

DISSERTATION

HOW THE PENDULUM SWINGS: CONSERVATION AS A TOOL TO BOTH REINFORCE
AND DISRUPT COLONIAL SYSTEMS OF OPPRESSION

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ABSTRACT

HOW THE PENDULUM SWINGS: CONSERVATION AS A TOOL TO BOTH REINFORCE AND DISRUPT COLONIAL SYSTEMS OF OPPRESSION

Elevating Indigenous leadership in conservation science is critical for social and ecological resilience and recovery. However, Indigenous conservation governance is frequently undermined by persistent colonial research standards. In response, calls to implement ethical guidelines that honor Indigenous rights are mounting. Despite this growing movement, most conservation studies continue to follow largely colonial, extractive models, presenting a widening gap between ethical guidelines and practical applications across diverse research contexts. To help bridge this gap and contribute to the development, application, and evaluation of ethics in conservation practice, my dissertation offers: 1) a primer of the histories and contemporary paradigms that continue to hinder justice in conservation research and practice, 2) ethical guidance and relational evaluation attuned to Indigenous and communal conservation contexts, and 3) a case study example of transdisciplinary approaches to wildlife conservation, grounded in relational accountability to Indigenous and communal rights-holders. My dissertation research draws from Indigenous and multicultural values and methodologies that aim to re-center relationships, with outcomes represented through research, story, and art. Through diverse modalities, this body of work seeks to provide an entry point for cultivating a deeper understanding of justice and decolonization in conservation while offering guidance, recommendations, and examples for researchers, scholars, community members, and institutions to reaffirm Indigenous rights and improve relations with Indigenous stewards, thereby strengthening collective conservation visions and futures.

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POSITIONALITY

I am a US academic based at the land grab institution of Colorado State University, which continues to deny the inherent rights of the Ute, Arapaho, and Cheyenne and many other Nations and peoples throughout the region (Lee & Ahtone, Tristan, 2020). I also call the Pacific Northwest home, specifically Portland, Oregon, whose lands, mountains, rivers, lakes, and oceans have and continue to be home to many Indigenous Nations, including the Multnomah, Wasco, Cowlitz, Clackamas, Bands of Chinook, Tualatin, Kalapuya, and Molalla, among more, despite the ongoing pollution of ancestral waterways among numerous other violations to Treaty and Indigenous rights. Living on these lands I am reminded that the landscapes are in good company, and that I have a hugely important responsibility (and honor) to all beings and kin, to be in good relation, rather than a conduit for continued systemic and institutionalized oppression.

My research lens is shaped by my lived experience navigating a white academic culture as a queer brown woman of diaspora who has witnessed and experienced outcomes of colonialism. Specifically, colonial and patriarchy violence removed my maternal family of farmers and land stewards from their ancestral territory in what is now called Puducherry, India. My mother, who maintains these cultural and familial connections at a distance through mind, body, and spirit, was adopted by US-based Christian missionaries with ongoing attempts to assimilate her to white American culture. Despite these disruptions, my mother has always reaffirmed and helped cultivate my own connection to land and ways of being through her continued embodiment of home. Through my maternal connections, I also bare the pain and loss of a multi-generational lineage rich in community care and nurtured landscapes. My story, my mother's story, and the stories of so many others forced from ancestral homelands complicate

conceptions of “Indigeneity” (*who are we separated from our homelands, communities, and ancestors?*). However, returning to ourselves and ways of being despite colonial separation is a powerful act of resurgence and recovery across all our identities and connected landscapes.

Now, in diaspora, I have come to hold the complexity of US citizenship, coupled with the loss of homelands. I also hold the privilege of proximity to white, Christian family, alongside the isolation and dismissal of the cultural richness and my own queerness that they will never know. However, I remain resilient and steadfast, knowing that each day I am alive is a testament to the histories and realities that came before me. Including through my paternal lineage, as western European settlers, with mixed privileges through wealth, whiteness, and education. My father, a laborer and activist, never hid these parts, but instead helped to cultivate a critical lens. As my father's daughter, I look, in part, through a prism of whiteness that can distort my vision. Though, it can also illuminate it by exposing the unnamed and insidious features of coloniality and white supremacy. After all, my father has always spoken truth to power and my mother has always breathed and cultivated new life into this world. I hold these two lenses, the hatchet that embodies the tools we need to break down (dismantle) systems of oppression, and the seed of healing and resilience that grows from this newly exposed soil, ready to take root.

Holding these two pieces together, the hatched and the seed (Robbins, 2020), I turn my gaze onto the systems, institutions, and cultural norms that uphold harmful systems of oppression, to shed light on how these systems harm all those within and in relation to them. I also turn my heart and spirit towards recovering relations and connections to place, across diverse Indigenous, diasporic, and otherwise disconnected communities – through honoring inherent rights and strategizing pathways to recover lands, waters, knowledges, and lifeways. As such, my lens is informed by intergenerational trauma and conceptualizations of healing and

rematriation, despite displacement—for my mother, my sister, my nieces, the grandmother I never got to meet, and the lineage of women fighting for justice across colonial borders.

INTRODUCTION

“Research is one of the ways in which the underlying code of imperialism and colonialism is both regulated and realized” (Smith, p. 8, 2021)

Indigenous Peoples have been stewarding landscapes since time immemorial through diverse and adaptive systems of knowledge and ways of being (Fernández-Llamazares et al., 2021; McGregor, 2004; Whyte, 2018b). Colonialism and the oppressive structures on which it relies have been hugely disruptive to relational dynamics that sustain ecosystems and communities across the globe (Eichler & Baumeister, 2021; Gilio-Whitaker, 2019; Whyte, 2018a). Although colonization represents merely a blip across the expansive histories and current realities of Indigenous Nations, institutions today continue to prioritize colonial systems that serve only a small minority of people (Hird et al., 2023; Zinn, 2011). In response, the global majority has been denouncing and actively fighting against colonization since its inception, backed by numerous international legal and policy instruments (Carroll et al., 2020; Garba et al., 2023; International Labour Organization, 1989; Organization of American States, 2016; United Nations General Assembly, 2007). My dissertation aims to align with the ongoing fight against colonization, seeking to speak to institutions, colleagues, and communities that strive for change through our own unique, but intersecting roles and strategies. This body of work does not seek to convince the reader of the value of Indigenous knowledge systems and governance to securing social and ecological resilience given the expansive culmination of evidence that supports this already (Fernández-Llamazares et al., 2021; Fisk et al., 2024; Lake & Christianson, 2019; Leonard et al., 2023; Status of Tribes and Climate Change Working Group, 2021, 2025; Waller & Reo, 2018; Whyte, 2018b). Rather, my dissertation

aims to outline tools, strategies, and insights to broadly answer the question, *“how can we move thoughtfully and determinedly towards environmental research and practice grounded in ‘good relations’ for our communities, cultures, and landscapes?”*

In the context of my dissertation research, “good relations” represents both the antithesis of the conventional, extractive, and colonial modes of engagement (David-Chavez & Gavin, 2018) alongside the movement towards an Indigenous, anti-colonial, and reciprocal engagement model (Arcand, 2024; David-Chavez et al., 2024; Smith, 1999; Zanotti et al., 2020). Grounded in a relational framework (David-Chavez et al., 2024; Kūlana Noi‘i Working Group, 2021), my dissertation research seeks to account for both the histories and ongoing realities of oppression (the “hatchet”), as well as attune to Indigenous models of recovery and rematriation (the “seed” of this work) (Robbins, 2020). Related to the “hatchet” of decolonization, my dissertation research emphasizes the role of colonization and intersecting oppressions, such as white supremacy, patriarchy, imperialism, and capitalism, as the underpinning levers of violence that aim to disempower and erase Indigeneity and communal lifeways (Layden et al., 2025; Smith, 1999; van Uitregt, 2021; Zanotti et al., 2020). My dissertation research also focuses on Latin American contexts, which brings in additional considerations regarding conceptions of “Indigenous” prevalent in the Global South. Specifically, Indigenous histories, realities, and associated rights are made complex by the pervasive displacement, dehumanization, and attempted erasures of Indigenous communities in Latin America and worldwide due to both local and imperial political agendas (Fox, 2024; Menchú et al., 1992; Ybarra, 2018). However, there are critiques for conflating Indigenous Peoples with a vaguely described “local community” as this can undermine distinct cultural, land-based, and intellectual property rights, while mainstream definitions of “Indigenous” can also be exclusionary of Afro-Indigenous and displaced or diasporic communities

(Huambachano et al., 2025). Therefore, my dissertation research aims to be specific where possible and prioritize how communities self-identify to align with locally relevant strategies for reaffirming individual and collective rights.

To help understand and navigate the complexities embedded in my dissertation research and nurture my research “seed,” I employ several tools and strategies that strengthen reflexivity and emergence in research to decenter academic authority and recenter Indigenous expertise and lived experiences (Beck et al., 2021; Mao et al., 2016; Rose, 1997; Zanotti et al., 2020). For example, throughout the research process, I employ reflective journaling questions as well as art as methodology. As stated by Dr. Gregory Cajete (Tewa), the “way of doing and relating to art,” like the *process* of conducting research, is “infinitely more important than the product” as “the sacred level of art not only transforms something into art, but also transforms the artist at the very core of [their] being” (Cajete, 2000, pp. 46–47). In this way, art becomes a means of both transformation and emergence – to deepen understandings and relationships through building connections and fostering self-awareness (Skukauskaitė et al., 2022). Reflexivity and art-based processes also helped nurture an iterative and emergent approach to the research process, in alignment with grounded theory methods of inductive analysis, such that research processes and outcomes are created from the cultural contexts and values in which they are embedded (Charmaz, 2017). Approaches for building self-awareness are crucial for multi- and inter-cultural partnerships to promote accountability and responsibility to Indigenous rights-holders (Latulippe & Klenk, 2020; Merriam et al., 2001).

Stemming from a relational and culturally-grounded framework, my dissertation research aims to 1) summarize the histories and ongoing realities of colonial oppression embedded in conventional conservation and environmental practice, 2) outline ethical approaches for addressing

and responding to power dynamics and oppressive systems that continue to erode good relations, and 3) offer a case study of relational, transdisciplinary, and community-led approaches to environmental research and practice. Each of these chapters builds off one another to offer unique insights and strengthen collective knowledge-building or “coming to know” (McGregor, 2004). To begin, Chapter 1 synthesizes diverse bodies of work to outline conventional conservation’s connection to historic and ongoing manifestations of systems of oppression, such as settler colonialism (Layden et al., 2025). To conclude, this chapter also provides several recommendations and conceptual diagrams for envisioning and developing a relational, decolonial conservation practice. Chapter 2 applies the critical framing and recommendations outlined in Chapter 1 by expanding on the ethical foundation of a conservation project conducted in community contexts, including through relationally grounded research evaluation. Chapter 2 specifically details the design and evaluation of a wildlife conservation research project based on the Relational Science Model, which provides guidance for improving research relations with Indigenous Peoples (David-Chavez et al., 2024). The evaluation design for this study focuses on the results of a post-survey from the perspectives of the intended project beneficiaries of La Bendición in southwestern Guatemala, accompanied by researcher reflections and observations developed through reflexivity methods (Layden et al., 2024). Chapter 3 provides specific methods and outcomes related to the field research evaluated in Chapter 2, expanding on the transdisciplinary and community-led field work efforts and co-creation approaches, while sharing further experiences and recommendations across our diverse collaborations. Together, this collective body of work emphasizes the role of research processes, and the relationships embedded within these processes, as essential to cultivating meaningful and multidirectional research benefits and outcomes (Figure 1).

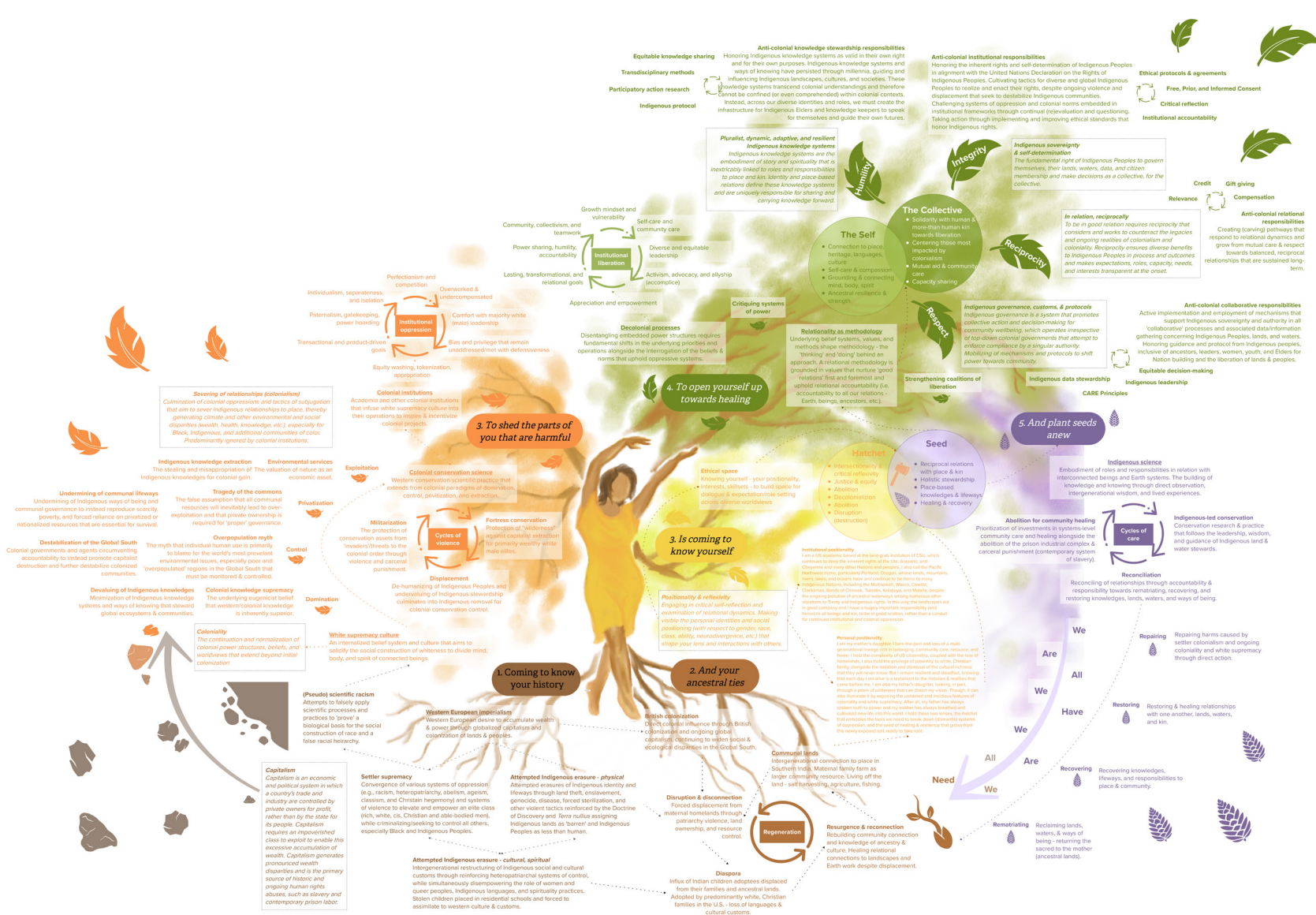


Figure 1. Conceptions & visions for a decolonial conservation future. Digital art was created by author using Sketchbook and Mural.co ([Tinyurl.com/DecolonialConceptMap](https://tinyurl.com/DecolonialConceptMap)) in partial fulfillment of their preliminary exam.

CHAPTER 1: Confronting colonial history: Toward healing, just, and equitable Indigenous conservation futures¹

“Decolonising practices within research methods are not only a matter of naming colonialism and critiquing it: they entail an active engagement with a mirror in which to reflect and interrogate our own actions and motives as researchers.” (Estrada, p. 8, 2005)

1. Introduction

As concerns for the health and well-being of our planet and all its relatives (both human and more-than-human) continue to rise, collective calls for environmental and social justice are culminating. There is growing agreement that the issues affecting our planet are not scattered and isolated, but systemic, deeply rooted, and interconnected across diverse institutions, disciplines, and practices. Scholars and activists have identified historic and ongoing colonial systems of oppression as driving many of the social and environmental disparities we see today (Tuck and Yang 2012, Whyte 2018a, Gilio-Whitaker 2019, Eichler and Baumeister 2021, Curley et al. 2022). These colonial systems of oppression, which include settler colonialism, patriarchy, imperialism, capitalism, and white supremacy, among others, often converge to mutually reinforce the subjugation of peoples, animals, lands, and waters. More specifically, settler colonialism has been the pioneering force from which other oppressive systems often follow or build upon with the aim to sever Indigenous relationships with place (Table 1). As such, it is important to center settler colonialism and underlying colonial logics (i.e., logics that seek to minimize and erase Indigenous Peoples and ways of being) when addressing environmental and

¹ **Published:** Layden, T. J., David-Chavez, D., Galofré García, E., Gifford, G., Lavoie, A., Weingarten, E., & Bombaci, S. (2025). Confronting colonial history: Toward healing, just, and equitable Indigenous conservation futures. *Ecology and Society*, 30(1), art33. <https://doi.org/10.5751/ES-15890-300133>

social injustice. For example, Kyle Powys Whyte (Potawatomi) clearly demonstrates the centrality of settler colonialism, stating that it “can be interpreted as a form of environmental injustice that wrongfully interferes with and erases the socioecological contexts required for indigenous populations to experience the world as a place infused with responsibilities to humans, nonhumans and ecosystems” (Whyte 2016:3). Consequently, as the systems that reinforce settler colonialism persist and spread through imperialism and globalized capitalism, social and ecological relationships that support healthy and resilient ecosystems and peoples become further jeopardized on a global scale. Without fully understanding both the source and extent of settler colonial influence, disciplines that may aim to maintain and improve ecological well-being, can instead act as an arm of settler colonial destruction. Therefore, practitioners and scholars nested within environmental institutions, organizations, and governments, especially those based in the imperial core of the United States, have an undue responsibility to engage all relevant histories to fully understand and work to address the coupled social and ecological injustices driven by settler colonialism.

The fields of conservation and environmentalism more broadly have been continually critiqued for upholding and institutionalizing oppressive colonial ideologies (Dowie 2011, Whyte 2018a, Gilio-Whitaker 2019, Eichler and Baumeister 2021, Hessami et al. 2021). In response, however, energy has largely been allocated to initiatives and projects that do not directly hold institutions accountable and instead remain merely aspirational in their actualization of justice (Tuck and Yang 2012, Hird et al. 2023, Tripathi et al. 2023). Rather than working to solve systemic issues, these often superficial initiatives have instead perpetuated a mismatch between decolonial recommendations and practice, underscoring the fundamental need to disentangle past and remnant harms in order to truly divest from what we refer to as the

conventional (settler colonial) conservation model and instead invest in healing conservation futures. Although scholarship addressing equity and justice in conservation and environmentalism is growing (Eichler and Baumeister 2021, Busck-Lumholt et al. 2024), the scope of history covered remains limited, largely relying on readers to already have a grasp of the contexts that shape these fields and underlying disparities. Meanwhile, although these broader historic references are vast and ever-increasing, they remain scattered and often decontextualized across various bodies of work and disciplines. This lack of fundamental training and guidance poses an immense challenge for conservationists (practitioners, scholars, researchers, and professionals alike who are entangled with conventional conservation) to build the foundation of knowledge needed to more effectively center anticolonial and decolonial processes in practice. Without deepening field-specific decolonial understandings, conservationists, even those who value justice, risk unknowingly perpetuating oppressive paradigms embedded within the field, such as by focusing on recruiting (assimilating) minoritized individuals into an oppressive field before working to uproot harmful settler colonial constructs (Hird et al. 2023). Taken as a whole, cultivating a decolonial lens offers an opportunity to reconstruct and reenvision conservation roles and futures outside the field's pervasive colonial legacy and toward collective benefit.

In response to the growing need to contextualize decolonial guidance, here we bring together diverse bodies of knowledge and key references to reframe and re-orient conventional conservation practice. We define justice in the context of conservation as the healing and restoring of Indigenous relationships to lands, waters, and beings through field-specific anti-colonial and decolonial processes (Montgomery and Blanchard 2021). Orienting toward this definition of justice requires that we “frame issues in terms of their colonial condition” (Gilio-

Whitaker 2019:25) by offering an expansive lens that “sheds a different light on the processes of history, providing irrefutable linkages between all eras and aspects of settler and Indigenous contact” (Gilio-Whitaker 2019:39). To achieve broadscale conservation justice also requires expanding conceptions of Indigeneity to be inclusive of Indigenous African Peoples exploited for chattel slavery, and Indigenous Peoples exposed to displacement, assimilation, adoption, and other forms of identity and land theft, such as through settler colonial legal or conceptual frameworks (e.g., blood quantum, reservation status, etc.) or after crossing colonial borders (Mays 2021, Curley et al. 2022). In this way, approaches to healing and justice can be transcendent across diaspora and inclusive of both Indigenous sovereignty and abolition to achieve, “a shared future-oriented solidarity that must understand history ...” (Mays 2021:16) across our various forms of oppressed and privileged identities to move toward collective resistance (rebellion, even) against settler colonialism and all its derived forms of oppression (Mays 2021, Curley et al. 2022).

In this synthesis, we explain settler colonial conservation’s proximity to pivotal developments in colonial control of Indigenous Peoples and landscapes across the Americas (Figure 1) and offer ways in which conservationists can work toward a more restorative future (Figure 2). Proceeding this introduction, we highlight Indigenous lifeways and knowledges as persistent through and beyond colonial narratives. We elaborate on the origins of settler colonialism in the U.S. and discuss conservation’s settler colonial and imperial legacies across the Americas. We assess contemporary manifestations of settler colonialism within the field, with implications to global landscapes. Finally, we offer strategies to apply anti-colonial and decolonial processes in conservation practice in support of Indigenous leadership and futures. These topics aim to provide a gateway toward deepening decolonial understandings in

conservation while guiding the reader toward envisioning their role and sphere of influence within these larger systems. Overall, developing an understanding of the intersections between settler colonialism and conventional conservation generates pathways toward healing Indigenous landscapes and lifeways.

Table 1. Glossary.

Term	Definition
<i>Indigenous Peoples</i>	Peoples and their collectives (Indigenous Nations) who share intergenerational cultural or kinship ties with the pre-colonial stewards of ancestral lands and waters in a specific region of the world, holding distinct rights-based status irrespective of recognition by colonial governments (United Nations General Assembly 2007, David-Chavez and Gavin 2018, Whyte 2020, Wheeler and Root-Bernstein 2020)
<i>Indigenous knowledges/ Indigenous knowledge systems/ Indigenous ways of knowing/ Indigenous science</i>	Dynamic systems of knowledge collectively held and renewed by Indigenous community members that draw from intergenerational, place-based, culturally grounded relationships and experiences, which inform interactions between living beings and their surrounding environment (Cajete 2000, Whyte 2013, David-Chavez and Gavin 2018, Thompson et al. 2020, Wheeler and Root-Bernstein 2020)
<i>More-than-human kin</i>	Nonhuman life, plants, rivers, and other parts of the ‘environment,’ which are closely tied to Indigenous (human) relatives through shared habitats, responsibilities, and reciprocal relationships. A term based in Indigenous ontologies that refers to the beingness of our surroundings (Kimmerer 2013, Stoffle et al. 2016, Gilio-Whitaker 2019, Whyte 2020)
<i>Indigenous sovereignty</i>	The international recognition of Indigenous Nations as political bodies that hold inherent power to govern themselves, their lands, waters, data, and citizen membership (Darian-Smith 2010, Rodriguez-Lonebear 2021)
<i>Abolition</i>	The complete uprooting and eradication of the settler carceral state structures, institutions, and policies that produce violence against Black, Indigenous, and additional people of color and other minoritized identities (Davis 2003, Curley et al. 2022)
<i>Settler colonialism</i>	A social and political structure that relies on interrelated systems of violence and oppression to remove Indigenous Peoples from landscapes to stabilize an illegitimate settler sovereignty (Wolfe 2006, Tuck and Yang 2012, Whyte 2018b, Mays 2021, Curley et al. 2022, Hird et al. 2023)

Term	Definition
<i>Colonial science</i>	A relatively small subset of knowledge characterized by a positivist approach that emphasizes objective empirical measurements, written and quantitative evaluation of abstract principles to test hypotheses, and is deeply intertwined with colonial processes, including separation of people from place (Agrawal 1995, Simpson 2004, Baker et al. 2019)
<i>Conventional/ settler colonial conservation</i>	Conservation of lands, waters, and wildlife stemming from a positivist praxis and is centralized and associated with colonial and imperial attempts to increase settler statehood, sovereignty, and dominion over Indigenous landscapes (Agrawal 1995, Simpson 2004, Baker et al. 2019)
<i>Imperial/ neoliberal conservation</i>	Globalization and expansion of settler colonial conservation through market-based capitalism and militarized approaches (Dowie 2011, Adams 2017, Kashwan et al. 2021)
<i>Settler nativism</i>	Assumed Native identity by settlers, while envisioning a settler-as-native future (Tuck and Yang 2012, Eichler and Baumeister 2021)
<i>White supremacy</i>	A false ideology that white people and their ideas, thoughts, beliefs, and actions are superior to that of people of color (Bonnett 1997, dRworksBook 2021)
<i>Racism</i>	A social and institutional system of power and race-based prejudice. A system of advantage and oppression based on the social construction of race and white supremacist ideology to preclude cross-racial solidarity (Bonnett 1997, Vaughan and Allen 1999, dRworksBook 2021)
<i>Patriarchy/ heteropatriarchy/ heteropaternalism</i>	A system of control based on the perceived normalization of cis-male dominance, heterosexuality, nuclear-domestic arrangements, and gender binaries (Allen 1992, Arvin et al. 2013)
<i>Rematriation</i>	An Indigenous and decolonial framing of repatriation that specifically honors Mother Earth and Indigenous women. Rematriation involves the reclamation and revitalization of Indigenous lifeways, cultures, customs, spiritualities, knowledges, and reciprocal relationships to lands and waters through the resurgence of Indigenous sovereignty and self-determination (Tuck and Yang 2012, Kermoal and Altamirano-Jiménez 2016, Middleton Manning 2019, Leonard et al. 2023, Wilber and Lane 2023)
<i>Decolonization</i>	The uprooting of colonial legacies through intentional rematriation and healing of relationships (Tuck and Yang 2012, Shiva 2020, Smith 2022)
<i>Anti-colonial</i>	The active resistance against and disruption of colonial systems of power and oppression and their manifestations in individual and collective actions, relationships, and thinking (Liboiron 2021, Curley et al. 2022, Schneider 2022)

2. Sustained Indigenous knowledges and lifeways

In contradiction to pervasive colonial myths, many Indigenous Peoples have been developing long held and deeply reciprocal relationships with their environments since time immemorial. Before the invasion of the Americas, Indigenous Peoples occupied every area of land across the region, establishing extensive networks of travel and trade (Dunbar-Ortiz 2014, Farrell et al. 2021). Through millennia, many Indigenous Nations and Peoples have also been developing mutually sustainable relationships with place and more-than-human kin, cultivating, adapting, testing, and refining robust, evidence-based knowledges of earth, water, and life (McGregor 2004, Fernández-Llamazares et al. 2021, Eichler and Baumeister 2021). Some models of Indigenous stewardship strategies and responsibilities to land and waters include sustainable hunting and fishing practices, fire treatments, erosion prevention, soil enhancement, agricultural techniques, management for mature and diverse forests, among more (Waller and Reo 2018, Whyte 2018b, Lake and Christianson 2019, Fernández-Llamazares et al. 2021, Whyte et al. 2021; Borrero 2020). For example, the Kwakwaka'wakw Peoples in what is now known as British Columbia are well practiced in marine farming techniques spanning generations, including by nurturing clam gardens that provide ideal habitat for butter clams and other edible shellfish (Deur et al. 2015). The Kwakwaka'wakw Peoples' stewardship continues to increase productivity and resource security and has for thousands of years, all the while supporting healthy marine ecosystems. On lands, the Karuk Tribe in what is now known as California represents another sustained stewardship example, enhancing forest food systems through systematic fire regimes, with as much as 75% of species that the Karuk Tribe relies upon benefiting from these fire treatments in some way (Whyte 2018b). Meanwhile, there are thousands more diverse Indigenous Nations and Peoples across the globe that continue to

steward landscapes and strengthen their ancestral and cultural lifeways despite settler colonial opposition and disruption (Fernández-Llamazares et al. 2021). As we continue to develop our understanding of the damage caused by settler colonialism, we respect and honor the persistence, resurgence, and recovery of Indigenous knowledge systems and lifeways first and foremost.

3. Colonization, white supremacy, and the making of so-called “America”

To understand the links between settler colonialism and the conventional conservation model first requires an understanding of the foundational logics and systems of oppression that have and continue to disrupt Indigenous lifeways. Because settler colonialism fundamentally seeks to replace Indigenous Nations with illegitimate settler-states (i.e., outside governments attempting to usurp power, resources, and control of established Indigenous Nations), it relies heavily on structures of violence and oppression (Hird et al. 2023). We see this reflected in the building of what is now known as the Americas where, throughout history, settler colonial processes have repeatedly attempted to replace Indigenous sovereignties, ontologies, and cosmologies with those of settler society. As expressed by Paula Gunn Allen, “To that end the wars of imperial conquest have not been solely or even mostly waged over the land and its resources, but they have been fought within the bodies, minds, and hearts of the people of the earth for dominion over them” (Allen 1992:214). Although colonization and U.S. imperialism have plagued every continent of the world and share common features across time and space, here we focus on the colonial practices that informed the tenets of North American institutions, including conventional conservation, and the actualization of power and control over people, lands, and waters.

3.1. Colonization of the Americas and Indigenous resistance

Numerous mechanisms bolstered settler sovereignty and reinforced a logic of elimination (in that, Indigenous Peoples must be removed for settler colonialism to persist) that fueled colonization across the Americas, including capitalism backed by settler colonial law (Wolfe 2006). Capitalist ideals of progress, extraction, and exploitation have been used to fundamentally restructure landscapes as well as human relationships with each other, land, waters, and more-than-human kin (Whyte 2018a). Simultaneously, violent colonial tactics in the making of so-called America have been justified through the European-created and Christian-sanctified Doctrine of Discovery (Miller et al. 2010), which remains as International Law to this day (Getches et al. 2017). This doctrine gives legal precedence for explorers to claim “wildland” as “land belonging to no one” (Terra nullius), prescribing concepts of ownership across the world, while concurrently attempting to invalidate Indigenous customary rights and stewardship of lands and waters by deeming Indigenous Peoples as less than human (Wolfe 2006, Hendlin 2014).

Colonization of the Americas in the late 15th century was inspired by the capitalist urge for resources and labor and was endorsed by the Spanish monarchy and the Catholic Church (Wolfe 2006, Zinn 2011). In the words of Roberto Mukaro Borrero, a Taíno scholar and community leader, “the Spaniards didn’t come over to this side of the world [the Americas] to plant beans, they came over to get gold” (Borrero 2020). The Taíno (Island Arawak) were the first peoples to greet the Spaniards, offering them gifts, food, and water, while adorned in gold ornaments (Zinn 2011). The Spanish conquistadores, emboldened by a sense of superior civility, considered the ways of the Taíno Peoples, such as their well-established societies, complex networks of trade, and frequent bathing, “beneath” their comprehension (Borrero 2020). In

response, the Spaniards used military forces financed by Western Europe to brutalize and enslave many Taíno Peoples, including women and children for sex and labor, in pursuit of material wealth (Forte 2006, Zinn 2011). Despite this extreme violence, Taíno Peoples, such as the Taíno cacique (chief) Anacaona, worked to implement diplomatic solutions to this invasion (Barreiro 2012), alongside numerous acts of resistance and rebellion. For example, many enslaved Taíno Peoples refused to plant their annual crops, resulting in severe starvation of the Spaniards who otherwise could not grow food (Paravisini-Gebert 2016). Meanwhile, other Taíno caciques, such as Enriquillo and Hatuey, led recurring, and in some cases successful, rebellions against the Spanish invasion, despite fierce militarized opposition (Forte 2006, Zinn 2011, Barreiro 2012; Borrero 2020). These rebellions, however, did not discourage the English from replicating this regime in North America nearly a century later, building the foundation for prominent colonial institutions that remain steadfast to this day.

Over the last 500 years since the origination of the Americas, Indigenous Peoples have been targeted by a settler colonial elimination agenda to build what is now known as the United States. During this time, cruel and violent tactics were enabled by Manifest Destiny—a settler colonial concept first coined in the mid-1800s to justify westward expansion in the name of God, and resulted in the exploitation of Indigenous lands, labor, women, children, animals, and the land (Getches et al. 2017). The Manifest Destiny rhetoric promoted the replacement of Indigenous Peoples with European settlement in North America and became the toehold for the U.S. Federal Indian Law and Policy, which aimed to fracture Indigenous relationships to lands and waters. For example, treaties (government-to-government agreements) that recognize select Indigenous Nations as sovereign were often coerced with the intention of broadening colonial control (Getches et al. 2017). However, many Indigenous Nations strategically ingrained their

fundamental rights within these agreements, breathing life back into them through the generations despite continued colonial attempts to undermine Indigenous governance structures (Wilber and Lane 2025). Other legalized acts of attempted Indigenous genocide included the Indian Removal Act of 1830, which led to forced marches of Indigenous Peoples in the Trail of Tears, sterilization without consent, starvation, displacement, war, and rampant disease (Wolfe 2006, Zinn 2011, Whyte 2018c, Gilio-Whitaker 2019). Indigenous lands were also targeted through the creation of the Indian reservation system in 1851, followed by the end of treaty making in the U.S. in 1872, and the Dawes Act of 1887, which inaccurately assigned blood quantum to create categories of “Indian-ness,” and expedited sales of Indigenous land through allotments to settlers as private property (Rodriguez-Lonebear 2021, Schneider 2023). Indeed, westward expansion together with U.S. law have continued to work jointly to gain control of Indigenous lands and resources through the centuries, with every treaty ever made between the settler colonial government and Indigenous Nations broken in some way (Getches et al. 2017, National Park Service 2022). Consequently, the U.S. settler state has dispossessed over 98.9% of Indigenous lands to create an idealized America as a New World for European prosperity (Wolfe 2006, Getches et al. 2017, Farrell et al. 2021).

Alongside these direct and often physical attempts at Indigenous genocide and land theft came the frequent targeting of Indigenous social and cultural customs. One example of attempting to distort Indigenous customs was through shifting matriarchal and spiritually pluralistic governance systems to a heteropatriarchal (supreme male) system of control (though, many Indigenous Nations still maintain matriarchal governance systems and spiritual practices to this day; Allen 1992, Lugones 2016). This colonial tactic of patriarchal supremacy served to disempower those who did not identify as male from economic and political gain as well as

suppress unique community roles and responsibilities to privilege a singular and elite male class instead (Allen 1992). The subjugation of Indigenous cultures and customs became quickly institutionalized through boarding schools that sought to erase Indigenous languages, spiritual practices, and community roles, while simultaneously degrading the status of women (Whyte 2018a, Bacon 2019). Colonial assimilation tactics also aimed to depreciate common Indigenous sexuality customs and gender pluralities, and, in turn, corresponding responsibilities within communities (Allen 1992, Lugones 2016). Pre-colonization, homosexuality and two-spirit peoples were nearly universal across Indigenous Nations, associated with key community contributions alongside elevated respect and honor (Allen 1992, Gilley 2006). In Anishinaabe communities, for example, two-spirit people would assume special roles, such as tending fire, leading ceremonies, and community healing (Chacaby and Plummer 2016). However, as expressed by a two-spirit individual, the “stigmatism on homosexuality is at the heart of the decline in our roles” (Gilley 2006:59). Through the settler colonial process that prioritized (and enforced) heterosexuality and a gender binary, homophobia and heteropatriarchy spread alongside Christianity (Allen 1992, Gilley 2006). Now, many two-spirit Indigenous Peoples fear, instead, that their social standing and respect will become replaced by alienation should their full identity become known within their community (Gilley 2006). The pervasive restructuring of gender and governance was used as a weapon against Indigenous ways of being and existence in and of itself and continues to shape prevailing colonial norms in conservation and related fields (Allen 1992, Lugones 2016, Collins et al. 2024).

3.2. Inception of white supremacy on colonized land and Afro-Indigeneity

In addition to attempting to eliminate Indigenous Peoples from landscapes, the European conquest for settler sovereignty created the most insidious ideology: white supremacy. This

social construction was used to further embed the role of ownership beyond land to people and instill a logic of settler superiority into the colonial legal framework (Finney 2014, Lugones 2016, Taylor 2016, Getches et al. 2017, Gilio-Whitaker 2019). European elites had been well practiced in the control of people for capitalist gain before transferring systems of slavery to the Americas. The inception of private property and commercial industry in Europe displaced subsistence farmers, propagating poverty across Europe (Harvey 1974, Zinn 2011, Dunbar-Ortiz 2014). Many displaced farmers became indentured servants, promised settlement in North America in the early 1600s (assuming the absence/removal of Indigenous Peoples), but instead they experienced severe starvation on unfamiliar lands, even resorting to cannibalism (Dunbar-Ortiz 2014). With the exploitation of knowledge, labor, and land already entrenched in the colonial model to remedy settler struggles, enslavement of Indigenous African Peoples became an inviting means of bolstering this regime. This system of enslavement, which ripped Indigenous African Peoples from their ancestral lands, belongings, and familiarities, provided a foundation of vulnerability for exploitation (Zinn 2011, Williams and Holt-Giménez 2017). Enslaved Indigenous African Peoples also brought with them extensive agricultural and technical expertise of soils, water, herbal remedies, and several food crops (Williams and Holt-Giménez 2017). For example, South Carolina's hugely profitable rice industry was built from the stewardship knowledge of enslaved Indigenous African Peoples (Carney 2001). Displaced Indigenous African Peoples also found success through their resistance, such as through cultivating what is now the Great Dismal Swamp National Wildlife Refuge. This swamp, though extremely hazardous, became a place where runaway enslaved Indigenous African Peoples could grow crops, hunt, and build refuge (Finney 2014). These unified acts of resistance were not uncommon as "Black and Indigenous people used a variety of modes of resistance to obtain their

freedom and to create the steps for liberations. They used nationalism and sovereignty, violence, the breaking of tools and poisoning of masters, the law, writing and forms of solidarity...” against their oppressors (Mays 2021:22).

In response to ongoing rebellions, European colonizers devised a false means of superiority to divide the laboring class and attempt to subdue the profound resistance embodied by diverse Indigenous Peoples and non-Indigenous comrades. Starting with the first permanent English colony in Jamestown, Virginia in 1619, Indigenous African Peoples worked side-by-side with indentured European servants, until white elites stoked a racial divide between them to prohibit cross-racial solidarity and rebellion of the laboring class (Allen 1994). For example, those who would revolt would receive higher penalties if they were Black, with additional penalties for white people who conspired with enslaved Black people (Zinn 2011). As instances of unified rebellion increased, white supremacy became codified, incentivizing white indentured servants to “stay in line” or police their Black neighbors through slave patrols. In this way, the legal privileging of whiteness, coupled with the simultaneous penalization of Blackness, became a means of controlling white and Black collaboration for the benefit of capitalist expansion (Zinn 2011). Additionally, colonizers used similar tactics of subjugation and brutalization of Black women to reinforce the growing heteropatriarchal system of control. For example, Black women sold into slavery were sold as wives, assuming the role of sex slave, companion, child bearer, and caretaker, often from a young age (Zinn 2011). Rape of Black women, coupled with the “one drop rule” that dictated that any amount of Black ancestry (i.e., even a single drop of “Black blood”) determined someone’s identity as Black, served to create an unending and automatically enslaved laboring force (Allen 1994, Davis 2001, Wolfe 2006, Tuck and Yang 2012, Lugones 2016, Saini 2020). Therefore, the construction of the U.S. and its institutions and upper-class

wealth were materially and ideologically predicated on the subjugation of Indigenous women, the exploitation of Indigenous bodies and labor, and the separation of Indigenous Peoples from their homelands (Wolfe 2006, Lugones 2016, Taylor 2016, Mendieta 2020, Mays 2021).

4. Settler colonial underpinnings of the conventional conservation model

The colonial logics that built so-called America also became the ideological foundations of many U.S.-based institutions and disciplines, such as conservation, with centuries of evidence demonstrating their complementarity (Ghosh 2021). Since its origination, conventional conservation has followed closely in the footsteps of the colonial and imperial agendas of the U.S., often side-by-side, assuming the same false logics of settler superiority and Indigenous elimination. As such, settler colonial conservation has become a major driving force in the restructuring of ecosystems and relational ties to place across the Americas, with its influence swiftly broadened thereafter to global landscapes (Dowie 2011).

4.1. Conventional conservation and the logic of superiority

The conventional conservation paradigm, bolstered by colonial science, has a long history of enabling colonization for the benefit of settler prosperity (Ghosh 2021). Colonial science aided in creating a disconnected depiction of the world, separating nature from humans to be categorized, observed, and collected. This affinity for categorizing life became the basis of the European folklore that built the groundless biological construction of race in early 18th century Europe with Swedish botanist Carl Linnaeus who, alongside his classification of nonhuman organisms, also racialized humans (Saini 2020). In his early work, he denoted humans by color, deeming Indigenous or “red” Peoples as naturally subjugated and Black people as “feral” or “monsterlike.” Furthering these myths, German naturalist Johann Blumenbach created a hierarchical division of people, describing “Caucasian” (white) as the idealized human race.

Meanwhile, influential scientists of the time, such as Charles Darwin, promoted the opinion that dark skinned people occupied “the lowest rungs of human hierarchy” and whites the highest (Saini 2020:28). Indeed, Darwin’s cousin, Francis Galton, coined the term “eugenics” to advocate for the selective breeding of an “ideal” Caucasian society (Saini 2020). These elite white men promoted the rise of social Darwinism and eugenics, which assumed a sense of superiority of the “civilized” over the “primitive” (Yakushko 2019). Darwin’s followers, such as biologist Thomas Huxley and naturalist Ernst Haeckel, made unsubstantiated claims about the reduced brain size of Black people and even questioned their very humanness, suggesting them to be the “missing link” between Europeans and apes (Finney 2014, Saini 2020), claims that aimed to justify and bury the horrors of European colonization and the continued human rights abuses of Indigenous Peoples.

Unfortunately, the racist tropes upheld by early naturalists did not end with the abolition of slavery and instead became embedded and preserved in the conventional conservation model as it cultivated in the U.S. Although colonization-driven environmental degradation sparked the development of settler colonial conservation (Murdock 2021), instead of collectively battling these oppressive and destructive forces together, place-based realities became quickly eclipsed by colonial fallacies, leading to further harm. In fact, it was the conventional conservation forefathers, such as Madison Grant and Theodore Roosevelt among others, who drew parallels between conservation and race-based eugenics as joint efforts to preserve white America (Powell 2015, Ghosh 2021). For example, Madison Grant, who was well known for his initiatives in protecting buffalo (American bison) and the California redwoods, also championed the book *The Passing of the Great Race* (1916). This work served to uplift the Nordic people as supreme and propagate eugenicist ideals praised by Theodore Roosevelt alongside Adolf Hitler, validating

widespread concerns about the diminishing pure white race (Tuck and Yang 2012, Taylor 2016). The work to conserve buffalo, which had become a symbol of the American frontier within settler imaginaries, was also fueled by the perceived loss of manliness and white racial dominance highly associated with the colonization of the American West (Powell 2016, Schneider 2023). Roosevelt, revered as the first environmental president (1901–1909), amplified this symbology through trophy and sport hunting by wealthy elites, effectively conquering species nearing extinction at both local and international scales (Taylor 2016). He was also a rancher who influenced the integration of capitalism into environmental priorities, such as by promoting free range cattle grazing through the U.S. Bureau of Land Management and deforestation through the U.S. Forest Service, which authorized the harvest of over 95% of old-growth trees in the U.S. in support of economic gain (Dowie 2011). Roosevelt claimed, “the rude, fierce settler who drives the savage from the land lays all civilized mankind under a debt to him. It is of incalculable importance that America, Australia, and Siberia should pass out of the hands of the red, black, and yellow aboriginal owners and become the heritage of the dominant world races” (Dowie 2011:259).

Other notable environmentalists perpetuated similar ideals early on, including John Muir, Gifford Pinchot, Henry David Thoreau, Ralph Waldo Emerson, and others: white male elites in search of a mythical rugged (yet Godly) wilderness, while prescribing an American settler identity as the “first” peoples (Dowie 2011, Taylor 2016, Eichler and Baumeister 2021). Muir and Pinchot, in particular, infused social Darwinism and white supremacist views into their conceptions of wilderness, which did not interfere with their ability to rise in ranks within the field (Taylor 2016, Yakushko 2019). Muir, who described Indigenous and Black people as “dirty, lazy, and uncivilized,” became the founder of the Sierra Club (Dowie 2011, Kashwan 2020) and

Pinchot, a leading figure in the eugenics movement, also headed the National Conservation Commission and the Forest Service (Purdy 2015). Meanwhile, although Thoreau and Emerson were known for opposing slavery, they made little effort to understand or reduce manifestations of settler colonialism (including slavery) in environmentalism, and instead, emboldened settler nativism and Indigenous replacement (Purdy 2015, Taylor 2016, Eichler and Baumeister 2021). These individuals, among others, shaped the tenants of settler colonial conservation, successfully instilling these ideals into many of the prominent environmental agencies we know today as well as creating the bedrock of academic teachings in the field (Morales et al. 2023). In doing so, they directed the conventional conservation agenda for decades to come (Murdock 2021).

4.2. Conventional conservation and the logic of elimination

The white supremacist and patriarchal ideologies perpetuated by the forefathers of conservation became infused into the conventional conservation model to continue centuries of violence against the land and its stewards for the preservation of a “pristine” and “rugged” American wilderness (Cronon 1996, Eichler and Baumeister 2021) agenda was also carefully tied to the logic of Indigenous elimination to extend Manifest Destiny. Settler colonial conservation was predicated on the construction of an idealized barren and sacred wilderness, devising several tactics for removing the influence of the lesser, “savage” Indian and intensifying Indigenous land theft, with a key example being “fortress conservation” (Hessami et al. 2021). Through a prominent preservationist rhetoric invented by settler colonial conservationists, such as John Muir and Henry David Thoreau, the inception of protected areas (PAs), a model of “fortress conservation,” began in the U.S. Yosemite Valley was the first PA, followed by the creation of Yellowstone National Park in 1872, the same year that treaty making ended in the U.S., further undermining the sovereignty of Indigenous Nations (Stark et al. 2022). Working in

conjunction with PAs, settler colonial conservationists also aimed to disrupt Indigenous relations with more-than-human kin. For example, the American Bison Society (ABS), founded in 1905 by Theodore Roosevelt and Gifford Pinchot, although charged with protecting buffalo, stood by as “surplus” buffalo were killed in droves at the newly formed PA at Yellowstone (Taylor 2016). This coordinated culling of buffalo extended the ongoing colonial attacks on Indigenous lifeways, where the near extinction of buffalo served in part as a military strategy to starve Indigenous Peoples who resisted colonial expansion and relied on buffalo to maintain cultural lifeways and responsibilities to more-than-human kin (Taschereau Mamers 2019, 2020, Reed 2020).

By 1916, the National Parks system was formalized, further inspiring forced removals of Indigenous Peoples for the preservation of idyllic nature, protecting what ought to be, rather than what has been continually cultivated by Indigenous Peoples (Cronon 1996, Bacon 2019, Murdock 2021), similar to how European settlements swept the nation in the 17th century. The creation of PAs, including forced evictions and denial of rights for Indigenous Peoples, worked alongside colonial land grabs in the movement westward (Colchester 2004). PAs, predicated on forced removal, also set precedent for the militarized protection of settler assets (e.g., stolen land) from Indigenous Peoples, often working in tandem with settler state policies to justify further displacement, imprisonment, and violence (Murdock 2021). Not only did these tactics promote colonization, but they also created a conservation paradox where the removal of Indigenous Peoples from their ancestral, cultural, and hunting territories opened areas up to heavy resource extraction, pollution, and sport hunting, thereby threatening habitats and facilitating species extinction, which PA’s and colonial conservationists have since failed to recover (Cronon 1996, Lele et al. 2010, Fletcher 2017, Eichler and Baumeister 2021, Liboiron

2021, Whyte et al. 2021). Instead, by uprooting the most qualified and knowledgeable ecosystem stewards, conventional conservation practices have paved the way for a long history of mismanagement by settler colonial government agencies, including the stocking of freshwater systems with invasive fish for sport and species misidentification leading to drastic native fish declines through the centuries (DeCicco 2005); fire suppression and villainization of cultural burning leaving forests more vulnerable to severe and uncontrolled fires (Whyte et al. 2021); and predator removal leading to disruptions in species interactions that transformed landscapes (Blossey and Hare 2022). The legacy of conservation, under the guise of protecting resources from humans, acted to instead enable settler colonialism and capitalism and enforce control of Indigenous lands and waters for the benefit of the few (i.e., white male elites) rather than the collective (Cronon 1996, Büscher and Fletcher 2020).

4.3. Colonial expansion through conservation mediated imperialism

As conventional conservation sanctioned the spread of settler colonialism across the U.S., it also promoted the expansion of U. S. imperialism to control people and environmental resources across the Americas and informally strengthen a U.S. empire (Ghosh 2021; Fox 2024). Justified by the Monroe Doctrine of 1823, which relied on the prevailing “civilized” vs. “uncivilized” discourse to grant legal authority for the U.S. to invade foreign countries, U. S. interventions ramped up throughout the 20th century, contributing to militarized occupation and economic restructuring throughout Latin America (Fox 2024). With immigration from the South to the U.S. increasing substantially during this time to escape violent conditions (Fox 2024), anxieties began to rise amongst settler colonial conservationists who aimed to preserve a wealthy white wilderness. For example, alongside growing concerns about rising immigration, came the revitalization of the 18th century Malthusian argument that linked human bodies to resource

depletion, which incited a fear of “overpopulated” lands, or, as Aldo Leopold put it, wilderness “pestered with inhabitants” (Fletcher et al. 2014, Powell 2015, Ojeda et al. 2020). The culminating xenophobia, coupled with the rise of Nazi Germany in the 1930s–1940s, inspired the eugenics foundation of conventional conservation to take on a more palatable form: population control (Powell 2015). Several literary best-selling works of their time moved conventional conservation’s population control agenda forward, such as the 1948 books *Road to Survival* by ecologist and ornithologist William Vogt that advocated for universal birth control to curb human overabundance and *Our Plundered Planet* by conservationist Henry Fairfield Osborn Jr. that touted similar concerns of overpopulation and environmental destruction (Powell 2015). In 1968, biologist Paul Ehrlich published another best-selling book *The Population Bomb*, which further placed blame on poor people, often non-white, for their own suffering and demise (Harvey 1974, Fletcher et al. 2014, Powell 2015, Hughes et al. 2023). In this same year, the “tragedy of the commons” narrative emerged, asserting that ungoverned or unmanaged commons of limited resources alongside greed will inevitably lead to overexploitation of those resources (Elías 2012, Shiva 2020, Ghosh 2021). Not only did this narrative serve to overshadow sustainable communal resource sharing practiced by diverse Indigenous Peoples across the Americas, but it also promoted the idea that resources can only be managed properly as private property, to enclose the commons to further settler colonial control (Wolfe 2006, Li 2007, Shiva 2020). Together, these two narratives harnessed the fear of resource limitation together with stereotypes of disease, unprovoked crime, and resource scarcity to further justify U.S. intervention alongside racist immigration policies (Connelly 2008, Fletcher et al. 2014, Ghosh 2021).

With decades of conservation discourse contributing to justifications for U.S. intervention, by the end of the 20th century, conventional conservation received a return on its

investment with a steep rise in international conservation interventions (Kashwan et al. 2021, Busck-Lumholt et al. 2024). During this time, valuation of natural assets, such as biodiversity and associated ecosystem services, became weaponized against Indigenous lifeways across the Americas to instead promote privatization and the expansion of fortress conservation for U.S. capital benefit (Escobar 1998, Kashwan et al. 2021, Murdock 2021, BusckLumholt et al. 2024). The growing infatuation with biodiversity contributed to a reductive story denoting universal threats (e.g., overpopulation) and solutions (e.g., protecting biodiversity) that allowed conventional conservation to leverage the growing imperial (and militarized) power of the U.S. to control global lands and resources (Harvey 1974, Li 2007, Büscher and Fletcher 2020). By viewing Latin America as increasingly wasteful, polluting, and inefficient, this allowed the U.S. to shift blame for the global environmental crisis onto Latin America and the Global South more broadly to impose sustainable development solutions to preserve the reservoir of natural resources and biological diversity for settler exploitation (Goldman 2005, Li 2007, Fletcher et al. 2014, Adams 2017, Taconet et al. 2020, Anguelovski and Corbera 2023). In turn, the frontline communities to the South have become largely responsible for mitigating the world's most prevalent environmental concerns, placing the onus for change onto the most disempowered communities (Ojeda et al. 2020, Taconet et al. 2020) despite mounting evidence demonstrating that wealthy nations and people, particularly in North America, have a much larger relative negative impact on the environment (Motesharrei et al. 2016, Nielsen et al. 2021, Green et al. 2022, Hughes et al. 2023). Unfortunately, this perverse narrative is perpetuated by likeminded settler colonial scholars from the U.S. who continue to blame marginalized people for biodiversity decline, although their arguments have been consistently and substantially refuted (Green et al. 2022, Hughes et al. 2023). Therefore, these colonial conservation ideologies are not

simply historic artifacts, but remain as guideposts for ongoing violations to lands, waters, and human rights on a global scale (Connelly 2008, Oberhauser et al. 2018, Ojeda et al. 2020).

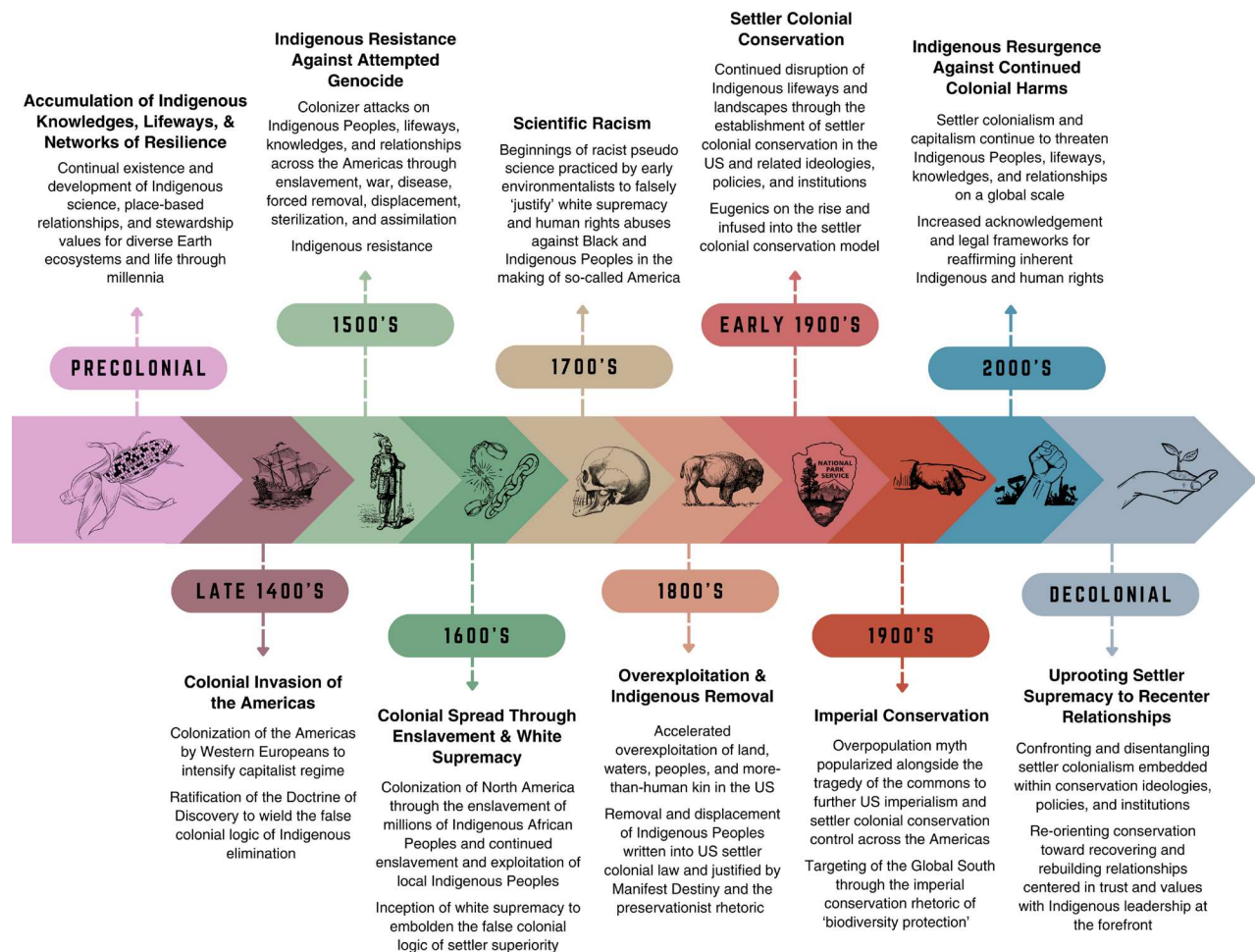


Figure 1. Timeline of Indigenous resilience, resistance, and resurgence through colonization. Displayed are key historic events in colonial history and the making of settler colonial conservation, from pre-colonization through to a decolonial future.

5. Ongoing manifestations of settler colonial conservation

As a result of the oppressive settler colonial legacies and ongoing harms described (and summarized in Figure 1), Indigenous communities, scholars, and activists have pointed to conservation as a major destructive force of Indigenous lifeways and associated ecosystems (Dowie 2011). However, settler colonial ideologies and mechanisms of control remain

complexly interwoven into the conventional conservation model, such that how land and resources are allocated and whose knowledges are validated versus evaluated in the field largely mirrors these historic legacies. Below we discuss examples of how settler colonial conservation dynamics continue to emerge across contemporary and globalized landscapes and practice, emboldened and broadened by U.S. imperialism.

5.1. Transformation of access and control of lands and waters

The legacy of settler supremacy rooted in the conventional conservation model is reflected in the dissolution of Indigenous land and resource rights today, with associated consequences to human and ecosystem health. In the words of Dr. Kaitlin Reed (Yurok/Hupa/Oneida), continued “violence against Indigenous bodies has been paralleled as violence against the natural world and non-human kin” (Reed 2020:36). With colonial governments and conventional conservation often working in harmony against Indigenous lifeways, Indigenous Peoples, alongside connected lands and waters stewarded for resource gathering, hunting, and cultural practices, are continuously under threat (Dowie 2011, Long and Lake 2018). As a result of regular displacements for conservation privatization, over 15% of the global surface area is under the control of international conservation activities and complex arrangements of governance and militarization, generating millions of Indigenous conservation refugees around the world (Dowie 2011, Dempsey and Suarez 2016, Shiva 2020). Meanwhile, the severe reduction and dismissal of Indigenous stewardship has led to detrimental changes in landscapes and ecosystems, such as through shifting forest structure and habitat, transforming ecosystems, changing community compositions and species range distributions, altering soil quality and temperature regimes, and more (Shiva 2005, Long and Lake 2018, Pigott 2018, Liboiron 2021, Whyte et al. 2021, IPCC 2023). Although the consequences of Indigenous land

dispossession on Indigenous stewards and relational ties are well documented, conventional conservation continues to broaden settler colonial control of lands and waters. For example, both inside and outside of designated protected areas, there is a continued privileging of white male sport hunting over Indigenous subsistence or ritual hunting as well as colonial environmental management decisions that fundamentally ignore Indigenous ecosystem knowledge and responsibilities to more-than-human kin (Huntington and Watson 2012, Kermoal and Altamirano-Jiménez 2016, Eichler and Baumeister 2018, Hird et al. 2023). Together, these prevailing colonial norms not only undermine the sovereign rights of Indigenous Peoples worldwide (United Nations General Assembly 2007), but also continue to erode social and ecological well-being.

Adding to the impacts of displacing Indigenous stewards is conventional conservation's long-lived history of promoting capitalist ventures under the neoliberal fallacy that, through capitalist development, nature can be conserved, rather than destroyed (Adams 2017, Kashwan et al. 2021). For example, colonial conservation aims to further accelerate the privatization of lands and waters on a global scale, as exemplified by the "30 by 30" plan or the more ambitious "Half-Earth" project that aspires to put 50% of global land and water into reserves (Noss et al. 2012, Dinerstein et al. 2019, Jung et al. 2021). These and other "green-grabbing" initiatives, largely facilitated by Euro-American conservation organizations, often infuse for-profit models into biodiversity protections, such as through carbon trading and offsetting (Kashwan et al. 2021). For example, The Nature Conservancy, which touts protecting over 125 million acres of land largely across the Americas, continues to sell areas of this land to artificially offset the carbon production of big businesses, thereby actually allowing them to exceed their carbon emission quotas without accountability (Elgin 2020). Other demonstrations of conventional conservation's

close ties to corporations include partnerships with the oil, gas, and mining industries, such as the Energy and Biodiversity Initiative and the Fauna & Flora International-Anglo American mining partnership of the early 2000s, both of which claim to embed biodiversity protection into industrial operations (Adams 2017).

Compounding these concerns is that strategically opening up certain areas of the landscape to industrial practices, as achieved through the settler state, conservation agencies, and corporations working together, can heighten land and human rights abuses in areas largely occupied by Black and Indigenous Peoples (Grogan et al. 2011, Whyte 2018a, Gilio-Whitaker 2019). For example, recent evidence shows that Indigenous Peoples are directly impacted by over one-third of worldwide environmental conflicts, 75% of which are caused by mining, fossil fuels, dam projects, and the agricultural, forestry, fisheries, and livestock sector (Scheidel et al. 2023). Therefore, as conservationists continue to ignore or even facilitate social inequities, the global majority of Black and Brown Indigenous Peoples worldwide experience increased environmental risk (Kermoal and Altamirano-Jiménez 2016, Jacobs 2019, Tripathi et al. 2023). As a result, a settler colonial conservation agenda continues to shape the planet and relationships to place, often to the detriment of both (Reo and Parker 2013, Eichler and Baumeister 2018, Whyte 2018a).

5.2. Perpetuating extractive relationships and co-opting knowledge

Because of the underlying settler colonial ideology that often goes unnamed, when conservationists do aim to consider social disparities in practice, their efforts may be undermined by an ignorance of positionality and power of researchers who are mostly white, male, and from U.S.-based institutions. These power imbalances can create a chasm of misunderstanding and misapplication of conservation initiatives through conceptions of “white saviorism.” The “white

savior” complex can manifest when privileged scholars, practitioners, or professionals speak on behalf of Indigenous Peoples with which they have no shared lived experience, understanding, or relationships, rather than providing a means for them to speak for themselves. Not only does this dynamic undermine Indigenous sovereignty, but it also distorts Indigenous knowledges, worldviews, and understandings, while granting false credit to settler colonial scholars for “rescuing” or “saving” them. Meanwhile, although there are mechanisms for crediting Indigenous knowledge holders (Carroll et al. 2022), these standards are minimally applied, with who leads and who benefits from projects often left to the discretion of settler colonial institutions and researchers (David-Chavez and Gavin 2018, Busck-Lumholt et al. 2024). Overall, conservation projects based in Indigenous contexts that still rely on the conventional model may propagate uneven power dynamics, even if aimed at addressing injustices. As a result, settler colonial research priorities may (intentionally or unintentionally) take precedence over the interests and realities of Indigenous Peoples (Baker et al. 2019).

In bolstering a savior complex and research elitism, a largely extractive and top-down approach to engagement arises in the conventional conservation model. These extractive projects largely serve to appropriate knowledge from their bearers for settler colonial uses, such as through claims of scientific discovery or sole authorship (Tuck and Yang 2012, Baker et al. 2019, Hird et al. 2023), while simultaneously minimizing decision-making opportunities for Indigenous Peoples (Adams et al. 2014, David-Chavez and Gavin 2018, Emanuel and Bird 2022). Even in projects that may or may not use an extractive mode of engagement (David-Chavez and Gavin 2018), another barrier to ethical collaboration with Indigenous Peoples is the assumed need to evaluate Indigenous knowledges using colonial science before it can be “incorporated” into the settler-constructed ecological story (Simpson 2004, Tengö et al. 2014, Whyte 2018b). In

this way, scholarship that predominantly centers the history and context of white settlers is made the central appraiser of all ways of knowing across numerous diverse Indigenous Nations and Peoples (Hird et al. 2023). As a result, Indigenous knowledge systems, which are extensive and pluralistic, are subject to filtration and appropriation through a singular lens based on their perceived utility to the settler colonial conservation management objective (Agrawal 1995, Whyte 2013, 2018b, Tengö et al. 2014, Baker et al. 2019, Thompson et al. 2020, Bingham et al. 2021). While conventional conservation is amidst a current awakening to ethically engage Indigenous Peoples, these pursuits too often fail to recognize Indigenous science as equal and valid in its own right. Instead, researchers prioritize a rigid scientific method, often associated with the “myth of scientific objectivity” (Halpin 1989, Bauer 1992, Leonelli 2015), that engages with the natural world as an “object” (Halpin 1989) and exists in contrast to Indigenous relational ethics. This disconnect further emphasizes how Indigenous concepts and languages can become misrepresented and largely discounted to fit into settler colonial worldviews (McGregor 2004, Simpson 2004). Processes such as these, especially with respect to environmental policy, can separate Indigenous Peoples from controlling their own outcomes and contributions to science and sovereignty by undermining locally relevant systems of knowing. Not only does this often lead to misaligned and ineffective action, but also reinforces distrust between researchers and Indigenous Peoples by perpetuating settler colonial assimilation practices (Tengö et al. 2014, Bingham et al. 2021).

6. Toward healing and building a relational model of conservation

In the words of Pōkā Laenui (Wai‘anae), “True decolonization is more than simply placing Indigenous or previously colonized people into the positions held by colonizers. Decolonization includes the reevaluation of the political, social, economic, and judicial

structures themselves and the development, if appropriate, of new structures that can hold and house the values and aspirations of the colonized people” (Laenui 2000:84). Decolonization and justice, i.e., healing of relationships between ecosystems, peoples, and more-than-human kin, requires turning knowledge into action (Figure 2). To embody decolonial action, conservationists (academic, governmental, non-governmental, and private industry practitioners, and other professionals) must not only question and work to disrupt settler colonial ideologies and practices within their own institutions, but also actively adopt anti-colonial strategies that center those most negatively impacted by historic and ongoing colonial harms (Reo et al. 2017, Muller et al. 2019, Liboiron 2021, Hird et al. 2023, Stein et al. 2023). Ultimately, there is no single ready solution, but conservationists must critically examine the nature of their work, such as by evaluating how projects might reinforce existing inequalities within their scientific fields and the communities with which they work. This re-evaluation must also be coupled with a conscious effort to de-center the settler colonial agenda and re-center Indigenous leadership and ways of knowing in conservation (Zanotti et al. 2020). Below we offer some guidance, strategies, and initiatives to aid in this process.

6.1. Politicing and contextualizing conservation

The first step to transforming conventional conservation is to recognize how it has been fundamentally shaped by settler colonialism and an anti-Indigenous and anti-Black rhetoric throughout history and across the globe. Conservationists must also recognize the politics and power of knowledge and the role of capitalism and imperialism in the attempted erasure of diverse knowledges, histories, realities, and lived experiences (Agrawal 1995, Aswani et al. 2018, Hird et al. 2023). Because the current conventional model of conservation is largely centered around so-called objective science, this relieves settler colonial scientists and

practitioners from their responsibilities as oppressors, thereby limiting what can be discussed or mobilized to change this dynamic (Simpson 2004, Hird et al. 2023). This injustice ignorance is exacerbated when social inequities are deemed as unrelated or tangential to ecological inquiries, with scientists rarely branching out of their field unless required (Simpson 2004, Baker et al. 2019). To ameliorate this unhelpful cultural norm, the social and political components of ecological research, such as influences of race, class, ability, sexuality, and gender, need to be elevated and prioritized to better connect intentions with realized social and ecological outcomes (Agrawal 1995, Adams et al. 2014, Baker et al. 2019). In doing so, conservationists themselves must also acknowledge their positionality with respect to their research and collaborators, so that power dynamics and privileges can be addressed rather than insidiously invisibilized (Whyte 2018b, Baker et al. 2019). There must also be an intentional effort made by professionals across all roles and sectors of conservation to challenge and work to uproot settler colonial paradigms, inclusive of state policies that seek to erase Indigenous Peoples and lifeways, white supremacist institutional norms, militarization and policing, and commercialization, to fundamentally transform and decolonize the field (Agrawal 1995, Simpson 2004, Mays 2021, Tripathi et al. 2023). For example, joining and amplifying often politicalized efforts led by Indigenous Peoples that stand against colonial oppressions offers pathways toward building trust and accountability. Some of these initiatives could include standing against oil development and promoting dam removal (Rowe et al. 2017, Diver et al. 2024), with several other opportunities to engage and build momentum toward broader, mutually beneficial conservation action.

6.2. Centering Indigenous knowledges, values, and relationships to place

To heal relationships and responsibilities to land, waters, and more-than-human kin requires an intentional shift in power in support of Indigenous sovereignty and the recovery of

placebased knowledges (Agrawal 1995, Simpson 2004, Schneider 2023). Indigenous knowledges facilitate relational healing by embodying “... the way of living within contexts of flux, paradox, and tensions, respecting the pull of dualism and reconciling opposing forces.... Developing these ways of knowing leads to freedom of consciousness and to solidarity with the natural world” (Battiste and Henderson 2000, as cited in McGregor 2004:390). In redirecting power, there first must be an immediate appreciation of Indigenous knowledge systems as legitimate and relevant to ecological and social processes, while maintaining that these knowledges exist in their own contexts and for their own purposes without the need to assign them within colonial science or extract them for settler colonial gain (Mistry and Berardi 2016, Whyte 2018b). In this way, the holders of diverse Indigenous knowledges and languages must always determine their use, relevancy, transfer, verification, and recovery, transcending and often directly opposing the settler colonial model (Agrawal 1995, Simpson 2004, Muller 2012, Whyte 2018b, Eichler and Baumeister 2021). Additionally, in respecting Indigenous knowledge holders and stewards, it is the responsibility of conservation scholars and practitioners to honor the intellectual property rights of Indigenous Peoples, affording proper Indigenous attribution, credit, and authorship in the generation of knowledge (Carroll et al. 2022, David-Chavez et al. 2024, Layden et al. 2024).

Alongside appreciating and reaffirming Indigenous knowledges and knowledge holders is the need to elevate Indigenous lifeways and value systems in the working definition of, and processes embedded within, conservation. Knight et al. (2019:1532) define effective conservation as “any purposeful activity that involves people successfully working toward achieving their explicitly stated goal of ensuring the persistence of nature, in ways that do not compromise human well-being.” This definition could be made even more explicit by acknowledging that perspectives on what is effective varies by values, beliefs, and context.

Values-based approaches that apply anti-colonial value systems make conservation relevant to both conservationists and Indigenous Peoples (Chan et al. 2016). Specifically, a relational values approach may strengthen cultural, academic, and Indigenous government institutions while simultaneously heightening the resiliency of communities against rapid economic and environmental change (Whyte 2018b, Tripathi et al. 2023). For example, the recently published values-led relational science model offers guidance for attuning conservation efforts to strengthen Indigenous sovereignty, self-determination, and environmental governance (David-Chavez et al. 2024, Layden et al. 2024).

6.3. Transferring power: Indigenous-led environmental stewardship

Alongside working toward disentangling deeply rooted settler colonial norms within research and conservation dynamics, there must also be an intentional repatriation of lands, waters, resources, and authority from settlers to Indigenous Peoples (Tuck and Yang 2012, Middleton Manning 2019, Eichler and Baumeister 2021). The transfer of lands and waters must include that which is managed or owned by conservation organizations and government agencies, with opportunities to reclaim and rebuild “home” extended to displaced peoples and communities, such as through rebuilding access to green space and traditional lifeways (Mays 2021, Anguelovski and Corbera 2023, Tripathi et al. 2023). Concurrently, there must be an immediate disinvestment in colonial and imperial driven projects, particularly partnerships with industry, and a direct reinvestment in Indigenous Nations and community partners (Kashwan et al. 2021, Layden et al. 2024). To facilitate the transfer of power and control, conservation scientists, practitioners, and professionals must immediately respect and uphold the inherent sovereignty of Indigenous Nations, as reaffirmed by the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), by promoting Indigenous leadership and communal

governance, as rights-holders, throughout each stage of conservation projects (United Nations General Assembly 2007, Busck-Lumholt et al. 2024). Cultivating reciprocal partnerships that center Indigenous worldviews and value systems are key to supporting Indigenous-led conservation movements and activism to continue to shift resources, power, lands, and waters back to Indigenous Peoples (Wheeler and Root-Bernstein 2020, Zanotti et al. 2020, Eichler and Baumeister 2021, Gardner-Vandy et al. 2021, Kūlana Noi‘i Working Group 2021). These relationships must confront the settler colonial foundation of conservation to facilitate grassroots change and decision making. To re-orient away from the settler colonial conservation model, conservationists must apply high-level ethical standards and data governance protocols unique to Indigenous contexts, such that Indigenous Peoples define the use and creation of different sciences and knowledges to address ecological questions in support of Indigenous governance and self-determination (Agrawal 1995, Battiste et al. 2008, Martin et al. 2013, Pascual et al. 2014, Suiseeya 2014, Reo et al. 2017, David-Chavez and Gavin 2018, Whyte 2018b, Artelle et al. 2019, Tauli-Corpuz et al. 2020, Collaboratory for Indigenous Data Governance 2021, Carroll et al. 2022, Jennings et al. 2023, David-Chavez et al. 2024, Layden et al. 2024).

There are several examples that bring ethical, socially just guidelines into practice, including environmental restoration by, and in partnership with, the original stewards, with rematriation efforts increasing on a global scale and across diverse contexts (Youdelis et al. 2021, Vogel et al. 2022; Cannon 2019, reading list, <https://doi.org/10.5281/zenodo.4429220>). For example, Indigenous parks and protected areas are expanding across the U.S. and Canada (Carroll 2014), such as Indigenous Protected and Conserved Areas (IPCA) in Canada, which elevate Indigenous rights and leadership in long-term conservation goals (find more stories and experiences related to IPCA here: <https://ipcaknowledgebasket.ca/>; Indigenous Circle of Experts

2018). Meanwhile, to further strengthen these initiatives, recent works outline considerations for the continued reimagining of parks and protected areas in alignment with Indigenous value systems and sovereignty (Fisk et al. 2021, Jacobs et al. 2022). There are also numerous examples demonstrating shared knowledge generation and contemporary Indigenous stewardship, such as a Decolonial Model of Environmental Management and Conservation and its application in Indigenous-led wildlife stewardship of Grizzly bear in British Columbia (Artelle et al. 2021). Other examples that aim to address complex environmental issues following Indigenous leadership include the Witness, Acknowledge, Mend, Protect, Unite, and Move (WAMPUM) climate change adaptation framework (Leonard 2021) and the Menominee Sustainable Development Institute (SDI). The Menominee Nation's sustainable forestry practices reach back centuries and include utilizing both Indigenous and academic sciences to meet longterm sustainability goals, as determined by Indigenous experts (Dockry et al. 2016, Muller et al. 2019).

The infrastructure for strengthening respectful relationships, elevating Indigenous methodologies and sovereignty, and sharing diverse knowledge systems can also be extended from land to water ecosystems (Arsenault et al. 2018, Galappaththi et al. 2021, Leonard et al. 2023). Among examples of Indigenous-centered collaborations in water governance, we observe the Columbia River Inter-Tribal Fish Commission (CRITFC) and the Whanganui Iwi of Te Awa Tupua. The CRITFC represents a coordinated effort between four Indigenous Nations of the Columbia River Basin in the Pacific Northwest region of North America to ensure treaty fishing rights and restoration of Indigenous fisheries in perpetuity (CRITFC 2021). In Aotearoa New Zealand, Māori activism led to the legal designation of the Te Awa Tupua (Whanganui River system) as a "legal person" (Leonard et al. 2023), thereby securing Whanganui Iwi sovereign

rights to the river after years of denial by the Crown (Muller et al. 2019). The examples presented here are just some of many bodies of work that detail approaches to building relational and anti-colonial conservation practices across diverse Indigenous contexts and geographies. For cases like these to become more commonplace, the settler colonial conservation model must fundamentally shift toward reaffirming Indigenous science and sovereignty (van Uitregt 2021). Conservation may then be contextualized within a broader and more robust understanding of ecologies and ecosystems, grounded in justice and equity for the land, waters, and beings.

HEALING, JUST, & EQUITABLE INDIGENOUS CONSERVATION FUTURES

Respecting Indigenous Knowledges

Respecting, honoring, and crediting diverse Indigenous knowledges, values, and relationships to lands, waters, and more-than-human kin. As conservation researchers, scholars, and practitioners, working toward relational and shared knowledge creation through reciprocal partnerships.



Contending with Colonial History

Acknowledging and teaching the history of conventional/settler colonial conservation as a system with a pervasive colonial legacy that impedes justice. Examining how conservation works to dispossess Indigenous lands and waters and undermine Indigenous Peoples as rights-holders and environmental stewards.



Supporting Indigenous Lifeways

Telling a more complete story of conservation, including reaffirming the long-held relationships between Indigenous Peoples and land, waters, and more-than-human kin. Supporting efforts to rebuild and heal relationships which have been harmed by settler colonial conservation.



Reaffirming Indigenous Rights

Recognizing and upholding internationally recognized Indigenous sovereignty, such as through honoring and reaffirming Treaty agreements in the US and the United Nations Declaration on the Rights of Indigenous Peoples on a global scale. Implementing related value-centered ethical frameworks for improved accountability and trust.



Advancing Indigenous Stewardship

Transferring power in conservation by supporting land and water reclamation projects and Indigenous-led environmental stewardship. Strengthening Indigenous communal conservation governance.



Centering Indigenous Women & Queerness

Centering and honoring Indigenous women and two-spirit peoples as knowledge-holders with central relationships to lands and waters. Acknowledging settler colonial control as a gendered project that has shifted many women-centered governance systems to heteropatriarchal systems of control, resulting in dual harms to people and place.



Elevating Indigenous Voices

Elevating the voices, perspectives, and realities of Indigenous Peoples in the conservation movement through creating relevant leadership roles, offering adequate and meaningful compensation, providing co-authorship opportunities, etc. These actions must begin with respectful, responsible, and reciprocal relationship-building.



Building Meaningful Relationships

Pursuing meaningful and sustained engagement with Indigenous communities, on their own terms, that centers their needs, priorities, values, and futures. Taking personal responsibility to understand positionality and address power dynamics in practice through Indigenous-centered ethics.



Challenging Settler Colonial Paradigms

Decolonizing conservation in research and practice by politicizing and contextualizing conservation in ways that directly challenge the settler colonial conservation paradigm to seek alternatives. Joining and uplifting Indigenous-led political movements.



Confronting Primary Forces of Biodiversity Decline

Making visible that the primary forces of biodiversity decline and climate change are rooted in systematic, capitalist, imperial-driven resource extraction for the benefit of corporations and the elite. Defunding these projects and people, making their industry ties transparent, and holding their ethical violations accountable.



HARMFUL, COLONIAL LEGACIES OF CONSERVATION

Devaluing Indigenous Knowledges

Asserting that settler colonial science is the superior, objective knowledge above all other knowledges. Promoting discourse that decenters Indigenous worldviews and realities and instead extracts Indigenous knowledges in the name of settler colonial science.

Perpetuating Colonial History

Justifying theft of Indigenous lands and waters in the name of conservation through Manifest Destiny ideals of 'progress' and capitalist expansion. Endorsing 'fortress conservation' that repeatedly dispossesses Indigenous Peoples from their lands and lifeways to invent a wealthy white wilderness.

Disrupting Indigenous Lifeways

Continuing the settler colonial conservation rhetoric that excludes Indigenous lifeways. Supporting partnerships, projects, and practices that aim to sever Indigenous relationships with place, such as through enabling harmful capitalist industry.

Undermining Indigenous Rights

Promoting a model of conservation that continues to uphold settler colonial power, while undermining Indigenous sovereignty (e.g., through stealing Indigenous lands and minimizing customary subsistence and stewardship rights).

Vilifying Indigenous Stewardship

Prioritizing management and control of land and waters by settler colonial institutions, including conservation. Reaffirming the tragedy of the commons discourse that is rooted in capitalist and imperial ideals that aim to blame the world's environmental problems on the Global South and communal and Indigenous management systems.

Centering Heteropatriarchal Control

Emboldening patriarchal, paternalistic ideals and actions in conservation that ignore the gendered relations of environmental conservation and the gendered impacts of colonization.

Elevating White Supremacy

Elevating white supremacy in conservation through the empowerment of white male scientists, preservationists, and values rooted in eugenics, social Darwinism, and Malthusian beliefs. Tokenizing Indigenous voices and prioritizing superficial initiatives, while largely ignoring ongoing social and environmental injustices.

Building a White Savior Complex

Assuming a 'white savior' identity by disempowering Indigenous voices through misrepresentation and prescriptive colonial science that fails to address local needs and power dynamics.

Allying with Settler Colonial Paradigms

Assuming an apolitical, 'value-neutral' conservation paradigm that fundamentally ignores the root causes of social and environmental problems worldwide (i.e. capitalism-driven colonialization).

Misapplying Blame for Biodiversity Decline

Emphasizing individualized human use (a derivative of the overpopulation narrative) as a major cause of biodiversity decline, which supports a resurgence of Malthusian beliefs of humans and nature at the expense of women and communities of color in the Global South.

Figure 2. Ten ways to begin to heal from settler colonial conservation legacies. Offered are 10 strategies to move away from the harmful, colonial legacies and norms of conservation and toward healing, just, and equitable Indigenous conservation futures.

7. Conclusion

This synthesis highlights how historical and contemporary manifestations of settler colonialism in conservation are inextricably intertwined, leading to broadscale and enduring social and ecological inequities. Specifically, conventional conservation science and practice remain largely centered in settler colonial ideologies, although the field maintains the capacity to combat this legacy through anti-colonial and decolonial approaches, including strengthening Indigenous sovereignty and relationships. Before a decolonial shift can occur, conservationists must grapple with how the dislocation of people from land and power has transformed landscapes and disrupted the ecosystems they desire to protect, including settler colonial conservation's role within these histories and ongoing realities. Conservationists must also engage with the evidence highlighting the link between social justice, and healthy economies, ecosystems, and cultures (Wilder et al. 2016, Schuster et al. 2019, Dawson et al. 2021). Recovering and maintaining Indigenous knowledges and stewardship practices, while re-evaluating colonial social and political structures, is central to achieving justice for both lands and peoples (Fernández-Llamazares et al. 2021, Smith 2022).

This synthesis also highlights pivotal opportunities for conservationists to explicitly center Indigenous rights, governance, and rematriation in the conservation mission, instead of colonial logics, to better align with stated goals and resist furthering attempts to erase Indigenous lifeways, landscapes, and futures (Tuck and Yang 2012; Whyte 2016). In this pursuit, conservationists can grow ethics and justice in environmental research and policy to work to reconcile imbalances created by the colonial forefathers of the field. Specifically, conservationists, depending on their role within an agency or institution, hold tremendous power to re-orient narratives, policy, and access to land by applying anti-colonial and justice-centered

frameworks. In practice, this requires an intentional redirection of inquiries from how Indigenous Peoples can support conservation goals to how academic science and conservation practice can support sovereignty and abolition in initiatives defined by Indigenous Peoples. In particular, centering Black and Indigenous women in the actualization of power and decision making is key, alongside uplifting their frequent roles as leaders in resistance against white supremacy and colonial violence since its inception (Allen 1992, Oberhauser et al. 2018). Therefore, conservation, and all its agents of change (scholars, practitioners, professionals, students, affiliates, etc.), have a responsibility to fuel resistance from the ground up rather than suppress it, to transform landscapes of oppression into landscapes of liberation.

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CHAPTER 2: Shifting power in practice: Implementing relational research and evaluation in conservation science²

“Doing science with awe and humility is a powerful act of reciprocity with the more-than-human world.” (Kimmerer, 2013, p. 252)

1. Introduction

Amidst growing concerns for biodiversity loss and climate change, Indigenous stewardship and conservation governance arise as pivotal mechanisms in environmental and species recovery (Artelle et al. 2019; Fernández-Llamazares et al. 2021). Indigenous Peoples have been stewarding landscapes since time immemorial, and they continue to embody diverse, dynamic, and adaptive knowledge systems that support social and ecological resilience (Fernández-Llamazares et al. 2021). These Indigenous stewardship responsibilities and kinship ties to lands, waters, and wildlife are often demonstrated through sustainable hunting and fishing practices, fire treatments, erosion prevention, soil enhancement, management of mature and diverse forests, and numerous other stewardship practices that span across diverse ecosystems, including forests, deserts, grasslands, tundra, coastal areas, and waters (Fernández-Llamazares et al. 2021; Fisk et al. 2024; Julia de Burgos Cultural Arts Center 2020; Lake and Christianson 2019; Leonard et al. 2023; Waller and Reo 2018; Whyte 2018b). With Indigenous Peoples stewarding over a quarter of the planet’s land surface (Garnett et al. 2018) and 80% of global biodiversity (Waller and Reo 2018), elevating these uniquely contextual and relational knowledge systems is crucial to meet international calls for honoring Indigenous rights and

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strengthening environmental sustainability (David-Chavez and Gavin 2018; United Nations General Assembly 2007).

Despite the growing recognition of the importance of Indigenous stewardship, historical injustices and the ongoing realities of colonial oppression reinforce contemporary environmental and social disparities (Gilio-Whitaker 2019; Whyte 2018a). For example, the conventional (i.e., “typical”, by western standards) research model for engaging Indigenous Peoples and their knowledges has been widely criticized for continuing legacies of knowledge extraction, land dispossession, and human rights violations to preserve the false conception that humans are separate from their environments (Dowie 2011; Eichler and Baumeister 2021; Farrell et al. 2021; Kashwan et al. 2021; Lele et al. 2010; Liboiron 2021). This conventional paradigm is especially critical to re-evaluate in environmental studies that aim to promote ecological wellbeing, though they are often confined to limited and detached settler-colonial ways of knowing that fail to recognize the pluralistic and place-based knowledge systems embodied by Indigenous Peoples (Fernández-Llamazares et al. 2021; Gazing Wolf et al. 2024; Hird et al. 2023; Whyte 2018b). Consequently, without ethically engaging and honoring Indigenous Peoples and their knowledges, cultures, customs, and inherent rights in environmental research and conservation, this inevitably leads to inaccurate, irrelevant, and/or incomplete datasets that may be used to draft ill-suited policy and management decisions across diverse landscapes (David-Chavez et al. 2024; David-Chavez and Gavin 2018; Lele et al. 2010; Suiseeya 2014). Additionally, by restricting the ability of Indigenous Peoples to determine their own outcomes or practice Indigenous ways of being, this not only infringes on Indigenous Peoples’ fundamental right to self-determination (United Nations General Assembly 2007) but also contributes to reverberating

social harms and largely ineffective conservation efforts (Armitage et al. 2019; Dawson et al. 2021; Fernández-Llamazares et al. 2021).

In response to these encounters and mis-encounters, several scholars, activists, and practitioners have highlighted the central importance of applying values-centered ethical frameworks to foster research initiatives that reaffirm, rather than undermine, Indigenous rights, in alignment with the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), which our nations have endorsed (David-Chavez and Gavin 2018; Gardner-Vandy et al. 2021; Toomey 2016). There are numerous ethical frameworks that represent both broad and place-specific guidance for elevating the respect and honor of Indigenous rights in environmental research and practice (Collaboratory for Indigenous Data Governance 2021; David-Chavez et al. 2024; Hayward et al. 2021; Lovo et al. 2021). Many of these guiding frameworks collectively underscore the importance of centering relational values in projects engaging Indigenous Peoples, such that these efforts are directed by the self-determined goals, interests, visions, and futures of the local rightsholders (holders of land title and/or customary rights to ancestral lands and waters) (Carjuzaa and Fenimore-Smith 2010; David-Chavez et al. 2024; Ermine 2007; Gardner-Vandy et al. 2021; Jennings et al. 2023; Kūlana Noi‘i Working Group 2021; Whyte 2018b). However, although well established, these ethical frameworks are rarely meaningfully applied (David-Chavez and Gavin 2018), with conventional extractive paradigms continuing to shape mainstream research, practice, and evaluation (Chilisa et al. 2016; LaFrance and Nichols 2008). Consequently, interest in engaging Indigenous Peoples and their knowledges is outpacing the implementation of ethical guidance that honors Indigenous rights into conventional conservation research protocols, further eroding trust in partnerships alongside social and ecological outcomes (Toomey 2016).

Given the underlying, often unconscious, bias present in conventional conservation research that can diminish desired research outcomes, there is a need for researchers to reconsider and re-evaluate their research processes outside of these colonial paradigms. Evaluation is a critical step in this process, as it offers “a lens through which judgements are made and standards are set about what should be considered real program outcomes, what knowledge measures that reality, and what values support the evaluation practice” (Chilisa et al. 2016, p. 1). Under the colonial model of evaluation, the interests of researchers and funders often take precedence, which can fundamentally de-prioritize locally specific interests, values, and goals (Chilisa et al. 2016; LaFrance and Nichols 2008; Lucero et al. 2024). Meanwhile, this type of evaluation can also invite negative judgments and false depictions of Indigenous Peoples based on assumed deficiencies with respect to colonial standards (Chilisa et al. 2016; David-Chavez et al. 2024; LaFrance and Nichols 2008; Walter and Andersen 2013). Not only does the colonial evaluation approach contribute to harmful and inaccurate depictions of Indigenous Peoples, but it also redirects accountability away from external researchers and institutions who hold tremendous power to influence norms and standards in practice. Therefore, alongside research as a whole, there is a need for evaluation to prioritize the lived experiences, priorities, rights, and worldviews of Indigenous Peoples in order to improve standards of engagement (Chilisa et al. 2016; David-Chavez et al. 2024; Lucero et al. 2024). Applying values-based approaches throughout research processes, from initial conception through evaluation, provides valuable pathways towards improving research relations and accountability in practice across diverse contexts.

To promote the application of these leading ethical guidelines in conservation science, our study aims to field test the recently published Relational Science Model (RSM) as an

evaluation instrument for a wildlife conservation field project conducted in Guatemala (David-Chavez et al. 2024). The RSM is a comprehensive framework that consolidates leading guiding principles and wise practices in research to improve leadership of and relations with Indigenous Peoples. The RSM also provides evaluation outcomes based on community-based Indigenous research scholarship that centers Indigenous sovereignty and self-determination (David-Chavez et al. 2024). In support of elevating these relational standards in the environmental field, the authorship team specifically aims to achieve the following: (1) outline the implementation of RSM recommendations into a wildlife conservation research project and (2) evaluate the project based on the experiences and insights of community research partners, alongside researcher reflections, in alignment with the values, principles, and intended outcomes of the RSM. To achieve these aims, we compiled key examples of how the research team implemented RSM ethical principles throughout a wildlife conservation research project, co-created and led by the local rightsholders and intended project beneficiaries of La Bendición, a multicultural mixed mestizo and Indigenous (Mayan mam) community in southwestern Guatemala. Next, to evaluate the research process, we compared the intended outcomes of the RSM against the realized outcomes of the wildlife conservation research project, based on community research partner experiences gathered via a post-survey and complementary researcher reflections. We conclude by offering further considerations and recommendations for researchers, institutions, and agencies to improve their relational science efforts in conservation and related fields.

2. Applying the Relational Science Model in conservation research

As the RSM is intended to guide diverse projects and collaborations that engage or are led by Indigenous Peoples towards honoring Indigenous rights and maintaining relational accountability (David-Chavez et al. 2024), our research draws from this model to build an

underlying ethical framework in the context of conservation science. The RSM, in particular, emphasizes honoring Indigenous rights in practice by underscoring protocols and actions that align with the UN Declaration on the Rights of Indigenous Peoples (UNDRIP). UNDRIP is a formal and comprehensive statement that establishes a universal understanding of the fundamental and inherent rights of Indigenous Peoples, expanding upon the individual rights to respect for persons, beneficence, and justice established by the Belmont principles to the rights and protections of Indigenous collectives (FAO et al. 2016; Tsosie et al. 2021; United Nations General Assembly 2007). UNDRIP is especially pertinent to environmental fields, such as conservation, as, in addition to recognizing the rights of Indigenous Peoples to control their own lands and resources, UNDRIP also recognizes the importance of respecting Indigenous knowledges, cultures, and practices to ensure proper, sustainable, and equitable environmental management (United Nations General Assembly 2007). Meanwhile, with Indigenous Peoples recovering and working to maintain relational ties across global landscapes, researchers, institutions, and agencies have a clear responsibility to reaffirm these rights outlined in UNDRIP in environmental research and practice.

To further the adoption of UNDRIP in research, the RSM outlines several principles and protocols to nurture relational accountability across research collaborations, upheld by the four core values of integrity, respect, humility, and reciprocity. These values reflect long-held value framing evident throughout Indigenous scholarship and practice that are necessary to shift from colonial research paradigms centered in extraction towards relational research paradigms. Relational research paradigms aim to reconcile and tend to past and ongoing colonial harms while also strengthening pathways for communities to determine their own outcomes, both of which are necessary for achieving environmental justice (Gilio-Whitaker 2019; Raphael and

Matsuoka 2024). Specifically, the values framing of the RSM provides mechanisms and guidance for (1) reaffirming the inherent individual and collective rights of Indigenous Peoples in making environmental policy and research decisions concerning their lands, waters, and knowledges (actualizing the value of integrity through procedural justice), (2) sustaining and restoring Indigenous research and conservation governance (actualizing the value of respect through transformational justice), (3) confronting colonial paradigms and honoring diverse ways of knowing and being in research and policymaking (actualizing the value of humility through recognition justice), (4) and ensuring equitable access to research and environmental resources and benefits (actualizing the value of reciprocity through distribution justice) (Matsuoka and Raphael 2024). Taken as a whole, the RSM, which embeds an environmental justice ethic, aims to redirect power and authority from external researchers and towards frontline communities to strengthen social and ecological recovery and resilience.

In implementing this relational framing, the wildlife conservation field project became grounded in the interests, goals, histories, and realities of the local rightsholders of La Bendición while calibrating to the skillsets and capacity encompassed by the research team. Our research team consisted of academic researchers from a US-based institution, local Guatemalan biologists and bilingual community liaisons, local and international nonprofit collaborators, and La Bendición community research partners, which included a diversity of networks, expertise, resources, and relationships to facilitate capacity sharing towards a collective, community-rooted vision. In attuning this team to the community context, we identified the primary goal of the project as promoting the shared generation of academic and place-based knowledges of the local landscape to support the strengthening of ancestral and kinship ties to place, alongside communal conservation governance. In pursuit of this goal and through the implementation of RSM

principles (Figure 1; Table S1) (David-Chavez et al. 2024), the research team used a combination of participatory action research, social science methods, Indigenous ethical protocols, and standardized ecological survey methods to inventory the biodiversity (mammals and birds) and plant knowledge (herbal medicines) in the community-managed area of La Bendición. The outcomes of the wildlife conservation project included a photo album of all mammal species identified with camera traps and local experts, locally specific field guides of birds and mammals, workshops related to field equipment, data stewardship, and technology, a visual community timeline and map, medicinal herb recipe books for all community research partners, and ongoing support, recommendations, and considerations for strengthening self-determined communal conservation governance strategies, such as a community-run ecotourism program.

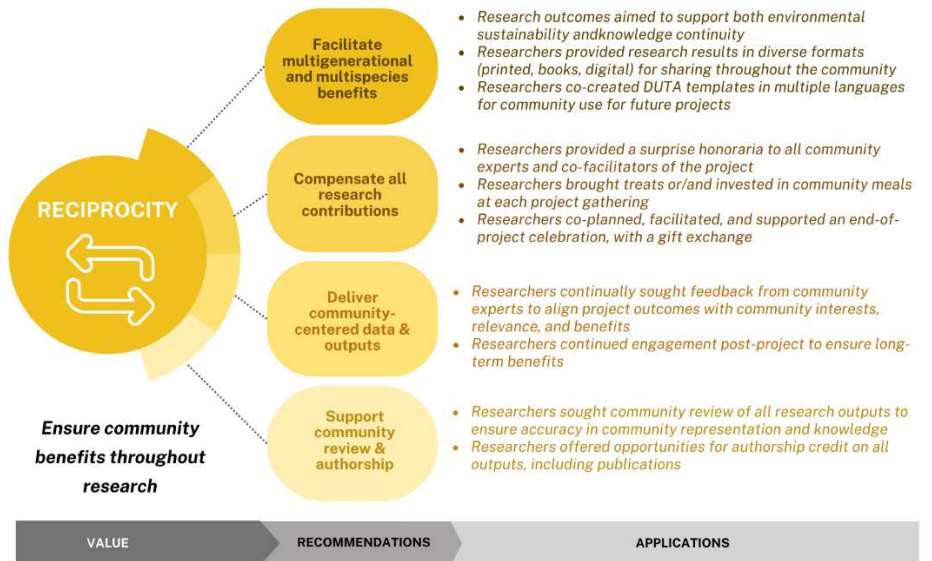
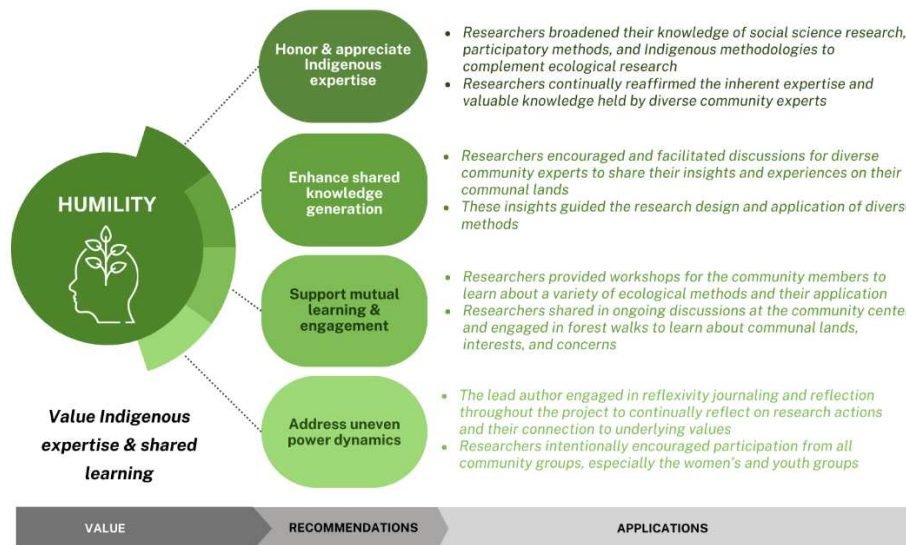
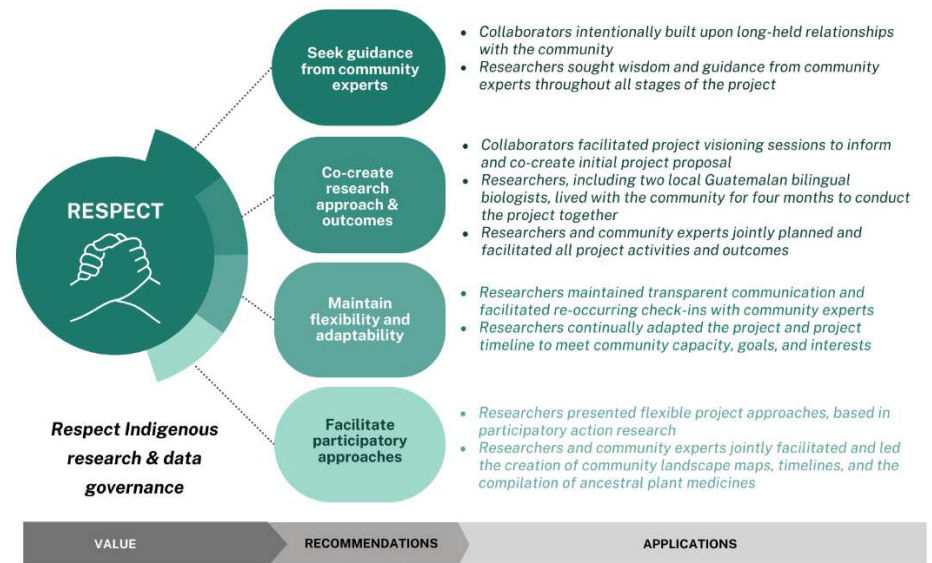
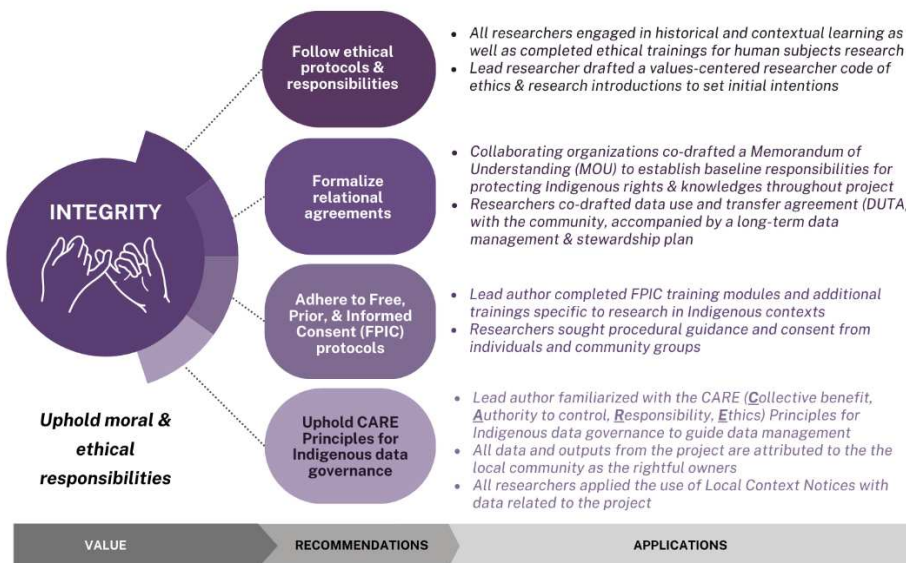


Figure 1. Implementation of Relational Science Model values and recommendations in conservation research.

3. Evaluating conservation research based on the Relational Science Model

To evaluate the wildlife conservation research project based on the RSM, we conducted a post-survey, followed by an inductive thematic analysis, highlighting the perspectives, stories, and lived experiences of community research partners (Chilisa et al. 2016; LaFrance and Nichols 2008; Lucero et al. 2024). We supplemented qualitative response data with quantitative assessments, as well as researcher insights, reflections, and observations regarding the wildlife conservation research process (Beck et al. 2021; Toomey 2016). We then summarized these results in relation to the four core values and associated Indigenous rights and relational-based outcomes outlined in the RSM (David-Chavez et al. 2024), focusing on challenges and opportunities for improving relational accountability in conservation science practice.

3.1. Survey Data Collection

The survey population included La Bendición community members who had some relationship to the wildlife conservation research project conducted in February–June 2023. These community respondents were also representatives of central leadership groups within the community, including the Youth Council, Women’s Council, and Board of Directors. Members of the research team conducted the survey in person with the community on 5 September 2023, approximately three months following the closure of the wildlife conservation research project. We chose to conduct this survey soon after the closure of the project so that community research partners could more easily and clearly recall project activities and their relevance, even if priorities may change in the future. Additionally, we did not complete a pre-survey and instead focused exclusively on a post-survey to request feedback only after we had established intentional and reciprocal relationships with community research partners.

Prior to administering the survey process, we briefed respondents (community members) on consent procedures, emphasizing that their participation in the survey was completely optional and that they could leave (opt out) at any time. We also assured respondents that their responses would remain anonymous. To administer the survey, researchers and community research partners co-organized three separate survey events for each group for a total of 50 participants (8% Youth Council, 58% Women's Council, and 34% Board of Directors), representing approximately 10% of La Bendición. Because the focus of the survey was on assessing the lived experiences of community research partners who engaged in the previous wildlife conservation project, the survey population reflected that research demographic, rather than the demographic of the entire community. To start each survey event, we provided each community group with a visual representation of all the activities contained within the project so that they could review it and provide general feedback. Following this activity, we handed out hardcopy surveys to each respondent in Spanish, and it consisted of 14 questions regarding their experience with the project, including 9 open-ended questions used in subsequent qualitative analyses (Supplementary S1). These questions were developed predominantly by the academic research team, with input and insights from external collaborators.

3.2. Analyses

3.2.1. Qualitative Analyses

The authorship team, including local bilingual liaisons, compiled, translated (Spanish to English), and verified the accuracy of open-ended survey responses, making minor grammatical and spelling corrections to improve English interpretations. Using these data, we then completed a multilingual open-coding analysis (Supplementary S1). We found, early on, that respondents did not necessarily answer questions directly but often included additional or general thoughts,

so we did not pre-categorize responses based on the survey questions. Instead, for this approach, two English-language coders used NVivo Pro 12 (version 12.6.0.959) to inductively (i.e., without predetermined categories) code all translated open-ended responses. Both coders, alongside the local bilingual liaison, reexamined, refined, and integrated these open codes, providing descriptions of each based on multilingual (Spanish to English) interpretations. The open codes then went through several rounds of collapsing and combining to identify connections that emerged in relation to the RSM potential outcomes (Creswell 2014; Glesne 2011). We then reviewed these codes and together determined our final set, including corresponding descriptions, interpretations, and connections to RSM potential outcomes (Table S3) (David-Chavez et al. 2024). Although shaped by the Indigenous ethics that frame the RSM, this inductive coding and organization process enabled community experiences derived from response data to further contextualize and define the interpretations of the outcomes presented in this study. Finally, we calculated the proportion of respondents that identified each thematic code and assessed inter-coder reliability using NVivo Pro 12 (version 12.6.0.959) to calculate a kappa coefficient of agreement among the two English-language coders for each code. Kappa coefficient values indicated almost perfect agreement for 34 out of 41 codes and perfect agreement for the remaining 7 codes (Landis and Koch 1977), with an overall percentage of 91.5%. Summary information is based on the lead author's final analysis (Table S2).

3.2.2. Quantitative Analyses

Prior to analysis, members of the authorship team cleaned the data to only include numeric values where relevant, and they replaced all blank and extraneous responses with NA. Following this cleaning stage, we calculated summary statistics to complement our qualitative responses. We analyzed all quantitative responses using R statistical software (version

2024.04.02+764). Specifically, we calculated the percentage of respondents who agreed or disagreed (along a five-point Likert scale) with nine statements regarding their experience (Supplementary S1). We also calculated the percentage of respondents who were using, were not using, or hoped to use the results of the wildlife conservation research project. Lastly, we calculated the percentage of respondents who indicated that they were more interested or less interested in forest conservation following the wildlife conservation research project and whether they were more likely or less likely to participate in a similar project. Sample sizes (n) varied because not all the respondents answered every component of every question in the survey.

3.3. Results and Discussion

To broadly assess the alignment of the overall project process with the RSM principles, Figure 2 outlines key reflections that correspond to each of the four RSM core values of integrity, respect, humility, and reciprocity, each of which demonstrated high agreement (agreement percentage ranging from 74 to 97%; Figure 2). Statements that reflected the value of integrity received the lowest level of agreement, though the majority of respondents still felt that their community was able to control the outcomes and information gathered during the project (86% agreement, n = 35) and that they knew what the project was about and how it would benefit their community from the start (74% agreement, n = 35). This lower level of agreement could indicate that more effort could have been dedicated towards engaging community research partners at the onset of the project, prior to initiating field project activities. Related to the value of respect, respondents largely agreed with feeling that the project team was flexible and accommodating of community needs and interests as they developed (95% agreement, n = 36) and feeling that they were able to provide input, lead, or change aspects of the projects or meetings if desired (91% agreement, n = 34). Statements that reflected the value of humility

received the strongest agreement from respondents, which included feeling listened to and honored in their interactions with the research team (97% agreement, n = 33) and feeling that the research team was genuinely interested in learning from them and about their community or culture (94% agreement, n = 36). Lastly, regarding reciprocity, the respondents largely felt that the project was made relevant to community interests and concerns (94% agreement, n = 35), that there was a balance between what was asked and the benefits of the project (92% agreement, n = 35), and that they were able to access information and findings related to the project (81% agreement, n = 31).

Although these ratings provide a baseline understanding of the overall impression of the research on local rightsholders, the primary voices and experiences of community research partners offer a deeper understanding of the realized impacts of the wildlife conservation research project in alignment with RSM values and intended outcomes (LaFrance and Nichols 2008). Therefore, to provide a more complete evaluation, the proceeding sections outline the thematic analysis and additional complementary quantitative metrics and researcher reflections related to each RSM value to assess community-based outcomes, as well as the implications of these results.

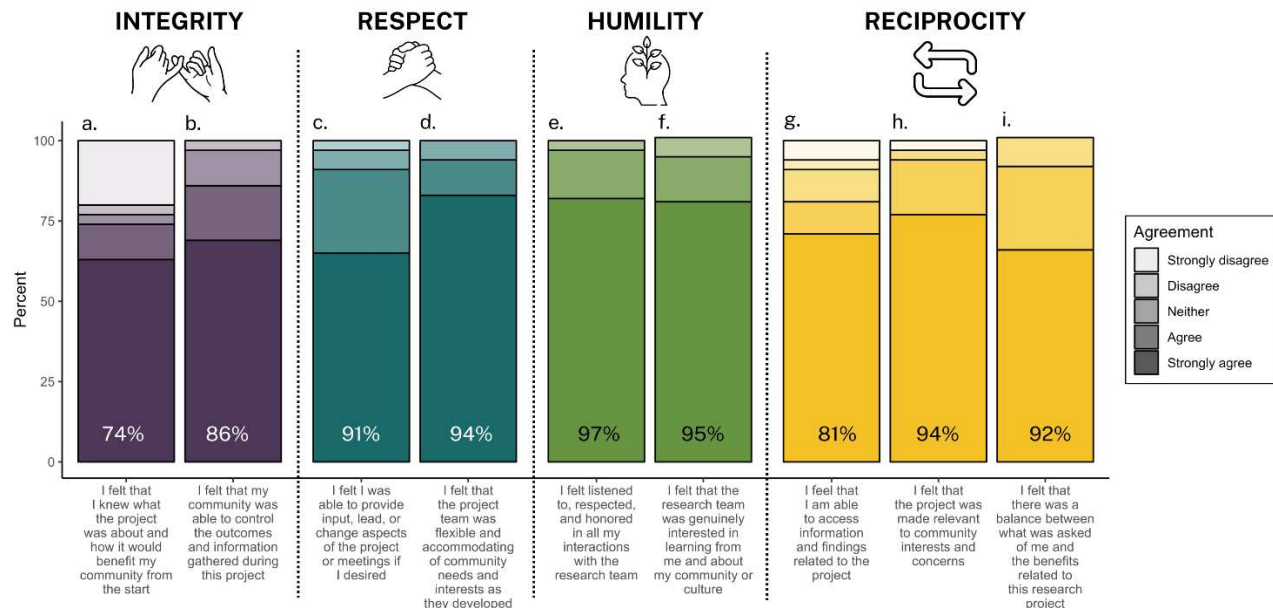


Figure 2. Community ranking of research processes. The x-axis shows each statement that we asked the respondents to rank, binned by each Relational Science Model value. The y-axis shows the agreement percentage for each statement, and the shading represents agreement rankings from “Strongly agree” (darkest) to “Strongly disagree” (lightest). The combined percentage for agreement rankings (“Strongly agree” and “Agree”) are shown at the bottom of each bar.

3.3.1. Integrity

The RSM outlines four potential outcomes of applying research integrity, including accountability to community, upholding sovereignty, improved data quality, and improved trust in research processes and relationships (David-Chavez et al. 2024). Overall, the authorship and analysis team identified the value of integrity as largely representing outcomes that corresponded to how the external research team and affiliated institutions formally and ethically prepared for working with Indigenous research partners, such as through drafting accountability agreements, completing ethics trainings, introducing the project and researchers, and facilitating Indigenous data governance strategies (Figure 3), which we further expand upon in our methods (Figure 1; Table S1). Therefore, evaluation indicators of integrity include both internal mechanisms demonstrating researcher and institutional preparations (Figure 3), as well as how these actions

influenced community experiences (Figure 2a,b; Figure 4). For example, regarding how the community experienced the outcome related to trust, responses indicated a growing and persistent interest in the research and research topic, with 100% of respondents indicating that they were more interested in forest conservation because of this project, 8% of whom had a growing interest in medicinal plants specifically (n = 38; Figure 4a). Meanwhile, there were several respondents who noted continued excitement and interest in future projects, exemplified by statements such as “Keep doing more research projects”, with 97% of respondents indicating they were more likely to participate in a similar project thereafter, with the rest being unsure (n = 39; Figure 4b). These results arose even after previous lived experiences with researchers entering La Bendición lands for environmental research purposes and extracting knowledge, with limited community engagement or reciprocity. These results underscore the role of relational accountability strategies in supporting reconciliation efforts (Armitage et al. 2019; David-Chavez et al. 2024).

In striving to implement ethical standards of integrity, the research team did face challenges in articulating rights within local political and international contexts, as Guatemala and U.S.-based institutions have minimal legal guidance for working with Indigenous and mixed rural communities in this region (Nature 2022). The lack of guidance required the academic researchers to independently outline the implementation of UNDRIP in appropriate research protocols, such as the university Institutional Review Board (IRB) protocol. Meanwhile, because this research was facilitated by university affiliates, original templates came directly from the institution. However, because the use of these formal and legal agreements is generally not required by institutions, it became the responsibility of the researchers to be the primary liaisons, even if this was not their area of expertise. In the end, due to the limited legal support,

researchers and community research partners dedicated substantial time outside of regular research activities to walking through and revisiting these documents throughout the study and critically considering the meaning and importance of data retention and long-term data stewardship in alignment with the CARE principles (Carroll et al. 2020, 2021, 2022; Jennings et al. 2023). These processes could be improved through the institutional recognition and consideration of Indigenous research and data sovereignty, such as through dedicated support staff and Indigenous rights-specific research protocols. Additionally, further consideration of the resources, expertise, and timelines required to thoughtfully develop these formal agreements and data stewardship plans is warranted.

Lastly, the research team also harbored concerns involving the accessibility of digital data, given the lack of digital infrastructure and mixed literacy within the community. These concerns, coupled with ongoing discussions with community experts, led us to pursue diverse data outputs (e.g., printed visuals, written reports, presentations, workshops, and an external hard-drive) to support community authority and the utility of their data (Figure 2b) and build research and data stewardship capacity in La Bendición. The importance of pursuing data creations beyond academic publications is consistent with other research illustrating the broad social and political impacts offered by expansive community-specific outputs (Bennett et al. 2017). However, these diverse data creations could be further enabled by university-level support, such as academic incentives, to pursue community-based outcomes, rather than conventional metrics based on the quantity of data extracted and publications generated.

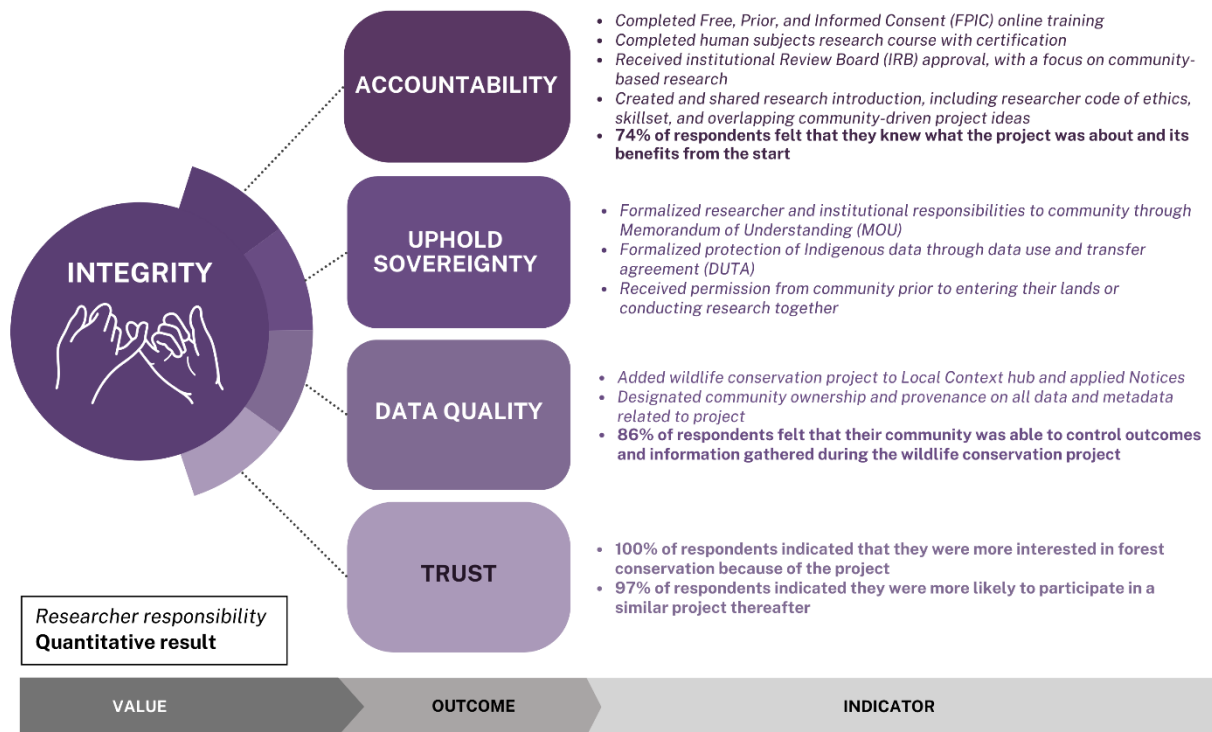


Figure 3. Evaluation indicators of outcomes related to the value of integrity. The four potential outcomes arising from the core value of integrity, as presented in the Relational Science Model. Included in the evaluation indicators are external researcher responsibilities (*italicized*) and quantitative results (in **bold**, from Figure 2 and Figure 4) binned by each of the outcome criteria.

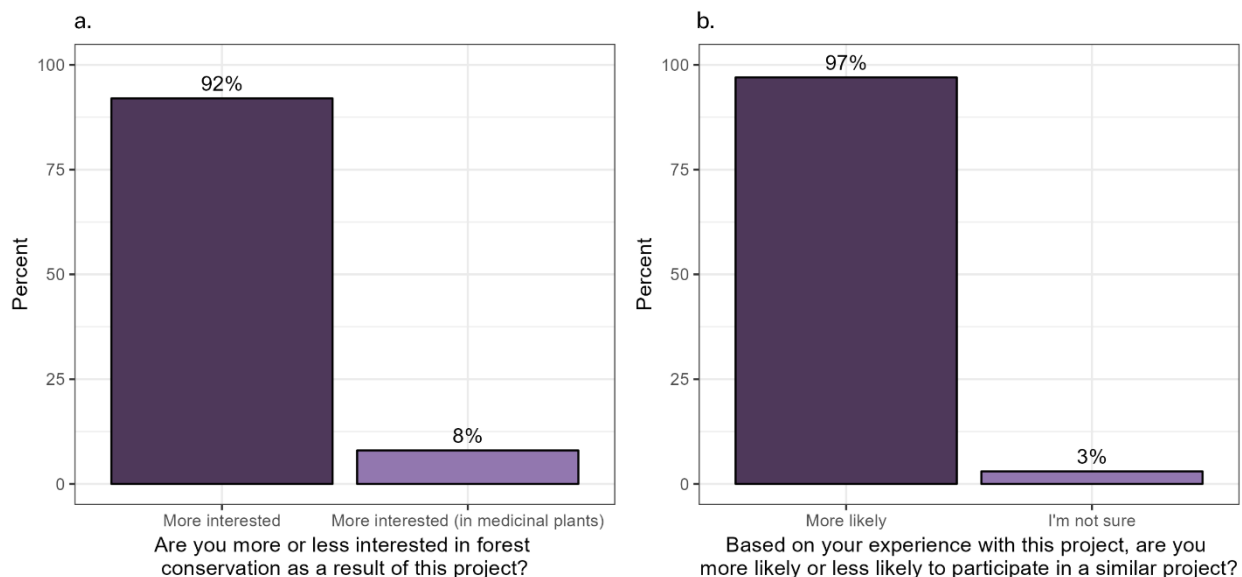


Figure 4. Post-project community perception. (a) shows the percentage of community respondents who are more interested in forest conservation (or medicinal plants, specifically) following the project. (b) shows the percentage of community respondents that are more likely or less likely to participate again in a similar project.

3.3.2. *Respect*

Regarding the RSM core value of respect, four central outcomes arise, including project relevance, utility, and support for local decision-making and self-determination (David-Chavez et al. 2024). Regarding project relevance, several respondents voiced general project appreciation and community benefits, including noting how supporting forest conservation could support livelihoods as well, with one respondent noting, “We need to protect the forest. Without forest, there is no source of water or animals. The forest regulate[s] the weather and they provide food” (Figure 5). By intentionally making research processes relevant to community interests and goals, this led to a high degree of utility, with nearly three-quarters of community research partners already using project results after merely three months following the conclusion of the project ($n = 33$; Figure 6), with one respondent stating, “What this left us is something visible, for example the recipe book, [and] the pictures of the animals of the forest”, and another noting, “For the future, my family could get benefit through an ecotourism project. [This] could be a way to open this possibility”. Of those not yet using project results (27%), 4% are hoping to use project results in the future ($n = 12$; Figure 6), with one respondent commenting “The projects you have brought to us have been very good. I couldn’t participate but I would like to in another opportunity”.

The ability for community members to engage in future project efforts could be encouraged through the advancement of local decision-making and self-determination, both of which had demonstrated support through this project (Figure 2c,d and Figure 5). For example, because the ability of the community to make decisions as a collective is largely supported by the strength of connections within the community, we highlight several responses that emphasized growing community appreciation, learning, and cohesion, with one respondent commenting that

“It was interesting to talk and remember how we as a community are structure[d], and share... the [role] of each of us in the community”. Meanwhile, regarding self-determination, some community members noted how the project paves the way for future, community-driven projects, with one community member commenting, “We [were] exposed [to] the forest diversity and richness in addition to the services it provides... we are able to manage new projects and there is more forest conservation conscience”.

Related to improvements, other community members noted the desire to play a stronger role in project leadership, supported by internal community processes, as well as external researcher facilitation, with one respondent noting, “Involve more [of] the directive organisms in the process [so] that everything goes well”. Community leadership could be supported through external researchers spending more time with the community and meeting with community experts, respected leaders, and community groups more often prior to developing a project proposal. The importance of building relationships in this way has been underscored throughout the literature as a primary driving force in promoting Indigenous leadership and co-creation (David-Chavez et al. 2024; Ermine 2007; Gardner-Vandy et al. 2021). However, funding allocation to relationship development and project co-creation outside of data collection is frequently undervalued in grant priorities (Gardner-Vandy et al. 2021; Tachera 2021), with the majority of conservation grants prioritizing extractive research paradigms (Hird et al. 2023; Kashwan et al. 2021). Based on these results and the culmination of research outlining the importance of Indigenous-led research processes, funding that explicitly prioritizes relationship building, local leadership, and flexible, community-driven timelines and outcomes would elevate the value of respect in these contexts (Toomey et al. 2015; Zonta et al. 2023) and thereby provide

additional capacity for researchers to outline thoughtful engagement strategies early on (e.g., in a grant proposal).

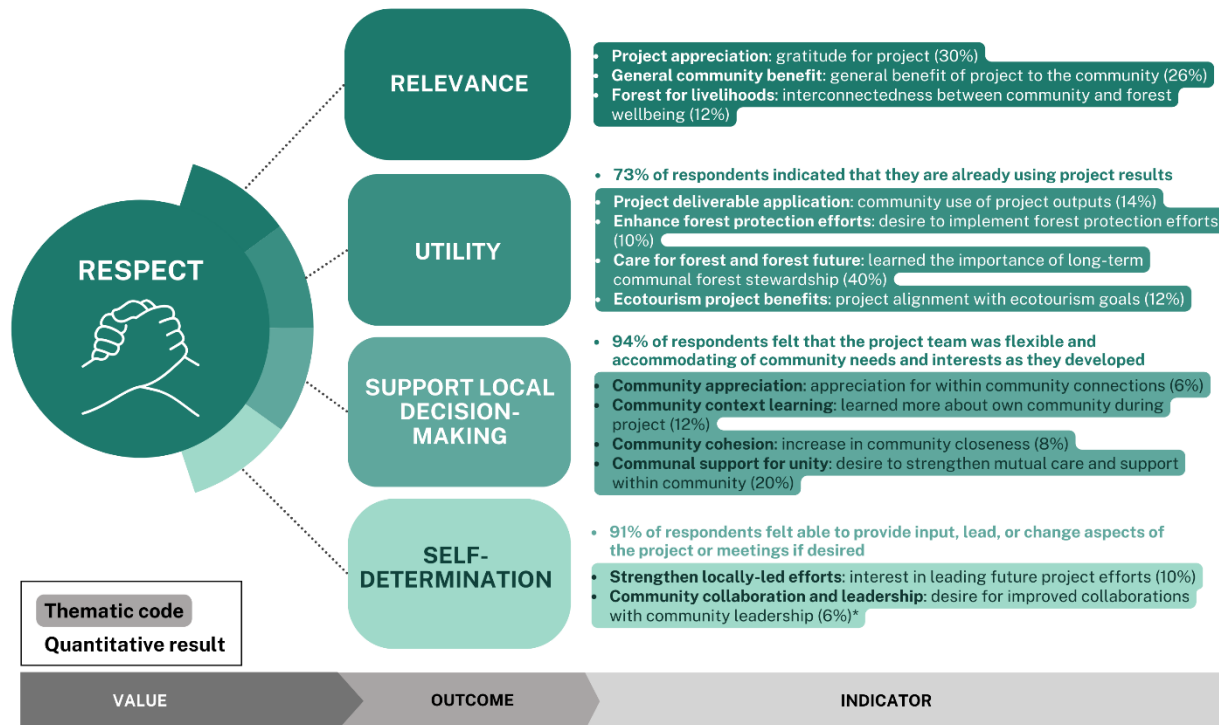


Figure 5. Evaluation indicators of outcomes related to the value of respect. The four potential outcomes arising from the core value of respect, as presented in the Relational Science Model. Thematic codes (in **bold** and highlighted) are binned by each of the outcome criteria, including brief descriptions and the proportion of respondents who mentioned each thematic code in parentheses. Asterisks (*) denote codes that infer a critique or area of improvement within the project (Table S2). Included, where relevant, are complementary quantitative results (in **bold** with no background, from Figure 2 and Figure 6).

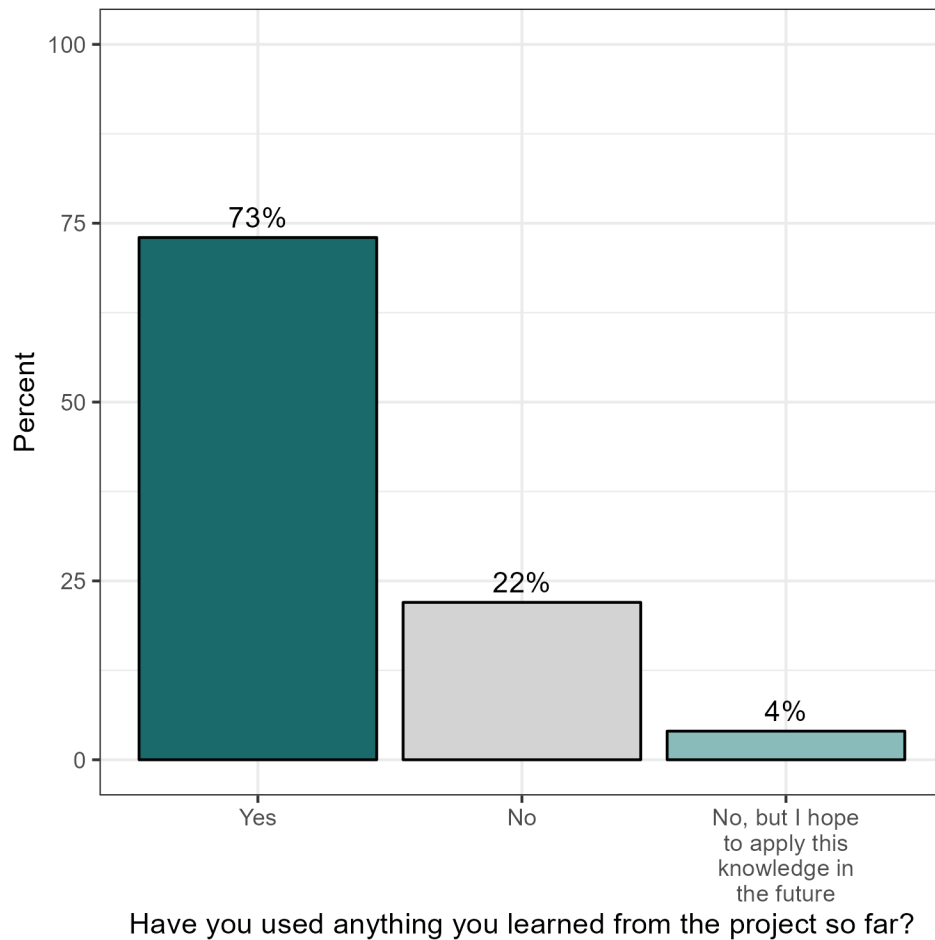


Figure 6. Proportion of community research partners using project results. The figure above shows the percentage of respondents that are using, hope to use, or are not yet using project results following the conclusion of the project.

3.3.3. *Humility*

For the RSM core value of humility, outcomes encompass increased capacity, collective action, innovation through knowledge generation, and the strengthening of knowledge transmission (David-Chavez et al. 2024). In particular, implementing principles of humility yielded increased capacity and collective action of community research partners through the diverse methods employed during the research process (Figure 7). Results related to capacity demonstrated strong ties to the potential for extending knowledge transmission within the community, with several respondents noting the desire for, interest in, and intention of continuing

to create new knowledge within the community, developing future projects, and expanding knowledge exchanges to include more of the community or other communities, with one respondent commenting, “I would like to share more knowledge about the forest and medicinal plants” (Figure 7). Some respondents also commented on a personal interest or desire to engage in the project further. Regarding collective action, several respondents noted how this project and future projects might contribute to community development, with one respondent noting, “The community improves as we improve as well. The nature preserves”. Additionally, related to collective action for strengthening knowledge transmission, in particular, women played a leading role in organizing the community in a medicinal recipe knowledge exchange that proved to be transformative and rewarding for the majority (60%; Figure 7) of community research partners, with several respondents underscoring the importance of learning about and utilizing medicinal plants to “heal the family” and to “not lose the ancestral information of the recipes”. This exchange was especially important for this community given their mixed culture, with much of the community originally coming from different regions of Guatemala. Meanwhile, the importance of women’s knowledges for safeguarding crucial food and medicine resources and thereby local ecosystem diversity has long contributed to ecosystem stewardship and conservation innovation (Shiva 1994). In this way, the implementation of RSM principles related to humility demonstrated strengthened conservation development, as well as communal governance and healing through honoring the local expertise and leadership of women in the community (Figure 2e) (Armitage et al. 2019).

In addition to supporting the generation and sharing of medicinal recipe knowledge, the application of participatory methods and community-engaged research and knowledge sharing (Figure 2f) contributed to innovative, place-based knowledge generation in support of both

immediate concerns and future visions of La Bendición (Bingham et al. 2021; Maiter et al. 2008). For example, community members commented on the importance of each research method employed, from specific learning outcomes related to birds, camera traps, and their communal forest to the general creation and application of new knowledge alongside project novelty, with one respondent noting, “We know our forest... now we know animal species and we are very interested in the forest, to keep watching over the forest to know better the richness of it”. These same sentiments were also expanded by the transmission of knowledge within the community, with respondents commenting on the importance of communal and intergenerational knowledge exchanges facilitated during the project, with one respondent commenting, “I tell my children and the family about the animals that live in the forest and about the existence of camera traps”.

Community research partners also provided valuable feedback on how to improve humility within the project, such as the need for Indigenous (Mayan mam) language translation, as well as more youth engagement. Similar to the value of respect, these features of humility could have been improved through the dedicated investment in relationships early on across diverse demographics and roles (Gardner-Vandy et al. 2021; Walker et al. 2020; Wong et al. 2020). Although relationships with Indigenous language speakers and youth community members became strengthened by the end of the project, with results recently translated into Mayan mam and youth engagement in workshops, these initiatives occurred well after the development and application of research activities, rather than during important co-creation stages of the project. Because language revitalization and the transmission of knowledge to youth are central to the resurgence and continuity of Indigenous knowledge systems (Simpson 2004),

strengthening these processes throughout would promote communal forest stewardship innovation both now and into the future (Fernández-Llamazares et al. 2021).

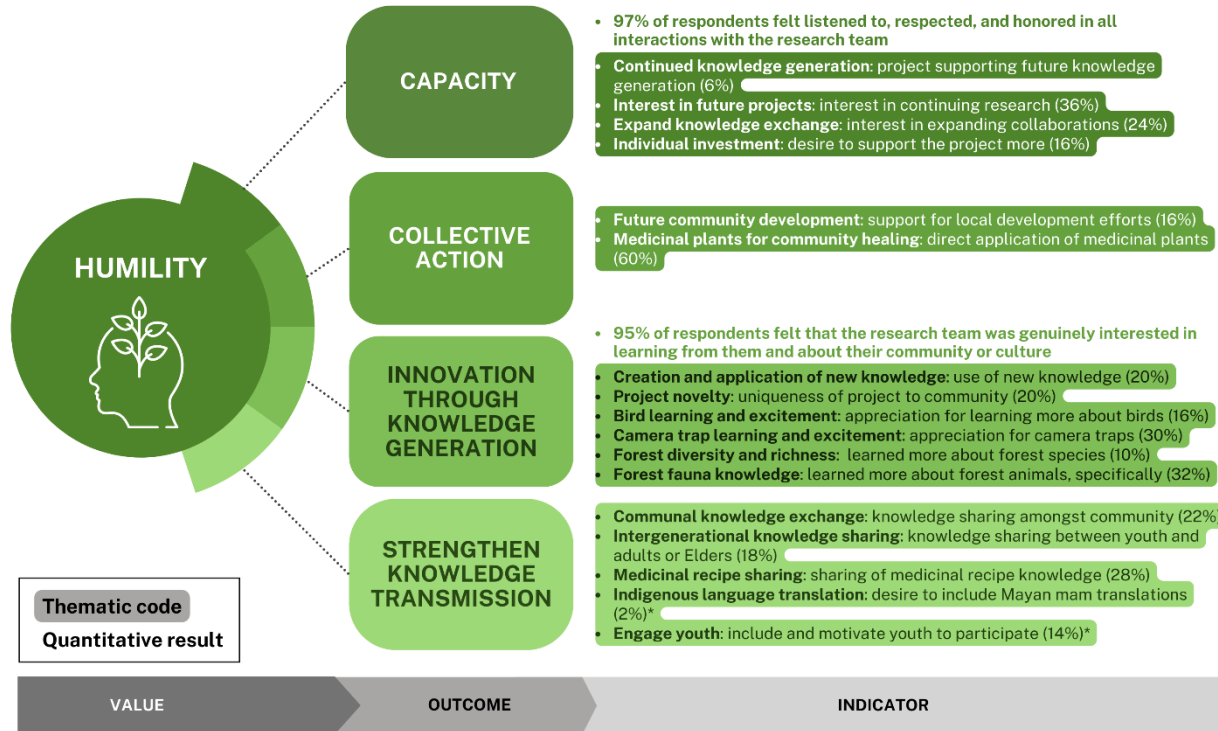


Figure 7. Evaluation indicators of outcomes related to the value of humility. The four potential outcomes arising from the core value of humility, as presented in the Relational Science Model. Thematic codes (in **bold** and highlighted) are binned by each of the outcome criteria, including brief descriptions and the proportion of respondents who mentioned each thematic code in parentheses. Asterisks (*) denote codes that infer a critique or area of improvement within the project (Table S2). Included, where relevant, are complementary quantitative results (in **bold** with no background, from Figure 2).

3.3.4. Reciprocity

For the RSM core value of reciprocity, outcomes include improved access, sustained relationships and support, equitable outcomes, and validity of research results (David-Chavez et al. 2024). These outcomes build upon the previous values, as well as the intentional framing of the project, with the project led by the self-determined goals and interests of the local community (Figure 2h,i). Building from these relational intentions and methods (Figure 1), in alignment with

the accessibility of the project results, several respondents emphasized the generation and retention of knowledge for the community, with one respondent noting, “The job that you came to do here will remain here at the community, you didn’t take it away” (Figure 8), consistent with quantitative results (Figure 2g). However, community research partners outlined several needs and areas of improvement to ensure broader access and engagement, including a desire for more of the community to participate in the research, alongside addressing literacy and language barriers and other accessibility barriers, such as scheduling of research activities. Regarding sustained relationships and support, several respondents emphasized interest in maintaining research efforts amongst the community and with researchers and requested more learning opportunities, such as workshops, alongside continued visits and follow-ups by the research team. In supporting equitable outcomes, although respondents indicated a balance between research requests and benefits (Figure 2i), respondents also underscored the need to motivate more of the community to participate, especially youth members. Additionally, respondents noted that improved facilitation, including supporting more unity amongst the community and with the researchers, would be helpful. Lastly, related to the outcome of research and data validity, while the respondents did not speak to this directly, the overall reliability of the research was supported by both internal processes of community review, feedback, and authorship, as well as expressed project relevance (Figure 2h).

Similar to the previous values, investing in relationships and meaningful community leadership opportunities arise as key for strengthening reciprocity in project processes. specifically, cultivating a research team at the onset, inclusive of diverse community members and respected leaders, could help foster more community ownership and facilitation of project activities through sharing capacity (Muhl et al. 2023). However, given the full and abundant lives

of community members, these additional roles would need to be appropriately and meaningfully supported. Monetary compensation is one option, though identifying conservation grants that emphasize community engagement presents an outstanding challenge, with the other major hindrance being the logistical constraints of providing direct funds to rural community members, especially non-English speakers and those based in the Global South (e.g., written English forms, digital transfers, tax and citizenship requirements, etc., as required by our institution). While we were able to strategize honorarium payments to community research partners at the closure of the project, these funding constraints limited our ability to provide initial and ongoing monetary compensation during the project. In response, members of the authorship team have since been working with La Bendición to establish a formal community organization and website to facilitate more direct funding moving forward.

Because monetary compensation is just one option out of many, during the project, we pursued other community-rooted compensation options as well, such as gift giving, celebrations and meals, community-driven products, and co-authorship (Chief et al. 2015; David-Chavez et al. 2024). Although we implemented co-authorship and acknowledgments in all community-specific outputs, the additional requirements of academic journals (e.g., individual authorship, email access, and literacy and language standards) presented further barriers for authorship by community organizations, especially in rural contexts. Additionally, thesis and dissertation research in particular reinforces the requirement for lead authorship by the academic researcher, thereby undermining ethical procedures, alongside the significant knowledge contributions of community research partners (Carroll et al. 2022; Chief et al. 2015; Kūlana Noi‘i Working Group 2021). Taken as a whole, strategizing compensation mechanisms while navigating institutional bureaucracy to adequately meet ethical standards with regard to reciprocity created an undue

burden on the research team, which is a growing concern for early-career researchers and researchers with minoritized identities (Jimenez et al. 2019). This dynamic can exacerbate inequities, not only regarding reciprocity between community research partners and external researchers but also within institutions where early-career researchers and scholars of minoritized backgrounds tend to assume the responsibilities of implementing and improving just practices (Hird et al. 2023; Jimenez et al. 2019). Identifying and working to mitigate these institutional challenges could help facilitate equitable compensation for communities, thereby lessening the researcher burden while encouraging valuable contributions to conservation science from community experts.

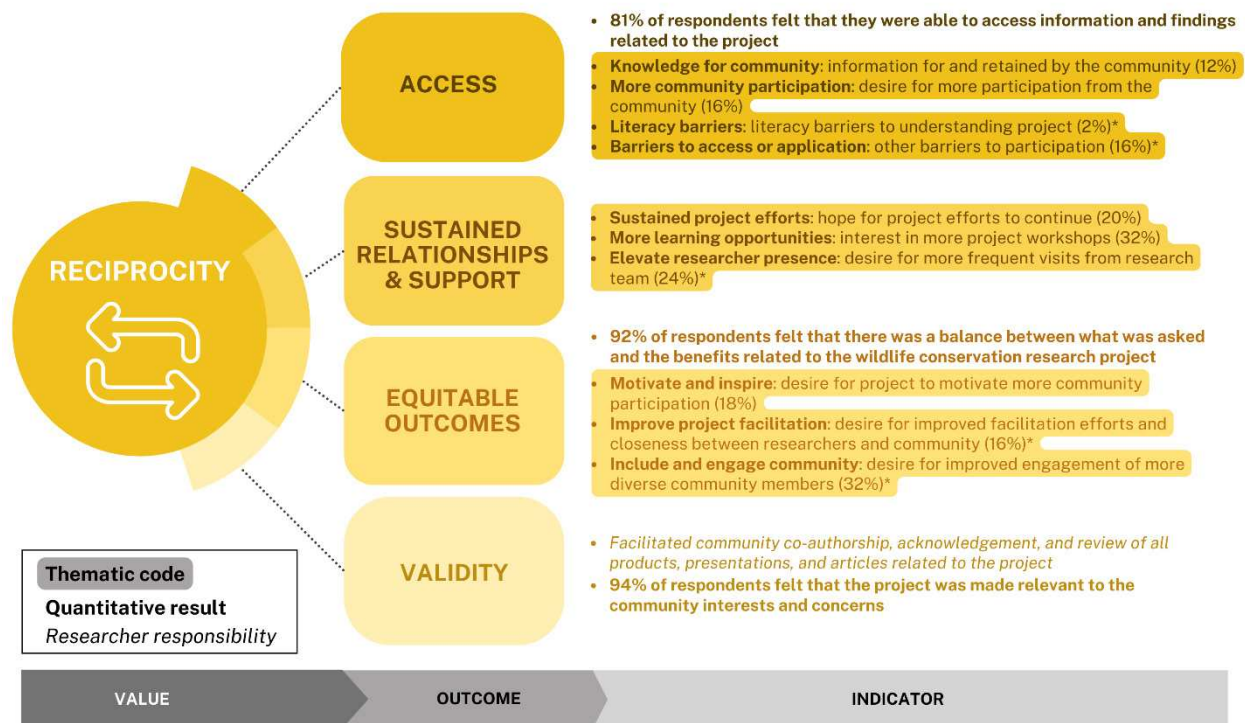


Figure 8. Evaluation indicators of outcomes related to the value of reciprocity. The four potential outcomes arising from the core value of reciprocity, as presented in the Relational Science Model. Thematic codes (in **bold** and highlighted) are binned by each of the outcome criteria, including brief descriptions and the proportion of respondents who mentioned each thematic code in parentheses. Asterisks (*) denote codes that infer a critique or area of improvement within the project (Table S2). Included, where relevant, are complementary quantitative results (in **bold** with no background, from Figure 2) and external researcher responsibilities (*italicized*).

4. Conclusions

This article underscores the possibilities and capacity of conservation and environmental sciences to engage Indigenous-centered ethical principles, with measurable outcomes for improved Indigenous conservation governance and research relations (David-Chavez et al. 2024) (Figure 2). Ethical models, such as the RSM, which was further contextualized in this study, offer crucial pathways and insights for fields such as conservation and environmentalism to divest from colonial research paradigms and instead honor and uphold the fundamental and legal rights of Indigenous Peoples (United Nations General Assembly 2007). Thereby, conservation initiatives can value the local expertise and place-based knowledges that are key for supporting social and environmental recovery and resilience (IPCC 2023). This article contributes to this goal by offering further guidance for applying and evaluating community-engaged conservation studies based on the RSM principles (Figure 1; Table S1), as well as key values-based recommendations for researchers, institutions, and agencies to continue instilling ethics for relational accountability into their research processes, as summarized below.

- 1) Integrity: We recommend that institutions, agencies, and governing bodies formalize an Indigenous rights-based practice for engaging with Indigenous Peoples in research that aligns with UNDRIP, such that protocols and mechanisms are made transparent to both institutional affiliates and community research partners with dedicated and informed support staff. These efforts should include identifying clear pathways to support Indigenous data governance and data stewardship (Carroll et al. 2022) as well as strategies for incentivizing community-driven outcomes. We also recommend that all

researchers consider the time and resources it takes to implement ethical procedures when crafting project timelines.

- 2) Respect: We recommend that funders (alongside researchers and institutions) place a stronger emphasis on relationship and trust building at the onset of research projects that engage Indigenous Peoples, lands, or interests, such that responsible engagement with and facilitation of community leadership is at the forefront of research planning (Gardner-Vandy et al. 2021).
- 3) Humility: We recommend that external researchers build diverse and meaningful relationships prior to developing formal research proposals, especially with youth, women, Indigenous language speakers, and Elders (Wong et al. 2020).
- 4) Reciprocity: We recommend that funders, external researchers, institutions, and other agencies meaningfully compensate and credit diverse, robust, and place-based research teams through improving community access to direct funding sources and authorship (Baker et al. 2019; Kūlana Noi‘i Working Group 2021).

With these research recommendations in mind, we also offer further limitations and refinements to our study design to consider for future evaluation efforts. For example, in alignment with suggestions to improve research participation, survey participation could also be encouraged by investing more time and resources into connecting with and providing tangible benefits to diverse community members prior to commencing the study, including those who may not have participated or have interest in the initial conservation project. Additionally, while the wildlife conservation research project emphasized participatory methodologies, we did not employ these same strategies in our survey design or analysis process, given this study’s more expedited time frame. Instead, in our process, we employed broad, open-ended questions to

promote an inductive analysis shaped by community voices and insights and further supported by researcher reflections and observations. However, this more generalized approach also limited the ability of this study to evaluate each RSM outcome based on community experience alone (e.g., the value of integrity). These limitations warrant further consideration of the balance between open-ended questions and more focused questions related to value outcomes from the RSM or other co-developed evaluation models. Overall, for future efforts, we recommend considering evaluation approaches for research projects at the onset of project activities to better attune both research and evaluation to community-specific values, worldviews, and outcomes (Chilisa et al. 2016). The RSM, for example, as it is considered a “living working model” (p. 10, David-Chavez et al. 2024), could be further adapted, including underlying values, to meaningfully reflect specific community contexts. Taken as a whole, this article outlines an approach to implementing Indigenous rights-centered ethical standards into conservation science to better align intentions with realized outcomes while demonstrating evaluation procedures for building in research responsiveness to continually adapt, innovate, and advance relational conservation science practice.

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6. Supplementals

Table S1. Core values and related responsibilities applied, based on Relational Science Model (RSM) recommendations.

Value	Key RSM Recommendations	Application
Integrity: “researcher’s commitment to understanding and honoring moral and ethical responsibilities to the communities impacted by the research.” (p. 5, David-Chavez et al., 2024)	- Clearly define and adhere to place-based ethical responsibilities and protocols in relation to Indigenous rights, such as Tribal or institutional review boards (IRB) - Formalize relational agreements, such as a memorandum of agreement or understanding (MOAs/MOUs) and/or data use and transfer agreements (DUTA) - Understand and respect protocols of Free, Prior, and Informed Consent (FPIC), such as adhering to both individual and collective consent procedures - Uphold CARE principles for Indigenous data governance, including through respecting community-defined data restrictions	- All researchers engaged in ongoing historical and contextual learning through independent readings and discussions with collaborators and community research partners - All external researchers, including CSU researchers, local technicians, and community experts from Utz Che’, completed ethical trainings for human subjects research to build a strong understanding of consent and “do no harm” protocols - Lead author drafted a values-centered researcher code of ethics (David-Chavez et al. 2024; Kūlana Noi‘i Working Group 2021) and researcher introductions to share with community to help set expectations and intentions prior to requesting permission to conduct a project together (FAO 2016) - Collaborators drafted an MOU to protect Indigenous knowledges and rights - Researchers co-drafted a DUTA with the community, accompanied by a long-term data management and stewardship plan

Value	Key RSM Recommendations	Application
		• Lead author actively pursued trainings, including Free, Prior, and Informed Consent (FPIC) online modules (FAO 2016), and readings in support of ethical collaborations with Indigenous Peoples prior to developing any research proposals (Carroll et al. 2022; David-Chavez and Gavin 2018; Kūlana Noi‘i Working Group 2021; Suisseeeya 2014; Toomey 2016) • All researchers sought procedural guidance and consent from individuals involved in the project as well as collective, community consent throughout • Lead author familiarized with the CARE (<u>C</u>ollective benefit, <u>A</u>uthority to control, <u>R</u>esponsibility, <u>E</u>thics) Principles for Indigenous data governance to guide data management procedures and creation of the DUTA (Carroll et al. 2020; 2021; 2022) • All data and associated outputs from the project are attributed to the local community as the rightful owners • All researchers applied the use of Local Context Notices with data related to the project (https://localcontexts.org/)
Respect: researcher’s commitment to “sustaining or restoring Indigenous governance of research and data impacting Indigenous communities” (p. 6, David-	• Seek research guidance from community advisory groups throughout all stages of the research process, including data generation and stewardship • Co-design research goals, objectives, and processes with the community • Maintain flexibility and adaptability in research design and approaches in alignment with community outcomes	• Research built on over a decade of relationship-building between all project partners, including a local Indigenous-led non-profit organization originally founded by La Bendición community leaders (Gardner-Vandy et al. 2021) • Researchers sought wisdom and guidance from community experts, leadership councils, and community groups throughout all stages of the project

Value	Key RSM Recommendations	Application
Chavez et al., 2024)	● Facilitate participatory approaches for community members to authentically inform and drive research processes	● Collaborators facilitated project visioning sessions early on to inform and co-create initial project proposal ● Research team included two local Guatemalan bilingual biologists to facilitate project activities and work to understand local customs and contexts ● Researchers lived with the community for four months to further build relationships and support co-creation processes ● Researchers facilitated ongoing co-creation of project activities, workshops, deliverables, and gatherings through regular meetings with community advisory groups ● Researchers facilitated re-occurring project check-ins to outline roles and adjust project framework, timeline, and outputs in alignment with capacity and interests ● Researchers presented flexible project approaches based in participatory action research (Maiter et al. 2008) for the community to take ownership and authority of project processes ● Researchers and community experts jointly facilitated the community creation of maps and timelines outlining communal lands as well as ancestral plant medicines
Humility: research commitment to supporting “shared learning by acknowledging the underlying premise that all those engaged in the research	● Uphold Indigenous knowledges as valid in their own right and contexts and for their own purposes ● Engage multiple ways of knowing to enhance shared knowledge generation ● Support mutual learning and engagement	● Researchers broadened their knowledge of social science research, participatory methods, and Indigenous methodologies to complement ecological research approaches ● Researchers continually reaffirmed the inherent expertise and valuable knowledge held by diverse community experts

Value	Key RSM Recommendations	Application
bring unique strengths, expertise, and experiential insights that when brought together generate new knowledge” (p. 7, David-Chavez et al., 2024)	• Work to understand and address uneven power dynamics and social tensions	• Researchers encouraged and facilitated discussions for diverse community experts to share their insights and experiences on their communal lands, which in turn guided the research design and application of diverse methods • Researchers provided explanations and trainings of different social and ecological methods for the community members to learn about and choose from in alignment with communal goals and interests • Researchers shared in ongoing discussions at community center and engaged in forest walks to learn about community lands, interests, and concerns • The lead author engaged in reflexivity journaling and reflection in an effort to revisit and reflect on values and intentions and critically observe their expression (or limitations) in practice (Beck et al. 2021) • Researchers intentionally engaged all community groups, focusing particularly on the women’s group and youth group within the community to inform and direct project efforts
Reciprocity: research commitment to ensuring “Indigenous community members can access benefits from research outputs and outcomes” (p. 8, David-Chavez et al., 2024)	• Consider multigenerational and multispecies project benefits • Compensate project contributions to respect time, resources, and expertise shared • Pursue and generate community-centered data as well as outputs • Support and encourage community review of research data and outputs as well as authorship	• Research outcomes aimed to support both environmental sustainability and wildlife stewardship as well as knowledge continuity • Researchers provided research results in diverse formats (printed, books, digital) for sharing throughout the community • Researchers co-created DUTA templates in multiple languages (English and Spanish) that the community could use for future projects

Value	Key RSM Recommendations	Application
		● Researchers provided a surprise honoraria to all community experts and co-facilitators of the project ● Researchers brought treats or/and invested in community meals at each project gathering ● Researchers co-planned, facilitated, and supported an end-of-project celebration, including a gift exchange of treats and project deliverables ● Researchers continually sought feedback from community experts to align project outcomes with community interests, relevance, and benefits ● Researchers continued engagement post-project to ensure long-term benefits ● Researchers sought community review of all research outputs to ensure accuracy in community representation and knowledge ● Researchers offered opportunities for authorship credit on all outputs, including publications

Supplementary S1: Community reflection survey questions used in analysis (open-ended questions in **bold**).

Please tell us about your project role

1. *If you DID participate in the study - **why did you choose to participate in the study?*** (Please write a response below - skip if not applicable)
2. *If you did NOT participate in the study - **in what ways could project activities, processes, or collaborations be improved to support your engagement in the future?*** (Please write a response below - skip if not applicable)

Please tell us about what you learned from the project

3. **What are some things that you learned from the project?** (Please write a response below)

Please tell us about your learning outcomes

4. Have you used anything you learned from the project so far? (Please check one)
- **Yes (Please briefly describe how you *have already* used this information below)**
 - No, but I hope to apply this knowledge in the future (Please briefly describe how *hope to* use this information below)
 - No and I don't plan to use this information
 - I did not learn anything from this project

5. Are you more or less interested in forest conservation as a result of this project?

(Please check one)

- More interested
- No change
- Less interested
- Not sure

Please share more about your experience

6. Please rate the degree to which you agree or disagree with each statement (circle one number for each statement):

Reason for participating in the project	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1. I felt that I knew what the project was about and how it would benefit my community from the start	-2	-1	0	1	2
2. I felt that the project was made relevant to community interests and concerns	-2	-1	0	1	2
3. I felt that the project team was flexible and accommodating of community needs and interests as they developed	-2	-1	0	1	2
4. I felt that there was a balance between what was asked of me and the benefits related to this research project	-2	-1	0	1	2
5. I felt listened to, respected, and honored in all my interactions with the research team	-2	-1	0	1	2
6. I felt that the research team was genuinely interested in learning from me and about my community or culture	-2	-1	0	1	2
7. I felt I was able to provide input, lead, or change aspects of the project or meetings if I desired	-2	-1	0	1	2
8. I felt that my community was able to control the outcomes and information gathered during this project	-2	-1	0	1	2
9. I feel that I am able to access information and findings related to the project	-2	-1	0	1	2

Please share your thoughts about your experience with other projects

1. **If you have participated in another research project, how was this project similar or different?** (Please write a response below - skip if not applicable)
2. Based on your experience with this project, are you more likely or less likely to participate in a similar project? (Please check one)
 - More likely

- No change
- Less likely
- Not sure

Please share any additional thoughts you might have about the project

3. In what ways, if any, did the project feel relevant, beneficial, or important to you, your family, or your community?
4. In what ways could project activities, processes, or collaborations be improved?
5. Do you have anything else that you would like to be included or considered in future projects?
6. Is there anything else you would like to share?

Table S2. Codebook with summary statistics, including the number (*n*) and proportion (%) of respondents who mentioned each thematic code and kappa coefficients.

Thematic code	Code description	Sample quotation	Number (<i>n</i>)	Proportion (%)	Kappa Coefficient
<i>RESPECT (76%)</i>					
<i>Relevance (48%)</i>					
Project appreciation	Expressed gratitude or general excitement towards project, project activities, project insights, or/and project team	"I like a lot [of] your projects, thank you for giving us this workshop."	15	30	0.812
General community benefit	General benefit, relevance, or importance of the project to families and the community	"Very important for my community and also for my family."	13	26	0.892

Thematic code	Code description	Sample quotation	Number (n)	Proportion (%)	Kappa Coefficient
Forest for livelihoods	Supporting the forest/environment and related projects supports community livelihoods and local economy	"It would help the environment, so my children and my husband don't hunt anymore. We didn't have this knowledge before."	6	12	0.834
<i>Utility (52%)</i>					
Project deliverable application	Use of project deliverables (guides, recipe book, or/and photo album)	"We have come to check the guides and album"	7	14	0.978
Enhance forest protection efforts	Desire to implement forest protection efforts	"Make forest protection activities, like fire break paths"	5	10	0.914
Care for forest and forest future	Learned the importance of caring for, watching over, and protecting the forest, environment, and water-forest relations to secure communal forest future	"We [were] exposed [to] the forest diversity and richness in addition [to] the services it provides through the well care we are able to manage new projects and there is more forest conservation conscience."	20	40	0.824
Ecotourism project benefits	Project supporting ecotourism goals or/and the benefits of ecotourism for the community, such as more visitors	"For the future my family could benefit through an ecotourism project. Could be a way to open this possibility."	6	12	0.808
<i>Support local decision-making (32%)</i>					
Community appreciation	General appreciation for connection to community and learning about the community	"It was interesting to talk and remember how we as a community are structured and share the role of each of us in the community."	3	6	1.00
Community context learning	Learned more about the community, history, and/or communal forest	"About the maps, I learned the part of the community. Also I learned how the community was formed."	6	12	0.938

Thematic code	Code description	Sample quotation	Number (n)	Proportion (%)	Kappa Coefficient
	through project activities, such as participatory mapping and timelines	My grandfather told me before but this time I learned more details."			
Community cohesion	Evidence of the research or projects bringing the community closer together	"Know new people and share."	4	8	0.893
Communal support for unity	Desire to strengthen community unity through care and support among families and the community	"Be united to think about projects. And help each other to get involved more."	10	20	0.932
<i>Self-determination (16%)</i>					
Strengthen locally-led efforts	More insights, know-how, interest, and investment in leading future projects for the community and communal forest	"Organizing ourselves and collaborating"	5	10	1.00
Community collaboration and leadership	Desire for more collaboration with community leadership and the community more broadly in organizing the project and project activities	"Collaboration in assisting the meetings"	3	6	1.00
HUMILITY (90%)					
<i>Capacity (60%)</i>					
Continued knowledge generation	Strengthening future knowledge generation and insights in the community	"Create new knowledge."	3	6	0.998

Thematic code	Code description	Sample quotation	Number (n)	Proportion (%)	Kappa Coefficient
Interest in future projects	Interest in wanting to continue with research and workshops in the future	"I would like to share knowledge and help the rest feel supported in other future projects"	18	36	0.853
Expand knowledge exchange	More collaborations and connections both within and outside the community to expand knowledge and knowledge sharing	"You can include more people that are not [a] partner of the community."	12	24	1.00
Individual investment	Desire to invest more time, support, or engagement in the project	"An effort to give my time to support the unconditional help from Colorado [State] University. Because [of] your collaboration for my community La Bendicion."	8	16	0.893
<i>Collective action (70%)</i>					
Future community development	Support for future community improvement or/and local development.	"It helped for the community's development."	8	16	0.832
Medicinal plants for community healing	General knowledge of medicinal plants as well as their direct application or use	"The most important thing was the medicinal plants. That is something that we can use in our families."	30	60	0.945
<i>Innovation through knowledge generation (58%)</i>					
Creation and application of new knowledge	Generation and use of new knowledge learned during the project	"Because we knew new animal species in the forest that we didn't know before."	10	20	1.00
Project novelty	Comments on the uniqueness or novelty of the project	"Haven't participated in a similar project"	10	20	0.962
Bird learning and excitement	Specific learning or/and	"I learned about birds, that caught my attention a lot."	8	16	0.832

Thematic code	Code description	Sample quotation	Number (n)	Proportion (%)	Kappa Coefficient
	appreciation related to birds				
Camera trap learning and excitement	Learned about how to use and install camera traps and their benefits	"Set camera traps was something I enjoyed and the walk through the forest as well."	15	30	0.859
Forest diversity and richness	Learned about the diversity and richness of species within the forest (could be plants, animals, etc.)	"I learn[ed] that I need to take care of the forest more, because of the diversity We have."	5	10	0.874
Forest fauna knowledge	Learned about particular animal species in the forest	"I got to know the species that live in the forest, like birds and quadrupeds."	16	32	0.866
<i>Strengthen knowledge transmission (54%)</i>					
Communal knowledge exchange	Comments on how knowledge was/is being shared amongst the community	"We share and exchange experiences."	11	22	0.879
Intergenerational knowledge sharing	Community members (adults and elders) sharing knowledge with younger generation to pass on ancestral knowledge	"I tell my children and the family about the animals that live in the forest and about the existence of camera traps"	9	18	0.971
Medicinal recipe sharing	Explicit exchange and sharing of medicinal recipes within the community and families	"New medicinal recipes that were shared."	14	28	0.941
Indigenous language translation	Include translation to Mayan mam so that mam speakers can understand and engage in the project	"That somebody that is able to translate mam in all the activities, so mam speakers can understand."	1	2	1.00

Thematic code	Code description	Sample quotation	Number (n)	Proportion (%)	Kappa Coefficient
Engage youth	Involve all young people in the community to participate in the project and activities	"Transmit the information to the youth so they can start getting involved and interested"	7	14	0.845
RECIPROCITY (86%)					
<i>Access (38%)</i>					
Knowledge for community	Information for and retained by the community	"The job that you came to do here will remain here at the community, you didn't take it away."	6	12	0.832
More community participation	Desire for more of the community to participate in the project/project activities (from community to community)	"More participation from the community."	8	16	0.923
Literacy barriers	Not being able to understand the project due to reading and writing barriers	"Learned indirectly about the cameras but, because I'm not able to read and write"	1	2	1.00
Barriers to access or application	Barriers to participating in different aspects of the research project, including both physical (e.g., schedule misalignment) and conceptual (e.g., not understanding the project)	"Meetings in afternoon/evening time or in a more favorable schedule."	8	16	0.803
<i>Sustained relationships & support (46%)</i>					
Sustained project efforts	Desire/hope for the project and project efforts to continue	"That the work team keeps going on."	10	20	0.994
More learning opportunities	Interest in more meetings, information, workshops, talks,	"More meetings to inform the community that the project is to help us."	16	32	0.970

Thematic code	Code description	Sample quotation	Number (n)	Proportion (%)	Kappa Coefficient
	and comments about the project				
Elevate researcher presence	More frequent visits from research team	"More visits, with more frequency, so we don't forget."	12	24	0.912
<i>Equitable outcomes (54%)</i>					
Motivate and inspire	Using project to motivate and raise awareness in the community	"Inviting more community members and motivating them to assist and improve the community."	9	18	0.928
Improve project facilitation	Improve communication, facilitation, organization, and connection/closeness to community	"Better communication and being closer to the people of the community"	8	16	0.881
Include and engage community	Engage more of the community and community demographics in activities and education	"Include more married sons and daughters so they can feel involved."	16	32	0.906

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CHAPTER 3: Reclaiming lands and waters: Communal conservation in the tropics of Guatemala³

“Regarding the land, it is a relief to know that it is ours. Regarding the forest, it is life, because we, the community, have that relationship between community and the forest. We defend it, and we do work, we make fire breaks, and we take care of it, not because others incentivize us to do so, but because of the relationship that the community and people have with the forest. We know that from there we have water, we have air, and the forest is life for us in La Bendición, as women, and as inhabitants of the community.” – Doña Lesbia, La Bendición community leader

1. Introduction

Indigenous and communal conservation play a central role in safeguarding global ecosystems and associated biodiversity (Artelle et al., 2019; Dawson et al., 2021; Fernández-Llamazares et al., 2021; Garnett et al., 2018; Tauli-Corpuz et al., 2020; Waller & Reo, 2018). Communal conservation, i.e. conservation that is self-determined by and for local and Indigenous collectives, is characterized by land and water stewardship practices that are rooted in relational connections to place that foster sustainability through continual refinement and adaptation of practices to local landscapes (Dawson et al., 2021; Fernández-Llamazares et al., 2021; Waller & Reo, 2018; Whyte, 2018b). However, communal conservation governance is

³ **Unpublished:** La Bendición, Layden, T. J., Fernández, S., Sandoval-Lemus, M., Bueso, D., Chan, J., Sosa, D., Sonius, K. J., Alessandro, H., David-Chavez, D., Bombaci, S. P. (2025). Reclaiming lands and waters: Communal conservation in the tropics of Guatemala. *Journal pending*.



BC (Biocultural) Notice

The BC (Biocultural) Notice is a visible notification that there are accompanying cultural rights and responsibilities that need further attention for any future sharing and use of this material or data. The BC Notice recognizes the rights of Indigenous Peoples to permission the use of information, collections, data and digital sequence information (DSI) generated from the biodiversity or genetic resources associated with traditional lands, waters, and territories. The BC Notice may indicate that BC Labels are in development and their implementation is being negotiated.

routinely undermined by colonial legacies and prevailing extractive conservation paradigms (i.e. the “conventional” conservation model) that dispossess lands and authority from Indigenous and local stewards, threatening lifeways and associated landscapes (Aswani et al., 2018; David-Chavez & Gavin, 2018; Dowie, 2011; Fernández-Llamazares et al., 2021; Kashwan et al., 2021; Layden et al., 2025; Lele et al., 2010).

In response to ongoing threats to Indigenous and communal lifeways, Indigenous Peoples across the globe have been mobilizing to enact international legal and policy instruments to strengthen local rights and self-determination in environmental stewardship, such as the International Labor Organization (ILO) Convention 169, the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), and the American Declaration on the Rights of Indigenous Peoples. While not legally binding, these frameworks provide important leverage for action in support of human and communal rights globally (International Labour Organization, 1989; Organization of American States, 2016; Tauli-Corpuz et al., 2020; United Nations General Assembly, 2007). For example, Article 31.1 (United Nations General Assembly, 2007) states that:

Indigenous Peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge, and traditional cultural expressions, as well as the manifestations of their sciences, technologies, and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts. They also have the right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions.

Although these frameworks have begun influencing global conservation discourse, their implementation is often hindered by entrenched anti-Indigenous paradigms within environmental institutions and initiatives, requiring a shift away from conventional conservation models and towards community-rooted approaches (Eichler & Baumeister, 2021; Layden et al., 2025; Lele et al., 2010; Liboiron, 2021; Whyte, 2018a).

To counter colonial dynamics and strengthen communal conservation governance, local and Indigenous Peoples are advancing community-led, transdisciplinary research grounded in relational values and ethics to align with global rights-based frameworks while challenging colonial paradigms (David-Chavez et al., 2020, 2024; Moewaka Barnes et al., 2021).

Transdisciplinary research, by definition, works beyond narrowly defined academic disciplines to engage pluralistic knowledges to promote shared knowledge generation and re-orient research towards relevant, context-specific action, such as through participatory methods (Baker et al., 2024; Moewaka Barnes et al., 2021; Toomey et al., 2015; Zonta et al., 2023). Indigenous relational values and ethics strengthen transdisciplinary research by explicitly honoring Indigenous and communal rights, wisdoms, and ways of knowing, such that local and Indigenous Peoples guide and contextualize all phases of research, in alignment with communal needs and futures (David-Chavez et al., 2024; Gardner-Vandy et al., 2021; Latulippe & Klenk, 2020; Layden et al., 2024; Moewaka Barnes et al., 2021; Zonta et al., 2023). Relational, communally-led transdisciplinary research offers pathways toward strengthening long-term communal stewardship in support of interrelated benefits for both landscapes and peoples.

In alignment with global movements towards reaffirming communal conservation governance, our project aims to share the process and outcomes of relational, transdisciplinary research approaches to community-led conservation, highlighting the ongoing efforts of the

community of La Bendición in Guatemala. Specifically, this paper will highlight co-creation of methods, ethical engagement practices, and the ways in which this communal conservation approach supports both ecological stewardship and cultural resilience. By documenting these collaborative practices and their impacts, our paper also contributes to broader conversations regarding equity, decolonial methodologies, and knowledge sovereignty in conservation science. While this article weaves together stories and insights across our diverse collaborative team, this story belongs to La Bendición. Together, we highlight key historical and cultural context that frame our work, followed by project-specific processes, including guiding relational values, ethics, and methods for shared knowledge generation. We conclude by offering reflections and recommendations with the overall goal of informing conservation protocols and practices across global contexts.

1.1. Becoming “La Bendición”: Histories & realities of communal conservation in Guatemala

In response to centuries of destabilization and displacement, communities like La Bendición in southwestern Guatemala are reclaiming land, water, rights, and knowledges through grassroots organizing, sustainable land stewardship, and transformative science bringing knowledge generation into their own hands and for their own purposes (Carroll et al., 2019; Whyte, 2018b). In the words of Rigoberta Menchú, a K'iche' Mayan human rights activist, “We will try to defend the rights of our ancestors to the last” (Menchú et al., 1992, p. 79). For decades, local and Indigenous communities and associated landscapes in Guatemala have been targeted by broad-scale land and political reformation agendas, including the US-backed Guatemalan civil war that lasted 36 years and culminated into the genocide of over 200,000 predominantly Indigenous Peoples and the displacement of as many as one million people from

the Guatemalan highlands (Fox, 2024; Fundación de Antropología Forense de Guatemala, 2024; Menchú et al., 1992; Ybarra, 2018). Although the Guatemalan government has since ratified international agreements in support of Indigenous rights through the Peace Accords of 1996, it has continued to violate these international agreements, including the ILO Convention 169 and UNDRIP, by prioritizing resource extraction and agro-industrial development over the fundamental right of Indigenous Peoples to “determine and develop priorities and strategies for the development or use of their lands or territories and other resources” (UNDRIP, Article 32.1) (Birner et al., 2005; Cultural Survival, 2022; Elías, 2012; United Nations General Assembly, 2007). Conventional conservation initiatives have exacerbated the restructuring of Indigenous governance and cultural lifeways in Guatemala through ongoing conversions of Indigenous customary lands and waters into exclusionary protected areas (Elías, 2012; Ybarra, 2018). As a result of the Guatemalan government and conventional conservation working in tandem, Indigenous communities face continual displacement and undermining of Indigenous rights that threaten communal conservation governance. Meanwhile, conceptions of “Indigenous” remain complicated by political tensions and histories that vary throughout the region (Corntassel, 2003; Huambachano et al., 2025) and may be associated with more risk than benefit, given the country's genocidal history.

Despite the government's continued violations of Indigenous sovereignty and self-determination, local and Indigenous communities have been strategizing innovative solutions to recover land and lifeways. For example, La Bendición, a multicultural *mestizo* and Indigenous Mayan mam community, has spent the last 25 years reconnecting with place and strengthening sustainable livelihoods. The community of La Bendición first formed in 2001 when over 177 displaced families originally from Huehuetenango and San Marcos in the highlands of

Guatemala came together to transform an abandoned coffee plantation in the lowlands to the southwest into a community-owned landscape focused on agroforestry, conservation, and health. Securing and cultivating this land after years of struggle inspired the name “La Bendición,” when a respected community member remarked “For me and for all of you, this is a blessing from God for us.” Through this journey, each member brings their own history and culture, but together they are La Bendición. Today, approximately 50 La Bendición families continue to safeguard their land and their rights amidst continued demands of the government and large-scale agricultural encroachment, such as sugarcane, that threaten communal forest land, cultural lifeways, and associated species (Birner et al., 2005). As stated by Doña Lesbia, a community leader, “We have also preserved the forest for 25 years... and we will have it for life,” emphasizing that:

Regarding the land, it is a relief to know that it is ours. Regarding the forest, it is life, because we, the community, have that relationship between community and the forest. We defend it, and we do work, we make fire breaks, and we take care of it, not because others incentivize us to do so, but because of the relationship that the community and people have with the forest. We know that from there we have water, we have air, and the forest is life for us in La Bendición, as women, and as inhabitants of the community.

In alignment with forest conservation and livelihood goals, La Bendición initiated a transdisciplinary ecological survey to inform communal forest management and future ecotourism programming alongside compiling native and harvested medicinal herb recipes from the community to support community health (vonHedemann & Osborne, 2016; Whyte, 2018b). Built on over a decade of collaborations between the local rights-holders of La Bendición and partnering organizations, this project emphasizes ethical engagement, alongside community co-

creation and leadership (Layden et al., 2024). As stated by community members, “this is our story,” “this is our culture,” and “we are bringing truths from our ancestors” through these ongoing efforts. The goal of this paper is to outline social and ecological participatory action methods in transdisciplinary research, offer initial ecological insights, and share corresponding reflections and recommendations based on our research experiences, as community research partners, external researchers, and collaborators. Overall, through this shared knowledge generation approach, we aim to reaffirm connections to place, communal rights, and intergenerational stewardship in support of social and ecological wellbeing (Bray & Velazquez, 2009; Layden et al., 2024; Tengö et al., 2014).

2. Methods

2.1. Orienting to place

La Bendición lands are located in southwestern Guatemala (Figure 1), nestled in a valley of dense tropical rainforest in proximity to high mountains as well as low coastal regions. Across the ~6 km² of La Bendición land use is diverse, covering mixed agricultural areas, important water sources, and community infrastructure (houses, gardens/food production, soccer fields, churches, communal school, communal kitchen, and the communal house), with the majority of land occupied by tropical rainforest habitat. La Bendición has managed their lands communally since their formation in 2001, working to survey the land, regulate hunting, protect and reforest water banks to reduce erosion, and prevent forest fires by clearing debris and creating fire break paths seasonally. Meanwhile, the remainder of land is primarily used for small-scale farming (e.g., corn, coffee, beans, bananas, and many herbs), largely for subsistence, using mixed agroforestry and shade-cropping techniques. La Bendición community members have mixed individual and communal roles across their lands and define their community as an organized

“union of members... focused on the same principle... which is the work system and forest care system” to “take care of the forests of the Earth in order to have a better world.”

To manage and respond to the dynamic needs and responsibilities within the community, La Bendición also has several communal governance bodies in the form of leadership councils, including the Board of Directors, the Women’s Council, the Youth Council, and more. The Board of Directors oversees the major decision-making within the community, including land management decisions, and includes members that focus on forest management, including Don Chepe who states, “I also like to take care of the fauna and flora. And we should also take care of the forest, because it gives us water. If we cut down more, it gets dryer. And if we cut down a tree, we have to plant it to replant the ones we cut down. That's the role.” The Women’s Council manages the communal house kitchen, cooking for guests and community forest stewards, and selling crops at local markets. Through these activities, the Women’s Council also facilitates lending supplies and funds to the families of council members, primarily to strengthen internal community support systems and governance and played a pivotal role in paying off land debts for the community to become official and sole owners of La Bendición land. The Women’s Council also emphasizes the interrelatedness of clean air, healthy soil, and water within the forest along with personal and communal health and wellbeing, stating that “if we don't conserve, [if] we don't take care of our forest, one day, we're going to run out of water.” The Youth Council originally formed to help with forest maintenance and continues to provide 80% of the forest stewardship workforce. The Youth Council also focuses on community development projects, such as climate projects, honey production and bee conservation, food production and sales, and ecotourism. Because of each of the unique roles, responsibilities, and relationships to the forest across La Bendición, diverse community members contributed to different components of the

project outlined in this article. Below we describe the methods applied, including regarding community engagement throughout the research process.



Figure 1. Location of La Bendición lands to the southwest, in the Department of Escuintla, Guatemala.

2.2. Foundational relational values and ethics

This project was jointly created and inspired by La Bendición (“community research partner”), with support from Colorado State University (CSU) researchers and local Guatemalan biologists (together referred to as “external research partners”), the regional Indigenous-run Asociación de Forestería Comunitaria de Guatemala Utz Che’ (Utz Che’) co-founded by La Bendición community members in 2006, and the international non-profit Trees, Water, and People (TWP), which together (Utz Che’ and TWP, collectively referred to as “collaborators”) have been working to support community-led, regenerative natural resource projects over the

past decade. La Bendición has had continued interest in developing their knowledge of local forest landscapes and strengthening livelihoods which inspired the creation of this transdisciplinary ecology project to support planning and development for a communally governed ecotourism program. External research partners first visited collaborators and the community in May 2020 to listen and learn from community experts on their areas of interest and concern. Stemming from this initial visit, research ideas then developed over approximately the next two years through joint conversations and planning. During this time, external research partners also developed their understanding of rights-based ethical procedures as well as locally-specific communal governance structures to inform the research process and related protocols. The ethical protocol of this research draws from relational values-based models (David-Chavez et al., 2024; Kūlana Noi‘i Working Group, 2021) and participatory action frameworks (Coombes et al., 2014; Kovach, 2010; Laituri et al., 2023; Maiter et al., 2008) and is further outlined in Layden et al., 2024, with key support mechanisms summarized below.

Prior to conducting field work, CSU researchers outlined a researcher code of ethics, tentative data management plan, and a formal project proposal that required community guidance and approval before co-conducting research. External research partners and collaborators (CSU and TWP) also completed a Memorandum of Understanding (MOU) to formalize and make transparent their intentions and methods for supporting self-determined community research throughout the research process. After La Bendición approved the proposed project, CSU researchers completed an Institutional Review Board (IRB) protocol with their institution, which required additional research considerations for community contexts, such as community members as research partners rather than research subjects, which was beyond the scope of what was offered by institutional protocols (Layden et al., 2024). After commencing the research

project, external researchers and community research partners co-drafted a Data Use and Transfer Agreement (DUTA), reaffirming La Bendición as the rightful owners and authors of the data and data products. Throughout the research process, external researchers sought permission and guidance from La Bendición community research partners, including in generating community deliverables (Figure 2).



Figure 2. Overall project process. Research workflow and conceptual model, where shared knowledge generation (inner circle) is embedded in the relational values and ethics that give rise to community deliverables (outer dotted ring).

2.3. Co-creation & relationship building

Before formalizing each method and associated deliverable related to our project, we intentionally planned and developed ideas and processes through collaborative dialogue (Box 1). For example, prior to commencing any methods, we jointly organized a series of discussions with each of three community leadership councils, the Women's Council, the Board of Directors, and the Youth Council, at the communal meeting and guest house (*casa communal*) to plan specific project methods and timelines (Box 1). Generally, planning discussions and engagement in research was offered as an open invitation to the community, with community leaders facilitating broader communication, therefore community research partners represent a subset (~10%) of the larger community with demonstrated interest and capacity in the research efforts. For the discussion with the Youth Council, external research partners additionally asked youth members about their favorite aspect of their community and what community initiatives they are most excited about, offering a large piece of paper and colored pens to visualize their ideas. To conclude these initial discussions, each community leadership council decided on a set of methods they would be interested in engaging with or leading based on their interests, capacity, and overall communal goals, with support from external research partners, which we describe in the next section.



Box 1. Co-creation & relationship building methods

Community research partners and external research partners gather at the *casa communal* (pictured right) after coordinating schedules via WhatsApp. External research partners set-up chairs in a circle around a large table, setting out gifts and snacks in the center. Community research partners arrive staggered, with community leaders arriving first to check in and confirm the discussion agenda. Women bring their children, who play in the background. When each person arrives, they share a greeting and an introduction, including their name and general roles assumed within the community.



Everyone gathers around or facing the shared table (pictured left). External research partners share gratitude and introduce themselves and a general overview of project ideas. External research partners elaborate on different methods they can help facilitate and ask for feedback, including any ideas community members have. Community research partners share their interests generally, which methods they are drawn to, what they would like to support, how different components of the project aligns with community goals, and also share new ideas. External research partners help summarize and consolidate ideas and reflect them back for community verification and approval. To conclude, community leaders offer support to coordinate our next convening and ongoing logistical support with different methods in which community members shared interest.

To complement these initial discussions, external research partners met separately with key community leaders from each council to learn more about social dynamics and to strategize meaningful processes for continued engagement. Throughout the duration of the research, outside of formal data collection (described in more detail below), external research partners and community leadership councils met regularly (~weekly) on walks, at the *casa communal*, and at their homes, to further calibrate methods and draft deliverables together. By the end of the field component of the research, external research partners engaged specific community leaders that elected to co-facilitate or lead recurring project processes as a community advisory council, which included 1-2 key members from each community leadership council. External research partners compensated advisory council members to reciprocate their additional time and dedication to guiding project, deliverable, and publication efforts. To conclude the field research,

we co-organized a communal celebration and gift exchange. During this celebration, amongst the community art show, altar, cake, piñatas, and dancing, the community advisory council and external research partners shared project deliverables with the larger community and a project slideshow to offer their experiences and lessons learned.

2.4. Shared knowledge generation through transdisciplinary research

We conducted all field work, discussions, and participatory processes on the communal lands of La Bendición land from late February to late May 2023. The field work season encompassed the end of the dry season and the beginning of the wet season and is marked as a time of ecological transition. Following our initial collaborative discussions, the methods we decided on included community timeline creation, landscape mapping, medicinal herb recipe sharing, mammal surveys via camera traps, and bird surveys via community forest walks and point counts, each serving a unique role for the community. Collaboration on each of these methods reflected a similar approach as our co-creation and relationship building method (Box 1), with community research partners and external research partners convening primarily at the casa communal to check in and adjust methods as needed and meet with community experts to conduct methods together, as described below (Figure 2).

2.4.1. Community timeline creation

To share community context and build collective understanding, community research partners visually and orally shared a community timeline. To create the community timeline, four representatives of the Board of Directors created one timeline and 20 members of the Women's Council created a separate timeline. When asked what components of their communal history felt important to include, some members of the Women's Council responded with "everything is important," thereby providing a more comprehensive overview of their shared histories.

Collectively, community research partners shared their experience and insights related to La Bendición's history, hopes, and concerns regarding communal forest conservation and animal kin as well as key details related to communal governance structures and processes. External research partners consolidated and digitized the community timeline, which we then collaboratively translated into multiple languages (Spanish, English, and Mayan mam). Community experts checked each timeline and supported language translation, especially for Mayan mam. Once finalized, we printed and framed each timeline to hang at the communal house to share with community members and visitors.

2.4.2. Landscape mapping

Four community members from each leadership council participated in a mapping activity facilitated by the external research partners to develop culturally-specific maps related to our research activities. Each community leadership council used both a blank gridded paper and markers as well as a printed map and stickers to check territory and land use designations and identify key features of the community landscape. Community members responded visually to the prompt “what is important on the landscape?” to jointly visualize examples of communal responsibilities to land and livelihoods (Duncan, 2006; Newing, 2011; Slocum, 1995). The mapping activity provided an important opportunity for external research partners to observe and listen deeply to key community context and initiatives that framed our collaborative efforts.

2.4.3. Medicinal herb recipe share

We expanded knowledge of local plants with an herbal recipe exchange and community garden and forest tour organized and facilitated by the Women's Council. The information gathered through this process was strictly for community use to promote communal health. Additionally, due to concerns of intellectual property theft and biopiracy (Ambang et al., 2019),

the research team decided not to share details beyond high-level results and methods summaries. A total of 30 people (Women, Youth, Elders) participated in the herbal medicine recipe exchange. To start, members of the Youth Council compiled a list of garden and forest plants and associated recipes, uses, and/or cultural importance. The larger group then self-organized into small groups to draft recipes of a subset of plants on the list. At the end, participants presented these recipes along with samples they brought with them to present to the larger group. After compiling a list of plants, the same group offered a tour of their family gardens to further familiarize themselves with plants and their locations, all of which was included in the medicinal herb recipe guide we created following these activities, which external research partners printed and offered to each participating member.

2.4.4. Mammal surveys

Mammal surveys included both key informant interviews and camera trap surveys, with the overall goal of compiling preliminary data on mammal species across the landscape to inform communal forest management and create a photo album and guide book for sharing amongst the community and with visitors, as there is no locally specific mammal guide for this region offered in Spanish or any Indigenous languages, such as regionally-specific Mayan mam. To understand long-term trends and identify particular species of interest or cultural importance to the community, community experts on the Board of Directors offered insights into mammal species across the communal landscape through dialogue and a basemap, using stickers to indicate individual species and approximate locations. Community research partners and external researchers also conducted several community forest walks together across the communal landscape to learn local context, ecologies, animal trails, and discuss the importance and use of project methods. These land survey walks helped us determine which areas were most accessible,

used frequently by animals (e.g., nearby animal trails, tracks, or dens), and of most interest to measure using camera traps.

To initiate the camera trap survey at the beginning of the field season in March, several members of our collaborative research team (including the Board of Directors, Youth Council members, Women's Council members, and external research partners) set up 11 cameras in the forest and 4 cameras closer to communal areas, placing a total of 15 cameras together. For the camera trap process, community research partners directed camera placement, while external research partners guided camera learning set-up and data review. Due to the size of the area (6 km²) and likelihood of finding smaller mammals with limited ranges, we placed cameras between 400-600 meters apart to maximize coverage across La Bendición land, inclusive of communal areas, agroforestry areas, and protected area forest (Ahumada et al., 2013; Smith et al., 2017). Camera height on trees varied depending on the slope and habitat, such as arboreal or non-arboreal locations, with a total of two cameras placed higher in the trees (arboreal). We checked cameras monthly and removed them at the end of April, 2023, with two cameras replaced due to concerns of damage or theft. After removing the cameras, external research partners left the camera equipment, alongside Spanish-language instructions and maintenance guides, for community members to continue surveying the landscape.

2.4.5. Bird surveys

Bird surveys included both ongoing monitoring (i.e., encounters during community forest walks over the course of the project) (David-Chavez et al., 2024) and point count surveys to identify “bird tour” walks for ecotourism and start compiling a species list to inform locally specific field guides for continued monitoring. Community research partners recommended the survey route based on considerations for ecotourism (e.g., terrain difficulty and proximity to

communal house), which we walked together to conduct each point count survey. For the point count surveys, we followed the PROALAS (Latin American Program for Wild Birds) methodology, sampling at distinct time intervals beginning in mid-March and ending in early May. Each point count survey consisted of visiting 10 survey locations, each ~350 meters apart to create a survey loop starting at the communal area, through the agroforestry area, and into the protected area forest. We conducted each survey from ~6:30 am to 10:30 am for a total of 4 hours, alternating clockwise then counterclockwise in the loop. We had 1-4 observers for each survey (1-2 community members and 1-2 external research partners), compiling observations into a single integrated eBird list over the course of 10 minutes per site, with each site receiving equal effort. We compiled additional records through song recognition and Merlin ID song identification. We sampled all sites at least 5 times. In total, we compiled 54 independent samples, which translates into at least 20 hours of travel with 540 independent minutes of sampling. The process of repeated and intentional sampling, field guides, binoculars, and an iPad with bird survey software, offered a repeatable methodology and related tools for community members to continue and share with future visitors to build their own ecotourism monitoring program.

3. Analyses

External researchers primarily facilitated initial data synthesis as community research partners built their computer lab and computing capacity. External researcher partners consolidated and digitized community timelines using Miro ([Miro.com](https://miro.com)). For all other data outputs for the community (medicinal herb recipe book, bird and mammal field guides, mammal photo book, and summary reports), we created and printed Spanish-language deliverables using Canva ([Canva.com](https://canva.com)). Both Miro, Canva, and related platforms provided a digital workspace

focused on visual collaboration, synthesis, and graphic creations for accessible community engagement. For landscape visualizations of land use, mammals, and bird survey data, we used ArcGIS Pro (version 3.0.1). Regarding land use designations, we uploaded information that was previously generated in ArcMap by superimposing field-verified geographic coordinates of La Bendición land onto land use layers from the local Ministry of Agriculture data (SIEAgro, 2021) onto our ArcGIS maps. To process camera trap data, we first organized raw camera trap images by camera ID and deployment date and then organized images by species, removing any blank or sensitive images (e.g., any images of people). We then compiled a species list for each camera trap location and inputted this information into ArcGIS to visualize preliminary richness by camera trap location and community land use designations, such as agricultural type, forest, and urban areas. For the participatory mapping of mammal species, we transferred the information from the physical maps into ArcGIS, denoting each sticker used to identify animal species as a location point, which we then summarized across each land use area to quantify species richness by land use area. To summarize the bird survey information, we downloaded survey data from eBird and visualized initial species richness for each sampling point using ArcGIS. We also used the mammal and bird survey data to generate preliminary species lists, including survey detections and local conservation status where possible (Tab S1 & S2).

4. Data stewardship & Indigenous data governance

La Bendición checked and verified all data and outputs generated from the research (“member checking”) (David-Chavez et al., 2024), including in publications, and external research partners ensured data and deliverable access through printing hard-copies and storing on an external hard drive for future use by the community (Figure 2). In addition to the external hard drive, long term data stewardship includes temporary organization by external research

partners followed by turnover to long-term collaborators, such as Utz Che' and TWP, to safely secure and provide continual access to the data and data products by La Bendición. All data is accompanied by a copy of the data use agreement, which explicitly outlines how and with whom data can be shared, and includes provenance labels that identify La Bendición as the owners and intellectual property right holders where possible (Carroll et al., 2022; Jennings et al., 2023). Additionally, related to this article, community members contributed through multiple rounds of in-person feedback and dialogue, which external research partners then translated and transcribed into an article format. External research partners also facilitated the creation and application of Local Contexts labels (LocalContexts.org) using an interactive activity where the community advisory council compared printed labels to each project activity and associated output, deciding which label (e.g., Traditional Knowledge Attribution, Biocultural Provenance, among others) were relevant to the information being shared.

5. Results

Through transdisciplinary research that encompassed diverse social, ecological, and participatory methods, we compiled and documented a culmination of data outputs relevant to community goals and contexts, including a community timeline in multiple languages, locally-specific bird and mammal field guides, a mammal photo album of camera trap images, bird and mammal survey tools and protocols, a medicinal herb recipe book, and a summary report (Figure 2). Ongoing discussions, forest walks, landscape mapping, and community timeline creation, yielded crucial information to align project processes to community context and priorities as well as frame data collection, analyses, and dissemination. Regarding medicinal plants, although specific names are retained for community use only, we compiled over 80 medicinal plant recipes, from both family gardens and the communal forest. Meanwhile, using our participatory

survey approaches, we also documented 23 mammal species and 94 bird species over a 3-month period across the 6 km² of communal land, with more species continually documented by community research partners, emphasizing these data as preliminary – a starting place to continue building community attuned protocols for long-term ecosystem monitoring.

From our preliminary mammal survey, community experts documented a total of 23 mammal species. Of this total, camera traps detected a total of 16 unique species during our field season (Table S1). From our limited dataset to-date, we detected the highest richness of mammal species in the broad-leaf forest, which generally decreased as we moved closer to the urban center (Figure 3). Community expert knowledge confirmed at least 20 unique species in the broad-leaf forest area in total (Figure 3a). For camera trap data, the highest species richness count was near the transition point between the broad-leaf forest and the agroforestry lands, for a total of 8 species (Figure 3b). The broad-leaf forest, which is the largest communal forest area and where the community focuses most of their conservation and forest management efforts, also contained the most species listed 2 species on the List of Threatened Species of Guatemala (Lista de Especies Amenazadas de Guatemala or LEA), meaning that they are considered locally endangered. We also documented several LEA listed 3 species (locally vulnerable) in both the broad-leaf forest and agroforestry lands as well as in the urban center (Table S1).

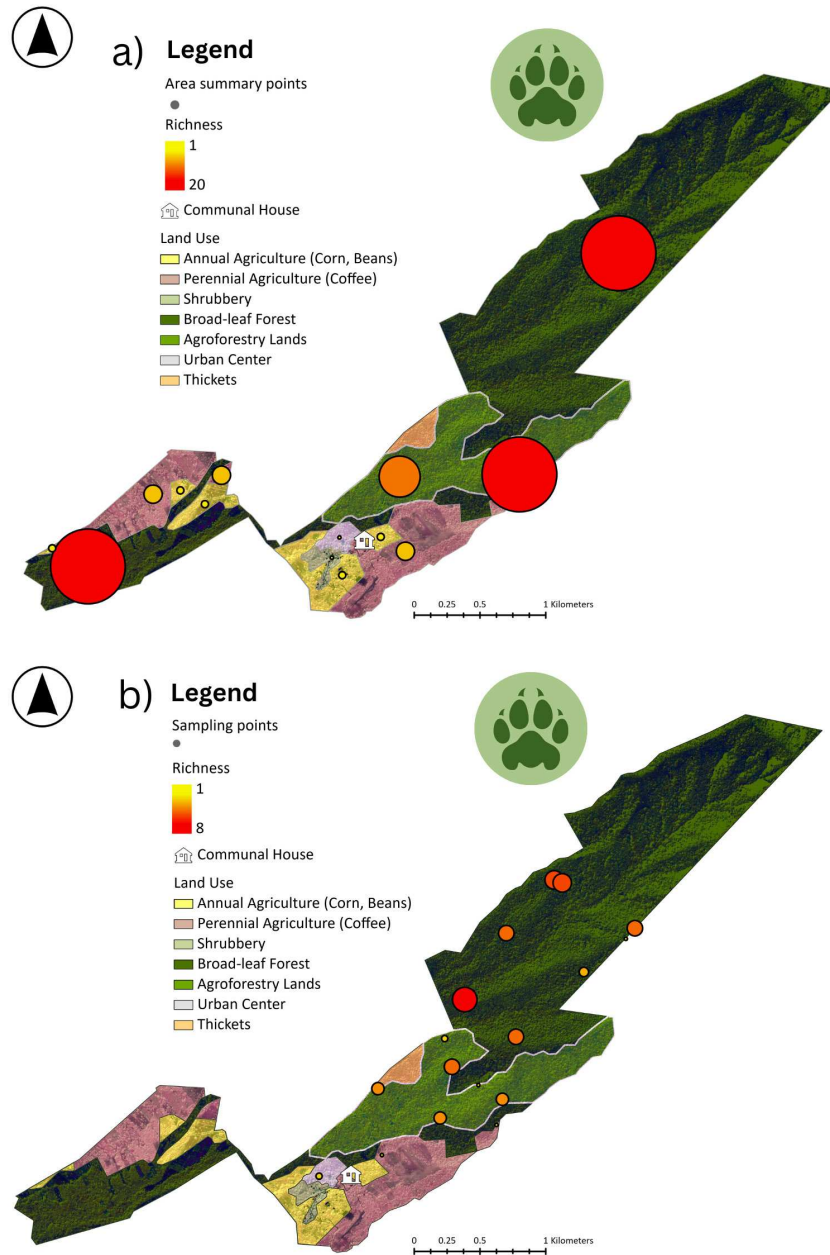


Figure 3. Mammal species richness summarized from a) participatory mapping data, and b) camera trap data. For a) each circle represents the sum of all unique species denoted in each respective land use area. For b) each circle represents a unique camera and sampling point during the duration of our study. The warm color bar and sizing indicate relative richness. Maps are displayed using the Generative Topographic Mapping (GTM) system.

From our preliminary bird survey, we noticed the opposite spatial trend as with mammals, where bird species were more concentrated near the urban center and mixed agricultural areas, with the highest richness of birds recorded so far (up to 54) concentrated near the communal house (Figure 4). Of the 94 total bird species documented, 21 are listed LEA species, with the *Amazon auropalliata* (Yellow-naped Amazon) identified by community experts listed as endangered, with the rest listed as vulnerable (Table S2).

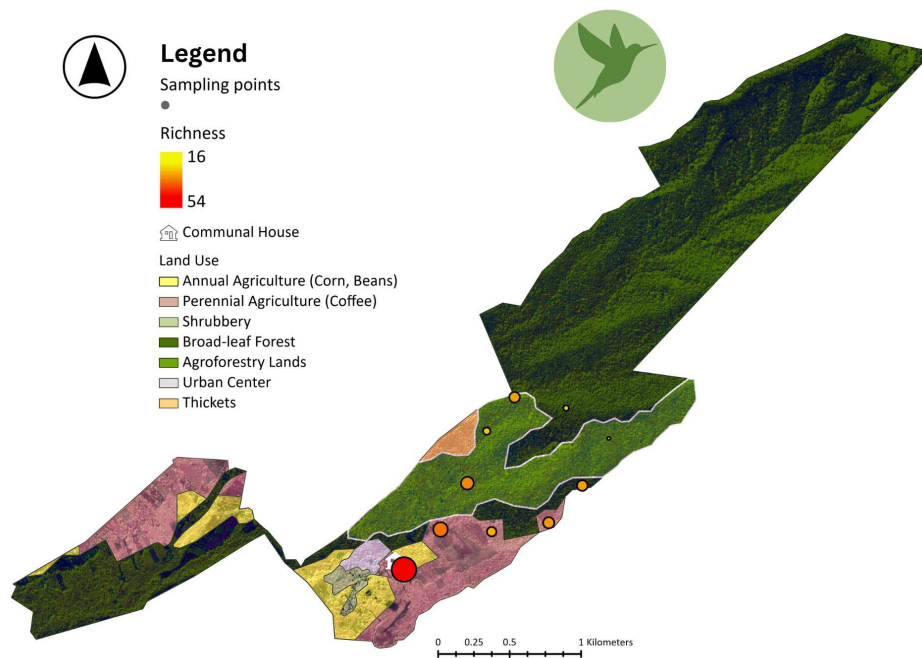


Figure 4. Bird species richness summarized from point count survey data. Each circle represents a unique sampling point during the duration of our study. The warm color bar and sizing indicate relative richness. Maps are displayed using the Generative Topographic Mapping (GTM) system.

6. Discussion

Overall, our results demonstrate how relational, transdisciplinary research offers a culturally grounded approach to documenting forest biodiversity, while supporting communal conservation leadership and governance. Following Indigenous rights and values-centered ethical guidance, our research approach was structured around relational responsibilities and community

guided outcomes, which also supported improved trust and accountability in our research process (David-Chavez et al., 2024; Layden et al., 2024). In particular, adhering to ethical frameworks such as Free, Prior, and Informed Consent (FAO, 2016) and CARE Principles for Indigenous Data Governance (Carroll et al., 2022) provided a structure that placed Indigenous leadership and ownership of research processes and data at the forefront, both of which are essential to achieving communal conservation governance and aligning with international rights-based frameworks (Armitage et al., 2019; United Nations General Assembly, 2007). To continually support ethical collaborations with local rights-holders, La Bendición recommends upholding mutual respect between community research partners and external research partners. Mutual respect includes honoring formal community governance structures and processes, pursuing permissions to access and work with the community, facilitating transparent communication, and following community leadership, guidance, and interests, including their focus on communal forest stewardship and small-scale agriculture. Together, our collaborative team underscores the necessity that projects stem from the needs and interests of community members with ongoing feedback, insights, and permissions throughout the research process to reorient from extractive research paradigms and towards community-rooted approaches (external research partner reflections, institutional considerations, and further recommendations are accessible via Layden et al., 2024).

Following the co-created relational protocols that framed our research process, we were able to deepen the relevance and utility of project processes and outcomes (David-Chavez et al., 2024; Layden et al., 2024). The process of community-engaged and led research was important for shared learning and building motivation for continuing projects amongst the community, consistent with literature underscoring the role of participatory action research in mobilizing

community initiatives (David-Chavez et al., 2020; Laituri et al., 2023; Maiter et al., 2008). Now members of the Youth Council are currently planning an additional survey in high elevation areas of their communal forest and community research partners continue observing bird activity within the area, both of which are informing locally specific ecotourism and conservation planning. Youth engagement is especially important for strengthening long-term stewardship and cultural continuity, recognizing the important role of intergenerational leadership and knowledge exchanges (Petrucka et al., 2016; Simpson, 2004). Additionally, the process of knowledge sharing amongst the community, such as through the medicinal herb recipe sharing activity and the community timeline creation, promoted knowledge transmission across the diverse ages, cultures, and geographies encompassed by La Bendición. Exchanges such as these embody an important strategy for the recovery and maintenance of communal knowledge (Simpson, 2004; Tang & Gavin, 2016), including ancestral plant knowledge, where, as stated by Rigoberta Menchú, “We had no artificial medicines or pills before [colonization], our medicines were the plants” (Menchú et al., 1992, p. 81). These community context sharing activities have inspired members to continue knowledge exchanges within the community to better document the community’s history so that “the knowledge of our [the community’s] ancestors is not lost.” All these processes, i.e. the process of *doing* relational science focused on building relationships and sharing capacity, offered key opportunities for broadening multidirectional learning beyond the scope offered by rigid academic disciplines and conventional research protocols (Baker et al., 2024; David-Chavez et al., 2024; Layden et al., 2024).

In addition to culturally important processes embedded within the research, research outcomes also expanded beyond conventional academic outputs, such as publications, toward communal interests and ownership (Bennett et al., 2017; Whyte, 2018b). For example, each

community-specific output, such as the locally specific field guides, mammal photo album, community timeline, medicinal herb recipe book, and summary reports are serving unique roles for the community. The field guides are currently being applied and expanded to continue passive monitoring of birds and mammals in communal lands and learn new species. The mammal photo album is being shared amongst the larger community to show forest species to members who aren't able to visit the forest often. The medicinal herb recipe book is also being shared in the community to learn recipes to support communal health. The community timeline and reports are being used to show visitors and guide ecotourism programming, such as where to develop trails, birding routes, and visitor housing. Regarding ownership of community deliverables, all of these outputs are printed and only available through asking direct permission from the community for access. Additionally, raw datasets are also intentionally not made available publicly given that La Bendición wouldn't be able to access, steward, or control their online data themselves. Rather, all of the community outputs are exclusively meant to support the community and add to their growing toolbox for community conservation and data governance. The additional implementation of Local Contexts labels also provides data security benefits to the community by making communal ownership, authority, and data stewardship procedures explicit (Jennings et al., 2023).

Complementary to the extensive culturally important outcomes, we also documented an initial assessment of local ecologies, outlining 80 medicinal plants, 23 mammal species, and 94 bird species by community experts. Our ecological data also helps us speculate potential spatial trends of birds and mammals, though we also have to consider the seasonal limitation of our study and other confounding variables, such as landscape differences (e.g., urban areas being more open/easier to detect animals visually) that could be influencing our results. Additionally,

although not comprehensive, our transdisciplinary research provides an opportunity for broadening standardized survey methods, which are often seasonally and spatially confined, by offering more expansive longitudinal and cultural insights to build a more thorough and place-based understanding of the landscape (Figure 5) (Baker et al., 2024; Skroblin et al., 2021). Our research insights also offer important baseline information to add to the growing body of literature documenting biodiversity in the tropics, including threatened and endangered species, which is exceedingly crucial given the coupled threats to local biodiversity and communal livelihoods (Elías, 2012; Myers et al., 2000; Nájera & Simonetti, 2012; Thornton et al., 2011). Meanwhile, given the interrelatedness of community and ecological outcomes, coupled with La Bendición's unending safeguarding of communal lands, our efforts also reaffirm the contributions of communal and Indigenous stewardship to both local and global conservation efforts (Aswani et al., 2018; Garnett et al., 2018; Schuster et al., 2019; Wilder et al., 2016) for improved social and ecological benefits (Bonham et al., 2008; Elías, 2012).

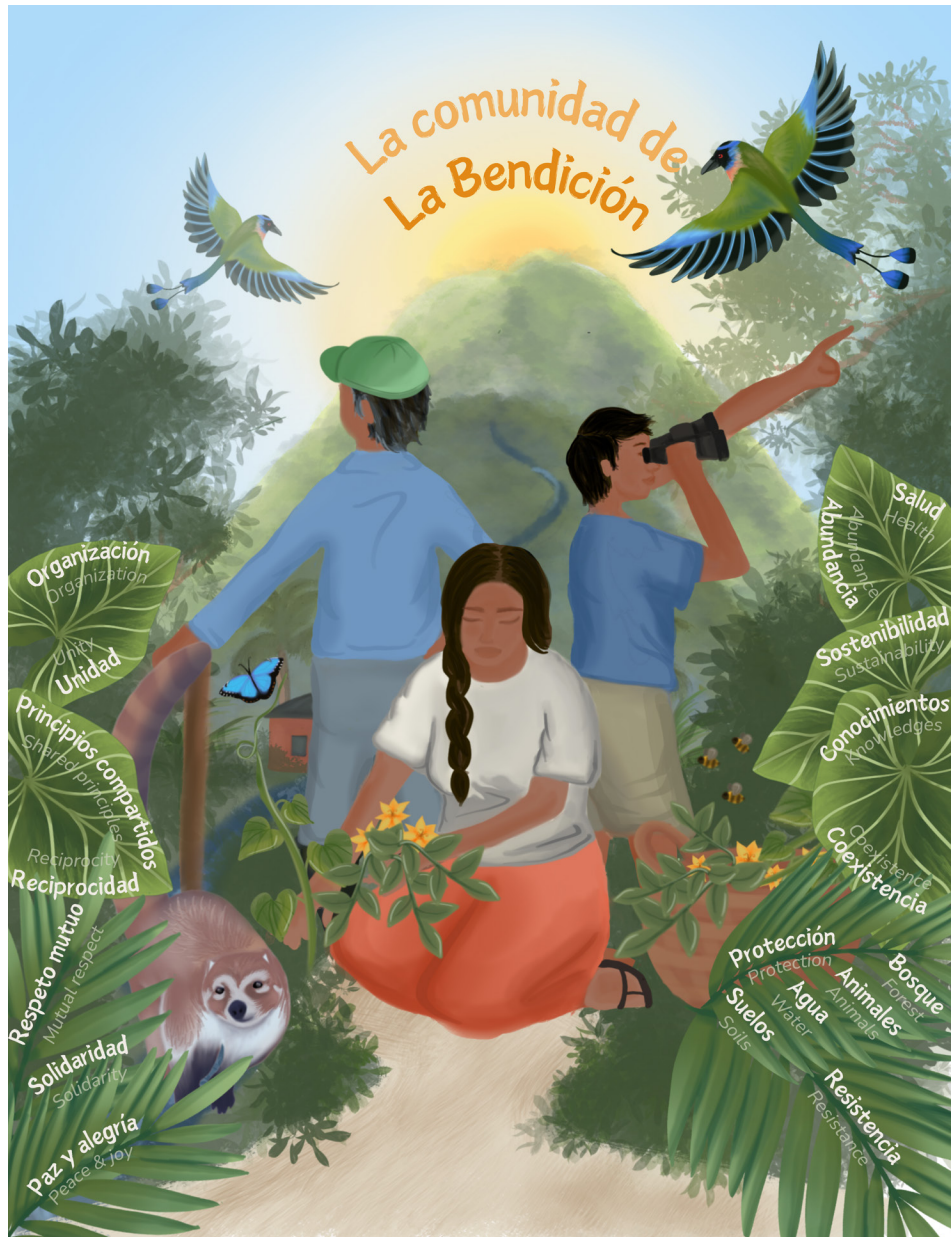


Figure 5. Visual depiction of La Bendición and their efforts through this project process. Also included are phrases and terms used to define communal conservation for La Bendición. Art creation and synthesis by Tamara Layden.

As this study represents a working model of engagement, we must also acknowledge the barriers and limitations to our co-creation and capacity sharing approaches. Firstly, our study only represents a subset of La Bendición and their collective insights and expertise, with broad engagement limited by the capacity and timeframe of external researchers and direct institutional

support (Layden et al., 2024). There were also gaps in engagement of Indigenous language speakers and youth members, with relationships only beginning to arise towards the end of our field work study. To improve these types of research partnerships, we recommend deeper consideration of the time it takes to build relationships, especially with those who may be marginalized within their own communities. Additionally, regarding youth engagement, we recommend that project activities maintain productive and applied benefits to improve motivation and retention of youth who often migrate out of the community for other work opportunities “because we [the community] can’t live off trainings alone, we need to eat.” Similarly, holding events in the afternoons would also help better support the engagement of farming families who are working during the day. Overall, applied projects with livelihood implications, coupled with continued investment and leadership organization, can help harness the existing interest amongst the youth to continue to grow and rebuild (Petrucka et al., 2016).

In addition to gaps in engagement, there were also limitations to community leadership and decision-making within both the research and larger cultural context. For example, women within the community, although well organized and interested in collaboration and leadership in communal conservation activities, retain limited decision-making power with respect to men, even when the women are the legal landowners. This constraint on the autonomy and leadership of women can hinder their valuable contributions to community development and conservation efforts and associated impacts (Armitage et al., 2019). Similarly, external researchers also retained leadership and initial guidance throughout the project, especially regarding data management and analysis procedures as La Bendición continues to build their computing power (Walker et al., 2020). Consequently, in addition to expanding workshops and follow-ups to continue field work efforts, we also recommend facilitating more joint and culturally grounded

analysis methods that engage diverse community members to help bridge the practice-analysis gap in rural contexts (David-Chavez & Gavin, 2018). However, while further workshops, trainings, and exchanges would be useful for maintaining and developing research tools and activities within the community, there is also a need to consider the additional labor these projects introduce as “we [the community] learned to prioritize and organize ourselves, but we also realized that sometimes the project exceeds our group’s capacity.” Taken as a whole, there is a need to calibrate external research efforts to context-specific continuity and capacity considerations to help seed intentional and long-lasting initiatives that are in turn nurtured by and rooted in community interests and futures.

7. Conclusion

Overall, this study offers an example of relational, transdisciplinary research considerations in community contexts. Through these methodologies, we were able to generate diverse data and data products, offering unique insights of the landscape with direct benefits to the community (Layden et al., 2024). Alongside generating unique environmental insights for the region, our study adds to the growing body of work that aims to ground-truth ethical approaches to environmental research (David-Chavez et al., 2024, such as by demonstrating the use of relational and Indigenous data governance protocols in communal conservation contexts in Latin America. In doing so, our research provides guidance for future efforts that aim to ethically and meaningfully engage local and Indigenous communities across global landscapes in conservation research and practice. We recommend that future efforts continue to catalog and critically evaluate their alignment with rights and values-based ethical frameworks, including areas of tension or barriers in implementing protocols (Layden et al., 2024), alongside pathways or “openings” toward improved engagement, capacity sharing, and research equity.

8. References

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9. Supplementals

Table S1. Mammal species names and associated detections. Mammal species identified via participatory methods only marked with a *. Detections represent the number of cameras across the landscape that detected the species. Also displayed are the species listed on the List of Threatened Species of Guatemala Guatemala (Lista de Especies Amenazadas de Guatemala or LEA), with 3 = locally vulnerable and 2 = locally endangered. Years that species were first and last seen on the landscape and whether or not the species is considered locally important is also summarized.

Species Name	English Common Name	Local Name	Camera Detections	First Seen	Last Seen	LEA Category	Locally Important
<i>Bassariscus sumichrasti</i> *	Cacomistle	Cacomixtle/Guayugo	0	2021	2023	2	No
<i>Canis latrans</i>	Coyote	Coyote	1	2018	2022	3	No
<i>Cuniculus paca</i> *	Paca	Tepezcuintle	0	2001	2023	3	No
<i>Dasyprocta punctata</i>	Central American Agouti	Cotuza/Agouti	7	2004	2023	3	Yes
<i>Dasyopus novemcinctus</i>	Nine banded armadillo	Cuzo o Armadillo (de 9 bandas)	7	2001	2023	3	Yes
<i>Didelphis marsupialis</i>	Common opossum	Tacuacín negro	10	2001	2023	Not listed	Yes
<i>Didelphis virginiana</i>	Virginia opossum	Tacuacin blanco	3	2001	2023	Not listed	Yes

Species Name	English Common Name	Local Name	Camera Detections	First Seen	Last Seen	LEA Category	Locally Important
<i>Leopardus wiedii</i>	Margay	Margay/Tigrillo	4	2018	2023	2	No
<i>Lontra longicaudis</i> *	Neotropical River Otter	Nutria/Pemo de agua	0	2017	2017	2	Yes
<i>Mephitis macroura</i>	Hooded skunk	Zorillo	1	2001	2023	3	Yes
<i>Mustela frenata</i>	Long-tailed weasel	Comadreja	1	2001	2019	3	No
<i>Nasua narica</i>	White-nosed coati	Pizote/Andasolo	6	2001	2023	Not listed	Yes
<i>Odocoileus virginianus</i>	White-tailed deer	Venado cola blanca	3	2001	2023	Not listed	Yes
<i>Orthogeomys grandis</i> *	Large Pocket Gopher	Taltuza	0	2001	2011	Not listed	Yes
<i>Pecari tajacu</i>	Collared peccary	Coche de monte/Pecari	1	2015	2022	2	No
<i>Philander opossum</i>	Gray four-eyed opossum	Cuatro ojos/Tacuacín ratón	1	2001	2023	3	No
<i>Potos flavus</i> *	Kinkajou	Micoleón/Leoncillo	0	2008	2023	2	No
<i>Procyon lotor</i>	Northern Raccoon	Mapache	2	2001	2022	Not listed	Yes
<i>Sciurus variegatoides</i>	Variegated squirrel	Ardilla	12	2001	2023	Not listed	Yes
<i>Sphiggurus mexicanus</i> *	Mexican Porcupine	Puercoespín	0	2001	2023	Not listed	Yes
<i>Sylvilagus floridanus</i> *	Eastern Cottontail	Conejo	0	2001	2023	Not listed	Yes
<i>Tamandua mexicana</i>	Northern tamandua	Oso hormiguero	1	Not specified	2023	2	No
<i>Urocyon cinereoargenteus</i>	Gray fox	Gato de monte/Zorra Gris	4	2001	2023	3	Yes

Table S2. Bird species names and detections. Detections represent visual detections of birds through point counts, exploratory walks, and community identification. Species marked with * are listed on List of Threatened Species of Guatemala (Lista de Especies Amenazadas de Guatemala or LEA) with * = locally vulnerable and ** = locally endangered.

Species Name	Detections	Species Name	Detections	Species Name	Detections
<i>Amazilia rutila</i>	1	<i>Pachyramphus aglaiae</i>	2	<i>Chordeiles acutipennis</i>	1
<i>Basileuterus culicivorus</i>	1	<i>Pachysylvia decurtata</i>	1	<i>Colaptes rubiginosus</i>	1
<i>Basileuterus delatirii</i>	1	<i>Passerina cyanea</i>	1	<i>Crax rubra</i> *	1
<i>Brotogetis jugularis</i> *	4	<i>Patagioenas flavirostris</i>	5	<i>Cyanocorax melanocyaneus</i>	1
<i>Calocitta formosa</i>	1	<i>Pheugopedius maculipectus</i>	4	<i>Dendrocincla homochroa</i> *	1
<i>Campylorhynchus rufinucha</i>	7	<i>Piaya cayana</i>	3	<i>Dryocopus lineatus</i>	1

<i>Cantorchilus modestus</i>	1	<i>Piranga ludoviciana</i>	6	<i>Falco sparverius</i> *	1
<i>Cathartes aura</i>	2	<i>Pitangus sulphuratus</i>	4	<i>Geotrygon montana</i>	1
<i>Catharus ustulatus</i>	14	<i>Psittacara strenuus</i> *	3	<i>Herpetotheres cachinnans</i> *	1
<i>Chiroxiphia linearis</i>	17	<i>Pteroglossus torquatus</i> *	3	<i>Icteria virens</i>	1
<i>Columbina inca</i>	2	<i>Quiscalus mexicanus</i>	6	<i>Icterus galbula</i>	1
<i>Coragyps atratus</i>	1	<i>Ramphocaenus melanurus</i>	1	<i>Icterus pectoralis</i>	1
<i>Crotophaga sulcirostris</i>	5	<i>Saltator atriceps</i>	6	<i>Leiothlypis ruficapilla</i>	1
<i>Crypturellus cinnamomeus</i> *	15	<i>Saucerottia cyanura</i> *	2	<i>Myiozetetes similis</i>	1
<i>Cyanerpes cyaneus</i>	2	<i>Thamnophilus doliatus</i>	1	<i>Nyctibius jamaicensis</i>	1
<i>Cyclarhis gujanensis</i>	1	<i>Thraupis abbas</i>	2	<i>Ortalis leucogastra</i>	1
<i>Dives dives</i>	10	<i>Tityra semifasciata</i>	1	<i>Penelope purpurascens</i> *	1
<i>Eumomota superciliosa</i>	1	<i>Trogon caligatus</i>	5	<i>Penelopina nigra</i>	1
<i>Eupsittula canicularis</i> *	4	<i>Trogon collaris</i> *	4	<i>Pheucticus ludovicianus</i>	1
<i>Glaucidium brasilianum</i> *	1	<i>Trogon elegans</i> *	14	<i>Piranga bidentata</i>	1
<i>Habia fuscicauda</i> *	1	<i>Turdus assimilis</i> *	4	<i>Piranga rubra</i>	1
<i>Habia rubica</i>	1	<i>Turdus grayi</i>	20	<i>Saltator grandis</i>	1
<i>Hirundo rustica</i>	1	<i>Vireo flavoviridis</i>	3	<i>Sayornis nigricans</i>	1
<i>Icterus gularis</i>	4	<i>Xiphorhynchus flavigaster</i>	1	<i>Setophaga magnolia</i>	1
<i>Leptotila verreauxi</i>	35	<i>Zenaida asiatica</i>	5	<i>Spizaetus tyrannus</i> *	1
<i>Megarynchus pitangua</i>	4	<i>Amazona albifrons</i> *	1	<i>Thraupis episcopus</i>	1
<i>Melanerpes aurifrons</i>	7	<i>Amazona auropalliata</i> **	1	<i>Troglodytes aedon</i>	1
<i>Mniotilta varia</i>	2	<i>Aramides albiventris</i>	1	<i>Tyrannus forficatus</i>	1
<i>Molothrus aeneus</i>	2	<i>Ardea alba</i>	1	<i>Tyrannus melancholicus</i>	1
<i>Momotus lessonii</i>	38	<i>Aulacorhynchus prasinus</i> *	1	<i>Zentrygon albifacies</i>	1
<i>Myiodynastes luteiventris</i>	2	<i>Caracara cherriway</i>	1		
<i>Myiopagis viridicata</i> *	2	<i>Cardellina pusilla</i>	1		

CONCLUSION

My dissertation research highlights how legacies and ongoing realities of colonialism embedded in environmental research and practice continue to impede “good relations,” requiring an immediate shift from colonial towards relational, community-rooted paradigms, with each chapter emphasizing unique roles and responsibilities as institutions, researchers, and community experts. Specifically, Chapter 1 underscored how historical and contemporary manifestations of settler colonialism remain complexly interwoven in conservation research and practice, such that contemporary conservation processes and outcomes largely serve a colonial agenda. Through this synthesis, Chapter 1 also emphasized how re-orienting conventional paradigms requires a critical re-evaluation of the underpinning ideologies that frame related institutions, policies, and practices to shift towards rematriation and recovering relationships. Chapter 1 represents the “hatchet” of this work, or the critical analysis and evaluation of oppressive structures that continue to harm landscapes, lifeways, and peoples. Understanding the histories and contemporary paradigms that frame our work is critical to be able to attune our strategies for beneficial and locally-relevant impacts, rather than intentionally or unintentionally perpetuating the same disparities we aim to solve.

Learning our histories and contexts allows for strategy-building to emerge, such as through the application of ethical principles, relational values, and participatory action research offered in Chapter 2 and Chapter 3, culminating into the “seed” of this collective body of work, or the healing of landscapes, peoples, and relationships. Chapter 2 specifically outlined possibilities towards recovering relations by demonstrating the application of Indigenous rights and values-based protocols in conservation research and evaluation. Chapter 2 underscored

external researcher responsibilities and capacity to attune research protocols and evaluation procedures in support of community goals and outcomes, focusing on the process of conducting research in relation with community research partners, rather than conventional academic output-driven procedures that so often violate Indigenous sovereignty and intellectual property rights. Chapter 2 also emphasized the outstanding gaps and barriers that remain, such as a lack of institutional expertise and support for Indigenous leadership. Lastly, Chapter 3 offered practical, co-creation methods, with demonstrated support for communal lifeways and wellbeing. Specifically, Chapter 3 highlighted how community-led transdisciplinary research offers opportunities for strengthening culturally relevant processes and outcomes in support of Indigenous values and rights-based frameworks.

Taken as a whole, my dissertation research demonstrates how the embedded colonial paradigms in conventional conservation research and practice contribute to disparities that seek to destabilize Indigenous collectives. However, by following leading and long-lived Indigenous rights-based ethical frameworks, this research also underscores pathways towards re-orienting and re-evaluating conservation practice, with documented expansive benefits, for animals, environments, communities, and cultures.

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