Exploring the Unique Needs of Wilderness First Responders: A Polyvagal-Informed Framework for Mental Health Support

by

Natasha Black

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APPROVED BY

Amanda Murphy, M.C., R.C.C., Capstone Advisor, Master of Counselling Faculty

Alicia Spidel, Ph.D., R.C.C., Faculty Reader, Master of Counselling Faculty

School of Health and Social Sciences

Abstract

Wilderness First Responders (WFRs) are a distinct population within the first responder (FR) community who face an elevated risk for occupational stress injuries (OSIs) due to the overlap between their personal and professional identities, systemic inequities, and culturally embedded stigmas. This capstone project reviewed existing literature on FR mental health and distinguished WFRs as a unique group with distinct experiences. The neurophysiological impacts of stress using polyvagal theory are explored along with the limitations of existing resilience-building interventions. This research guided the development of a framework for mental health support with WFRs that highlights six core principles: collaboration and integration, addressing systemic inequities, advocating for a culture shift to reduce stigma, social engagement, nervous system literacy and self-awareness, and leveraging nature. The framework underscores the need for culturally attuned, community-grounded, and relational approaches to mental health care and acts as a catalyst for further conversation to better support WFRs in rural mountain towns.

Keywords: first responder, occupational stress injury, outdoor industry professional, polyvagal theory, wilderness first responder

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Chapter One: Introduction

Wilderness First Responders (WFRs) occupy a unique position in the landscape of emergency response (Curran-Sills et al., 2013). These outdoor industry professionals are highly trained within their scope of practice and respond to emergencies in austere environments where conventional access to medical support is limited or non-existent (Hawkins, 2012). Despite their critical role in the safety of civilians in mountain towns, WFRs remain understudied within the literature on trauma, occupational stress injury (OSI), and mental health. Considerable research has been dedicated to urban-based first responders (FRs) such as paramedics, firefighters, or police officers (Mundo et al., 2023a), however the psychological, social, and physiological impacts on those who operate in wilderness and adventure-based contexts remain largely left out of empirical studies.

Responding to emergencies in remote and often unpredictable natural environments can present considerable challenges for WFRs (Argentero & Setti, 2011). These professionals are likely to witness severe injuries or fatalities while working in isolated, risky conditions that may promote the development of OSI and burnout (Mundo et al., 2023a). Additional stress arises from responding in inherently hazardous environments, where life-threatening natural events, such as avalanches, floods, fires, or severe weather, are a constant possibility (Curran-Sills et al., 2013). Repeated exposure to potentially psychologically traumatic events (PPTEs) in these settings can lead to cumulative, chronic stress that may result in emotional and physiological strain, even in the absence of a formal mental health diagnosis (Kosor, 2016).

A critical factor in shaping the unique experiences of WFRs is the intersection of their professional role with their personal identity. Outdoor industry professionals are oftentimes passionate adventure participants who experience a sense of self that is defined by their careers

and recreational pursuits. Occupational science explains this phenomenon by emphasizing that individuals typically choose occupations based on the personal meaning they assign to them (Frances, 2006). The same mountains, rivers, glaciers, or forests that serve as their workplace are often central to their identity, purpose, and belonging (Immonen et al., 2022). It may be difficult to distinguish between distress that originated in an occupational setting and exposure that arose from personal pursuits. As Mundo et al. (2025) express, future research that explores the intersection of these various cultural, social, and environmental factors could contribute to a more nuanced understanding of how this complicates trauma recovery.

The culture of mountain towns plays a central role in shaping how WFRs perceive and respond to stress and PPTEs. In these close-knit, adventure-driven communities, values such as stoicism, self-reliance, commitment, and endurance are celebrated (Jones et al., 2020). An ethos of pushing limits and "earning turns" may reinforce the importance of staying regulated for sound decision-making in high-risk environments, while simultaneously normalizing exhaustion and minimizing the significance of psychological distress (Immonen et al., 2022). At the same time, the depiction of WFRs as heroes or seasoned guides who host local knowledge and experience may inhibit vulnerability and help-seeking behaviours. As more individuals embrace mountain town lifestyles and the prevalence of critical incidents unfortunately rises (Tritz et al., 2018), systemic invisibility and engrained cultural ideals may detract WFRs from recognizing when to seek support for OSI.

Given the persistent risks inherent for a WFR, understanding their lived experience is essential for fostering a culture that is more open to alleviating the impacts of PPTEs. Despite efforts to mitigate danger or disaster, the potential for injury, close calls, fatalities, or serious interpersonal conflict remains (Jones, 2018). The uncertainty in both personal and professional

areas of life can accumulate over time and contribute to experiences of chronic stress, which is likely to manifest as mental health challenges rooted in physiological dysregulation (Porges, 2022).

The nervous system's response to ongoing stress is a central feature in understanding how trauma and burnout manifest among WFRs. Polyvagal theory offers a compelling framework for exploring the dynamic, embodied nature of OSI. Porges (2022) illuminates how repeated exposure to stress-inducing environments affects nervous system regulation, stress reactivity, and an individual's capacity for co-regulation and recovery following trauma. Polyvagal theory posits that in recovery states, the autonomic system plays a central role in what we often deem as psychological resilience (Porges, 2022). Utilizing a bottom-up, body-based, and nervous-system informed lens to conceptualize and treat OSI prioritizes safety, neurophysiological awareness, and regulation-based practices.

As interest in outdoor recreation continues to grow (Zwart & Ewert, 2022), it is likely that more WFRs and adventure participants will begin seeking mental health support for the challenges they face due to their unique circumstances. Helping professionals who work with this population may feel more attuned and effective when they understand the nature of wilderness-based occupations, the cultural values that shape client identities, and the physiological underpinnings of traumatic stress exposure. For many WFRs, working in the wilderness is not just a job – it is a lifestyle. This capstone argues that specialized, trauma-informed support is essential for counsellors working with WFRs, particularly when addressing the long-term impacts of PPTEs, OSI, and the unique interplay between identity, place, and occupation. In *Beyond the Edge* (2025), Registered Clinical Counsellor Sydney Badger sheds light on the complexities of injury and trauma in mountain settings:

> When someone comes into counselling and they want to talk about avalanche terrain, because they're telling a story that has terminology and language that's connected to avalanche terrain, if they have to explain that to their therapist, that's a lot of time and energy and maybe prevents them from being able to connect. (33:12)

This sentiment highlights the significance of exploring this topic and this project's hope for continued evaluation of best practices for supporting WFRs in mountain town settings.

Purpose Statement

The purpose of this capstone project is to investigate the unique intersection of occupational stress, personal identity, and physiological responses among WFRs who live and work in mountain towns. By conducting a literature review on the manifestations and treatment of OSI in urban-based FRs, this project hopes to apply research to an understudied and underrepresented occupation. The findings will be extrapolated, and conclusions will be drawn in hopes of developing a thorough understanding of population and setting specific experiences of wilderness-based OSI. Guided by the research question, How can polyvagal theory enhance trauma-informed approaches and support resilience-building among WFRs?, this paper aims to:

1. Contextualize WFRs within the broader category of FRs and highlight the similarities and differences in their experiences and mental health vulnerabilities.
2. Explore a nervous-system informed explanation of the physiological response to stress, trauma, and burnout in WFR contexts.
3. Identify relevant trauma-informed approaches and resiliency practices that may be effective for this population in a counselling setting.

In the face of coping with occupational stress, it is important that WFRs proactively work towards maintaining a healthy, happy, and thriving lifestyle where they feel confident in their

ability to continue pursuing joyful pursuits in the mountains. Intervening proactively could help prevent exacerbated mental health issues documented in FRs and foster balanced and sustainable lifestyles (Kosor, 2016). Initiatives that could support resilience and psychological readiness are important for these populations to implement in their repertoire (Kaplan et al., 2017). This capstone aims to provide a landscape for further conversations between helping professionals who work with WFRs in mountain town settings. The intended audiences for this work include mental health professionals, outdoor educators, WFR organizations, and researchers invested in adventure-based populations and occupational trauma recovery.

Theoretical/Conceptual Framework

A community-informed approach aligns with the broader movement toward decolonizing mental health services by prioritizing local knowledge, lived experience, and culturally relevant practices over rigid, one-size-fits-all frameworks (Nebelkopf et al., 2011). In the context of populations that are underrepresented in empirical research, this means engaging with those in the field to ensure that discussions around mental health and occupational stress are shaped by their unique realities and not imposed by external systems. A trauma-informed perspective further reinforces this by facilitating healing through collaboration and empowerment that avoids pathologizing or aggrandizing language towards an individual or community (Ranjbar et al., 2020). This capstone project is grounded in this foundational framework and seeks to honour the autonomy and resilience of WFRs while advocating for their long-term wellbeing.

As both a practitioner and researcher, I align with the theoretical and practical applications of Porges' polyvagal theory and have remained grounded in a holistic view of the mind-body connection throughout this project. This research is informed by somatically based, bottom-up frameworks that emphasize the role of the nervous system in shaping individual

responses to stress and OSI. By applying polyvagal theory, this project examines the ways WFRs experience and regulate stress, offering mental health recommendations rooted in physiological safety and nervous system attunement rather than solely cognitive or behavioural, top-down approaches. Research has shown that bottom-up interventions are particularly effective in supporting trauma recovery (Grabbe & Miller-Karas, 2018). Through this lens, trauma recovery focuses on modulating autonomic nervous system (ANS) responses, fostering co-regulation, and building resilience through physiological safety (Porges, 2022).

Contribution to the Field

This capstone seeks to contribute to the field of counselling by addressing a critical gap in the conceptualizations of OSI and trauma among wilderness emergency professionals. This project argues that WFRs experience occupational trauma in distinctive ways from FRs, shaped by environmental exposures, mountain town culture, and an interwoven nature of work and recreation.

By conducting this research, a framework is provided that integrates neurophysiological theory with real-world occupational experiences, bridging physiological science with applied therapeutic interventions. In consideration of Porges (2023) theory about environmental cues of safety being necessary for nervous system regulation and a healthy stress response, a critical question arises: how does the nervous system adapt when the source of threat is not another person, but the natural environment itself? The very landscape a WFR interacts with professionally and recreationally can become embedded in experiences of trauma. Provocation of nervous system arousal in response to these spaces may challenge the theoretically presented intervention of interpersonal co-regulation. This gap in the literature is clear, which tends to focus on human-to-human threat or human-caused traumatic experiences. By applying the

science of safety to professionals working in potentially unsafe natural environments, this project extends polyvagal theory into new terrain. This invites us to consider how somatic, environmental, and relational interventions need to be adapted to support resiliency building in preventing OSI or recovering from OSI and burnout.

Furthermore, I aim to challenge dominant narratives of resilience that rely on individual grit and determination. Instead, this project advocates for systemic, relational, and embodied models of care that emphasize preventative measures for nervous system regulation and resiliency. Including a discussion on the sociocultural landscape of mountain towns integrates socioecological variables that contribute to both protective and risk factors for mental health issues. Ongoing support can be integrated when helping professionals recognize how personal livelihoods are shaped by a passion for the outdoors which complicates the trauma that originates in natural spaces.

There is no single narrative that accurately defines every mountain town, WFR population, or outdoor community. Acknowledging how mental health supports may need continued individualization within different community networks fosters the necessary practices of reflexivity and creates space for adaptations. This work has the potential to inform the development of training and wellness programs with specified therapeutic language that speaks directly to the needs to WFRs. I hope the conversation continues to evolve and include perspectives that expand the discourse around this underrepresented population. As outdoor recreation and adventure-based employment continue to grow (Tritz et al., 2018), so too will the number of individuals impacted by the psychological toll of risk exposure in nature. May this invite meaningful progress towards contextually relevant and inclusive work that honors those living through traumatic experiences in the mountains.

Reflexivity and Positionality Statement

To my very core, I am an outdoor adventure participant. At just 18 months old, I learned to ski, and this sport has shaped my identity in countless ways. Researching and writing about the community of folks who pursue careers as outdoor industry professionals is a subject close to my heart. I live, recreate, and work alongside these individuals. I have witnessed the impact of critical incidents and OSI among friends, coworkers, and community members. It does not fail to amaze me that the mountains that offer me of joy, purpose, and spiritual connection can – without warning - become unapproachable should I be exposed to the real risk they pose.

I was raised in rural communities built around adventure tourism, creating bonds with others who engage in high-risk, high-reward sports. I have chosen to remain in places that support my lifestyle and surround myself with community who share a reverence for the natural environments we adventure in. With this comes a responsibility to express my gratitude to live and recreate on the unceded traditional territories of the Ktunaxa?amak?is and Îyãħé Nakón mąkóce (Stoney) peoples and to name my commitment to decolonization and reconciliation.

I also recognize that I approach this research from a social location that has granted me unearned privilege as a white, cis-gendered, Canadian, heterosexual woman who is pursuing graduate level education. My ability to participate in adventure sports is itself a form of privilege, given the time, resources, and access that are required to call oneself an outdoor and adventure enthusiast. While outdoor industry professionals face undeniable stress and risk, they are likely in positions of relative socioeconomic advantage or have consciously chosen to neglect socioeconomic position in exchange for a mountain town lifestyle. Acknowledging this positionality allows me to remain mindful of the unconscious biases that may shape my

interpretation and presentation of this work. It is my ongoing responsibility to continue to identify my blind spots and honour the inherent complexity of diversity in individual cultural backgrounds that differ from my own (Truscott & Crook, 2021).

In a career as a counsellor, I hope to contribute meaningfully to my communities by supporting individuals struggling with trauma related to their time in the mountains. My hope is to help people stay connected to the joy that drew them to the mountains, while also fostering psychological resilience, healthy boundaries, and longevity in both their careers and personal lives. Although there is growing awareness and dialogue about the importance of mental health, barriers continue to exist in workplace cultures. As organizations adhere to their systemic and structural constraints, they lag in implementing the kinds of trauma-informed practices that are necessary to fully support mental health initiatives.

A first step in addressing these gaps is developing a comprehensive understanding of how wilderness-based trauma, vicarious trauma, and near-miss experiences might affect those working and playing in wilderness settings. By devoting this time and energy, I aim to deepen my understanding of the trauma response, aftermath consequences, and nervous system regulation in response to natural threats to safety.

My interest in the nervous system and the mind-body connection flourished during my undergraduate degree in behavioural neuroscience. I became fascinated by the brain's meticulous orchestration of internal and external processes, and the ways it can be overridden by evolutionarily driven autonomic responses. Upon furthering my studies in yoga and mindfulness, my passion for neuroscience expanded in a more holistic sense, exposing me to the ideas of polyvagal theory and the dynamics of regulation and dysregulation. This project weaves together my scientific, experiential, and spiritual curiosities while offering a chance to explore real-world

implications of repeated sympathetic activations in the face of chronic environmental stress. Ultimately, this work reflects both a professional commitment and a personal calling to foster healing in the communities I most identify with.

Definition of Terms

First Responder (FR)

An occupation that implies high risk for exposure to potentially psychologically traumatic events and occupational stress injury (Jones et al., 2020). Examples include urban police, firefighters, emergency medical personnel, or paramedics.

Occupational Stress Injury (OSI)

Psychological and physiological harm resulting from exposure to a potentially psychologically traumatic event in one's occupation (Antony et al., 2020).

Outdoor Industry Professional

An individual who is employed or volunteers to guide, teach, or assist individuals in outdoor activities within a wilderness environment and possesses specialized knowledge and skills to ensure safe and enjoyable experiences.

Polyvagal Theory

An innovative scientific theory that integrates neuroanatomy and neurophysiology to describe the hierarchical functioning of the nervous system in relation to safety, danger, and trauma responses (Porges, 2022).

Potentially Psychologically Traumatic Event (PPTE)

An event that has the potential to cause trauma-related mental health conditions and tunes the nervous system to be locked into a state of defense (Porges, 2022). This term is more precise than terms like critical incident (Heber et al., 2024). Examples may include responding to a

significant injury, responding to public or staff affected by an avalanche, being personally impacted by an avalanche, “close calls,” or other first aid and rescue scenarios in wilderness settings.

Secondary Traumatic Stress

Indirect exposure to a potentially psychologically traumatic event that is considered an occupational hazard of first responders (Cieslak et al., 2014; Heber et al., 2024). Also referred to as *vicarious trauma.*

Trauma

An unresolved stress response that disrupts return to equilibrium (Levine, 2010).

Wilderness First Responder (WFR)

Within the scope of this review, an outdoor industry professional who acts as an emergency first responder in the wilderness environments of mountain towns. Examples include ski patrollers, search and rescue, ski and mountain guides, river guides, or wilderness fire fighters.

Outline of the Capstone Project Chapters

Chapter one provides an overview of the capstone project, including the intended purpose and contributions to field, while highlighting theoretical frameworks and the positionality of the writer. This section intends to help the reader grasp the area of focus and understand the necessity for conducting this research within the field of counselling.

Chapter two uses current literature to define the landscape of WFRs in mountain town settings by discussing the mental health susceptibilities implicated by the occupational, social, and individual factors specific to the population. The second portion of the literature review is devoted to developing a clear understanding of the stress response while integrating polyvagal

theory to explain the physiological underpinnings of OSI. Using this gathered information, the review then focuses on evaluating current interventions and highlighting gaps in applying these interventions to WFRs.

In chapter three, a summary is provided along with a discussion of the limitations and gaps found in the literature and in the current review. A practical application of the research project is presented that provides an application for counsellors working with WFRs. The framework integrates knowledge from the project to inform best practices. Emphasis is given to community-informed, nervous-system based approaches and preventative strategies for supporting long-term wellbeing in personal and professional domains.

Chapter Two: Literature Review

Defining the Landscape of Wilderness First Responders

WFRs occupy a distinct niche within the broader field of emergency response, offering care in remote, unpredictable, and often austere natural environments (Curran-Sills et al., 2013). This section of the literature review aims to situate WFRs within the larger context of occupational stress research and illuminate the multifaceted realities outdoor industry professionals may face. From navigating logistical limitations, environmental risks, and the sociocultural factors of mountain towns, examining how WFRs diverge from traditional FRs has implications for culturally responsive mental health support.

Understanding Occupational Stress and Trauma

Culturally Informed Language in Trauma Work

The language used to discuss mental health, trauma, and stress injury is constantly evolving, shaped by a wide range of social and cultural factors that influence both professional approaches and individual interpretations (Heber et al., 2024). In the literature, terms such as trauma, traumatic event, critical incident, occupational stress injury, vicarious trauma, secondary traumatic stress exposure, and post-traumatic stress are often used interchangeably, despite the important variations in meaning depending on context (Heber et al., 2024). While trauma is a global phenomenon affecting individuals regardless of social location, establishing a definition that aligns with the specific population being studied is essential (Blehm, 2024; McDonald, 2020). WFRs may operate within subcultures that value stoicism and strength, and thus developing these distinctions becomes more than semantic. It is essential for effective engagement and care.

Using precise, culturally resonant language has been shown to enhance trust and promote help-seeking behaviors by fostering greater resonance between the client and the helping professional (Jones et al., 2020; Truscott & Crook, 2021). Studies have found that FRs are more likely to participate in mental health programs when they are designed for emergency responders than they are to utilize generalized resources, such as suicide hotlines (Jones et al., 2020). This is echoed by Laura McGladrey, founder of The Responder Alliance, who advocates for field-informed terminology that reflects the lived experiences of outdoor industry professionals (Climbing Grief Fund, 2019).

McGladrey (Climbing Grief Fund, 2019) and others (Antony et al., 2020) have critiqued the automatic association of post-traumatic stress disorder (PTSD) to FRs and WFRs, noting that this diagnosis can miss the nuanced and cumulative nature of stress in the field. Given that PTSD research has largely focused on military and combat personnel in the emergency response landscape, it is evident that this is not particularly pertinent to WFR experiences (Climbing Grief Fund, 2019; Kleim & Westphal, 2011). As such, this capstone adopts a nervous system-based, polyvagal framework to describe trauma as a continuum of physiological dysregulation, rather than one diagnosis (Climbing Grief Fund, 2019; Levine, 2010).

The subjective and dynamic nature of trauma is central to this conceptualization. Reframing the stress response as an adaptive survival mechanism that limits an individual's capacity to integrate the incident and respond in real time is de-pathologizing (Climbing Grief Fund, 2019). It is important to acknowledge that not all events are inherently traumatic. Rather, when the nervous system is overwhelmed and unable to return to safety and regulation, subjective experiences of hyperarousal or shutdown can manifest as post-traumatic symptomatology (Levine, 2010). This shift in perspective creates the necessary space for

responsive, person-centered care that recognizes the toll of FR work on the nervous system and the capacity for resilience and resourcefulness within these professions (Levine, 2010; McDonald, 2020).

Symptomatology and Nervous System Impacts

The symptomatology of OSI among FRs is very diverse and complex. Research has identified a wide array of symptoms that affect emotional, cognitive, physical, and interpersonal functioning (Mundo et al., 2025). Specifically, these may include flashbacks, nightmares, emotional numbing, irritability, sleep disturbances, avoidance, and increased substance use (American Psychiatric Association, 2022; McDonald, 2020; Van der Kolk, 2014). It is likely for FRs to develop and be diagnosed with mental health disorders such as PTSD and major depression (Wild et al., 2016). Other internalized and externalized symptoms include anxiety, anger, self-destruction, and manifestations of physical disease (McDonald, 2020; Van der Kolk, 2014).

Anxiety experienced by FRs and disaster workers is often linked to the unpredictable variables associated with this kind of work (Thormar et al., 2013). Thormar et al. (2013) longitudinally assessed disaster responders following a large-scale event and found responders to equate their anxiety to the various uncertainties associated with the work. They identified unknown variables such as timing of response, lack of information prior to responding, concern about quality of response, and worrying about post-response outcomes to be mediators of increased anxiety (Thormar et al., 2013). Anxiety persisted across all follow-up periods in this population, suggesting it may represent a chronic post-incident response that contributes to nervous system dysregulation and may predict the longer-term symptomatology outlined above (Thormar et al., 2013).

Trauma in FR populations may not be tied to a single disaster or catastrophic event, but rather can emerge through cumulative, repeated exposure (Brooks et al., 2016). Job burnout is associated with feelings of mental and physical exhaustion and has been linked to occupational exposure to vicarious trauma (Cieslak et al., 2014). This may significantly impact occupational performance, professional relationships, career longevity, and team cohesion (Mundo et al., 2025; Wild et al., 2016). Cieslak et al. (2014) found that when health service providers experience secondary traumatic stress exposure in the workplace, they are more likely to experience traumatic stress symptoms themselves which can lead to long-term feelings of burnout. For WFRs whose work can span long hours in isolated conditions, it is reasonable to assume that they may experience vicarious trauma and therefore develop symptoms of burnout.

Avoidance and absenteeism are commonly seen following a PPTE in FRs and can further entrench symptoms (McDonald, 2020). FRs may disengage from recreational activities, community events, or work responsibilities to suppress distressing memories or physical sensations that remind them of a traumatic event (McDonald, 2020). This can lead to worsening overt indicators of traumatic stress and greater emotional isolation (Wild et al., 2016). Riskier coping strategies, such as substance misuse, might help suppress memories and sensations. In Colorado, a study on back country search and rescue teams found 33% of participants readily admitted to binge drinking and met criteria for alcohol use disorder (Mundo et al., 2022). Mountain town culture is entrenched in patterns of substance use and access to resources are limited (Mundo et al., 2022). This coping strategy is likely to go unnoticed among friends and colleagues as a worrisome sign of mental health deterioration (Rapkin & Regan, 2023).

First Responder Susceptibility to OSI

The literature consistently affirms that FRs are at an elevated risk for mental health issues. Understanding where this vulnerability originates helps paint a holistic picture of both occupational and personal risk factors. Estimates suggest that up to 37% of FRs meet diagnostic criteria for PTSD, compared to 8.7% in the general population (Jones et al., 2020). Acknowledging this difference has helped researchers identify some determinates, such as cumulative PPTE exposure, long working hours without adequate decompression time, organizational stress, and limited mental health resources (Mundo et al., 2023a).

The chronic stress of FR work is particularly insidious. The nature of prolonged shifts and "on-call" culture primes the nervous system for being "on duty" for extended periods of time, often 24-72 hours (Jones et al., 2020). This type of hypervigilance has been known to increase the severity of OSI when multiple PPTEs occur back-to-back (Jones et al., 2020). In contrast to the military, which may offer structured decompression tactics and reintegration support following deployment, FRs may be expected to return to regular duties without recognition of the traumatic exposure (Mundo et al., 2025). Extended periods of OSI are likely given that FRs commonly commit to lifelong work in the field, which is another significant difference from experiences that occur during deployment in the military (Jones et al., 2020). Moreover, FRs face further challenge in that their roles are often unfairly compensated, or completely unpaid, increasing financial strain and contributing to burnout (Mundo et al., 2025).

The perpetuation and idealization of stoicism, strength, and self-reliance within FR occupational culture perpetuates ongoing stigma against seeking mental health support (Jones et al., 2020). The stigma in FR settings against mental health support runs deep, as most FRs do not readily identify professional helpers as possible means to maintaining positive health following a PPTE (Crowe et al., 2017). This perpetuates the belief that issues should be dealt with internally,

and that survival is dependent on individual coping mechanisms (Crowe et al., 2017). Internalization of the experience is far more common in individuals who are worried about public perception of their capacity to handle the event (McDonald, 2020). Negative self-appraisals and rumination might occur to avoid judgement from colleagues or community members (McDonald, 2020). Jones et al. (2020) found that FRs are likely to withhold personal struggles from team members to avoid workplace interpersonal problems and loss of credibility or respect. In one study, firefighters who screened positive for PTSD but did not seek support were concerned about being judged or losing their reputation (Jones et al., 2020). In WFR contexts where communities are embedded in relationship to one another, these concerns may be even more pronounced.

Across emergency response disciplines, statistical reports of post-traumatic mental health symptoms and resiliency measures are quite varied (Berger et al., 2012; Brooks et al., 2016). Heterogeneity of experience is prevalent between professional and volunteer responders, with professionals often faring better than non-professionals in OSI symptoms and coping capacities (Brooks et al., 2016). Volunteers are less supported by their organizations and can be left alone to process their vicarious trauma following a PPTE (Thormar et al., 2013). These implications would be important to consider if working with members of volunteer search and rescue or ski and bike patrol in comparison to professionally trained workers (Brooks et al., 2016).

Further variation may be attributed to individual personality traits and life experiences, which have been linked to negative outcomes following a PPTE (McDonald, 2020). FRs who have reported pre-OSI traumatic life events, faced significant adversity, or pre-incident mental health concerns are found to have more negative outcomes post-incident (Brooks et al., 2016; Mortimer & Mortimer, 2023). In a longitudinal study of paramedics, baseline characteristics

predicted the likelihood of PTSD or major depression after two years of work (Wild et al., 2016). The researchers linked measures of dissociation, neuroticism, maladaptive coping mechanisms, depressive qualities, intentional numbing and avoidance, or having low social support that were identified in the first week of training as predictive to their ability to cope with PPTE exposure (Wild et al., 2016). The subjectivity of trauma symptomatology is complex in this way, because there can be no standardized measure of what makes an event more or less likely to lead to negative mental health consequences from one individual to the next (McDonald, 2020). Future research is needed to define exactly which groups and in what scenarios are more at risk and why this might be (Brooks et al., 2016), especially when considering that WFRs have not been included in most explorations of FR occupational stress.

The Unique Experiences of Wilderness First Responders

Upon exploration of the literature, it became evident that empirical research on WFRs is limited, particularly regarding their experiences of OSI. This section of the review argues that WFRs are a particularly vulnerable group for developing post-traumatic injuries and explores the occupational and psychological hazards that distinguish them from other FR disciplines.

Training and Scope of Practice

Providing emergency care in remote settings requires WFRs to possess specialized emergency response skills due to limited resources that FRs may otherwise have access to (Tritz et al., 2018). Their training extends beyond typical emergency response due to the wide range of emergencies they may respond to and the necessity for adaptation and improvisation techniques (Constance et al., 2012; Moore, 2023). Many WFRs undergo wilderness medicine courses that provide them with the skills to utilize unique treatments modalities (Tritz et al., 2018). Beyond medical knowledge, WFRs must also be familiar with wilderness operations, backcountry

extrication considerations, environmental injuries, or sport-specific first aid (Constance et al., 2012).

Studies have found that rescue workers that feel confidently assured in their capacities to handle the events that occur in the field experience better post-disaster outcomes (Brooks et al., 2016). A sense of professional mastery and assurance in the team's capacities to respond appropriately to the realities of the disaster reduces distress (Brooks et al., 2016; Thormar et al., 2013). However, when placed in situations beyond their formal training, disaster workers report feeling inadequately prepared and at risk of personal harm, which can lead to ethical strain and occupational stress (Brooks et al., 2016; Curran-Sills et al., 2013). It is important to highlight how gaps in training may impact WFRs as they may be called to work outside their scope of normal practice when support or evacuation is delayed or unavailable (Fell et al., 2023). For individuals responding to disasters, subjective feelings of safety can decrease when they have limited information about the required response or are unable to provide high quality care (Thormar et al., 2013). Thus, if WFRs are placed in situations that require creativity and decision making beyond their normal practice, negative outcomes post-incident may be more likely (Thormar et al., 2013). Variables such as increased pressure to succeed and moral distress, coupled with isolation from advanced medical personnel, may lead to feelings of shame or inadequacy, therefore increasing the chances of OSI (Moore, 2023).

Environmental and Physical Stressors

Unlike urban FRs, WFR training includes technical skills that require them to be exceptionally physically capable and attuned to navigating nature (Curran-Sills et al., 2013). Their training extends beyond typical standard emergency response competencies, encompassing the ability to operate in hazardous terrain such as mountainous, riverine, or forested settings

(Constance et al., 2012). WFRs may need to deploy rope systems, travel through avalanche terrain, or navigate swift water simply to reach an injured party. Once on scene, they must tend to patients without medical infrastructure or equipment, often under extreme conditions such as steep cliffsides, avalanche debris fields, or amid harsh weather (Moore, 2023).

As the body and mind are fully devoted to the task at hand, harsh cold, heat, high altitude, or rapidly shifting weather conditions could compromise physical performance and cause fatigue (Brooks et al., 2016). Research on military medics offers a relevant parallel as these professionals respond to critical injuries using enhanced technical skills while under life-threatening and environmentally hazardous conditions (Russell et al., 2021). Studies have shown that the demand of military aid increases the risk of post-deployment PTSD and depression in comparison to military personnel who do not provide aid (Pitts et al., 2014). Threats of danger to self and others might be a constant variable for military medics and WFRs to manage (Pitts et al., 2014). Pitts et al. (2014) found that when life-threatening situations inhibit military medics from tending to an injured soldier, the experience of trauma worsens. These environmental and physical stressors faced in the field likely deplete the body of resources and energy, compromising the return to healthy homeostasis (Porges, 2009; Russel et al., 2021).

Duration and Isolation of Care

Backcountry emergency care can require extended treatment periods until further rescue or transport to the front country is possible. WFRs are required to stay engaged in the emergency far longer and with fewer tools than urban FRs, who transport patients comparatively quickly (Berger et al., 2012; Mortimer & Mortimer, 2023). The site of emergency may be tucked far away in the mountains, causing evacuation to be slow and treacherous, especially if inclement conditions emerge. When delayed access to further medical aid is hindered by isolation in the

field, the risk of developing OSI becomes markedly higher (Brooks et al., 2016; Pitts et al., 2014). Furthermore, being present at an emergency scene with a victim(s) for longer time periods might require WFRs to work outside of their scope of practice to make life saving decisions (Fell et al., 2023). This can lead to role ambiguity, which in turn worsens the impact of vicarious trauma (Fell et al., 2023). WFRs may have limited opportunities for timely emotional processing, downregulation, peer-coregulation, or meaning-making when placed in extended rescue response scenarios, increasing the risk for dysregulated trauma storage.

Exposure to Near Misses

In wilderness contexts, trauma that leads to ongoing stress responses may arise not only from incidents involving serious injury or rescue but also "near misses" that heighten future awareness of danger (Mortimer & Mortimer, 2023). Outdoor professionals may downplay these experiences due to the absence of visible injury and in adherence to culture norms of toughness. Yet, their nervous systems may still register these moments as life-threatening (Mortimer & Mortimer, 2023). Rescue workers who perceive their lives to be at risk in the line of duty are more likely to develop OSI, PTSD, anxiety, and depression (Brooks et al., 2016). Extreme environments may be very likely to communicate a threat to safety and prime the nervous system for stress injury.

Emotional Proximity and Community Ties

Medical responders who are first on scene frequently report higher rates of post-traumatic symptoms, a trend associated with proximity to vicarious medical trauma (Brooks et al., 2016). This aligns with broader research on pre-hospital emergency providers, who consistently show elevated levels of burnout and OSI compared to non-medical FRs, such as police or firefighters (Mundo et al., 2023b). WFRs can face an even greater vulnerability should the victim be known

to them (Brooks et al., 2016). Dual relationships in rescue scenarios and emotionally taxing interpersonal interactions while at work complicate the ability to remain professionally regulated (Houge Mackenzie & Kerr, 2013; Mortimer & Mortimer, 2023).

It is often the case that professional, personal, and recreational roles overlap in rural settings. WFRs may serve as guides, instructors, business owners, or family members, and interact with their communities in different forms depending on the context. Unlike urban FRs, who may maintain clearer boundaries between work and personal life, WFRs often live and work within the same social ecosystems. As a result, community grief may be felt more deeply, and compartmentalizing traumatic experiences may be exceptionally difficult. This proximity can prolong the impact of a single traumatic event, causing a WFR to re-live their trauma and for it to become further entrenched.

Lived Investment: Passionate Adventure Participants

For many WFRs, the path to their profession begins not with a job posting, but with a deep, personal pull toward the mountains. In mountain town settings, career decisions are often driven less by salaries and professional titles, and more by the ability to maintain living in a close relationship with nature. Passion-driven pursuits aligned with personal values frequently take precedence over job security or financial stability (Siciliano, 2022).

Recreational engagement in wilderness activities is often central to the identities of outdoor industry professionals. They are fueled by the psychological and physical health benefits of spending time in nature and develop a relationship to the land that fosters joy, wellness, and community (Moore, 2023). However, the same spaces also serve as sites for emergency response, creating a deeply entwined experience between personal fulfillment and professional vulnerability in experiencing PPTEs.

The biophilia hypothesis states that evolutionarily driven urges to connect with nature exist within all of us due to our ancestorial relationship to the land (Moore, 2023). Other theories, such as the stress reduction theory, propose that natural environments have a calming effect and can lower stress levels (Moore, 2023). Individuals might be drawn to mountain towns in pursuit of adventure sport and physical health but also find a sense of psychological and emotional well-being due to their participation in outdoor activities (Moore, 2023). Compared to urban environments, forests are consistently found to be more enjoyable and restorative (Moore, 2023). Feelings of awe produced from being in nature are known to decrease sympathetic arousal and increase vagal tone, which indicates nervous system regulation (Moore, 2023; Porges, 2023).

As social beings, outdoor industry professionals also benefit from the communal aspect of outdoor adventure (Brown, 2013). Social cohesion can emerge when individuals enter the wilderness with a shared goal, cooperate, and develop mutual trust and interdependence (Brown, 2013; Moore, 2023). Pro-social behaviours increase vagal tone and deepen connections (Moore, 2023; Porges, 2023). For these reasons, the wilderness is not just a setting for work, but is the very foundation for WFR lifestyle, identity, and community involvement.

Yet, a deeply rooted connection to outdoor pursuits also means that an experience of OSI could have far reaching personal consequences. Should the wilderness be a source of trauma, WFRs might avoid the environments and activities that are central to their belonging and sense of self. OSI poses a significant threat for WFRs should it result in a loss of connection to the land or an inability to maintain regulation in natural environments.

Culture of Seasonal Work

In addition to the vulnerabilities caused by on-call, shift-work culture, the seasonal nature of many WFR roles introduces further social and organizational difficulties. Unlike full-time

FRs, WFRs such as ski patrollers may be considered highly employable only during specific seasons. In the off-season, they will often transition to less professional roles and face a lack of organizational support, such as health care and benefits, contributing to financial and identity instability. The intense demands of a work season combined with the irregular income of an off-season can pose a challenge for sustainable work-life balance (Guidetti et al., 2021). A "push through" mentality can be fostered during the on-season and might spark burnout and limited opportunities to process PPTEs. While some workers might find a seasonal role attractive, maintaining this lifestyle may be unsustainable (Guidetti et al., 2021). In some cases, WFRs transition directly from one high-intensity seasonal role to another, compounding the risk of cumulative stress.

Further, a lack of social and professional continuity between seasonal roles can cause fragmentation and a lack of integration (Houge Mackenzie & Kerr, 2013). Team cohesion, debriefing, and trust is reduced when seasonal breaks occur (Houge Mackenzie & Kerr, 2013). In mountain town settings, seasonal workers are often geographically mobile, but those who remain must deal with the consequences of a revolving workforce (Houge Mackenzie & Kerr, 2013). This unstable, inconsistent rhythm of employment amplifies the mental health vulnerabilities unique to WFRs.

Context, Culture, and the Nervous System: Next Steps

This portion of the review has presented research, theory, and narrative to highlight the occupational and psychological demands of WFRs who live and recreate in mountain town settings. While research on FR mental health often explores symptomatology, diagnostic outcomes, and preventative measures, they often do not recognize the full spectrum of OSI experience and its intersection with life outside of work. This review aimed to emphasize how

the interplay of cultural, psychological, social, and environmental vulnerabilities shapes the unique positionality and needs of WFRs.

Considering these factors, a deeper understanding of the physiological science behind negative mental health outcomes offers a promising avenue to further explore the holistic implications of OSI. This capstone continues by illuminating how polyvagal theory can expand the current narratives of WFR experiences from a nervous-system, de-pathologizing perspective.

The Nervous System and the Stress Response

When examining OSI, it is essential to understand the anatomical and physiological mechanisms that drive the body's response to stressful stimuli. This portion of the literature review first defines the key distinction between stress and stressor, then examines the traditional structure and function of the nervous system before integrating a polyvagal perspective to explore evolutionarily driven stress responses. Polyvagal theory is then utilized as a guiding theoretical perspective in examining how exposure to PPTEs might negatively impact healthy functioning in WFRs.

Differentiating Stress and Stressors

Stress research encompasses a wide range of experiences, from mild challenges to severe trauma (Deussing & Chen, 2018). For WFRs, stress responses may vary significantly depending on the individual, the environment, and the nature of their work. To accurately assess the physiological impact of stress in occupational settings, it is necessary to distinguish between "*stress*" and "*stresso*r" (Deussing & Chen, 2018). *Stressors* are external stimuli that the nervous system perceives as threats, triggering the body's stress response (Nagoski & Nagoski, 2019). In contrast, *stress* is the body's response to those stimuli, involving a disruption in homeostasis that reorganizes the ANS to promote survival (Porges, 2022). Whether stress has a positive or

negative effect depends on its duration and the body's ability to return to homeostasis (Porges, 2022). It is important to consider how stressors contribute to experiences of long-term stress and the implications for mental, physical, and psychological well-being.

The Nervous System: Structure and Function

The primary function of the nervous system is to process sensory information and generate appropriate responses. This is achieved through the central nervous system (CNS), which includes the brain and spinal cord, and the peripheral nervous system, which consists of nerves and ganglia that link the CNS to the rest of the body (Ju, 2018). There are two branches of the peripheral nervous system: the somatic nervous system and the ANS (Ju, 2018). The somatic nervous system is under voluntary control and helps us consciously perceive our experiences in the world while choosing how to respond (Ju, 2018). Conversely, involuntary and unconscious actions of the body's internal systems that strive for homeostasis are designated as functions of the ANS (Ju, 2018). The ANS contains two further divisions, the sympathetic nervous system (SNS), which is commonly associated with "fight-or-flight," and the parasympathetic nervous system (PNS) ("rest and digest") (Ju, 2018). Maintaining a balance between these systems is crucial, as they initiate opposing responses while collaborating with other bodily systems, such as the endocrine and exocrine systems, to regulate stress recovery (Ju, 2018).

The Polyvagal Perspective: Expanding the Understanding

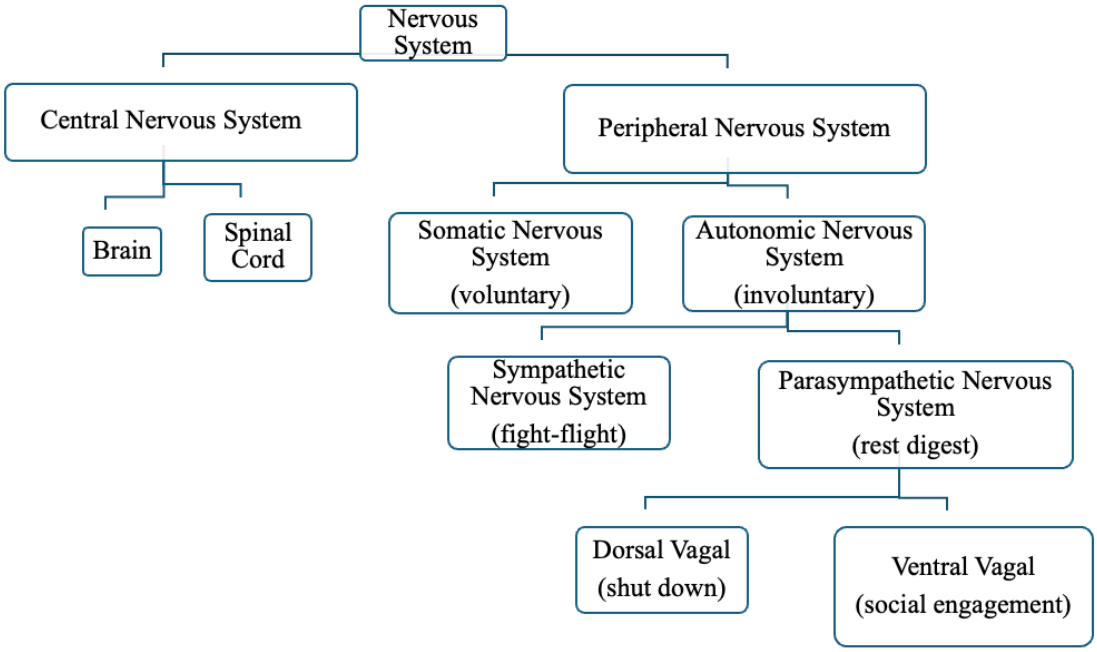
The traditional division of the nervous system is expanded upon by Porges' Polyvagal theory, which postulates that the ANS evolved in mammals to facilitate adaptive behaviours specific to safety (see Figure 1) (Geller & Porges, 2014). This theory provides a critical framework for understanding how WFRs experience and recover from OSI, particularly in environments where social engagement may be limited or unavailable as a regulatory

mechanism. The vagus nerve is considered an integral component of the neural system because of its widespread innervation between the brain and body and its interconnection with body-mind-social functioning (Porges, 2003). Polyvagal theory identifies three evolutionarily distinct pathways within the ANS that create a hierarchy of stress responses (Dana & Porges, 2018).

The dorsal vagus is primitive and was the first division of the ANS to develop (Dana & Porges, 2018). It is involved in physiological shut down, immobilization, or collapse when threats in the environment become too overwhelming to cope with (Dana & Porges, 2018). Survivors of trauma are quick to identify with feelings of hopelessness, abandonment, dissociation, chronic fatigue, and other health consequences that are associated with a state of dorsal vagal shut down (Dana & Porges, 2018; Van der Kolk, 2014). Next to evolve was the SNS, which allowed organisms to mobilize as a necessary action of survival (Dana & Porges, 2018). The newest branch of the vagus nerve, the ventral vagus, is specific to mammals and their desire for social engagement (Porges, 2022). A state of ventral vagal activation is where people feel regulated and view the world as peaceful, safe, and socially secure (Dana & Porges, 2018). Understanding these polyvagal mechanisms within the broader structure of the nervous system offers a critical framework for exploring how stress responses may, over time, contribute to OSI and vicarious trauma in WFRs.

Figure 1

The Nervous System



Note. This graph depicts the divisions of the nervous system. The traditionally defined nervous system is presented by the first three divisions, with polyvagal divisions beneath the parasympathetic nervous system.

Neuroception and the Perception of Threat

A key element of polyvagal theory is the process of unconscious threat detection, termed neuroception, that describes how the nervous system does not distinguish between real and perceived threats to safety (Porges, 2009). During the process of neuroception, the ANS and the CNS communicate outside of conscious awareness to shift the dominant autonomic state that will prepare the body for the appropriate response (Dana & Porges, 2018; Porges, 2009). When the environment is deemed safe, the threat response is downregulated and connection and communication are fostered (Dana & Porges, 2018). However, when the nervous system becomes attuned to detecting danger, such as in cases of prolonged stress, neuroception becomes

biased towards threat detection, even in neutral or safe settings (Porges, 2009). As Dana & Porges (2018) eloquently describe:

> When we receive cues of danger we react, and when we receive cues of safety we relax. But for many clients, neuroception brings a misattunement: They cannot reliably inhibit their defense systems in safe environments or activate their defense systems when needed in risky environments. (p. 38)

Dysregulated neuroception in WFRs has profound implications. In environments where safety is unpredictable, the nervous system may not be capable of generating an appropriate response. In a default defensive state, a heightened stress response and difficulty returning to baseline may interfere with effective decision making in emergency situations. Moreover, heightened threat perception can become self-reinforcing – when one individual is hyper-attuned to risk, those around them unconsciously perceive and mirror this defensive state, fostering a negative feedback loop of heightened arousal (Dana & Porges, 2018). In an occupation that requires functional teamwork and interpersonal receptivity, the consequences of entrenched nervous system patterns of defensiveness could lead to detrimental mistakes in the field.

Further, neuroception becomes increasingly intriguing when considered alongside the inherently risky natural environments that WFRs work in. Porges (2023) describes neuroception as the ability to detect intentionality in biological movements and "sounds of inanimate and living objects" (p. 9). This raises many considerations that contribute to the uniqueness of WFR populations. How do volatile, risky, or unpredictable natural environments communicate with the nervous system? How can familiar outdoor settings that bring a sense of purpose, joy, and peace, be altered to communicate risk and activate a stress response? If a responder perceives an area as safe, only for disaster to strike, does their nervous system permanently attune towards threat?

Does their trust in the natural world become altered, rendering them unable to feel safe in their professional or recreational activities? These questions are complex in examining the interplay between occupational stress, long-term nervous system dysregulation, and environmental neuroception in WFR populations and highlight a gap in the research for the applications of polyvagal theory.

Ultimately, the ability to accurately assess whether an environmental cue is dangerous or safe is foundational to healthy, functional stress recovery (Porges, 2022). In cases where the nervous system becomes attuned to danger, it becomes more difficult to transition towards healthy states of growth and connection (Dana & Porges, 2018). The following section explores the biological science behind functional and chronic stress responses, bridging polyvagal theory's concept of neuroception with the underlying physiological mechanisms.

The Stress Response: Biological Science Behind Stress Injury

From an evolutionary biology perspective, the body's instinctive reaction to a perceived threat is to fight or flee – ensuring survival. On any given day, WFRs may cycle through phases of social engagement, mobilization, and disconnection as they respond to environmental and occupational demands (Dana & Porges, 2018). Under the pressure of time, danger, or risk, WFRs must quickly respond to sudden changes in their environment, requiring SNS mobilization mediated by the sympathetic adrenal medullary (SAM) system (Dana & Porges, 2018). The SAM signals the immediate release of norepinephrine (noradrenaline) and epinephrine (adrenaline) from the adrenal gland, triggering activation of respiratory, musculoskeletal, and cardiovascular systems (Dana & Porges, 2018; Ju, 2018).

When the SAM system alone cannot resolve distress, the Hypothalamic Pituitary Adrenal (HPA) axis and the Core Response Network (CRN) are turned on to sustain the stress response

(Kuhfuß et al., 2021; Payne et al., 2015). These systems coordinate the release of hormones, primarily cortisol, that regulate long-term stress responses (Dana & Porges, 2018). Under normal conditions, blood cortisol levels notify the HPA axis and pituitary gland that the stressor has been properly resolved, allowing the body to downregulate the stress response (Deussing & Chen, 2018).

Allostasis and Hypervigilance

Maintaining stability under persistent stress requires allostasis, a process in which the body actively adjusts physiological systems to meet anticipated demands, rather than simply returning to a fixed baseline (Deussing & Chen, 2018). Unlike homeostasis, which assumes returning to regulation from anticipated states of dysregulation, allostasis acknowledges that bodily systems function dynamically in response to environmental and situational stressors (Deussing & Chen, 2018). A dynamic response in a chronically activated nervous system might lead to allostatic overload, causing cumulative wear and tear on the body and a repetitive pattern of dysfunctional stress responses (Deussing & Chen, 2018). This recurring, inefficient stress regulation can manifest as nervous system overactivity, under reactivity, failure to deactivate, or an inability to habituate to recurring stressors (Deussing & Chen, 2018).

As previously mentioned, prolonged stress exposure can lead to biased threat detection, which in turn contributes to a state of heighted arousal termed hypervigilance (Deussing & Chen, 2018; Porges, 2022). Hypervigilance is adaptive for WFRs who must remain alert and make rapid assessments to ensure safety (Wiegand, 2018). While stress responses and hypervigilance are adaptive, necessary survival mechanisms in acute settings, chronic hypervigilance places significant strain on the nervous system and weakens the body's ability regulate (Levine, 2010). WFRs who remain in a heightened state of alertness throughout a shift, or an entire season, may

struggle to “switch off,” limiting opportunities for recovery (Wiegand, 2018). Additionally, many individuals transition between seasonal outdoor professions, further reducing the ability to shift out of an active survival state.

In wilderness emergency settings, where the natural environment provides many dangerous, varying, and unpredictable factors to account for, WFRs experience heightened allostatic load as their nervous systems cycle between autonomic states in an ongoing effort to maintain safety for self and others. The concept of allostasis, when considered alongside the biological mechanisms of the stress response under a polyvagal lens, assumes that regulation is about the nervous system’s ability to flexibly shift between autonomic states and promote healthy balance. This perspective emphasizes that adaptability is key to building resilience in populations that are exposed to stress inducing occupational environments.

Co-regulation

Over time, chronic hypervigilance may condition the nervous system to become less responsive to calming, grounding cues from others. As outlined earlier in the discussion on neuroception, social feedback loops can inadvertently reinforce dysregulation, leading to entrenched autonomic patterns of fight, flight, or shut down. Polyvagal theory reframes social connectedness not simply as a psychological nicety, but as a biological necessity governed by the ventral vagal branch (Porges, 2022). Co-regulation occurs when individuals exchange safety cues in a reciprocal manner, bringing each other into a shared state of regulation via the ventral vagal system (Porges, 2023). Facial expressions, vocal tone, and body posture act as subtle signals of safety that the nervous system detects unconsciously through neuroception, allowing defensive responses to be downregulated when safety is sensed (Dana & Porges, 2018).

In wilderness emergency contexts, however, co-regulation may be limited or inconsistently available. Long stints in remote environments, lack of access to familiar relational supports, and cultural norms that valorize stoicism and emotional suppression can all hinder the opportunity to attune to others. Team dynamics become particularly important in these settings, as nervous system states can be "contagious"—a dysregulated colleague may inadvertently cue threat in others, while a regulated presence can support collective calm and cohesion.

Moreover, co-regulation may not only occur interpersonally, but also in relation to the natural environment. Many outdoor enthusiasts find wild settings grounding, calming, or spiritually satisfying, suggesting that nature itself might serve as a co-regulator when human relational safety is unavailable (Moore, 2023). Following a PPTE that occurs in the natural environment, it may be important to re-tune the nervous system to perceive cues of safety from nature, just as it can be important to build relational safety as a ventral vagal regulator. Viewing co-regulation as a biological process that is essential for recovery and resilience may help create a culture shift within WFR teams away from ostracizing emotional neediness. Embracing safety and connection as survival tools, not luxuries, may be a necessary reframe to enhance team dynamics and recover from PPTEs and OSI.

Burnout: A Disruption to the Autonomic Hierarchy

In the context of dysregulated and chronic stress responses, polyvagal theory introduces a key concept for understanding how individuals shift between autonomic states: the vagal brake. The vagus nerves' innervation of the heart suppresses heart rate, thus creating a physiological "break" that modulates the body's response to stress (Dana & Porges, 2018). When the vagal break is engaged, the ventral vagal system is in control and heart rate is slowed, whereas when the breaks are "released," sympathetic energy is activated (Dana & Porges, 2018). The vagal

break is crucial for facilitating smooth transitions between states of safety, mobilization, and immobilization; however, this flexibility is diminished by traumatic experience (Dana & Porges, 2018). When the SNS or dorsal vagus is constantly in control, the vagal break cannot easily return the system to physiological regulation (Dana & Porges, 2018). Over time, chronic stress and trauma reduce vagal tone, meaning even minor stressors can overwhelm the system's ability to engage the ventral vagal pathway (Dana & Porges, 2018).

Considering this, burnout can be understood through a polyvagal lens as a loss of vagal tone and autonomic flexibility. Typically, burnout in the work context is described as a state of emotional exhaustion, depersonalization, and overwhelm (Mundo et al., 2023). For WFRs, the cumulative burden of OSI, exposure to PPTEs, and demanding environmental conditions can overwhelm their physiological capacity to recover and regulate. This creates a perfect storm for vagal brake dysfunction and burnout (Mundo et al., 2023). In this state, personal protective factors like resilience may be overridden, and vulnerability to mental health challenges increases (Mundo et al., 2023; Noureen et al., 2024). WFRs experiencing burnout may feel disconnected from themselves, their team, and the original passion that brought them into the field—especially when professional identity and personal purpose are deeply intertwined. These symptoms might be interpreted as psychological fragility or poor attitude, yet from a polyvagal perspective, they reflect the body's protective adaptation to chronic dysregulation. When access to the ventral vagal system is diminished, the body defaults to more primitive survival states as a means of protection (Porges, 2009).

Bridging the Nervous System with Proactive Interventions

Developing an understanding of burnout and OSI through this polyvagal, nervous system informed lens helps us dynamically understand the mental health challenges faced by WFRs. The

next section of the review will gather information on proactive, preventative treatment approaches that align with this capstone's theoretical and conceptual frameworks.

Building Resiliency

Without early, proactive, and sustained interventions for repeated exposure to PPTEs, FRs may be more vulnerable to long-term physical, emotional, and relational consequences of OSIs (Boothroyd et al., 2019). This section explores resiliency as a dynamic, protective capacity and reviews a range of current and emerging strategies used to support mental health in FR populations, with hopes to identify limitations that can be targeted by future interventions.

Defining Resilience Within First Responder Cultures: Key Factors

Community-specific definitions of resilience provide a critical foundation for developing trauma-informed care by honouring the distinct cultures in which FRs operate (Crowe et al., 2017). Mundo et al. (2025) found that disaster responders viewed resilience a necessary quality for preventing occupational burnout, while Crowe et al. (2017) explored the specific factors underlying this resilience. Their findings suggest that FRs conceptualize resilience as an internal process marked by self-reliance, emotional stoicism, and individual coping mechanisms such as humour and positive thinking (Crowe et al., 2017). In contrast, the public included external resources, such as professional mental health support, as mediators of resilience (Crowe et al., 2017). Notably, FRs acknowledged the value of strong social networks but viewed these as opportunities for detaching or relaxing, whereas the public sought emotional support from their social connections (Crowe et al., 2017). These findings align with broader themes in the literature that find FR occupational cultures equate mental strength with endurance and autonomy (Mundo et al., 2025). The lack of reference to societal or external resources in FR definitions of resilience underscores the deeply engrained stigma within this occupational culture

(Crowe et al., 2017). Resilience contributes to FR preparedness for their challenging occupational environments, but their beliefs may hinder help-seeking behaviours.

Resilience is a dynamic, learnable behaviour that is founded in social co-regulation, perceived personal competence, acceptance of change, and an internal locus of control (Mortimer, 2010). FR teams that routinely practice resilience see improved decision-making capacities under stress (Smith et al., 2021). In military and healthcare settings, resilience is associated with reduced PTSD and adaptability during hardship, regardless of the exposure severity (Kaplan et al., 2017; Mortimer, 2010).

A neurophysiological framing of resilience that draws from polyvagal theory might define resilience is a mechanism that supports vagal flexibility. The ability of the ANS to fluidly shift between mobilized, activated, and recovery states is more achievable with resiliency and vagal flexibility. Resilience can be likened to vagal tone because they both promote emotional regulation, social engagement, and recovery after stress (Kaplan et al., 2017). For trauma survivors, reduced sympathetic activation or dorsal vagal shutdown indicates psychological and biological resiliency that protects against burnout and hypervigilance (Kaplan et al., 2017).

Taken together, the need for resilience-building interventions that support autonomic flexibility and psychological recovery while aligning with the cultural values and social dynamics of FRs and WFRs is apparent. Ultimately, this would promote more sustainable help-seeking practices and occupational wellbeing.

Provincial-Level Initiatives: British Columbia's Roadmap

To begin exploring current initiatives, this section examines a systemic example of community-defined practices for supporting resilience in FRs. The British Columbia First Responders' Mental Health Committee (2020) outlines a structured roadmap for mental health

initiatives that begins with a top-down organizational approach that emphasizes senior leadership buy-in for fostering culture shifts in FR teams (British Columbia First Responders' Mental Health Committee, 2020). They advocate for team-specific, non-pathologizing strategies that are proactive and reactive while acknowledging the need for coordinated organizational efforts (British Columbia First Responders' Mental Health Committee, 2020).

Specifically, the committee recommends including peer support services for employees, families, and retirees, education on early detection, access to mental health experts and extended health benefits, and utilizing critical incident stress debriefing (CISD) and defusing protocols when necessary (British Columbia First Responders' Mental Health Committee, 2020). This roadmap is a useful tool that could be utilized as a framework for WFRs teams while recognizing that tailoring approaches to match the cultural rhythms of the community will lead to more success (British Columbia First Responders' Mental Health Committee, 2020).

Evaluating Existing Interventions

Peer Support

Peer support programs, such as the International Association of Fire Fighters' Behavioural Health Awareness Program, train military personnel, firefighters, paramedics, and police team leaders in crisis intervention strategies (Anderson et al., 2020; Jones et al., 2020). Across different disciplines and settings, peer-led interventions aim to provide an informal space for debriefing, likely helping FRs access the social engagement system (Jones et al., 2020; Porges, 2023). Certain programs, such as the Road to Mental Readiness, target resilience factors and reduce stigma but do not significantly improve mental health results (Anderson et al., 2020). The emotional burden on peer facilitators can be mitigated through training, supervision, and

organizational support; however, such support is often lacking, posing a risk for facilitator mental health (Anderson et al., 2020).

The Responder Alliance has resiliency building peer-support frameworks for outdoor-based FRs and outdoor industry professionals (The Responder Alliance, n.d.). A pilot program delivered to a group of backcountry search and rescue volunteers using The Responder Alliance's tools found the team was able to identify early signs of stress and became more engaged with supportive resources post-training (Mundo et al., 2023b).

The Responder Alliance's "Stress Continuum," (See Figure 2a and 2b) a military tool modified by McGladrey for FR populations, is used as a check-in for team members to self-identify their current physiological state, from 'ready' to 'critically injured' (Mundo et al., 2023b). When implemented in team settings, early mitigation is possible (Mundo et al., 2023b). Peer support networks can foster open dialogue about OSI and burnout, with shared experiences among responders creating a foundation for trust, vulnerability, and meaningful connection (Mountain Community CISM Team., n.d.; Mundo et al., 2023b; Smith et al., 2021). However, the question can be raised if peer-support networks are an effective way to engage WFRs given Crowe et al.'s (2017) findings that FRs do not seek out social support to process OSI. While peer support groups can, even if temporarily, improve stigma and distress in workplace cultures, they are often not connected to significant improvements in mental health (Anderson et al., 2020).

Figure 2a

Individual Stress Continuum

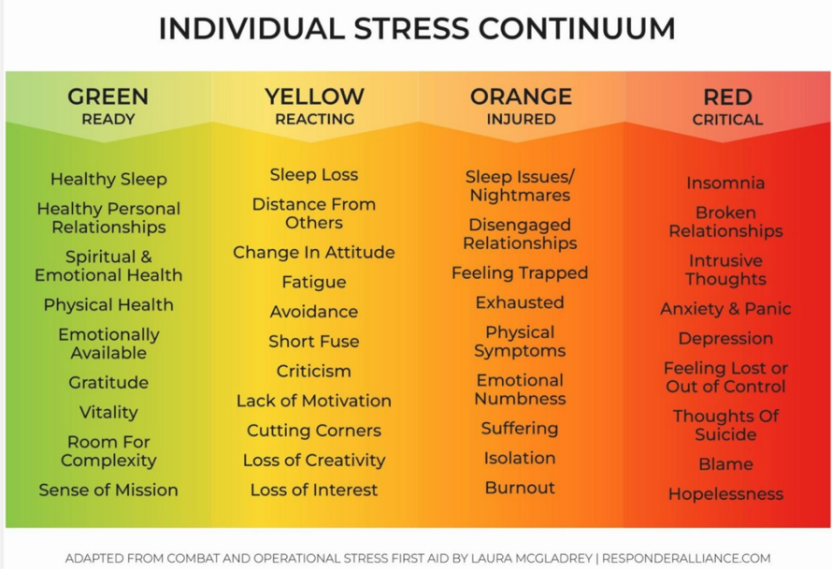
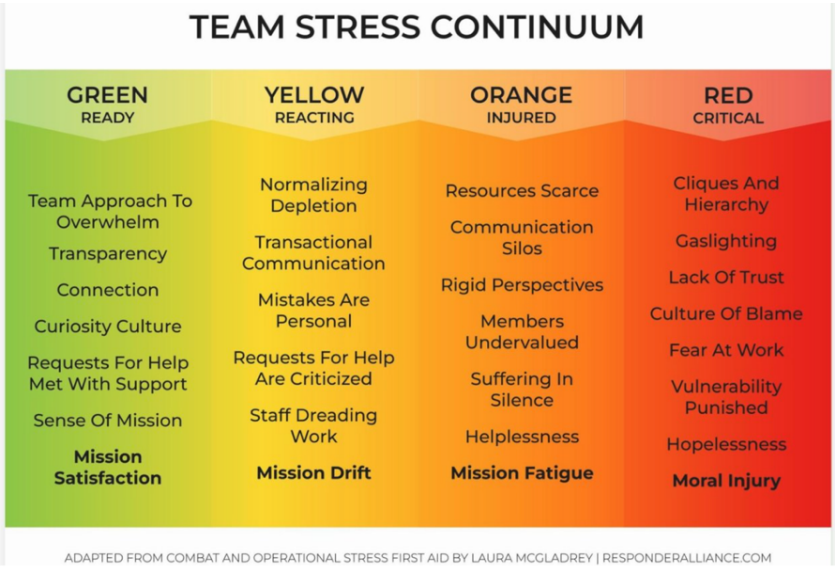


Figure 2b

Team Stress Continuum



Note. Developed by The Responder Alliance, these tools situate individual and team impacts of stress-injury along a continuum of experience (Mundo et al., 2025).

Crisis-Focused Psychological Interventions

Critical incident stress management (CISM) and CISD are two of the most referred to crisis-focused psychological interventions that are implemented in FR settings 24-72 hours post PPTE (Anderson et al., 2020; Fisher & Lavender, 2023). Modules of CISM that can be delivered pre-crisis target resiliency building and focus on stress education and resistance techniques (International Critical Incident Stress Foundation, n.d.). However, the target of CISM and CISD is crisis stabilization post-critical event with the goal of mitigating acute symptoms and accessing the need for further outside support (International Critical Incident Stress Foundation, n.d.).

Despite widespread use, there is considerable diversity in format and delivery across disciplines and organizations (Anderson et al., 2020). There is a lack of consistency in when CISM/CISD are accessed and who delivers the content, leading to mixed evidence on their effectiveness (Anderson et al., 2020; Presley et al., 2024). For example, when delivered by a knowledgeable, trained mental health professional, the risk for debriefing protocols intwined in CISD to cause re-traumatization is lower than when CISD is adapted as a peer-led program (Presley et al., 2024). Further criticism of CISD is that single-session discussions of trauma do not effectively mitigate the widespread impacts and can feel intrusive or re-traumatizing (Anderson et al., 2020; Mortimer & Mortimer, 2023). This reflects the broader tension in trauma intervention work between the effectiveness of exposure therapy and the risks of re-exposure without adequate containment, which can lead to higher stress levels post-debriefing (Mortimer, 2010). Research has found that ongoing interventions are found to be more preventative of burnout than single-session interventions for FRs exposed to vicarious traumas (Kleim & Westphal, 2011).

Local Adaptations. The BC Search and Rescue (BCSAR) CISM program utilizes a volunteer-led framework that integrates peer support, debriefing, and resiliency building (BC Search and Rescue Association, n.d.). Resiliency building suggestions include attending team-based trainings that foster group cohesion and improving professional boundaries (BC Search and Rescue Association, n.d.). Their psychoeducation brochures offer wellness techniques such as connecting with nature, adopting gratitude and mindfulness practices, and taking care of basic health needs (BC Search and Rescue Association, n.d.). The Canadian Mountain Community CISM Team also trains volunteers to lead in-person and virtual debriefing groups following critical incidents (Mountain Community CISM Team., n.d.). There is a notable gap in the literature concerning the potential benefits of locally adapted CISM/CISD groups for WFRs, and future research could investigate the specific elements that enhance their effectiveness in building resilience against OSIs.

Psychological First Aid and Psychoeducation

Widely used in military contexts, psychological first aid (PFA) provides early intervention post-deployment to assess and support mental well-being (Jones et al., 2020). In wilderness search and rescue teams, PFA's ability to prepare individuals for psychological hardship has been shown to improve outcomes in the field and after a response (Mortimer & Mortimer, 2023). PFA aims to differ from CISD by focusing on connection and engagement while giving participants permission to not recall traumatic events (Mortimer, 2010). The program promotes a sense of safety by instilling calmness, hope, community, and self-efficacy and is suggested to be facilitated by mental health professionals or extensively trained volunteers (Mortimer; 2010, Mortimer & Mortimer, 2023). From a nervous system perspective, PFA offers a container that fosters co-regulation and a return to homeostasis.

PFA often incorporates psychoeducation groups which can help responders acquire resilience techniques and coping strategies prior to a traumatic event (Mundo et al., 2025) but is delivered in PFA post-response. Psychoeducational content provided as an isolated intervention has been shown to be ineffective at reducing distress symptoms one year later, likely due to its limited impact on the deeply embedded cultural norms of vulnerability and endurance within FR communities (Crowe et al., 2017; Jones et al., 2020; Smith et al., 2021). Further, Jones et al. (2020) found that organizational challenges prevent culturally relevant PFA and psychoeducation programs from reaching FR. Oftentimes, they are implemented but not adapted to the community, thus leading to reduced participation and mixed outcomes (Jones et al., 2020).

Retreats

A holistic approach to trauma healing can be supported in retreat settings, where disengaging from occupationally driven sympathetic activation is more likely (Porges, 2022; Smith et al., 2021). Programs such as The Badge of Life Canada offer specialized retreats for FRs that incorporate group and equine-assisted therapy, holistic wellness practices such as yoga, and Indigenous-led, nature-based activities that foster a sense of safety and social attunement (Badge of Life Canada, 2020). Research suggests that FRs exhibit more positive outcomes in retreat settings than those who participate in short-term, crisis-focused or solution-targeted cognitive therapies (Smith et al., 2021). Some FR retreats integrate comprehensive CISM or CISD frameworks, enhancing the safety and effectiveness of these programs (Boothroyd et al., 2019). Retreats can foster group cohesion and co-regulation while integrating more comprehensive psychoeducation regarding stress reduction (Boothroyd et al., 2019). Longitudinal benefits on resilience measures remain unclear, however, retreats held in natural

outdoor environments may be particularly effective for WFRs by creating opportunity to connect with wilderness in a safe, grounded, and co-regulated state.

Mindfulness

Mindfulness, described as both a process and an outcome, brings awareness and attentiveness to the present moment and fosters the active acceptance of thoughts, feelings, and sensations while encouraging self-regulation (Bluth & Blanton, 2014; Gu et al., 2015). Emerging research supports the physiological benefits of Mindfulness-Based Interventions (MBIs), including reduced HPA axis and SAM activation (Christopher et al., 2020). MBIs have gained traction for FRs due to their potential to reduce stress, depression, suicidal ideation, substance use, and burnout (Bluth & Blanton, 2014; Christopher et al., 2020). Polyvagal and somatic perspectives might equate enhanced mindfulness with interoception, which could lend to earlier activation of resilience strategies and seeking timely support (Grabbe & Miller-Karas, 2018; Tan & Martin, 2012).

A synergistic link between mindfulness and resilience has been proposed as a mechanism for improving health outcomes in FRs, with mind-body resilience training shown to reduce short-term OSI symptoms and enhance adaptive coping in both active responders and veterans (Christopher et al., 2024; Tan et al., 2024). Christopher et al. (2024) developed Mindfulness-Based Resilience Training (MBRT) as an eight-week program that adapts evidence-based mindfulness training to target resilience-related processes. Police participation deemed the pilot program to be feasible while preliminary results suggested improvements in stress reactivity, psychological health, and aggression (Christopher et al., 2024). An immersive format of MBRT paired with follow-up sessions may offer a more practical approach for engaging FRs, given the unpredictable nature of their work schedules (Christopher et al., 2024).

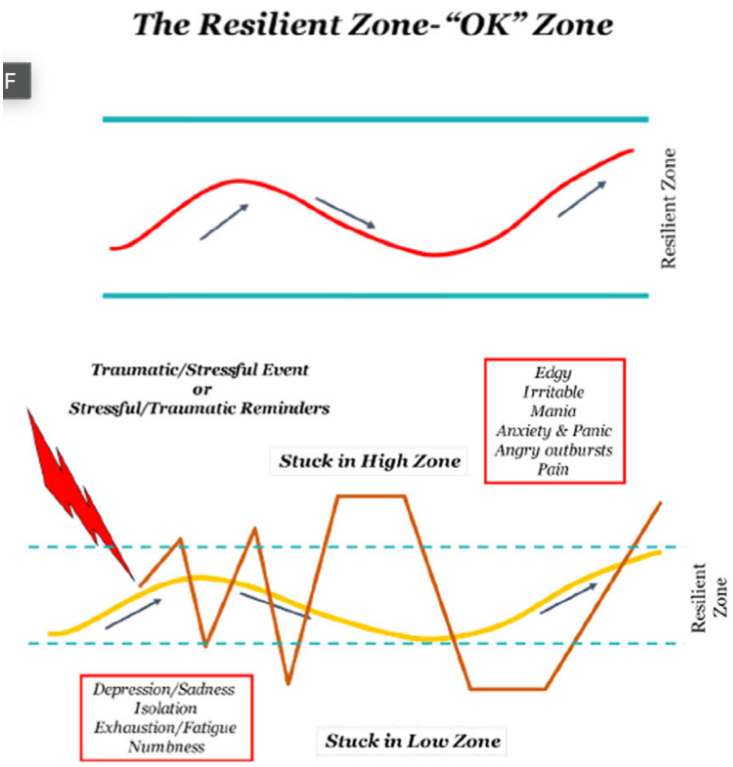
Somatic Therapeutic Approaches

As a natural progression from MBIs, somatic approaches understand trauma as a psychological interruption to sense-of-self and a physical disruption to ANS regulation that becomes trapped in the body (Grabbe & Miller-Karas, 2018; Van der Kolk, 2014). Somatic therapies, such as Somatic Experiencing (Levine, 2010), guide intentional interoception to enhance ANS literacy, self-regulation, and healthy social engagement (Grabbe & Miller-Karas, 2018; Levine, 2010). Bottom-up approaches are more effective than top-down, cognitively based mindfulness practices at processing somatic imprints of trauma, making them particularly relevant for intervening with OSI (Grabbe & Miller-Karas, 2018). Interestingly, cross-cultural studies of emotional processing have found consistent body maps of emotions across diverse populations, indicating broad cultural relevance (Grabbe & Miller-Karas, 2018).

The Trauma Resiliency Model (TRM) was designed to prevent and treat stress-related injuries in high-risk populations, including FRs, by focusing on fundamental skills that regulate nervous system arousal within the "Resilient Zone (RZ)" (See Figure 3) (Grabbe & Miller-Karas, 2018). Similar to the Window of Tolerance, the RZ represents an optimal range of nervous system arousal in which individuals can function effectively, avoiding states of shutdown or hypervigilance (Miller-Karas & Karas, 2015). The TRM's theoretical alignment with polyvagal principles and its adaptability for both individual and group delivery positions it as a promising intervention for addressing OSI. Given these strengths, future studies exploring the TRM in both FR and WFRs would help specify direct outcomes for these groups.

Figure 3

The Resilient Zone



Note. Grabbe et al. (2023) present this visual tool modelling experiences of hypo- and hyper-arousal along with an optimal state, termed the "Resilient Zone."

Nature-Based Interventions

Spending time in nature has long been recognized across cultures as beneficial for mental, emotional, and spiritual wellness (Duvall & Kaplan, 2014). Emerging research supports its role in enhancing mental health and psychological resilience (Duvall & Kaplan, 2014; Jenkins, 2024). Nature-based therapy, also known as eco-therapy or outdoor therapy, draws from Indigenous knowledge systems and somatic science to support nervous system regulation and emotional resilience by cultivating mindful presence in the natural world (Jenkins, 2024). Even outside of therapeutic settings, personal outdoor recreation and adventure activities are linked to

improved emotional regulation, social engagement, and psychological resilience (Clough et al., 2016).

While research on eco-therapy in FRs is limited, preliminary studies have explored the benefits of nature-based peer-led programs in veterans (Jenkins, 2024). For example, Warrior Adventures Canada (WAC) facilitates weeklong wilderness adventures for veterans and FRs that blend outdoor skill building with peer support to support recovery from OSI (Warrior Adventures Canada, 2021). This non-clinical, peer-led format may be especially well-suited for WFRs to engage with nature and peers in a non-performative, restorative setting. Tools like the Connectedness to Nature Scale could help evaluate changes in connection and wellbeing in future groups (Jenkins, 2024).

Nature-based approaches may offer a compelling framework for engaging FRs and WFRs who often resist traditional interventions due to the perceived rigidity and associated stigmas (Jenkins, 2024). For individuals accustomed to spending time outdoors, nature can serve as a non-threatening point of engagement. In cases where nature becomes linked to traumatic events, intentionally, somatically informed engagement can foster bottom-up processing and rebuild a sense of safety, identity, and regulation.

Summary

This chapter explored the unique ways FRs and WFRs experience OSI and trauma, with particular attention to the nervous system impacts and symptomatology associated with their roles. It highlighted the distinct characteristics that set WFRs apart from other FRs, including training, scope of practices, specific environmental and physical stressors, community relations, and intersecting identities. Further, chapter two introduced polyvagal theory as a lens for understanding the nervous system, stress response, burnout, and hypervigilance in these

populations. This theoretical framework informed an exploration of how targeted, bottom-up interventions can support nervous system regulation, which in turn fosters psychological and physical resilience. Current widespread and locally adopted mental health initiatives were evaluated for their potentially applicability to the lived realities of WFRs.

Together, chapter two underscores the need for adaptive, trauma-informed, and community-sensitive approaches that consider the multifaceted contexts that implicate WFRs to be at risk for mental health challenges.

Chapter Three: Discussion and Applied Practices

This capstone project has explored the manifestation of OSI and trauma among FRs and WFRs, populations whose frequent exposure to PPTEs elevates their risk of long-term mental health consequences. While FRs have been the focus of increasing academic and organizational attention, WFRs remain largely absent from the literature despite facing unique stressors related to remote work environments, overlapping recreational and professional identities, and the cultural landscapes of rural mountain towns. The purpose of this project was to address that gap in consideration of the research question: How can polyvagal theory enhance trauma-informed approaches and support resilience-building among WFRs? The current chapter presents a synthesis of the findings from the review and offers a practical framework for mental health professionals working with WFRs.

Throughout this project, it became evident that WFR exclusion from research and mental health initiatives reflects a broader systemic inequity affecting rural and remote populations. In rural mountain towns, access to high quality, culturally relevant, and context-specific care is lacking. As someone who has always lived in rural towns, I can echo that this is a widespread issue impacting health care as a whole and consequentially, rural people face very real disadvantages. With a lack of organizational and systemic support, stigmas remain culturally reinforced, making efforts at cultural shifts a constant uphill battle. While some promising initiatives are emerging in mountain communities, they are still in their early stages and require grounding in empirical research that points to their effectiveness. This rings true for somatic and nervous system informed approaches, which are especially absent. What I found in the literature is that bottom-up interventions that target impacts of cumulative stress exposure are more

effective and yet are vastly underutilized, and this likely reflects the social and systemic inequities that exist.

Limitations

The literature review evaluated how existing mental health initiatives among FR groups may fall short when applied to WFRs. Existing initiatives lack cultural relevance and fail to address the unique contexts of WFRs, which can be combatted through community-informed language, psychoeducation, and collaboration. Furthermore, while stigma is often a concern, tailored anti-stigma initiatives would reduce resistance to effectively integrating and accepting support. Programs that rely solely on psychoeducation without engaging with somatic or relational aspects of trauma may not find effective, long-term nervous system healing. This aligns with the weaknesses of one-off trainings that may provide temporary insight but are unlikely to create sustained change, pointing to the need for repeated therapeutic interventions. Alternatively, immersive formats such as retreats, would foster embodied engagement and disconnection from the workplace. In addition, while peer-led programs are meaningful for creating safety, professionally facilitated therapeutic work ensures clinical integrity and broadens the scope of support that can be offered. Finally, interventions that intentionally incorporate resilience enhancing components are likely to yield beneficial mental health and nervous system impacts for WFRs. Taken together, this highlights areas of refinement that can inform future programming to be more responsive to the needs of this overlooked population.

While the research reviewed in this capstone offers valuable insights, several limitations must be acknowledged to contextualize the findings and support more accurate interpretation. Firstly, the field of wilderness medicine presents significant challenges for empirical researchers due to the unpredictability of responses that occur in remote environments (Tritz et al., 2018).

Thus, acquiring data on experiences of PPTE in controlled settings is not attainable, and qualitative data would likely present a vast array of variables to control for. Compounding this, there is a lack of consistency in what constitutes stress-injury across disciplines, which inhibits the ability to operationalize symptoms among WFRs (Mundo et al., 2023b). Addressing these limitations is necessary for reducing concerns about the applicability of empirical evidence to populations that are not represented in the research (Nebelkopf et al., 2011).

Furthermore, while this project highlights the sociocultural and environmental contexts that impact experiences of OSIs, empirical research that incorporates these variables into studying WFR experience remains scarce (Mundo et al., 2025). From a decolonizing perspective, prioritizing community-informed, culturally responsive approaches is essential to disrupting these structural disparities and developing tailored interventions (Nebelkopf et al., 2011). Despite the inclusion of FRs in empirical studies on mental health impacts, resiliency factors, and proactive interventions, findings must be interpreted with caution in the context of this project because of these limitations.

The literature search yielded limited findings on the use of nature-based and bottom-up approaches to addressing trauma in FRs. This gap suggests an opportunity for polyvagal and nature-based concepts to be applied in a new context. These approaches have been effective in other trauma contexts, but their relevance and effectiveness for WFRs remains to be validated. Given the alignment between somatic, nature-based interventions and the values and environments familiar to WFRs, future research is warranted to explore their applicability. The framework that is presented is grounded in these theoretical perspectives while acknowledging that there is ample space to better understand the implications of theory in practice.

Application

This capstone proposes a framework designed to guide mental health professionals in their work supporting WFRs in mountain town settings. Rather than a structured curriculum, this application maintains flexibility for mental health professionals to adapt to community-specific needs while offering a principle-based framework based on key considerations. Drawing from the research in this project, the goal is to help practitioners tailor their approach to this population's unique needs.

While the primary audience for this framework is mental health professionals, it may inform the development and support of peer-led initiatives. WFR organizations could enhance the impact and sustainability of peer support groups by ensuring that peer leaders receive foundational training based on this framework's principles. This would ensure organizational backing that reduces stigma, emotional overburden for supporters, and enhances the perceived quality and reliability of the support offered. Although developed with clinicians in mind, this framework is intended to be adaptable and scalable, offering guidance across resource-limited mountain communities where formal services are often sparse.

Framework for Mental Health Support with Wilderness First Responders

Theoretical Foundations

While crisis-focused psychological interventions rooted in top-down modalities can offer valuable psychoeducation on cognitive patterns like internalized stigma, research shows that bottom-up approaches are more effective in addressing cumulative nervous system activation that results from trauma exposure (Grabbe & Miller-Karas, 2018). This framework encourages practitioners to become familiar with the concepts presented in chapter two and to explore ways of integrating polyvagal concepts into trauma-informed therapeutic practice. Polyvagal theory de-pathologizes trauma by defining it is a continuum of physiological dysregulation that adapts

as a necessary survival mechanism against environmental threats. This perspective can foster compassionate, body-based understandings of physiological, emotional, and mental health challenges. Integrating polyvagal concepts such as the vagal break, nervous system hierarchy, neuroception, and co-regulation into therapeutic practice can empower clients to regain a sense of agency over their bodily responses, particularly when paired with somatic modalities (Dana & Porges, 2018).

Role of the Counsellor

Polyvagal theory defines therapist presence as essential for creating the safety required for healing in the therapeutic relationship (Dana & Porges, 2018; Geller & Porges, 2014). A counsellor can embody cues of safety through tone, facial expression, posture, and attuned presence, which encourages the client nervous system to shift out of a defensive state and into a regulated, socially engaged state (Geller & Porges, 2014; Porges, 2022). This process of co-regulation creates a shared autonomic language necessary for healing trauma (Dana & Porges, 2018; Geller & Porges, 2014; Levine, 2010). As the nervous system becomes more regulated, new neural pathways are formed that promote trust and capacity for healthy social engagement (Geller & Porges, 2014). These outcomes are particularly poignant for WFRs whose occupations may desensitize them to their own stress responses and isolate them from supportive social relationships. The unpredictable, high-stakes environment of emergency response is balanced by engaging in a therapeutic relationship that is consistently grounding and restores internal cues of safety.

Geller and Porges (2014) propose that therapeutic presence begins with the counsellor cultivating self-regulation and a grounded awareness prior to client engagement to embody calm and receptivity (Geller & Porges, 2014). When working with WFRs whose nervous systems may

be chronically hypervigilant, repeated exposure to an attuned presence will support the neuroception of safety, encouraging the nervous system out of sympathetic activation or dorsal vagal shut down (Geller & Porges, 2014). Beyond fostering and containing feelings of safety, the counsellor plays a critical role in the development of resilience by focusing on self-regulation skills (Levine, 2010). While co-regulation is imperative, self-regulation is an essential skill for WFRs who may not have regular access to a co-regulating relationship in remote places while under stress. Strong therapeutic boundaries and practices that limit co-dependency are essential (Levine, 2010).

Core Principles

Collaboration and Integration. Engaging FRs and WFRs in mental health initiatives is often challenged by the absence of tailored, culturally relevant resources. To address this, mental health professionals must integrate cultural responsivity into their work by recognizing and adapting to the unique social, cultural, and environmental realities of the WFRs they are working with. Meaningful collaboration begins with curiosity – invite clients to explore how occupational risks, the sociology of the mountain town life, and their relationship to natural world shape their identity. This fosters reciprocity and a heightened sense of being seen and heard, likely leading to better outcomes.

Address Systemic Inequities. A truly inclusive framework must also account for the broader context by addressing the organizational, cultural, and systemic structures that hinder WFRs from receiving high quality support. Collaborating with local outdoor industry organizations, employers, or companies to develop community-defined, accessible models of care communicates a commitment to systemic change. Organizational investment aligns with the

British Columbia First Responders' Mental Health Committee (2020) guidelines for increasing leadership buy-in to create pathways for participation.

Practitioners should also accommodate the structural realities of WFR work. Flexibly responding to seasonal demands and irregular shift cycles demonstrates respect for the logistical barriers clients face. The goal should be to engage WFRs in ongoing, rather than one-off, sessions and collaborating with each WFR community to gain a sense of when, where, and how support can be best accessed. For instance, considerations should be made for if individual, group, or immersive, retreat-based sessions would be best received in the on/off season or year-round.

Advocate for a Culture Shift to Reduce Stigma. Deconstructing the dominant narrative of individual toughness, grit, and endurance that is inherited from traditional FR culture is necessary for increasing WFR engagement. Counsellors must be prepared to meet resistance with curiosity and compassion, validating these responses while acknowledge how negative experiences may perpetuate stigma. Stigma can be challenged by reframing resilience as the capacity to seek relational support and increase nervous system adaptability. Through the therapeutic process, practitioners can help WFRs redefine resilience by identifying and building resiliency factors rooted in purpose, identity, and connection to the natural world.

Social Engagement. Polyvagal theory emphasizes the biological significance of safe social connections (Dana & Porges, 2018). When an individual is accessing the ventral vagal system, they feel calm, engaged, attentive, passionate, alert yet relaxed, joyful, and compassionate (Dana & Porges, 2018). In high-stress occupational environments, regulation mediated by the ventral vagus is essential for individual wellbeing and team safety and effectiveness. Reducing stigma is foundational for accessing the social engagement system in

occupational environments, promoting emotional sharing, healthier interpersonal dynamics, and co-regulation. Counsellors can support this shift by encouraging individuals to build strong social networks or offer group-based sessions that nurture peer connection. Further, sustained social engagement can be supported at the organizational and systemic level by encouraging teams to provide time, space, and permission to interact relationally and co-regulate.

Nervous System Literacy and Self-Awareness. The counsellor and client can collaboratively engage with psychoeducational resources to build a clear understanding of how the nervous system can be utilized to build sustainable resilience in the face of OSIs. Suggested tools include “The Stress Continuum” and the “Resilient Zone”. Community-informed adaptations can be welcomed by leaving these tools empty and guiding the client to customize it based on personal experiences and terminology that resonates with them. Encouraging clients to use their own words will deepen integration. Key topics in nervous system education may include:

- The nervous system structure and function, expanded through a polyvagal lens.
- Biological science behind OSI: normalize nervous system responses rather than pathologizing them.
- Neuroception and the unconscious perception of threat.
- The social engagement system.
- Hypervigilance as a precursor to burnout.
- Burnout framed as a disruption to the nervous system hierarchy.

Along with psychoeducation surrounding these principles, increasing client nervous system self-awareness is a necessary step in increasing vagal tone (Dana & Porges, 2018). Practical skills and tools to include in the counselling process:

- Self-monitoring tools that promote tracking shifts between dorsal, sympathetic, and ventral states: The Personal Profile Map, The Triggers and Glimmers Map, and The Regulating Resources Map from Dana and Porges (2018), adapted to client language as necessary.
- Reflective practices: journaling, safe social interactions, team debriefs.
- Integrative elements of polyvagal theory and TRM that strengthen vagal tone: breathwork practices, rhythmic physical activity (i.e. running), resourcing and resource intensification, therapeutic pendulation and titration (Dana & Porges, 2018; Grabbe & Miller-Karas, 2018).

Leverage Nature. As this capstone has explored, WFRs are a distinct population due to the intersection between occupational and personal identities that are both rooted in a passion for the outdoors. Nature is likely a familiar and meaningful entity for this group, and its capacity to support autonomic regulation can be harnessed, even before relational co-regulation is possible. In this way, leveraging WFR relationships to nature could be a bridge to therapeutic engagement, particularly for those who resist traditional therapeutic settings.

For some WFRs, PPTEs may have disrupted their relationship with the natural world. In such cases, extra consideration should be taken to gradually foster nervous system re-attunement to cues of safety in nature. Drawing from somatic-informed approaches, counsellors can apply techniques such as tracking, grounding, and titration to process trauma storage and help realign the nervous system (Grabbe & Miller-Karas, 2018).

Nature-based interventions can be integrated with other modalities and may include experiential and sensory-based techniques such as:

- Nature-based attunement and grounding exercises that emphasize sensory immersion (i.e. mindful walking, soundscapes, solitude with intentional noticing).
- Structured therapeutic outdoor experiences that reflect WFR existing outdoor passions (i.e. hiking, camping, rock climbing, walk-and-talk therapy).
- Retreats or immersions facilitated in outdoor environments.

Conclusion

This capstone project sought to explore the unique mental health needs of a population overlooked in trauma literature while conceptualizing experiences of OSI through a polyvagal and trauma-informed lens. It is argued that WFRs face heightened vulnerabilities and susceptibilities compared to the more extensively researched group of other FRs due to the intersection of systemic inequities, the overlap between occupational and personal identity that is entrenched in mountain town sociology, and cultural stigmas around help-seeking.

Chapter one introduced the scope of the project and rationalized the need for conducting this focused review. Chapter two synthesized literature on OSI in FRs, the neurophysiology of the stress response, the relevance of polyvagal theory, and the limitations of current resilience building interventions. This set the stage for chapter three, which argued that embodied, relational, and culturally attuned care is more likely to align with WFR needs. A framework was proposed with a set of core principles to guide mental health professional's therapeutic work with WFRs in mountain town settings.

The principles of this framework highlighted the need for nuance. Community-informed collaboration offers a decolonizing approach to mental health care by challenging one-size-fits-all models and advocating for context-specific, culturally responsive interventions. Mental health professionals are encouraged to advocate for WFRs by adopting a community-driven lens that

aims to create change in individuals, teams, and systems that WFRs operate in. Grounding this framework in polyvagal theory allows for a holistic appreciation for the role of safety, connection, and nervous system regulation in fostering collective healing. Further, this framework highlights how applying polyvagal concepts while integrating nature-based perspectives aligns with WFRs.

There are still significant gaps to understanding the best approaches to incorporating proactive, resiliency-driven mental health care for WFRs. This capstone continues to an ongoing conversation that invites community and practice-based innovation for supporting those who dedicate themselves to emergency response in the wilderness.

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