlapping valuations that are guided by the Dreamtime (time of creation); these contrast with non-Indigenous perspectives whereby Water is "a resource owned and/or managed by the state, with competing commercial, environmental, recreational, and cultural values" (Jackson and Palmer, 2012: 5). The Murray-Darling Basin (MDB) comprises over 1 million square kilometres of Australia's land mass; it crosses four states, one territory, and over 40 Indigenous Nations with Water rights claims (Jackson et al., 2015; Lynch et al., 2013). The *Kaldowinyeri* (creation) of the rivers Murray and Darling recount the river serpent, Murray Cod, and Ancestors including Ngurunderi – powerful Dreamtime beings – who shaped the rivers into their current existence and instilled governance principles that constitute much of the IK management of the Water today (Jackson et al., 2012). According

to Moggridge and Thompson (2021: 4) many Indigenous Nations across Australia share an understanding of caring for Water that emanates from the saying "Garima gala nyabay. Gala nyabay garama ngali ngih" "Look after the Water. The Water looks after us". Marshall (2014, 2017) reflects on the notion that despite the significant political and social change that has affected Indigenous communities in the last 200+ years, the sacredness of Water remains formative in shaping identity and values.

In diverse and unique ways, Indigenous Peoples around the world celebrate Water through song, origin stories, dance, teachings and ceremonies. These demonstrate the individual and collective responsibility to respect Water, protect Water, and love Water. Far more than a resource or a commodity to be bought and sold, Water to many Indigenous Peoples is our connection to Creation and to all life, and we must treat Water as a sacred gift which has been shared with all living beings (Chiefs of Ontario, 2008; Smith, 2012).

Water cosmologies and knowledge systems

Cosmologies, informed by observations and Indigenous Knowledge Systems, are essential for caring for Water. Indigenous understandings of the natural world and the importance of sustainable hunting, fishing, navigating, gathering and cultivation practices are commonly referred to in academic literature as Traditional Knowledge (TK), Traditional Ecological Knowledge (TEK), Indigenous Knowledge Systems (IKS), Native Science, or Ancestral Knowledge (Arsenault, 2020; Borrows, 1997; Chilisa, 2012; Smith, 2012; McGregor, 2014, 2015; Oliveira, 2014; Cajete, 2000; Kawagley, 1996). In Indigenous communities, these go by different names such as Hawaiian ʻike or ʻike ʻāina kūpuna, Inuit Qaujimajatuqangit, mātauranga Māori (Stewart-Harawira, 2020), Caribbean aitakuwahi (Josephs, 2016; David-Chavez, 2020) or Australian First Nation the dreaming or songlines (songlines is a description of Dreamtime or creation sites linked by song along a path which the ancestors travelled; many are Water based especially in a dry landscape) (Moggridge et al., 2019). In Indigenous Australia Dreaming is an English word with many different language meanings across Australia and with deep connotations among Indigenous Peoples. These terms remind us of the diversity of knowledges and of the importance of considering how knowledge is conceptualised through generations and how information is obtained, ordered, passed down intergenerationally, and applied to support balanced relations with and in the world.

As Indigenous Peoples, we have used cosmology-guided observations and Knowledge Systems to sustain our survival for thousands of years. Globally, UNDRIP protects Indigenous Peoples' relationships with Water which is evidenced by Articles 25 and 26 (United Nations General Assembly, 2007). Article 25 describes the right that Indigenous Peoples have to "maintain their spiritual relationship with their traditionally owned or otherwise occupied [L]ands, territories, [W]ater, and coastal [S]eas". Furthermore, Article 26 adds that Indigenous Peoples have "legal recognition and protection…with due respect to the customs..[and] traditions… of the Indigenous peoples concerned" (United Nations General Assembly, 2007). As highlighted in the 2011 Mandaluyong Declaration,

> Our spirituality which link[s] humans and nature, the seen and the unseen, the past, present, and future, and the living and non-living has been and remains as the foundation of our sustainable resource management and use. We believe that if we continue to live by our values and still use our sustainable systems and practices for meeting our basic needs, we can adapt better to climate change.

Describing an explicit relationship of honour and respect towards the environment, these Indigenous oral histories and original teachings have been long valued within Indigenous communities. The recent interest in Indigenous Knowledges by settler-colonial societies highlights the recognition of their value to non-Indigenous governments. This growing interest in IK and TEK among non-Indigenous communities also highlights the need to acknowledge the absence of a singular definition for these terms. This complexity emerges from the rich diversity of Indigenous Peoples and our longstanding practice of TEK for thousands of years (McGregor, 2004). Indeed, many Indigenous Peoples express that Indigenous Knowledges are the way that Indigenous People live our lives. These Knowledges have been passed down

from Elders through oral traditions; they often come through observation and interaction with plants and animals, landscapes and Waterscapes in the surrounding environment.

Indigenous Peoples are rematriating Indigenous Water Knowledges through hosting gatherings and symposia to share Water research. One watershed event occurred in 2010 when the National Centre for Māori Research Excellence hosted a Water symposium in Christchurch, Aotearoa New Zealand (Muru-Lanning, 2012). Muru-Lanning (ibid) positions the need for Indigenous scientists to lead Indigenous freshwater research as they possess relational accountability for authenticity in use of mātauranga Māori for Water governance. As Challies and Tadaki (2022: 6) state,

> Te Mana o te Wai needs to be coupled directly with efforts to reclaim and practice Indigenous sovereignty. Without meaningfully empowering Māori to fulfil their roles as environmental guardians (kaitiaki), implementation of Te Mana o te Wai risks becoming a symbolic appropriation of Indigenous concepts, furthering and perhaps even legitimating dispossession.

The deliberate inclusion of IKS in Water governance holds the potential to facilitate the restoration of Indigenous Peoples as primary decision-makers. By recognizing and valuing the wisdom, experiences, and practices embedded in IKS, a transformative shift can occur, empowering Indigenous Peoples to reclaim our rightful roles and responsibilities in safeguarding Water. This reclamation not only promotes holistic and sustainable approaches to Water governance but also nurtures the rematriation of Indigenous cultures, Knowledge Systems, and self-determination.

Knowledge systems aid the restoration of Indigenous Water governance

Across settler-colonial states, Indigenous Peoples have struggled to gain Water Back in all its manifestations; difficulties have arisen due to the politics of recognition (Coulthard, 2007), the exclusion of Indigenous leaders from Water decision-making institutions (Emanuel and Wilkins, 2020), and discrimination against Indigenous women (Anderson, 2010). However, Indigenous Peoples have found ways to circumvent dominant oppressive Water regimes founded on logics of Water coloniality, by including IKS/TEK in environmental problem-solving. Indigenous Water governance is a 'hydrosocial' challenge whereby management of Water is a product of the relationship between its natural and physical components and its social and political context (Norman, 2015). For integration of IKS to be effective, communication flows must engage Indigenous Peoples from the outset of the planning process and must be maintained with consistent follow-up and exchange of ideas. Failure to achieve meaningful sharing of power structures with Indigenous Peoples in Water regimes is shaped by differing world views of Water policymakers and by institutionalised historical traumas and injustices committed against Indigenous Peoples that were designed to remove our environmental sovereignty (Biggs et al., 2011; Bernhardt, 2020). Transformative research is more urgent than ever. Recent scholarship on the current geological age known as the Anthropocene has articulated how human activity has decimated the environment, leading to our climate crisis (Todd, 2015). Community-driven research on the Anthropocene can build partnerships between Water management systems and IKS (Pandya, 2014). Shinnecock Water scientist Kelsey Leonard in researching the Great Lakes defines Indigenous Water governance as the "practices of nationhood, decision-making, citizenship, and diplomacy by Indigenous Peoples in fulfilment of responsibility to future generations and Water as a living relation" (Leonard, 2019: xxi).

Anishinaabe scholar Deborah McGregor has for several decades advocated for, and researched extensively on, TEK; she has both drawn on the teachings of her community Elders in the implementation of her people's knowledge within western natural resource management systems, and utilised Indigenous research methodologies for environmental research. In 2008, McGregor published *Aboriginal Perspectives from the 2000 State of the Lakes Ecosystem Conference (SOLEC)*, marking the first time that Indigenous perspectives were included on the regional conference's agenda. Indigenous communities from the Great Lakes region were previously excluded from giving input on the ecological conditions of

the lakes (McGregor, 2008). Following the event, non-Indigenous environmentalists began reaching out to Indigenous knowledge-holders for input on implementing IK in the management of Water quality within the larger Great Lakes region. Indigenous participation increased by including discussions on how TEK, IKS, and western science could complement each other while conducting Great Lakes environmental research (Arsenault et al., 2018). As scientific institutions and professionals begin to recognise the importance of IKS to a fuller understanding of Water-dependent ecosystems, more opportunities are generated for listening, for stronger and more equitable partnerships to restore health to Water bodies, and for the formation of coalitions to help advance environmental justice and restore Indigenous Water governance.

In CANZUS nations, a growing recognition of the value of IKS is currently being reflected in policy guidance across different levels of government (Arsenault, 2020; Government of Ontario, 2018). For example, the Canadian Department of Fisheries and Oceans updated the Fisheries Act in 2019 to require IK to be part of decision-making (Government of Canada, 2019). The US White House Office of Science, Technology and Policy and the Council on Environmental Quality similarly issued a memorandum in November 2021 which formally recognised IK and committed to, "elevating Indigenous Traditional Ecological Knowledge (ITEK) in federal scientific and policy processes" (The White House, 2021). Indigenous Peoples, however, have been asserting the value and validity of IKS since time immemorial; they contend that integration of IKS into settler-state laws and sciences does not necessarily mean that Indigenous Water cosmologies are simultaneously valued (Deloria, 1970; Borrows, 1997; Chilisa, 2012; Smith, 2012). Non-Indigenous academics also typically emphasise the ecological component of IKS rather than their spiritual and relational foundations or the well-being of Indigenous Peoples themselves (Kapyrka and Dockstator, 2012; McGregor, 2021; Reano, 2020). While interest in Indigenous Science and Knowledge Systems is on the rise globally, discussions among Indigenous Peoples recognise the ongoing challenges around authenticity, efficacy and problematic 'integration' (Nadasdy, 1999; Bohensky and Maru, 2011; David-Chavez and Gavin, 2018).

In response to the historical exclusion of Indigenous Peoples in basin planning and the development of new national Water policies in Australia, Indigenous Nations formed a Water institution in 1998 to advocate for Water rights; this was known as the Murray Lower Darling Rivers Indigenous Nations (MLDRIN) (Hunt, 2012). MLDRIN, representing over 20 Indigenous Nations along the southern Murray River, serves as a forum for Indigenous Nations to share information with one another and engage as a unified network with the Murray-Darling Basin Authority (MDBA) in the development of basin management practices (Hunt, 2012; MLDRIN, 2007). MLDRIN describes itself as a "confederation" of Indigenous Nations, that constitutes an alliance of political entities, built from pre-colonisation systems of family connections, trade and exchange (Hill et al., 2012; Weir, 2009). Delegates to MLDRIN stress that it does not substitute for the authority of traditional owners; rather, it provides a means of establishing their distinct political status (Hill et al., 2012). As a result of the success of MLDRIN in paving a pathway for Water security in the MDB, another institution in 2010 was formed called the Northern Basin Aboriginal Nations (NBAN), which represents 21 Indigenous Nations across the northern portion of the MDB (Moggridge and Thompson, 2021). NBAN is working with MLDRIN to advocate for Indigenous decision-making powers in the basin and for allocation of funding for Indigenous research needs in the basin especially pertaining to cultural flows (Mooney and Cullen, 2019; Moggridge and Thompson, 2021). NBAN and MLDRIN are also actively working to develop their own policies for Water allocation and management in the basin that are reflective of Indigenous Water values, Knowledges and cosmology (Mooney and Cullen, 2019; Moggridge and Thompson, 2021). Water governance is now on a path towards nation-building, with Indigenous communities such as the Kamilaroi, who are developing methodologies to inform and influence Water management (Moggridge et al., 2022) and the Ngarrindjeri leading the way in developing creative nation-to-nation partnerships for Water decision-making (Hemming et al., 2017). Additional examples include the Martuwarra/Fitzroy River Declaration and the

establishment of an Indigenous-led council to ensure river management of the Martuwarra (Poelina et al., 2019).

The dominant society's engagement with TEK has led to powerful metaphors for knowledge pluralism (Kimmerer, 2013; Tengö et al., 2014) and reciprocity of complementary and mutually-enhancing Knowledge Systems (Chilisa, 2012; Bang and Medin, 2010; Barnhardt and Kawagley, 2005). Reid et al. (2021) highlight Elder Albert Marshall's Mi'kmaw concept of Etuaptmumk or 'two-eyed seeing' through which we can, "build an ethic of knowledge coexistence and complementarity in knowledge generation" (Reid et al., 2021: 245). In this way, a key outcome of increased valuation of TEK is increased collaboration with Indigenous Peoples to achieve environmental stewardship goals (Whyte, 2013). Indigenous perspectives on TK, TEK, IKS, knowledge pluralism, reciprocity, and collaboration easily extend to restoration of contemporary Indigenous Water governance and motivate researchers to engage in transformative and meaningful research and collaboration with Indigenous communities (Arsenault, 2020, 2021; Chilisa, 2012; Smith, 2012).

Māori hapū and iwi in Aotearoa New Zealand are asserting their mana motuhake and rangatiratanga in management of freshwater in many ways. More and more, the country's freshwater management legislation, policy and governance are better reflecting Māori worldviews and cosmologies.

> In te ao Māori – ancestral Māori ways of living – rivers and lakes are the tears of Ranginui, the sky father, mourning his separation from Papatuūānuku, the earth mother, and people are their descendants, joined in complex whakapapa that link all forms of life together (Salmond et al., 2019: 45).

The concept of whakapapa (genealogy) is central to contemporary expressions of Māori cosmologies in freshwater management. A well-known case in point is the establishment of the Te Awa Tupua (Whanganui River Claims Settlement) Act 2017 (Ruru, 2018; Winter, 2021). After a long history of grievance-making, Whanganui iwi negotiated the legal recognition of the Whanganui Awa as a legal person embedding the rights of the river in law. The legal personhood of the Awa aligns with its recognition as a tupuna (ancestor) for Whanganui iwi. Mauri (life-force or essence) is another fundamental concept in Māori cosmologies that is progressively being recognised in freshwater management (Hopkins, 2018; Michel et al., 2019; Hikuroa et al., 2018; Stewart-Harawira, 2019; Harmsworth et al., 2016). Most notable are the monitoring frameworks that work to bring the mauri of the Waterways into consideration in decision-making in a quantitative way (Robb et al., 2015). The recognition of the concept of mana in freshwater policy and legislation is now changing the face of freshwater management in Aotearoa New Zealand (Kitson and Cain, 2022; New Zealand Government, 2020; Te Aho, 2019). After several iterations, Te Mana o Te Wai now sets an explicit hierarchy of priorities in the National Policy Statement for Freshwater Management 2020. The hierarchy places the health and wellbeing of the Waterways ahead of human needs, which both prioritise economic development and use of freshwater. While such recognition of Māori worldviews in the freshwater management system in Aotearoa is a significant milestone in Māori freshwater advocacy, the extent to which they actually embed the full extent of Māori values and worldview is debated (see, for example, Taylor, 2022). Nonetheless, each of the many models marks a significant step forward in restoring Indigenous relational values in freshwater management and critiquing such models will drive us on that continued trajectory.

Indigenous Peoples have long recognized the unique power of Water: no one has the authority to control its flow across Mother Earth, and it cannot be treated as a colonial asset. 'Colonial asset' refers to the view of Water as a resource that is extracted and valued only for its usefulness to humans, a perspective that diverges from most Indigenous cosmologies (Deloria, 1970; Borrows, 1997; Smith, 2012). Xiye Bastida, a youth Water champion from San Pedro Tultepec, Mexico, recognizes the value of Indigenous cosmology in addressing Water governance issues. With first-hand experience of the impact of flooding and environmental degradation on Indigenous communities, she brings her knowledge and cosmology to the forefront of the Water Back movement. In an interview with Vox magazine she says, "We don't call water a resource; we call it a sacred element (…) The relationship we have with everything

that Earth offers, it's about reciprocity. That's the only way we are going to learn how to shift our culture from an extraction culture to a balanced and harmonious culture with the land" (Burton, 2019). As someone who values Indigenous cosmology for Water governance, Xiye Bastida brings a unique perspective to her work in protecting Water. Hailing from the Otomi-Toltec community in Mexico, Bastida sees Water as sacred kin. Rather than a unidirectional relationship with Water and other parts of the natural world, Indigenous Peoples relate to Water through concepts of kinship, responsibility, reciprocal obligation, participation, and co-creation, as expressed and perpetuated through unique Indigenous and cultural cosmologies and customary forms of governance. Extractive colonial logics and institutions, however, continue to attempt to destroy these relations. The subsequent section explores Water colonialism literature that positions these violent interruptions of Indigenous Water cosmologies and governance as both unjust and as a form of physical, spiritual and cultural harm.

WATER COLONIALISM

Contemporary Water injustices facing Indigenous Peoples are linked to experiences of Water colonialism. Robison et al. (2018) define these as the "living legacy" of settler-colonial institutions, processes, and laws that enable physical Water theft or the removal of Indigenous Peoples from Water and from Water decision-making. For instance, based on the geographical contiguity of rivers, Law Professor Robert J. Miller observes that the European doctrine of discovery – which has been used to dispossess Native Peoples from our ancestral Land and resources worldwide – held that the European 'discovery' of the mouth of a river created a claim over the entire Watershed as well as over any adjacent coast (Miller and Ruru, 2008; Miller et al., 2010; Miller, 2011). There are many types of colonialism, including settler-colonialism (where colonisers stay and occupy Indigenous Lands and Waters), extractive colonialism (where raw materials are stripped from the Land and transported to colonial centres), and imperial colonialism (where colonial powers use force to annex territory). All of these may overlap and reinforce one another (Kauanui, 2016; King, 2019). Indigenous scholars and knowledge-holders articulate some characteristics that these colonialisms have in common. This includes the domination of Indigenous Peoples in their homelands, not only through genocide but also through the severing of Indigenous Peoples from Land which includes Water, language, self-governance and life-giving kinships (Whyte, 2016a). Ongoing colonialism perpetuates Indigenous dispossession through continued prioritisation of non-Indigenous access and exploitation of Indigenous lives, Lands and Waters for settler-colonial goals, desires, objectification and futures (Neville and Coulthard, 2019; Liboiron, 2021).

In this way, obstacles to Water Back can be explained through the legacy of colonial Water regimes that have in large part led to the alienation of Indigenous Peoples' agency to maintain Water relationality (Robison et al., 2018). This may include Water diversion, harvesting, damming, draining, pumping, enclosure, pollution, technological control, theft and privatisation, all of which are strategies and effects that are reviewed by this article. According to Abate and Warner (2013: 11-12),

> [M]any indigenous communities (…) share a unique connection to the land that is often not present in the dominant society. This connection resides in both legal and a spiritual or cultural context. Following colonization from outside societies, many indigenous communities found themselves relegated to certain territories within the dominant nation (…). Beyond legal considerations, many indigenous peoples also have a strong spiritual and cultural connection to the land upon which they reside or to their traditional homelands. For many indigenous peoples, their spirituality is intimately connected to the earth and their environment.

Water colonialism is interwoven with advancements and development of infrastructure (Curley, 2021). Diné geographer Andrew Curley argues that infrastructure development in the arid southwest of the US cannot be disentangled from Indigenous Peoples' loss of Water. In fact, the colonial design to civilise the southwest required the manipulation of Water away from Indigenous Peoples into the cosmopolitan capitalist schemes that created sprawling desert cities such as Phoenix, Arizona and Las Vegas, Nevada

(ibid). Water colonialism, however, was not solely through expansions of manifest destiny; it also took more 'benevolent' forms such as the creation of parks and marine protected areas that restrict Indigenous access to homelands and home Waters, sometimes called eco-colonialism or environmental colonialism (Ruru, 2012; Sepulveda, 2018; Gilio-Whitaker, 2019).

In Aotearoa New Zealand the entrenched utilitarian understanding of Water relationality in policy and legislation is made apparent time and time again as Māori hapū and iwi challenge Water allocation decisions and consents (Stewart-Harawira, 2020). In 2011, in a case where hapū along the Waitotara Awa in south Taranaki contested a Water-take consent application, Ester Tinirau highlighted the divergence between Māori and settler-colonial values for freshwater, pointing out that, "the applicants and the hap[ū] had ended up talking past each other because of divergent values and understanding" (Taranaki Regional Council, 2010: 5). She also laid bare the need, yet apparent inability, for freshwater policy, legislation and decision-making structures to better recognise and give weight to "cultural and spiritual concerns" and "matters relating to M[ā]ori values" (ibid). The recent introduction of the concept of Te Mana o Te Wai into national legislation, the broader legislative reform that is underway in Aotearoa, and the many hapū and iwi-level arrangements that have been hard won, are helping put in place a freshwater management and decision-making system that can better support diverse Māori cultural and spiritual values. These, paired with the many novel freshwater monitoring frameworks that hapū and iwi are developing and implementing (Awatere and Harmsworth, 2014; Rainforth and Harmsworth, 2019; Crow et al., 2020), seem set to diminish the prominence of utilitarian values in driving freshwater decision-making.

From some Indigenous perspectives, Land and Water cannot truly be "stolen" because they are relations, not objects that can be taken (Palmer, 2020: 795). We Indigenous Peoples, however, still often articulate Land and Water as 'stolen' through the language and logics of settler-colonial societies that understand relationships as things rather than relations (Watts, 2013). A better way to understand the injustices of settler-colonialism might be as the extinguishing of life through the splitting of Indigenous relations (obligations) to Land and Water, including the literal extinguishment of life through physical death. "[E]nvironmental injustice cuts at the fabric of systems of responsibilities that connect [nonhuman] people to humans, nonhumans and ecosystems. Environmental injustice can be seen as an affront to peoples' capacities to experience themselves in the world as having responsibilities for the upkeep, or continuance, of their societies" (Whyte, 2016a: 9). It is, in other words, a destruction of lifeworlds, life, and physical worlds (Sepulveda, 2018; Estes, 2019; Gilio-Whitaker, 2019).

In the US, this destruction relates partly to dam construction and the impact it has had upon our Water relatives, on Indigenous Water rights (and responsibilities), and on the entire ecosystem. Dam placement has displaced many Indigenous Peoples and has impacted sources of traditional foods such as salmon and lamprey, which are important first foods for many Northwest and Great Basin Peoples (Russell, 2012; Schneider, 2013). There are 274 hydroelectric dams within the Columbia River Watershed (Osborn, 2012). Many of them serve as major obstacles to the practicing of Indigenous lifeways. Two in particular have had great impacts upon the region's energy; these are the Bonneville Dam, built in 1933, which is located on the border between Oregon and Washington, and the Dalles Dam which was built in 1952 (Robison et al., 2018). These dams were built in the prime hunting and fishing areas of many Indigenous communities; in at least one case, they were in violation of Treaty Rights. In 2019, the Yakama Tribes called for removal of the Dalles Dam located in Celilo Falls, a revered space for salmon fishing. Yakama Nation Tribal Council Chairman JoDe Goudy described the dam as a "colonial doctrine of Christian discovery" (Goodykoontz, 2019). In their call for removal, the Tribes stated that the US government did not have the Yakama Nation's free, prior and informed consent, which was required under their 1855 Treaty. The Bonneville Dam has had a direct negative impact on the fishing economy, which has resulted in the creation of the Columbia River Inter-Tribal Fish Commission (CRITFC, 2021). The Shoshone-Bannock Tribes of Idaho have also made a call for the removal of the four Lower Snake River dams, as they directly impact culture, spirituality and their way of life (Shoshone-Bannock Tribes, 2021).

In Canada, First Nations, Inuit and Métis have also faced Water injustices through the proliferation of hydroelectric dams. As Professor Ramona Neckoway from the Nisichawayasihk Cree Nation, a hydro-affected community in northern Manitoba, underscores,

> Over the last decade or so, and in addition to witnessing the widespread and cumulative impacts of Hydro in our territories, I have witnessed incredible acts of courage, individual and collective acts of 'resurgence'. Thankfully, many Hydro-affected peoples and communities in northern Manitoba have not and are not cowering to the new steel thunderbirds that have invaded our horizons. Since the 1970's, when the plans and visions of developers became known to our grandfathers, Ithinewuk responded swiftly and collectively to protect the rights and livelihoods of our communities. Despite the setter-colonialism that we have been and continue to experience, and particularly where Hydro is concerned, Ithinewuk are drawing upon their teachings, languages, stories and values and confronting the settler-colonialism that has been imported into our communities. The steel towers may bring energy that makes us somewhat comfortable, but the cost is high and the consequences far-reaching (Neckoway, 2018: 154).

These acts of resurgence are the embodiment of Water Back. They represent a larger movement for Water protection that has been mobilised by Indigenous Peoples and Nations across Canada who are responding to the ongoing settler-colonialism of the federal and provincial governments. These acts of Water colonialism have manifested not only through hydropolitics (Daigle, 2018) but also in the many First Nations Water crises; these include mercury contamination in Grassy Narrows (Simpson et al., 2009), a more than 28-year boil Water advisory in Neskantaga First Nation (Castleden et al., 2017), and groundwater depletion by the bottled Water industry in Six Nations of the Grand River (Sioui et al., 2022).

Water has consistently been used as a tool of colonisation. In Australia, the removal of Indigenous Peoples from high-value Water areas was a way to promote the growth of settler communities and agricultural production on the Land, with little concern for environmental degradation (Connell, 2011; Connell and Grafton, 2011; Short, 2003). Dispossession of Indigenous Peoples in the MDB from our Waters came in waves of violence, disease, poisoning of Waterholes, forced relocations, stolen generations and systematic attempts to wage biological warfare for cultural extermination (Lynch et al., 2013; Short, 2003). In 1860, the Yorta Yorta petitioned the Victorian government – unsuccessfully – to stop the destruction of their natural fishing areas by paddle steamers (Lynch et al., 2013). In 1886 with the approval of the Irrigation Act in Victoria, Water was declared a "public resource" (Poirier and Schartmueller, 2012); however, Aboriginal People were not considered citizens of the state and were therefore not members of the 'public' with equal rights to share in the development and management of Water. Early conflicts over Water use were geared towards issues of navigation and trade, none of which included MDB relationality and use by Indigenous Peoples. With the introduction of irrigation settlements, it was necessary for the states of New South Wales, Victoria, and South Australia to sign the 1915 River Murray Water Act to provide minimum Water entitlements for Water and flow-sharing (Wheeler et al., 2014).

Notably, as this marked the shift from policies of colonisation to policies promoting assimilation, Indigenous Nations were excluded as parties to the 1915 Act. Indigenous Peoples, however, did use the courts when necessary to challenge our absence from political processes for Water management. In the early part of the 20th century, Aboriginal claimants unsuccessfully brought litigation to protect the construction of weirs in their traditional territories; known as the 'Roper River weir case', it is the earliest found court case adjudicating Indigenous Water management practices in Australia (Barber and Jackson, 2015). More recently, some scholars have argued that the National Water Initiative (NWI) is a form of 'water colonialism', as it embeds Water decision-making power in the Australian government and discounts Indigenous Water Knowledges that cares for Water (Howey and Grealy, 2021). Water colonialism is thus not a vestige of past harm, but rather is ongoing today in the form of contemporary Land grabs aimed at acquiring the additional Water necessary for the proliferation of energy, agriculture and other extractive industries (Hartwig et al., 2020).

Colonialism is not a series of discrete events, and it is not about the intents, values, or heritages of settlers. It is, "not even a structure, but a milieu or active set of relations that we can push on, move around in, and redo from moment to moment" (King, 2019: 40; see also NYSHN, 2016). Following la paperson (2017), we can think of settler-colonialism as,

> [a set of technologies] "of alienation, separation, conversion of land into property and of people into targets of subjection (…) that enable the 'eventful' history of plunder and disappearance. Property law is a settler-colonial technology. The weapons that enforce it, the knowledge institutions that legitimise it, the financial institutions that operationalize it, are also technologies. Like all technologies, they evolve and spread" (la paperson, 2017: 5).

Even so, however, we "refuse the master narrative that technology is loyal to the master" and understand that "[e]ven when they are dangerous, understanding [colonial Water] technologies provides us some pathways for decolonizing work" (ibid: xiv). This article documents both the ways that colonialism impacts Water and some of these efforts to push, move, and undo Water colonialism. We emphasise that Water is not only sacred, but powerful (Peltier, 2018). Harnessing its power for colonial purposes does not align with Indigenous Knowledges of working with and for the sacred relative and entity, Water.

WATER JUSTICE

Indigenous Water justice recognises that Water is a living entity. In doing so, Water justice moves beyond conceptualisations solely focused on fairness, equity and participation of humans in Water decision-making, to also include relationality. It asks – "What does the Water need?". In their seminal legal article on Indigenous Water justice, Robison et al. (2018) underscore the pre-eminence of UNDRIP as the foundation of international law supporting Indigenous rights for Water protection and ultimately shaping the hydropolitics of Water Back for Indigenous Peoples. Moreover, Indigenous Water justice recognises the rights of humans and more-than-human relations, while balancing individual and collective responsibilities (ibid).

In 2015, Anishinaabe-kwe scholar Deborah McGregor positioned natural law as being key to realising Water justice. She positions "the concept of zaagidowin (or 'love') as central to achieving Water justice" (McGregor, 2015: 72). McGregor (ibid) puts forward the following definition of Water justice:

> Water justice, in Anishinaabek understanding, considers not only the trauma experienced by people and other life due to Water contamination, etc.; but values the Waters themselves as sentient beings in need of healing from historical traumas. Only when the Waters are well and able to fulfil their duties to all of Creation is Water justice achieved.

This positionality highlights the deep sentience of Water as a living entity deserving of justice (McGregor et al., 2020). Within this understanding justice is not for humans alone; it is also for the Water. Moreover, conceptions of restoration must shift away from anthropocentric-driven Water quality standards to ecocentric practices of "loving responsibility" to Water for our collective healing (McGregor, 2015). McGregor (ibid) also notes that Indigenous Water justice moves beyond assertions of "Water as a human right" or "commodity" to assert that the Water itself is deserving of justice (McGregor, 2015: 72). Ulloa (2020), in describing Water injustices facing the Wayúu People of Colombia due to mining, similarly notes that the commodification of Water promotes conflict. Water justice is shaped by the politics of Water, which includes dimensions of access, distribution, fairness, control, decision-making power and recognition of Water as a living relation (Wilson and Inkster, 2018; Yazzie and Baldy, 2018; Taylor et al., 2019; Ulloa, 2020; Hartwig et al., 2021; Hernandez, 2022). In this way, Water justice encompasses more than just humans; it recognises the interconnectedness of Water, including all life that depends on Water to exist and thrive (Ulloa, 2020).

Indigenous Water justice is also inextricably linked to Indigenous assertions with regard to social justice, climate justice, and environmental justice (Estes, 2019; Hartwig et al., 2021). Wilson et al. (2021) highlight that Indigenous Water injustice often manifests as regulatory and jurisdictional injustice whereby the law is weaponised to disenfranchise Indigenous Peoples from Water decision-making processes. These processes can turn violent, and murders of Indigenous environmental defenders are increasing globally (Glazebrook and Opoku, 2018; Le Billon and Lujala, 2020; Tran et al., 2020; Scheidel et al., 2020). Around the world, Indigenous Peoples and communities facing conflicts of "Water access rights and entitlements" make up nearly half (1651 of 3446) of all documented cases of groups mobilising to face environmental justice conflicts (Temper et al., 2015). Global data in the EJAtlas (Temper et al., 2015) shows, "Indigenous people mobilize most frequently against damaging environmental conflicts" (Scheidel et al., 2020: 6) and that when Indigenous Peoples are engaged in mobilisation against these conflicts, they "face significantly higher rates of violence" (ibid: 2). Indigenous women are also recognised as disproportionately impacted by, and mobilising in uniquely large numbers against, natural resource development in order to protect Waters and bring about justice for our families and future generations (Deonandan et al., 2017; Klasing, 2016; Chiblow, 2019). Moreover, Indigenous women play a central role in Indigenous movements that are connected to Water protection, famously through #IdleNoMore (John, 2015), #NoDAPL (Estes and Dhillon, 2019; Privott, 2019), and #TinyHouseWarriors (Cantieri, 2018).

The Injustice of settler-colonial Water relations are abundantly evident in Aotearoa New Zealand. In their book, *Decolonising Blue Spaces in the Anthropocene* (2021), Meg Parsons, Karen Fisher and Roa Petra Crease explore the historical context of the Waipā River (the ancestral Awa of two of the authors) through an environmental Indigenous justice framing. The authors,

> demonstrate, through this book, that the environmental changes that took place within the Waipā catchment were (and are still) unjust because those changes (directed by one society for its benefit) robbed local Māori iwi, hapū and whānau of their capacities to experience their landscapes and waterscapes (their worlds) on their terms; which included their subsistence and flourishing as well as their abilities to maintain their systems of responsibilities (Parsons et al., 2021: 466-467).

Of course, the injustice goes beyond unequal distribution of the "environmental risks and benefit" (ibid: 468). The sentiment of this injustice remains evident in the response of New Zealand's Federated Farmers to a proposal that Māori could be granted set Water allocations. The farming lobby group feared the security of their own allocations as "all available Water has already been allocated" (The Economist, 2015). Their response reveals the continued economic marginalisation of Māori and the limited appetite for any restorative justice model. Behind many of the advances for Māori rangatiratanga over freshwater taonga are Treaty of Waitangi claims settlement processes, which Margaret Mutu suggests are in some ways "smoke and mirrors" (Mutu, 2018). She argues that successive governments have avoided any engagements in restorative justice and that there is "no prospect for justice and reconciliation for Māori without constitutional transformation" (ibid: 208). Entangled with these claims for justice for Māori is justice for tupuna Awa. The practicalities of these rights of nature, such as those embedded in Te Awa Tupua (Whanganui River Claims Settlement) Act 2017, are being explored in literature and in practice (Brierley et al., 2018).

Despite global Water protection movements advancing Water Back principles, Indigenous Water justice is often an omitted topic in international law and policy-making (Taylor et al., 2019). Hartwig et al. (2022) advocate for the redistribution of Water benefits including Water rights to Indigenous Peoples as an equitable path forward. Additionally, other Water scholars propose that government agencies must recognize Indigenous self-determination and sovereignty to actively work to reconcile the legacy of Water harm. Taylor et al. (ibid) argue that global Water governance frameworks that exclude assertions of "Indigenous Water justice and UNDRIP cannot be dismissed as simply oversights. It is a manifestation of ideological positions about Water and political interests. Implementing UNDRIP necessarily changes the discourse about authority for Water, sovereignty, and the relationships between Indigenous Peoples,

Water and states" (ibid: 12). Adoption and implementation of UNDRIP is critical to achieving Indigenous Water justice and furthering Indigenous Peoples rights to self-determination (Robison et al., 2018). Moreover, Water justice paradigms must be equally inclusive of the human right to Water, Indigenous rights, and the rights of Water itself. Emerging Indigenous Water justice paradigms advancing recognition of the inherent rights of Water itself include cultural flows and legal personhood (Ruru, 2018; Woods et al., 2022).

Indigenous-led Water institutions that can advocate on behalf of Indigenous Peoples and Nations and for Water are also critical to achieving Water justice. New Indigenous Water institutions have emerged in recent years across Canada, Australia, Aotearoa New Zealand, the US and elsewhere to advance Indigenous Water justice. For example, the Murray Lower Darling Rivers Indigenous Nations (MLDRIN) and the Northern Basin Aboriginal Nations (NBAN) have been instrumental in advancing Indigenous Water rights and interests in the Murray-Darling Basin in Australia (Woods et al., 2022). Other Indigenous Water institutions such as the Great Lakes Indian Fish and Wildlife Commission and the Columbia River Intertribal Fish Commission have had similar success in advancing Indigenous Water justice (CRITFC, 2021; GLIFWC, 2021; Leonard, 2021a). These institutions embrace Indigenous ways of knowing; they recognise that Indigenous Water justice can only be advanced by understanding our inherent responsibilities to Water as a living relation.

WATER RESPONSIBILITIES AND RIGHTS

Advancement of Water Back movements are challenged by the economic systems that dominate settler-colonial states, where Water markets and valuing of Water as a commodity are long-standing barriers to Indigenous Water protection. Settler-colonial Water regimes prioritise Water rights over responsibilities. The tensions between Indigenous and non-Indigenous worldviews for valuing Water are symptomatic of the Indigenous Water crisis.

Rights-based frameworks

While many Indigenous Peoples, Nations, and communities choose to engage with the settler-state to secure rights (Taylor et al., 2021; Te Aho, 2011, 2019), there is also a critique of the limits of state-recognised rights when it comes to Indigenous models of justice (Jenkins et al., 2021). Building on the writing of Franz Fanon, Glen Coulthard wrote about how colonial-state recognition of Indigenous rights, access, identity and/or political standing occurs in ongoing contexts of domination and that the terms of recognition and accommodation are determined by their legibility to, and the degree to which they are in the interests of the hegemonic settler-state (Coulthard, 2007).

In the western US, Water rights are primarily governed by the Doctrine of Prior Appropriation. Indigenous scholar Bernhardt asserts that the same the presumptions and philosophies driving the agenda of Manifest Destiny that supported the Homestead Acts and the Doctrine of Discovery are the same as those that have shaped Water rights in the western US; these include Water allocation based on "first in time, first in right" and property rights that are based on the alteration of Water sources from their natural state (Bernhardt, 2020: 225). Water rights for Tribal Nations are reserved under the Winters Doctrine, whereby priority is established at the time of the creation of the reservation. After the Winters decision of 1908, it was unclear whether reserved rights for groundwater were also established (Quesenberry et al., 2015). In 2003, after many years of litigation and negotiation under the Gila River Adjudication, the Arizona Supreme Court ruled that groundwater rights were reserved under the Winters Doctrine (ibid). Outside of Arizona the protection of Indigenous groundwater rights still remained unsettled. However in 2017, in *Agua Caliente Band of Cahuilla Indians v. Coachella Valley Water District*, the US Court of Appeals for the Ninth Circuit held that Tribal Nations have priority groundwater rights (Zablan, 2018). According to Womble et al. (2018: 453), the "ruling establishes a new standard throughout nine western states within the lower court's jurisdiction and establishes persuasive, although

nonbinding, legal precedent for the rest of the United States". Pueblo Water rights are also recognised through the *1848 Treaty of Guadalupe Hidalgo*. Many Water basins in the west are, however, over-allocated challenging the ability of Tribal Nations to exercise their rights to Water.

Water rights for Tribal Nations were originally not included at the creation of interstate compacts such as the 1938 Rio Grande Compact and the 1922 Colorado River Compact (McCool, 2006; Curley, 2019, 2021; Robison et al., 2021). This leaves many western states responsible for designating portions of their allocations through Water compacts with Tribal Nations. Although Tribal Nations have priority by virtue of their seniority, Tribal Water rights are typically determined through Water rights settlements. Two drawbacks of Water settlements are that Tribal Nations are prone to settling for a reduced quantity of Water, and that under 'use it or lose it' scenarios, most Tribal Nations lack the initial infrastructure needed to develop Water and put it to 'beneficial use' (defined by Eurocentrism). Deol and Colby (2018) examined correlations between quantified Water rights, infrastructure and economic development and found that Tribes with quantified Water rights have higher agricultural revenue and are more likely to operate casinos. Although Water rights are reserved under the Winters Doctrine, quantity estimates during settlement negotiations are based on population growth and economic development. Some Tribal Nations (i.e., reservations) may see population declines because of inadequate infrastructure, development, and housing, and due to opportunities that attract citizens to move off-reservation, whether part- or full-time. Relying on Water quantity for settlements is also subject to poor US Census reporting and does not fully consider the future plans of Tribal Communities to establish permanent homelands. Curley (2019) argues that Tribal Water rights settlements are forms of colonial enclosures that deprive Indigenous Nations of our rights to Water and our relationships to the environment; in this, Curley is referring to the San Juan River Basin settlement of 2005 with the Navajo Nation and the Navajo-Hopi Little Colorado River Water Rights Settlement Act of 2012. Wilson et al. (2021) also examine how frameworks of self-determination and Tribal sovereignty clash with reIndigenisation frameworks during Tribal Water rights settlements in the US.

Water rights are constantly under attack in many Indigenous communities throughout the world. In 2010 the Apsáalooke or Crow Nation signed a compact, the Crow Tribal Water Settlement of 2010 to address ageing infrastructure and irrigation in Apsáalooke communities. In the process, however, the Crow Nation gave up Water rights to all basins except the Bighorn River Basin. The settlement states that,

> Once approved by S. 375, and ratified by the Tribe's membership, the Compact is the full and final settlement of the Tribe's Water rights within the State of Montana and the Tribe waives any claims to Montana Water rights not contained in the Compact (United States, 2010: 7).

The Confederated Salish and Kootenai Tribes also ceded some Water rights in order to gain control of the National Bison Range through the Bison Range Restoration legislation, as part of the Montana Water Rights Protection Act in 2020. As Diné geographer Andrew Curley underscores,

> Indian Water settlements are forms of colonial enclosures, built on a lineage of law that replicates and perpetuates edicts of dispossession and colonialism that are foundational to the United States. They enclose upon unquantified Indigenous rights to use and access the continent's Water resources (Curley, 2019: 15).

This legacy of exclusion and dispossession of Indigenous Peoples from Water, entrenched within settler-colonial state Water laws, has emboldened Water Protectors to advocate for Water Back.

In Hawai'i, Wai (Water) is a public trust resource. This concept is grounded in the Hawai'i state constitution and the Hawai'i water code and is reaffirmed through Hawai'i State Supreme Court rulings (Sproat, 2015). The 1978 amendments to the Hawai'i state constitution established that all natural resources, including Water, are held in trust by the state for the benefit of the people (Article XI, Sections 1 and 7). The same constitution also asserts that the state shall protect traditional and customary rights of Native Hawaiians (Article XII, Section 7), and established policy to support this through the Hawai'i water code (HRS 174C) and designate a seven-member Water Commission as the implementing body for

this policy. While the Commission was tasked with balancing a dual mandate of upholding the public trust while ensuring, "reasonable and beneficial use", the composition of the Commission has tended to favour large landowner interests. The enforcement and implementation of the framework establishing Wai as a public trust resource has thus most often required litigation, placing the burden of proof on communities who are advocating for restoration of surface flows that were initially diverted a century ago in the sugar plantation era pre-dating the Water Code (Cantor et al., 2020; Sproat, 2015, 2010). Over the decades, Hawai'i State Supreme Court rulings have consistently clarified public trust purposes to include environmental protection, traditional and customary use, appurtenant rights and domestic uses, and reservations of the Department of Hawaiian Home Lands (DHHL) (Sproat, 2015). In this sense, Native Hawaiian access to Water for traditional practices and environmental stewardship has protection under the state constitution, even though Native Hawaiians are not represented by a sovereign representative government with sovereign territory.

According to Jackson and Palmer (2012), the Australian Native Title Act of 1993 was the first recognition of Indigenous Water rights by the Government of Australia, although it was limited to inland Waters under Australian law. The Act, however, only recognised Indigenous rights for personal, domestic and cultural needs; it purposefully excluded Indigenous Water rights for commercial purposes (ibid.). After the passage of the Act, Indigenous Peoples were able to negotiate Water rights, but the 1998 Native Title Amendment Act prohibited further negotiations (Tan and Jackson, 2013). In response to the restrictive nature of the amendments and the clipping of Native Title rights, Indigenous Nations began to organise at the regional, national and international levels to assert our Indigenous Water rights claims. In Australia, in 2004 the NWI marked an evolution in Indigenous Water policy in the MDB because it was the first time the Australian government recognised the need to incorporate Indigenous Peoples into Water management (Jackson et al., 2015). As Jackson et al. (2015: 142) note, the NWI recommends that states *should* take into account "native title interests, to assess and include Indigenous customary, social, and spiritual objectives in Water plans, and to engage with Indigenous communities in their development"; however, the NWI does not go far enough stopping short of requiring states to include these meaningful levels of Indigenous engagement. Biennial assessments of the NWI in 2009 and 2011 found that Indigenous engagement across jurisdictions for basin planning is minimal and that explicit Indigenous interests in Water plans are rare (Tan and Jackson, 2013). The denial of Water rights has also meant that Indigenous Peoples have not benefitted from accumulation of intergenerational wealth in comparison to Australian settlers who have engaged in trading of entitlements in Water markets (Hartwig et al., 2020). The NWI is outdated and lacks real outcomes for Indigenous Water rights and is under review as recommended by the Productivity Commission (PC, 2021) which included a recommendation of: "increasing Indigenous Australians' involvement and influence in water resource management", Indigenous Peoples hold little hope of changes in Water ownership and rights in Australia.

Māori Water rights and ownership are perceived as being controversial in Aotearoa New Zealand (Strang, 2014; Sullivan, 2017). Amidst government musings over the privatisation of Water resources, Māori asserted our rights and interests in freshwater. Despite the Waitangi Tribunal finding that, "Māori do possess rights in Water bodies akin to ownership", the government refuses to recognise those rights (Erueti, 2016: 58). The discourse persists as an ongoing debate amongst Māori with iwi, such as Ngāi Tahu, developing a clear rationale and strategies for negotiating the recognition of those rights. Ngāi Tahu have since taken legal action against the Crown to assert those rights, with Ngāti Kahungunu joining the legal action to have our rights to freshwater recognised. Erueti (2016) maps three arguments through which Māori Water rights could be negotiated, contributing to a framework for Māori hapū and iwi to continue to assert and negotiate recognition for their Water rights. Set amongst broader conversations about Water trading schemes and their potential to support better Water management in Aotearoa, it seems inevitable that Māori rangatiratanga over freshwater as a taonga, as guaranteed in Te Tiriti o Waitangi, will include an element of fiscal control. Importantly, this concept of rangatiratanga does not simply track with notions of 'ownership', rather, "as a concept and a practice [it] encompasses rights,

responsibilities and obligations. And that includes the obligation to do what we can to stop the continued degradation of our freshwater system" (Te Rūnanga o Ngāi Tahu, 2020). These assertions of Water rights embody how hapū and iwi are exercising their rangatiratanga – our rights and responsibilities.

In sum, Water rights exist within the settler-colonial state property rights regime and, as shown in the literature, this may further perpetuate colonialism and Water loss for Indigenous Peoples. At the same time, recent Indigenous Water innovations and research aim to move away from colonial framings of Water rights and articulate Indigenous Water Knowledges within responsibility-based frameworks.

Responsibility-based frameworks

Indigenous justice and legal frameworks tend to focus on relationality and responsibility and on ensuring that those connections are intact and flourishing (Borrows, 2010; Todd, 2016; Whyte, 2016b). In these Indigenous legal orders, Water is understood as a living entity with its own rights, supported through Water-human relations and human responsibilities to Water and Life. As Jenkins et al. (2021) highlight, competing Water values create biased or exclusive Water security models that often prioritise economic or human rights over the rights and responsibilities of the Water itself. Colville Confederated Tribes scholar Dina Gilio-Whitaker has written about Indigenous environmental justice paradigms that exceed the frameworks of the state, frameworks that, "must be capable of a political scale beyond the homogenising, assimilationist, capitalist State. [They] must conform to a model that can frame issues in terms of their colonial condition and can affirm decolonization as a potential framework within which environmental justice can be made available to the" (Gilio-Whitaker, 2019: 25).

Hawaiian communities continue to face resistance in our efforts to restore and access Wai (see, for example, Hoʻokano, 2014; Scheuer and Isaki, 2021). Besides power asymmetries between development interests and Hawaiian communities, the legal and administrative arenas of current Water decision-making require quantification of the amounts of Water that are necessary to support ecosystems and traditional and customary practices. These calculations present a tremendous challenge when some diverted streams have been dry for over 100 years, when even the science of hydrology struggles to characterise surface-groundwater exchange, and when even groundwater-dependent coastal ecosystems supporting traditional gathering practices have not been fully characterised (Oki, 2003; Cantor et al., 2020; Sproat, 2011). The existing accounting-oriented framework of decision-making prioritises permitted Water users over in-stream or in-ground values. At the same time, many DHHL entitlements to Water for Hawaiian homesteading remain unfulfilled (Liu, 2002). Since 2012, at least one member of the Commission must possess expertise in traditional Hawaiian Water resource management (HRS 174C-7[b]). In conjunction with the organisation of Hawaiian and environmental coalitions, this and other factors have helped facilitate the restoration of flows to previously dry streams and their communities. More than a demand for individual Water rights, the framing of collective social responsibility to Wai and to all life that is dependent on it has been a powerful force for cultivating alliances for the restoration and stewardship of Wai, including in researcher-community realms.

As Stewart-Harawira (2020: 3) similarly expresses, in Aotearoa New Zealand there is an understanding of an "ecological ethic of responsibility" that one is connected to through our whakapapa (genealogy). In this way, Stewart-Harawira emphasises the relational responsibilities that humans have to Water as "kaitiaki (stewards)" (ibid). Burdon et al. (2015: 337) suggest that, in Australia, a "consequence of this ethic of responsibility" of 'caring for Water' is that Indigenous Peoples must fulfil our obligations to our relation – Water – and that any exclusion of Indigenous participation from Water decision-making in basin governance is an affront not just to our inherent Water rights but to our cultural and spiritual responsibilities. How then might responsibility-based and rights-based frameworks evolve to support Indigenous movements for Water Back?

Blended paths forward for responsibilities and rights

Transboundary Water agreements are the foundational international legal mechanism by which to secure Water rights and responsibilities; however, treaties with Indigenous Nations are often overlooked as the first transboundary Water agreements (Leonard, 2019; Wolf, 2000). Treaties with Indigenous Nations are international agreements made with settler-colonial governments such as the British Crown (the colonial Government of Canada), the United States, and Aotearoa New Zealand. Historically, treaties also demarcated geographic boundaries between Indigenous Lands and settler Lands. In Australia, where treaties were not signed with Indigenous Peoples, new nation-building efforts have carved out a movement for the recognition of cultural flows or Indigenous flows that are guaranteed "to each Indigenous Nation to enable them to exercise their custodial responsibilities to care for the river system" (Moggridge and Thompson, 2021: 6). For Māori in Aotearoa New Zealand, the assertion of Māori concepts of mana motuhake and rangatiratanga are explicit shifts from contemporary notions of 'ownership'; they recognise a more relational connection to freshwater with both rights and responsibilities. In Canada, recent education on treaty history has brought an awareness that all Lands are Treaty Lands and that all Canadians are Treaty People. Indigenous scholars Aimée Craft and Lucas King have researched and published work on how the Anishinaabek within the Treaty #3 region have produced a Nibi (Water) Declaration of Treaty #3. This declaration supports Indigenous legal protections for the Water. Its main goal is to "help advance the Watershed management planning in the Treaty #3 territory" (Craft and King, 2021: 1). The declaration was founded to establish Anishinaabek jurisdiction in Treaty #3 and to help reIndigenise governmental processes of Water decision-making. Ultimately, the ability to restore responsibilities for caring for Water to Indigenous Peoples also helps to restore Water health.

WATER HEALTH

Humans, animals and plants cannot live without Water. Water is an indispensable molecule in the human body, consisting of two hydrogen atoms and one oxygen atom. It is responsible for constituting around 60% of the body's mass, enabling vital functions such as nutrient transportation, waste removal, temperature regulation, and supporting overall health and well-being (USGS, 2021). Water is essential to every living being; it is necessary for such things as washing hands and clothes, preparing food, staying hydrated, and participates in traditional ceremonial practices. As previously mentioned, Water also connects humans to the spiritual world. Indigenous Peoples' lack of access to Water and sanitation has severe human health implications that are prevalent across settler-colonial states (Hartwig et al., 2020; Wilson et al., 2021). In large part, deteriorating Water Health and thereby deteriorating human, plant and animal relatives' health can be linked to environmental racism, biodiversity loss and climate change (Whyte, 2016b; Waldron, 2018).

Water security comprises access to safe, reliable, sufficient and affordable Water that supports thriving communities (Jepson et al., 2017). In the global north, research has shown that the idea of universal Water security is a myth (Barlow, 2016; Meehan et al., 2020), and similar experiences affect other geographies. Gaps in Water provision and access are not simply a case of 'technical' issues or network failures; rather, they are, the product of a system of racialised dispossession, colonialism and property rights, often through and at the hands of the state (Curley, 2019; Leonard, 2019). Moreover, what counts as trustworthy, clean and safe Water can differ between state definitions and Indigenous definitions, impacting Water quality and security (see, for example, Wilson et al., 2021). Indigenous Peoples across the CANZUS settler-colonial states often rely on decentralised drinking Water systems that are more prone to contamination (Russell et al., 2020; Leonard 2021b; Harmsworth, 2014; Bradford et al., 2016).

In Canada, Water Health is a key area in Indigenous Water research, particularly studies examining First Nation Water crises and long-term boil Water advisories (Bradford et al., 2016; McGregor, 2012). As

Meehan et al. (2020: 5) note, "the displacement and forced relocation of Indigenous peoples to reserves were accompanied by a lack of planning for infrastructure development or policy frameworks to ensure universal water and sanitation". Indigenous Nations and communities not only lack access to many basic Water services, but our suffering is often ignored by the media. According to Lam et al. (2017), the limited media coverage of these issues poses a challenge in addressing the water-related health crises many Indigenous communities face because it can undermine public and government interest. Frequent drinking water advisories and persistent Water quality concerns further highlight the urgent need for action to ensure safe and healthy Water in First Nations (Bradford et al., 2016). Today, there are Indigenous-led movements to revise safe drinking Water standards to ensure that all First Nation reserves are protected, where prior governmental fragmentation may have left them victim to regulatory gaps (Hanrahan, 2017; White et al., 2012). Black and McBean (2017: 248) underscore the need for an Indigenous national Water strategy to address these issues, emphasizing key areas such as "legislation, jurisdiction, regulation, funding, technical components, and policy and governance". They further argue that any strategy developed should aim to be 'bottom-up' and 'participatory', considering "community-specific needs, historical context, and urgency" to effectively address these pressing water crises (ibid). However, these movements for healthy Water and healthy people require improved access to Water data for Indigenous Nations and communities.

Water data plays a crucial role in understanding and managing Water for the protection of health and well-being of ecosystems and Indigenous Peoples (Sugg, 2022). The concept of Indigenous Peoples' Water research sovereignty acknowledges our rights and authority to collect, own, and govern Water data. Water data is essential for Indigenous Nations and communities for several reasons. Firstly, monitoring Water quality, aquifer levels, and basin Water quantity is vital for assessing the health and availability of Water within our territories (Restrepo-Osorio et al., 2022; Yong et al., 2019). By collecting and analysing data on Water quality parameters, such as pH, dissolved oxygen, and contaminant levels, Indigenous Nations and communities can identify potential threats to the environment and public health and take appropriate measures to safeguard Water (ibid). Additionally, tracking aquifer levels helps Indigenous Nations and communities understand the sustainability of groundwater sources, informing decisions on Water allocation and management (ibid). Basin Water quantity data is vital for fulfilling Water settlement agreements, as it provides evidence of historical water availability in different areas (ibid). This data is essential for negotiating fair Water rights and ensuring compliance with treaties and other legal agreements. Furthermore, Indigenous Nations can use Water data to collaborate with private landowners and Water managers, promoting sustainable practices that improve Watershed conditions (ibid). Promoting data sharing practices, as well as improving access to necessary technology and capacity training for Indigenous data scientists, is crucial for addressing the existing gaps and improving Tribal Nation access to Water data. With improved access to and collection of Water data, Indigenous Peoples can effectively assess current conditions, enhance Water decision-making and improve watershed health. However, the absence of comprehensive Water data for Indigenous Peoples is not only a result of historical marginalisation but also an outcome of settler-colonialism and other systemic factors that perpetuate threats to Water health.

In settler-colonial states, practices that have been directly harmful to Indigenous Lands and lifeways have been tied to injustices towards Water or involving threats to Water health (see Murdocca, 2010). The Pick-Sloan Missouri Basin Program of the 1930s (formerly called the Missouri River Basin Project), for example, in the Missouri River basin in the US, resulted in the flooding and destruction of large swaths of Lands belonging to Tribal Nations on the Great Plains in the name of increased settler access to, and benefits from, the Water of the Missouri River (Estes, 2019). The very Waters that were beneficial and important to Indigenous communities ended up being the same Waters that flooded the communities and Tribal Lands (ibid). Of course, the Missouri would become the centre of another controversy decades later, with the construction of the Dakota Access Pipeline, which crossed the Missouri River in ceded territories near the Standing Rock reservation. The construction of this pipeline gave rise to fears around

the risks to drinking Water in Tribal Nations if the pipeline leaked into the river (ibid). Such fears are not unfounded, since in 1991, —just 560 kilometres to the east, Enbridge's Line 3 pipeline leaked onto the Prairie River (a tributary of the Mississippi River) in ceded Anishinaabe territories, in what is understood to be the largest inland oil spill in US history (Kraker and Marohn, 2021). Had it not been for the fact that it was winter when the spill happened, the oil would have spread to the Mississippi, which was just a few kilometres away from the spill site (ibid).

Unfortunately, this pattern of Water harm also emerged in the 2015 Gold King Mine Spill, which resulted in the release of three million gallons of acid mine drainage into the Animas and San Juan Rivers within the Colorado River Basin, harming Water critical for the livelihoods of citizens of the Southern Ute Indian Tribe, the Navajo Nation, the Ute Mountain Ute Indian Tribe, and the Jicarilla Apache Tribe among other Tribes in the basin (Cavazos et al., 2019; Chief et al., 2016a; Chief et al.,2016b). In a more recent example, the COVID-19 pandemic spread across Tribal Nations at disproportionately high rates. The recommendation was to wash hands frequently, however many Tribal Nations do not have running Water or access to clean Water on a daily basis (Leonard, 2020a, 2020b; Tanana et al., 2021b; Eichelberger, 2010, 2018). In the Navajo Nation, access to clean Water (Tó) is a struggle for both humans and livestock. The US government has mined the Lands of the Navajo Nation and left many mine pits with radioactive tailings and debris that has made its way into the Land and Water systems (Jones et al., 2020). Wilson et al. (2021) argue that contamination of Water can also be driven by settler occupation. A process they call "contamination by occupation" that can be remedied through incremental reassertions of Indigenous sovereignty in Water decision-making (ibid: 12). In response to these threats to Water health, federally recognized Tribes have increasingly utilised the Clean Water Act and its Water quality standards to protect against contamination, including incidents like oil spills (Diver, 2018).

The Treatment in the same manner as a State (TAS) status delegated to federally recognized Tribes under the Clean Water Act (CWA) plays a pivotal role in safeguarding Water health and ensuring the protection of Tribal Waters (Tanana et al., 2021a). Scholars have examined the legal and policy frameworks surrounding TAS provisions and their implications for Tribal Nations' Water management (Robison et al., 2018; Tanana et al., 2021b). There are also tensions present in the administrative processes that determine how Tribes are delegated TAS status. According to Kyle Powys Whyte (2011), a Potawatomi philosopher, the implications of TAS status on Tribal Nations' efforts to protect Water health reveal the intricate complexities and challenges it presents in terms of preserving Tribal sovereignty and avoiding subordination to federal agencies. In some instances TAS status does not provide sufficient protection against the potential harm to Water health caused by the actions of large government entities and corporations (Cavazos et al., 2019; Diver, 2018). Moreover, without TAS status the CWA and federal Water quality standards do not apply to many waterways within Tribal territories. Although in 2023, the Environmental Protection Agency proposed a new rule to close this decades long loophole (US EPA, 2023). In terms of practical implementation and challenges, Cohn et al. (2022) explore Nimiipúu (Nez Perce) spatio-temporalities of Water and underscore significant issues such as colonialism, U.S. state and local challenges to Tribal Water quality standards, and the temporal scale mismatch within Water governance frameworks like the Clean Water Act. The research highlights how these factors impede long-term thinking and Tribal efforts to protect Water health. Moreover, research by Diver et al. (2019) recognizes the inherited vestiges of colonialism present in the TAS framework. The authors argue that although Tribes may choose to engage with federal regulatory policies (i.e., CWA) we should do so while also establishing our own Water quality standards and ordinances within our Indigenous legal systems to ensure the preservation of Water health (Diver et al., 2019; Leonard, 2019).

Additionally, the issue of Water health, particularly Water quality, remains an ongoing concern in Aotearoa New Zealand (Elston et al., 2015; Stewart-Harawira, 2020). The settler colonial history of Aotearoa New Zealand has seen the removal and drainage of many Water bodies and the harnessing of what remains for agricultural use (Elston et al., 2015). Intensive agriculture remains the primary contributor to the poor quality and health of freshwater systems both for surface and groundwater, and

is impacting environmental and human health (Elston et al., 2015; Joy, 2019). While the economic dependence on high density and high input agriculture is not entirely movable through influence on freshwater policy, embedding Te Mana o Te Wai in the National Policy Statement for Freshwater Management may improve at least reducing nutrient leaching and sediment runoff into Waterways. It is also important that management of Water quality not only involve Māori but include leadership at the relevant hapū level (Morgan, 2006). In this way maintaining Water Health is an intimate act which depends on ensuring a strong fit of governance scale that empowers local relationality and understanding of caring for Water. Stewart-Harawira (2020) documents how Māori leadership in developing freshwater health frameworks has shaped global Water conservation efforts. Specifically, the Cultural Health Index and the Mauri models prioritise mātauranga Māori and allow for culturally informed decision-making (Stewart-Harawira, 2020; Harmsworth et al., 2016; Townsend et al., 2004). The incorporation of Indigenous values into freshwater monitoring frameworks coincides with similar advancements in Australia to establish cultural and Indigenous flows in Water Health management (Harmsworth et al., 2016; Pinner et al., 2019).

Across Australia, Indigenous Peoples experience higher rates of exposure to waterborne illnesses than do non-Indigenous people (Hall, 2019; Hall et al., 2022). These health inequalities are driven by Water, Sanitation and Hygiene (WASH) services that are less safe than those of the general population of Australia with remote Indigenous communities being more at risk (Hall, 2019). Improved drinking Water and sanitation standards across Australia should align with the Australian government's commitment to achieving the Sustainable Development Goals (SDGs), including the realisation of SDG 6, which is "to ensure water and sanitation for all" (United Nations, 2015). Despite this pledge, it has been noted that service levels in remote communities are at a lower standard and that they suffer more major disruptions than do residents of non-Indigenous and urban centres (Hall et al., 2022). Russell et al. (2020) also highlight that Indigenous Peoples can have increased exposure to contaminated surface Water due to cultural and spiritual activities that go beyond drinking Water to bathing and other Water-based activities. The authors further found that Indigenous Water Knowledges of billabongs, rivers, creeks, etc. include awareness of seasonal Water health indicators that help evaluate surface Water quality; when combined with other scientific methods, these indicators may be beneficial in the ongoing management of waterbody health (Russell et al., 2020). Moggridge and Thompson (2021) put forward the concept that healthy Water is interconnected with a healthy country, healthy people and a healthy culture (see Figure 1).

Water Health includes human-Water interactions such as Water safety and drowning (Phillips, 2020). Indigenous Peoples understand that Water as a source of life not only gives life but can also take it away if Water is not respected. As such, access and 'health' are not synonymous. Health and wellness are better understood as a condition where shared responsibilities between Water and people can flourish (Chiblow, 2019; Figueroa and Waitt, 2008; McGregor, 2010; Dotson and Whyte, 2013). Indigenous women are often at the forefront of advocating for the protection of Water Health. Water Protectors include women like Judy Da Silva, who has fought tirelessly for the restoration of Water health to her home community of Grassy Narrows, where Water has suffered from mercury poisoning for decades (Simpson et al., 2009). As Indigenous Peoples our Water insecurity and the absence of Water Health has been shaped not only by our experiences of settler-colonialism but also increasingly by the effects of anthropogenically induced climate change (Hall and Crosby, 2020; Sanderson et al., 2020; Leonard, 2021b).

WATER AND CLIMATE CHANGE

In this section, we outline the inherent tensions that Indigenous communities face through the dual narratives of marginalisation and resilience. We review related historical and policy contexts that situate these stories and we highlight present opportunities in the face of climate change and our current climate

crisis. The relationship between Water and climate change for Indigenous Nations and communities engages themes that are woven throughout this article, further situating the need to support human and environmental rights and equity on an intergenerational time scale within the Water Back movement. Climatic change impacts on Water security not only threaten existing biodiversity and Water Health, but also the health of future generations of all relations. This section especially interconnects with Water colonialism, given the implications of settler-colonial and capitalist agendas as drivers of current climate crises (Whyte, 2016b; Funes, 2022). Indigenous Peoples are subjected to disproportionate effects from the impacts of climate change on Water and from the secondary impacts on beings that are dependent on Water, which are necessary for maintaining life and core cultural and ceremonial practices. We also carry critical guidance in the form of Indigenous Knowledge Systems and practices for observing and adapting to climate change (IPCC, 2014; STACCWG, 2021; Jantarasami et al., 2018). As described by Wildcat, a Yuchi scholar of the Muscogee Nation of Oklahoma,

> awareness of climate change is the result of practical lifeway experiences and sensitivity to the rhythms of seasons that make them particularly knowledgeable about what is going on where they live and Indigenous peoples draw on practical lifeway experiences – not one person's experience – but that of entire nations and communities to share multi-generational "deep spatial" Knowledges of empirical landscapes and seascapes (Wildcat, 2013: 510).

For Indigenous Peoples, climate change and adaptation discourses pose certain risks of exploitation or further marginalisation. Properly leveraged, however, they also present opportunities to assert Native claims, confront historical injustices, and expand ethics of stewardship and kinship into policymaking, which can effectively shift Indigenous Knowledges, cultures and histories from the margins to the centre (Smith, 2012; Whyte, 2013). The case studies and anecdotes included in this review highlight a handful of lived experiences which, though they are embedded in unique policy, geography and historical contexts, share similarities in terms of this duality of resilience and marginalisation.

As climate change impacts progress, there is also increasing awareness of vulnerabilities linked to colonial dispossession and environmental changes that alter landscapes and threaten Indigenous spiritual and cultural connections to territories and homelands (Abate and Warner, 2013; Garriga-López, 2019). Indigenous hydrologists and earth scientists are now leading cultural and context-rich studies on climate change-related Water impacts within our respective communities and Nations. Emanuel (2018), for example, demonstrates how climate change will potentially impact the Lumbee River Watershed and the Lumbee Tribe of North Carolina. The study findings acknowledge the particular vulnerability faced by a Tribe that is not federally recognised, due to lack of access to resources and protection. The collaborative research conducted by Tulley-Cordova et al. (2018) and Tsinnajinnie et al. (2018), in close partnership with the Navajo Nation Water Management Branch, is a strong example for Indigenous-led Water research on climate change. By working together, these partnerships between Indigenous scientists and Tribes actively address Water security concerns impacting livelihoods of those living on the Navajo Nation. Through their research on trends in precipitation and snowpack, they not only contribute to the understanding of climate change impacts on Water resources, but also empower Indigenous communities to develop effective strategies for adaptation and resilience. These partnerships foster the integration of Indigenous Knowledge Systems, ensuring that Traditional Ecological Knowledge and cultural perspectives are valued and incorporated in the face of environmental challenges.

Among climate change-related Water impacts on Indigenous Peoples, impacts on Tribes in the US that have been noted by Cozzetto et al. (2013: 570) include,

> 1) Water supply and management (including Water sources and infrastructure), 2) aquatic species important for culture and subsistence, 3) ranching and agriculture particularly from climate extremes (e.g.; droughts, floods), 4) Tribal sovereignty and rights associated with Water resources, fishing, hunting, and gathering, and 5) soil quality (e.g.; from coastal and riverine erosion prompting Tribal relocation or from drought-related Land degradation) (Cozzetto et al., 2013: 570).

Cozzetto et al. (ibid) also expressed the need for more relevant and culturally appropriate studies of Water and Land, planning and implementation of projects, and incorporation of TEK at all stages of climate adaptation processes. Apsáalooke/Crow Tribal members from the Northern Plains of North America observed how hydroclimatic impacts such as declining snowpack, warming winters, increased flooding, hotter summers, increasing wildfires, and impacts to ecosystems interact with other environmental, historical, economic, and cultural factors that shape the overall vulnerability of their Tribe and Water to climate change (Martin et al., 2020). Similar Water impacts that are connected to other factors are seen in Indigenous communities and Nations throughout various regions of the world; these include Ocean acidification, increases in plastic pollution as ice melts, and other sources of freshwater and marine pollution linked to climate change. All of these not only impact aquatic ecosystems; they also impact food sovereignty and cultural, ethical and physical forms of wellness associated with practices around traditional food (Hoover, 2017; Ngata and Liboiron, 2020). In a community-driven and Inuit-led study in Nunatsiavut, in Labrador, Canada, participants described how a mounting vulnerability to weather due to climate change required increasing attention: "You have to be more attentive to what the land is doing. Like when was the frost and how much Water did you get (…)" (Middleton et al., 2020: 113137). Riskier, or less, access to ice or to safe Water conditions due to climate events was also strongly articulated as a source of sadness, grief and an inability to feel well (Durkalek et al., 2015).

Surface Water sources in the southwestern US that are fed by snow and rainfall from mountains are few and far between. Many Indigenous communities are thus located in areas where groundwater is easily accessible through springs or shallow wells. Several place names on the Navajo Nation refer to groundwater sources that have been the primary source of Water for Indigenous communities since time immemorial. With lack of infrastructure to transport surface Water resources, groundwater continues to be the most important source of Water for Indigenous communities in the southwest. Several large aquifers, however, such as the Navajo (N-aquifer) are being depleted from extractive energy practices (Higgins, 2010). This is leaving Indigenous Nations and communities without a backup source of Water, as climate change impacts both groundwater and surface Water resources. Similarly, in the northwestern US, climate change continues to impact Indigenous communities. With the decrease in snowpack and precipitation, and the rapid glacial melts, Water resources are becoming more and more depleted. For the Crow Nation, the future of access to Water is heavily dependent on the Yellowtail Dam, whose reservoir is fed by the headwaters of the Bighorn River, which are also the headwaters of the Wind River in the Rocky Mountains (Martin et al., 2020). As Indigenous Peoples around the world face the increasing impacts of climate change on our Water and cultural practices, the Water Back movement becomes even more imperative in ensuring the preservation and sustainable management of Water for future generations.

Indigenous communities on Oceanic islands and in coastal regions are also experiencing the impacts of climate change. In Hawai'i, drying streams and more frequent flooding are already negatively affecting farmers' abilities to mālama Hāloa (perpetuate our kinship practices) by growing kalo (taro). The decreasing success rate of this culturally important staple crop exacerbates the challenges faced by families and communities in sustaining our livelihoods, including our cultural practices and identity. At the shoreline, decreasing coastal groundwater discharge is exacerbated by development-related demands for Water, which in turn affects nearshore limu (macroalgae or seaweed), fisheries and associated cultural gathering. These impacts will only intensify with climate change (Sproat, 2016). In the Caribbean region, Indigenous communities are experiencing climate change impacts on Water in the form of severe flooding and drought, rising sea levels, salinisation of freshwater used for drinking Water and crops, and loss of marine communities due to coral bleaching and Ocean acidification (UNESCO, 2020). In these regions, the physical impacts of climate change on Water exacerbate existing stressors on Indigenous communities that stem from histories of forced displacement and lack of legal title to customary Lands (Garriga-López, 2019). In these contexts, climate change is expected to intensify existing conflict and disparities (Keener et al., 2012).

Without proactive measures to combat climate change in Australia, the impacts outlined in the Intergovernmental Panel on Climate Change (IPCC) WGII Sixth Assessment Report (IPCC, 2021: 9-11) will exacerbate existing socio-economic inequalities and disproportionately affect Indigenous Peoples, further limiting our opportunities for adaptation. Further climate change is already threatening Indigenous Water security and is also threatening loss of biocultural diversity, nutritional changes through unavailability of traditional foods and forced diet change, and loss of land and cultural resources through erosion and sea-level rise documented both in Australia and the Caribbean (TSRA, 2018; Ezcurra and Rivera-Collazo, 2018). This includes episodes of high sea levels causing the buried ancestors to be exhumed from erosion and storm surge as well as other risks to cultural heritage sites along coastlines. In Australia's Northern Territory, the impacts of climate change are are occurring in the form of increased frequency of droughts and limited precipitation events for the recharge of the groundwater aquifers from which drinking Water supplies are largely drawn (Howey and Grealy, 2021).

In Aotearoa New Zealand many rural marae already face Water insecurity concerns that are likely to be exacerbated by climate change (Jones et al., 2014). Droughts have become an annual occurrence for some marae and are increasing in intensity and duration (Johnson et al., 2022). Moreover, the stress of Water insecurity often falls disproportionately on wāhine Māori caring for our whānau, and in rural communities climate change induced Water stress will further exacerbate existing inequalities and poverty (ibid). The review also highlighted the need for more research on the impacts of climate change on Māori Water relations.

Considering these impacts, both within on-the-ground community stories and in high-level scientific forums, two different discourses emerge: one of vulnerability and the other of adaptive capacity related to IKS and practices. The 2014 Intergovernmental Panel on Climate Change (IPCC) report states, for example, in regard to climate change impacts, that, "Livelihoods and lifestyles of indigenous peoples, pastoralists, and fisherfolk, often dependent on natural resources, are highly sensitive to climate change and climate change policies, especially those that marginalise their knowledge, values, and activities". Elsewhere, on climate change adaptation, it states that, "Indigenous, local, and traditional knowledge systems and practices, including indigenous peoples' holistic view of community and environment, are a major resource for adapting to climate change, but these have not been used consistently in existing adaptation efforts" (IPCC, 2014). In the global context, the IPCC and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) recognise disproportionate impacts of climate change and climate change policies on Indigenous Peoples, on our cultures, and on natural resource dependent livelihoods, while also increasingly emphasising the critical value of Indigenous and local Knowledges and practices for addressing climate change adaptation (Adger et al., 2014; Tengö et al., 2014). In the 2021 IPCC report, there is high confidence that, "Water cycle variability and extremes are projected to increase faster than average changes in most regions of the world and under all emission scenarios" (IPCC, 2021). This emphasises the importance of Indigenous and local Knowledges to understanding historical climate changes – including observation of sea level rise in Australia (Nunn and Reid, 2016) and changes in sea surface temperature and Ocean currents on the Peruvian coast and in the equatorial Pacific (Cushman, 2004) – and for enhancing climate adaptive capacity.

We also observe the need to remain attentive to which members within the community maintain these Knowledges; for example, Indigenous climate champion Hindou Oumarou Ibrahim, president of the Association for Indigenous Women and Peoples of Chad and member of the Mbororo pastoralist community, asserts that Indigenous women – as those who hold knowledge of Water and Land protection, food harvesting and traditional medicines – hold a critical role regarding the observation and addressing of climate change impacts on our communities (Portalewska, 2018). The language in the IPCC reports suggests that the global community sees Indigenous Peoples as both, victims of a climate change problem we did not create, and as keepers of Traditional Knowledge Systems that may inform and improve states' adaptive capacities (IPCC, 2021). The language used in the IPCC reports reflects a perception of Indigenous Peoples as presenting both a moral dilemma and a valuable resource. As climate

scientists increasingly engage with Indigenous Peoples in their desire to gain access to Indigenous Knowledges, extractive and colonial-informed practices have dominated; these have taken the form of, for example, externally driven research agendas and the lack of Indigenous governance of, or access to, data extracted from our communities (David-Chavez and Gavin, 2018). We must shift away from this and look to Indigenous self-determined and equitable partnerships.

As international, national and local climate adaptation policy-making proceeds, developing equitable relationships with Indigenous communities should be an important goal. Indigenous legal scholar Rebecca Tsosie pushes aside the victim/vulnerability/moral discourse and instead frames climate change as an issue of international justice. She writes that current climate adaptation strategies undermine Indigenous Peoples' rights to self-determination in a myriad of ways, including forced migration and/or challenges to political sovereignty in the case of Tribal governments interacting with the US Federal Government (Tsosie, 2010, 2013). The specifics of each case depend on Indigenous Peoples' relationship to the nation-state and on whether the community has political sovereignty and the rights associated with federal recognition or remain under ongoing colonial occupation. Regardless of political status, Tsosie argues, Indigenous Peoples have a recognised right to self-determination that is being challenged by international resistance not only to their mitigation efforts but also to their adaptation strategies (ibid). Climate justice must, "transcend narrow accounts of social justice (…) or of reparative justice for harms, such as relocations (…). Instead, national and international policies and programs should fairly consider and respect the different cultures, values, and circumstances of affected populations" (Tsosie, 2013: 10). Further, recommendations for addressing threats to local and Indigenous Knowledge Systems include ensuring, "full and effective participation and engagement of Indigenous Peoples and local communities in regional, national, and international decision-making about land, ocean spaces, natural resource management, and climate change mitigation" (Fernández-Llamazares et al., 2021: 156). The call for the full and effective participation of Indigenous Peoples in decision-making processes aligns with the principles of Water Back, which seeks to rematriate Indigenous sovereignty and agency over Water. This inclusion ensures the recognition and preservation of Indigenous Knowledge Systems, values, and rights in relation to Water.

As the climate crisis forces human societies to reflect upon our relationships with Water and nature, we observe opportunity and growing support for Indigenous-led justice- and kinship-based climate planning and adaptation initiatives. Potawatomi philosopher and scholar Kyle Powys Whyte calls attention to justice-based climate adaptation as framed around Peoples' collective continuance, sustained by relationships from the ecological to the political. As Whyte observes, justice is situated within systems of responsibilities; he further observes that climate change, "threatens collective continuance by changing the contexts in which systems of responsibilities are meaningful" (Whyte, 2013: 520). At the same time, he considers the possibility that political orders are also capable of facilitating continuance. We extend his four policies of climate adaptation to pursue a 'justice forward' approach that centres on systems of responsibilities to support the collective continuance of Indigenous Peoples. The four policy recommendations include, (1) ensuring that adaptation planning is a process of equitable codesign with Indigenous communities/governments, (2) upholding existing historical responsibilities to Indigenous communities, (3) supporting participatory research that engages multiple Knowledge Systems (scientific and Indigenous Knowledge Systems), and (4) enhancing multiparty governance and wider partnerships, given the transboundary challenges of climate change (ibid). The implementation of such arrangements requires the normally slow work of building relationships and the requisite consent, trust, accountability and reciprocity, which are easily cast aside in an urgency-filled climate response that is centred around preventing ecological tipping points (Whyte, 2019a). But what if climate action was centred around the urgency of re-establishing kin-centric relationships?

Around the globe, Indigenous-led climate adaptation and planning efforts underway and guiding resources, centre relational responsibilities to Water, kinship ties, and intergenerational accountability. Indigenous aquaculture communities in Hawai'i , for example, developed a climate change assessment

of our practice (Hui Mālama Loko Iʻa, 2020) and over 60 Tribal entities in the US have engaged in climate change assessments or action plans (ITEP, 2021). *Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu* was developed by Ojibwe and Menominee Tribal partners and the Great Lakes Indian Fish and Wildlife Commission in the US; it emphasises Indigenous language, concepts and values within climate adaptation planning (Tribal Adaptation Menu Team, 2019). This includes the importance of relational connections with more-than-human beings and strategies for maintaining or restoring Nibi (Water) quality (Tribal Adaptation Menu Team, 2019). Moving east, coastal Tribal Nations along the northeast and mid-Atlantic coastlines can apply the WAMPUM Indigenous adaptation framework for sea level rise, as guided by Indigenous responses and knowledges for adaptation; this framework includes strategies to, "witness, acknowledge, mend, protect, unite, and move" (Leonard, 2021b: 847). On the Caribbean islands, we observe pathways for climate adaptation and resilience through sustaining and regenerating IK of hurricane-adapted traditional architecture and rain-fed agricultural practices, and IK regarding ecological and astronomical indicators for determining seasonal shifts, changing weather patterns, and when to plant or harvest crops and materials (David-Chavez and Ortiz, 2018; UNESCO, 2020). In the Sahel region of Chad, Ibrahim has developed a participatory mapping approach that she describes as being able to, "leverage indigenous knowledge and nature-based solutions to protect and share fresh-Water resources, identify drought-resistant crops, and help combat climate change and desertification through sustainable pastoralism" (Ibrahim, 2021). Advancing Indigenous Water research sovereignty requires Indigenous-led partnerships of mutual benefit in adapting to climate change.

The Yukon First Nations Climate Action Fellows, who graduated in 2023 from their fellowship program, embody the concept of Water Back through their "reconnection vision". They aim to move away from an anthropocentric view of the world and instead focus on reconnecting with the Land and Water and restoring balance to the environment. Their climate action plan looks at various topics such as governance, education, food sovereignty, and resource extraction. The fellows consulted with community members, including elders and youth, to ensure that their plan is reflective of their worldview and addresses the emotional, mental, physical, and spiritual concerns of their communities (YFNCA, 2023). Their approach is based on traditional knowledge and a "two-eyed seeing" approach that combines both western and Indigenous ways of knowing. The fellows are recognized as leaders in their communities and are inspiring others to act in addressing climate change while respecting the Land and Water. Shauna Yeomans-Lindstrom (Geehaadastee), one of the fellows, explained that they prioritise Indigenous approaches to climate action by asking different questions, such as "how can we help the salmon thrive?" rather than "how much salmon can we take" (Amminson, 2023). The future of Indigenous-led climate change Water research will be more transdisciplinary, more focused on justice, more inclusive of IKS, intergenerational, and more motivated by its desire to benefit Indigenous Nations and communities.

CONCLUSIONS AND FUTURE RESEARCH

Indigenous Water research is a changing Waterscape in which Indigenous scholars continue to reclaim and re-story Indigenous Water Knowledges and traditional ways of knowing. In this paper, we outline a Water Back framework for Water research that is led by Indigenous Nations, communities and scholars as an exercise in research sovereignty. While there are many place-based and struggle-specific ways to understand Water Back, just as there are for Land Back, this review has highlighted core elements and principles of Water Back that resonate across the places, cases and movements reviewed. Indigenous Water scholarship advancing Water Back covers the thematic areas of: (1) Water Cosmology and Governance, (2) Water Colonialism, (3) Water Justice, (4) Water Responsibilities and Rights, (5) Water Health, and (6) Water and Climate Change.

The settler-colonial experience of Indigenous Peoples, landscapes and their freshwater systems are certainly nuanced, but they have striking similarities around the world. That experience has left

Indigenous Peoples ostracised from our Water relations and associated lifeways, while the landscapes and Waters themselves have been inextricably, and perhaps irreversibly changed. Add the unpredictable future of global climate systems and it is perhaps unlikely to return to our Water relations of old. The concept of change, however, is not new to Indigenous Peoples and cultures. Indeed our cultures have continually adapted in relationship to new and changed Waterscapes, landscapes, seascapes and climates. What seems evident, though, is that settler-colonial paradigms that centre utilitarian Water relations are good for neither Mother Earth, humanity, nor our more-than-human relations. Returning to Indigenous Water relations is imperative at the global scale as much as at the local scale. Water Back offers a structured platform from which Indigenous Peoples can exercise Water advocacy at the local scale, taking inspiration and insights from other Indigenous actors. Fundamental to any such platform is access to local narratives of Indigenous advocacy from around the world. Here, we profile and privilege Indigenous Water scholarship in a performative show of strength; we do so in solidarity with Indigenous Water Protectors and scholars, to bolster them and to help them build on the work of current and past Indigenous Water scholars and advocates and on that of our non-Indigenous allies. In doing so, we pay homage to their efforts and skill and to the hardships they have faced, and give comfort as we take up the torch with and amongst our own communities. A true Water Back movement should be led by Indigenous Peoples who are firmly embedded in our worldviews, beliefs, knowledges, and traditions. The neoliberal and capitalist contemporary world order seems at odds with living in good relation. By connecting with our Water relations of old and new, we adapt to an ever changing world.

Democratising Water research requires empowering Indigenous rights to self-determination and responsibilities for Water kinship and stewardship. Indigenous Water champions continue to rise to stand on the frontlines of our most pressing planetary challenges. Young people such as Xiuhtezcatl Martinez highlight that youth are not future leaders but existing Water champions. As he puts it,

> People say that we're the *future* right, that we're going to inherit this planet, and in the *future* we're going to be able to make a difference. And it's amazing to see young people stand up and say "We're not going to wait until then, we're going to do something *now*" (Martinez, 2017; see also Conrad, 2021).

These calls to action echo the messages of Indigenous youth changemaker and Anishinabek Nation Chief Water Commissioner Autumn Peltier, who in 2019, when addressing the Global Landscapes Forum at the United Nations highlighted the, "need to have more elders and youth together sitting at the decision table when people make decisions about our lands and Waters" (Erskine, 2019). Indigenous Water research can shape this desire into reality. Valuing Indigenous Knowledges for addressing global Water crises also requires valuing Indigenous researchers. Lastly, the path forward must reconcile the historical and contemporary Water injustices and colonialism that continue to obstruct Indigenous-led Water research for Water Back.

Through this process of rematriation, guided by an Indigenous relational worldview, the Water Back movement emerges as a powerful force shaping the future of Water research. It acknowledges Water as the lifeblood of Mother Earth and emphasizes the need for alliances, research sovereignty, and reconciliation to address the pressing challenges we face. By embracing reciprocity and recognizing that Water is life, the movement envisions a future where healthy lifeways and healing are intertwined with our relationship to Water. In this vision, Water rematriation becomes a transformative path, allowing humanity to be rematriated into the care of Mother Earth and her life-giving Waters. It is through this collective commitment to honouring Water as our first medicine that we can honour the Water for sustaining our collective well-being.

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SUPPLEMENTARY MATERIAL

Codebook: The codebook presented here provides a comprehensive overview of the categories contained in the database of Indigenous Water research.

The 419 references collected and analysed can be found here.

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