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Pop-up restoration in colonial contexts: applying an indigenous food systems lens to ecological restoration

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As environmental injustices and their disproportionate harms to Indigenous communities are increasingly acknowledged, restoration strategies are being deployed widely by environmental NGOs, resource extraction industries, and government agencies. The inclusion of Indigenous communities and their knowledges in restoration efforts are often considered progress in the pursuit of ecological reconciliation. However, in some cases we have observed a lack of meaningful progress as settler colonial prescriptions for land-healing can eschew efforts to decolonize ecological restoration — what we have labeled "pop-up restoration." We consider two restoration efforts underway in St'at'imc and Quw'utsun territories (Canada) and contrast them with what we are learning alongside the communities' own values and efforts to reclaim and revitalize food systems throughout forest, wetland, and grassland systems. Utilizing culturally appropriate pathways, we then evaluate how applying an Indigenous Food Systems lens to ecological restoration may provide a framework to remedy pop-up restoration, confronting settler colonial aspirations to transform Indigenous homelands while asserting justice in ecological restoration contexts.

KEYWORDS

indigenous food systems, ecological restoration, indigenous knowledge, traditional food systems, indigenous food sovereignty, traditional resource and environmental management, traditional land stewardship

1. Introduction

Over the last half century there has been an increase in efforts to right the multitude of environmental harms inflicted upon ecosystems by both human land-use practices and/or impacts from increasing disturbances caused by climate change. These efforts have largely been underpinned by the field of restoration ecology, a scientific field that focuses on the practice of restoring ecosystems that have been degraded, destroyed, or damaged by applying ecological principles and practices to facilitate the recovery of biodiversity, ecosystem functioning, and ecosystem services (Bell et al., 1997; Perring et al., 2015; Higgs et al., 2018). Restoration involves intervening in natural ecological cycles and can include reclamation efforts (after industrial land-use changes from mining, oil and gas development, etc.), invasive species mitigation (species eradication, planting native species in their place), and other habitat rehabilitation efforts (e.g., wildfire recovery). According to the International Principles and Standards of the Society of Ecological Restoration, when restoration is implemented effectively and sustainably

it, "contributes to protecting biodiversity; improving human health and wellbeing; increasing food and water security; delivering goods, services, and economic prosperity; and supporting climate change mitigation, resilience, and adaptation" (Gann et al., 2019).

In North America, restoration initiatives vary considerably in scale and scope but are often led by non-Indigenous stewardship societies, industry proponents and contractors, NGOs, and government agencies. Restoration initiatives in these contexts are largely based on Western scientific principles, values, and objectives, and are implemented across various scales and with varying degrees of success (Suding, 2011; Boström-Einarsson et al., 2020; Mansuy et al., 2020). While restoration falls within the practice of "applied sciences" it is also a special domain of ecology defined largely by context (Palmer et al., 2006) and in Canada is regulated through a combination of federal and provincial laws, policies, and regulations. In these contexts, restoration is driven by scientific inquiry and discovery, legal and regulatory requirements (i.e., mandated under provincial and federal legislation), but also a sense of morality based on very personal, cultural, philosophical, and social norms, all of which tend to posit that restoring damaged or degraded habitats is a noble endeavor. A notion that can make it difficult to objectively evaluate its efficacy and intended outcomes.

Restoration ecology, both in research and applied contexts, has been heavily scrutinized. This is unsurprising given the lofty goals of restoring ecosystems and the potential for practitioners to fall short of their long-term ecological objectives. Burbidge et al. (2011) outlined various challenges to ecological restoration, including inappropriate funding and political timelines and the apparent disconnection between research and practice (but see Wyborn et al., 2012). Another critique is the end goal of restoration itself, to "fake nature" or to construct and manage landscapes toward a state that mimics a natural system before the onset of a given disturbance, an objective that garners significant debate about "naturalness" and the problem of imposing subjective historical and/or shifting baselines (Higgs et al., 2014; Almassi, 2017).

While researchers have defined strands of restoration ecology that focus largely on things like the conservation of endangered species or communities, ecosystem services, and ecological functions (Ehrenfeld, 2000; Higgs et al., 2014; Krievens et al., 2018), the purview of restoration ecology has grown to include a more meaningful consideration of *people*. Debates in the field have long questioned the role of people in restoring and re-designing nature (Katz, 1991), and question which or whose ecological baselines to restore ecosystems to (Foster et al., 2003; Whipple et al., 2011). For example, Moreira et al. (2006) identified a landscape-oriented approach to restoration ecology that centered, among other things, traditional land management techniques and cultural heritage. Similarly, Weinstein (2007) highlighted how urban estuary restoration efforts were more successful when ecosystem functioning objectives were coupled with peoples' sustainable use of the estuary (i.e., for social and economic purposes).

Small and gradual changes in the field of restoration ecology like the increasing inclusion of people, provides some hope for more equitable and just relationships to land-healing decision-making. However, despite the intimate connections and understandings that Indigenous communities have to their ancestral lands, Indigenous knowledges, values, and traditional stewardship practices are rarely considered in land-use decision-making or restoration (Wilkinson et al., 2022). For example, we have observed only a slow and reluctant inclusion or superficial assimilation of Indigenous Peoples' knowledges into dominant restoration ideologies and practices in settler nations like Canada (Grenz, 2020). We argue that restoration objectives have, to date, largely included reformist and incremental attempts to include Indigenous Peoples in restoration efforts, abating the influence or application of Indigenous worldviews to efforts that could provide novel approaches to improving long-term ecological outcomes (Nelson, 2008).

Here, we introduce the term "pop-up restoration" to describe restoration initiatives in British Columbia (BC), Canada that not only fall short of their restoration goals, but in presiding over how land is used and "restored," continue to discriminate and impose inequities on unceded and stolen lands. Our goal is not to undercut all restoration efforts, but to highlight how some efforts are causing more harm than good. These efforts are commonly led by industry proponents, government, and NGOs, are consistently limited in scope (fragmented efforts), and are disconnected from the wider spatial, temporal, and cultural contexts of a given landscape or region. Three key characteristics underly our definition and critique of pop-up restoration. First, such restoration efforts literally pop-up then leave; they lack long-term and continued engagement, funding, or monitoring after initial restoration activities (e.g., removal of invasive species). Second, restoration efforts that are conducted under the logic of fortress conservation, that deny access to and use of areas by people whose traditional territories have been used for *millennia*, characterizes a pop-up restoration mentality (Hunn et al., 2003; Dowie, 2011).

Finally, the third characteristic we define in pop-up restoration efforts concerns the practical issue of restoration baselines—restoration for who, and restoring to when? Although not a new critique, in settler nations like Canada we continue to grapple with the issue of pre-colonial or pre-industrial baselines, which not only privilege one historical moment over another (Almassi, 2017), but often do so without sufficient or critical use of historical-ecological data (Lane, 2019; Clavero et al., 2022). For example, in places like British Columbia, narratives about Indigenous land-use and their effects on floral and faunal communities, populations, and entire landscapes continues to be downplayed or ignored (Anderson, 2005; Deur and Turner, 2005; Turner, 2020). Few ecologists are aware of or accept the fact that Indigenous Peoples actively managed forests, wetlands, grasslands, and intertidal ecosystems through repeated and intensive fertilizing, burning, coppicing, pruning, transplanting, weeding, or landform engineering (Trusler and Johnson, 2008; Deur et al., 2015; Armstrong et al., 2023). Overtime these practices resulted in highly diverse, heterogenous, and ever-changing landscapes that do not fit the restricted space–time limits proscribed in pop-up restoration efforts. Pop-up restoration appears self-serving and hypocritical: working in acknowledgment of an increasingly changing climate, but effectively pausing the essential ebbs and dynamisms of a living and breathing system. Pop-up restoration might overlook climate resiliency and food systems, countering deeply entangled and rooted Indigenous histories, labor, and relationality.

Indigenous worldviews, which posit a deep and interconnected relationship between people, lands, and the biota within them, are guided by a complex axiology of relational accountability, respect, and reciprocity (Wilson, 2008; Kimmerer, 2013; Smith, 2021). Unlike pop-up restoration, these fundamental tenants, and philosophies of

being conceptualize land as, for example, food and medicine—the things that nourish and sustain us and that are responsible for the health and well-being of all relations. While Indigenous food systems differ globally (regionally and culturally), the Indigenous Food Systems Network (2023) frames such systems in ecological terms, as the interdependent relationships between all species, air, water, and soil, the health of which is inseparable from Indigenous Peoples foods which are actively cultivated and cared for with respect and through reciprocating acts (Paulowska-Mainville, 2020). An Indigenous food systems lens provides a holistic approach to food production, distribution, and consumption, that centers humans' coexistence with other living beings and prioritizes a cultural-ecological equilibrium over exploitation or fixed restoration goals (Kuhnlein, 2020). Indigenous food systems are increasingly recognized for their potential contributions to community health and well-being, biodiversity conservation, and sustainable forest use (Settee and Shukla, 2020), but have yet to be fully considered in the context of restoration ecology. Here we consider the ways in which an Indigenous food systems approach to restoration ecology offers an opportunity to confront colonial assumptions about land and Indigenous land-use—particularly around restoration dualities which continues to divide people from "nature" and inherently erases longstanding and purposeful land management and stewardship efforts (Grenz, 2020; Wilkinson et al., 2022).

We assess how the application of an Indigenous-food systems lens to restoration may provide a paradigm shift to counter and remedy pop-up restoration and the issues raised here by sharing research experiences working on two distinct but overlapping restoration efforts in so-called British Columbia. We assess restoration efforts after a large-scale (450 km^2) wildfire in St'at'imc territory and a previously managed Garry oak ecosystem (6.5 ha) impacted by farming and urban expansion in Quw'utsun (Cowichan) territory. The unique cultural and historical contexts, combined with their distinctive restoration needs and ecological settings provide two unique perspectives on restoration efforts currently underway in the province. These study areas were chosen based on the cultural and ecological contexts we are most familiar with (especially Grenz) and given our roles as interlocutors in both restoration efforts to date. Furthermore, longstanding colonial impositions (land-use conflicts) and colonial infrastructures (regulatory requirements) persist in each region, making these valuable case studies in which we can assess the successes and failures of Western-dominant environmental and regulatory practices. First, we briefly assess historical-ecological data for each region and then consider the efficacy of current ecological restoration efforts therein. We then consider how Indigenous-led restoration efforts, which centers food systems reclamation and revitalization, are currently underway in each community. These efforts center the perceptions, values, and needs of both St'at'imc and Quw'utsun, leading to a critical integration of Indigenous food systems approaches in ongoing and future restoration efforts.

2. Methods

We assessed disturbance-restoration cycles in two unique study regions (Figure 1) with each assessed at a relatively broad landscape-scale, focusing on: (1) historical-ecological evidence of Indigenous and settler colonial land-use practices over broad (centennial and millennial) timescales (2) recent, current, and ongoing restoration efforts, and (3) future-focused and Indigenous-led visions for land restoration and revitalization.

One author (Grenz) has worked for 7 years on restoration efforts in Quw'utsun territory and 2 years in St'at'imc territory. These added interlocutor experiences form part of the conceptual methodologies used to consider disturbance-restoration cycles and alternative strategies presented herein. As an Indigenous scholar (Grenz) works alongside Indigenous communities in a praxis grounded within Indigenous research methodologies based on respect, reciprocity, and relationality, using land-based learning and open-ended knowledge sharing opportunities, such as "sitting on land" in observation and discussion with community (Wilson, 2008; Kovach, 2021).

2.1. St'at'imc territory, McKay Creek wildfire area

St'at'imc (pronounced *Stat-liem*, previously known as Lillooet) is a large polity of independent Indigenous Nations in the southern Coast Mountain and Middle Fraser Canyon regions of British Columbia. The focus of our study is the McKay Creek Wildfire Area, a roughly 450 km^2 area encompassing major Fraser River drainages of Bridge River and Seton Lake (Figure 1). A unique feature of this landscape is its impressive combination of Biogeoclimatic Zones—the area is encompasses Interior Douglas-fir, Ponderosa Pine, and Bunchgrass zones at lower elevations and Interior Mountain-heather Alpine, Montane Spruce, Engelmann Spruce–Subalpine fir at higher elevations (Meidinger and Pojar, 1991). The heterogeneity of the landscape is matched by its long-term and diverse use and occupation by St'at'imc people spanning millennia (Prentiss and Kuijt, 2012) and illustrates a vibrant intersection of biological and cultural diversity (see Maffi, 2007).

We analyzed historical and written texts documenting Indigenous and setter colonial land-use in the McKay Creek Fire Area, but also included broader St'at'imc references if they were deemed relevant. While not an exhaustive historical-ecological study, this short review allowed us to consider aspects of land-use not typically considered in restoration contexts. Special attention was given to extractive industry gray literature, ethnographic accounts, and government surveys and reports (e.g., grazing tenures, agricultural land reserves, etc.). On June 29, 2021, after a heat dome spurred record-breaking temperatures causing extreme fire conditions over much of the Pacific Northwest of North America (Still et al., 2023), the human-ignited McKay Creek Wildfire, began approximately 11 km north of the town of Lillooet, BC. In response to the devastating fire, restoration planning activities led by the BC government gave rise to the assembly of the McKay Creek Technical Committee which offered an opportunity for affected St'at'imc communities to express their concerns and priorities regarding wildfire recovery. Non-Indigenous governments, NGOs, academic researchers, and restoration contractors were invited to join the technical committee. The technical committee was mandated to facilitate and act as a communication channel between the member communities, government and, when necessary, industry.

One of us (Grenz) is a member of the technical committee and evaluated invasive plant records (prior to the wildfire), assessed fire records amassed by the provincial government's Wildfire Service, and conducted a post-fire plant assessment in the area. We conducted

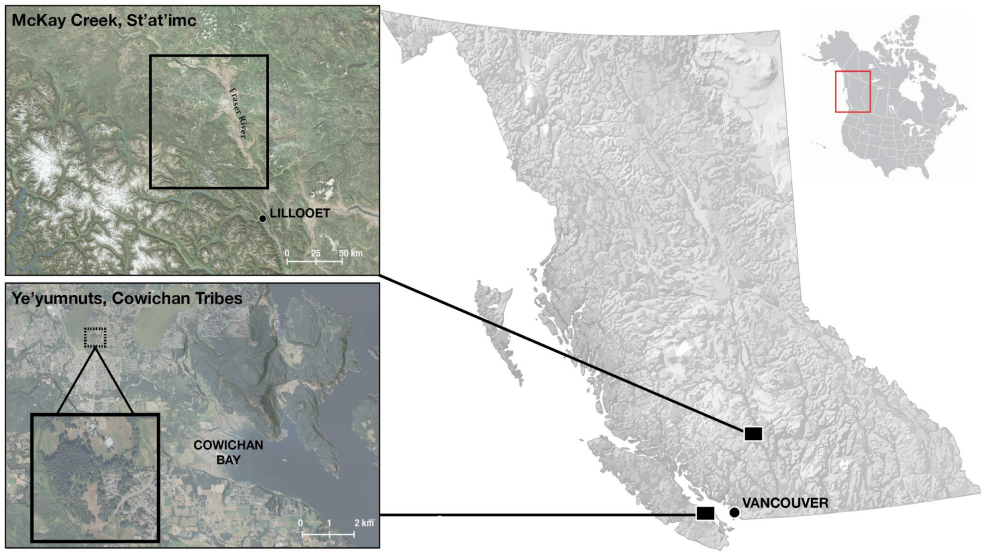

FIGURE 1
Study site locations.

multiple field visits across the entire fire zone to ground truth fire severity mapping (this work began in September of 2022 and is ongoing). Based on community knowledge of plant harvesting locations (locations withheld to protect data sovereignty) we used targeted meandering surveys to map culturally important plants. We coupled these surveys with invasive plant species data from pre-fire inventories in the Invasive Alien Plant Program Database for the Province of British Columbia. Plots for a more in-depth study of vegetation, and to project growth trajectories, were established in June 2023 using a combination of preferential and stratified random sampling methods (Michalcová et al., 2011). Hundred and twelve plots were coded by (i) burn severity rating (low, medium, and high), (ii) grazing pressure (grazed, un-grazed), and (iii) invasive species presence prior to the wildfire (prior presence, no prior presence). Using ArcGIS, plot locations were randomly selected within each of these strata combinations, yielding 12 unique plots for vegetation monitoring. All work was, and continues to be, directed by St'at'imc leadership as members of the wildfire recovery technical committee and we continue to be guided by lessons and input provided by knowledge sharing opportunities (workshops, interviews) and monthly participation in technical committee meetings.

2.2. Quw'utsun camas meadows (Garry oak ecosystems) and Ye'yumnuts ancient village site

Ye'yumnuts is an important biocultural landscape in the densely occupied city of Duncan on Vancouver Island. The eastern flank of the site is bounded by the Somenos River (meaning "resting place") which drains southeast for roughly 3 km into the Cowichan River and ultimately to the Cowichan Bay Estuary which hosts a diverse mix of tidal mudflats, salt marshes, and seagrass beds (Figure 1). The region is heavily developed but comprises the dry maritime subzone of the Cedar Western Hemlock Biogeoclimatic Zone and is characterized by a mix of forested ecosystems dominated by western hemlock (*Tsuga heteropylla*), Western redcedar (*Thuja plicata*), and Douglas fir (*Pseudotsuga menziesii*), and more sparsely vegetated ecosystems of arbutus (*Arbutus menziesii*) and hairy manzanita (*Arctostaphylos hispidula*), wetland ecosystems of peat-moss bog and Sitka willow (*Salix sitchensis*), and finally, the dominant ecosystem type at Ye'yumnuts: Garry oak ecosystems. Garry oak ecosystems are some of the most biologically diverse ecosystems in Canada and are fundamentally cultural spaces that have been shaped and used by people for millennia (McCune et al., 2013; Pellatt and Gedalof, 2014). Recently, restoration of Garry Oak ecosystems across Vancouver Island has been more inclusive and acknowledging of Indigenous Peoples' long-term stewardship of these places (Beckwith, 2004). However, the story of Garry oak restoration at Ye'yumunts is still unfolding and was critically analyzed here.

To investigate 150+ years of Quw'utsun and settler colonial land-use history at Ye'yumnuts, historical and archeological data were collated and analyzed (e.g., archeological reports, historical texts provided by Cowichan Tribes, Cowichan Valley Naturalists, and Somenos Marsh Wildlife Society). Working in close step with Dianne Hinkley, Director of Cowichan Tribes Lands and Research Department and Ye'yumnuts community authority, we conducted semi-structured interviews with Quw'utsun Elders and knowledge holders (Luschiim, Mena and Peter Williams, Harold Joe), and archeologists about the historical and ecological legacies of the site.

To assess current and ongoing restoration efforts, we compiled a mix of ecological and semi-structured ethnographic data. Plant inventories were conducted between April–September 2018. A complete inventory of all vascular plant species (herbaceous plants, shrubs, and trees) was conducted over the entire site (including mapping and recording of relative abundance/density). Land-based knowledge-sharing workshops and field site tours with Cowichan Tribes staff, Elders, and ethnobotanists familiar with the site were conducted April 2018–July 2022. The purpose of these workshops and visits was to share oral histories, stories, and traditional ecological

knowledges, to take part in archeological work completed on site, and to discuss restoration planning and visioning. Some of this data is based on Grenz (2020) doctoral dissertation work, who took part in and reviewed the consultation process and restoration planning at Ye'yumnuts between Cowichan Tribes and Provincial government/contractors in 2017–2020. This process is ongoing.

Finally, we assessed Indigenous-led visions for restoration at both sites. We scoped and assessed how these visions align with, challenge, disrupt, or enrich current and ongoing land restoration efforts led by non-Indigenous organizations and governments. This work coincided with the workshops, field visits, interviews, and technical committee meetings at each study site.

3. Results

3.1. St'at'imc territory, McKay Creek wildfire area

There was a relatively rich body of archeological and ethnographic data to piece together aspects of St'at'imc land-use histories. Archeological surveys and excavations spanning decades have highlighted the extensive use and occupation of the McKay Creek region by people for millennia (Prentiss and Kuijt, 2012; Prentiss et al., 2014, 2020). Archeological data provided glimpses into pre-colonial seasonal rounds and broad usage of fish, plant, animals. Prentiss et al. (2014) inferred how kin-groups moved three to four times a year to access foods growing at different locations and at various altitudes. People used the entirety of the landscape, harvesting ungulates like deer (*Odocoileus hemionus*) in the alpine and harvesting root foods like spring beauty (*Claytonia lanceolata*) and balsamroot (*Balsamorhiza sagittata*) in the sub-alpine. Plant foods that could be harvested in large quantities, like mountain blueberries (*Vaccinium cespitosum*) and saskatoon berry (*Amelanchier alnifolia*) formed a critical part peoples' diets and, veering down slope into the river valleys, salmon harvesting along the Fraser River and its productive tributaries formed an integral component of the round.

Early twentieth-century anthropologist James Teit's publications (Teit and Boas, 1900; Teit, 1906, 1930) and unpublished field notes and manuscripts collected and analyzed by historians like Wickwire (1991, 1998, 2019) and Wickwire and Tiet (1993) provided broad perspectives for St'at'imc (and Nlaka'pamux) resource management and governance. For example, Teit noted how nearby Nlaka'pamux organized in a de-centralized fashion, appointing different chiefs for tasks like war, hunting, and cultivation. Wickwire notes, "He wrote that … female plant specialists and cultivators appointed a respected member of the group to serve as the chief of their berry-picking or root-digging expeditions" (Wickwire, 2019, p. 168). James Teit recorded direct accounts of a rich and complex range of land-use protocols relating to the production of food, where everyone "'understood that it was against the law to interfere with the service berry [saskatoon berry] patches until a designated man or woman declared that the berries were ready for picking. At that point, all the girls and women arrived at the designated picking grounds at the same time and held a ceremony to offer thanks 'to the crop of berries' and to ask for abundance the next year. They did this for huckleberries, tobacco, and certain roots that 'were all products of the earth and related to a kind of earth deity.' The community approached its fishing sites, hunting grounds, soapstone outcroppings, and paint deposits in a similar way" (Teit, Wickwire, 2019, p. 181).

St'at'imc People were not mere hunter-gatherers, but active, coordinated, and knowledgeable landscape managers. The minimum extent of St'at'imc cultivation and management is exemplified by the genetic manipulation and isolation of plant species like saskatoon berries that resulted in distinct crop varieties. Turner (1972) recognized five varieties of saskatoons among Fraser River St'at'imc: (1) The main variety: stsaqwəm-ʔúl (real/original saskatoons); (2) the lowland variety: (s)páqpəq (white); (3) the red-berried variety: (s)wałkwaʔúʔsaʔ ("red-berries"); (4) the sweet variety: (s)tl'əxl'ús (sweet-eye/face/berry) and; (5) the bitter variety: təxl'ús (bitter).

Settler colonial history in the St'at'imc region began with the Fraser River Gold Rush which, after spotty and incidental contact between fur traders beginning in the 1810s, overnight propelled thousands of miners into the region. The colonial discovery of gold in 1857 spread quickly and boomtowns sprang up along the Fraser River at Yale, Lytton, and Lillooet. The rush quickly declined as the more accessible deposits were depleted—mining continued in some pockets, while other speculators settled the area permanently, ushering in an age of intensive cattle ranching. The impacts of Fraser cattle farming on the forests and grasslands in St'at'imc country cannot be underscored enough. The clearing of land for cattle, ensuing compaction, introduction of invasive species through fodder, wildfire suppression, and pre-emption policies that removed Sts'at'imc managers and stewardship authorities from their lands have resulted in significant changes and in some cases negative impacts to landscapes and ecosystem functions in the region (Turner, 2008; Grenz and Clements, 2023). Our experience in the restoration and land-use space have found that many of the land-use conflicts and issues brought on by the sudden influx of miners and ranchers have not been dealt with and the legacies of their impacts persist.

Results focusing on the impacts of the McKay Creek wildfire and current restoration and management efforts show that most of the wildfire area was classified as severe, owing to the >70% mortality of tree biomass after the fire (Hagmann et al., 2021), leaving behind virtual moonscapes mostly devoid of plant life (Figure 2A). Such a high severity wildfire has not been previously or historically observed in this region (Grenz and Clements, 2023). Post-impact assessments of the McKay Creek wildfire found multiple overlapping causal factors including a century of fire suppression, resulting in a dominance of fire-intolerant species and increased fuel loads accumulated at surface, ladder, and canopy levels (Hagmann et al., 2021). The area's grasslands have become dominated by a hyperabundance of sagebrush (*Artemisia tridentata*) (see Figure 2B) that was previously managed by St'at'imc through repeated low intensity burnings (Grenz and Clements, 2023). Forested areas have become more homogenous in structure, spatial patterns, and composition, dominated by Douglas fir (*Pseudotsuga menziesii*) with poor light conditions for herbaceous and other understory species.

Preliminary vegetation surveys across the wildfire area were conducted in the fall of 2022, 1 year after the fire. During plot placement for a long-term vegetation trajectory study, meander searches revealed little to no vegetation in recovery in the high severity burn areas. Soil organic matter appeared to be burned entirely with only deep ash deposits (~30 cm) remaining on the surface. Significant soil erosion and soil movement was observed throughout the high severity burn areas. Sparsely present plants included native species

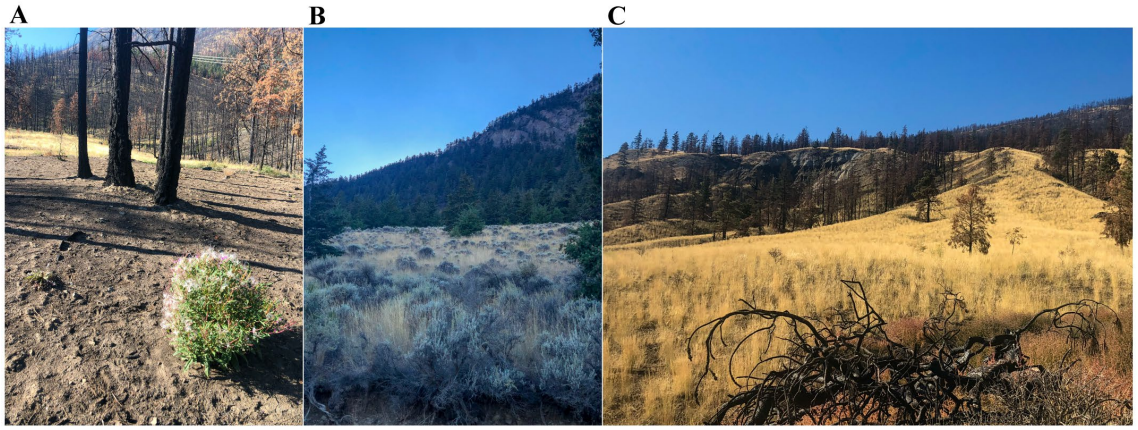

FIGURE 2
McKay Creek wildfire area 1 year post-fire **(A)** high severity burn site, **(B)** unburned grasslands with encroachment by conifers and high-density sagebrush just outside the fire zone, in comparison to **(C)** low severity burn grasslands with conifers and sagebrush burned.

such as snowberry (*Symphoricarpos albus*), fireweed (*Chamaenerion angustifolium*), kinnikinnick (*Arctostaphylos uva-ursi*), Sandberg's bluegrass (*Poa secunda*) and non-native and/or invasive species such as lamb's quarters (*Chenopodium album*), common mullein (*Verbascum thapsus*), and Russian thistle (*Salsola kali*). Riparian areas, streams, and wetted areas where springs occur appeared to serve as plant nurseries regardless of burn severity, with some ethnobotanically salient medicinal and food plants (*Symphoricarpos albus*, *Chamaenerion angustifolium*, *Balsamorhiza sagittata*, *Achillea millefolium*). Medium severity burn sites appeared to have similar plant species to the nursery sites with slightly higher distribution and density. Low severity burn sites in grasslands appeared to respond as Indigenous fire stewards predicted from their own experiences using prescribed burning (see Figure 2C). Previously encroaching Ponderosa pines (*Pinus ponderosa*) were burned back along with large sagebrush, leaving behind dense native grass species and an abundance of native plant species such as nodding onion (*Allium cernuum*), umber pussytoes (*Antennaria umbrinella*), and chocolate lily (*Fritillaria affinis*).

Throughout the intergovernmental wildfire recovery process and participation on the Indigenous-led McKay Creek technical committee, it became evident that concurrent government-led wildfire recovery in the region was largely driven by the values, goals, and priorities of only a few interest groups. Non-Indigenous hunter and rancher interests seemed to be given priority over St'at'imc values, goals, and priorities, especially when those interests were at odds (e.g., a few values certainly overlapped but most did not). For example, rancher desires to re-seed much of the landscape with agronomic species not only undermined the complexity of the landscape (and would introduce non-native plants) but ignored short-and long-term vegetation requirements of resident mammals, birds, and other wildlife relied on by St'at'imc community members. Over the millennial time scale with which the region has been stewarded, this opportunistic solution to a deep-rooted problem exemplified the pop-up restoration ethos. Another example included the provincial government's proposal to reintroduce cattle grazing tenures within the wildfire zone despite expressed concerns of St'at'imc community about insufficient vegetation recovery to support both the cattle and ungulate species relied upon by the Nation for food, such as mule deer (*Odocoileus hemionus*). In assessing the government-led restoration process, we observed a general lack of understanding of the complexity and historical dynamics of St'at'imc environmental management knowledge and values—values that have been applied, tested, and adapted over millennia. We observed how government policy and decision-making overlooked, and in some cases outright dismissed, St'at'imc voices, knowledge, and expertise at the table.

3.2. Quw'utsun camas meadows and Garry oak ecosystems, Ye'yumnuts ancient village site

Archeological excavations at Ye'yumnuts beginning in the 1990s revealed extensive Quw'utsun use and occupation in the area over millennia (2800–800 BP) (McLay et al., 2009, 2013). Remains from a large cooking feature dated to 2,800 BP included plant remains from thimbleberry (*Rubus parviflorus*), blackcap raspberry (*Rubus occidentalis*), red goosefoot (*Oxybasis rubra*), and sedges (*Carex* spp.). Other remains present at the site included fish such as herring (*Clupea pallasii*), salmon (*Oncorhynchus* spp.), skate (multiple species), flounder (*Platichthys stellatus* and *Atheresthes stomias*), anchovy (*Engraulis mordax*), dogfish (*Squalus suckleyi*), sculpin (*Aleutian sculpin*), and greenling (*Hexagrammos decagrammus*) (McLay et al., 2009, 2013). Recent and longer-term fire management at the site was evident from the occurrence of fire-scarred trees and charcoal flecking and lenses identified in organic soil layers. Garry oak ecosystems were managed for, among other reasons, camas production. Archeological evidence spanning the early-mid Holocene highlights camas (and hazelnut, *Corylus cornuta*) as principal plant food resources across the Pacific Northwest (Aikens, 1993; Armstrong et al., 2018; Carney et al., 2021). Historical and ethnographic evidence indicated that camas was one of the most important food staples for Quw'utsun, and that it formed an essential commodity of Quw'utsun economies and trade relationships with other Coast Salish groups on the mainland and up the Fraser River (Lyons and Ritchie, 2017). Well-maintained camas meadows could produce approximately 10,000 bulbs or ~ 225 kg per

family, per year (Deur and Turner, 2005). Ye'yumnuts was likely one such productive meadow that was managed through repeated burning, weeding, and selective harvesting, especially by women, over millennia.

Based on archival and other historical sources, Ye'yumnuts colonial history began in 1876 when a 100-acre parcel was pre-empted and farmed for the next century with much of the Garry oak meadow serving as pasture for livestock and other portions of the site cleared to grow grain (Thom, n.d.). One of Canada's most threatened habitats, only 1–5% of original Garry oak ecosystems persist in British Columbia (Lea, 2006). Substantial changes to ecosystem composition, structure, and function occurred after European settlement in the region, who often favored Garry oak meadows for farming. With the suppression of fire and ongoing expansion of peri-urban subdivisions, Ye'yumnuts is one of the few remaining but severely fragmented Garry oak ecosystems on Vancouver Island and coastal islands (McCune et al., 2013).

Current conditions at Ye'yumnuts exhibit heavily degraded and compacted soils, the contracting of Garry oak trees (*Quercus garryana*) and associated plant species, and the hyperabundance of invasive plant species such as Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), English ivy (*Hedera helix*), Canada thistle (*Cirsium arvense*), and reed canarygrass (*Phalaris arundinacea*). More recent soil formation processes indicate the proclivity of nutrient rich anthrosols (Howard, 2017) that are result of historical agriculture on the site (likely from the application of manure fertilizers). This is distinct from the anthrosols associated with typical Garry Oak ecosystems which are often shallower, have excessive drainage (Roemer, 1972, 1993), and are nitrogen poor (Klinka et al., 1989).

We assessed various restoration attempts of Ye'yumnuts Garry oak meadows over the course of a decade, beginning with stewardship groups and government agencies who planted Garry oak seedlings at the site (with 50% success rate) and planted camas bulbs at various ages and sizes in the southern portion of the site (0% success rate). Efforts to eradicate invasive species have been relatively unsuccessful. Non-chemical management trials on reed canarygrass (*Phalaris arundinacea*) (solarization and covering) were applied, and Scotch broom was cut (when in bloom)—both attempts were unsuccessful. Without follow-up or further studies, planting and eradication efforts could be considered "pop-up." The Garry oak ecosystem continues to contract and longer-term approaches are clearly needed.

Douglas fir continues to encroach on the site (see Figure 3A), outcompeting Garry oak seedlings and in some cases resulting in a net turnover of Garry oak meadow species like nitrogen-fixing forbs and ethnobotanically significant species (Erickson, 1996). Alternatives to longstanding Quw'utsun fire stewardship techniques were proposed to stop the encroachment of Douglas fir. These alternatives (e.g., felling encroaching conifers) were not supported by the surrounding settler community who did not want any trees cut down. A compromise was reached, and restoration technicians topped encroaching conifers, but it was shown to be ineffective as light conditions remained insufficient for Garry oak and associated species to grow and adjacent canopy closure continued so the treatment was stopped (Singleton, personal communication, 2018; see Figure 3A).

Other restoration issues included the overwhelming presence of the native plant species snowberry (*Symphoricarpos albus*) which grows evenly across the meadow understory, reaching a height of 1.6 m (see Figure 3B). We observed that their presence likely inhibited the germination and growth of Garry oak seedlings causing seedling mortality. The current stand of Garry oaks in the area is, as one Elder described, "grandparents without their children or grandchildren," referring to the proclivity of snowberry which halts multigenerational succession (Luschiim, personal communication, 2018). Approximately one decade ago, mowing experiments were used and were relatively successful in keeping species like snowberry at bay, but this required repeated care and the project ran out of long-term funding (Singleton, personal communication, 2018). Mowing was also observed to accidentally kill off Garry oak seedlings that were growing among the dense snowberry as they were difficult to see (Hinkley, personal communication, May 2023). There continues to be challenges in managing snowberry as its categorization as a "native" species does not lend itself to management resources allocated by the provincial invasive plant management program.

We observed that, over time, camas numbers appeared to be declining in areas it was re-introduced to through local stewardship groups in the upper Somenos Garry Oak Preservation Area of Ye'yumnuts. Not only did this observed decline manifest in the reduced number of individuals, but also reduced bulb size, and/or plants exhibiting signs of stress such as decreased growth and drought intolerance. We observed that camas bulbs were overcrowding for lack of harvesting and, despite signage, recreators were walking and biking over top of them.

3.3. Indigenous-led restoration

In both study areas, St'at'imc and Cowichan Tribes governments participated in the restoration processes. In both cases, despite the limitations of working within settler government-led programs, they continued to find ways to increase their influence within restoration spaces. As a result, both communities were actively developing rationales and plans for restoring and revitalizing the McKay Creek Wildfire Area and Ye'yumnuts.

In evaluating the beginning stages of Indigenous-led visioning and restoration, we observed several commonalities between both efforts. First, both placed considerable value upon archeological and historical-ecological data and oral histories and testimonies for providing an informed and long view context prior to making management decisions on the ground. Second, both communities applied a food systems lens which emphasized four discrete but overlapping components which we have distilled here (Figure 4).

The St'at'imc and Quw'utsun food system approach to restoration and reclamation required: (1) a holistic perspective accounting for the entire landscape as a food system, including all of the processes, actors, and actions involved in the production, distribution, re-distribution, and consumption of food; (2) an interdisciplinary and cross-epistemological approach which valued, evenly, multiple knowledge systems (e.g., Indigenous and Western scientific praxes) and had to be justly combined to assess baseline ecosystem conditions before creating any restoration plans; (3) a community health focus was emphasized in revitalization planning and required deep community consultation to gain clarity on the health values, concerns, and needs of people. Both communities expressed the desire to reconnect with and incorporate traditional foods as a greater part of their current diets to improve community health (spiritual, emotional, physical). Supply chain issues arising from the

FIGURE 3
Garry oak ecosystem encroachment at Ye'yumnuts by **(A)** coastal douglas fir (*Pseudotsuga menziesii*) and **(B)** snowberry (*Symphoricarpos albus*).

FIGURE 4
Indigenous-led land healing routinely points to: food; valuing all knowledge systems; health and well-being; and justice.

COVID-19 pandemic were underscored as an ongoing issue, galvanizing more emphasis on how traditional food systems, through land restoration and revitalization, can play a greater role in the daily lives of community members and help to combat food insecurity. Finally, (4) equity and long-term visioning was, across the board, heavily centered on youth involvement and justice through reconciliation —increased access to lands and traditional foodways. In all aspects of restoration planning, land healing efforts were touted as both the process and outcome to strengthen individual and community skills, leadership, and culture.

In assessing both community's restoration visions, there was some divergence when it came to the specificity of place. As predicted, the composition of, and emphasis on, certain species in each food system differed slightly, as well as peoples' relationships and stories of plants and soils, land usages, stewardship techniques, seasonality, colonial histories and impacts to land, and community interests, needs, and capacity. This confirms our expectation, that Indigenous food systems are not a monolith and should reflect the diversity of peoples' practices through space and time.

One concern consistently raised about restoring food systems was about the "types" of species being introduced—that some varieties or subspecies may not be suitable for all systems. Even when there are similar taxonomic species across Indigenous food systems, there was emphasis on ensuring the genetic integrity of local varieties, even if they were not recognized by the standards of western taxonomies. This underscores the importance of long-term and deep consultation and engagement—an anathema to the funding cycles and timelines of pop-up restoration. For example, in St'at'imc contexts, Elders and knowledge keepers recognized the local specificity of the same species growing at different elevations, those that tolerate heat, those that grow along a particular stream, and those species that produce fruit that look, taste, and preserves differently. In some cases, this was reflected within the languages where there were multiple words for what we would consider to be one species differentiated them in different ways (e.g., restoration of saskatoons would call for more nuanced and critical approach that considers the multiple St'at'imc varieties and their ecological needs).

4. Discussion

Results suggest that applying an Indigenous food systems lens to ecological restoration may provide a tangible framework for resolving some of the issues faced in top–down colonial policies common in pop-up restoration contexts. Our findings underscore that the good intentions which compel restoration ecologists and their works are largely driven by settler-ingrained stewardship expectations and paradigms which, despite numerous calls by restoration ecologists, continue to rely on a fixed separation of people and place, further dispossessing Indigenous Peoples from their lands (Gordon et al., 2023). Consciously or not, Western frameworks that exclude Indigenous title-holders as active managers and decision-makers, continue to influence how restoration goals are defined, funded, and implemented, not just in our case studies, but across British Columbia. The result has been a fragmented and privileged restoration *modus operandi*, where not only are Indigenous Peoples excluded from restoration projects, but they also often feel the negative impacts of their faulty implementation the most. As Robinson et al. (2021) have argued, "restoration projects exclusive of Indigenous needs are more akin to degradation than restoration."

While restoration practitioners continue to confront influences and biases in their work—biases that stem from conservative environmentalism, outdated scientific paradigms, and deep unknowing of historical and ongoing land-severing policies—two themes in our assessment of pop-up restoration emerged. First, true self-reflexivity, which acknowledges colonial wrongdoing, injustices, and ongoing legacies appears to be rare in restoration contexts (see also Beller et al., 2019; Liboiron, 2021) and globally, the characteristics of pop-up restoration embedded in many restoration plans and policies continue to disconnect Indigenous Peoples from their territories and livelihoods (Moola and Roth, 2019; see also Scheidel et al., 2023). For example, we found that restoration practitioners in St'at'imc and Quw'utsun contexts either disregarded or were simply unaware of basic principles of environmental justice, where acts of distributive, recognition, and restorative justice (e.g., Figueroa and Waitt, 2010; McGregor et al., 2020) should be the norm, but were mostly unknown or uncharted territory. In our review of the literature, we found this to be true in other Canadian contexts, where restoration practices in protected areas or mitigation of land-use changes from industry continue without consent or regard to Indigenous inherent and legal rights (Binnema and Niemi, 2006; Sutherland-Wilson et al., 2019). This unknowing is an obstacle, but also an opportunity for practitioners to dedicate themselves to active growth and life-long learning (see also Igance et al., 2023). Historical ecologists have remarked that "the landscape is a liberating scale at which we can work to prevent harm and recognize/restore who and what has agency" (Wolverton et al., 2023, p. 65). In this sense, restoration is a privilege. Learning to be mindful and attentive to non-human agents, places, and descendant communities is a privilege. And so, researchers and practitioners have an opportunity to exert this privilege toward more transformative and lasting outcomes—not only is this more just, but we have found it is more ecologically viable as well.

The second theme that emerged from the results is that while biases in pop-up restoration are beginning to be confronted and challenged, there is a simultaneous expectation that Indigenous knowledge and practices must instantaneously inform all that Western science has been ill equipped to handle on its own. The integration of Indigenous knowledge in restoration ecology requires ethical engagement with community and a sincere and critical integration of source knowledges and worldviews (Grenz, 2020; Robinson et al., 2021). However, such epistemologies and values are specific to place (Wickham et al., 2022) and are not easily duplicated and scaled-up—an anathema to large restoration enterprises and management agencies where formulaic or cookie-cutter solutions are the goal (Tsing, 2005; see also Armstrong et al., 2023). The idiosyncrasies of space and complexity of time mean that Indigenous knowledges risks being misused or misrepresented, appropriated, co-opted, and in some cases even discredited (Nadasdy, 1999; Johnson and Hunn, 2010).

We are at a critical juncture in applied environmental sciences, where Indigenous knowledge (traditional ecological knowledge or TEK, etc.) is finally, thanks to Indigenous leaders, Elders, and knowledge holders, being recognized. However, this recognition comes with important warnings regarding the superficial applications of that knowledge, misappropriations of the knowledge and unreal expectations (Wildcat, 2010; Campion et al., 2023). The reality of "academic gaslighting" where Indigenous knowledges have been coercively and actively suppressed for over a century but are now being summoned by the same institutions that tried to erase them, causes measurable harm (Geniusz, 2022). While broader scholarly discussions have more recently considered the importance of bridging Western scientific and Indigenous knowledges, referred to as braiding (Kimmerer, 2013), weaving, or two-eyed seeing (Reid et al., 2021), there is still significant learning and growth that individual practitioners and institutions must undertake to accomplish something that resembles a symmetrical, lateral, and equal bridging (Campion et al., 2023).

Done critically and justly, Indigenous-led restoration can lead to all kinds of cultural, social, and ecological benefits (Folke et al., 2010; Hofstra et al., 2020). Applying an Indigenous food systems lens to restoration and reclamation may be one avenue for centering the health of the land and the health of the people (e.g., Parlee et al., 2005). An Indigenous food systems approach attempts to critically dismantle settler colonial conceptions of *terra nullius* and wilderness and unsettles and rejects anthropological heuristics like the "hunter-gatherers." Our call to relational food-centered thinking pushes restoration practitioners beyond land acknowledgements and low-level consultation meetings and urges practitioners to process the deep and highly cultural, spiritual, and social histories of the lands they are attempting to shape. From the stewardship actions and governance principles that have been enacted since time immemorial, to the relational experiences and powers brought to the fore by medicines, foods, and technology, to the colonial harms, physical and systemic, that continue today.

Bringing the People back to the land and rekindling People-land-food relationships was a primary focus across our research sites, as it has been in other Indigenous-led food restoration projects (e.g., Settee and Shukla, 2020; Joseph and Turner, 2020; Tea Creek Farm Impact Report, 2022). As such, Indigenous-led restoration efforts should also dovetail with other overlapping pursuits (e.g., ethnobotanical studies, land-based cultural camps and initiatives, etc.). This is a priority in many communities—to ensure accountability and reciprocity that the lands need and have been missing —so they can be productive. As my (Grenz) Nlaka'pamux Elders have shared, "If we do not use the plants,

they will disappear." This wisdom is supported by widespread regional evidence in both Nlaka'pamux and St'at'imc territories where it has been observed that traditional root harvesting enhances their overall productivity (Turner and Kuhnlein, 1983).

The lessons we have learnt when applying an Indigenous food systems lens to restoration efforts include: (1) honoring the specificity of people and place and making space for each community's unique (and often unscalable) values, goals, knowledges, stories, plants, and animals; (2) acknowledging the diversity of experiences and impacts under past and ongoing waves of colonialism; (3) being genuinely open and flexible to evolving needs, cumulative impacts, current and changing conditions, including acknowledging failures and wrongdoings, and; (4) understanding and having compassion for the varying levels of interest, knowledge, resources, and skills for supporting land healing initiatives. This framework provides yet another path toward food sovereign futures for Indigenous communities (see also Coté, 2016), while providing a tangible way for ecological restorationists to pursue ecological justice without co-opting Indigenous knowledges. It broadens the collective construct of sustainable food systems and allows us to go beyond measuring success by counting individual shrubs and trees planted, to more meaningful and just and ongoing measures of accountability that ensure all are fed and healthy.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by UBC Behavioural Research Ethics Board. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

JG and CGA contributed to conception and design of the study, preformed the analysis of the data. JG conducted the research at the study sites and wrote the first draft of the manuscript. CGA gathered and analyzed the historical data for each study site. All authors contributed to manuscript revision, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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