

Rebuilding Yunesit'in fire (*Qwen*) stewardship: Learnings from the land¹

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ABSTRACT

Yunesit'in First Nation is reclaiming fire stewardship after generations of suppression. Applying a “learning by doing” approach, Yunesit'in members plan and implement proactive fire practices to the landscape, which are low intensity cool burn fires driven by the needs of the landscape and community goals. Through a structured monitoring and evaluation process, the participants generate knowledge and science on fire stewardship; the outcomes are documented and mobilized in various ways, including video, photos, and peer-reviewed articles. The pilot program has initially been evaluated through four general measures: *area stewarded* (in hectares); *people employed and trained* (number and diversity of people employed); the level of *planning, vision, and program sustainability* (generating plans where fire is a tool to meet the goals in these plans, supported by carbon funds); and *partnerships and knowledge mobilization*, (fostering partnerships for knowledge production and mobilization). On these measures, the program is growing and is a success. A holistic framework is being developed by the community, which encompasses ecological, social, economic, and cultural indicators, including a health and wellbeing evaluation framework to assess the physical, mental health and wellbeing benefits for participants in the program. A holistic approach is critical for understanding the connection between people, place and the role that fire stewardship plays in mediating positive outcomes.

Keywords: land stewardship, proactive fire practices, low intensity cool burn fires, health, and well-being

RÉSUMÉ

La Première Nation Yunesit'in réclame le contrôle des feux de forêt après des décennies de suppression des feux. Au moyen d'une approche « d'apprentissage par l'essai », les membres de la Première Nation Yunesit'in planifient et mettent en place des pratiques proactives d'utilisation du brûlage en milieu forestier, notamment par des interventions de faible intensité visant à respecter le milieu et les objectifs de la communauté. Au moyen d'une supervision structurée et d'un processus d'évaluation, les participants accumulent des connaissances pratiques et scientifiques sur le contrôle des feux ; les essais sont documentés et enregistrés sous différentes formes, notamment des vidéos, des photos et des articles révisés par des pairs. Le projet pilote a été évalué initialement selon quatre niveaux de base à savoir *la superficie gérée* (en hectares) ; *le nombre de personnes embauchées et formées* (nombre et diversité des personnes embauchées) ; *le niveau de planification, de vision et de durabilité des programmes* (nombre de plans où l'utilisation du feu en tant qu'outil pour atteindre les objectifs de ces plans en plus d'être financés par les fonds carbone) ; ainsi que *les partenariats et les activités de dissémination* des connaissances (recherche de partenariats pour la production et la dissémination des connaissances). Selon ces mesures, le programme s'étend de plus en plus et s'avère être un succès. Un cadre de référence global est en voie d'élaboration par la communauté et comprend des indicateurs écologiques, sociaux, économiques et culturels, en plus d'un cadre d'évaluation de la santé et du bien-être visant les bénéfices se rapportant à la santé physique et mentale et au bien-être des participants au programme. Une approche holistique est essentielle à la compréhension des relations entre les personnes, leur environnement et rôle joué par le feu dans l'obtention de résultats positifs.

Mots clés : intendance du territoire, pratiques proactives de brûlage, feux de faible intensité, santé et bien-être

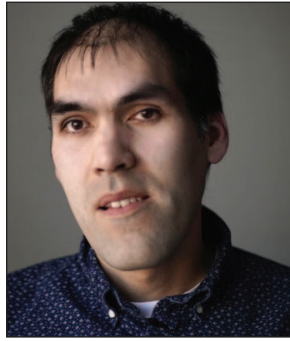
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Introduction

British Columbia's 2017 wildfires were the largest in the province's recorded history, burning some 2.57 million hectares and forcing 70 000 people to evacuate their homes (Nikolakis and Roberts 2021). Yunesit'in First Nation, located in British Columbia's dry Chilcotin region, had recognized the threat of wildfire some time before the 2017 wildfires. Unsustainable forest harvesting, unhealthy and overgrown forests, and a lack of cultural burning on the landscape, had created a "ticking time bomb" of fuels in the woods. Yet the ability for Yunesit'in to revitalize their fire stewardship and begin to address this threat at the time was highly constrained.

The general conversation for wildfire management around 2017 did not include First Nations as active players. While there were some small efforts to implement prescribed burning, such as through the British Columbia Wildfire Service (BCWS), this was limited—the fire suppression model was, and still largely is the dominant model. Fire suppression spending in the severe years of 2017 and 2018 in the Cariboo-Chilcotin fire region (over half being the Chilcotin) was \$229 503 189 (2018 Canadian dollars), whereas spending on preventative measures (like prescribed burning) was \$394 930 1 (Nikolakis and Roberts 2021). As the wildfires in the summer of 2017 threatened to engulf the Yunesit'in community, the efforts of Yunesit'in people with wildfire experience were critical. No houses were lost and no Yunesit'in members harmed. However, large swathes of Yunesit'in territory were severely damaged. Many of these areas remain scorched and barren today—with long-term impacts on constitutionally protected Aboriginal rights. Many berry patches, medicines, water springs, and grazing lands for deer and moose, have been lost—perhaps never to return. The effect of the wildfire on people's psyche could be long-lasting as well—for many in the community, the fires were a call to action—to bring back Yunesit'in fire stewardship to protect their community and their lands.

In the winter of 2017, Yunesit'in (led by then Chief Russell Myers Ross) and Gathering Voices Society (Dr. William Nikolakis) developed a plan to revitalize Yunesit'in fire stewardship—to build a proactive fire management program driven by the community's goals from the ground up (Nikolakis *et al.* 2020). In the winter of 2018, the partnership had collected enough resources to bring Victor Steffensen, an Indigenous Australian fire expert, to Yunesit'in and to neighbouring Xení Gwet'in, to share his rich experience on rebuilding Indigenous fire management programs with communities. What we learned from Victor was that this process

was not only about reclaiming fire stewardship from the provincial government—but it was also about Yunesit'in reclaiming fire for themselves—to take ownership of this sacred responsibility of putting fire to the land.

Victor's visit sparked a strong interest in the community about Indigenous fire stewardship. Elders shared stories of putting fire to the land with their grandparents. They reminisced about horse rides into mountain meadows as children during early spring, with their grandparents and parents using fire to remove last year's dead grass, so animals could have easy access to the green shoots below. Stories of fire's renewal potential, rather than its destructive force started to blossom.

The province's report into the 2017 wildfires by Abbott and Chapman (2018) developed a number of recommendations relating to First Nations becoming active players in wildfire governance. As well, the report called for more proactive and decentralized measures to prevent large and dangerous summer wildfires from occurring with increasing regularity. These recommendations created a "space" for negotiations to develop burn plans for Yunesit'in to put fire to Crown lands. However, the burn planning process remains centralized, complex, and lengthy (Hoffman *et al.* 2022).

Victor's visit in April 2019 trained six community members who spent time walking the land, learning about soil and vegetation types and their relationship to fire. Participants learned to understand if fire was needed in a particular system.⁴ In fire-prone areas like the Chilcotin, fire is critical to supporting biodiversity in certain ecosystems, or what some researchers have termed "pyrodiversity" (Bird *et al.* 2016; Bowman *et al.* 2016). Applying the right fire at the right time to the right place is a key goal of Indigenous fire stewardship programs (Nikolakis and Roberts 2020).

The pilot with Victor Steffensen and Gathering Voices Society was a success, not only because Yunesit'in fire practices were put on the land for the first time for at least two generations—but especially in terms of community interest in reclaiming fire as a stewardship tool. The year 2020 was largely taken up by COVID-19 restrictions but at the end of the year, the Yunesit'in team had engaged in landscape level planning and developed a burn plan with the province that was approved for implementation in the spring of 2021.

The April 2021 season saw 17 Yunesit'in people trained, and fire applied to more than 150 hectares of Yunesit'in territory. The Yunesit'in fire team also partnered with the BCWS, collaborating with a controlled burn for ecosystem stewardship goals—the first such partnership that BCWS has engaged in, to their knowledge.⁵

As we write this paper following the Canadian Institute of Forestry conference "Rooted in Resilience", the fall burns in 2021 were completed, and the planning for spring 2022 well underway, with more people to be trained and larger areas targeted. We are also in the process of developing rules and guidelines to generate carbon credits for Indigenous fire stewardship and cultural burning—this would create a private source of funding that can strengthen the program over the long term—building resilient ecosystems and resilient communities. This paper provides our insights from the Yunesit'in fire stewardship program as it is developing, with the aim of informing theory and practice.

⁴For video, see <https://vimeo.com/377626207>

⁵See video, see: <https://vimeo.com/663544456>

Context

Nestled west of the Fraser River and east of the Coast Mountain range in central British Columbia, the Chilcotin plateau ranges 1000 metres above sea level. The region contains Interior Douglas-fir (IDF), Sub-Boreal pine—Spruce (SBPS), Engelmann spruce—subalpine fir (ESSF) and bunchgrass (BG) Bio geoclimatic Zones (British Columbia Forest Service 2016). Lightning strikes often ignite fires during the hot, dry summers, and the disturbance regime is characterized by stand-maintaining fires where fuels are consumed periodically (Copes-Gerbitz *et al.* 2022). Many trees and grasses are fire-adapted, including lodgepole pine (*Pinus contorta* Dougl.), which reproduces through fire (Logan and Powell 2001).

The Yunesit'in and Xení Gwet'in First Nations are two of six members of the Tsilhqot'in Nation, and part of the Supreme Court Canada decision of *Tsilhqot'in Nation v. British Columbia*, 2014. This decision was the first in Canada's history recognizing and declaring Aboriginal title to almost 1700 km² held by Xení Gwet'in who have jurisdiction to make laws for forests and for wildfire governance (among other areas for self governance). The decision acknowledges that the Tsilhqot'in Nation have ownership to land and that there is an expectation of consent where this title is affirmed, which was systematically denied for the last 150 years.

This title recognition has provided the political space to reconstruct relations of consent between the Tsilhqot'in Nation and the Crown. This acknowledged jurisdiction has been reflected in nation-to-nation government relations that have manifested since 2014, including the Nenqay Deni Accord (2016), Gwets'en Nilt'I Pathways Agreement (2019), and Tsilhqot'in Collaborative Emergency Management Agreement (2018). The nation-to-nation government relations, as reflected through these agreements, outline expectations of engagement, and have a role in addressing the land question. The wildfire governance power raises some important cross jurisdictional tensions exposed in the 2017 and 2018 wildfires documented by Verhaegue *et al.* (2019): that government authorities assumed First Nations played a passive role in emergency management, and they even lacked basic information on First Nations' governance and legal authority that led to an overall lack of communication and coordination in wildfire response. This situation, Nikolakis and Roberts (2021) argued, reflects broader power dynamics that shape who controls wildfire governance and for whose benefit.

Like across most of British Columbia, the Tsilhqot'in used fire (*Qwen*) to shape the landscape, to encourage ungulate browsing, thin understory vegetation, and prevent conifer and sagebrush encroachment into grasslands (Turner 1999; Blackstock and McAllister 2004). Indigenous burning produced a fire-adapted landscape, and the Tsilhqot'in have a memory of fire based on the Nenqayni language. Fire is considered sacred and may have a spiritual force, an agent of renewal that can bring back vegetation. Since the establishment of reserves, Yunesit'in have applied fire to renewing the grasslands to enliven fresh grass for the benefit of horses, cattle and storing hay for the winters. However, the fire suppression policies of Canadian governments since the early 20th century (Lake and Christianson 2019), resulted in fuel buildup (Blackstock and McAllister 2004) and woody species

encroachment into grasslands (Bai *et al.* 2004). These policies viewed fires as destructive, threatening property and lives, as well as rangelands and timber values (Pyne 2007; Lake and Christianson 2019).

The general fire prohibitions, that also stamped out Indigenous fire stewardship, altered the Chilcotin's landscape and along with unsustainable forestry, mountain pine beetle and climate change, heightened the risk of unmanaged wildfires, reflected in the over 800 000 hectares burned in 2017 and 2018 (British Columbia Public Safety and Emergency Services 2019). The negative impacts on Yunesit'in and Xení Gwet'in peoples included stressful evacuation, psychological and cultural impacts, reduced hunting, and poor water quality (Verhaegue *et al.* 2019).

Yunesit'in's Vision

Yunesit'in have gathered as a community to develop a vision for the land. The community has expressed its vision to be "strong, independent, spiritual, and in control" to describe our strength in preserving our value system, the yearning for independence from Crown and industry land alienation, spiritual in acknowledging our powerful connection and long-standing relationship with the land, and in control in terms of asserting our responsibilities. Since 2014, there has been a stronger presence in asserting Tsilhqot'in values towards a conservation economy, where Tsilhqot'in are active participants, including land and fire stewardship and sustainable forest management.

Yunesit'in have sought to achieve this vision by actively aligning values with Xení Gwet'in, first in respect to the Tsilhqot'in decision, and second with respect to the work started in applying conservation approaches to forestry and land use. The Dasiqox Nexwagwez7an is the latest expression of this unity between Yunesit'in and Xení Gwet'in; announced in 2014 after the decision, it became an area of focus in attempts to build a management plan with the values of the Tsilhqot'in. There has since been a prioritized interest by both communities to support ecosystem stewardship, economic livelihoods, cultural revitalization, and health and healing.

Approach: Learning by doing, learning from the land

To be resilient in the face of increasing wildfire risk, Yunesit'in and Xení Gwet'in are revitalizing their fire practices which includes strengthening landscape stewardship and training local people in management practices rooted in Indigenous knowledge. Although there was a break in the old techniques that Tsilhqot'in ancestors may have used, the advantage for Tsilhqot'in was that there had been a strong knowledge of the land. Through collective deliberation, the community determines where and when to burn, and establishes the rationale and goals for burning particular areas (Nikolakis *et al.* 2020). A pilot program began in April 2019, supported by Gathering Voices Society, a charitable foundation based in Vancouver that facilitates Indigenous-led environmental stewardship programs. In the first round of burns, six Yunesit'in community members were trained by Australian Indigenous fire-expert Victor Steffensen who brought grounded Indigenous fire methodologies from Australia to revitalize Tsilhqot'in fire knowledge. The trainees were mentored in an experiential and practice-based approach to fire

management, which is used to connect communities to their local environment (see Standley *et al.* 2009). The trainees learned to interpret landscapes, seasons, and local ecological indicators to determine where and when to burn. What was learned is that knowledge systems can be built up by doing the work together and developing an understanding of what is ideal. Burning was initially targeted at reducing forest fuel loads through understory burning (burning cured grasses, shrubs, and dead biomass) and broadcast burning in meadows and grasslands.

Battiste and Youngblood (2000) documented that Indigenous knowledge is underpinned by a principle of “totality or holism”. While translating fire knowledge across jurisdictions, like sharing knowledge from northern Australia to central British Columbia has its challenges, Battiste and Youngblood (2000) described Indigenous knowledge systems that share the following structure (among others): a belief in “unseen powers” in ecosystems; that all things are interdependent; knowledge keepers teach morals and ethics to specific people; and this knowledge is passed down orally through generations. Grounded in Indigenous knowledge, practices, lore and customs, Indigenous fire stewardship brings the right fire to the right place at the right time. Nikolakis and Roberts (2020) defined Indigenous fire management as “the proactive use of fire to achieve multiple and complex landscape-level objectives”, which can include cleaning the landscape, mitigating wildfire, ceremony, and promoting food security (Lake and Christianson 2019). In Australia, where Indigenous fire management programs are the most established, empirical studies, typically in the northern tropical savannas, show beneficial outcomes for mitigating late-season wildfires, reducing greenhouse gas emissions, and conserving biodiversity (Russell-Smith *et al.* 2013; Moura *et al.* 2019; de Veiga and Nikolakis 2022). Social and livelihood benefits are also documented among participants, like reductions in lifestyle diseases and improved health (Burgess *et al.* 2005) and other co-benefits framed as a “social return on investment” (see Social Ventures Australia 2016; Nikolakis *et al.* 2022).

Weaknesses exposed in the centralized fire suppression approach, where fires are simply put out to protect life and property, have encouraged the emergence of more proactive and decentralized approaches such as localized prescribed burning and mechanical thinning to meet diverse objectives (Schoennagel *et al.* 2017; Thompson *et al.* 2018; McWethy *et al.* 2019). This is creating the space for Indigenous fire management approaches to emerge (Nikolakis and Roberts 2021). However, there are a number of barriers to its implementation. For instance, it is documented that state wildfire agencies tend to focus on the symptoms of the wildfire problem (such as damage to infrastructure), rather than the root cause (a lack of methods to co-exist with fire) (McWethy *et al.* 2019), which leads to differences in understanding between different actors on the causes and solutions to wildfire risk. Innovative solutions to address the root causes of wildfire risk, outside the centralized approach, are often overlooked due to socioeconomic, cultural (fire perspectives), and institutional (path dependency) barriers (Nikolakis and Roberts 2021) as well as legal, political, and attitudinal ones (Rasmussen *et al.* 2007).

Integrating different worldviews comes with challenges (Christianson 2015; Smith *et al.* 2021), such as creating

spaces where one knowledge systems does not usurp the other like “ethical space” (Nikolakis and Hotte 2021). Funding for Indigenous fire stewardship is generally low (Verhaegue *et al.* 2019) and the Crown's complex prescribed burning approvals process can be prohibitive for Indigenous fire stewardship practices (Hoffman *et al.* 2022). Despite these barriers, these programs are being implemented (see Nikolakis and Roberts 2021). Documenting the outcomes from these programs will be critical moving forward, and the Yunesit' in fire stewardship program is studying the effects of cultural burning on fire-behaviour, forest health, berries, ungulates, and carbon emissions. This information will support an evidence-based approach for the fire stewardship program, will improve understanding on the role of fire (Qwen) as a stewardship tool, and can guide efforts elsewhere.

Program and goals

The program

The fire stewardship program currently involves landscape level planning for applying low intensity “cool” burns to areas with high fuel loads. The fuels are typically dried grasses and shrubs, as well as woody debris from trees that have died from insect infestation, disease, drought, or previous wildfire. The volume of fuels in these forests and grasslands is significant and acknowledged as unhealthy by community members for a number of reasons: the buildup of debris is a wildfire risk; the forest is difficult to access for community members; and wildlife like deer and moose have trouble navigating through this debris as well as finding food. Community members have identified that a key role for people is to “clean the landscape” with fire, opening up grasslands for wildlife, making forests easier to access, and promoting new growth for animals to feed. Fire (Qwen), it is theorized by community members, will also remove ticks and other parasites, which in turn protects the wildlife.

There are two windows each year to apply fire to the land that typically last for two to three weeks each window. The first is in early spring, typically April once the snow has melted on the valley floor. Much of the grass is cured and lays matted from the weight of the snow. At this time of year, the days are relatively warm with intermittent wind patterns—there are patches of snow higher up on hillsides and mountains, which act as firebreaks and contain the controlled fires. After the controlled burns, green re-growth follows and deer and other animals are observed immediately coming to feed in these areas. The removal of the previous year's grasses, weeds, and other woody debris (particularly the ladder fuels in forests), mitigates fuels for summer wildfires.

The second window of opportunity is in late fall, typically October and November. This burn window is the most challenging in the Chilcotin, with snowfall and rain making it unpredictable for putting fire to the land. However, small windows open up when winds and humidity are supportive for fire on the landscape. Like the spring, the aim is to remove fuel loads, which have grown into forests and grasslands over the last century. In some instances, there is a need to thin areas out with machinery and chain saws because these areas are too thick to put fires into. There are, for example, significant stands of lodgepole pine (*Pinus contorta* Dougl.) that have grown in following wildfires and applying fire into these stands is considered too risky.

The fires are applied to the land using hand ignition tools

like lighters and matches, although in some areas drip torches are used (though there are concerns about the effect of these in sensitive areas, such as in food gathering areas). The ignition zones depend on the terrain, in some places strips are burned to establish perimeters, while in other areas, ignition zones are more random and are applied to patches of fuels where they arise. The teams carry shovels, picks and water tanks, and pumps and hoses are also readily available. A film crew is on hand to capture the burn zone (pre- and post-fire), as well as the work of the fire crew. Interviews with the fire team are undertaken regularly during the burn periods to understand their perspectives and to share insights more broadly, with the aim of scaling these programs up elsewhere across the province and Canada.

The fire crew is led by a “boss” who manages and coordinates the team. The boss has extensive experience in fire fighting and connecting to the land. The team has ranged from 6 to 17, with ages ranging from youth to elders (16 to 70 years old), with the average age at 40 years. Five women participated in the spring burns of 2021, and there has been an active effort for women to participate so gender equity can be achieved.

The crew consists of those involved in ignition and those in monitoring and containing the fire. There is 24-hour monitoring of the burn site involving people, and where possible drones, to ensure any fires are contained and extinguished. The burn sites are mapped and monitored throughout the year, with regular photos and observations made to understand the effect of the burn: what is growing back in? Is what is growing back expected? What is the effect on invasive species? How are animals interacting with the areas burned? Experimental fenced plot networks are being developed (with control and treatment sites), and some of these are fenced in to prevent cows, horses, and other ungulates from grazing these sites, so that we have a clear picture of what is growing back. The aim is to connect the data from observations to the map, so we have a deep understanding on the effect of fire across the landscape over time.

Goals

There is a dearth of studies in the social science and natural science literatures that looks at goals from Indigenous fire stewardship. Christianson (2015) argues that this is due to “differences in worldview, ethical requirements and the added time often needed to build relationships” (p. 197) which makes such research both complex and time-consuming. Mainstream scientific literature has typically not treated fire-prone landscapes as complex socio-ecological systems—with direct feedback loops between ecosystems, and cultural and social systems (Spies *et al.* 2014). However, this is changing, with literature emerging from Indigenous and non-Indigenous scholars which defines the goals and targets for Indigenous fire stewardship and in turn, offer a basis for evaluating the performance of these programs (Lake *et al.* 2018; Nikolakis *et al.* 2020).

Lewis *et al.* (2018) used community interviews in Lytton, British Columbia, recently the site of a devastating wildfire, to show how traditional burning was now seen as a tool to reduce wildfire risk beyond delivering multiple ecological and cultural objectives. Among Indigenous Australian

landowners, Ansell *et al.* (2019) documented six integrated fire management goals that reflect the multidimensional nature of Indigenous fire stewardship: (1) healthy fire management, (2) fewer wildfires, (3) protection of biodiversity, (4) preserving culturally important sites, (5) maintenance and transfer of knowledge, and (6) carbon abatement. It has been documented in Australia that Indigenous fire stewardship can address multiple goals, for example, reducing greenhouse gas emissions from late season wildfires, which in turn helps the government to achieve international emissions reduction commitments as well as delivering on local livelihood goals through carbon funds (Russell-Smith *et al.* 2013; Moura *et al.* 2019; de Veiga and Nikolakis 2022). Indigenous fire stewardship can also achieve individual-level benefits, such as improved physical and mental health among participants, with important public health outcomes flowing on from this (see Burgess *et al.* 2005; Nikolakis *et al.* 2022).

Nikolakis *et al.* (2020) conducted unstructured, open-ended interviews with community members from Yunesit’in and Xeni Gwet’in in 2019 and identified three general goals from their fire management program. The first was strengthening cultural connections and well-being which included revitalizing and sharing Indigenous knowledge around fire, which was seen as important to connecting people to their land and to individual and community well-being. In the study, participants described how they felt good being on the land and stewarding the land. Second was restoring the health of the land through Indigenous fire stewardship, which could result in fewer wildfires, the protection of Mother Earth (biodiversity), and maintaining culturally important sites. Third, interviewees saw Indigenous fire stewardship as a way to “respect traditional laws”, which were their own laws reflecting responsibilities to the land and to future generations, as opposed to government made laws that focused on property rights and economic growth. Nikolakis *et al.* (2020) documented among participants that Indigenous fire stewardship was viewed as a pathway to revitalizing holistic traditional teachings and land stewardship practices and restoring the health of the land. These goals are interdependent, and like other work, reflect a more holistic perspective on goals from fire stewardship.

Goal setting can refine problems and their potential solutions in the face of uncertainty (Conley and Moote 2003). The challenge for wildfire management has been too much disagreement on the causes of wildfire problems and a lack of agreement on the solutions (Carroll *et al.* 2007). In exploring the goals of Indigenous peoples around fire stewardship, the tensions with the goals of non-Indigenous governments are revealed. The goals of subnational governments for fire management are focused on protecting life and property (Moura *et al.* 2019), while for Indigenous peoples these goals are fundamental; they bring a broader set of goals that require ongoing and proactive stewardship. Conflicts may emerge where Indigenous groups want to burn fuels in certain times of the year, but non-Indigenous governments and neighbouring communities’ express concerns around fire risk and smoke (Maguire and Albright 2005). There may also be concerns and tensions around control and tenure and red tape in approving proactive burning measures, which may constrain Indigenous fire stewardship (Hoffman *et al.* 2022).

Outcomes

In addition to the three goals identified by Yunesit'in members, strengthening cultural connections and well-being; restoring the health of the land; and respecting traditional laws, there are four general measures for evaluating the program. The first is *area* (in hectares) to which fire stewardship is being applied and the effect on the landscape. Second, the *number of people trained and employed* in the program, and the inclusion of women, youth, and elders. Third is the level of *planning and the sustainability of the program*. Fourth is *knowledge mobilization and partnerships*.

Area stewarded

The first year of the pilot program, 2019, saw 15 hectares burned in Yunesit'in—the aim was to get people familiar with fire, under the guidance of Victor Steffensen. In April 2021, the program had expanded to more than 150 hectares burned of diverse ecosystems—from Interior Douglas-fir stands to dry grasslands. The areas were identified and prioritized because of the over-burden of fuels on the landscape. Drones and mapping technology were used to document and measure the area, with follow-up fire treatments applied which will be monitored and evaluated over the next five years.

Control and treatment plots are being established to understand the effect of “cool burns” on forest and grassland health, the productivity of traditional foods (berries, wild potato) and medicines, fire behaviour, and carbon mitigation and sequestration. Fenced plots have been established to exclude grazing. These plot networks will be monitored over the next five years, combining technical methods (GIS and remote sensing) with Indigenous knowledge.

People employed and trained

Six Yunesit'in community members were trained by Victor Steffensen in 2019. During 2020, efforts were made to deepen the involvement of the broader community in the fire program—the vision was to have elders, youth and women included as participants in a “whole of community” approach. In April 2021, the number of people employed in the program increased to 17 in Yunesit'in and included five women and five youth. There were also three elders involved in the work. A key observation from the April 2021 burns was the interactions between these generations, which supported knowledge and skills transfer between participants.

While small teams are sought, there is often a mix between those that have had fire-related employment and those that have a limited employment history; people are encouraged to participate, even if only to observe or try it out for the day. In more recent seasons, school children were invited to participate to explain, educate and share the appropriate application of fire and to show that fire has a positive effect. Similar to building knowledge together, the idea was that this is a community effort and that it needed to be inclusive to an inter-generational approach from children to Elders. Although these were small intentions, it is meant to reflect Tsilhqot'in governance insofar as everyone in a community context has a relationship with the land and the responsibilities that come with it to take care of it. In contrast, often government led organizations are predominantly hierarchal in nature, akin to a military organization, male-dominated, top-down in terms of knowledge distribution.

The participants are involved in various phases of fire stewardship from planning and goal setting to the implementation of the fire plan, and ongoing monitoring and evaluation. While having a “job” is recognized as important—this job is not just work—the bigger goal is promoting a deep sense of connection to the land. An important component of the program is to nurture a sense of responsibility that participants feel for stewarding their land—and reclaiming their role of “guardianship”, which is reinforced through cooperation and conversation on the land.

Planning, vision, and program sustainability

Developing a landscape level plan for land and forest use, is important to guide the fire stewardship program. In turn, fire stewardship is a key tool for delivering on the goals within land and forest use plans and strategies. For instance, fire stewardship can promote grassland health, which in turn can support ungulates like moose and deer—this has positive effects for Yunesit'in food security and health.

The plans must be adaptive for dynamic conditions and informed by ongoing monitoring of the landscape from program participants. A holistic evaluation framework for the fire stewardship program is being developed by the community, rooted in their own goals. The goals from fire stewardship cover a range of interdependent areas, from ecological goals (such as improved forest and grassland health, enhanced biodiversity) to social goals (community employment, participant well-being), cultural goals (connecting people to the land and caring for the land) and economic goals (improved income, skills, and training). Currently, Yunesit'in is developing a health and well-being framework with Gathering Voices Society to assess the effect of participation on the physical and mental health and well-being of participants. What we understand from the Australian context is that participation in these programs delivers enhanced physical activity through active stewardship of the land, and this combined with a closer connection to the land improves mental health and well-being—what Nikolakis *et al.* (2022) term a “stewardship-health nexus”. The aim of the Yunesit'in health and evaluation framework is to determine whether this positive relationship exists here which can support community goals and program sustainability.

To sustain the program over the long-term, both public and private funding are being actively sought—an important part of the private funding may be derived from the sale of carbon credits (Nikolakis, Welham, Greene, 2022). These credits may be generated by the difference between the emissions from proactive burning measures and the potential emissions mitigated from summer wildfires. The revenues from the sale of carbon credits have been important for resourcing Indigenous fire stewardship activities in Australia and increasingly in other parts of the world (Lipsett-Moore *et al.* 2018; de Veiga and Nikolakis 2022).

Partnerships and knowledge mobilization

An important goal of this program is to develop partnerships and networks with experts and stakeholders, including neighbouring First Nations such as Xení Gwet'in, as well as the province, ranchers and others who live and work in the region. A recent partnership with the BCWS in April 2021, saw cross-cultural and technical learnings produced in the first joint prescribed burn for ecosystems stewardship objec-

tives. Working with Gathering Voices Society and the University of British Columbia also supports the development of science and Indigenous knowledge on the effect of fire stewardship across a range of community generated indicators.

Given the breadth of partnerships and actors involved in the fire stewardship program, knowledge mobilization is targeted at the diverse audiences through different channels. For the academic and policy audiences, peer-reviewed articles, webinars, and other reports are produced to share lessons and findings. For community members and the broader public, videos, photos, and social media posts are used to share insights to build awareness and to catalyze these programs across Canada, and across global networks for Indigenous fire managers.

Discussion and conclusions

The Yunesit'in fire stewardship program is a community-led approach to address a range of goals for the community, including restoring the land, connecting people to the land and their stewardship responsibility, and respecting traditional laws (Nikolakis *et al.* 2020). The fire stewardship program was catalyzed by the 2017 wildfire season which exposed the wildfire risk and vulnerability of Yunesit'in and heightened the need to reclaim their fire (*Qwen*) practices, and to mitigate wildfire in a changing climate and degraded landscape. Working in partnership with Gathering Voices Society, Yunesit'in is slowly and methodically reclaiming fire stewardship, applying a "learning by doing" approach where participants plan and implement fire practices—low intensity cool burn fires, driven by the needs of landscapes, reflected in certain indicators exhibited in these landscapes—and they engage in ongoing monitoring and evaluation to understand the effects. In doing so, the participants are "learning from the land", deepening their connection to the landscape to understand what interventions are required and when. Through a structured monitoring and evaluation process, the participants are building Indigenous knowledge and science on fire stewardship, which is being documented in various ways, including video, photo and in peer-reviewed publications (see Nikolakis *et al.* 2020; Nikolakis and Roberts 2021), to mobilize knowledge to community members, the public, and academics and policymakers. The ambition is to build public awareness of Indigenous fire stewardship, and then to catalyze these programs more broadly across British Columbia and Canada.

The pilot program, relatively small in scale and community-led, has initially been evaluated through four general measures: *area stewarded* (in hectares); the *people employed and trained* (including the number and diversity of people employed); the level of *planning, vision and program sustainability*, where the goal is to advance land and forest use planning with fire as an important tool to meeting the goals in these plans and supported by diverse funding sources such as carbon funds; and *partnerships and knowledge mobilization*, where the aim is to foster partnerships that facilitate knowledge production and mobilization across diverse audiences to build awareness of these fire programs. On these measures, the program is growing and is a success.

A holistic evaluation framework is being developed by the community, which encompasses ecological, social, economic, and cultural indicators. For example, Yunesit'in and

Gathering Voices Society are developing a health and well-being evaluation framework to assess the physical and mental health and well-being benefits for participants in the program, which are theorized to be positively related to the act of stewarding the land (see Burgess *et al.* 2005, 2008; Nikolakis *et al.* 2022). Generating positive health and well-being benefits among participants can strengthen stewardship activity in a virtuous health cycle (Nikolakis *et al.* 2022).

To sustain the program over the long-term, and to tackle the growing wildfire threat caused by declining forest health and climate change, rules and guidelines are being developed to generate carbon credits from the fire stewardship program. In Australia and increasingly other jurisdictions such as California and Botswana (Lipsett-Moore *et al.* 2018), revenues from the sale of carbon credits have enabled Indigenous communities to manage their land with fire to reduce the incidence of devastating wildfire (and the carbon and greenhouse gas emissions resulting from these fires) (de Veiga and Nikolakis 2022).

Looking forward, the program will continue to grow to cover larger areas that will likely include contested "Crown" lands, and not only in areas that have not been impacted by wildfire, but in areas devastated by wildfire to restore these ecosystems—it is important to acknowledge that this will take time to reach across larger scales and will require broad political commitment. Further research could examine the role that fire can play in restoring these fire devastated ecosystems, to examine whether cool fires can reactivate seedbanks, remove invasive species, and encourage the re-growth of native grasses, shrubs, and trees. Further research will also examine the relationship between participation in stewardship programs and the health and well-being of participants and more broadly their families and the community. Holistic approaches that bring a lens to the connection between people and place is critical to understanding the role that stewardship plays in mediating positive outcomes in these interconnected domains.

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