

ABSTRACT

FAWCETT, JENNIFER EVANS. From Spark to Proficiency: Exploring Prescribed Burn Association Members' Motivations, Learning Experiences, and Training Needs Through an Andragogical Lens. (Under the direction of Dr. K.S.U. Jayaratne).

Prescribed Burn Associations (PBAs) play a key role in expanding the use of prescribed fire, particularly on private lands that dominate U.S. land ownership. While their primary focus is conducting burns, most PBAs also provide training and education that empower members to apply prescribed fire, whether through structured programs or as natural byproducts of group burning activities. This descriptive and correlational study was conducted with a nationally selected sample of PBA members in the U.S. The main objectives of the study were to determine PBA members' characteristics, their motivations for participating in PBA-offered educational programs, learning experiences regarding andragogical principles, and training needs. The study was limited to active PBAs that chose to participate and whose members had available contact information and online survey access. The survey received 580 usable responses, yielding an 8.3% response rate, which is comparable to studies of similar groups.

Most respondents (62%) were landowners or ranchers/farmers, with 42% aged 65 or older. Respondents represented PBAs from 18 states, mostly from the Southeast (39%) and West (31%), with fewer from the Northeast (14%) or Midwest (16%). Experience ranged from none to leading over 100 burns, with 93% having participated in at least one and 51% having led at least one. While 58% had been burning for four or more years, only 28% had been members that long. In the past year, 69% attended at least one PBA educational event, primarily prescribed burns (61%). Time constraints and travel distance were identified as the main barriers to participation.

The dominant motivation items were "To align with my commitment to environmental stewardship" ($M = 3.95$) and "To increase my overall competence in burning" ($M = 3.92$).

Statistical analysis found that participants with lower education levels, more burning experience, and longer PBA membership were more likely to attend events. Significant associations between overall motivation to participate in PBA events and age, education, and region suggest that younger individuals, those with less formal education, and those from western states exhibited slightly higher overall motivation. Weak but significant associations were found between demographic, experience, or participation variables and each of the five motivational constructs.

Participants expressed agreement with the integration of andragogical principles in PBA programs, particularly for Motivation to Learn ($M = 4.27$), and reported high overall satisfaction with the educational experience ($M = 4.30$). All 21 competencies were rated as moderately to very important. The highest and lowest-rated competencies in terms of self-assessed proficiency were within the Smoke Management competency construct. Leadership and Communication competencies were identified as the most critical training needs. These findings provide valuable insights to prioritize training focus, address gaps in proficiency, and better support members through training to apply prescribed fire on their land.

To ensure all members have the opportunity to participate and benefit from training, events should be offered at varying times, including weekends and evenings, while also exploring options like rotating locations or virtual components to enhance accessibility, engagement, and impact. PBAs with more new or less experienced members should prioritize hands-on burning opportunities and structured training to build confidence and skills. Applying adult learning theory can enhance engagement by tailoring education to members' experience levels and learning preferences. A mix of structured instruction and self-paced learning can accommodate different levels of self-direction. To better align training with members' skills, a simple performance-based approach could assess competencies in various fireline roles and burn

complexities. Regular training needs assessments will help PBAs adapt to evolving priorities. Future research should examine how members' participation, leadership roles and motivations evolve over time and assess whether training aligns with their motivations and skill development needs.

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From Spark to Proficiency: Exploring Prescribed Burn Association Members' Motivations,
Learning Experiences, and Training Needs Through an Andragogical Lens

by
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DEDICATION

To my son, sweet Everett: We started this journey together before you were even born, and since then, you have brought me more joy than I knew was possible. Your curiosity, sense of wonder, and laughter remind me to slow down and appreciate the world around us and what truly matters. I hope I have shown you that with hard work and passion, you can achieve anything. I'm looking forward to more arts and crafts, identifying insects, finding the best hiking sticks, reading books, and exploring with you in the extra time that we can spend together now.

To my husband, Ryan: Thank you for standing by me through the early mornings, the late nights, and moments of doubt. Your encouragement kept me going, and your willingness to step in when needed and dedication to our family allowed me to pursue my goals. I couldn't have done it without you.

To my parents: You have always believed in me and have been proud of me, no matter the outcome. I appreciate the support you have given me throughout my life and during this time.

To Zorro (from both sides of the rainbow bridge) and Winston: Thank you for your comforting presence on the days I needed it most.

To PBA members and other private lands burners: Your important work inspired this dissertation. As challenges in land management grow across the country, your contributions will only become more critical. Thank you for all that you do to steward the land.

This dissertation is dedicated to you all.

BIOGRAPHY

Jennifer Fawcett was raised in a small rural town in Delaware, where she spent a lot of time outdoors. She earned her Bachelor of Science in Animal Science from the University of Delaware in 2004 and her Master of Science in Forest Resources from Clemson University in 2012. Prior to receiving her master's degree, she worked as an Ecologist in Southwest Florida, where she witnessed firsthand the importance of fire on the landscape. However, it was not until she began her studies at Clemson that she held her first driptorch and caught "the fire bug." The experience of using fire as a beneficial land management tool resonated with her, and she never looked back.

Jennifer has worked in Extension Forestry at North Carolina State University (NCSU) since 2013. In her current role as an Extension Specialist in wildland fire, she provides partnership coordination, develops and delivers science-based Extension, education, and outreach programs, and engages private landowners, fire practitioners, and students in hands-on learning experiences. She is passionate about Extension's work and is proud of co-authoring several fire-related publications and fact sheets as well as the *Guidebook for Prescribed Burning in the Southern Region*, which are intended to be resources primarily for Prescribed Burn Association (PBA) members and other private landowners.

Jennifer's personal and professional interests align with the concept of PBAs. She enjoys using fire to steward the land, being outside, connecting people, facilitating meaningful conversations, mentoring others, and helping individuals to feel empowered, especially through hands-on learning. She is excited to become a NCSU alumna and firmly agrees that "the strength of the pack is the wolf, and the strength of the wolf is the pack." Outside of academia, Jennifer enjoys spending time with friends and family, traveling, hiking, and exploring public lands,

especially National Parks, with hopes of visiting all of them in her lifetime. While pursuing her doctorate, she married her husband, Ryan, and welcomed their son, Everett.

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Beginning this dissertation at the start of a global pandemic, while pregnant, was a challenge I never could have fully prepared for. Since then, it has grown and evolved, gradually taking shape into what it is today. I am proud of the final product, and am deeply grateful to everyone who supported me, not only during the dissertation process but throughout my entire doctoral journey.

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CHAPTER 1: INTRODUCTION

Background

Fire has played a crucial role on the Earth for millions of years, including in the development of plant adaptations and the distribution of ecosystems (Coughlan et al. 2018; McLauchlan et al., 2020; Pausas & Keeley, 2009). It is essential for the health of many ecosystems, including forests, savannas, grasslands, rangelands, prairies, meadows, and stream systems, whether ignited naturally from lightning or human-caused (Kobziar et al., 2015). For thousands of years, Indigenous communities have used fire to support ecological, cultural, and spiritual goals, guided by Tribal or Traditional Indigenous laws and customs (Clark et al., 2022). Traditional, rural, Native, and Indigenous fire practices have existed alongside lightning-caused fire since the dawn of humanity, shaping and inspiring local, community-based fire use today (Clark et al., 2022; de Oliveira et al., 2023; Deak et al., 2025b; Lake et al., 2017). However, the anthropogenic use of fire has diminished over the past two centuries due to population growth, development, and a cultural shift towards suppressing wildfires (Kobziar et al., 2015; Nowacki & Abrams, 2008; Ryan et al., 2013). As a result, prescribed fire has become an important tool to maintain fire-adapted ecosystems, especially in the United States (U.S.). No alternative method of fuel reduction (such as grazing, timber harvest, or biomass utilization) can replicate the distinctive ecological impacts of fire, which include simultaneous soil heating, nutrient cycling, and the alteration of its biotic assemblage (Leenhouts, 1998).

To meet the necessary level of fire on the landscape, the use of prescribed burning will need to expand, particularly on private lands. Across the U.S., the majority of land (61%) is privately owned (Rasker, 2019), including approximately two-thirds of rangelands (U.S. Department of Agriculture [USDA], n.d.-a) and 58% of forests and woodlands (Oswalt et al.,

2019). In the Southern region, nearly 90% of forestland is privately held (Southern Group of State Foresters, 2025). However, private landowners often face numerous barriers to conducting prescribed burns, including limited resources, equipment, capacity, experience, and training (Diaz et al., 2016; Weir et al., 2015). Securing adequate labor, equipment, and insurance to perform prescribed burns independently can be particularly challenging (Toledo et al., 2014).

To address these challenges, local forest landowner associations and landowner networks, where peers share knowledge and experience, have proven effective in increasing landowner engagement in forest planning and management. These networks also broaden the reach of educational programs, including those designed to address the growing challenges of wildland fire (Kueper et al., 2013; Rickenbach, 2009). One such cooperative group, the Prescribed Burn Association, is uniquely positioned to provide both peer-to-peer learning opportunities and avenues to expand the use of prescribed burning on private lands.

Prescribed Burn Associations (PBAs), or other community-based cultural, pile, and prescribed burning groups (hereafter collectively referred to as PBAs for the purpose of this study), are voluntary, collaborative groups of private landowners and community members who are or have the desire to use prescribed fire in land management (Toledo et al., 2014). They typically operate on members' privately-owned land within a single county or across multiple counties (Deak et al., 2025b). They are generally informal groups or non-profit entities initiated and run by volunteers who seek to collaborate in restoring or maintaining ecosystems, such as rangelands, grasslands, or forests, through the use of prescribed fire (Deak et al., 2025b; Kreuter et al., 2008; Quinn-Davidson & Stackhouse, 2019; Taylor, 2005; Toledo et al., 2014).

A recent study of PBA leaders by Deak et al. (2025b) found that the primary objectives of most PBA burns are the management of invasive species or woody plant encroachment,

wildlife habitat improvement, restoration of fire-adapted ecosystems, and wildfire risk reduction, with objectives differing by PBA and region. Maximizing the acres or number of burns was found to be of lower importance to them than actions such as broadening access to the use of prescribed fire as a management tool, increasing public acceptance and understanding of fire, or providing field-based training (Deak et al., 2025b). Most PBAs do not have strict requirements for people to participate in a burn, such as previous training qualifications or age requirements, or cost-prohibitive fees for members to have their land burned (Deak et al., 2025b).

While each PBA is unique in its structure, most maintain some sort of membership, ranging from informal email lists of interested individuals and past participants to formal membership processes with required dues (Deak et al., 2025b); however, at least one PBA avoids the term ‘members’ altogether, viewing it as too formal (J. Wimberley, personal communication, January 29, 2025). Membership sizes vary widely, ranging from fewer than 20 to more than 300 members per PBA, with most (56%) reporting between 21 and 100 members (Deak et al., 2025b; Texas Parks and Wildlife, n.d.). The demographic characteristics of PBA members are unknown at the national level. However, membership has typically included ranchers and landowners, especially those with properties that can support the application of fire, as well as other private citizens, educators, fire practitioners, and state and federal employees (Deak et al., 2025b; Diaz et al., 2016; Taylor, 2005; Weir et al., 2016; Weir et al., 2017).

The PBA community has a well-established culture of volunteerism, with the majority of PBAs (88%) relying on donated time and resources from their members (Deak et al., 2025b). Most PBAs (61%) also reported that their leadership consists of volunteers, particularly in the Great Plains (93%) and Northeast (90%) regions (Deak et al., 2025b). PBAs are the largest volunteer civic groups that engage in prescribed burning and lack direct affiliation with state

agencies (Jobes, 2019). While some PBAs expressed that agency support was important, especially during PBA establishment, their importance was found to wane over time (Deak et al., 2025b).

Since PBA members are volunteers, likely with diverse backgrounds, different prescribed burning needs, and varying levels of experience in prescribed burning, multiple factors may influence their motivation to participate in fire-related learning activities offered by the PBA. Adults are primarily motivated by internal factors, such as self-actualization, and are driven to learn when it improves their ability to perform tasks or helps them address real-life problems (Knowles, 1990). As Knowles (1980) noted, "People become ready to learn something when they experience a need to learn it in order to cope more satisfyingly with real-life tasks or problems" (p. 44). Furthermore, adults acquire new knowledge, understanding, skills, values, and attitudes effectively when engaged in real-life situations. Participants in voluntary organizations have been shown to be motivated, in part, by learning, especially through direct hands-on experience (Clary et al., 1992). Most PBAs provide hands-on experiential learning opportunities (Deak et al., 2025b) that address real-life problems (i.e., the land needs to be burned).

Houle (1961) linked the reasons for learning by adults into three basic groups: goal-oriented (learners had a distinctive objective for their learning), learning-oriented (learners enjoyed learning and sought knowledge for its own sake), and activity-oriented (learners without ties to course goals but perhaps studied with social reasons in mind). Other researchers have since found additional motivations for learning (Boshier, 1991; Sheffield, 1964). When adult education practitioners understand the motives driving adults to participate in educational programs, they can tailor information delivery to meet participant needs, enhance the likelihood of adult learning, and encourage sustained participation in the program (Merriam et al., 2007).

The growing number of adults seeking to learn how to apply prescribed fire as part of a PBA (Deak et al., 2025b) highlights the need for PBA-offered educational programs to integrate principles of adult learning theory, also known as andragogy. Andragogy supports a self-directed learning approach and the role of the teacher as a facilitator in the learning process (Knowles, 1990). Adult learners bring a wealth of experience to the training; andragogy involves incorporating these experiences into the learning process. Participants may be encouraged to share their experiences, and the training content is often linked to real-world situations they may encounter (Knowles et al., 2020). Since andragogy emphasizes problem-centered learning, it allows participants to engage in real-world challenges and apply their knowledge and skills in solving problems commonly faced in the field (Knowles, 1984).

The need to apply andragogy in training for both structural fire (i.e., buildings and structures) and wildland fire (i.e., wildfires and prescribed fires) has been recognized (Boyle, 2023; Buczynski, 2023; Chinnasamy, 2013; Greenwood, 2020; Heward et al., 2024; Hill, 2023; Wildland Fire Lessons Learned Center [WFLLC], 2018). Over the past 50 years, there has been rapid growth in adult learning theory and the adoption of new techniques for the training and education of wildland firefighters (WFLLC, 2018). Andragogical principles can be used in a variety of prescribed fire-related trainings to enhance the effectiveness of the education to adult audiences (Heward et al., 2024; WFLLC, 2018).

Educational and training opportunities grounded in andragogy are among the key services that PBAs can offer their members. While classroom or online courses, lectures, and workshops do not provide the necessary hands-on experience essential for successful burning, PBAs provide members with opportunities to gain experience and build skills and confidence through practical, hands-on participation (Weir et al., 2017). PBAs offer their members a range of learning

opportunities beyond traditional workshops. These primarily consist of prescribed burns that present as informal training opportunities, but also include field tours, meetings with natural resource professionals, demonstration burns for community observation, “Learn and Burn” events where community and PBA members can actively participate in prescribed burns, and other training events (Deak et al., 2025b; Weir et al., 2017). These hands-on experiences offered to PBA members actively using or seeking to use prescribed fire for the first time align with andragogy, which highlights that adults learn best when they are internally motivated and when learning is problem-centered (Jobes, 2019; Van Den Berg et al., 2009).

It has been suggested that fire professionals require a combination of training, hands-on experience, and education to be effective (Kobziar et al., 2009). To prepare future fire managers, Scasta et al. (2023) emphasize the importance of providing practical experiences and fostering collaborations that contribute to the establishment of social license (i.e., a form of community and stakeholder approval that enables the initiation or continuation of burning activities). Similarly, the researcher argues that individuals who participate in prescribed burning but are not paid fire professionals, including volunteer PBA members, also need a combination of training, practical hands-on experience, education, and collaboration, possibly through an integrated approach, to develop and maintain the skills, knowledge, and competencies essential for safely and effectively conducting burns.

Surveys of private landowners, Cooperative Extension professionals, and fire practitioners indicate a demand for more accessible prescribed fire information and training, including hands-on, field-based opportunities (Fawcett et al., 2021; Miller, 2022; Miller et al., 2024). The andragogical principle of "Self-Concept" is particularly relevant to determine these educational and training needs. Adults are more likely to engage and participate when they have

the autonomy to identify their own learning needs (Knowles, 1990) and take an active role in determining what training is necessary for their personal and professional development. The process involves acknowledging adults as capable of self-assessment and allowing them to contribute to the identification of their learning needs. Private landowners and other fire practitioners in the U.S. Southern region have expressed a need for more field-based operational training, Certified Prescribed Burn Manager courses, and instruction on topics such as burning for ecological benefits, wildlife habitat management, smoke management, burn plan development, and fire ecology (Fawcett et al., 2021). Despite these insights, no comprehensive needs assessment has been conducted to determine the training needs of PBA members at a national level.

PBAs are growing in popularity, increasing from 50 known PBAs in seven states in 2012, to 62 PBAs in eight states, along with three statewide burn association alliances and one regional alliance in 2015 (Weir et al., 2015). Since 2015, the number of PBAs across the U.S. has more than doubled. This increase is especially considerable in the Southern region and in states such as California, with more than 140 PBAs in 20 states across the country (Fawcett, 2025; Great Plains Fire Science Exchange [GPFSE], 2025). Based on this exponential growth in just the past decade, it is likely that they will continue to rapidly expand. As new PBAs are established and membership continues to grow, the need for prescribed burning education and training will also continue to increase.

Currently, the characteristics of PBA members, their motivations to participate in PBA-offered prescribed burning educational and training programs, their perceptions of the extent to which these programs are consistent with principles of andragogy, and their training needs are unknown. Some researchers have recommended that future studies explore how to best support

and encourage the growth of PBAs (Stroman et al., 2020). The findings of this study will provide valuable insights to help design educational programs to meet the needs of the growing number of PBAs and their members.

Statement of the Problem

Prescribed Burn Associations (PBAs) are becoming vital for expanding prescribed burning across privately owned lands (Deak et al., 2025b; Diaz et al., 2016; Toledo et al., 2014) and fostering responsible fire management practices. They offer members opportunities for cooperative burning on their land, along with training, educational programs, and other valuable services (Deak et al., 2025b; Diaz et al., 2016). A 2012 survey of PBAs across the Great Plains identified training as their most important need (Weir et al., 2015; Weir et al., 2016). Similarly, 57% of PBA leaders considered providing field-based training to their members as a top action they should be doing, yet fewer than half (45%) felt they were “extremely” or “very” successful in doing so (Deak et al., 2025b). Because no national standardized educational or training requirements exist for PBAs, each PBA is responsible for independently providing education and training to its members. In many cases, this education is delivered through non-formal or informal programs, such as prescribed burns (Deak et al., 2025b).

Motivation is an important factor in understanding why people choose to participate in educational activities. However, no studies have examined PBA members’ motivations for participating in PBA-offered educational programs. In addition, these programs should incorporate andragogical approaches that address the training needs of PBA members. However, the extent to which members perceive that the PBA-offered educational events reflect principles of andragogy or meet their training needs remains unknown. As PBAs continue to rapidly expand across the country (Deak et al., 2025b; Fawcett, 2025), it will be important that their

educational programs meet the needs of their members, are based on the members' motivations for participating in learning activities, satisfactorily incorporate andragogical principles, and fill gaps in members' competencies.

Purpose and Objectives

The purpose of this study was to determine PBA members' characteristics, their motivations for participating in PBA-offered educational programs related to prescribed burning and whether these motivations were associated with their demographics, experience, or participation, as well as their learning experiences and training needs. This research aimed to accomplish the following objectives:

1. Determine PBA members' demographic characteristics, prescribed burning experience, and PBA participation.
2. Determine the factors that motivate members to participate in PBA-offered prescribed burning educational programs.
3. Examine the associations between PBA members' demographic characteristics, prescribed burning experience, PBA participation, and their motivations to participate in PBA-offered educational programs.
4. Ascertain the extent to which PBA members perceive that PBA-offered educational programs reflect principles of andragogy.
5. Determine which competencies are important to conduct prescribed burns, as perceived by PBA members.
6. Determine PBA member self-reported proficiency levels for competencies necessary to conduct prescribed burns.
7. Identify the training needs of PBA members.

Theoretical Framework

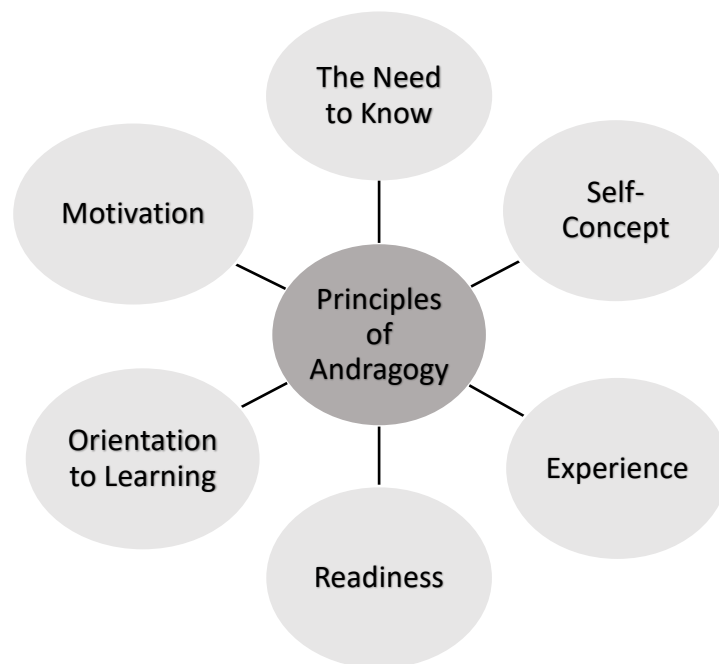
A theory from the tenets of adult learning is the most applicable to connect conceptual ideas to the problem statement and the study. An understanding of adult learning theory benefits those who oversee planning, designing, and facilitating outreach and training programs in many fields, including natural resources (Gootee et al., 2010). It has been found that some PBAs provide learning opportunities consistent with adult learning principles (Kreuter et al., 2008). This study follows the framework of adult learning theory (Knowles, 1990) to examine PBA members' perceptions of whether andragogical principles are incorporated in PBA-offered prescribed burning educational programs, with a focus on their motivation to learn and self-identified training needs. This theory provides the foundation for the study.

Adult learning theory, based on andragogy, is the art and science of adult learning. Initially, Knowles (1968) characterized andragogy as contrasting with pedagogy, suggesting that pedagogy was more suitable for children, and andragogy for adults. However, in his later works (1979, 1980, 1987), he revised his stance, acknowledging that both approaches are viable and can be applied to either children or adults, depending on the circumstances. Knowles provided two criteria for determining whether a learner should be considered an adult. First, the individual assumes roles (such as a parent or worker) traditionally defined as adult roles. Second, the person's self-concept aligns with that of an adult: "He becomes an adult psychologically at the point at which his concept of himself changes from one of dependency to one of autonomy...To be an adult means to be self-directing" (Knowles, 1968, p. 351). An adult is someone who "perceives herself or himself to be essentially responsible for her or his own life" (Knowles, 1980, p. 24).

According to Knowles (1975), adult learners are task motivated, bring their own experience and a readiness to learn, and have the ability to self-direct. Knowles (1968, 1980, 1987, 1998, 2020) suggests there are six distinguishing characteristics of the adult learner as compared to children (Figure 1).

Figure 1

The Six Principles of Andragogy as Defined by Knowles et al. (1998)



The six assumptions about the characteristics of adult learners (Knowles et al., 1998) are described in further detail below.

1. *The need to know*: Adult learners want to know why they need to know something before they attempt to learn it. They require a clear understanding of the reasons behind what is learned, how it is learned, and ultimately knowing why learning is important at all (Knowles et al., 1998). Instruction imposed by a teacher is not

deemed acceptable, as stated by Knowles (1987, p. 170): "It is seldom convincing for them to be told by someone (like the boss) that it would be good for them."

2. *The learner's self-concept*: The self-concept of a child is initially characterized by dependency and reliance on others, but as they age and mature, it transforms into the adult's self-concept of independence. Consequently, many adults prefer self-directed learning opportunities that allow them to draw on their personal experiences and are often reluctant to engage in hierarchical settings with experts (Gootee et al., 2010; Knowles, 1990). Adults tend to want to take responsibility for their own decisions and appreciate opportunities to participate and contribute to the learning process. Knowles et al. (2020) suggest that self-concept develops organically, and that learners may exhibit greater independence when they are more familiar with the subject matter. Merriam (2001) noted that self-directed learning has "helped bring to the forefront the importance of informal learning that occurs as we go about our daily lives" (p. 94).
3. *The role of the learner's experience*: With age comes more life background and experience. According to Knowles et al. (2020), "...for many kinds of learning, the richest resources for learning reside in the adult learners themselves" (p.44). Adults come into an educational activity with extensive prior learning, including formal education, training, cultural influences, reading, and life experiences. Considering this accumulated knowledge, adult learners develop assumptions about the world. These assumptions can either facilitate or impede the process of learning new material (WFLLC, 2018).

4. *Readiness to learn:* Adults' readiness to learn stems from their developmental needs and changes over time as they progress through different stages of development (Knowles et al., 2020). Adults are more ready to learn when it impacts and is applicable to their real-life situation. "The adult...comes into an educational activity largely because he is experiencing some inadequacy in coping with current life problems" (Knowles, 1972, p. 36). Knowles et al. (2020) state that "adults become ready to learn those things they need to know and be able to do in order to cope effectively with their real-life situations" (p.45). Cranton (2000) found that "adults choose programs, courses, or workshops based on their sometimes immediate and/or practical interests and needs" (p. 72).
5. *Orientation to learning:* Adults are life-centered in their orientation to learning. They are inclined to learn about present and practical matters that directly impact the improvement of their lives by helping them to better perform tasks or to deal with problems. They aspire to apply and use acquired knowledge to enhance their ability to address current life challenges in which they may currently feel inadequacies (Knowles, 1968). Therefore, this principle is both problem-centered (e.g., 'Adults are motivated to learn to the extent that they perceive that learning will help them perform tasks or deal with problems that they confront in their life situations,' p.46) and contextual (e.g., adults learn most effectively when those knowledge and skills can be applied to real-life situations) (Knowles et al., 2020).
6. *Motivation to learn:* Adult learners are motivated by some external factors (such as awards, job promotions, or higher salaries), but are primarily motivated by internal factors (such as self-esteem, improved job satisfaction, and quality of life) (Knowles

et al., 2020). Internal motivation is more important than external motivation for most adults (Knowles et al., 2020). Their engagement in learning and educational pursuits is primarily driven by personal needs and concerns rather than external mandates for participation (Knowles, 1984). Tough (1978) found that adults are motivated to keep growing and developing but often run into barriers such as inaccessibility of opportunities or resources, time constraints, and programs that do not incorporate principles of adult learning.

Engaging landowners through educational approaches grounded in andragogy may offer efficient and effective opportunities to increase management on private lands (Gootee et al., 2010). Sixty percent of U.S. forestland is privately owned (excluding interior Alaska), with more than one-third classified as family forestland, while in the Southern region, family forestland classification rises to about 86% (Butler et al., 2021; Butler & Wear, 2013; Kueper et al., 2013). However, only a small percentage of these landowners actively manage their forests. Gootee et al. (2010) demonstrate that the natural resource professionals most effective with forest owners are those providing what the established literature describes as classic elements of a good adult learning environment. These elements include empathy, mutual respect, non-hierarchical information exchange, praxis, emphasis on experiential rather than passive learning, and evidence that tangible results may be expected. The presence of trusted interpersonal relationships affects landowner acceptance of management information and advice; for many, this trust is found among peer groups rather than expert sources (Gootee et al., 2010). Numerous examples of peer networks that foster and support self-guided learning on an as-needed basis exist, including Extension master volunteer programs, forest landowner cooperatives, and landowner associations.

Given the diverse and emerging membership of PBAs nationwide (Deak et al., 2025b), it is prudent for PBA leaders to address members' motivational and learning needs while also considering how adult learning theory influences the application of knowledge. For example, PBA members with lower proficiency in prescribed burning may require more guidance, while more proficient members may prefer self-directed learning approaches, aligning with Knowles et al.'s (2020) principles. Additionally, members may not be ready for advanced training, such as writing a burn plan, until they have mastered the foundational knowledge and feel prepared for greater responsibility. By understanding members' motivations for participating in learning activities, PBA leaders can tailor programs to meet their needs, enhancing recruitment and retention. This study aimed to explore necessary information to provide PBA leaders with insights into members' motivations and learning needs, helping them effectively engage participants and transform interest in prescribed burning into practical skills for conducting burns.

Need for the Study

Prescribed Burn Associations are rapidly expanding across the country, most of which provide some form of training and education to their members (Deak et al., 2025b), yet no studies have explored PBA members' characteristics, motivations, learning experiences, or training needs at a national level. It has been found that training is the most important need of PBAs (Weir et al., 2015), and improved access to new knowledge and information is one of the most important benefits to forest landowner cooperative members (Blinn et al., 2007). A recent study of PBA leaders found that 57% of survey respondents considered providing field-based training as one of the most important actions for PBAs to undertake (Deak et al., 2025b). A thorough knowledge of landowners' educational practices and preferences, demographics,

attitudes, and motivations is necessary for developing effective educational programs and materials (Kuhns et al., 1998). Given the well-established need for prescribed fire, the fact that a majority of land in the U.S. is privately owned (Butler et al., 2021), and that traditional expert-led outreach efforts have failed to reach most private landowners (Kueper et al., 2013), it is important for PBAs to continue exploring their potential to educate private landowners and ranchers.

Although much has been written about the reasons that PBAs conduct prescribed burns (Deak et al., 2025b; Quinn-Davidson & Stackhouse, 2019; Weir, 2010; Weir et al., 2015, 2017), no studies have examined PBA member characteristics, the motivations of PBA members for participating in PBA-offered prescribed burn educational programs, whether andragogical principles are reflected in those programs, or the competencies and training needs of members. Once these factors are understood, educational and training programs can be tailored to address the needs. This information will guide the development of effective educational and training activities, as well as the creation of relevant materials and programs. This study aims to fill a void in the research by informing future programming needs and enhancing educational opportunities for PBA members.

Significance of the Study

This study aimed to identify the characteristics, motivations of PBA members for participating in prescribed burning educational programs, their perceptions of whether andragogical principles are reflected in those programs, and training needs of PBA members. The findings of this study fill a gap in the literature and provide information necessary for the development of relevant prescribed burn education and training programs for the growing number of PBA members across the country.

In 2023, there were 75 known active PBAs consisting of more than 7,000 members (Deak et al., 2025a) that collectively burned more than approximately 84,000 acres per year, on average, across the U.S. (Deak et al., 2025b). PBAs are rapidly expanding and offer a variety of educational and training events across the country each year. More than half (57%) of PBAs have identified field-based training as one of the most important actions of their PBA (Deak et al., 2025b). Therefore, the researcher underscores the importance of understanding the factors that contribute to the education of PBA members and facilitate their participation in PBA programs.

Understanding the motivational orientations of adults with multifaceted reasons for engaging in learning activities can serve as a foundation for strategizing educational programs tailored to meet the specific requirements of adult learners (Merriam & Brockett, 2007). In turn, participant needs can be met through better information delivery, there is an increased likelihood that new information is learned, and continued participation in the program can be fostered (Merriam et al., 2007). Acquiring insight into their motivations and training needs will aid in shaping the curriculum, instructional methodologies, and resource allocation, thereby fostering success in attaining the intended objectives for both the members and the PBA. Training programs specific to members' needs could be used to build the knowledge and skills of the PBA members, thus ultimately helping to increase the use of prescribed burning by PBAs across the country.

Limitations

While there are 140 documented PBAs, with 75 confirmed to be active (Deak et al., 2025b), the number of PBA members across the country can only be estimated since there is no mechanism in place to capture these data. Therefore, it was not possible to develop a population

frame inclusive of all the members. The population frame developed as part of this study only included those PBA members whose contact information was provided to the researcher by their PBA leader or who were contacted by the PBA leader on behalf of the researcher as part of this study. It is possible that the population frame is larger than the actual number of active members since membership criteria is defined differently for each PBA, and many PBAs do not distinguish between active members who participate in PBA activities and those members who just receive PBA emails but have not participated in PBA events. In addition, membership varies over time as members join and leave. The sample frame was restricted to the accessible population frame and those PBA members who participated in this study. The results of this study depended on people's willingness to complete the survey and was based on PBA members' self-reported demographics, motivations and perceptions, with the assumption that they were truthful in their responses. Consequently, the insights and lessons learned garnered from this study may be unique to this group and context only. Generalizations may not be appropriate for non-PBA members. Therefore, the findings of this research may only be transferred if deemed suitable by the reader.

Delimitations

This study was limited to members of active PBAs in the U.S. Additionally, this study used an online survey for data collection, which limited participation to those with access to a computer, the internet, or email.

Definition of Terms

Adult education – An educational program or activity established to meet the learning needs of adults.

Andragogy - The art and science of teaching adult learners; the methods and principles used in adult education.

Andragogy in Practice Inventory (API) - A tool developed and refined by Bates (2020) consisting of Likert scale items that evaluates how well adult learners perceive that their learning activities align with the six principles of andragogy.

Borich needs assessment model - A needs assessment model designed by Borich (1980) to determine for which competencies training is needed for a target audience. Results are based on respondents' perceived importance (or "what should be") and perceived level of attainment (proficiency, or "what is") of competencies aligned to the goals of the program. The difference between the two ratings is known as a discrepancy score.

Competencies - The knowledge, skills, and attitudes needed to be successful (Iqbal et al., 2017; McClelland, 1973). A broad description grouping core behaviors necessary to perform a specific function (National Wildland Fire Coordinating Group [NWCG], n.d.-a).

Education Participation Scale (EPS) - A tested research instrument developed and refined by Boshier (1971, 1977, 1991) consisting of Likert scale items utilized to measure the motivations of adult learners for participating in educational programs. It allows researchers to identify key factors that drive individuals to engage in learning activities. Scale items can be adapted based on the research questions, study population, and specific needs and motivations (Das & Kumar, 2021).

Informal education - Does not follow a plan; it happens in all settings and learning is unconscious (Grajcevci & Shala, 2016). The responsibility for learning is by the individual.

Motivational orientation - Social and psychological determinants of participation in educational activities usually determined by a Likert scale of items (Prichard, 1979).

Non-formal education - Structured learning that occurs outside of the formal school system, often designed to be flexible, learner-centered, and tailored to the needs of specific groups or communities (Coombs & Ahmed, 1974). Curricula and methodology are flexible, but learning is intentional and organized, not just by chance (Grajcevci & Shala, 2016).

PBA-offered educational programs - Programs offered by PBAs to their members and/or the community that result in increased knowledge or skill-building related to prescribed burning. For purposes of this study, these programs include both education and training in informal or non-formal formats, such as prescribed burns, workshops, or “Learn and Burns,” and often involve peer-to-peer learning, peer teaching, or mentorship.

Prescribed Burn Association (PBA) - A cooperative volunteer network of landowners and other interested citizens working together to plan and conduct prescribed burns on privately owned lands. For purposes of this study, it also includes other cooperative volunteer groups that conduct prescribed, pile, or cultural burns, such as Prescribed Fire Cooperatives, Pile Burn Cooperatives, or Cultural Burn Associations.

PBA member - An individual recognized as part of a PBA. Membership structures vary by PBA, ranging from informal e-mail lists of interested individuals or past participants to formal membership processes with paid dues (Deak et al., 2025b). While some PBAs do not use the term "member," for purposes of this study, all individuals included on a PBA’s membership list or recognized as part of the group are considered members.

Prescribed fire - A land management tool used by trained professionals, contractors, and landowners to intentionally apply fire to vegetation in accordance with applicable laws, policies, and regulations to meet specific objectives under specified weather conditions. It is “a safe way to apply a natural process, ensure ecosystem health, and reduce wildfire risk” (Georgia

Department of Natural Resources, n.d.). The act of using prescribed fire is prescribed burning, also sometimes called controlled burning.

Proficiency - The capability to perform a given opportunity (Knox, 1980).

Training need - The difference between desired status of learners and status of learners (Popham, 1993). A discrepancy or a gap between “what is” (current state) and “what should be” (desired state) (Borich, 1980).

Wildfire - A wildland fire originating from an unplanned ignition, such as lightning, volcanoes, unauthorized and accidental human-caused fires, and prescribed fires that escape and are declared wildfires.

Wildland fire - Any non-structure fire that occurs in vegetation or natural fuels. Includes wildfires and prescribed fires.

Chapter Summary

Prescribed Burn Associations (PBAs) play a crucial role in achieving the amount of prescribed burning needed on private lands across the U.S. Over the past decade, the number of PBAs has more than doubled. In addition to facilitating opportunities for prescribed burning, PBAs offer their members valuable educational and training opportunities, which are among their key services. Providing education that incorporates andragogical principles, particularly in areas where members feel the least proficient, could be an effective avenue for enhancing the use of prescribed fire on private lands.

Despite the importance and rapid growth of PBAs, there has been a lack of research on members’ characteristics, motivations for participating in PBA-offered prescribed burning educational programs, their perceptions of how well these programs incorporate andragogical principles, and their training needs. To address this gap, the study explored members’

demographics, experience levels in prescribed burning, PBA participation, motivations for participating in PBA-offered educational and training programs, perceptions of andragogical principles within these programs, perceptions of the importance of prescribed burning competencies, self-assessed proficiencies in these competencies, and their derived training needs based on the assessments. The insights gained from this study will help PBAs better meet their members' educational and training needs in the future. This research will also contribute to the field of adult learning within the context of PBAs, ultimately supporting land management objectives on privately owned lands through the safe and effective use of prescribed fire.

CHAPTER 2: LITERATURE REVIEW

The Literature Review includes the following topics: Prescribed Fire and Its Significance, Barriers to Prescribed Burning on Private Lands, Prescribed Burn Associations and Their Function, Demographics of PBA Members, Motivational Orientation, Andragogy in Non-formal Education, Educational and Training Opportunities for Prescribed Burning, Competencies Necessary for Prescribed Burning, and Extension's Potential Role in PBAs. The importance of prescribed fire on private lands and the barriers to burning are described to set the context as to the need for PBAs and the challenges that private landowners face in conducting prescribed burns. Next, an overview of PBAs and their function establishes their background and significance, followed by an examination of factors that could influence the demographic makeup of PBA members. A discussion of motivational orientations of adult learners is then provided, including an overview of previously developed instruments designed to measure motivations for participation in continuing education and their potential use in the context of PBAs. Then, a description of what is currently known about andragogy in non-formal education and a history of the instruments that have been designed to measure andragogical principles in continuing education is provided to set the stage for an overview of prescribed burning educational and training opportunities within PBAs. Next, a description of the competencies needed for prescribed burning are discussed, distinguishing differences between professional and non-professional burners. Finally, a review of Extension's role in PBAs highlights how Extension has been involved to date and explores possible opportunities to be involved in the future.

Prescribed Fire and Its Significance

Because fire has always been a part of the environment, it plays a vital role in maintaining many terrestrial ecosystems that are adapted to fire (Francos & Úbeda, 2021; Pausas & Keeley, 2009). Fire-maintained forests are a critical natural resource across the U.S. They provide significant economic revenue and ecological services such as watershed protection, carbon sequestration, and wildlife habitat (Kirkman & Jack, 2017; Kreye et al., 2017). Similarly, fire-maintained rangelands and grasslands provide food and cover for wildlife, and can provide nutritious forage for cattle (Scasta et al., 2023). However, over the past century, rapid changes in climate and human activity have led to challenges in fire-dependent ecosystems.

Wildfire potential and severity are expected to increase worldwide in the coming decades because of climate change (Finlay et al., 2012; Liu et al., 2010). Longer dry seasons with less precipitation increase the risk of more frequent wildfires (Fill et al., 2019). Forests in the western United States have experienced a surge in hazardous fuels due to a highly successful fire-suppression policy that excluded fires for a significant portion of the 20th century (Pausas & Keeley, 2009). In the eastern U.S., fire suppression has shifted oak and pine woodlands towards mesophytic hardwoods, resulting in reduced flammability and fire activity (Nowacki & Abrams, 2008). Leenhouts (1998) estimated that ten times more area across the landscape was burned and eight times more biomass was consumed in the conterminous U.S. during the pre-industrial era as compared to the 20th century. In California, Stephens et al. (2007) estimated that just 5.6% of the area that would have been burned during the prehistoric era is burned by wildfires today.

Anthropogenic burning is known to have been used for millennia as a form of landscaping and biomass accumulation by the Vikings (Kaland, 1986), Native Americans (Keeley, 2002; Kobziar et al., 2015; Pyne, 1982), and Aboriginal Australians (Bowman, 1998).

Across the world, traditional, rural, native, or indigenous fire uses are often associated with grazing, pruning, planting, harvesting, hunting, and beekeeping (Williams, 2003). Today, traditional fire use serves a variety of purposes, including pasture renewal, forest clearing for new pastures, crop installation, hunting facilitation, biomass management, fuel reduction, fruit production enhancement, pest and disease control, wildlife management, biodiversity conservation, and cultural or ceremonial practices (Eriksen, 2007; Mistry et al., 2016; Oliveira & Fernandes, 2023; Oliveira et al., 2023). In other countries, ‘traditional’ fire practices are often carried out by landowners or local communities, while ‘prescribed burning’ is typically conducted by professionals (Montiel & Kraus, 2010). In the U.S., however, the term ‘prescribed burning’ is used regardless of whether the burn is conducted by trained professionals or others.

Today, prescribed fire is often used to mimic the low-intensity fire that would have naturally occurred on the landscape and is necessary to maintain the health of fire-adapted ecosystems across the U.S. The frequent, recurrent use of prescribed fire has been shown to decrease the intensity, severity, and probability of wildfires (Addington et al., 2015; Brose & Wade, 2002). Recent studies have shown that the repeated use of fire also reduces the tick population (Fulk et al., 2022; Gallagher et al., 2022). The adverse impacts of prescribed fire on soil, water, and vegetation are temporary, with significantly greater long-term benefits (Francos & Úbeda, 2021).

In the U.S., a majority of the prescribed burning is conducted in the southern region (Melvin, 2020; Melvin, 2021). In some parts of the U.S., pile burning or broadcast burning of slash materials from logging or thinning may also be used (Korb et al., 2004). Prescribed fire burned acreage increased by 28% between 2011 and 2019 in forests and rangelands across the U.S. (Melvin, 2020). In 2020, nearly 10 million acres were treated across the country, with more

than 1 million acres burned in each Florida and Kansas alone (Melvin, 2021). More than 7.9 million (84%) of those acres were treated on state and private lands (Melvin, 2021). At the local level, prescribed burns are conducted on both public lands, such as state and national forests, and on privately-owned land, such as those lands owned by non-governmental organizations, corporations or families. The exact location of a prescribed burn depends on many things, such as the land management objectives of the landowner or the geographic location of the land (Boby et al., 2023).

In recent years, the use of prescribed fire has increased in western states such as California and Washington (Melvin, 2021) to help mitigate the risk of wildfire. Even with these advances in the use of fire, more prescribed burning is needed across the U.S. at appropriate scales and frequencies to reduce fuel loads (Kobziar et al., 2015) and invasive plants, increase biodiversity, restore and maintain fire-adapted ecosystems, and minimize wildfire risks.

Barriers to Prescribed Burning on Private Lands

The barriers to prescribed burning have been well documented in the literature. There are numerous barriers to prescribed burning, and they can be different for public lands and private lands (Kobziar et al., 2015). Functional barriers encompass concerns such as property size, limited resources (i.e., money or equipment), narrow burn windows, and capacity issues (i.e., insufficient personnel availability to safely conduct the burn) (Kreuter et al., 2008; Melvin, 2021; Quinn-Davidson & Varner, 2011). Additional barriers may include smoke management concerns, negative public perception, permitting and regulations, and liability concerns (Diaz & Evans, 2015; Kobziar et al., 2015; Melvin, 2021). In a 2012 survey of PBAs, it was found that factors limiting the number of burns conducted each year included not enough burn days,

drought, time of year, and burn bans (Weir et al., 2015). However, research suggests that barriers to burning on private lands evolve over time (Rougle, 2019).

While prescribed burning is a much more inexpensive land management tool as compared to other options (Maggard, 2021), there are still costs associated with implementing a burn and the amount varies greatly across the U.S. In the southeastern U.S., where prescribed burning is more established, the average cost is approximately \$31 per acre (Maggard, 2021). While the cost of prescribed burning in the Northeast/Mid-Atlantic states hasn't been formally documented, insights from practitioners indicate that costs can range from \$40 to \$400 per acre or even higher, depending on factors such as the total area to be burned and the availability of trained personnel (Regmi et al., 2023). Given these costs, some landowners may require financial assistance to meet their burning goals (Regmi, 2024), or it could be cost-prohibitive when relying on a contractor or state agency to conduct the burn.

For prescribed burners on both public and private lands, weather has been cited as a significant barrier to using prescribed fire (Melvin, 2021). Since prescribed burns are carefully planned with very specific weather parameters required, the weather must be within those parameters for the burn to be carried out (Boby et al., 2023). Oftentimes, depending on the location, this leaves narrow windows when the weather is optimal for conducting a burn on a specific site (Swain et al., 2023). In the western U.S., Swain et al. (2023) suggest that the number of days per year for which prescribed fires can be used safely may decrease by 17% in the coming decades; the projections are even more pronounced in the spring and summer when burn days are projected to decrease by 25% and 31%, respectively.

Results of climatic change in combination with growing pressure from expanding populations affect management decisions about whether to manage landscapes with prescribed

fire (Chiodi et al., 2018; Mitchell et al., 2014), since it becomes much more difficult to prescribe burn areas with significant drought or nearby communities. Extended periods of drought lead to drier and more combustible fuels, stronger winds lead to quicker fire movement, and higher temperatures lead to more intense fires (Liu et al., 2010). Drought can also lead to increased bark beetle outbreak, which in turn, has been shown to produce significantly greater fuel loading as the needles and trees fall to the ground (Evans, 2012; Xie et al., 2020). In addition, forest structure is altered in these post-outbreak areas with fewer live pines and more hardwoods. In turn, extreme fire behavior is possible, especially under drought conditions (Evans, 2012; Xie et al., 2020). Hurricanes and tropical storms have the potential to drastically transform both forested and non-forested landscapes, introducing hazards and factors that must be carefully considered by wildland firefighters and prescribed burn practitioners in both the short and long term (Godwin et al., 2022).

In some cases, promoting the use of fire on private lands has been challenging due to landowners' concerns regarding perceived risks associated with fire, both as a physical hazard and from a legal liability perspective (Eburn & Cary, 2017; Morton et al., 2010; Toledo et al., 2012; Wonkka et al., 2015), as well as their past experience or a lack of knowledge or confidence in implementing fire practices (Kreuter et al., 2008, 2019; Toledo et al., 2013; Twidwell et al., 2015; Yoder et al., 2004). An escaped prescribed burn was found to be the greatest fear of some members of Prescribed Burn Associations in Oklahoma; however, current norms, reputation, and track record alleviate these fears when competency and benefits are seen firsthand (Jobes, 2019). The perceived risk of liability is frequently listed as one of the major impediments to landowner decisions regarding fire (Kreuter et al., 2019; Weir et al., 2019; Wonkka et al., 2015).

With the population of the U.S. increasing each year (U.S. Census Bureau, 2023), the social implications of prescribed fire are increasing. In areas where human development meets undeveloped areas, often called the wildland urban interface (WUI), these are zones of transition that are often at high risk for wildfire (Cohen, 2008; U.S. Fire Administration, 2022). As the WUI continues to grow by approximately 2 million acres each year across the U.S. (U.S. Fire Administration, 2022), the potential for catastrophic wildfire effects in these areas also increases (Cohen, 2008). Large wildfires near urban areas can pose public health concerns like reduced pulmonary function in smoke-sensitive populations, result in increased traffic accidents, or destroy property (Abdel-Aty et al., 2011; Finlay et al., 2012). For example, the Palisades Fire in Los Angeles County, California, in January 2025 destroyed approximately 6,837 structures, resulted in 12 confirmed fatalities, and required 800 firefighters and 24 days to contain (California Department of Forestry and Fire Protection, 2025).

Conducting prescribed burns in WUI areas is becoming increasingly challenging, largely due to smoke management concerns (Campbell et al., 2020). In some states, air quality regulations may also restrict the amount of burning that can be conducted (Melvin, 2021). These restrictions may increase with recent changes to the EPA National Ambient Air Quality Standards for Particulate Matter (PM 2.5) (Environmental Protection Agency, 2023).

Rougle (2019) suggested that landowners new to burning may want to burn but are not confident in burning; they tend to focus on individual-level barriers like lack of knowledge and fear of liability. Then, when PBAs are developed, these individual barriers are overcome but are replaced by social barriers at the community level such as a shortage of equipment and qualified help. Later, as PBAs mature, the remaining barriers are major features of the environment such as political barriers, expectations about air quality, or natural barriers such as seasonal changes in

humidity (Rougle, 2019). Weir et al. (2015) similarly found that the primary impediments to burning for the more experienced PBAs were not a shortage of training or liability concerns but, instead, unfavorable conditions and regulations that limit the available burn days. According to Rougle (2019), this succession is an inherent outcome of landowners with increased confidence aspiring to undertake larger and more intricate burns.

Prescribed Burn Associations and Their Function

One possible response to the new and recurring challenges around wildland fire is to keep more of the management in the hands of local communities through cooperatives. Cooperative associations have formed for a variety of reasons by non-industrial private forest owners, ranchers, and other landowners across the world in which the members cooperate with one another at scales larger than their individual properties to enhance both their individual ownership and public benefits (Kittredge, 2005). Cooperative forest owner associations exist in at least 19 different countries outside of the U.S., including Australia, Austria, Belgium, Canada, Finland, Sweden, Denmark, Germany, France, Japan, South Korea, Switzerland, Netherlands, United Kingdom, Ireland, New Zealand, Norway, Lithuania, and Slovenia to share information and equipment and work together on cooperative forestry activities (Kittredge, 2005). The origins of these forest owner associations included the following common elements: government involvement (such as through direct or indirect financial support in countries such as Japan, Germany, France, Netherlands, and Belgium), response to a problem or a stimulus (such as the need for fuelwood during World War II), and upheld existence over time (for example, local cooperative forestry associations date back to the 15th century in Korea) (Kittredge, 2005).

Landowners also work cooperatively on fire-related activities such as fighting wildfires, or prescribed, traditional, or pastoral burning. In the U.S., collaborative wildfire management

initiatives bring together federal, state, local, and tribal agencies, along with private landowners, to enhance fire response and landscape restoration efforts. Rangeland Fire Protection Associations (RFPAs) and projects under Good Neighbor Authority (GNAs), aim to jointly address the containment of wildfire and promote restoration projects, including hazardous fuel reduction (Abrams et al., 2017; Bertone-Riggs et al., 2018; Stasiewicz & Paveglio, 2017; Taylor, 2005; Twidwell et al., 2013). RFPAs are composed primarily of ranchers and other private landowners, that partner with state and federal agencies to suppress wildfires on rangelands, leveraging local expertise and resources (Davis et al., 2017; Idaho Department of Lands, 2025).

The literature suggests that in Europe, the term “prescribed burning” is primarily held for describing the use of fire by professionals, whereas traditional or pastoral burning is conducted by farmers (Fernandes et al., 2013). In some cases, prescribed burning programs, such as those in Spain and France, have replaced or revived pastoral burning practices by working with local communities. This collaboration integrates traditional ecological knowledge into prescribed burning efforts, aligning range management with forest management (Fernandes et al., 2013). For example, in France, “fire committees” of landowners were developed in response to strict measures that were taken against traditional burning in the French Pyrenees. The rules were initiated to safeguard new government investments in timber plantations replacing former rangelands, inadvertently resulting in an upswing in prescribed fire damage. Shepherds altered their burning practices, choosing times to burn based on avoiding authorities rather than optimal safety conditions (Fernandes et al., 2013). In response, landowners in the Hautes-Pyrénées region established "fire committees" to collaboratively identify areas suitable for controlled burns. In collaboration with rangeland service personnel, citizens assess the difficulty of each burn on a scale of one to three. This approach empowers regular livestock farmers to conduct burns

categorized as easy or moderate, while a specialized burn task force handles the most technical burns. Additionally, the specialized burn team takes the lead in a working group aimed at revising regional burning regulations. Consequently, French fire committees serve as a link for rural burners to engage in political action. As another example, Coastal Norwegian heathlands were regularly burned to support sustainable herbivore production for approximately 5000 years. However, this practice was largely absent for a period of 60–70 years starting in the 1950's until a civic group of primarily farmers was established in 2009 to resume burning practices (Metallinou, 2020).

One form of landowner cooperatives, Prescribed Burn Associations (PBAs), are rapidly increasing across the U.S. in an effort to provide private landowners and other community members with more access to the use of prescribed fire (Deak et al., 2025b). PBAs are necessary to accomplish more burning, thereby minimizing the risk of catastrophic wildfire and restoring native fire-adapted ecosystems on private lands. PBAs distinguish themselves from state Prescribed Fire Councils (PFCs), which typically consist of communities of land managers, policymakers, and fire practitioners and work on efforts such as improving state prescribed fire laws, creating state smoke management programs, and developing fire awareness programs for the public (Coalition of Prescribed Fire Councils, 2025). Unlike the state PFCs, the primary purpose of PBAs is to actively carry out prescribed burns on private lands.

PBAs are typically volunteer-based groups that are made up of landowners and other community members who collaborate to conduct prescribed burns on private lands (Weir, 2010). These groups include individuals who want to cooperatively restore or maintain ecosystems, such as rangelands or forests, by applying prescribed fire (Kreuter et al., 2008; Taylor, 2005). They form for a variety of reasons, ranging from the degradation of grassland ecosystem services

and the potential to use fire to improve the management of encroaching woody plants (Twidwell et al., 2013) to using prescribed fire as a tool for maintaining oak dominance and associated wildlife habitat and wildfire protection (Riechman et al., 2014).

Similar to other models of cooperative landowner associations (Kittredge, 2005), PBAs do not have a fixed set of goals, structures, sizes, or types. Each PBA operates differently and varies considerably based on the needs, interests, and capacity in their area (Deak et al., 2025b). Some PBAs have an elected officer structure, membership with paid dues, and other guidelines (Taylor, 2005), whereas others are more informal (Deak et al., 2025b). PBAs can be formed at various levels, including local, county, or multi-county depending on the need and the size of the area to be covered (Diaz et al., 2016). State-level PBAs also exist in states such as Texas and Oklahoma to support the local PBAs and to help develop new PBAs within the state.

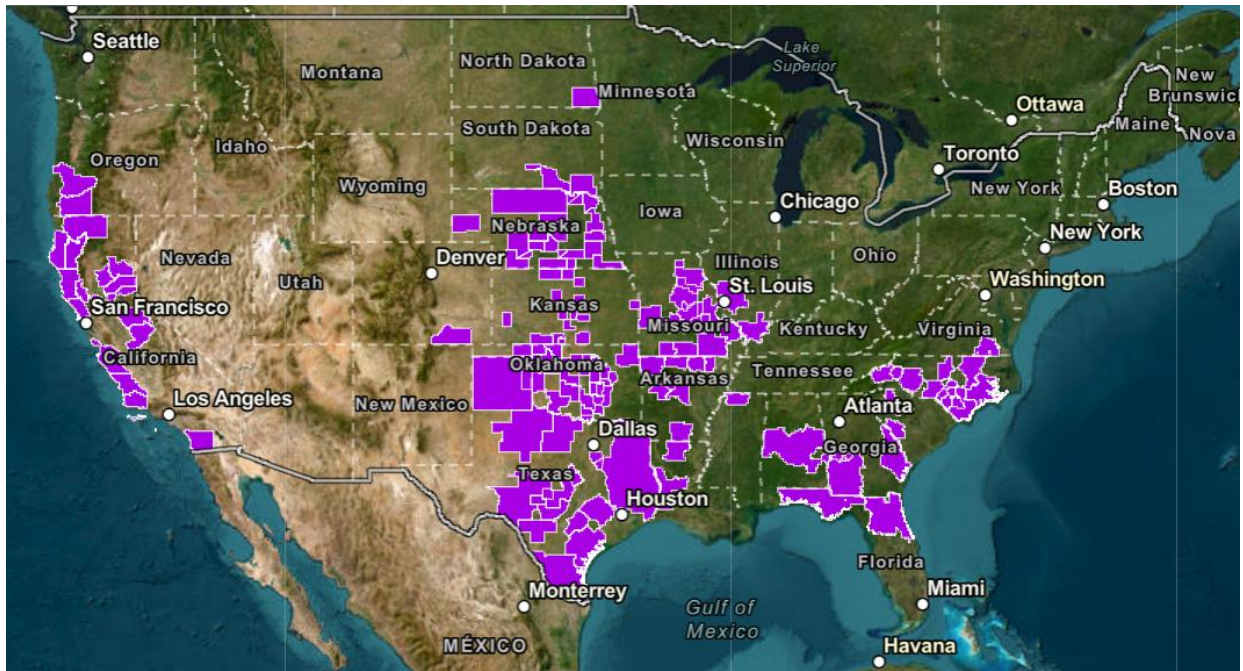
Landowners are known to be aware of the landscape-scale implications of their actions and can be open to a cooperative effort to attain their goals, especially when it is likely to increase the safety and effectiveness of prescribed fire (Piatek & McGill, 2010). PBAs present members with the chance to collaborate in overcoming obstacles associated with prescribed burning (Diaz et al., 2016). This is achieved through the provision of sharing equipment, labor, and experience among neighbors, working to decrease individual liabilities and costs, and providing encouragement, camaraderie, and support to safely implement controlled burns (Diaz et al., 2016; Weir et al., 2017). Because neighbors are helping one another, it is not necessary for them to hire labor (Weir et al., 2017). Similarly, since members pool their equipment, no one person must buy all the equipment needed to burn (Weir et al., 2017). Knowledge is primarily obtained from other landowners rather than from natural resource professionals as in traditional forestry technical assistance and outreach. PBAs create peer-to-peer learning networks for the

implementation of prescribed burns and educational events, thereby increasing landowner social capital and increasing positive perceptions of prescribed fire (Toledo et al., 2012). Consequently, this cooperative approach to prescribed burning reduces both risk and costs (Toledo et al., 2014; Weir, 2010).

There are 140 documented PBAs across the country (Fawcett, 2025; GPFSE, 2025) (Figure 2), with 75 confirmed to be active (Deak et al., 2025b). PBAs began in the mid-1990s in the Great Plains, an area dominated by private lands (Weir et al., 2016). Following one of Kittredge's (2005) key elements for landowner cooperation (e.g., having a 'threat' or 'catalyst' to inspire landowner interest') (p.683), they were initially inspired by the need to address landscape-scale challenges such as the invasion of red cedar into rangelands and prairies through increased burning (The Nature Conservancy [TNC], 2020; Weir et al., 2016). These PBAs were extremely successful at implementing large-scale prescribed burning; in just an eight-year period, 27 PBAs conducted almost 1,100 burns over more than 470,000 acres (Weir et al., 2015).

Figure 2

Map of the Documented PBAs and the Counties They Cover Throughout the U.S.

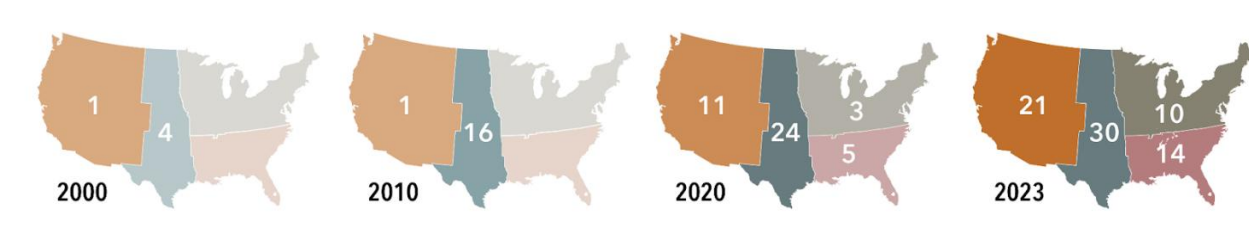


Note. Map as of February 2025. Source: Great Plains Fire Science Exchange, 2025.

Later, in 2015, PBAs started to form in the Southeastern region, primarily to enhance private lands within the longleaf pine ecosystem, with the first one established in the sandhills region of North Carolina. In 2018, PBAs began to take root in California, with the Humboldt County PBA being the first in the Pacific West and boasting 24 burns over almost 1,200 acres in just two years (TNC, 2020). By mid-2020, California had 15 active or forming PBA-style groups (TNC, 2020). PBAs are continuing to expand across the country over time (Figure 3).

Figure 3

Emergence of PBAs Through Time From 2000-2023 Across the West, Midwest, Northeast, and Southeast regions.



Note. The numbers represent the number of PBAs established in each region by the years 2000, 2010, 2020, and 2023, based on a 2023 survey of PBA leaders, indicating the known active PBAs in the U.S. (N = 75). Darker regions represent a higher density of responding PBAs.

Adapted from: Deak et al., 2025b.

Prior studies have demonstrated that numerous PBA members initially had reservations about the use of prescribed fire before joining a PBA. However, participation in the PBA facilitated a shift in their perception of prescribed fire as a risky land management tool and then therefore opted to implement fire on their land (Kreuter et al., 2008). One study in Texas found that membership in the PBA showed increased support, knowledge, and acceptance of prescribed fire use when compared to non-member landowners (Kreuter et al., 2008). Another study from the Southern Plains Region of Texas and Oklahoma found that PBA members were more likely than non-PBA members to view woody plants on their land as a problem; therefore, it was suggested that PBA membership may be helpful in increasing prescribed fire use to combat woody plant expansion (Stroman et al., 2020).

Several successful PBA models have been developed, and many have led to tremendous increases in the local use of prescribed fire by private landowners. As of 2021, the North

Carolina Sandhills PBA (Figure 4) had over 300 members managing approximately 20,000 acres (J. Wimberley, personal communication, October 13, 2021). Since then, their membership has more than doubled, with the PBA now boasting over 700 members managing even more land (J. Wimberley, personal communication, August 23, 2024). In a recent study, it was found that the 75 responding PBAs collectively conduct an estimated average of 660 burns a year for a total of nearly 85,000 acres (Deak et al., 2025b). One PBA alone estimated that they burn an average of 10,000 acres per year. While several successful models of PBA organization and structure exist, many landowners lack a clear roadmap for maintaining a successful PBA in their community, and some PBAs have disassembled due to lack of participation (J. Weir, personal communication, September 7, 2023).

Figure 4

Members of the North Carolina Sandhills Prescribed Burn Association Pose for a Picture While Conducting a Prescribed Burn on a Member's Property



Note. Credit: Angela Gaskell.

The feasibility of forming a PBA in a given area may be influenced by socio-ecological factors such as existing knowledge on the ecological role of fire, sharing a common vision, and previous experience with fire (Piatek & McGill, 2010; Riechman et al., 2014). PBAs do well in regions where landowners share a common land ethic and where the application of prescribed fire is accepted by the general public (Riechman et al., 2014). If those factors are not in place, PBAs may need to focus more on education, outreach, and capacity building before they begin implementing burns (Biemiller, 2018).

In addition to PBAs focused on prescribed burning, other collaborative groups facilitate different types of burning, such as pile burning and cultural burning. Landowner cooperatives known as Pile Burn Cooperatives are in the early stages of formation in Colorado. These groups focus on burning slash piles rather than broadcast burns (K. Leger, personal communication, March 20, 2024), as pile burning is a key tool for wildfire mitigation and forest restoration in the state (The Ember Alliance, 2025). Like PBAs, they are community-based networks that follow a “neighbors helping neighbors” model where landowners work together to build and burn slash piles, reducing wildfire risk and improving forest health (The Ember Alliance, 2025). In addition, Tribal organizations such as the Cultural Fire Management Council facilitate cultural burning on the Yurok Reservation and Ancestral lands and collaborate with other Tribes and local fire agencies to conduct prescribed fires across the region (Cultural Fire Management Council, 2023). The Lumbee Tribe in North Carolina has developed a Cultural Burn Association focused on cultural burning within their landscape, and several others are in the early stages of discussion for possible future formation.

Demographics of Prescribed Burn Association Members

Each PBA across the country is organized differently, including their membership structure, how membership is defined, and the responsibilities associated with membership (Deak et al., 2025b). In California, some members only assist the fire department with the burning, but do not conduct burns on their own, whereas other burns are primarily prepared and led by landowners (Rougle, 2019). In other PBAs, members must participate in a certain number of burns each year or pay membership dues (Deak et al., 2025b). Some PBAs define membership simply as an informal email list of individuals interested in participating in prescribed burns, with no required responsibilities (Deak et al., 2025b). Others prefer to avoid the term "members" altogether, viewing it as too formal (J. Wimberley, personal communication, January 29, 2025). Membership ranges from less than 20 to more than 300 members (Deak et al., 2025b). In some cases, membership is even greater, such as the Sandhills PBA in North Carolina and the Central Coast PBA in California, which have approximately 700 and 900 individuals on their email lists, respectively (J. Childress, personal communication, August 19, 2024; J. Wimberley, personal communication, August 23, 2024). While no prior studies were found to have specifically studied the demographics of PBA members at a national level, some factors that may influence the demographics include:

1. Occupation: Since members are community volunteers, they may include professionals from various fields, such as forestry, land management, agriculture, or an unrelated field. Additionally, in some PBAs, individuals from the community may join (Rougle, 2019), contributing to a mix of backgrounds and expertise.
2. Age: The average age of the primary decision-maker for private family forestlands is 65 years old; for approximately 20% of these ownerships, the primary decision-maker

- is 75 years of age or older (Butler et al., 2021). The age range of PBA members can be diverse (Stroman et al., 2020), including both younger individuals such as college students and older individuals with experience in land management practices. In a recent study of PBAs, only 11% indicated age-based restrictions to participate in a burn (Deak et al., 2025b).
3. Gender: It has been found that 76% of self-reported primary decision makers of private family forest land are male (Butler et al., 2021). While traditionally male-dominated (Stroman et al., 2020), there is a growing recognition of the importance of diversity in PBAs. Efforts are being made to encourage more women to participate in PBA-offered prescribed burning activities (Wagner, 2023).
 4. Education: Butler et al. (2021) found that 42 percent of primary decision makers of private family forest land have a college degree. PBA members may have diverse educational backgrounds, ranging from those with practical, hands-on experience in land management to individuals with advanced degrees in relevant fields (Stroman et al., 2020).
 5. Experience: PBAs may attract both experienced individuals with a long history of involvement in prescribed burning and newcomers interested in learning and contributing to fire management practices. Research has found a strong correlation between PBA membership and the use of prescribed fire on both the member's property and assistance with the application of prescribed fire on other people's properties (Kreuter et al., 2008; Stroman et al., 2020; Toledo et al. 2014).
 6. Geographic location: Forests, grasslands, rangelands, and other fire-adapted ecosystems may attract members with specific interests and expertise. Geographic

regions differ in terms of climate, culture, and physical geography, resulting in differing burn objectives and fire use (Deak et al., 2025b). Rates of adoption for prescribed burning have been slower in the Northeast/Mid-Atlantic region, where there has been historical exclusion of fire and potentially complicates the reintroduction of fire (Lee et al., 2014; Melvin, 2021). Regmi et al. (2024) suggest that landowner perspectives and willingness to use prescribed fire likely hinges on the political, cultural, and economic context in which decisions are made, and may vary due to diverse ownership objectives, regulatory frameworks, and complex ecological and geographical conditions.

7. Community involvement: Some PBAs have a strong community focus, attracting members and leaders who may be actively involved in local environmental and community issues (Wagner, 2025). PBA members are typically volunteers from the community. A majority of PBAs (57%) believe one of their most important actions is to increase public acceptance and understanding of prescribed fire (Deak et al., 2025b), which implies community involvement.
8. Interests and values: Cultural values about prescribed fire are often influenced by individuals' knowledge, beliefs, and attitudes (Regmi et al., 2024). Members of PBAs typically share a common interest in promoting the responsible use of prescribed fire for ecosystem management, biodiversity, and wildfire risk reduction (Deak et al., 2025b; Jobes, 2019). PBA members have been found to have a more positive view of prescribed fire than non-members (Stroman et al., 2020). It is suggested that past experiences with prescribed burning can impact how fire is valued (Kreuter et al., 2008).

Motivational Orientations of Adult Learners Participating in Educational Programs

Adult learning can be improved when researchers and practitioners can gain insight into the motivations driving adults to participate in educational programs (Merriam et al., 2007). Understanding the reasons behind adult participation is beneficial for practitioners to develop and deliver programs that relate to adult needs (Merriam & Brockett, 2007). The six principles of adult learning are helpful for understanding the motivation of adults in educational pursuits (Knowles et al., 2020). Motivation among adult learners to engage in educational programs can be understood through the lens of motivational orientations.

The foundation of contemporary motivational research in adult education lies in Houle's (1961) three-part typology: goal-, activity-, and learning-oriented reasons for study. In *The Inquiring Mind*, Houle (1961) discussed his efforts to identify the basic structure underlying the diverse reasons that people provide for participating in adult education. He discovered that all participants had specific goals they wanted to achieve, although the motivation driving their participation varied. The goal-oriented individuals viewed education as a pathway to achieving specific objectives. The second group, the activity-oriented, participated in learning because they found inherent meaning in the process itself, often without direct ties to the content or stated purposes of the activity. Lastly, the learning-oriented individuals pursued knowledge for its intrinsic value. Houle (1961) was the first to distinguish various styles of learners based on motivational orientations. Prior to 1961, the majority of conceptualizations regarding this fundamental question were rudimentary (Das & Kumar, 2021).

A review of the literature was conducted in an effort to find a reliable and valid measure of motivation related to PBA member participation in educational events. Since Houle's (1961) original study, many researchers (Boshier, 1991; Burgess, 1971; Morstain & Smart, 1974;

Sheffield, 1964) have developed an instrument utilizing factor analysis to measure the motivations of adult learners. To test Houle's typology, Sheffield (1964) studied the motivational orientations of adults who attended educational university conferences. From the study, Sheffield found similar orientations to Houle's typology, but subdivided goal-oriented and activity-oriented learning to create five factor levels of orientation:

1. Learning orientation - learning is for its own sake.
2. Sociability orientation - learning has a deep interpersonal or social meaning.
3. Personal-goal orientation - learning to solve problems or to pursue certain interests.
4. Societal-goal orientation - learning for clearly social or community-centered objectives not connected to course content.
5. Need-fulfillment orientation - circumstances of learning have personal meaning unrelated to course content or activity purposes.

The motivation of adults to participate in educational programs has been examined in empirical studies in several different research areas including adult education and volunteer programs. Researchers exploring motivations for participation have designed instruments to assess learning motives and have identified many other factors (subject to the researcher's interpretation), expanding upon the initial three categories (Boshier, 1971, 1977; Boshier & Collins, 1985; Burgess, 1971; Morstain & Smart, 1974; Sheffield, 1964). Expanding on Sheffield's (1964) research, Boshier (1971) aimed to examine Houle's (1961) typology of motivational orientations within a New Zealand context. Boshier (1971) sought to create a tool for investigating participation motives that would facilitate replication across different cultures and institutions. He created a 48-item Education Participation Scale (EPS) to investigate a

randomly selected sample of adult education participants enrolled in diverse non-vocational courses across three institutions: a high school evening institute, a university extension program, and a workers' education association. After conducting a factor analysis and applying promax/varimax rotation, 14 first-order factors were identified. These factors were then intercorrelated, subjected to another round of factor analysis, and rotated to generate second and third-order factors. The third-order model yielded four factors. Boshier (1971) suggests that the motivational orientations are four independent and uncorrelated factors. Over time, Boshier (1977) transitioned to conceptualizing motivational orientation around the concept of life chance (deficiency) or life space (growth), thereby evolving the model into a two-factor second-order model.

Boshier's study highlighted the diverse motivational orientations among adult education participants and emphasized the importance of understanding these motivations to effectively design and deliver adult education programs. The EPS was published commercially in 1982 (Das & Kumar, 2021), and by 1985, the EPS had been applied in most parts of the world (Boshier & Collins, 1985). Boshier and Collins (1985) approximated that around 60,000 participants had completed some version of the EPS factor structure. The EPS is widely used to analyze adult learning motivations (Das & Kumar, 2021) and is considered to be the most enduring, often used, and psychometrically checked instrument (Güngör, 2006). It has been suggested that the EPS is the most well-known and used instrument in research studies within the domain of adult motivational orientations towards education participation (Fujita-Starck, 1996; Merriam & Caffarella, 1999). Boshier and others have revised the EPS to meet the needs of specific groups and there are now multiple versions as seen in Table 1.

Table 1*Versions of the EPS Over Time with Their Respective Intents and Subscales*

Versions of the EPS	Intent	Subscales
Boshier (1971): EPS ^a (48 items, 9-point scale)	The original version was developed to understand the motivation of adults seeking continuing education.	<ul style="list-style-type: none"> • interpersonal improvement or escape, • inner versus other directed, • advancement, • social sharing, • artifact, • self-centeredness versus altruism, • professional future orientedness, cognitive interest
Boshier (1976): EPS-F ^b (40 items, 4-point scale)	A modified version of the EPS was developed with fewer items and different subscales.	<ul style="list-style-type: none"> • social contact, • social stimulation, • professional advancement, • external expectations, • cognitive interests, • community service
Mergener (1979): M-EPS ^c (43 items, 5-point scale)	From Houle's (1961) adult learning orientation typology	<ul style="list-style-type: none"> • competency-related curiosity, • interpersonal relations, • community service, • escape from routine, • professional advancement, • compliance with external influence
O'Connor (1979, 1982): EPS-M ^d (56 items, 10-point scale)	Modified the original EPS scale (EPS-M) for nurses participating in continuing professional education.	<ul style="list-style-type: none"> • improvement in social relations, • improvement in social welfare skills, • professional advancement, • professional knowledge, • compliance with authority, • relief from routine

Table 1 (continued)

Versions of the EPS	Intent	Subscales
Boshier (1991): EPS-Form A (40 items)	Developed a new alternative scale (Form A) to apply to a more diverse population of adults seeking continuing education.	<ul style="list-style-type: none"> • social contact, • social stimulation, • communication improvement, educational preparation, • professional advancement, • cognitive interest, • family togetherness
Garst & Ried (1999): Modified EPS (43 items, 5-point scale)	A modified version of the original EPS for pharmacists.	<ul style="list-style-type: none"> • interpersonal relations, • competency-related curiosity, • professional advancement, • compliance with external influence, community service, • escape from routine

Note. Adapted from “The Education Participation Scale–Modified: Evaluating a Measure of Continuing Education” by D. Dia, C.A. Smith, A. Cohen-Callow, and D. L. Bliss., *Research on Social Work Practice*, (p. 215), 2005, 15:3, 213-222.

^aEPS = Educational Participation Scale. ^bEPS-F = Educational Participation Scale–First form.

^cM-EPS = Mergener’s Educational Participation Scale. ^dEPS-M = Educational Participation Scale–Modified.

Six constructs were derived from the M-EPS (Mergener, 1979) (Table 1). Agresti & Finlay (2009) define reliability as the consistency of a social sciences instrument; Mergener (1979) reported a reliability of .90 for the M-EPS. The EPS-M (O’Connor, 1979) drew upon three primary sources for item extraction. First, responses from an open-ended questionnaire were collected from participants enrolled in university Extension courses. Second, items were

derived from a qualitative study conducted by Houle (1961), which categorized adult learners into three groups based on motivational orientation: goal-oriented, activity-oriented, or learning-oriented. Lastly, additional items were derived from Sheffield's study (Boshier, 1971). The EPS-M has been used in several studies targeting nurses (O'Connor, 1979, 1982; Thomas, 1986) and social workers (Dia et al., 2005) pursuing continuing professional education.

The EPS-A was created and validated to make it more appropriate for international and low-literate participants (Boshier, 1991; Das & Kumar, 2021). The alternative (A) version of the EPS is broader in scope and applies to a more diverse population compared to the original EPS form, which demonstrated optimal effectiveness with middle-class adults. It was correlated with the original EPS scale. The EPS-A factor structure was based on an analysis of correlation matrices that contained 40 items. The seven factor loadings in the EPS-A are in the following categories:

1. Communication Improvement - enrolled to improve verbal and written communication skills. This category is comprised of six items with a Cronbach alpha of .89 and a test/retest reliability of .56.
2. Social Contact - Enrolled with the aim of meeting new people and making friends. This category loaded six items, boasting an alpha of .95 and a test/retest reliability of .75.
3. Educational Preparation - motivated to overcome educational deficiencies and prepare for future education loaded six items with an alpha of .80 and a test/retest reliability of .61.
4. Professional Advancement - concerned with job growth in an existing or future job position loaded six items with a reliability alpha of .80 with test/retest reliability of .70.

5. Family Togetherness - concerned with improving familial relationships loaded with six factors with Cronbach alpha of .82 and test/retest reliability of .74.
6. Social Stimulation - moved to escape isolation, boredom, or unhappiness loaded six items with alpha reliability of .80 and test/retest reliability of .58.
7. Cognitive Interest - desiring knowledge for its "own sake" loaded six items with an alpha of .76 and test/retest reliability of .60.

Due to the substantial factor loadings observed in the items, Boshier (1991) determined that the instrument exhibited construct validity. Additionally, the alpha coefficients ranging from .76 to .91 were highlighted as evidence of the instrument's reliability, signifying strong internal consistency.

The items on the EPS can be reorganized based on the research question, study population, and specific needs and motives (Das & Kumar, 2021). For instance, in a study focusing on the motivational orientation among older adults, items pertaining to professional advancement may be deemed irrelevant and thus can be omitted or adjusted accordingly. The factor structure cannot be assumed to remain the same if items are removed or added to the scale (Boshier & Riddell, 1978). Fujita-Starck (1996) discovered variations in motivational orientation among different groups of learners, advocating for distinct scoring methods tailored to each group (e.g., professional versus art and leisure groups).

Darkenwald and Merriam (1982) observed that motivation to learn is influenced by various demographic factors, such as marital status, gender, age, occupation, income, and race. Their research revealed adults engage in learning primarily to fulfill specific requirements, such as job tasks or life skills. Smith (2001) also discovered that the level of motivation in adult learners to engage in learning activities is closely linked to their ability to relate learning to their

personal and professional lives. However, no single motivational factor was found to prevail, which poses challenges for adult educators who must acknowledge the diverse needs and purposes of adults re-entering a learning environment (Darkenwald & Merriam, 1982).

Numerous scholars have recognized the necessity of understanding the motivations behind adult participation in non-formal education (Clemons & Vogt, 2004; Kirby et al., 2009; Rabušicová & Rabušic, 2006; Yan-Fung & Tsz-Man, 1999). Van Den Berg, Dann, and Dirx (2009) applied Houle's Typology to recognize the learning and activity orientations that motivated adults to engage in a non-formal conservation education program. Strong and Harder (2012) used the M-EPS to determine what motivated adults to participate in Master Gardener program in Florida. Prior to their study, the M-EPS had not been previously used to identify motivation orientations for participation in Master Gardener or other non-formal educational programs (Strong & Harder, 2012). Only the Escape from Routine (.81) and Community Service (.84) factors were found to have reasonably high reliability levels when using Cronbach. The remaining factors (Professional Advancement .70, Competence-related Curiosity .76, Interpersonal Relations .77, and External Influence .79) had low reliability levels.

Studies indicate that individuals engaged in voluntary organizations are driven by a desire for knowledge and the opportunity to put their ideas into practice (Clary et al., 1992). While PBAs are volunteer organizations, motivations for volunteering in the PBA itself may differ from the motivations for participating in PBA educational events. The continued interest from program planners in the motivational orientations that compel people to participate in adult education can be accounted for by the desire to develop programs that meet learner needs and interests (Boshier & Collins, 1983). However, adult learner motivation has been described as complex and subject to change (Merriam & Caffarella, 1991). The lack of studies on adult

learner motivation provides opportunities for continued research aimed at gaining a deeper understanding of the phenomenon of adult learning (Wilson, 2005), particularly in non-formal education.

Adult Learning in Non-Formal Education

In theory, andragogy is broadly applicable to various adult learning contexts, including post-secondary education, vocational education, leisure courses, and workplace training (Wilson, 2005). The six principles of andragogy guide educators in transitioning adult education from a teacher-centered to a learner-centered approach. These principles of adult learning delineate how instructors can meaningfully influence their students. Emphasizing a learner-centered approach, these principles encompass various aspects including students' learning needs, curriculum design, course delivery, and student assessment (Holton et al., 2009).

Etling (1993) suggests that non-formal education is learner-centered, emphasizing practical skills, knowledge, and application. Such education is typically structured as instructional programs offered by community associations, cultural institutions, and voluntary organizations (Merriam et al., 2007). According to Boateng (2009), non-formal educational institutions and employers provide sixty percent of non-formal education and training. Despite its prevalence, evaluating participation in non-formal educational programs remains challenging (Merriam et al., 2007), likely contributing to the scarcity of published research (Strong & Harder, 2012). Taylor (2006) notes the problematic lack of understanding about non-formal education in the literature, given its widespread presence and the limited information available about its unique educational context and practices.

Adult learning can play an important role in helping adults develop and sustain essential information-processing abilities and gain additional knowledge and skills over their lifetimes

(Organisation for Economic Co-operation and Development [OECD], 2019). Across the world, adult learning frequently occurs through non-formal and/or informal education and training, rather than formal education as primarily experienced by young people (OECD, 2022). This trend is consistent across all countries, including among 25–34 year-olds, who constitute the age cohort with the most participation in formal education and training (OECD, 2019). In the majority of countries, the participation rates for both women and men differ by less than five percentage points (OECD, 2019). Therefore, providing and ensuring access to organized learning opportunities for all adults beyond their initial formal education is crucial (OECD, 2013).

Kuenzi (2005) highlights the significant role of non-formal education in developing countries. Of the numerous countries that participate in the Survey of Adult Skills developed by the Programme for the International Assessment of Adult Competencies, it was found that approximately one-half of adults (25–64 years old) participate in adult education, mostly opting for non-formal education (OECD, 2019). Non-formal education can include activities such as seminars, private lessons, on-the-job training, and distance learning courses (OECD, 2019). Substantive research on non-formal education participation in the U.S. is limited (Taylor, 2006). However, it has been found that nearly 60% of adults (25–64 years old) in the U.S. participate in some form of adult education; 45% participate in non-formal education only, less than 5% participate in formal education only, and roughly 10% participate in both formal and non-formal education (OECD, 2019).

Participation rates in non-formal education and training have been found to decrease as people age (OECD, 2019). Younger adults (aged 25–34) exhibit higher rates of participation in both formal and/or non-formal education and training compared to older age groups (35–44, 45–54, and 55–64 year-olds) (OECD, 2019). The older demographic is more inclined to pursue

education for reasons such as cognitive interest and social contact, as indicated by various studies (Boshier & Ridell, 1978; Fisher, 1983; Kim & Merriam, 2004; Prichard, 1979; Russett, 1998).

There have been several studies that have attempted to examine adult learners' relationships with the andragogical principles and design elements (Cannonier, 2014; Leigh et al., 2015; Watts, 2015). Surveys are the most widely used research approach to measure and test the theory of andragogy (Brockett & Darkenwald, 1987) and in the adult learning field (Williams, 2001). Numerous instruments measuring andragogical principle and process design elements emerged in the literature in the late twentieth century, each adding to the collective body of knowledge (Christian, 1982; Colton & Hatcher, 2004; Conti, 1978; Hadley, 1975; Kerwin, 1979; Knowles, 1987; Perrin, 2000; Suanmali, 1981). However, each instrument exhibited its own shortcomings and constraints, particularly in its failure to entirely isolate (1) adult learners, (2) the six andragogical principles, or (3) the eight andragogical process elements (Holton et al., 2009). In 2009, the Andragogy in Practice Inventory (API) was established by Holton et al. (2009) to measure learner satisfaction and evidence of learning through andragogical teaching methods.

A review of the literature found that most instruments were developed to measure the differences in beliefs, teaching behaviors, and effective learning strategies employed by the adult educators (Conti, 1978; Hadley, 1975; Knowles, 1987; Suanmali, 1981), or to measure the student's perceptions of the educator's behaviors (Kerwin, 1979; McCollin, 1998; Perrin, 2000). One of the few instruments found that measured the student preferences, attitudes, and beliefs about education rather than about their educator was the 50-item Student Orientation Questionnaire (SOQ) (Christian, 1982). It was created to gauge student preferences for either

andragogical or pedagogical instruction, however, the SOQ inadequately measured all six principles of andragogy. In addition, the sample primarily consisted of 300 military and civilian personnel from a mandatory management training in a military educational environment, as well as adults attending voluntary education programs conducted on the military installation by a local university, limiting the generalizability of the findings to all adult learning settings.

The API serves as a psychometrically robust measurement tool aimed at determining the application of andragogy in adult education (Bates, 2020). In the original study conducted to evaluate the validity and reliability of the API, the API originally consisted of a 77-item Likert scale measurement instrument that “solicited student responses in two areas: (Section 1) agreement with andragogical principles for a total of 35 items, and (Section 2) perception of the instructor’s andragogical behaviors and learning design process for a total of 42 items” (Holton et al., 2009, p.181). The statistical analysis from the study reduced the number of items from 77 to 43 (21 for andragogical principles and 22 for andragogical process design elements) (Holton et al., 2009). Additionally, of the six andragogical principles examined, only five factors emerged explaining 60.6% of the variance; the ‘Orientation to Learning’ principle was not retained. However, this study was still more successful than any previous study in measuring andragogical principles and process design elements and was the first instrument with sound psychometric qualities to successfully measure most of the andragogical constructs (Holton et al., 2009).

The original 2009 API was later updated in 2010 and there since been several versions (Bates, 2020). Utilizing the same 5-point Likert-type scale spanning from strongly disagree to strongly agree, the most current version of the API (version 4) comprises 60 items strategically designed to assess 14 variables across two domains: andragogical principles and andragogical design elements (Bates, 2020). The questionnaire aims to gauge the extent to which learners

perceive the alignment of their learning activities with andragogical principles and the design of andragogy processes (Knowles et al., 2020). The API is segmented into two sections, encompassing andragogical principles scales and andragogical design scales.

In the pursuit of validating the API, two studies were identified in the literature search. Park et al. (2016) reported a reliability score of .82, and Yusoff (2011) asserted a reliability of .87 through Cronbach's alpha analysis. Yusoff's (2011) study, conducted among 196 first-year medical students in Malaysia, focused on testing the validity and reliability of the API. Park et al. (2016) aimed to assess the API's validity and explore the relationship between adult learning principles and learner satisfaction in a Jordanian context, garnering 305 responses from adults enrolled in a higher education institute in Jordan.

The API has also been used to evaluate the extent to which educational programs reflect the principles and design elements of andragogy in clinical experiences (Leigh et al., 2015). Leigh et al. (2015) found that Cronbach's alphas for the Andragogical Principles Scales reflect strong internal consistency of the instrument (ranging from .91 to .96). No studies were found through the literature search to validate the API for non-formal adult education.

It has been argued that successful learning should have a combination of all six principles of andragogy (Chinnasamy, 2013). Holton et al. (2009) suggest that every practitioner aiming to implement andragogical approaches should seek feedback from students to gauge their success as facilitators and assess whether student achievement and satisfaction are outcomes of the learning experience. It is important to understand whether these programs are meeting the learner's expectations since adult learners tend to experience increased satisfaction when the learning process and environments align with their expectations (Park et al., 2016).

Educational and Training Opportunities for Prescribed Burning

As noted by Stephens and Ruth (2005), fire management is in transition from a period predominantly focused on fire suppression to one where both fire use and suppression are considered viable options for resource management. Given this evolving paradigm, the education and training system also needs to adapt toward a more integrated perspective on the use of fire within ecosystems. There is a pressing necessity for outreach initiatives designed to educate landowners about the ecological and economic benefits of periodic prescribed fire (Stroman et al., 2020). Prior studies have indicated that although educational programs can enhance landowners' knowledge and acceptance of prescribed fire programs, this may not necessarily result in the adoption of the practice (Loomis et al., 2001). In contrast, PBAs are highly effective in involving landowners in prescribed fire utilization. PBAs provide their members with fire safety training and equipment, fostering a culture of safe fire application through collaborative efforts on burn days (Kreuter et al., 2019; Toledo et al., 2014; Twidwell et al., 2013; Weir et al., 2016).

Kobziar et al. (2009) recommend the integration of training, education, and experience for wildland fire professionals. Some colleges also provide their students with the training, education, and experience needed to become wildland firefighters (Wagner & Fawcett, 2025). The researcher argues that this same integration is necessary for non-professionals such as PBA members. In many states, educational opportunities, though often limited, are available to anyone interested in learning more about prescribed burning through their state forestry agencies, Extension offices, or other educators. Certified prescribed burn manager courses provide landowners an opportunity to gain education at a state level for the states in which they exist (Matonis, 2020). Many online learning opportunities are also available (North Carolina State

University, 2016; University of Florida Institute of Food and Agricultural Sciences, 2024; Weir et al., 2016).

Despite the aforementioned opportunities, more prescribed burn education and training are needed for private landowners and PBA members (Riechman et al., 2014). Regmi et al. (2024) found that landowners' limited knowledge and experience with prescribed burning indicate a need for education and training programs in the Northeast/Mid-Atlantic region. Training was also identified as the most important need in a 2012 survey of PBAs across the Great Plains (Weir et al., 2015). In response, Extension professionals developed a regional online basic prescribed fire-training course for the Great Plains, with content on weather, smoke management, firebreaks and equipment, and each state's fire laws (Weir et al., 2016). Regmi et al. (2024) suggest that liability concerns among landowners in the Northeast/Mid-Atlantic region related to escaped fire indicate a need for educational programs to improve landowner understanding of liability protection options in their state. Stroman et al. (2020) suggest that these programs should also offer training and assistance in prescribed fire usage to alleviate concerns regarding the legal liability associated with this management approach. A PBA leader from the Napa PBA in California shared that, "...you need people with training who can carry out a prescribed fire..." (Rougle, 2019) as the most important factor a PBA needs for success.

Most PBAs provide education, training, and experience to their members, though the amount, type, and requirements for participation appear to vary (Deak et al., 2025b). These programs include "learn and burn" events where people can participate in a burn, demonstration burns where people can watch a burn, meetings with natural resource experts, and to a lesser degree workshops and field tours, networking events, certification courses and online resources (Deak et al., 2025b). A majority (77%) of PBAs provide experiential training and view each

prescribed burn as a training opportunity (Deak et al., 2025b; Roughton, 2019). The NC Sandhills PBA provides workshops, field days, and mentorship programs to private landowners and participants who wish to increase their comfort, capacity, and confidence to conduct prescribed burns (Sandhills Prescribed Burn Association, n.d.). The Southeastern Illinois PBA required that all members attend a minimum amount of training, often including both classroom sessions and field days to give members broader stewardship training while developing operational skills (Riechman et al., 2014). According to Biemiller (2018), the greatest strength of PBAs is that they increase the education, training, experience, and skill sets of landowners. However, he notes an opportunity to develop training protocols that are more appropriate for private landowners. While other types of forest landowner associations often provide educational content to their members in a structured manner (Kronholm, 2016), there are currently no standard curricula or training specific to the needs of members of PBAs.

Common themes that have contributed to landowner participation and learning in landowner networks include maintaining an atmosphere conducive to social learning, emphasis on local information and hands-on learning, and access to rich networks that include both practical peer-derived information and trusted technical expert-derived information (Kueper et al., 2012). Many studies report that non-industrial private landowners respond best to interpersonal communication with experts and peer-to-peer approaches (Monroe et al., 2006; Ricci et al., 2010). The premise of peer learning is that people learn with and from each other in both formal and informal ways (Boud, 2001). It is frequently used in higher education (Boud, 2001; Havnes, 2008), but in the realm of agriculture and natural resources, it involves landowners sharing their knowledge and experience with one another through existing social networks or facilitated peer learning opportunities (Catanzaro, n.d.). In a peer-to-peer approach,

a sense of equality should be fostered where peers can share knowledge and individuals are acknowledged to serve as both learners and leaders (Kunkle et al., 2015). Peer teaching, in which a more advanced member with more experience takes on an instructional role and may include payment for their work (Boud, 2001), may also occur. The role of the resource professional in self-sustaining peer networks includes convener, facilitator, and/or source of information (Catanzaro, n.d.).

Landowner networks where peers share knowledge and experience are a proven method to broaden the reach of educational programs such as those needed to increase the use of prescribed fire on private lands (Kueper et al., 2012). Peer learning efforts by local forest landowner associations and prescribed burn cooperatives have gained recognition as ways to increase landowner engagement in forest planning and management (Rickenbach, 2009; Twidwell et al., 2013). Peer-to-peer learning has been used in wildland fire educational programs and was favored by participants over traditional teaching methods (Restivo et al., 2023). To help landowners feel more comfortable implementing prescribed fire, a variety of methods that use interpersonal contact and hands-on learning should be used (Toman et al., 2006).

Competencies Necessary for Prescribed Burning

A competency, according to the dictionary, is ‘possession of sufficient knowledge or skill’ or ‘a specific area of competence’ (Merriam-Webster, n.d.). Competencies are commonly developed through the acquisition of knowledge and hands-on experience, frequently emphasizing cognitive processes (ten Cate & Schumacher, 2022). Competencies represent distinct elements of broader competence, tailored to particular tasks. It's widely accepted to view them as the integration of knowledge, skills, and attitudes (KSAs) necessary for executing those specific tasks (van Merriënboer et al., 2002). According to ten Cate & Schumacher (2022), “it is

the *ability* that counts” (p.491). In the case of this study, competencies are a person’s abilities to perform activities that lead them to be successful in prescribed burning. Skills, in comparison, are the specific activities that a person needs to perform to do something well (ten Cate & Schumacher, 2022). These include both technical and quantifiable hard skills that a professional may demonstrate through their specific qualifications and soft skills that are non-technical and less rooted in specific vocations. For example, hard skills needed for prescribed burning could include the proper use of fire tools (such as a driptorch, rake, swatter, shovel, etc.) or suppression equipment (such as a water sprayer or pumper). Soft skills useful for prescribed burning could include teamwork, leadership, adaptability, and verbal communication.

Competencies should be developed using past studies of effectiveness or from important program learning objectives (Borich, 1980). Many competencies have been described as necessary for fire professionals to conduct prescribed burns (Diaz & Evans, 2015; NWCG, 2024). However, no known efforts have been made to develop a comprehensive list of necessary competencies to conduct prescribed burning for non-fire professionals such as PBA members.

Prescribed burners within many local, state and federal agencies, and some non-governmental organizations, must adhere to the minimum qualifications standard for training, experience, physical fitness, and professional currency for mobilization to wildland fire incidents as outlined by the National Wildland Fire Coordinating Group (NWCG) Wildland and Prescribed Fire Qualifications System Guide (PMS 310-1) (Diaz & Evans, 2015; NWCG, 2024). NWCG uses a performance-based approach that focuses on verifying the capabilities of personnel to fulfill the necessary roles in incident-related positions (NWCG, 2024). This approach integrates education, training, and experience to cultivate proficiency and establishes performance as the primary qualification criterion. NWCG achieves this by fulfilling mandatory

training, accumulating necessary experience, meeting physical fitness standards, and obtaining certification through the relevant NWCG Position Task Books (PTB) in wildland fires, events, incidents, job activities, and through simulated exercises or classroom tasks (NWCG, 2024).

Competencies are specific to various positions within the Incident Command System (ICS). ICS is a standardized approach to emergency management across the country that numerous agencies and organizations follow for wildfires and prescribed fires. NWCG uses a comprehensive list of core competencies and behaviors for each position qualification. These competencies and behaviors serve as the foundation for position-specific training, PTBs, job aids, and other performance-based documents (NWCG, 2024). Each position in the ICS has a PTB; this offers a standardized and quantifiable method to assess and record the proficiency of trainees in a manner that is observable and measurable (NWCG, n.d.-a). According to NWCG (n.d.-a), “Each PTB lists the competencies, behaviors, and tasks required for successful performance in specific positions. Trainees must be observed completing all tasks and show knowledge and competency in their performance during the completion of this PTB.” Maintaining qualification in a position is achieved through completing recurrent training, undergoing annual fitness assessments, and consistently demonstrating successful performance in the designated position (NWCG, 2024).

In addition to the NWCG PTBs, the NWCG Incident Response Pocket Guide (IRPG) is an essential, pocket-sized job aid for wildland firefighters, providing best practices, checklists, and guidance on key competencies and decision-making during incidents (Topo Fire, 2023). It provides operational standards and critical information on risk management, fire environment, and aviation management. The IRPG provides a structured framework for making sound decisions, which often rely on individual judgment, creativity, and collaboration (Topo Fire,

2023). These skills are developed through training, practice, and experience, which the guide facilitates.

One NWCG position that requires such skills for prescribed burning is the Prescribed Fire Burn Boss 3 (RXB3), who directs prescribed fire operations on burns of low complexity (i.e., few personnel assigned, a very low threat of escape and present a minimal risk to personnel involved in the operation) (NWCG, n.d.-b). The RXB3 PTB includes multiple tasks in the following three categories: General (i.e., review policies and burn plan, safety), Prescribed Fire Activities (i.e., recon the burn unit, obtain and interpret weather conditions, conduct burn operations, etc.) and Post-Burn Operations (i.e., evaluate and document accomplishment of fire objectives, ensure post-burn records are completed, monitor costs). While not formalized in the NWCG system yet, two new positions have been proposed to provide opportunities for prescribed fire practitioners to gain confidence and skills in burning at a basic level before advancing to the RXB3 position (G. Wood, personal communication, February 26, 2024). The Ignition Team Member and Prescribed Fire Practitioner positions would allow prescribed burners to work from a PTB without the requirement of participating in a wildfire, which most NWCG positions require. This could be useful for prescribed burners who do not work in a fire suppression agency but would like to adhere to NWCG protocols.

No similar method to the PTB exists to measure the competencies of prescribed burners that do not follow the NWCG standards, such as private landowners and PBA members. However, non-NWCG prescribed burn certification programs have been established in many U.S. states, in which both professional fire practitioners and landowners can participate. Twenty-one states possess laws or policies mandating state agencies to supervise formal training programs for certifying individuals in safe burning techniques (Matonis, 2020). The majority of

prescribed burn regulations stipulate that individuals must satisfactorily finish their state's certified prescribed burn manager program to qualify for liability coverage (Cary et al., 2024; Matonis, 2020). Among these states, fifteen currently maintain active Certified Prescribed Burn Manager (CPBM) programs (Matonis, 2020). Certification programs in Alabama, Mississippi, North Carolina, Tennessee, and Virginia have reduced requirements as compared to other states which more closely follow NWCG standards, making them more accessible to landowners that have limited to no prior fire experience (Matonis, 2020).

One of the overarching goals of the certification programs is to ensure that prescribed burners have the knowledge and experience necessary to safely conduct prescribed burns (Matonis, 2020). Each state certification program includes coursework covering subjects such as fire weather, fire behavior, burn planning, burning laws and regulations, safety and personal protective equipment, and smoke management (Matonis, 2020). Additionally, certain states include instruction on firing tools and techniques in their curriculum. Other states require a specified number of hours of continuing education to maintain certification. Alabama Certified Prescribed Burn Managers must complete six hours of approved continuing education every five years. This requirement ensures that prescribed burn managers remain updated on the latest advancements in technology, particularly in relation to air quality (Hanby & Alabama Forestry Commission, 2012). Eight states require individuals to demonstrate competency by writing burn plans and conducting between one and five prescribed burns (Matonis, 2020). While most CPBM programs provide learning objectives for the coursework, the programs are not available in every state and are not required for landowners to participate in the states that do have programs. Therefore, there are no set competencies available at a national level for PBA members.

A review of the NWCG proposed Prescribed Fire Practitioner and RXB3 PTBs and various state CBMPs do provide some guidance as to basic competencies that are necessary for anyone conducting prescribed burning. In addition, the *Guidebook for Prescribed Burning in the Southern Region* was developed by Extension and fire professionals as a reference for private landowners and others in the Southeast who conduct, or would like to conduct, prescribed burns (Boby et al., 2023). This guidebook provides a step-by-step process and covers information necessary for a burner to create a burn plan and conduct a burn in accordance with their state laws (Boby et al., 2023). The chapters within the guidebook outline several categories in which a burner must be proficient: Getting Started, Planning, Conducting, Evaluating, Weather, Smoke management, Fuels, and Fire behavior. Within each of these chapters, specific competencies can be inferred based on the checklists of information to be gathered, actions to take, and the content. In the *Oklahoma Prescribed Burning Handbook*, Weir et al. (2021) provide information on how to properly plan and conduct a prescribed burn in Oklahoma; however, much of this information could be transferable to other states as well.

Prescribed burn training for which competency standards have been set is also available in many other parts of the world, including Europe, South America, and Australia (Colaco & Molina, 2010). In Europe, six competency standards were developed for fire crews and personnel working in both wildfire suppression and prescribed burning. These range from safety and communication to applying ignition techniques (Colaco & Molina, 2010).

The Australian competency framework comprises two levels of prescribed burns (i.e., simple and complex); separate competencies for planning and conducting prescribed burns; pre-requisite requirements for training in safety and operational firefighting prior to training to plan or conduct a prescribed burn; and a pre-requisite requirement for training in safety prior to

training to assist with prescribed burning (Australasian Fire and Emergency Service Authorities Council Limited [AFAC], 2018). AFAC (2018) describes the training content required for each position. For example, training content for the Burn Crew Member role or “The person participating in lighting and conducting prescribed burns under direct supervision” includes nearly 40 topics from various agencies; of these, all of the agencies delivered the following units of competency: work in a team, prevent injury, and respond to wildfire. It was found that most of the agencies deliver training related to safety, operation of communications equipment, driving, and navigation to a fire (AFAC, 2018). A Burn Manager/Operations Officer role (simple burn), or the person “Responsible for the management of all operational aspects and resources allocated to a simple prescribed burn, i.e. a burn characterised by low risk, low intensity, small area, low risk to assets, with minimal variation to fuel characteristics and terrain,” is required to take additional coursework (AFAC, 2018).

Different agencies apply units of competency to prescribed burning roles and developmental pathways in varying ways (AFAC, 2018). Based on a review of prescribed burn training and competencies, AFAC (2018) proposed ‘Skill Sets’ for key prescribed burning roles, along with the associated competencies (AFAC, 2018). The number of competencies grew as the roles became larger; for example, the three competencies proposed for a burn crew member included ‘work in a team,’ ‘prevent injury,’ and ‘respond to wildfire,’ whereas eight competencies were proposed for a Prescribed Burn Operations Officer (complex burns) (AFAC, 2018). It was suggested that necessary competencies should differ between simple and complex burns; it was similarly suggested that the units of competency should be split for planning and conducting a burn. Gaps in the current units of competencies that needed to be strengthened were

found through the review. These included lighting patterns (for both ground and aerial ignition), risk management, and training for strategic and support roles.

Since the aforementioned training and competency requirements were only for Australian agencies and none exist for landowners, AFAC (2018) suggests that Skill Sets should also be developed for community or local groups undertaking small burns on private property since community groups and local landholders currently conduct and will continue to conduct prescribed burning on their own land. These Skill Sets would provide the minimum skills for a person planning, conducting or assisting with a small burn on private property. Review of the literature provided ample guidance on the competencies necessary for prescribed burning. In combination with expert input as part of this study, the review informed the development of a list of core competencies needed for prescribed burning by PBA members.

Extension's Potential Role in PBAs

The Cooperative Extension Service (CES) is a nationwide, non-credit educational network dedicated to addressing public needs through the provision of non-formal higher education and learning activities to farmers, ranchers, communities, youth, and families across the nation (USDA, n.d.-b). With a century-long history, CES is effectively positioned to deliver essential tools and knowledge to those who require them (USDA, n.d.-b). The need for CES to play a larger role in wildland fire education and outreach has been recognized, in part, by the establishment of the National Extension Wildland Fire Initiative (NEWFI) in 2018 (Association of Natural Resource Extension Professionals [ANREP], 2025). NEWFI is an initiative within the Association of Natural Resource Extension Professionals (ANREP) and functions to bring Extension professionals together to increase and promote Extension engagement on wildland fire issues, including prescribed burning (ANREP, 2025). Given Cooperative Extension's

responsibility to address community needs and its role as a reliable resource, Extension is both capable and encouraged to take an active role in collaborating with landowners and communities on matters related to wildland fire (ANREP, 2025). There is an urgent and critical need for Extension educators to also be capable of and confident in providing research-based science findings and their implications to a diverse audience, including PBAs since they are a quickly growing landowner group (Deak et al., 2025b).

Surveys of CES professionals and private landowners indicate a need for more accessible prescribed fire information and training (Fawcett et al., 2021; Miller, 2022; Miller et al., 2024). Expanded involvement of CES in prescribed fire education and training has been recommended, including: “Partnering with Extension professionals to offer programs such as ‘Learn and Burn’ workshops; Crafting a ‘Master Burner,’ or similar program modeled after Master Naturalist Programs that are designed to bring more information topics including fire implementation, burn plan writing, Fire Adapted Communities, and Firescaping; and connecting with landowners and others interested in prescribed fire through existing Extension channels such as Master Gardener programs” (Fawcett et al., 2021, pg. 29).

There is currently an effort underway to provide Extension personnel across the Southern region with fire-related training, based in part on a needs assessment of 23 Extension professionals from the Southern region focused on basic wildland fire knowledge gaps (Miller, 2022). The needs assessment found that the most common topics requested for in-service training include general fire and forestry knowledge (22%), on-the-ground protocols (22%), prescribed fire as habitat tool (17%), and how to talk to landowners about prescribed fire (17%) (Miller et al., 2024). A majority (83%) responded that they personally or their office received requests for fire information or on-the-ground assistance from their clientele. They rely on

several sources, including PBAs, to acquire more information about fire or to send their clientele for assistance (Miller, 2022; Miller et al., 2024). Extension personnel should be well-versed in PBAs and prescribed burning to be fully prepared to answer questions and create programs that benefit PBA members.

Even with the recognition of the need for more wildland fire education and training, many CES professionals already provide prescribed fire-related training, resources, and information to private landowners and PBA members. Miller et al. (2024) found that 70% of interviewed Extension professionals ($N = 23$) had experience with fire-related Extension programming, especially ‘Learn and Burn’ events, and 17% had experience with starting a PBA, a process that requires not only a working knowledge of fire but also an understanding of regulations and the ability to coordinate and collaborate with landowners, agency employees, and community members (Kreuter et al., 2008).

A recent survey found that 22% of responding PBAs reported that Extension played a critical role in supporting them (Deak et al., 2025b). To date, Extension has played a variety of roles when working with PBAs. This has consisted of compiling PBA-related information (Fawcett, 2025), developing fact sheets and educational resources (Boby et al., 2023; Diaz et al., 2016; Weir et al, 2017), advising and participating in research studies (Biemiller, 2020; Jobes, 2019; Miller, 2022), participating in PBA burns (Deak et al., 2025b), providing education and training to PBA members (Deak et al., 2025b), and assisting in PBA formation (Miller et al., 2024; The Nature Conservancy, 2020). Based on the researcher’s experience, this has also included providing meeting facilities and securing funding for food, fire tools, personal protective equipment, and other needs. Extension professionals are an ideal conduit for

disseminating resources related to prescribed fire and bringing landowners together to form PBAs because of their relationship with their local community.

Chapter Summary

A review of the literature provides background and context for the need and significance of the study. More prescribed fire is needed throughout the U.S., especially on private lands. However, numerous barriers to burning have been cited in the literature. Prescribed Burn Associations (PBAs) have been identified as an avenue to increase the use of fire on private lands. PBAs are comprised of landowners and other community members with an interest in prescribed burning, usually formed at the local, county, or multi-county scale, with a primary goal of cooperatively conducting prescribed burns. PBAs began in the mid-1990s in the Great Plains (Weir et al., 2016) but have expanded rapidly and there are now approximately 140 PBAs across the country (Fawcett, 2025; GPFSE, 2025). Membership requirements vary by PBA (Deak et al., 2025b) and member demographics are unknown at a national level.

While much of the learning that takes place within PBAs is peer-to-peer, there are many opportunities for PBAs to provide non-formal education, training, and experience to their members, especially on topics that have been identified as areas where members feel the least proficient. Most PBAs already provide some form of education and training to their members (Deak et al., 2025b). Understanding the motivations driving members to participate in PBA educational programs is beneficial to develop and deliver programs that relate to adult needs (Merriam & Brockett, 2007) and can improve their learning (Merriam et al., 2007). Numerous instruments have been developed over the years to attempt to measure the motivational orientations of adults for participating in continuing education; this study, in part, built off

previous versions of the Education Participation Scale (EPS) (Boshier, 1982, 1991) to develop a new scale specific to PBA members.

In addition to understanding motivational orientations, the six principles of andragogy (Knowles et al., 2020) are important for adult learning. The API (Bates, 2020) is the most widely used scale to measure the extent to which the andragogical principles and design elements are evident in adult education programs, and a modified version will be used in this study. Many competencies have been described as necessary for fire professionals to conduct prescribed burns (Diaz & Evans, 2015; NWCG, n.d.); however, no comprehensive list of necessary competencies to conduct prescribed burning exists for non-professionals such as PBA members. Understanding the competencies for which PBA members are the least proficient will determine potential future training needs. Extension has played an important role in supporting PBAs to date (Deak et al., 2025b) and there are opportunities to provide further support.

CHAPTER 3: METHODOLOGY

Research Design

This study employed a descriptive survey research design. Fraenkel et al. (2012) describe the purpose of a descriptive study as aiming to “describe a given state of affairs as fully and carefully as possible” (p. 15). To achieve this, a survey instrument was developed (Appendix A) with four major sections to determine: 1) the motivations of PBA members for participating in PBA-offered educational programs, 2) the perceived application of andragogical principles in PBA-offered educational programs, 3) the training needs of PBA members related to prescribed burning, and 4) the demographic characteristics, prescribed burning experience, and PBA participation of PBA members.

The survey's design included several questions in each section to determine these key aspects, starting with their motivations for participating in PBA educational events. A motivational orientation instrument consisting of 28 items in five constructs was used to determine PBA members' motivations to participate in PBA educational events. A modified version of the Andragogy in Practice Inventory (Bates, 2020) was used to determine the application of andragogical principles in PBA educational events. The Borich Needs Assessment model (Borich, 1980) was used to determine the competencies perceived as important for PBA members, their self-assessed proficiency level, and training needs related to prescribed burning. Questions regarding demographic characteristics, prescribed burning experience, and participation in the PBA were also included. The survey was conducted online using Qualtrics. To fulfill the purpose and meet the objectives of this study, the details of the procedures for data collection, analysis, and survey methodology have been carefully outlined and are provided in the sections below.

Population and Sampling

There are 140 documented PBAs across the U.S. (GPFSE, 2025). Each PBA operates independently with its own leadership and a membership size that can vary widely, ranging from just a few individuals to over 300 members (Deak et al., 2025b). For purposes of this study, members were defined based on the range of membership descriptions provided by PBA leaders in Deak et al. (2025b), which varied from an informal email list to formal memberships with paid dues.

The study's population consisted of all members of known active PBAs. Active PBAs were defined as those that offer at least one educational event or prescribed burn annually and maintain a membership list. A list of 75 active PBAs was compiled from a recent study of PBA leaders, which gathered information on membership size, the average number of burns conducted annually over the past five years, and the number and types of trainings offered to members each year (Deak et al., 2025a). Eleven additional known active PBAs were obtained by communications between the researcher and PBA leaders, for a total of 86 known active PBAs. The estimated membership of the 86 known active PBAs is approximately 10,617 members. This estimate was derived by averaging membership ranges reported in Deak et al. (2025a) and incorporating actual membership data collected directly from PBA leaders participating in this study.

A population frame was developed by contacting the PBA leaders of the documented PBAs and collecting as many membership email contact lists as possible. Of the 86 active PBAs, contact lists were obtained for 18 PBAs, consisting of 1,493 members. An additional 28 PBA leaders opted not to share their contact lists, but instead agreed to send the survey to their 5,504 members on behalf of the researcher, either via email or text messaging programs such as

GroupMe. Therefore, a total of 6,997 PBA members from 46 PBAs in 18 states across the country (Appendix B) comprised the population frame, which was the accessible portion of the population. The contact lists were evaluated and assessed by speaking with the coordinators to determine whether the list is updated and maintained regularly, contains everyone in the population, does not include people who are not in the study population, and does not contain entries listed more than once (Dillman, 2007). While it may have been more advantageous to draw a random sample of PBA members, logistically it was impossible to apply random sampling techniques on PBAs that opted not to share their members' contact information.

The researcher sent emails to 1,493 PBA members in 18 PBAs asking for their online participation in the survey using the Dillman Tailored Design Methodology (Dillman et al., 2014). The 28 PBA leaders who preferred to send out the request on the researcher's behalf received instructions and suggested language to send to their members. The researcher coordinated with those PBA leaders to ensure that the Dillman Tailored Design Methodology was followed, however, it is possible that up to six PBAs, representing 1,431 members, sent only the initial invitation without an announcement or reminder, and up to 13 PBAs may have sent just the announcement and survey invite, but not the reminder. A chance to win one of three books was offered as an optional incentive to complete the survey.

Instrumentation

Qualtrics software was utilized to design an online survey for collecting data from PBA members. To address the research objectives, the survey included questions on demographics and experience in prescribed burning, a Borich Needs Assessment based on competencies, and two scales: one to determine PBA members' motivational orientation to learning and a modified version of the Andragogy in Practice (API) to evaluate the extent to which PBA-offered

education programs reflect andragogical principles. After obtaining IRB approval, the survey was pilot tested with a purposively selected group of prescribed burners who were not part of the study population but were familiar with the needs of PBA members. Results from the pilot test were used to further refine and improve the instrument. Participants were asked to provide informed consent before proceeding with the survey. The survey instrument consisted of four major sections:

Section 1: A motivational orientation scale, which was validated as part of this study.

Section 2: A modified version of the Andragogical Principles portion of the Andragogy in Practice Inventory (API) version 4 (Bates, 2020).

Section 3: A Borich Needs Assessment instrument. The competencies perceived as important for PBA members to conduct prescribed burning and their self-assessed proficiencies in these competencies were validated as part of this study.

Section 4: Demographic information and prescribed burning experience.

Section one consisted of 28 scale items in five constructs designed to measure PBA members' motivations for participating in PBA-offered educational programs. These items and constructs were developed for this study based on relevant factors the Educational Participation Scales (EPS and EPS-A) (Boshier, 1982, 1991), Adult Learning Theory, and a review of the literature. Four motivational factors, whole or in part, were selected for inclusion in the motivational scale: the Community Service factor from the original Educational Participation Scale (EPS) (Boshier, 1982), which reflects motivation to "do good" in civil society, and three factors from the revised EPS-A scale (Boshier, 1991): Social Contact (enrollment to meet new people and make friends), Cognitive Interest (pursuit of knowledge for its own sake), and Professional Advancement (focused on job growth in current or future roles). The remaining

motivational factors from the EPS and EPS-A (Communication Improvement, Educational Preparation, Family Togetherness, and Social Stimulation) were excluded, as they were not deemed relevant to PBAs.

Given the rapid growth of PBAs nationwide and their reliance on non-formal training for prescribed burning (Deak et al., 2025b), it was important to develop a scale that incorporated additional constructs specifically related to prescribed burning and demonstrated strong face validity for PBA members. To address this need, two additional constructs (i.e., Knowledge and Skills Development and Environmental Stewardship) were included based on the literature, discussions with experts, and personal knowledge of the subject. The learning motivation scale was further refined through expert feedback and pilot study results, consolidating an originally proposed 41 items across eight constructs into 28 items across five constructs (Table 2). The items were rated on a five-point Likert scale with 1 being “not a motivator” and 5 being “extreme motivator” to assess the extent to which each of the 28 items motivated them to participate in the PBA-offered educational program. The higher the mean score, the stronger the motivation to participate in the program.

Section one also included questions to capture information about the average number of PBA-offered events attended annually, the type of PBA event respondents participated and an open-ended question to identify additional motivations not encompassed in the scale. For members who had not participated in a PBA event within the last 12 months, an additional question was included to identify reasons for non-participation, with an open-ended option to specify any reasons not listed.

Table 2*Scale Descriptions of Motivations for Participation in PBA-Offered Educational Events*

Construct and Description	Item Number and Description
Knowledge and Skills Development: motivated to acquire the practical knowledge and skills necessary for conducting burns safely and effectively	1) To learn new skills to conduct burns safely and effectively
	2) To gain proficiency in using fire tools and equipment
	3) To increase my overall competence in burning
	4) To stay informed about emerging technologies and techniques that could help me with future burns
	5) To understand the burning laws and liability statutes in my state
	6) To discover strategies to minimize risks associated with burns
Environmental Stewardship: motivated to learn about the ecological benefits of burning and aligns with a commitment to maintaining healthy landscapes and ecosystems	7) To understand how fire can be used to improve land for plants and animals
	8) To learn about fire's role in maintaining a healthy landscape
	9) To align with my commitment to environmental stewardship
	10) To adapt burning practices to changing environmental conditions, such as climate variations
	11) To become proficient in utilizing best smoke management practices to minimize impacts on my community

Table 2 (continued)

Construct and Description	Item Number and Description
Social Engagement and Community Service: motivated to learn with others participating in burning activities, including building relationships, networking, and being part of a supportive community.	12) To have a good time with friends
	13) To meet new people with similar interests
	14) To network with peers and other fire practitioners
	15) To be part of a supportive community that fosters the exchange of ideas, experiences, and best practices
	16) To enhance my ability to serve others, especially those needing help with conducting burns
	17) To become more effective as a community member
18) To fulfill my obligation to assist other members, so they will be willing to help me with burning my property in the future	
Professional Development and Leadership: motivated to enhance personal and professional growth, including career advancement, leadership development, and meeting training requirements.	19) To secure professional advancement
	20) To increase my job competence
	21) To achieve an occupational goal, such as a new qualification
	22) To meet training or professional development requirements (for the state, a job, organization, PBA, etc.)
	23) To improve my communication skills to shape public perception and increase acceptance of prescribed burning
	24) To equip myself to become a mentor or take on a leadership role within the PBA
Personal Fulfillment: motivated to learn related to personal satisfaction, lifelong learning, and honoring cultural heritage.	25) To honor my heritage
	26) To share my knowledge and experience with others
	27) To gain personal fulfillment
	28) To learn for the joy of learning and expanding my mind

Section two of the survey instrument, presented only to respondents who had participated in a PBA event within the last 12 months, consisted of a modified version of the Andragogy in Practice Inventory (API) version 4 (Bates, 2020). The API is typically administered at or around the conclusion of a learning event or experience (Bates, 2020). It originally included a 60-item scale designed to measure 14 variables in two categories: Andragogical Principles (six variables with 24 items) and Andragogical Design Elements (eight variables with 36 items) (Bates, 2020).

For purposes of this study, one item from the Andragogical Principles scale, within the Readiness construct (i.e., “The instructor helped me understand why the learning methods were right for me”) was excluded. This item was not applicable to PBA programs because the instructors likely did not provide this context to the participants, as andragogy is not the focus of the event, and they may not have been aware to do so. Similarly, the 36-item Andragogical Design Elements portion of the API was also excluded, as the PBA programs were likely not designed to apply these elements. As a result, the remaining Andragogical Principles scale included only 23 items, which were used to measure PBA participants’ perceptions of how well the PBA-offered educational programs facilitated student learning based on andragogical principles (Table 3). Some of the items were slightly modified from the original API to better align with non-formal PBA events. Permission was granted for modification and use of the API in this study (Appendix C). Three additional items were included to assess learner satisfaction (Table 4). These items were slightly modified from Wilson (2005), who studied course satisfaction among post-secondary students, to better align with the context of a non-formal PBA event.

Table 3*Scale Descriptions of Andragogical Principles*

Principle	Item Number and Description
Need to Know	1) I needed this learning at this time in my life.
	2) This learning was necessary to help me meet the changes happening in my work or life related to burning.
	3) This learning helped me develop the knowledge and skills I need at this time.
	4) This learning was necessary for the challenges I face.
Self-Directedness	5) I felt responsible for my own learning.
	6) I set my own goals for learning.
	7) I had control over what was learned.
	8) I had a role to play in my own learning.
	9) I made the decisions about how learning progressed.
Experience	10) I felt my prior life and/or work experiences helped my learning.
	11) My life and/or work experiences were a regular part of the learning experience.
	12) I felt my life and/or work experiences were a resource for this learning.
Readiness	13) We did things that illustrated how this learning could help me address real tasks or problems.
	14) The instructor explained how this learning would help me deal with changes in my life or work.
	15) Steps were taken to make clear how the learning would fit my needs.
Orientation to Learning	16) The things I learned will assist me in resolving a work or life problem.
	17) Mastery of this material will benefit me on my next burn.
	18) This learning experience will make a positive change in my life or work.
	19) The knowledge gained in this learning experience can be immediately applied to my life or work.
Motivation to Learn	20) I learn because of the personal satisfaction it gives me.
	21) I learn because of the inner fulfillment it provides.
	22) I learn because of the pleasure of discovering new things that interest me.
	23) I learn for the enjoyment of broadening my knowledge and skills.

Table 4

Scale Descriptions of Learning Satisfaction

Construct	Item Number and Description
Learning Satisfaction	24) Sufficient time was allocated to learn content.
	25) The event contributed to practical knowledge I can use for future burns.
	26) I was satisfied with what I learned at this event.

The items were rated on a five-point Likert scale with 1 being strongly disagree and 5 being strongly agree to assess the six adult learning principles (Knowles et al., 2020) in relation to the PBA program in which the respondents participated. The higher the mean score, the stronger the agreement that the educational program facilitated student learning based on principles of andragogy. Similarly, the learner satisfaction items were rated using the same Likert scale, with a higher mean score indicating a higher level of learner satisfaction.

Section three of the survey consisted of a 21-item scale in five competency constructs (Table 5) designed to measure PBA members' perceptions of the importance of and their current proficiency levels related to various aspects of prescribed burning. Each competency construct scale is composed of a list of competency items relevant to the scale construct. First, a list of the necessary competencies for PBA members to conduct prescribed burns was developed as part of this study based on the literature (AFAC, 2018; Boby et al., 2023; NWCG, n.d.-b; Weir et al., 2021) and personal communication (J. Stober, personal communication, March 28, 2024; G. Wood, personal communication, February 28, 2024). Then, the scale was refined based on feedback from PBA experts when establishing the content validity, including revising the proposed competencies from 31 items in 4 constructs to 21 items in 5 constructs.

Table 5*Scale Descriptions of Competency Constructs*

Construct	Item Number and Competency Description
<p>Planning a Burn: Encompasses the essential preparations and planning activities required to ensure the success and safety of a prescribed burn.</p>	<ol style="list-style-type: none"> 1) Develop clear and actionable objectives for the burn 2) Prepare detailed descriptions of burn units, including vegetation and fuels (e.g., logs, ground litter, plants, shrubs, trees) 3) Create an accurate and detailed map(s) of the burn area to guide operations 4) Identify acceptable weather parameters to execute burns effectively 5) Ensure compliance with state laws and statutes
<p>Smoke Management: Involves the strategies and practices used to manage smoke before, during, and after the burn.</p>	<ol style="list-style-type: none"> 6) Use tools (e.g., smoke screening systems) before the burn to assess potential smoke impacts on your burn unit and the surrounding area 7) Notify adjacent landowners and other parties of the burn and the potential for associated smoke 8) Minimize smoke impacts on the burn crew and smoke sensitive areas
<p>Risk Management and Safety: Emphasizes ensuring safety and managing risks associated with the burn.</p>	<ol style="list-style-type: none"> 9) Develop a plan for holding and contingencies (e.g., critical holding points, response plans for fire escapes and emergencies, etc.) 10) Identify potential hazards (e.g., stump holes, improper clothing, dead trees, stinging insects) before and during the burn 11) Inspect and ensure all tools, including the drip torch, are operational and properly fueled before use 12) Actively mitigate "watch-out" situations to prevent injury or fire escape 13) Conduct thorough mop-up operations to ensure the fire is completely extinguished or safely contained within the burn perimeter

Table 5 (continued)

Construct	Item Number and Competency Description
Burn Operations: Covers practical aspects of executing the burn, including monitoring and evaluation.	14) Complete a "Go/No-Go" checklist to make informed decisions if the burn should proceed
	15) Monitor weather conditions on-site using appropriate tools (e.g., pocket weather meter, sling psychrometer, etc.)
	16) Apply appropriate firing techniques based on real-time weather conditions and fire behavior to achieve burn objectives
	17) Conduct a post-burn evaluation, including determining whether the burn met the objectives
Leadership and Communication: Addresses the leadership and communication skills necessary to effectively coordinate and manage burn operations.	18) Conduct a crew briefing before the burn to ensure all team members are informed and prepared, covering topics such as burn objectives, work assignments, potential hazards, and contingency/back-up plans
	19) Maintain effective communication throughout the burn (e.g., two-way radio, cell phone, walkie-talkie, etc.)
	20) Supervise the burn crew, providing direction for ignition, holding, and other operational tasks to ensure effective and safe execution of the burn
	21) Conduct an after-action review (AAR) with the burn crew after the burn to evaluate the execution of the burn plan, identify successes and areas for improvement, and document lessons learned for future burns

For each item in the scale, participants were asked to rate their perception of the level of importance of each item in conducting a prescribed burn, and then to rate their current proficiency level in each item. Responses to both questions were recorded on a five-point Likert scale, with 1 being not important and 5 being very important, and 1 being very low proficiency and 5 being very high proficiency, respectively. Training needs were then determined using mean weighted discrepancy scores (MWDS) following the Borich needs assessment model (Borich, 1980). To calculate the MWDS for an item, a discrepancy score is calculated by subtracting each respondent's proficiency score from their importance score for each

competency. Each discrepancy score is then multiplied by the mean of the importance scores for that item to produce a weighted discrepancy score. The weighted discrepancy scores are then divided by the total number of responses for that item, resulting in the MWDS. To address the seventh research objective to identify training needs, the mean weighted discrepancy scores were ranked from largest to smallest. Higher MWDS values indicate a greater need for training in that area compared to lower values. In addition to the competency items listed in the scales, an open-ended question allowed for the identification of any competencies not included in the survey that respondents' felt were very important to conduct a prescribed burn.

Section four consisted of questions on demographic information including age, education level, and gender. Demographics have been found to play a role in other adult learning studies. As highlighted by Cranton (2000), student age delineates differences among individuals across several dimensions: (1) their assumptions, beliefs, and values; (2) prior educational backgrounds; (3) the extent of life experiences they bring into the classroom; and (4) disparities in physical or learning strategy requirements. In addition, it has been documented that younger and more educated people generally have a higher participation rate in adult education (Mok & Kwon, 1999). Since this study's subjects are adult PBA members across a range of ages and education levels, these variables became important to examine.

Boeren (2011) found that participation rates in formal, non-formal, and informal lifelong learning activities are similar for men and women; however, there are differences in the types of learning they engage in. While formal and non-formal education participation do not differ significantly by gender, informal self-directed learning differs between men and women (Boeren, 2011), with men preferring individual learning, whereas women place greater importance on social interactions and connections with others during the learning process (Hayes, 2001). Tough

(1978) suggests that motivations for learning often differ based on life roles, which can be influenced by gender. The concept of 'gender' encompasses roles, relationships, and expectations shaped by socio-cultural, political, and economic factors, extending beyond biological differences (UNESCO, 2003). Additionally, Cranton (2000) indicates that men and women potentially learn differently, which could impact the perception of learning strategies. Given these insights, the variable for gender was included in this study.

A few additional exploratory demographic variables were also included in this study due to their possible contribution: affiliation as a PBA member, prescribed burn experience in both years and the number of burns participated in or led, years of PBA membership, and the state in which the PBA primarily conducts burns. A PBA member's prior burning experience and length of PBA membership may influence their motivational orientations. The state in which the PBA primarily conducts burns was included since regional differences could play a role in motivational orientations due to the nature of their respective PBA goals and ecological disparities. For example, PBAs in the Southern region primarily burn for wildlife habitat improvement, while PBAs in the Great Plains primarily burn for the management of invasive species or woody plant encroachment (Deak et al., 2025b). In addition, private landowners have been burning for a longer period of time in the Southeast and Central regions as compared to the western and northeast regions, which could impact motivations to participate in PBA-offered events. A final open-ended question allowed respondents to provide any additional information they wanted to share.

Validity and Reliability

Content validity of the instrument was established by a panel of experts, specifically people who have helped to coordinate or lead PBAs, have conducted previous research on PBAs,

and/or who are experts in needs assessments, adult learning or survey design (Appendix D). Information from existing literature, in combination with information and feedback provided by the experts, informed the development of the questions in the survey instrument. Face validity was established by field-testing the survey instrument with PBA leaders, coordinators and other prescribed burners not used in the study sample. Testing of questions involved two stages: pretesting and pilot testing. Pretesting included cognitive interviews (Willis, 2005) conducted with selected PBA leaders to ensure the questions were understandable, there were no missing items, and the target concepts matched the respondents' understanding (Butler et al., 2021). After the survey questions were revised based on the feedback received during the pretesting, a pilot test was conducted with a group of 17 prescribed burners similar to the target population to verify interpretation of questions and examination of how they responded. Pilot study participants were excluded from the final sample. Data from the pilot test were analyzed to assess instrument reliability, and it was found that all four scales demonstrated high reliability, with Cronbach's alphas of .87, .92, .94, and .93 for the motivational orientation, modified API, competency importance, and competency proficiency scales, respectively. Changes to the survey were made as needed based on the pilot study participants' responses to ensure that the questions were clear and meaningful.

Collecting Data

The data were collected using the research instrument. The target response rate for the online survey was 10%, based on response rates from previous surveys of private forest landowners and ranchers (Bardon et al., 2023; McPeake et al., 2024; Penn et al., 2024; Sliwinski et al., 2018). Response rates were calculated according to the definitions provided in the 2023 *Standard Definitions* by the American Association for Public Opinion Research (AAPOR, 2023).

According to these definitions, respondents are considered individuals who either fully (more than 80% of questions answered) or partially completed the survey, with "partial completion" defined as answering 50–80% of the survey questions. To attempt to achieve this response rate, the Tailored Design Method (Dillman et al., 2014) was used. PBA members received an email with notice that the survey will be forthcoming; then, a few days later, they received an email request to participate in the survey (Appendix E) and a link to the online survey. For the PBAs in which contact information was provided to the researcher, the emails came from the researcher. For the PBAs in which no contact information was provided to the researcher but the PBA leader agreed to correspond with the members, the emails came from the PBA leader on behalf of the researcher. The importance of the study and how it could benefit their PBA and subsequently prescribed burning nationwide was expressed in the email messages. An additional request for participation was sent to non-respondents approximately two weeks following the initial invitation. For the emails sent by the PBA leader, a reminder email was sent to their entire membership, with a notice that it only pertained to those members who have not yet responded. This study was reviewed and approved by the Institutional Review Board at North Carolina State University (eIRB No. 27174) (Appendix F).

Addressing Nonresponse Error

To establish the generalizability of research findings to the target population, researchers must address whether the survey results would remain consistent if every individual in the population had responded (Richardson, 2000). Survey fatigue, declining response rates, and the rising costs and time of additional survey waves have highlighted the concern of nonresponse bias (Cycyota & Harrison, 2006; Groves et al., 2006). Lindner et al. (2001) recommended implementing procedures to address nonresponse issues when the response rate is below 85%.

Studies have shown that there are no differences between early and late respondents or between respondents and non-respondents when a response rate of 85% or more was achieved (Lindner et al., 2001; Meterko et al., 2006).

Given the response rate was below 85%, respondents were grouped into early and late categories following the approach outlined by Lindner et al. (2001) to address potential nonresponse error. Early respondents were defined as those who responded prior to the survey reminder, while late respondents were those who responded after the reminder. Of the 46 PBAs that participated in the study, 26 received a reminder, which was sent on or after September 16, 2024, following the initial survey announcement and invitation. However, because some PBA leaders distributed the survey announcement, invitation, and reminder on behalf of the researcher, up to seven PBAs representing 1,479 members, may have received only the initial invitation without the announcement or follow-up reminder. Additionally, members of up to 13 PBAs received the announcement and survey invite but may not have received a reminder. A t-test was conducted to compare early respondents and late respondents across key variables, including demographic variables (age, gender, and highest level of education completed), PBA participation variables (average number of PBA educational events attended annually and years of PBA membership or participation) and prescribed burning experience (number of burns led or participated in and years of burning experience) to assess potential nonresponse bias. Responses from members of PBAs where no reminder was sent, or where it was unclear if a reminder was sent, were excluded from the nonresponse bias analysis.

Data Analysis

Data were analyzed using the IBM-SPSS v.26 software program. Statistical analyses including descriptive statistics and correlations were conducted to describe variables and

examine the associations between the demographic and prescribed burning experience variables with the number of PBA events attended, years of PBA membership, and motivations. This study used a *p*-value of less than 0.05 as the predetermined significance level for data analysis.

The Kruskal-Wallis H test was used to assess differences between regions, with post-hoc comparisons conducted using Dunn's test and a Bonferroni correction. Regions were coded as categorical variables, with 1 = Northeast, 2 = Southeast, 3 = Midwest, and 4 = West. Spearman's rank correlation analysis was used to examine relationships between the five motivational constructs and age, highest level of education completed, experience, and participation variables. Experience variables included the number of prescribed burns led, the number of prescribed burns participated in, and years of prescribed burn experience. Education level was coded as an ordinal variable, sequentially from the lowest to the highest level of attainment. Variables with numeric ranges, such as age, number of burns, and years of PBA membership, were coded as ordinal variables in similar ascending order, from the lowest to the highest value. Motivations were coded as continuous variables in ascending order from lowest to highest.

Rank-biserial and point-biserial correlation analyses were used to examine gender differences in relation to PBA participation and the motivational constructs, respectively. Gender was coded as a dichotomous categorical variable, with male assigned a value of 1 and female assigned a value of 2, following the order listed in the survey. Other gender categories (*n* = 9) and respondents who preferred not to specify their gender (*n* = 13) were excluded from the analyses due to an insufficient number of responses in those categories.

Responses to the three open-ended questions about reasons for non-participation, additional motivations, and additional competencies were analyzed using content and thematic

coding. This involved reading and categorizing the responses into relevant themes and categories. Descriptive statistics were used to summarize the findings.

Chapter Summary

This study employed a descriptive survey research design using a web-based survey instrument with four major sections. The first section measured PBA members' motivations for participating in PBA-offered educational programs using 28 scale items across five constructs. The second section assessed PBA participants' perceptions of how well PBA-offered programs facilitated student learning based on six andragogical principles, using a 23-item modified *Andragogy in Practice Inventory*. The third section examined PBA members' perceptions of prescribed burning competencies, consisting of a 21-item scale measuring both the perceived importance of and their proficiency in key prescribed burning skills across five competency constructs. The final section collected demographic information, including age, education level, and gender, as well as additional exploratory variables such as PBA affiliation, prescribed burn experience (years and number of burns led or participated in), years of PBA membership, and the primary state in which their PBA operates.

The population frame consisted of 6,997 PBA members. To attempt to achieve a 10% response rate based on response rates from studies of similar groups of landowners and ranchers, the Tailored Design Method (Dillman et al., 2014) was used. To address potential nonresponse error respondents were grouped into early and late categories following the approach outlined by Lindner et al. (2001). The survey instrument underwent expert panel review and pilot testing, ensuring its validity and reliability. Quantitative data were analyzed using IBM SPSS v.26, while responses to three open-ended questions on non-participation, motivations, and competencies were analyzed using content and thematic coding. Descriptive statistics summarized the findings.

CHAPTER 4: RESULTS

This chapter reports the findings of the data analysis. This study was conducted to accomplish the following seven objectives and the findings are organized and reported according to the objectives of the study:

1. Determine PBA members' demographic characteristics, prescribed burning experience, and PBA participation.
2. Determine the factors that motivate members to participate in PBA-offered prescribed burning educational programs.
3. Examine the associations between PBA members' demographics (i.e., age, gender, educational level, geographic region), prescribed burning experience, duration of PBA membership, and their motivations to participate in PBA-offered educational programs.
4. Ascertain the extent to which PBA members perceive that PBA-offered educational programs reflect principles of andragogy.
5. Determine which competencies are important to conduct prescribed burns, as perceived by PBA members.
6. Determine PBA member self-reported proficiency levels for competencies necessary to conduct prescribed burns.
7. Identify the training needs of PBA members.

Survey Response Analysis

A total of 6,997 individuals were invited to participate in the survey, resulting in 757 responses. Of these, 177 were incomplete and deemed unusable, while 580 responses, classified as partial or complete according to AAPOR (2023) guidelines, were considered usable and valid

for analysis, yielding a response rate of 8.3%. To assess potential nonresponse bias, t-tests were conducted to compare early respondents ($n = 432$) and late respondents ($n = 63$) across key demographic, experience, and participation variables. Responses were excluded from the comparison if their PBA did not send, or potentially did not send, a survey reminder ($n = 85$).

No significant differences were found between early and late respondents in demographic variables such as age ($t = 0.46, p = 0.65$), education level ($t = -1.03, p = 0.31$), or gender ($t = -0.47, p = 0.64$). Similarly, no significant differences were observed in PBA participation variables, including the number of PBA-offered educational events attended ($t = 0.71, p = 0.48$) or years of PBA membership ($t = 0.50, p = 0.62$). These findings suggest that early and late respondents were comparable in terms of demographics and participation in PBA activities, with no significant differences observed between the two groups. However, significant differences were found between early and late respondents for experience-related variables: years of experience ($t = 2.99, p = 0.004$), number of burns led ($t = 3.80, p < 0.001$), and number of burns participated in as a crew member ($t = 3.28, p = 0.001$). Early respondents reported significantly higher mean values for these variables compared to late respondents. This observation suggests that respondents with greater prescribed burning experience may have been more motivated to participate in the study early, potentially due to their stronger interest in the subject matter or a perception that the study was particularly relevant to their PBA-related work. These differences highlight the importance of considering nonresponse bias when interpreting the results. If early respondents disproportionately represent more experienced individuals, the findings may underrepresent the perspectives of those with less experience.

Results Related to Objective 1

The first objective of this study was to determine PBA members' demographic characteristics, prescribed burning experience, and PBA participation. To achieve this objective, participants were asked to indicate their affiliation as a PBA member/participant, state in which their PBA primarily conducts burns, age range, highest level of education completed, gender, number of burns participated in and led over the course of their life, years of burning experience, number of PBA-offered educational and training events attended annually, and years of PBA membership.

A majority of the respondents (52%) identified as landowners when asked "which of the following best describes your affiliation as a PBA member/participant" (Table 6). Twenty-eight people who identified as "other" included affiliations such as firefighters and other fire professionals, retired professionals, leadership roles within the PBA, or combinations of several affiliations.

Table 6

Distribution of Respondents by Affiliation (N = 558)

Affiliation	n	%
Landowner	295	52.9
Forestry, wildlife, or natural resources professional	91	16.3
Community member	48	8.6
Rancher/Farmer	41	7.3
Volunteer/Professional Firefighter	32	5.7
Other (please specify)	28	5.0
Private contractor	9	1.6
Educator/Researcher	6	1.1
Extension professional	3	0.5
Student	3	0.5
Tribal member	2	0.4

Table 7 provides a summary of the distribution of respondents by gender, age, and highest level of education completed. The majority (73%) of respondents were male. Respondents varied in age, with responses to age categories ranging from the lowest option (i.e., “18–24 years old”) to the highest option (i.e., “65+ years old”), with the greatest proportion being 65 years or older (42%), followed by 55 to 64 years (22%). Study respondents varied in their highest education level completed, however, 75% had at least a bachelor’s degree, and 35% had a graduate or professional degree.

Table 7

Distribution of Respondents by Gender, Age and Level of Education

Characteristic	<i>n</i>	%
Gender, <i>N</i> = 555		
Male	405	73.0
Female	128	23.1
Prefer not to say	13	2.3
Non-binary / third gender	6	1.1
Prefer to self-describe	3	0.5
Age Group (Years), <i>N</i> = 558		
18–24 years old	8	1.4
25–34 years old	57	10.2
35–44 years old	71	12.7
45–54 years old	63	11.3
55–64 years old	120	21.5
65+ years old	234	41.9
Prefer not to say	5	0.9

Table 7 (continued)

Characteristic	<i>n</i>	%
Highest Level of Education, <i>N</i> = 557		
Some high school or less	2	0.4
High school diploma or GED	19	3.4
Some college, but no degree	62	11.1
Associate or technical degree	50	9.0
Bachelor's degree	227	40.8
Graduate or professional degree (MA, MS, MBA, PhD, JD, MD, DDS, etc.)	192	34.5
Prefer not to say	5	0.9

Study participants were asked in which state their PBA primarily conducts burns. Respondents from PBAs in 18 states participated in the study. California had the highest number of responses (*n* = 122), followed by Florida (*n* = 73), and North Carolina (*n* = 68). For purposes of this study, the states were separated into the four regions used by Deak et al. (2025b): Northeast, Southeast, Midwest, and West. Table 8 and Figure 5 provide a summary of the distribution of respondents by state.

Table 8

Distribution of Respondents by State in Which Their PBA Primarily Conducts Burns in

Alphabetical Order by Region (N = 556)

Region and State	<i>n</i>	%
Northeast		
Illinois	51	9.2
Missouri	23	4.1
Virginia	3	0.5
TOTAL	77	13.8

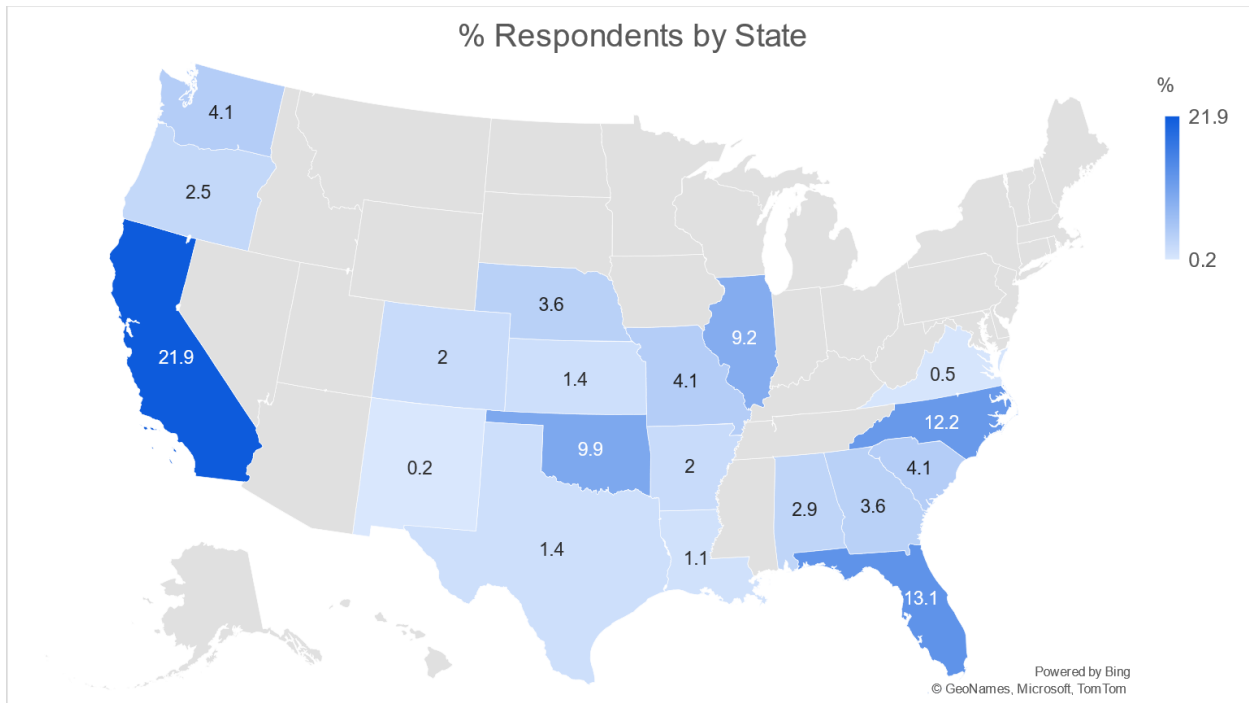
Table 8 (continued)

Region and State	<i>n</i>	%
Southeast		
Alabama	16	2.9
Arkansas	11	2.0
Florida	73	13.1
Georgia	20	3.6
Louisiana	6	1.1
North Carolina	68	12.2
South Carolina	23	4.1
TOTAL	217	39.0
Midwest		
Kansas	8	1.4
Nebraska	20	3.6
Oklahoma	55	9.9
Texas	8	1.4
TOTAL	91	16.3
West		
California	122	21.9
Colorado ^a	12	2.2
Oregon	14	2.5
Washington	23	4.1
TOTAL	171	30.7

^a One member indicated their state as New Mexico, but since their PBA's work is focused in Colorado, it has been included here.

Figure 5

A Map Representing the Percentage of Respondents from Each State (N = 556)



To better understand PBA member’s experience in prescribed burning, study participants were asked to estimate approximately how many prescribed burns they had participated in (as a crew member) and led over the course of their life. Responses varied as to their amount of participation on prescribed burns, but only 7% of respondents had never participated in a prescribed burn over the course of their life. For those that had participated on at least one burn, responses ranged from “1–5” burns (30%) to “More than 100” burns (9.7%). The largest proportion of respondents (49%) have never led a burn. However, it should be noted that 8.0% of respondents have led more than 50 burns, with 4.1% of those leading more than 100 burns. Table 9 provides a summary of the distribution of respondents by their participation on prescribed burns as a crew member and leading a burn.

Table 9

Distribution of Respondents by Experience Participating in and Leading Prescribed Burns (N = 558)

Number of Prescribed Burns	Prescribed Burns Participated		Prescribed Burns Led	
	<i>n</i>	%	<i>n</i>	%
None	39	7.0	273	48.9
1–5	168	30.1	111	19.9
6–10	81	14.5	46	8.2
11–20	99	17.7	49	8.8
21–50	74	13.3	34	6.1
51–100	43	7.7	22	3.9
More than 100	54	9.7	23	4.1

Nearly half of the respondents had been burning for less than three years, with most (25.9%) having between one to three years of experience. While the majority (58%) of respondents had been burning for four or more years, only 28% had been a PBA member for that long, suggesting that many participants gained experience outside of PBAs before joining. Responses ranged from “Less than 1 year” to “More than 20 years” for both the number of years prescribed burning and as a PBA member. Table 10 provides a summary of the distribution of respondents by number of years they have experience in prescribed burning and by their time as a PBA member.

Table 10

Distribution of Respondents by Number of Years of Experience in Prescribed Burning (N = 553) and as a PBA Member (N = 555)

Number of Years	Prescribed Burn Experience		PBA Membership	
	<i>n</i>	%	<i>n</i>	%
Less than 1 year	91	16.5	144	25.9
1–3 years	143	25.9	256	46.1
4–6 years	113	20.4	96	17.3
7–10 years	52	9.4	32	5.8
11–20 years	61	11.0	23	4.1
More than 20 years	93	16.8	4	0.7

Study participants were asked if they had participated in a prescribed burn or other educational or training event organized by a PBA within the last 12 months. It was found that 78% ($n = 521$) of respondents had participated in an event and 22% ($n = 144$) had not. When given a list of choices as to why those people who had not participated in an event, the greatest number of responses were because of lack of time ($n = 44$) followed by travel distance to the events was too far ($n = 32$) (Table 11). No one selected “I didn't know anyone else participating” as an option for non-participation. The respondents were allowed to select more than one choice.

It should be noted that an option for “Other” was provided, in which respondents could self-describe other reasons for non-participation. These responses ($n = 56$) were thematic coded, and it was found that the greatest number of responses was scheduling conflicts ($n = 17$). Several respondents discussed conflicts during the week due to their work schedule and expressed the need for events to be held on weekends. Other reasons include: recently joined the PBA and had not yet had a chance to participate in any events ($n = 13$), lack of PBA activity ($n = 7$), they are

not currently in need of assistance (e.g., because their property has already been burned or will not be burned, they live outside the PBA coverage area, or other reasons) ($n = 8$), or age or health reasons ($n = 6$). Other reasons cited by fewer than six respondents are not included here. In addition, several members addressed this topic in an open-ended question at the end of the survey which allowed respondents to share any additional information.

Table 11

Distribution of Respondents by Reasons They Had Not Participated in a Prescribed Burn or Other Educational or Training Event Organized by a PBA Within the Last 12 Months ($n = 144$)

Reasons for Non-Participation	<i>n</i>
Other	56
I don't have enough time.	44
Travel distance to the events is too far.	32
I was not aware of any PBA events that occurred in the last 12 months.	23
I don't have the knowledge or skills to participate on a burn.	11
I have a lot of experience in burning and don't have anything new to learn.	7
I have not paid my membership dues and therefore cannot participate.	6
I was not interested in the topics offered.	1
I didn't know anyone else participating.	0

Respondents who had participated in a PBA event within the last 12 months were asked to report the average number of prescribed burns or other educational or training events organized by a PBA they attended each year. The largest proportions of respondents attended 1–2 events ($n = 202$, 39%) or 3–5 events ($n = 188$, 36%) annually. Fewer respondents reported participating in 6–9 events ($n = 75$, 15%) or 10 or more events ($n = 54$, 10%) per year. They were provided choices as to the main activity at the most recent PBA event that they attended

(Table 12). A majority of the respondents (61%) participated in a prescribed burn during their most recently attended event. Other types of activities such as lectures and field days were less commonly reported. An option for “other” was also included for any choices that did not capture the main activity.

Of the respondents that selected “other,” the most commonly identified other type of activity was training ($n = 12$), either a Certified Prescribed Burn Manager training, an NWCG training, or another type of training. Other activities included business or other meetings ($n = 9$); fieldwork ($n = 7$) such as herbicide, seed gathering, or prepping future burn units; some combination of activities ($n = 5$); social events ($n = 2$); other types of burns, such as invasive grass control burns ($n = 2$), and a Cultural Fire Workshop ($n = 1$).

Table 12

Distribution of Respondents by Type of Educational or Training Event in Which They Most Recently Attended (N = 517)

Primary Activity at the Most Recent PBA Event	<i>n</i>	%
Prescribed burn	313	60.5
Lecture/Presentations	96	18.6
Other (please specify)	36	7.0
Field day outdoors (with NO live burn)	31	6.0
Pile Burn	22	4.3
Demonstration burn (that I could WATCH, but not participate)	13	2.5
Cultural Burn	6	1.2

Results Related to Objective 2

The second objective of this study was to determine the factors that motivate members to participate in PBA prescribed burning educational programs. The instrument used to record

motivation for participating in PBA-offered educational programs, consisting of 28 items, demonstrated high reliability (Cronbach’s alpha = .92). Respondents who had attended at least one PBA-offered event were asked to think back to when they decided to participate in their most recently attended PBA event and select the extent to which each of the provided choices motivated them to participate, on a scale from 1–5, with 1 being “not a motivator” and 5 being “extreme motivator.”

To compare and rank the motivation constructs, the mean scores of the motivation items within each construct were aggregated and the total score was divided by the number of competencies in that construct to get an overall mean score for each construct. The overall mean scores among the five motivation constructs ranged from 2.11 to 3.63 (Table 13). Knowledge and Skills Development was rated as the greatest motivational construct, with a mean score of 3.63, followed closely by Environmental Stewardship ($M = 3.61$) and Social Engagement and Community Service (3.34). Constructs rated slightly lower were Personal Fulfillment ($M = 2.81$) and Professional Development and Leadership ($M = 2.11$).

Table 13

Range of Motivation Mean Scores, Overall Mean Scores and Rank by Construct (N=498)

Construct	Range	<i>M</i>	<i>SD</i>	Rank
Knowledge and Skills Development	3.29–3.92	3.63	1.18	1
Environmental Stewardship	3.24–3.95	3.61	1.19	2
Social Engagement and Community Service	2.64–3.81	3.34	1.15	3
Personal Fulfillment	1.84–3.23	2.81	1.26	4
Professional Development and Leadership	1.77–2.66	2.11	1.30	5

Table 14 provides a summary of highest to lowest ratings of individual items in each construct. It was found that the greatest motivations were “To align with my commitment to environmental stewardship” within the Environmental Stewardship construct ($M = 3.95$), and “To increase overall my competence in burning” within the Knowledge and Skills Development factor ($M = 3.92$). The items with the lowest means were related to Professional Development and Leadership.

Table 14

Greatest to Lowest Motivations, Categorized by Construct (N = 498)

Individual Items and Constructs Used to Record Motivations	<i>M</i>
Environmental Stewardship	3.61
To align with my commitment to environmental stewardship	3.95
To understand how fire can be used to improve land for plants and animals	3.82
To learn about fire’s role in maintaining a healthy landscape	3.78
To become proficient in using best smoke management practices that minimize impacts on my community	3.28
To adapt burning practices to changing environmental conditions, such as climate variations	3.24
Knowledge and Skills Development	3.63
To increase my overall competence in burning	3.92
To discover strategies to minimize risks associated with burns	3.84
To learn new skills to conduct burns safely and effectively	3.83
To stay informed about emerging technologies and techniques that could help me with future burns	3.45
To gain proficiency in using fire tools and equipment	3.42
To understand the burning laws and liability statutes in my state	3.29

Table 14 (continued)

Individual Items and Constructs Used to Record Motivations	<i>M</i>
Personal Fulfillment	2.81
To learn for the joy of learning and expanding my mind	3.23
To gain personal fulfillment	3.20
To share my knowledge and experience with others	2.98
To honor my heritage	1.84
Professional Development and Leadership	2.11
To improve my communication skills to shape public perception and increase acceptance of prescribed burning	2.66
To increase my job competence	2.25
To equip myself to become a mentor or take on a leadership role within the PBA	2.21
To secure professional advancement	1.94
To achieve an occupational goal, such as a new qualification	1.82
To meet training or professional development requirements (for the state, a job, organization, PBA, etc.)	1.77
Social Engagement and Community Service	3.34
To be part of a supportive community that fosters the exchange of ideas, experiences, and best practices	3.81
To enhance my ability to serve others, especially those needing help with conducting burns	3.68
To network with peers and other fire practitioners	3.59
To become more effective as a community member	3.33
To meet new people with similar interests	3.17
To fulfill my obligation to assist other members, so they will be willing to help me burn my property in the future	3.15
To have a good time with friends	2.64

Respondents were given an open-ended question to share additional motivations not covered by the options provided. A total of 183 responses were received for this question. While many responses reiterated points already covered in the provided choices, the open-ended format allowed participants to elaborate on their motivations. Some responses, however, focused on broader motivations for conducting prescribed burns or volunteering with the PBA, rather than specifically addressing participation in the educational event. Examples of these broader motivations included restoring historic burn regimes and achieving land management goals, such as managing invasive species or improving grasslands. Notably, managing invasive species could also be a specific motivation for attending the event if that was a key focus.

Additional motivations for participating in the PBA event, as noted in the open-ended responses, were thematic coded and included ecological restoration; collaboration and mutual support, emphasizing shared efforts, exchange of knowledge, and the reliance on the PBA community to achieve goals; community engagement, including encouraging others to participate in future events; learning and skills development, like gaining a better understanding fire behavior and management; cultural and historical connections, including religious beliefs and understanding indigenous forest management practices; personal enjoyment, such as finding joy in putting fire back on the land; safety and risk reduction, aimed at reducing liability and mitigating wildfire impacts; family and heritage, reflecting a dedication to preserving family-owned forested land; and emotional and healing connections, such as using fire as part of a healing process after experiencing a major wildfire in their community.

Results Related to Objective 3

The third objective of the study was to examine whether participants' motivations to engage in educational programs offered by PBAs were associated with their demographics,

prescribed burning experience, or PBA participation. Statistical analysis identified significant associations between participation in PBA events and the demographic variables examined in this study (Table 15). A Kruskal-Wallis H test found a significant difference between participation in PBA events and region ($H = 20.72, p < .001$). Post-hoc comparisons using Dunn's test with Bonferroni correction revealed significant differences in PBA event participation between the West and Midwest regions ($H = 58.68, p = .003$), and the Southeast and Midwest regions ($H = -72.69, p < .001$), with the Midwest having higher participation than both other regions. A Spearman's rank correlation analysis found a very weak negative correlation ($r = -.13, p = .009$) with the highest level of education completed. This indicates that participants with lower education levels are more likely to attend PBA-offered learning activities. No significant correlations were found for gender or age.

A weak positive correlation ($r = .22, p < 0.001$) was found between PBA event participation and years of prescribed burning experience. A weak positive correlation was observed with the number of prescribed burns led ($r = .22, p < 0.001$). A moderate positive correlation ($r = .47, p < 0.001$) was found with the number of prescribed burns participated in (as a crew member) throughout participants' lives. In addition to the experience variables, a weak positive relationship was also found with years of PBA membership ($r = .30, p < 0.001$). All four correlations were significant; however, they were not strong. These findings suggest that individuals with more burning experience (measured by the number of burns led, participated in, and years of experience) and longer PBA membership are more likely to attend PBA events.

Table 15

Associations Between PBA-offered Educational Program Participation and Demographic, Experience, and PBA Membership Duration Variables, using Kruskal-Wallis Test (H), Rank-Biserial Correlation (r), and Spearman's Rank (r) Correlation

Demographic, Experience, and PBA Membership Duration Variables	N	H	r	p-value
Region	436	20.72**		<.001
Age	437		-.04	.443
Education Level	437		-.13**	.009
Gender	436		-.07	.145
Number of prescribed burns led	437		.22**	<0.001
Number of prescribed burns participated in (as a crew member)	437		.47**	<0.001
Years of burning experience	435		.22**	<0.001
Years of PBA membership	436		.30**	<0.001

**Association is significant at the $p < 0.01$ (2-tailed)

A Spearman's rank correlation analysis also indicated relationships between duration of PBA membership and most of the demographic and prescribed burn experience variables (Table 16). A Kruskal-Wallis H test found a difference between duration of PBA membership and region ($H = 70.99$, $p < .001$). Post-hoc comparisons using Dunn's test with Bonferroni correction revealed significant differences in PBA membership duration between the Southeast and Northeast regions ($H = 94.725$, $p < .001$), Southeast and Midwest regions ($H = -143.347$, $p < .001$), West and Northeast regions ($H = 73.472$, $p = .003$), and West and Midwest regions ($H = 122.094$, $p < .001$). This indicates that respondents from the Midwest have longer PBA membership than those from the West and Southeast, while respondents from the Northeast have longer membership than those from the Southeast and West. Based on the results, the Midwest

respondents have the longest PBA membership duration, followed by the Northeast, Southeast, and West respondents.

A weak positive correlation was found between PBA membership duration and age ($r = .24, p < .001$). No significant correlation was found for education level. A Rank-Biserial correlation analysis found a very weak negative relationship with gender ($r = -.14, p = .001$). Moderate positive correlations were found with the number of prescribed burns led ($r = .31, p < .001$) and participated in (as a crew member) ($r = .41, p < .001$), and years of experience ($r = .47, p < .001$). These results suggest that individuals who are older, male, are based in the Midwest, or have more experience tend to have longer PBA membership.

Table 16

Associations Between PBA Membership Duration and Demographic and Experience Variables, using Kruskal-Wallis Test (H), Rank-Biserial Correlation (r), and Spearman's Rank (r)

Correlation

Demographic and Experience Variables	N	H	r	p-value
Region	554	70.99**		<.001
Age	555		.24**	<.001
Education Level	555		-.08	.077
Gender	552		-.14**	.001
Number of prescribed burns led	555		.31**	<.001
Number of prescribed burns participated in (as a crew member)	555		.41**	<.001
Years of burning experience	550		.47**	<.001

**Association is significant at the $p < 0.01$ (2-tailed)

Overall Motivation

There were significant associations found between overall motivation and three of the study variables (Table 17). A Kruskal-Wallis H test revealed significant differences in overall motivation between the four regions ($H = 21.1, p < .001$). Post-hoc comparisons using Dunn's test with Bonferroni correction revealed significant differences in motivation scores between the Midwest and West regions ($H = -75.7, p < .001$), and the Southeast and West regions ($H = -51.7, p = .003$), with the West region showing the highest overall motivation (Figure 6). No other pairwise comparisons showed significant differences between any of the other regions.

A Spearman's rank correlation analysis found weak negative correlations with age ($r = -.19, p < .001$) and education level ($r = -.15, p = .001$), indicating lower age and education levels are associated with greater overall motivation. No significant correlations were observed between overall motivation and gender, prescribed burn experience or PBA-offered event participation. Table 17 summarizes these relationships between the overall motivation and the demographic, experience, and PBA participation study variables.

Table 17

Associations Between Overall Motivation and Study Variables, Using Kruskal-Wallis Test (H),

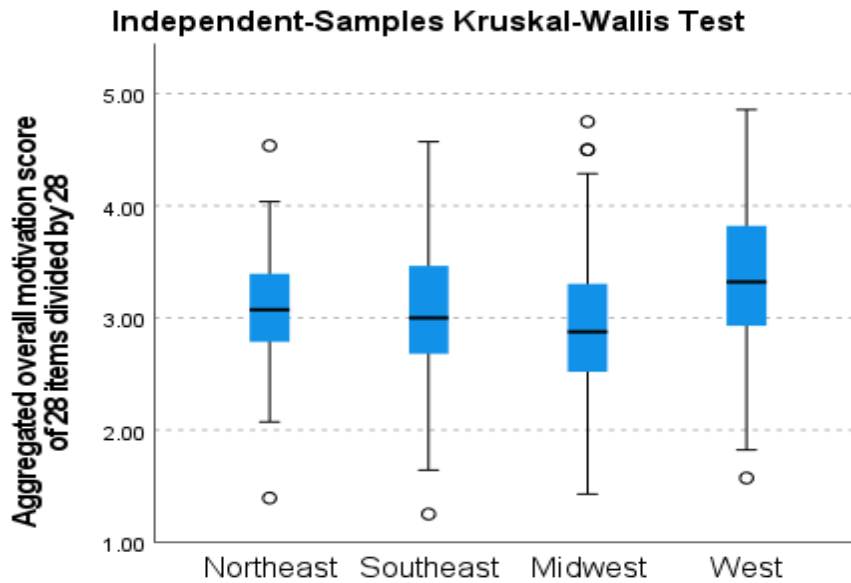
Point-Biserial Correlation (r), and Spearman's Rank (r) Correlation

Demographic, Experience, and Participation Variables	N	H	r	p-value
Region	434	21.11**		<.001
Age	434		-.19**	<.001
Education Level	434		-.15**	.001
Gender	421		.06	.202
Number of prescribed burns led	434		-.04	.432
Number of prescribed burns participated in (as a crew member)	434		-.02	.731
Years of burning experience	432		-.05	.322
Years of PBA membership	433		.01	.843
Average annual attendance at PBA-offered educational events	489		.05	.312

**Association is significant at the $p < 0.01$ (2-tailed)

Figure 6

Dunn's Post-Hoc Pairwise Comparisons of Regional Differences in Overall Motivation (N = 434)



Note. Dunn's post-hoc pairwise comparisons revealed that the West region had significantly greater overall motivation than the Southeast and Midwest regions.

Statistical and correlation analyses helped to identify patterns and potential associations of demographic, experience, and participation variables with different aspects of motivation. In the following sections, each motivational construct is examined individually to explore its specific associations and provide a more detailed understanding of the factors associated with it.

Knowledge and Skills Development

For the Knowledge and Skills Development motivational construct, no significant associations were found for region, age, gender, or PBA-offered event attendance (Table 18).

Weak to very weak negative correlations were found with education level ($r = -.10, p = .039$),

number of prescribed burns led ($r = -.18, p <.001$) and participated in ($r = -.27, p <.001$), years of burning experience ($r = -.26, p <.001$), and PBA membership duration ($r = -.10, p = .032$). These results suggest that individuals with lower education levels, less prescribed burning experience, and shorter PBA membership are more motivated by knowledge and skill-building than individuals with higher levels of education, greater prescribed burning experience, or a longer PBA membership. Because there were no differences between regions (Figure 7), this suggests participants across different regions are equally motivated to develop their knowledge and skills in prescribed burning.

Table 18

Associations Between the Knowledge and Skills Development Motivational Construct and Demographic, PBA participation, and Prescribed Burning Experience Variables, Using Kruskal-Wallis Test (H), Point-Biserial Correlation (r), and Spearman's Rank (r) Correlation

Variable	N	H	r	p-value
Region	434	3.05		.385
Age	435		.06	0.241
Education Level	435		-.10*	0.039
Gender	422		.05	0.298
Number of prescribed burns led	435		-.18**	<0.001
Number of prescribed burns participated in (as a crew member)	435		-.27**	<0.001
Years of burning experience	433		-.26**	<0.001
Years of PBA membership	434		-.10*	0.032
Average annual attendance at PBA-offered educational events	498		-.05	0.254

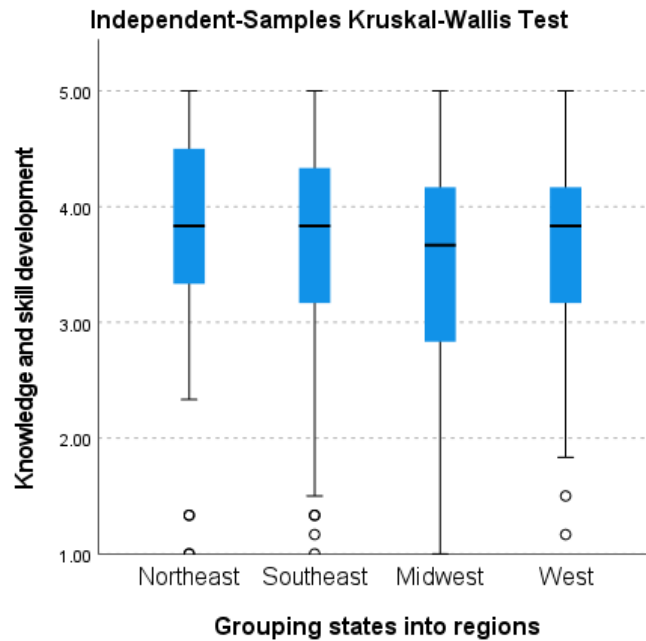
*Correlation is significant at the $p <0.05$ (2-tailed), **Correlation is significant at the $p <0.01$

(2-tailed)

Figure 7

Dunn's Post-Hoc Pairwise Comparisons of Regional Differences in the Knowledge and Skills

Development Construct (N = 434)



Note. A Kruskal-Wallis H test revealed no significant differences in the Knowledge and Skills Development motivational construct between the four regions.

Environmental Stewardship

For the Environmental Stewardship motivational construct, significant differences were found for region ($H = 11.34, p = .010$) (Table 19). Pairwise comparisons revealed the Midwest was significantly lower than the West and Northeast regions for motivation in the Environmental Stewardship construct (Figure 8). No significant differences were found between the Midwest and Southeast region, or between any other regions.

No significant correlations were found for age. Weak to very weak negative correlations were observed with education level, number of prescribed burns led and participated in, and

years of burning experience, while a weak positive correlation was found with gender. These findings suggest that females and those with lower education levels and less prescribed burning experience are more strongly motivated by environmental stewardship than males and those with higher levels of education and greater prescribed burning experience.

Table 19

Associations Between the Environmental Stewardship Motivational Construct and Demographic, PBA Participation, and Prescribed Burning Experience Variables Using Kruskal-Wallis Test (H), Point-Biserial Correlation (r), and Spearman's Rank (r) Correlation

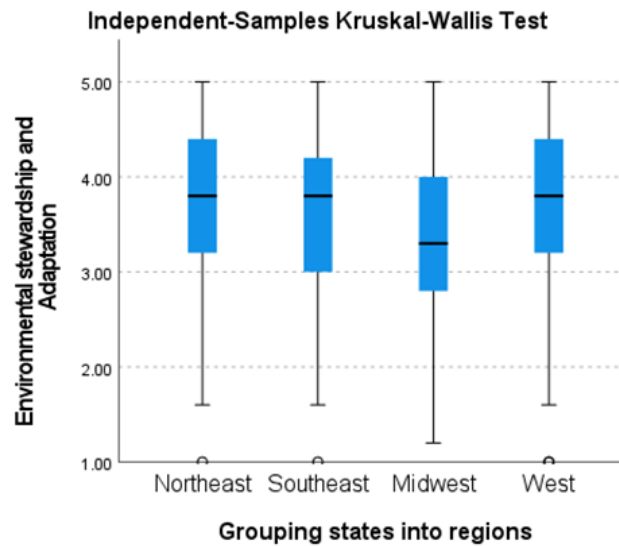
Variable	N	H	r	p-value
Region	436	11.34**		.010
Age	436		-.03	.530
Education Level	436		-.10*	.043
Gender	423		.21**	<.001
Number of prescribed burns led	436		-.20**	<.001
Number of prescribed burns participated in (as a crew member)	436		-.19**	<.001
Years of burning experience	434		-.21**	<.001
Years of PBA membership	435		-.05	.336
Average annual attendance at PBA-offered educational events	496		-.07	.119

*Correlation is significant at the $p < 0.05$ (2-tailed), **Association is significant at the $p < 0.01$

(2-tailed)

Figure 8

Dunn's Post-Hoc Pairwise Comparisons of Regional Differences in the Environmental Stewardship Construct (N = 436)



Note. Pairwise comparisons revealed the Midwest had significantly lower environmental stewardship motivation than the West and Northeast regions.

Social Engagement and Community Service

For the Social Engagement and Community Service construct, significant differences were found for region ($H = 12.29, p = .006$) (Table 20). Post-hoc Dunn's test with Bonferroni correction indicated a significant difference in motivation scores between the Southeast and West regions ($H = -50.05, p = .004$), with the Southeast region showing lower motivation in this construct (Figure 9). No other significant differences were found between regions.

Very weak negative correlations were observed with age ($r = -.13, p = .008$) and education level ($r = -.11, p = .018$). These results imply that individuals in lower age categories and education levels might have a slightly higher social and community service motivation compared to older individuals and those with higher education levels. Weak and very weak,

positive correlations were also found for prescribed burning experience (prescribed burns led, participated in, and years of experience), duration of PBA membership, and number of PBA events attended. These results suggest that individuals who have more prescribed burning experience, longer PBA membership, and attended more events, and are more strongly motivated by Social Engagement and Community Service compared to those with less burning experience, shorter PBA membership, and fewer events attended. However, the strength of these correlations are minimal, indicating that they are not strong predictors of the Social Engagement and Community Service motivation.

Table 20

*Associations Between the Social Engagement and Community Service Motivational Construct and Demographic, PBA Participation, and Prescribed Burning Experience Variables Using Kruskal-Wallis Test (*H*), Point-Biserial Correlation (*r*), and Spearman's Rank (*r*) Correlation*

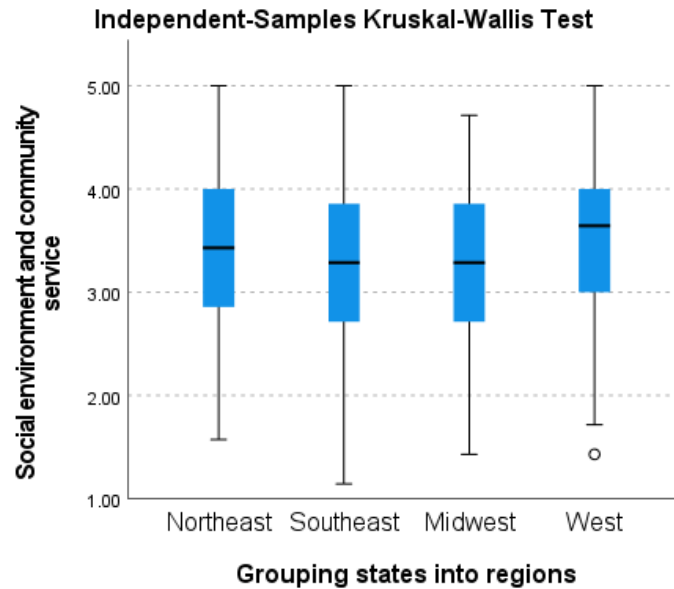
Variable	<i>N</i>	<i>H</i>	<i>r</i>	<i>p</i>-value
Region	435	12.29**		.006
Age	436		-.13**	.008
Education Level	436		-.11*	.018
Gender	423		.01	.775
Number of prescribed burns led	436		.11*	.025
Number of prescribed burns participated in (as a crew member)	436		.15**	.001
Years of burning experience	434		.10*	.033
Years of PBA membership	435		.10*	.032
Average annual attendance at PBA-offered educational events	497		.17**	<0.001

*Correlation is significant at the $p < 0.05$ (2-tailed), **Association is significant at the $p < 0.01$

(2-tailed)

Figure 9

Dunn's Post-Hoc Pairwise Comparisons of Regional Differences in the Social Engagement and Community Service Construct (N = 435)



Note. Pairwise comparisons revealed the Southeast had significantly lower social engagement and community service motivations than the West.

Professional Development and Leadership

For the Professional Development and Leadership motivational construct, significant differences were found between regions ($H = 32.55, p = <.001$) (Table 21). Post-hoc Dunn's test with Bonferroni correction indicated a significant difference in motivation scores between the Western region and each of the other three regions, with the Western region showing higher motivation in this construct (Figure 10). No other significant differences were found between regions.

Weak negative correlations were observed with age and education level. Weak to very weak positive correlations were found with prescribed burning experience (including number of burns led, participated in, and years of experience) and the number of PBA events attended. No correlations were found for gender, or years of PBA membership. These findings suggest that PBA members who are younger, have lower education levels, attend more events, and have greater prescribed burning experience may have slightly higher motivation for professional development and leadership compared to older members, with higher education levels, fewer event attendances, and less prescribed burning experience.

Table 21

Associations Between the Professional Development and Leadership Motivational Construct and Demographic, PBA Participation, and Prescribed Burning Experience Variables Using Kruskal-Wallis Test (H), Point-Biserial Correlation (r), and Spearman's Rank (r) Correlation

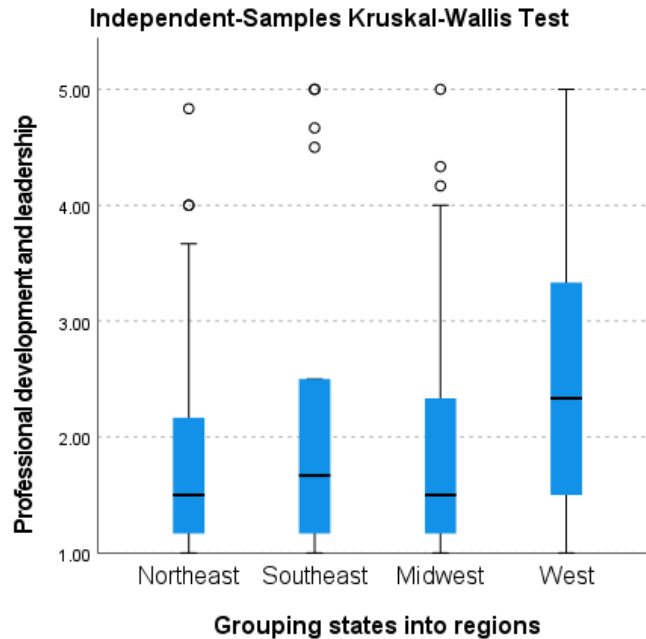
Variable	N	H	r	p-value
Region	436	32.55**		<.001
Age	437		-.32**	<.001
Education Level	437		-.17**	<.001
Gender	424		0.00	.984
Number of prescribed burns led	437		.12*	.015
Number of prescribed burns participated in (as a crew member)	437		.18**	<.001
Years of burning experience	435		.11*	.026
Years of PBA membership	436		.04	.370
Average annual attendance at PBA-offered educational events	497		.13**	.004

*Correlation is significant at the $p < 0.05$ (2-tailed), **Association is significant at the $p < 0.01$

(2-tailed)

Figure 10

Dunn's Post-Hoc Pairwise Comparisons of Regional Differences in the Professional Development and Leadership Construct (N = 436)



Note. Pairwise comparisons revealed the West had significantly higher professional development and leadership motivations than each of the three other regions.

Personal Fulfillment

For the Personal Fulfillment motivational construct, significant differences were found among regions ($H = 15.83, p = .001$) (Table 22). Post-hoc Dunn's test with Bonferroni correction indicated a significant difference in motivation scores between the West, Midwest, and Southeast regions, with the Western region showing higher motivation in this construct (Figure 11). No significant differences were found between the West and Northeast regions, or among any other regions.

Weak negative correlations were observed with age and education level. No significant correlations were found for gender or PBA participation. Weak to very weak positive correlations were found with prescribed burning experience (including number of burns led, participated in, and years of experience). These findings suggest that PBA members who are younger, have lower education levels, and have greater prescribed burning experience (in terms of burns led, burns participated in, and years of experience) may have slightly higher motivation for Personal Fulfillment compared to older members, with higher education levels, and less prescribed burning experience.

Table 22

Associations Between the Personal Fulfillment Motivational Construct and Demographic, PBA Participation, and Prescribed Burning Experience Variables Using Kruskal-Wallis Test (H), Point-Biserial Correlation (r), and Spearman's Rank (r) Correlation

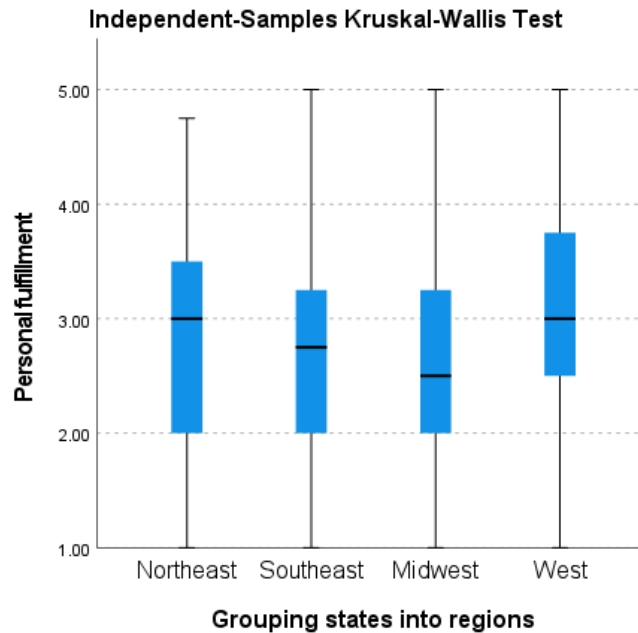
Variable	N	H	r	p-value
Region	435	15.83**		.001
Age	435		-.17**	<.001
Education Level	435		-.13**	.008
Gender	422		.02	.715
Number of prescribed burns led	435		.14**	.004
Number of prescribed burns participated in (as a crew member)	435		.18**	<.001
Years of burning experience	433		.19**	<.001
Years of PBA membership	434		0.06	.182
Average annual attendance at PBA-offered educational events	491		0.08	.070

**Association is significant at the $p < 0.01$ (2-tailed)

Figure 11

Dunn's Post-Hoc Pairwise Comparisons of Regional Differences in the Personal Fulfillment

Construct (N = 435)



Note: Pairwise comparisons revealed the West had significantly higher personal fulfillment motivations than the Southeast or Midwest regions.

Results Related to Objective 4

The fourth objective of the study was to ascertain the extent to which PBA-offered educational programs reflect principles of andragogy, as perceived by PBA members. The questions in this section of the survey instrument were related to the PBA members' perception of their learning experience. A slightly modified version of the andragogical principles portion of the Andragogy in Practice Inventory (API), version 4 (Bates, 2020) was administered to evaluate the extent to which the principles of andragogy manifested within each participant's learning

experiences. The resulting 23-item instrument demonstrated high reliability, as indicated by a Cronbach's alpha coefficient of 0.92.

The API scale assesses responses across six andragogical principles that reflect the assumptions of the educational needs and interests of adult learners. Participants rated their agreement with each of the 23 items using a five-point Likert scale. The higher the mean score, the stronger the agreement that the PBA event facilitated participant learning based on principles of andragogy. Findings indicate that study respondents generally agreed that andragogical principles were evident in their learning experiences, with higher agreement in areas such as Motivation to Learn ($M = 4.27$) and Experience ($M = 3.99$), and relatively lower agreement in Readiness to Learn ($M = 3.63$) and Need to Know ($M = 3.55$) (Table 23). These findings indicate that PBA-offered programs facilitated members' motivation for learning, but some PBAs did not always explain the immediate need for the information provided. Several responses in the final open-ended question of the survey touched on their learning experiences, particularly the 'Experience' principle. For example, one participant said, "Being an experienced volunteer...is a great way to be able to pass on the experience and knowledge I gained to others who are interested but never were able to work with fire."

Table 23

Range of Mean Scores, Overall Mean Scores, and Rank of Andragogical Principles Reflected in Training Events as Perceived by PBA Members

Principle	Range	<i>M</i>	<i>SD</i>	Rank
Motivation to Learn	4.09–4.37	4.27	0.82	1
Experience	3.89–4.09	3.99	0.96	2
Self-directed Learning	3.63–4.19	3.91	0.94	3
Orientation to Learning	3.49–4.33	3.89	0.96	4
Readiness to Learn	3.28–3.99	3.63	1.01	5
Need to Know	3.32–3.83	3.55	1.11	6

Mean scores for the 23 items within the six andragogical principles scales are shown in Table 24 and ranged from 3.28 to 4.37. More than half (12) of the items had a mean score above 4, including all four items within the Motivation to Learn principle, indicating strong agreement among participants that andragogical principles were evident in their learning experiences. However, no items within the Readiness to Learn or Need to Know principles achieved a mean score above 4. While participants perceived a fair level of self-direction, the range of scores (3.63–4.19) suggests some variability. Similarly, the wide range of orientation to learning (3.49–4.33) indicates diverse perspectives on how PBA members apply learning to real-world challenges.

Table 24*Mean Scores for Andragogical Principles Scales (N = 467)*

Scale	<i>M</i>	<i>SD</i>
Motivation to Learn Principle Items:		
I learn for the enjoyment of broadening my knowledge and skills.	4.37	0.78
I learn because of the pleasure of discovering new things that interest me.	4.31	0.83
I learn because of the personal satisfaction it gives me.	4.30	0.78
I learn because of the inner fulfillment it provides.	4.09	0.88
Experience Principle Items:		
I felt my prior life and/or work experiences helped my learning.	4.09	0.96
I felt my life and/or work experiences were a resource for this learning.	3.99	0.95
My life and/or work experiences were a regular part of the learning experience.	3.89	0.98
Self-directed Learning Principle Items:		
I had a role to play in my own learning.	4.19	0.83
I felt responsible for my own learning.	4.04	0.97
I set my own goals for learning.	4.03	0.94
I made the decisions about how learning progressed.	3.68	0.97
I had control over what was learned.	3.63	0.97

Table 24 (continued)

Scale	<i>M</i>	<i>SD</i>
Orientation to Learning Principle		
Items:		
Mastery of this material will benefit me on my next burn.	4.33	0.82
This learning experience will make a positive change in my life or work.	3.91	0.92
The knowledge gained in this learning experience can be immediately applied to my life or work.	3.82	1.02
The things I learned will assist me in resolving a work or life problem.	3.49	1.09
Readiness to Learn Principle		
Items ^a :		
We did things that illustrated how this learning could help me address real tasks or problems.	3.99	0.93
Steps were taken to make clear how the learning would fit my needs.	3.61	1.03
The instructor explained how this learning would help me deal with changes in my life or work.	3.28	1.07
Need to Know Principle		
Items:		
This learning helped me develop the knowledge and skills I need at this time.	3.83	1.02
I needed this learning at this time in my life.	3.60	1.09
This learning was necessary for the challenges I face.	3.44	1.12
This learning was necessary to help me meet the changes happening in my work or life related to burning.	3.32	1.20

^a One item in the original 24-item principles scale of the API, within the Readiness to Learn construct, was excluded from the survey instrument as it was not applicable for purposes of this study. The excluded item stated, “The instructor helped me understand why the learning methods were right for me.”

In addition to the 23-item andragogical principles scale, a 3-item learner satisfaction scale was included to assess the extent of satisfaction with the PBA-offered learning experience. The results indicate strong agreement on learning satisfaction ($M = 4.30$). All three items received mean scores above 4, reflecting a high level of agreement that the PBA-offered learning experience provided learner satisfaction (Table 25).

Table 25

Mean Scores for Learning Satisfaction (N = 467)

Learner Satisfaction Scale	<i>M</i>	<i>SD</i>
The event contributed to practical knowledge I can use for future burns.	4.43	0.75
I was satisfied with what I learned at this event.	4.43	0.77
Sufficient time was allocated to learn content.	4.04	0.88

Results Related to Objective 5

The fifth objective of this study was to determine which competencies are important to conduct prescribed burns, as perceived by PBA members. The survey captured PBA members' perceptions of the importance of 21 prescribed burn competencies, grouped into five competency constructs: planning a burn, smoke management, risk management and safety, burn operations, and leadership and communication. Each construct included between three to five competencies. Participants rated the importance of each of the 21 competencies using a five-point Likert scale: 1 = “Not Important”, 2 = “Slightly Important”, 3 = “Moderately Important”, 4 = “Important,” and 5 = “Very Important.” The importance scale demonstrated high internal consistency, with a Cronbach's alpha coefficient of 0.93.

All 21 competencies were rated as either “important” or “very important,” with mean scores for individual competencies ranging from 3.90 to 4.83 (Table 26). The highest rated competency, “Identify acceptable weather parameters to execute burns effectively,” under the Planning a Burn construct received a mean score of 4.83. This was followed by “Conduct a crew briefing before the burn to ensure all team members are informed and prepared, covering topics such as burn objectives, work assignments, potential hazards, and contingency/back-up plans” ($M = 4.80$), and “Maintain effective communication throughout the burn (e.g., two-way radio, cell phone, walkie-talkie, etc.)” ($M = 4.79$). Both of the latter competencies fall under the Leadership and Communication construct. Only one competency, “Use tools (e.g., smoke screening systems) before the burn to assess potential smoke impacts on your burn unit and the surrounding area,” which falls under the Smoke Management Construct, had a mean score below 4.0, with a score of 3.90. Competencies were ranked by importance based on their mean scores, with rankings ranging from 1 (most important) to 21 (least important).

Table 26*Importance Mean Scores and Rank of Competencies by Construct (N = 573)*

Competency Listed Under Each Construct	<i>M</i>	<i>SD</i>	Rank
Risk management and safety			
Conduct thorough mop-up operations to ensure the fire is completely extinguished or safely contained within the burn perimeter	4.77	0.56	4
Actively mitigate "watch-out" situations to prevent injury or fire escape	4.73	0.55	5
Develop a plan for holding and contingencies (e.g., critical holding points, response plans for fire escapes and emergencies, etc.)	4.70	0.60	7
Inspect and ensure all tools, including the drip torch, are operational and properly fueled before use	4.60	0.65	10
Identify potential hazards (e.g., stump holes, improper clothing, dead trees, stinging insects) before and during the burn	4.55	0.68	12
Leadership and communication			
Conduct a crew briefing before the burn to ensure all team members are informed and prepared, covering topics such as burn objectives, work assignments, potential hazards, and contingency/back-up plans	4.80	0.43	2
Maintain effective communication throughout the burn (e.g., two-way radio, cell phone, walkie-talkie, etc.)	4.79	0.46	3
Supervise the burn crew, providing direction for ignition, holding, and other operational tasks to ensure effective and safe execution of the burn	4.72	0.50	6
Conduct an after-action review (AAR) with the burn crew after the burn to evaluate the execution of the burn plan, identify successes and areas for improvement, and document lessons learned for future burns	4.24	0.84	19

Table 26 (continued)

Competency Listed Under Each Construct	<i>M</i>	<i>SD</i>	Rank
Planning a burn			
Identify acceptable weather parameters to execute burns effectively	4.83	0.43	1
Develop clear and actionable objectives for the burn	4.64	0.60	9
Ensure compliance with state laws and statutes	4.59	0.71	11
Create an accurate and detailed map(s) of the burn area to guide operations	4.46	0.77	16
Prepare detailed descriptions of burn units, including vegetation and fuels (e.g., logs, ground litter, plants, shrubs, trees)	4.38	0.78	18
Burn operations			
Apply appropriate firing techniques based on real-time weather conditions and fire behavior to achieve burn objectives	4.70	0.52	8
Complete a "Go/No-Go" checklist to make informed decisions if the burn should proceed	4.51	0.71	13
Monitor weather conditions on-site using appropriate tools (e.g., pocket weather meter, sling psychrometer, etc.)	4.47	0.79	15
Conduct a post-burn evaluation, including determining whether the burn met the objectives	4.20	0.83	20
Smoke management			
Notify adjacent landowners and other appropriate parties of the burn and the potential for associated smoke	4.49	0.72	14
Minimize smoke impacts on the burn crew and smoke sensitive areas	4.41	0.78	17
Use tools (e.g., smoke screening systems) before the burn to assess potential smoke impacts on your burn unit and the surrounding area	3.90	1.04	21

To compare and rank the competency constructs, the mean scores of the competencies within each construct were aggregated and the total was divided by the number of competencies in that construct, yielding an overall mean score for each construct. There was little difference in the overall mean importance scores among the five competency constructs, which ranged from 4.27 to 4.67 (Table 27). Risk Management and Safety was rated as the most important construct, with a mean score of 4.67, followed by Leadership and Communication ($M = 4.64$) and Planning a Burn ($M = 4.58$). Constructs rated slightly lower were Burn Operations ($M = 4.47$) and Smoke Management ($M = 4.27$).

Table 27

Range of Competency Mean Scores, Overall Mean Scores, and Rank for Construct Importance (N = 573)

Construct	Range of Mean Values of the Items Used to Record the Construct	<i>M</i>	<i>SD</i>	Rank
Risk Management and Safety	4.55–4.77	4.67	0.61	1
Leadership and Communication	4.24–4.80	4.64	0.56	2
Planning a Burn	4.38–4.83	4.58	0.66	3
Burn Operations	4.20–4.70	4.47	0.71	4
Smoke Management	3.90–4.49	4.27	0.85	5

Survey respondents were invited to suggest additional competencies they considered important for conducting a prescribed burn, beyond the provided options. Of the 158 responses submitted, 12 were considered not applicable, including answers like "they are all important" or "N/A." Some responses expanded or elaborated on existing competencies. For example, one

respondent suggested, “Briefing about the nearest hospital and a vehicle outside of the burn area designated as the medical evacuation vehicle, with keys readily accessible in case of an emergency medical situation.” This response expands on the existing Leadership and Communication competency, “Conduct a crew briefing before the burn to ensure all team members are informed and prepared, covering topics such as burn objectives, work assignments, potential hazards, and contingency/back-up plans.”

After excluding the responses deemed not applicable, the remaining responses were analyzed and, where relevant, grouped into the existing competency constructs (Table 28). Each of the existing constructs had at least two new competencies based on the responses. Several responses ($n = 54$) aligned with the Risk Management and Safety construct in particular, with some elaborating on the existing competencies, and others suggesting new competencies not on the list. Many of the suggested new competencies in this construct focused on the importance of assigning crew members to roles that match their abilities and experience. For example, one response emphasized the "ability to assess crew members' abilities and competencies and then assign them appropriately." Another highlighted the need to "determine the 'comfort level' of individuals when assigning tasks" and to "monitor participants to ensure that their competencies match what is expected and needed." The Burn Operations and Leadership and Communication constructs each received 31 aligned responses, which were comprised of a combination of expansion of existing competencies and also suggestions for new competencies. The Burn Planning ($n = 21$) and Smoke Management ($n = 2$) constructs had fewer aligned responses. Some responses included suggestions for multiple competencies across different constructs. One new construct, Human Factors and Team Dynamics, was developed to include a synthesis of the 20 suggested competencies that did not fit into the existing constructs. The Human Factors and

Team Dynamics construct focuses on building an inclusive, collaborative, and supportive team environment, managing stress and conflict, fostering trust and continuous learning, and ensuring positive and engaging experiences during burn operations. It should be noted that some individuals indicated that they have no desire to lead a burn themselves and prefer to participate as crew members, in which case some of these competencies may be less applicable. Table 28 depicts a synthesized list of the additional suggested competencies considered important for conducting a prescribed burn, grouped by construct.

Table 28

Additional Competencies Considered Important for Conducting a Prescribed Burn (N = 146)

Additional Competencies by Construct
Risk Management and Safety
Assess and monitor crew health by evaluating physical conditions before the burn and monitoring for dehydration, smoke inhalation, and heat stress throughout the burn.
Implement hydration protocols and emergency procedures, including providing first aid for injuries such as venomous snake bites and other burn-related health issues.
Ensure crew members are physically prepared to perform tasks such as hiking, digging, cutting, and lifting, which may be necessary for safe and efficient burn operations during preparation, execution, and mop-up.
Verify that all crew members wear appropriate personal protective equipment (PPE) and clothing suited to the burn conditions to ensure safety.
Establish and clearly communicate escape routes, safety zones, and a helicopter landing zone if necessary to maintain operational safety.
Maintain situational awareness throughout the burn by continuously adapting to changing conditions to ensure both safety and effectiveness.
Confirm that the number of personnel is sufficient to safely and effectively conduct all aspects of the burn operation.

Table 28 (continued)

Additional Competencies by Construct

Risk Management and Safety (continued)

Verify that crew members are proficient in the safe and effective use of prescribed burn tools and equipment, including fire suppression devices.

Apply strategies to manage stress in high-risk situations, such as escapes or spotting events, ensuring the safety of crew members.

Leadership and Communication

Communicate effectively and respectfully with the burn team by demonstrating humility, patience, tact, and respect, acknowledging varying levels of experience, and encouraging contributions.

Adapt communication to engage effectively with individuals from diverse backgrounds, communication styles, and varying levels of training or experience.

Establish clear and effective communication with area emergency responders and local authorities to ensure collaboration and preparedness.

Engage the public and media proactively by promoting a compelling and accurate narrative about prescribed fire, ensuring that communications highlight the program's goals and benefits.

Demonstrate strong interpersonal skills by engaging with onlookers, addressing concerns from nearby landowners, handling media inquiries, and maintaining professional relationships with all involved parties.

Respect the authority of the burn boss and defer to more experienced crew members when necessary to foster a culture of trust, accountability, and effective leadership.

Promote a culture of learning and growth by appreciating the diverse experience levels within the burn team and encouraging each member to operate within their competency while providing opportunities for skill development.

Ensure that appropriate parties are notified about the prescribed burn using clear, accessible, and audience-tailored language.

Table 28 (continued)

Additional Competencies by Construct

Planning a Burn

Make informed decisions on burn timing by evaluating the optimal start and stop times based on environmental conditions, safety considerations, and burn objectives.

Assess firebreaks to ensure they are sufficient for containing the burn and protecting adjacent areas from unintended fire spread.

Understand how various fuels, such as grass, brush, and timber, burn and recognize how these characteristics can impact the prescribed burn.

Plan and manage transportation routes and vehicles on the burn site to ensure the safe and efficient movement of crew and equipment.

Select the appropriate time of year for the burn by considering seasonal factors, fire behavior, and ecological impacts, while prioritizing strategies that minimize wildlife losses and protect desirable vegetation.

Understand the ecological goals of the burn by identifying the targeted plant species and recognizing the reasons for the burn objectives, such as habitat restoration or invasive species control.

Study and evaluate the terrain of the burn area before starting to anticipate potential challenges and adjust strategies as necessary.

Follow proper reporting requirements by notifying relevant authorities before the burn and ensuring that all necessary permits and documentation are completed.

Burn Operations

Evaluate how varying firing patterns may affect local wildlife and implement strategies to minimize harm.

Schedule burns to occur outside critical periods for ground-nesting birds and other wildlife to minimize ecological disruption.

Assign experienced lighting and holding bosses to guide and manage less experienced crew members, ensuring effective supervision during the burn.

Address the discovery of indigenous artifacts in the burn area by following established cultural and legal protocols with respect and care.

Assess and address the potential effects of the burn on livestock, wildlife, and soil erosion as part of post-burn evaluations and considerations.

Reinforce proper handling practices of tools and equipment during burn operations, ensuring they are used efficiently and safely throughout the burn.

Table 28 (continued)

Additional Competencies by Construct
Smoke Management
Demonstrate the ability to effectively use and interpret fire and smoke models to support decision making and mitigate potential smoke impacts.
Utilize sensors and monitors to assess and manage smoke impacts.
Human Factors and Team Dynamics
Foster an inclusive environment that welcomes diverse participants and ensures all voices are heard and valued.
Recognize psychological responses to stress and implement strategies to support team cohesion and performance under pressure, ensuring effective collaboration during challenging burn operations.
Promote crew cohesion and collaboration by leveraging previous experiences working together.
Manage team dynamics by recognizing signs of tension or conflict and applying effective conflict resolution strategies to ensure team cohesion and a positive work environment.
Adapt communication and learning approaches to support diverse team members' varied needs and maintain an effective, collaborative environment.
Encourage the sharing of "lessons learned" stories, including personal experiences and mistakes, to promote continuous improvement and collective learning.
Demonstrate understanding and respect for diverse cultures within the burn team.
Build a culture of trust and safety by reinforcing an environment that prioritizes open communication, safety, and a commitment to accountability.
Create a positive and engaging burn experience that encourages enjoyment and leaves participants eager to return for future events.

Results Related to Objective 6

The sixth objective of this study was to determine PBA member self-reported proficiency levels for competencies necessary to conduct prescribed burns. Participants were asked to rate

their proficiency level for each of the aforementioned 21 competencies, organized within the five competency constructs: planning a burn, smoke management, risk management and safety, burn operations, and leadership and communication. These competencies were originally assessed using the importance scale and were now evaluated using a designated proficiency scale. Proficiency was defined as a combination of skill and confidence, assessed using a five-point Likert scale: Minimal (1 - little to no proficiency), Basic (2 - some proficiency but needs development), Moderate (3 - adequate proficiency with room for improvement), Advanced (4 - high proficiency with minor improvements needed), and Exceptional (5 - exceptional proficiency with no improvements needed). The proficiency scale demonstrated excellent internal consistency, with a Cronbach's alpha coefficient of 0.98.

Mean proficiency scores for individual competencies ranged from 2.49 to 3.53 (Table 29). Competencies were ranked by self-reported proficiency, from 1 (highest proficiency) to 21 (lowest proficiency). When mean scores were tied, rankings were determined based on the item with the smaller standard deviation to reflect greater agreement among respondents. A majority of competencies (62%) were rated as “moderate,” with mean scores between 3.00 and 3.53. The remaining competencies were rated as “basic,” with mean scores between 2.49 and 2.99. None of the competencies were rated as “minimal,” “advanced,” or “exceptional.”

Notably, the highest-rated competency (“Notify adjacent landowners and other appropriate parties of the burn and the potential for associated smoke”) and the lowest-rated competency (“Use tools such as smoke screening systems before the burn to assess potential smoke impacts on your burn unit and the surrounding area”) both fell within the Smoke Management construct. The second-, third- and fourth-highest rated competencies were within the Risk Management and Safety construct: “Conduct thorough mop-up operations to ensure the

fire is completely extinguished or safely contained within the burn perimeter,” “Identify potential hazards (e.g., stump holes, improper clothing, dead trees, stinging insects) before and during the burn,” and “Inspect and ensure all tools, including the drip torch, are operational and properly fueled before use.”

Table 29

Proficiency Mean Scores and Rank by Construct (N=560)

Competency	<i>M</i>	<i>SD</i>	Rank
Risk Management and Safety			
Conduct thorough mop-up operations to ensure the fire is completely extinguished or safely contained within the burn perimeter	3.38	1.09	2
Identify potential hazards (e.g., stump holes, improper clothing, dead trees, stinging insects) before and during the burn	3.30	1.00	3
Inspect and ensure all tools, including the drip torch, are operational and properly fueled before use	3.27	1.16	4
Actively mitigate "watch-out" situations to prevent injury or fire escape	3.16	1.11	8
Develop a plan for holding and contingencies (e.g., critical holding points, response plans for fire escapes and emergencies, etc.)	2.97	1.17	15

Table 29 (continued)

Competency	<i>M</i>	<i>SD</i>	Rank
Leadership and Communication			
Maintain effective communication throughout the burn (e.g., two-way radio, cell phone, walkie-talkie, etc.)	3.25	1.10	5
Conduct a crew briefing before the burn to ensure all team members are informed and prepared, covering topics such as burn objectives, work assignments, potential hazards, and contingency/back-up plans	2.99	1.20	14
Conduct an after-action review (AAR) with the burn crew after the burn to evaluate the execution of the burn plan, identify successes and areas for improvement, and document lessons learned for future burns	2.85	1.18	19
Supervise the burn crew, providing direction for ignition, holding, and other operational tasks to ensure effective and safe execution of the burn	2.83	1.27	20
Planning a Burn			
Create an accurate and detailed map(s) of the burn area to guide operations	3.25	1.13	6
Develop clear and actionable objectives for the burn	3.18	1.01	7
Identify acceptable weather parameters to execute burns effectively	3.09	1.16	10
Prepare detailed descriptions of burn units, including vegetation and fuels (e.g., logs, ground litter, plants, shrubs, trees)	3.05	1.09	11
Ensure compliance with state laws and statutes	3.00	1.18	12

Table 29 (continued)

Competency	<i>M</i>	<i>SD</i>	Rank
Burn Operations			
Conduct a post-burn evaluation, including determining whether the burn met the objectives	3.10	1.08	9
Apply appropriate firing techniques based on real-time weather conditions and fire behavior to achieve burn objectives	3.00	1.21	13
Complete a "Go/No-Go" checklist to make informed decisions if the burn should proceed	2.91	1.16	16
Monitor weather conditions on-site using appropriate tools (e.g., pocket weather meter, sling psychrometer, etc.)	2.91	1.23	17
Smoke Management			
Notify adjacent landowners and other appropriate parties of the burn and the potential for associated smoke	3.53	1.03	1
Minimize smoke impacts on the burn crew and smoke sensitive areas	2.90	1.10	18
Use tools (e.g., smoke screening systems) before the burn to assess potential smoke impacts on your burn unit and the surrounding area	2.49	1.23	21

The mean scores for competencies within each construct were aggregated and divided by the total number of competencies in that construct to calculate an overall mean score for each construct. This allowed for the comparison and ranking of constructs. The overall mean scores for self-reported proficiency levels across competency constructs ranged from 2.97 to 3.22 (Table 30). When mean scores were tied, rankings were determined based on the item with the smaller standard deviation to reflect greater agreement among respondents. Participants reported the highest proficiency in the Risk Management and Safety construct ($M = 3.22$), followed

closely by Planning a Burn ($M = 3.11$). The constructs with the lowest reported proficiency levels were Leadership and Communication and Burn Operations, both with mean scores of 2.98, and Smoke Management ($M = 2.97$).

Table 30

Range of Competency Mean Scores, Overall Mean Scores, and Rank for Construct Proficiency
($N = 560$)

Construct	Range	<i>M</i>	<i>SD</i>	Rank
Risk Management and Safety	2.97–3.38	3.22	1.10	1
Planning a Burn	3.00–3.25	3.11	1.11	2
Burn Operations	2.91–3.10	2.98	1.17	3
Leadership and Communications	2.83–3.25	2.98	1.19	4
Smoke Management	2.49–3.53	2.97	1.12	5

Results Related to Objective 7

The seventh and final objective of this study was to identify the training needs of PBA members. Mean weighted discrepancy scores (MWDS) were calculated for each of the five competency constructs (Table 31). The construct with the highest MWDS, indicating the greatest training need, was Leadership and Communication, with a score of 7.70. In contrast, the construct with the lowest training need was Smoke Management, with a score of 5.48. For comparison, Table 31 includes the overall mean scores and rankings of the perceived importance (Table 27) and self-reported proficiency levels (Table 30) for each construct.

Table 31

Comparison of Competency Construct Importance Scores and Rank, Proficiency Level Scores and Rank, MWDS, and Training Need Rank

Competency Construct	Importance		Proficiency		Training Need	
	<i>M</i>	Rank	<i>M</i>	Rank	MWDS	Rank
Leadership and Communication	4.64	2	2.98	4	7.70	1
Risk Management and Safety	4.67	1	3.22	1	6.80	2
Planning a Burn	4.58	3	3.11	2	6.75	3
Burn Operations	4.47	4	2.98	3	6.69	4
Smoke Management	4.27	5	2.97	5	5.48	5

The mean weighted discrepancy scores (MWDS) were calculated for each competency, with scores ranging from 4.28 to 8.88. The distribution of competencies scoring between 5.0 and 7.99 is relatively even, with 24% of competencies falling within each of the 5.0–5.99, 6.0–6.99, and 7.0–7.99 ranges (Table 32). This suggests that training needs are spread across a broad range of competencies rather than being concentrated in just a few areas. A notable 19.1% of competencies scored 8.0 or greater, with half falling within the Leadership and Communication construct, indicating that training needs in this area are among the most pressing. Although the Smoke Management construct has fewer total items, its scores are relatively lower than others, indicating it is not perceived as a high-priority training need compared to other areas.

Table 32*Distribution of Competency MWDS by Competency Construct*

Competency Construct (total items)	Distribution of MWDS of Individual Competencies Under Each Competency Construct				
	4.0–4.99	5.0–5.99	6.0–6.99	7.0–7.99	8.0 or greater
Leadership and Communication (4)		1		1	2
Risk Management and Safety (5)		1	2	1	1
Planning a Burn (5)		2	1	1	1
Burn Operations (4)	1		1	2	
Smoke Management (3)	1	1	1		
TOTAL (21)	2	5	5	5	4
Percentage of Individual Competencies	9.5	23.8	23.8	23.8	19.1

Half of the competencies with the highest training needs were from the Leadership and Communication construct. This includes the two competencies with the top scores: 'Supervise the burn crew, providing direction for ignition, holding, and other operational tasks to ensure effective and safe execution of the burn' (MWDS = 8.88) and 'Conduct a crew briefing before the burn to ensure all team members are informed and prepared, covering topics such as burn objectives, work assignments, potential hazards, and contingency/back-up plans' (MWDS = 8.67) (Table 33). The third highest training need, 'Identify acceptable weather parameters to execute burns effectively' (MWDS = 8.41), was from the Planning a Burn construct.

In contrast, the competencies with the lowest training needs were found in various constructs, including Planning a Burn ('Create an accurate and detailed map(s) of the burn area to

guide operations,' MWDS = 5.39), Burn Operations ('Conduct a post-burn evaluation, including determining whether the burn met the objectives,' MWDS = 4.61), and Smoke Management ('Notify adjacent landowners and other appropriate parties of the burn and the potential for associated smoke,' MWDS = 4.28). The mean weighted discrepancy scores and the overall training need rankings for all competencies, organized by construct, are provided in Table 33.

Table 33

Mean Weighted Discrepancy Scores and Training Need Rank of Prescribed Burning

Competencies

Competencies Listed Under Each Construct	MWDS	Rank
Risk Management and Safety Construct		
Develop a plan for holding and contingencies (e.g., critical holding points, response plans for fire escapes and emergencies, etc.)	8.14	4
Actively mitigate "watch-out" situations to prevent injury or fire escape	7.40	6
Conduct thorough mop-up operations to ensure the fire is completely extinguished or safely contained within the burn perimeter	6.63	13
Inspect and ensure all tools, including the drip torch, are operational and properly fueled before use	6.13	14
Identify potential hazards (e.g., stump holes, improper clothing, dead trees, stinging insects) before and during the burn	5.70	17

Table 33 (continued)

Competencies Listed Under Each Construct	MWDS	Rank
Leadership and Communication Construct		
Supervise the burn crew, providing direction for ignition, holding, and other operational tasks to ensure effective and safe execution of the burn	8.88	1
Conduct a crew briefing before the burn to ensure all team members are informed and prepared, covering topics such as burn objectives, work assignments, potential hazards, and contingency/back-up plans	8.67	2
Maintain effective communication throughout the burn (e.g., two-way radio, cell phone, walkie-talkie, etc.)	7.38	7
Conduct an after-action review (AAR) with the burn crew after the burn to evaluate the execution of the burn plan, identify successes and areas for improvement, and document lessons learned for future burns	5.89	15
Planning a Burn Construct		
Identify acceptable weather parameters to execute burns effectively	8.41	3
Ensure compliance with state laws and statutes	7.31	8
Develop clear and actionable objectives for the burn	6.83	11
Prepare detailed descriptions of burn units, including vegetation and fuels (e.g., logs, ground litter, plants, shrubs, trees)	5.83	16
Create an accurate and detailed map(s) of the burn area to guide operations	5.39	19

Table 33 (continued)

Competencies Listed Under Each Construct	MWDS	Rank
Burn Operations Construct		
Apply appropriate firing techniques based on real-time weather conditions and fire behavior to achieve burn objectives	7.9	5
Complete a "Go/No-Go" checklist to make informed decisions if the burn should proceed	5	9
Monitor weather conditions on-site using appropriate tools (e.g., pocket weather meter, sling psychrometer, etc.)	7.21	9
Conduct a post-burn evaluation, including determining whether the burn met the objectives	6.98	10
	4.61	20
Smoke Management Construct		
Minimize smoke impacts on the burn crew and smoke sensitive areas	6.67	12
Use tools (e.g., smoke screening systems) before the burn to assess potential smoke impacts on your burn unit and the surrounding area	5.48	18
Notify adjacent landowners and other appropriate parties of the burn and the potential for associated smoke	4.28	21

Chapter Summary

This chapter summarizes the study's findings organized under the seven objectives of the study. The survey was completed by 580 participants for a response rate of 8.3%. Key findings showed that while experience-related variables, such as years of experience and number of burns led, were higher among early respondents, participation in PBA events was common, with 78.3% attending at least one event in the past year. Time constraints and travel distance were identified

as the primary barriers to participation for those participants that did not attend any PBA-offered educational events in the past year.

Program participants' motivations were recorded using a 28-item instrument, with the Knowledge and Skills Development and Environmental Stewardship constructs emerging as the most significant motivators. The Personal Fulfillment and Professional Development and Leadership constructs were less motivating, with respondents also highlighting additional personal and community-oriented reasons for participation. Some demographic and experience factors showed weak but significant relationships with motivation to participate. For example, there were regional differences in overall motivation and motivation for all of the constructs except Knowledge and Skills Development. Younger members exhibited higher overall motivation, and within the Social and Community Service, Professional Development and Leadership, and Personal Fulfillment constructs. Education levels were negatively correlated with motivation, with lower education levels associated with higher overall motivation and stronger motivation across all five constructs. Women tended to be more motivated by Environmental Stewardship than men. Respondents with less experience valued Knowledge and Skills Development and Environmental Stewardship more, whereas those with more experience were more motivated by Social Engagement and Community Service, Professional Development and Leadership, and Personal Fulfillment.

The study also evaluated how PBA educational programs aligned with adult learning principles using the 23-item API, revealing strong agreement of their application across PBA educational events. Participants particularly recognized the effectiveness of the programs in fostering motivation to learn, which received the highest ratings among the evaluated principles. However, some areas showed room for improvement, notably the Need to Know principle,

which received comparatively lower scores. Despite this, overall learner satisfaction was high, with participants expressing positive feedback on the quality, relevance, and delivery of the educational experiences offered by PBA programs. These findings suggest that while the programs are generally well-received, targeted enhancements could further strengthen their alignment with adult learning needs.

The study assessed the importance of 21 competencies needed for conducting prescribed burns, finding that all were considered important or very important. Risk Management and Safety, Leadership and Communication, and Planning a Burn were the most critical competency constructs. Participants self-reported moderate proficiency in these areas, with the lowest proficiencies in the Smoke Management and Leadership and Communication constructs. Training needs, measured by mean weighted discrepancy scores (MWDS), highlighted Leadership and Communication as the most needed area for improvement, suggesting a need for focused training in these competencies to enhance PBA members' abilities in prescribed burns.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the conclusions drawn from the results of this descriptive survey research and offers recommendations for both practice and future research. Through seven objectives, this study examined Prescribed Burn Association (PBA) members' characteristics, their motivations for participating in PBA-offered educational programs on prescribed burning, and how these motivations related to their demographics, experience, or participation, as well as their learning experiences and training needs. The study population was comprised of all PBA members of the 86 known active PBAs, which consisted of an estimated 10,617 members. A total of 6,997 PBA members from 46 PBAs in 18 states across the country comprised the population frame, which was the accessible portion of the population. The survey received a response rate of 8.3%, which is comparable with the response rates of similar groups (Bardon et al., 2023; McPeake et al., 2024; Penn et al., 2024).

Conclusions Related to Objective 1

The first objective of this study was to determine PBA members' demographic characteristics (e.g., affiliation, gender, age, education level, and state), their prescribed burning experience (e.g., number of burns participated in and led, and years of experience), and their PBA participation (e.g., attendance in PBA-offered events and duration of PBA membership). The majority of respondents (60%) identified as landowners or ranchers/farmers in terms of their affiliation within the PBA, while the remainder identified as professionals, community members, volunteer firefighters, or other affiliations. Most respondents were male (73%), aligning closely with findings that 76% of self-reported primary decision-makers of private family forest land in the U.S. are male (Butler et al., 2021). In addition, research indicates that women generally perceive greater risks, express higher levels of concern, and are less supportive of land

management practices like prescribed fire and herbicide use (Jarrett et al., 2009; McCaffrey, 2008; Ryan & Wamsley, 2008; Shindler et al., 2011).

Approximately 63% of respondents were over the age of 55, with 42% over 65. This is consistent with surveys of private landowners in Texas and Oklahoma, including some PBA members, where the average respondent age was between 60 and 66 years old (Kreuter et al., 2008; Stroman et al., 2020). However, it contradicts findings that participation in non-formal education and training tends to decline with age, with younger adults (aged 25–34) exhibiting higher participation rates compared to older age groups (35–44, 45–54, and 55–64 year-olds) (OECD, 2019). The predominance of respondents over the age of 55 in this study may reflect the fact that PBA members are primarily landowners, a group that tends to be older (Butler et al., 2016).

The majority of respondents were well-educated, with 86% having some college education or higher. Among them, 75% held at least a bachelor's degree, and 35% had a graduate or professional degree. This aligns with Stroman et al.'s (2020) findings, where 85% of respondents reported at least some college education, and exceeds Butler et al.'s (2021) findings, which showed that 42% of primary decision-makers of private family forest land have a college degree.

Most respondents were PBA members from the Southeast (39%) and West (31%), with fewer from the Northeast (14%) or Midwest (16%). The lower representation from the Northeast aligns with the region's historically slower adoption of prescribed burning (Lee et al., 2014; Melvin, 2021) and the limited number of PBAs there (Deak et al., 2025b; GPFSE, 2025). Additionally, lower survey participation from both the Northeast and Midwest may be due to survey fatigue from responding to other surveys of PBA members and/or survey weariness of

PBA members in those regions, according to PBA leaders from those areas (personal communication, February 18, 2024; February 19, 2024; August 23, 2024).

Experience levels in prescribed burning varied widely, from no prior participation (7%) to leading over 100 burns (4%). A majority (58%) had at least four years of burning experience, which is expected given research showing a strong correlation between PBA membership and prescribed fire use on both personal and shared properties (Kreuter et al., 2008; Stroman et al., 2020; Toledo et al., 2014). However, only 28% had been involved with their PBA for more than four years, likely due to the relatively recent establishment of many PBAs, limiting long-term membership opportunities. Most PBA members indicated they had been members for between one to three years (46%). Individuals who are older, male, based in the Midwest, or have more burning experience tend to have longer PBA membership. This may be because those with greater experience recognize the value of continued participation in PBAs for networking, training, and burn opportunities. Additionally, the Midwest has a longer history of PBAs (Deak et al., 2025b), which could contribute to members in that region having longer tenure.

It was found that a majority (78%) of the respondents had participated in at least one educational or training event organized by a PBA within the last 12 months, with most attending between 1 and 5 events, the majority of which were prescribed burns. Individuals with more burning experience and longer PBA membership were found to be more likely to attend PBA-offered events. This may be due to their greater appreciation of training or because they gain experience through these events. Nearly a quarter of participants (22%) had not participated in a PBA-offered event within the past year. Non-participation was primarily due to lack of time, travel distance, being unaware of any events offered by the PBA, and scheduling conflicts. This aligns with findings from Tough (1978) that adults are motivated to keep growing and

developing but often run into barriers such as inaccessibility of opportunities or resources, time constraints, and programs that do not incorporate principles of adult learning. Prior to this study, service providers were unaware of the nature and characteristics of PBA members. This study revealed this information to PBA leaders and all who need it to serve this audience effectively.

Conclusions Related to Objective 2

The second objective of this study was to determine the factors that motivate members to participate in PBA-offered prescribed burning educational programs. When adult education practitioners understand the motives driving adults to participate in educational programs, they can tailor information delivery to meet participant needs, enhance the likelihood of adult learning, and encourage sustained participation in the program (Merriam et al., 2007). Similarly, PBA leaders and training instructors can use this understanding to design educational opportunities that align with members' motivations, ensuring training remains relevant, engaging, and effective in fostering long-term involvement in the PBA.

It was found that a variety of factors motivated respondents to participate in their most recently attended PBA event. Knowledge and Skills Development was rated as the greatest motivational construct, with a mean score of 3.63, followed closely by contribution to Environmental Stewardship ($M = 3.61$). It should be noted that the top five items fell within these two constructs. It was found that the greatest motivations were "To align with my commitment to environmental stewardship" within the Environmental Stewardship construct ($M = 3.95$), and "To increase overall my competence in burning" within the Knowledge and Skills construct ($M = 3.92$).

The items with the lowest mean were related to professional development and leadership. This is likely due to the fact that only a proportion (26%) of respondents were participating in the

PBA as a professional or student, many were over the age of 65 (42%), and very few PBAs have training requirements (Deak et al., 2025b), making professional development and leadership less of a priority for this group. In addition to the provided choices, a surprising number of respondents ($n = 183$) shared additional motivations in the open-ended question. Additional motivations with the highest number of comments included motivations such as ecological restoration, collaboration and mutual support, emphasizing shared efforts, exchange of knowledge, and the reliance on the PBA community to achieve goals.

Conclusions Related to Objective 3

The third objective of the study was to examine whether participants' motivations to engage in educational programs offered by PBAs were associated with their demographics, prescribed burning experience, or PBA participation. Regarding overall motivation and motivation for each of the five motivational constructs, several associations were found between demographic, experience, and PBA participation variables. However, these correlations are weak, suggesting they are not strong predictors of motivation. While these findings offer insight into potential motivations, they should be interpreted with caution since other extraneous factors may also influence motivation. Additionally, respondents in this study were generally well-educated and highly motivated, which could affect the broader applicability of the results. However, these findings can help PBAs tailor programs to address a range of needs, from foundational skill-building to leadership and community engagement. Conclusions related to associations with overall motivation and each of the five motivational constructs are presented in more detail below.

Overall Motivation

Respondents from the West showed the highest overall motivation compared to the other three regions. This could be because prescribed burning opportunities in the West are often more limited due to regulatory and environmental constraints, making participants more eager to participate when opportunities are available. Age and education levels were negatively correlated with overall motivation. Younger individuals and those with lower formal education levels may be more motivated to gain hands-on experience and practical knowledge through PBA events, as they might have fewer alternative avenues for training or career advancement in fire management compared to older and more educated PBA members.

Motivation for Knowledge and Skills Development

Individuals with lower education levels, less prescribed burning experience, and shorter PBA membership are more strongly motivated by knowledge and skill-building than individuals with higher levels of education, greater prescribed burning experience, or a longer PBA membership. This could imply that those who have fewer credentials or less experience view these opportunities as critical for their personal and professional growth. In contrast, those with higher levels of education, greater prescribed burning experience, or a longer PBA membership may be less motivated to build knowledge and skills because they might feel that they already have the necessary knowledge and skills. Since there were no motivational differences between region or gender for the Knowledge and Skills Development construct, it is clear that participants across different regions and gender are equally motivated to develop their knowledge and skills in prescribed burning.

Motivation for Environmental Stewardship

The Midwest was significantly lower than the West and Northeast for motivation in the Environmental Stewardship construct. This regional difference may stem from variations in land use priorities and fire history, as the Midwest has a strong agricultural and rangeland management tradition where prescribed fire is often seen as a practical tool rather than primarily for ecological restoration (Deak et al., 2025b). In contrast, the West and Northeast may emphasize fire's role in ecosystem health and biodiversity conservation, leading to stronger environmental stewardship motivations among participants in those regions.

Females and those with lower education levels and less prescribed burning experience are more strongly motivated by Environmental Stewardship than males with higher education levels and greater prescribed burning experience. This may be because females, individuals with less education, and those newer to prescribed burning are more likely to view it through a conservation-focused lens, seeing it as a tool for environmental stewardship, whereas males, individuals with higher education, and those with more experience may approach it primarily as a land management tool to meet specific objectives such as reducing fuel loads or improving forage. Research has shown that women tend to have stronger pro-environmental attitudes and prioritize conservation more than men (McCright & Xiao, 2014; Zelezny et al., 2000). Those with less education or newer to prescribed burning may have been introduced to it through PBA outreach programs emphasizing ecological benefits, while experienced practitioners already understand the environmental benefits and may have shifted their focus toward operational efficiency and achieving targeted outcomes.

Motivation for Social Engagement and Community Service

A significant difference in motivation scores was found between the Southeast and West regions ($H = -50.05$, $p = .004$), with the Southeast region showing lower motivation in this construct. This variation may be influenced by regional differences in social dynamics, cultural attitudes toward prescribed burning, or the availability and structure of PBA programs. For example, in the Southeast, prescribed burning is more common and culturally ingrained, which might lead landowners to view it as a standard management practice rather than a community-driven effort. The Southeast also has a lot of private land ownership, which tends to be smaller and more fragmented, with a strong emphasis on individual property rights. In contrast, Western landowners may manage larger tracts of land where collective action is more necessary.

Individuals in younger age categories and those with lower education levels have higher motivation for Social Engagement and Community Service compared to older individuals and those with higher education levels, possibly due to a greater desire to build connections or to learn from others. This is in contrast to findings from other studies which found that the older demographic is more inclined to pursue education for reasons such as cognitive interest and social contact (Boshier & Ridell, 1978; Fisher, 1983; Kim & Merriam, 2004; Prichard, 1979; Russett, 1998). Additionally, individuals who attended more events, had longer PBA membership, and possessed more prescribed burning experience tended to be more strongly motivated by social and community service, suggesting that these members value the camaraderie and collaboration these events provide. Increased involvement could foster a stronger sense of community, engagement, and responsibility for helping others gain access to prescribed fire.

Motivation for Professional Development and Leadership

The Western region shows higher motivation in this construct than all three other regions, which may be influenced by factors such as a greater presence of fire-related professions in the West, or more fire professionals as PBA members. PBA members who are younger, have lower education levels, attend more events, and have greater prescribed burning experience exhibit slightly higher motivation for Professional Development and Leadership than those PBA members who are older, have higher education levels, attend fewer events, and have less experience. This could be due to younger individuals and those with less formal education seeking hands-on experience and skill-building opportunities to advance their careers or establish credibility in the field. Additionally, attending more events and gaining prescribed burning experience may naturally lead to a stronger interest in leadership roles and professional growth as individuals become more embedded in prescribed burning and the PBA network and recognize opportunities for advancement.

Motivation for Personal Fulfillment

Findings indicated higher motivation for Personal Fulfillment in the West compared to the Midwest and Southeast regions. This regional difference could be influenced by the cultural and ecological significance of fire in the West. The strong presence of fire-prone landscapes in the West may also foster a greater personal connection to prescribed burning, as individuals recognize its importance in maintaining ecological balance and reducing wildfire risk. Additionally, social and community support structures for prescribed fire in the West may enhance personal fulfillment by reinforcing a sense of belonging and shared purpose among PBA members.

PBA members who are younger, have lower education levels, and have greater prescribed burning experience exhibit slightly higher motivation for Personal Fulfillment than older members, those with higher education levels, and less experience. This could be because younger individuals and those with less formal education may find hands-on fire management particularly rewarding, offering a sense of achievement, mastering new skills, and connection to the land. Additionally, individuals with more prescribed burning experience may have developed a deeper personal appreciation for fire as a tool and find intrinsic satisfaction in applying their knowledge and skills. Studies indicate that landowners and practitioners engaged in fire management often experience a sense of accomplishment and belonging, particularly when working in collaborative settings like PBAs (Weir et al., 2019).

Associations Between Selected Variables and Motivational Constructs

Each demographic, experience, and participation variable's association with the motivational constructs was further examined. Since all significant correlations were weak or very weak, these factors do not strongly predict PBA members' motivations. However, this finding still has implications for understanding why members participate in PBA-offered programs. Motivation in the Social Engagement and Community Service construct and the Professional Development and Leadership construct was positively correlated with event attendance. This suggests that individuals who are driven by a desire to contribute to their communities or develop leadership skills may be more engaged in PBA activities, as attending events provides opportunities to network, collaborate, and take on leadership roles. Those who view PBAs as a means to serve their community may feel a strong sense of responsibility to participate actively, while those motivated by professional growth may see these events as valuable learning and networking opportunities.

Additionally, the length of PBA membership was positively correlated with motivation in Social Engagement and Community Service. This could be because long-term members have built relationships within the PBA and developed a stronger commitment to its mission, fostering a desire to give back and support newer members. Over time, experienced members may take on mentorship or leadership roles, reinforcing their motivation to contribute to the group's success. On the other hand, newer PBA members showed higher motivation in Knowledge and Skills Development. This could be because individuals who are just beginning their involvement with PBAs may be primarily focused on learning the fundamentals of prescribed burning and gaining hands-on experience. Their initial engagement is likely driven by a desire to build competence and confidence in fire application, whereas long-term members may shift their focus toward leadership and community engagement as they become more established within the PBA network.

Motivations for participating in PBA events vary based on experience. Prescribed burning experience was negatively correlated with motivation in Knowledge and Skills Development and Environmental Stewardship, likely because individuals with less experience are still building competency and confidence in prescribed fire. In contrast, experience was positively correlated with Social Engagement and Community Service and Professional Development and Leadership indicating that individuals with more experience had higher motivation in those areas as their focus may have shifted from skill acquisition toward mentoring others, contributing to fire culture, and taking on leadership roles. Experience was also positively correlated with Personal Fulfillment, as more experienced practitioners may find intrinsic value in conducting burns, witnessing ecological benefits, and fostering community within PBAs.

Regarding the demographic variables, region, age, education level, and gender were each associated with at least one motivational construct. Members in western states demonstrated higher overall motivation, as well as higher motivation than some regions in four of the five constructs. Specifically, the West showed:

- Higher motivation than the Midwest in the Environmental Stewardship construct, similar to the Northeast.
- Higher motivation than the Southeast in the Social Engagement and Community Service construct.
- Higher motivation than all three other regions in the Professional Development and Leadership construct.
- Higher motivation than the Midwest and Southeast in the Personal Fulfillment construct.

These regional differences in motivation may be influenced by variations in fire culture, policy, and opportunities for prescribed burning across the country. The Western region, where wildfires are larger, more catastrophic and fire management is a pressing concern, may foster a stronger sense of urgency and engagement in prescribed fire activities (Quinn-Davidson & Varner, 2012; The Nature Conservancy, 2024; Wildland Fire Mitigation and Management Commission, 2023). Additionally, differing state regulations and historical fire use traditions could shape the ways in which individuals perceive and engage with prescribed burning. Social and professional networks within PBAs may also vary by region, influencing how members develop their motivations and connections to prescribed fire. No regional differences were found for the Knowledge and Skills Development construct, suggesting that it serves as a consistent motivator for PBA members nationwide.

Age was negatively correlated with motivation, with younger members exhibiting higher overall motivation, and within the Social Engagement and Community Service, Professional Development and Leadership, and Personal Fulfillment constructs, which may be attributed to a greater enthusiasm for career growth, networking, and community involvement. Additionally, education levels were negatively correlated with motivation, with lower education levels associated with higher overall motivation and stronger motivation across all five constructs. This may suggest that individuals with less formal education view PBAs as a valuable opportunity to gain knowledge, skills, and experience in prescribed burning, with PBA events potentially filling a critical learning gap and providing accessible, hands-on learning opportunities. Females demonstrated higher motivation than males in the Environmental Stewardship construct, possibly reflecting a greater emphasis on conservation values or community-oriented perspectives. No other significant associations between gender and motivation were found.

Conclusions Related to Objective 4

The fourth objective of the study was to ascertain the extent to which PBA-offered educational programs reflect principles of andragogy, as perceived by PBA members. Holton et al. (2009) emphasize the importance of gathering student feedback to assess facilitator effectiveness and whether student achievement and satisfaction are outcomes of the learning experience, as adult learners tend to experience greater satisfaction when programs align with their expectations (Park et al., 2016). The andragogical principles scales portion of the API (version 4) was used to gauge the extent to which PBA members perceived the alignment of their learning activities with andragogical principles (Bates, 2020; Knowles et al., 2020). It has been argued that successful learning should have a combination of all six principles of andragogy (Chinnasamy, 2013). Findings from this study indicate that respondents generally agreed that all

six andragogical principles were evident in their learning experiences. In addition, results from the learner satisfaction scale indicated strong agreement ($M = 4.30$) that PBA-offered educational programs provided learner satisfaction, especially in contributing practical knowledge that can be used on future burns ($M = 4.33$).

Participants particularly recognized the effectiveness of the programs in fostering 'Motivation to learn', which received the highest ratings ($M = 4.27$) among the evaluated principles. This suggests that PBA programs successfully engage participants by addressing their intrinsic and extrinsic motivations, encouraging continued involvement and skill development. For adult learners, participation in learning and education is motivated more by personal interests and needs than by external requirements (Knowles, 1984). This is reflected in the four of the five lowest mean scores being in the Professional Development and Leadership construct, with the lowest motivation item being "To meet training or professional development requirements (for the state, a job, organization, PBA, etc.)" ($M = 1.77$), suggesting that members are less driven by external requirements. Instead, they are more motivated by intrinsic interests and personal goals, emphasizing the importance of educational programs that offer practical value and direct relevance to their internal learning interests. Programs can leverage this motivation by offering engaging and challenging learning opportunities that align with members' interests and goals.

Since learning motivation is enhanced when adults' experiences are recognized and valued (Knowles, 1990), this corresponds with participants' recognition of the effectiveness of PBA programs in reflecting the principle of 'Experience,' which received the second-highest ratings ($M = 3.99$). This finding suggests that PBA members appreciate opportunities to apply their past knowledge and practical experiences to new learning situations and to share that with others. Several people spoke to this in the final open-ended question of the survey. One

participant said, “Being an experienced volunteer...is a great way to be able to pass on the experience and knowledge I gained to others who are interested but never were able to work with fire.” According to Knowles et al. (2020), “...for many kinds of learning, the richest resources for learning reside in the adult learners themselves” (p. 44). This is evident in PBAs, where members bring diverse experiences and skills that contribute to a collaborative learning environment. This highlights the importance of hands-on, experiential learning approaches such as field-based training, learning from fellow participants through discussions, and mentorship within PBAs. Through peer learning, mentorship, and hands-on participation in burns, PBAs draw on the expertise of their members, emphasizing that learning happens not just through formal instruction but also through shared experience within the community.

There was strong perceived reflection of ‘Self-concept’ ($M = 3.91$) in PBA-offered educational and training programs, however, the range of mean scores (3.63–4.19) suggests some variability. Merriam (2001) noted that self-directed learning has “helped bring to the forefront the importance of informal learning that occurs as we go about our daily lives” (p. 94). This is especially relevant in PBAs, where members often learn through direct experience, peer mentorship, and participation in burns. The informal, hands-on nature of PBA activities fosters self-directed learning, allowing members to develop skills and knowledge in real-world settings beyond structured training programs. Knowles et al. (2020) suggest that self-concept develops naturally, with learners demonstrating greater independence as they gain familiarity with the subject matter. Members who perceive a lower reflection of the self-directed learning principle may benefit from additional support or structured resources, while those who perceive greater self-direction may do better in more independent learning environments. Programs might benefit from offering flexible learning pathways that cater to different levels of self-directedness, for

example, providing options for both self-paced online training courses as well as in-person training with mentors.

Adult learners aspire to apply and use acquired knowledge to enhance their ability to address current life challenges in which they may currently feel inadequacies (Knowles, 1968). The ‘Orientation to Learning’ principle received varied ratings (3.49–4.33), reflecting diverse perceptions of how effectively PBA programs demonstrate real-world application of learning. This suggests that while some PBA programs may provide immediate, hands-on opportunities for applying knowledge, others may focus more on foundational learning, which could influence how participants perceive their practical relevance. In the context of PBAs, members seek to apply their knowledge to improve their ability to conduct prescribed burns safely and effectively, addressing gaps in their skills or confidence. PBAs can enhance engagement by tailoring educational programs to emphasize practical, problem-solving applications, ensuring members see a clear path from learning to real-world implementation. This could include more hands-on training, scenario-based exercises, or opportunities to apply knowledge directly during burns.

Findings show that the ‘Readiness’ principle received the second-lowest score ($M = 3.63$), indicating that while motivation is high, participants may not always perceive PBA programs as effectively fostering their preparedness or confidence to engage with new content. This points to a need for basic education and training to build their confidence and preparedness. This could be especially useful for individuals with less burning experience or those new to the PBA. Cranton (2000) found that “adults choose programs, courses, or workshops based on their sometimes immediate and/or practical interests and needs” (p. 72). In the context of PBAs, this suggests that members are likely drawn to educational opportunities that address their specific, practical needs in prescribed burning, such as improving certain skills or understanding their

state's laws. Thus, PBAs can enhance engagement by aligning their programs with the challenges and training needs of their members.

The Need to Know principle received comparatively lower scores ($M = 3.55$), which could provide considerations for program improvement. This finding indicates that while participants found the programs engaging, some participants may not always see an immediate need for the information provided. There may be gaps in clearly communicating the immediate relevance and applicability of the training content to their personal and professional goals. According to Knowles et al. (1998), adult learners require a clear understanding of the reasons behind what is learned, how they are learning it, and why it is important. This finding highlights an opportunity to improve communication about the relevance and practical benefits of learning opportunities, helping participants better understand how the knowledge can directly impact their land management or prescribed burning goals.

These findings provide valuable insights to develop and improve programs that align with the learners' motivations and needs within PBAs. PBA leaders can utilize these API results to design and refine educational offerings tailored to their adult PBA members. By applying adult learning principles, andragogical design elements can be integrated into prescribed burning educational and training programs, fostering improved learning outcomes.

Conclusions Related to Objective 5

The fifth objective of this study was to determine which competencies are important to conduct prescribed burns, as perceived by PBA members. All five competency constructs (i.e., Planning a Burn, Smoke Management, Risk Management and Safety, Burn Operations, and Leadership and Communication) were perceived to be between important and very important on a five-point Likert scale ranging from 1 = "Not Important" to 5 = "Very Important." This finding

was expected, as the competencies developed through this study were derived from a comprehensive literature review and input from subject-matter experts.

Risk Management and Safety was rated as the most important construct, with a mean score of 4.67, followed by Leadership and Communication ($M = 4.64$) and Planning a Burn ($M = 4.58$). Constructs rated slightly lower were Burn Operations ($M = 4.47$) and Smoke Management ($M = 4.27$). While Risk Management and Safety was expected to be rated highly due to the inherent dangers of prescribed burning, the close proximity of the mean scores across all constructs indicates that respondents perceive each aspect of prescribed burning as crucial. The highest and lowest mean scores were only separated by 0.40 on a five-point scale, suggesting that PBAs recognize the interconnectedness of these competencies, and successful prescribed burning requires a balanced skill set across various domains. The five constructs included 21 individual competencies, with 20 receiving a rating above 4.0, indicating they were considered important or very important.

The highest-rated competency item, perceived to be the most important in conducting a prescribed burn, was "Identify acceptable weather parameters to execute burns effectively" from the Planning a Burn construct ($M = 4.83$). Understanding and identifying acceptable weather parameters are critical to the success and safety of a prescribed burn, so this finding is not unexpected. This was closely followed by "Conduct a crew briefing before the burn to ensure all team members are informed and prepared, covering topics such as burn objectives, work assignments, potential hazards, and contingency/back-up plans," with a mean score of 4.80, and "Maintain effective communication throughout the burn (e.g., two-way radio, cell phone, walkie-talkie, etc.)," with a mean score of 4.79. Both of the latter competency items are part of the

Leadership and Communication construct. These findings highlight PBA members' understanding of the importance of good communication during a burn.

Survey respondents were invited to suggest additional competencies they considered important for conducting a prescribed burn, beyond the provided options. This open-ended question generated 146 applicable responses, the majority of which aligned with the five existing constructs. More than one-third of the responses ($n = 54$) aligned with the Risk Management and Safety construct in particular. Many responses focused on the importance of assigning crew members to roles that match their abilities and experience. One new construct, Human Factors and Team Dynamics, was developed to include a synthesis of the 20 suggested competencies that did not fit into any of the five existing constructs. The Human Factors and Team Dynamics construct focuses on building an inclusive, collaborative, and supportive team environment, managing stress and conflict, fostering trust and continuous learning, and ensuring positive and engaging experiences during burn operations. This finding is useful for expanding the existing five competency constructs to six competency constructs.

Conclusions Related to Objective 6

The sixth objective of this study was to determine PBA member self-reported proficiency levels for competencies necessary to conduct prescribed burns. Participants were asked to rate their proficiency level for each of the aforementioned 21 competencies, organized within the same five competency constructs. Proficiency was defined as a combination of skill and confidence, assessed using a five-point Likert scale: Minimal (1 - little to no proficiency), Basic (2 - some proficiency but needs development), Moderate (3 - adequate proficiency with room for improvement), Advanced (4 - high proficiency with minor improvements needed), and Exceptional (5 - exceptional proficiency with no improvements needed).

The overall mean scores for self-reported proficiency levels across competency constructs ranged from 2.97 to 3.22. Participants reported the highest proficiency in the Risk Management and Safety construct, with a mean score of 3.22, followed closely by Planning a Burn with a mean score of 3.11. The higher proficiency in these constructs may suggest that they have been exposed to more opportunities for training and experience in these areas. PBA members may feel more comfortable with these competencies because they are essential for all prescribed burns and may be prioritized in training programs. The constructs with the lowest reported proficiency levels were Leadership and Communication and Burn Operations, both with mean scores of 2.98, and Smoke Management, with a mean score of 2.97. This could indicate that these skills are more challenging to become proficient in or may require more specific, advanced training and experience. Leadership and communication may be harder to develop, especially if participants have had fewer opportunities to take on leadership roles or practice communication on a burn. Similarly, proficiency may be gained over time with hands-on experience for Burn Operations and Smoke Management. It is also possible that the training and resources available to participants in these areas are less extensive compared to the Risk Management and Safety or Planning a Burn constructs.

Mean proficiency scores for individual competency items ranged from 2.49 to 3.53. A majority of the 21 competency items (62%) were rated as “moderate,” with mean scores between 3.00 and 3.53. The remaining competencies were rated as “basic,” with mean scores between 2.49 and 2.99. None of the competencies were rated as “minimal,” which was not unexpected since only a small portion (7%) of PBA members had never participated in at least one burn over the course of their life. While it was expected that competencies may not be rated as “exceptional,” it was surprising that none were rated as “advanced,” given that nearly half (46%)

of PBA members had participated in six to fifty burns, and more than half (51%) had led at least one burn. This could suggest that while many PBA members have substantial experience, the competencies being assessed might require additional training. Alternatively, it might indicate that the training and experience gained through participation and leadership in burns may not always be comprehensive or formalized enough to achieve higher competency ratings.

Additionally, there could be a gap between the hands-on experience and the depth of knowledge required for some of the competencies, or members may not have had the opportunity to develop all of the necessary skills in specific areas.

Notably, the highest-rated competency (“Notify adjacent landowners and other appropriate parties of the burn and the potential for associated smoke”) and the lowest-rated competency (“Use tools e.g., smoke screening systems, before the burn to assess potential smoke impacts on your burn unit and the surrounding area”) both fell within the Smoke Management construct. This could be because notifying adjacent landowners is seen as a straightforward task, while using smoke screening tools is more complex. Additionally, not all PBA members may have access to training on these tools, or they may not be necessary depending on the size or geography of the burn.

Conclusions Related to Objective 7

The seventh and final objective of this study was to identify the training needs of PBA members. Borich's (1980) method was employed to identify these needs. The mean weighted difference between the perceived importance level score and the perceived proficiency level score was calculated to determine which competencies required the most training. Higher MWDS values indicate a greater training need compared to lower values. The three competency items with the highest identified need for training are: 1) Supervise the burn crew, providing

direction for ignition, holding, and other operational tasks to ensure effective and safe execution of the burn (MWDS = 8.88), 2) Conduct a crew briefing before the burn to ensure all team members are informed and prepared, covering topics such as burn objectives, work assignments, potential hazards, and contingency/back-up plans (MWDS = 8.67) and 3) Identify acceptable weather parameters to execute burns effectively (MWDS = 8.41).

The distribution of competency items scoring between 5.0 and 7.99 is relatively even, with 24% of competencies falling within each of the 5.0–5.99, 6.0–6.99, and 7.0–7.99 ranges. This suggests that training needs are spread across a broad range of competency items rather than being concentrated in just a few areas. The Leadership and Communication, Risk Management and Safety, Planning a Burn, and Burn Operations constructs each have at least two competency items scoring in the 7.0–8.0 or greater range, highlighting potential focus areas for skill development in these areas. The Risk Management and Safety construct has competency items spread across nearly all score ranges, with one competency item in the highest range (8.0 or greater), suggesting that some aspects of safety training may require immediate attention. Although the Smoke Management construct has fewer total items, its scores are relatively lower compared to others, indicating it may not be perceived as a high-priority training need compared to other areas. Overall, the data suggest that while training needs exist across all competency areas, particular attention may be needed for competencies scoring 8.0 or higher (19%), with an emphasis on Leadership and Communication, Burn Operations, and Risk Management and Safety. It may be beneficial to prioritize these competencies in future training programs. Knowles et al. (1998) suggested that “a pedagogical strategy is appropriate, at least as a starting point when learners are more dependent due to a strange content area” (p. 69-70). Therefore, a

pedagogical approach may be necessary when working with PBA members who demonstrate lower proficiency levels, as they may require more guidance in these areas.

PBA members fall on a spectrum of experience, from those new to prescribed burning to those leading burns. Training should also follow this spectrum, offering foundational education for beginners while providing advanced training for those taking on leadership roles. For example, while all members benefit from understanding briefing and after-action review (AAR) processes, only burn bosses need proficiency in leading them. It should be noted that the competencies in the survey questions were for proficiencies in conducting a burn, however, some people indicated in the open-ended responses that they have no desire to ever lead or conduct a burn themselves, but rather only participate as a crew member, so therefore some of the training needs would not apply to everyone in this context. Additionally, since respondents were generally well-educated and highly motivated, their training needs may differ from those of less-educated or less-motivated individuals, who might have different knowledge gaps. Therefore, caution should be taken when interpreting these training needs, as not all members require expertise in every competency, and those with different educational backgrounds and motivations may have varying training needs.

Recommendations

Based on the findings of this study and a review of the literature, the following recommendations are made for PBA leaders and others who develop or conduct educational and training programs for PBA members:

1. Increase accessibility of PBA events to support diverse membership. PBAs bring together a diverse group of individuals committed to prescribed burning, each with different levels of experience, backgrounds, and availability. Although Motivation to

Learn was the highest-ranked andragogical principle in terms of perceived integration within PBA-offered programs, research shows that while adults are motivated to keep learning and developing, they often face barriers such as limited access to programs or resources, time constraints, and programs that fail to incorporate principles of adult learning (Tough 1978). Similarly, many of the PBA members who had not participated in an event within the last 12 months indicated it was primarily due to lack of time, travel distance, unawareness of any PBA-offered events taking place, and scheduling conflicts.

To ensure that all members have the opportunity to participate and benefit from training, PBAs should consider offering events at varying times, including weekends and evenings, while also exploring options such as rotating locations, virtual components, or recorded training sessions to improve accessibility, engagement, and overall impact. Some large PBAs and/or those that cover a lot of area may want to consider breaking into smaller chapters or sub-groups to offer more opportunities to members within a closer travel distance and more individual attention.

2. Offer targeted training opportunities. Individuals with less prescribed burning experience are more motivated by knowledge, skill-building, and environmental stewardship as compared to members with more experience. PBAs with a higher proportion of new members or those with less burning experience should focus on offering hands-on burning opportunities and structured training to build their confidence and abilities. Since women show greater motivation for environmental stewardship, hosting women-focused events that highlight ecological benefits and land stewardship could foster greater engagement.

3. Foster mentorship and leadership opportunities. Members with more prescribed burning experience tend to be motivated by social connections, community service, professional development, leadership, and personal fulfillment. PBAs can enhance engagement by encouraging experienced members to mentor newer participants through peer-to-peer learning or peer teaching. This aligns with the finding that the andragogical principle of Experience was perceived to be well integrated into PBA-offered programs, reflecting the importance of learning from firsthand knowledge and practical application.

Strengthening these opportunities can also help younger and less formally educated participants, who show stronger motivation for professional development, to gain job skills and leadership experience for careers in wildland fire. Hewlett et al., 2009 found that younger individuals prefer working with and are more likely to seek mentorship and support from older generations. Within PBAs, this suggests that younger members may be especially inclined to learn from older and more experienced landowners, highlighting the importance of intergenerational knowledge transfer in building skills and leadership in prescribed fire. Strengthening mentorship and leadership opportunities could also help to address sustainability concerns since the greatest threat to PBAs has been identified as a lack of long-term leadership and coordination (Biemiller, 2018). A recent study found that 40% of PBA leaders felt their PBA would not continue if key leaders left, while 28% were unsure how their PBA would continue (Deak et al., 2025a). By fostering a mentorship culture, PBAs can further enhance their members' capabilities while strengthening the community and preparing for the future.

4. Develop flexible, regionally adaptable education and training materials. Since participants across different regions share similar levels of motivation for knowledge and

skills development, PBAs may benefit from training approaches with minimal regional adjustments. For example, it has been suggested that Extension and other interested parties could adapt the *Guidebook for Prescribed Burning in the Southern Region*, commonly used by Southern PBAs, for other regions by modifying only the necessary components while maintaining a broad, consistent foundation of prescribed fire knowledge. Similarly, a training workbook could be developed for PBAs like the *Prescribed Fire Training Exchange (TRES) Activities Workbook* (Mueller, 2021), which is designed to compile and categorize useful training activities for professional wildland firefighters in a flexible, "plug-and-play" format.

5. Apply adult learning principles to improve training and education. Integrating adult learning theory into PBA training programs can enhance engagement and effectiveness by tailoring education to members' varying experience levels and learning preferences. By designing training programs that align with adult learning principles, PBAs can create more engaging and effective educational experiences that meet the needs of all members. Addressing lower scores in the 'Need to Know' and 'Readiness to Learn' principles requires making training directly relevant to real-world prescribed burning. Emphasizing real-world application through participation in live burns, scenario-based learning, and structured debrief discussions can enhance knowledge acquisition and retention. For example, after training exercises or live burns, an adapted version of an After Action Review (AAR) can help members reflect on what went well, identify areas for improvement, and understand the science behind the techniques used. This process can reinforce learning and deepen their understanding of prescribed burning practices.

To incorporate the Self-directed Learning and Orientation to Learning principles, programs should offer a mix of guided and self-paced learning. Combining structured, non-formal instruction with flexible, independent learning opportunities can improve engagement. Less experienced members may benefit from a more guided, hands-on approach, while experienced burners may prefer self-directed learning opportunities, such as online modules or discussion-based training. In addition, incorporating peer-learning and mentoring approaches align with the Experience principle. While PBAs may not be interested or have the capacity to provide these opportunities themselves, sharing existing resources with members could still be beneficial. Extension partners or other organizations may be able to help provide these opportunities to facilitate learning.

6. Structure education and training programs to match experience levels. PBA members range from beginners to experienced burn leaders, so educational and training programs should align with this spectrum. Foundational courses or training can introduce key concepts to new members, while advanced training can support those preparing for leadership or burn boss roles. For example, while all members benefit from understanding burn briefing processes, only burn bosses are responsible for leading them before a burn. Tailoring training content to different roles ensures members receive the right level of instruction without unnecessary complexity. Instructors should keep in mind that while andragogical principles are crucial for program effectiveness, a pedagogical approach may better serve less experienced members who require additional guidance in key areas.
7. Consider developing an optional, simple, performance-based approach to assess the capabilities of PBA members in burn planning, different fireline roles such as firing,

holding, or burn boss, and for burns of varying complexity to tailor training programs to meet their learning needs effectively. While several states have Certified Prescribed Burn Manager programs that recognize competency in prescribed burning, many of these programs offer only instruction without hands-on training to build knowledge and skills and may not distinguish between burn complexities. There are currently no known national efforts to help burners that are not affiliated with the National Wildfire Coordinating Group (NWCG) qualification system, such as landowners and PBA members, identify their training gaps.

In the open-ended section regarding additional competencies, many responses highlighted the need to better understand crew members' experience levels. Therefore, a performance-based approach could help in developing proficiency, particularly for those aiming to lead prescribed burns. This could take the form of a simple dichotomous key or a more accessible, concise landowner version of a Position Task Book that provides the minimum skills needed for a person planning, conducting or assisting with a prescribed burn on private property. Such evaluations could be self-reflective, with the option for supervision, approval, or submission optional for those who choose it. Given the wide range of training needs identified in this study, such an approach would be beneficial at the individual level to pinpoint areas where training is needed, rather than at the PBA level. The competencies identified through this study could serve as a foundation, with other competencies added as needed for local PBA contexts, varying burn complexities, splitting the competencies needed for planning and conducting a burn, or specific fireline duties such as firing or holding. Additionally, an advanced training program through Extension (modeled after similar programs like Master Gardener, Master Naturalist, or

Master Woodland Owner) could be developed in collaboration with PBAs to address any educational or training gaps, enhance leadership skills, and provide structured pathways for mentorship and skill progression in prescribed burning.

8. Target training in high-priority topic areas based on needs assessments. This study suggests that while PBA programs effectively address members' motivations and learning needs, targeted training in the highest-priority areas could further enhance their impact. The results of the training needs assessment highlight clear priority areas for training within PBAs, with Leadership and Communication, Risk Management and Safety, and Planning a Burn identified as the highest areas of need. Specifically, training in competencies like supervising burn crews, conducting burn briefings, and managing burn risks should be prioritized, especially for those members who want to lead a burn. These areas show the greatest gap between the perceived importance of these skills and the current proficiency levels, suggesting that focusing training efforts here will have the most immediate impact. Developing a prescribed burning version of the Incident Response Pocket Guide (IRPG) for landowners and other non-professional burners could provide PBA members with quick access to best practices, including these priority topics.

However, not all members will require training in these high-priority areas. These topics are most relevant to those taking on leadership roles, such as burn bosses, who are responsible for managing the burn and the crew. Members who are participating in burns but are not leading them may not need to focus on these competencies, as their roles typically involve supporting tasks like ignition or holding the line. Offering incremental skill-building opportunities will allow participants to gradually build their confidence and

competencies, ensuring they feel prepared to engage with more advanced topics when the time comes.

Since PBA membership changes over time, with new members joining and others leaving, it is important to regularly conduct needs assessments within each PBA to ensure that training continues to address evolving priorities. PBAs can use the competencies outlined in this study as a guide but may also want to incorporate additional competencies identified by this study when conducting needs assessments to develop tailored educational programs to meet the diverse learning needs of PBA members. In particular, the Human Factors and Team Dynamics construct, which emerged as a new area of focus, should be considered when conducting future assessments to ensure PBAs address the full spectrum of training needs.

9. Provide integrated training, education, and hands-on experience, including peer-to-peer learning and mentorship opportunities for achieving higher learning outcomes. To ensure PBA members remain informed and well-prepared for the complexities of prescribed burning, it is essential for PBAs to provide continued education or recommend opportunities provided by partners that complement hands-on training. While training focuses on practical skills like fire ignition techniques, safety protocols, and operational tasks, education covers the broader environmental, legal, and ecological context of prescribed burning. By including educational components such as fire behavior and weather patterns in training, members can gain a deeper understanding of why certain techniques are used and how to adapt to varying conditions. Field-based education allows members to immediately apply their knowledge, reinforcing their understanding through hands-on experience. When designing educational programs, it is important to consider

that most PBA members are well-educated but have varying levels of experience, which may influence the types of training approaches that are most effective. Since most PBA members are well-educated, they may quickly grasp key aspects of prescribed burning. Online educational programs could offer a flexible option to accommodate their schedules while meeting their learning needs.

10. The majority of PBA members are well-educated landowners with prescribed burning experience, making them valuable partners in developing prescribed burning educational and training programs for the membership. To establish this partnership, forming an advisory panel composed of knowledgeable and experienced PBA members can help tailor programs to better meet the needs of the membership.

Implications for Future Research

This study revealed the following areas that are recommended for future research:

- Future studies should explore strategies to increase survey participation among less experienced PBA members, as early respondents in this study tended to be more experienced in prescribed burning. A more representative sample would help capture the perspectives of newer members and provide a clearer picture of demographics, motivations, learning experiences, and training needs across experience levels. Additionally, collecting information on the members' occupations could help determine whether professional background influences their prescribed burning experience, motivations, learning experiences, and training needs.
- Future research should explore how motivations of PBA members differ based on the type of event attended, such as hands-on prescribed burns versus workshops, to determine whether certain formats are more effective for specific learning goals. Exploring any

associations between motivations and event type could provide valuable insights; for example, whether participants of hands-on prescribed burns have higher motivations related to knowledge and skills development compared to those attending workshops. Since participants in this study were asked to reflect on their most recently attended event, the variation in event type should be considered in this analysis. Additionally, examining the relationship between motivations, the Andragogy in Practice Inventory (API), and event type could further clarify the impact of hands-on learning on participants' experiences compared to those who attended classroom or workshop formats.

- Given the large number and wide range of motivations for participating in a PBA-offered educational program and competencies that respondents believed to be important in conducting a prescribed burn identified in open-ended responses, future research should consider qualitative or mixed-methods approaches to explore these areas further. These insights could expand the existing lists of motivational items and competencies for future assessments and could allow PBA training instructors to refine educational and training programs to better align with participants' needs and priorities.
- While this study examined motivations for participation in PBA-offered educational programs, further research could investigate motivations for individuals joining a PBA, and whether their involvement directly increases their experience with and use of prescribed burning. Members with longer PBA involvement tend to attend more events and have more experience, including burns led, burns participated in, and years of burning, highlighting the need to explore whether PBAs directly influence this association or if other factors contribute. A longitudinal study could track members over

time to assess how their participation, leadership roles, and motivations evolve. This could provide insight into whether members shift their focus toward leadership and community service as they gain experience or if they continue to prioritize knowledge and skill development and environmental stewardship.

- This study identified a new set of competencies important for PBA members. Future research should determine the training needs of PBA members associated with these competencies.
- Future research should evaluate whether existing prescribed burning training and education programs are meeting members' motivations and skill development needs, including an assessment of program effectiveness. Additionally, since this study only explored associations between members' demographic characteristics, experience, and participation with motivations, future research into how these factors relate to learning experiences and training needs would be valuable. For instance, it would be important to investigate whether members feel that the programs help them achieve the personal and professional growth they seek and how these outcomes vary by motivation. Studies could examine differences in learning experiences and training needs by experience level, leadership roles, and PBA membership duration. This could help PBAs tailor programs to support members at different stages of their prescribed burning journey.
- A comparative study could examine how PBAs or similar models, along with their members' motivations, vary across regions or countries with differing prescribed, traditional, or cultural burning traditions. This could provide valuable insights for strengthening fire management programs for landowners and ranchers globally while

creating opportunities for cross-cultural learning, ultimately enhancing the overall effectiveness of prescribed burning education and practice.

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APPENDICES

Appendix A: Survey Instrument

Thank you for participating in this study about Prescribed Burn Associations (PBAs). The survey should take 15-20 minutes to complete and has four sections about your:

1. Motivations for participating in PBA events
2. Opinions of your most recent PBA learning experience
3. Skills & knowledge in prescribed burning
4. Background and prescribed burning experience

Your time and participation are greatly appreciated. Your contribution to this study will help identify and prioritize training needs and support PBA educational programs.

(Please note: For consistency in this survey, Prescribed Fire Cooperatives, Cultural Burn Associations, Pile Burn Cooperatives, and other collaborative burn groups are referred to as PBAs)

Please list the **full name** of the PBA from which you receive communications and/or are a member.

Have you participated in a prescribed burn, or other educational or training event organized by a PBA **within the last 12 months?**

Yes

No

Which of the following describes why you have not participated in a PBA event within the last 12 months? Select all that apply.

I don't have enough time

I have not paid my membership dues and therefore cannot participate

I was not interested in the topics offered

I don't have the knowledge or skills to participate on a burn

I have a lot of experience in burning and don't have anything new to learn

I didn't know anyone else participating

Travel distance to the events is too far

I was not aware of any PBA events that occurred in the last 12 months

Other (please specify)

On average, how many prescribed burns and other educational or training events organized by a PBA do you attend each year?

1-2

3-5

6-9

10 or more

For the next several questions, please think about the specific PBA educational or training event in which you **most recently** participated.

Which of the following best describes the main activity at this PBA event?

Prescribed burn

Pile Burn

Cultural Burn

Demonstration burn (that I could WATCH, but not participate)

Field day outdoors (with NO live burn)

Lecture/Presentations

Other (please specify)

Please think back to when you decided to participate in this PBA event and select the extent to which each of the following reasons motivated you to participate.

	Not a motivator	Slight motivator	Moderate motivator	High motivator	Extreme motivator
To learn new skills to conduct burns safely and effectively	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To gain proficiency in using fire tools and equipment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To increase my overall competence in burning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To stay informed about emerging technologies and techniques that could help me with future burns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To understand the burning laws and liability statutes in my state	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To discover strategies to minimize risks associated with burns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued.....

	Not a motivator	Slight motivator	Moderate motivator	High motivator	Extreme motivator
To understand how fire can be used to improve land for plants and animals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To learn about fire's role in maintaining a healthy landscape	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To align with my commitment to environmental stewardship	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To adapt burning practices to changing environmental conditions, such as climate variations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To become proficient in using best smoke management practices that minimize impacts on my community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued....

	Not a motivator	Slight motivator	Moderate motivator	High motivator	Extreme motivator
To have a good time with friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To meet new people with similar interests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To network with peers and other fire practitioners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To be part of a supportive community that fosters the exchange of ideas, experiences, and best practices	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To enhance my ability to serve others, especially those needing help with conducting burns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To become more effective as a community member	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To fulfill my obligation to assist other members, so they will be willing to help me burn my property in the future	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued....

	Not a motivator	Slight motivator	Moderate motivator	High motivator	Extreme motivator
To secure professional advancement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To increase my job competence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To achieve an occupational goal, such as a new qualification	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To meet training or professional development requirements (for the state, a job, organization, PBA, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To improve my communication skills to shape public perception and increase acceptance of prescribed burning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To equip myself to become a mentor or take on a leadership role within the PBA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please list any other reasons, if any, not mentioned in the previous questions, that motivated you to participate.

Section 2. The questions in this section are related to your perception of your learning experience at the PBA event.

Please continue to reflect on the same most recent PBA event and select the appropriate button to indicate your level of agreement with each statement.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I needed this learning at this time in my life.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This learning was necessary to help me meet the changes happening in my work or life related to burning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This learning helped me develop the knowledge and skills I need at this time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This learning was necessary for the challenges I face.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I felt responsible for my own learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I set my own goals for learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had control over what was learned.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had a role to play in my own learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I made the decisions about how learning progressed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I felt my prior life and/or work experiences helped my learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My life and/or work experiences were a regular part of the learning experience.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt my life and/or work experiences were a resource for this learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
We did things that illustrated how this learning could help me address real tasks or problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The instructor explained how this learning would help me deal with changes in my life or work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Steps were taken to make clear how the learning would fit my needs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
The things I learned will assist me in resolving a work or life problem.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mastery of this material will benefit me on my next burn.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This learning experience will make a positive change in my life or work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The knowledge gained in this learning experience can be immediately applied to my life or work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I learn because of the personal satisfaction it gives me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I learn because of the inner fulfillment it provides.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I learn because of the pleasure of discovering new things that interest me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I learn for the enjoyment of broadening my knowledge and skills.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Sufficient time was allocated to learn content.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The event contributed to practical knowledge I can use for future burns.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was satisfied with what I learned at this event.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

This third section is no longer related to your experience at the PBA event, but rather about your perceptions of competencies that someone would need to conduct a prescribed burn.

Competencies are the skills, knowledge, and abilities that a person needs to effectively perform a specific task or job. They are what you need to know and be able to do to be successful in a particular role or activity.

Please indicate the level of importance for each competency that you believe someone would need to conduct a prescribed burn.

	Importance level of this competency in conducting a successful prescribed burn is:				
	Not important	Slightly important	Moderately important	Important	Very important
Develop clear and actionable objectives for the burn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prepare detailed descriptions of burn units, including vegetation and fuels (e.g., logs, ground litter, plants, shrubs, trees)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Create an accurate and detailed map(s) of the burn area to guide operations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identify acceptable weather parameters to execute burns effectively	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ensure compliance with state laws and statutes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued...

Importance level of this competency in conducting a successful prescribed burn is:

	Not important	Slightly important	Moderately important	Important	Very important
Use tools (e.g., smoke screening systems) before the burn to assess potential smoke impacts on your burn unit and the surrounding area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Notify adjacent landowners and other appropriate parties of the burn and the potential for associated smoke	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minimize smoke impacts on the burn crew and smoke sensitive areas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued...

	Importance level of this competency in conducting a successful prescribed burn is:				
	Not important	Slightly important	Moderately important	Important	Very important
Develop a plan for holding and contingencies (e.g., critical holding points, response plans for fire escapes and emergencies, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identify potential hazards (e.g., stump holes, improper clothing, dead trees, stinging insects) before and during the burn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inspect and ensure all tools, including the drip torch, are operational and properly fueled before use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Actively mitigate "watch-out" situations to prevent injury or fire escape	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conduct thorough mop-up operations to ensure the fire is completely extinguished or safely contained within the burn perimeter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued...

	Importance level of this competency in conducting a successful prescribed burn is:				
	Not important	Slightly important	Moderately important	Important	Very important
Complete a "Go/No-Go" checklist to make informed decisions if the burn should proceed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Monitor weather conditions on-site using appropriate tools (e.g., pocket weather meter, sling psychrometer, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply appropriate firing techniques based on real-time weather conditions and fire behavior to achieve burn objectives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conduct a post-burn evaluation, including determining whether the burn met the objectives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued...

Importance level of this competency in conducting a successful prescribed burn is:

	Not important	Slightly important	Moderately important	Important	Very important
Conduct a crew briefing before the burn to ensure all team members are informed and prepared, covering topics such as burn objectives, work assignments, potential hazards, and contingency/back-up plans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintain effective communication throughout the burn (e.g., two-way radio, cell phone, walkie-talkie, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supervise the burn crew, providing direction for ignition, holding, and other operational tasks to ensure effective and safe execution of the burn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conduct an after-action review (AAR) with the burn crew after the burn to evaluate the execution of the burn plan, identify successes and areas for improvement, and document lessons learned for future burns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please list any additional competencies that you believe are important for conducting a prescribed burn, which are not included in the previous questions.

The next set of questions will ask about your proficiency level (how skilled and confident you feel) in performing each of the competencies mentioned previously.

Please use the scale below to rate your proficiency level for each competency in the next several questions:

Minimal - Little to no proficiency or understanding

Basic - Some proficiency but needs development

Moderate - Adequate proficiency with room for improvement

Advanced - High proficiency with minor improvements needed

Exceptional - Exceptional proficiency with no improvements needed

My proficiency level in this competency is:

	Minimal	Basic	Moderate	Advanced	Exceptional
Develop clear and actionable objectives for the burn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prepare detailed descriptions of burn units, including vegetation and fuels (e.g., logs, ground litter, plants, shrubs, trees)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Create an accurate and detailed map(s) of the burn area to guide operations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identify acceptable weather parameters to execute burns effectively	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ensure compliance with state laws and statutes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued...

My proficiency level in this competency is:

	Minimal	Basic	Moderate	Advanced	Exceptional
Use tools (e.g., smoke screening systems) before the burn to assess potential smoke impacts on your burn unit and the surrounding area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Notify adjacent landowners and other appropriate parties of the burn and the potential for associated smoke	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Minimize smoke impacts on the burn crew and smoke sensitive areas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued....

	My proficiency level in this competency is:				
	Minimal	Basic	Moderate	Advanced	Exceptional
Develop a plan for holding and contingencies (e.g., critical holding points, response plans for fire escapes and emergencies, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identify potential hazards (e.g., stump holes, improper clothing, dead trees, stinging insects) before and during the burn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inspect and ensure all tools, including the drip torch, are operational and properly fueled before use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Actively mitigate "watch-out" situations to prevent injury or fire escape	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conduct thorough mop-up operations to ensure the fire is completely extinguished or safely contained within the burn perimeter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued....

My proficiency level in this competency is:

	Minimal	Basic	Moderate	Advanced	Exceptional
Complete a "Go/No-Go" checklist to make informed decisions if the burn should proceed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Monitor weather conditions on-site using appropriate tools (e.g., pocket weather meter, sling psychrometer, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply appropriate firing techniques based on real-time weather conditions and fire behavior to achieve burn objectives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conduct a post-burn evaluation, including determining whether the burn met the objectives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Continued....

	My proficiency level in this competency is:				
	Minimal	Basic	Moderate	Advanced	Exceptional
Conduct a crew briefing before the burn to ensure all team members are informed and prepared, covering topics such as burn objectives, work assignments, potential hazards, and contingency/back-up plans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintain effective communication throughout the burn (e.g., two-way radio, cell phone, walkie-talkie, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supervise the burn crew, providing direction for ignition, holding, and other operational tasks to ensure effective and safe execution of the burn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conduct an after-action review (AAR) with the burn crew after the burn to evaluate the execution of the burn plan, identify successes and areas for improvement, and document lessons learned for future burns.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How do you feel your overall competency in prescribed burning has changed since joining the PBA?

- Significantly decreased
- Somewhat decreased
- Stayed the same
- Somewhat improved
- Significantly improved
- Not applicable (I had no prior experience before joining the PBA)

This is the final section of the survey. The remaining questions will ask for information about your experience and background.

Which of the following best describes your affiliation as a PBA member/participant?

- Community member
- Educator/Researcher
- Extension professional
- Forestry, wildlife, or natural resources professional
- Landowner
- Private contractor
- Rancher/Farmer
- Student
- Tribal member
- Volunteer/Professional Firefighter
- Other (please specify)

Approximately how many prescribed burns have **you led** over the course of your life?

- None
- 1-5
- 6-10
- 11-20
- 21-50
- 51-100
- More than 100

Approximately how many prescribed burns have **you participated in (as a crew member)** over the course of your life?

- None
- 1-5
- 6-10
- 11-20
- 21-50
- 51-100
- More than 100

How many years of experience do you have with prescribed burning?

Less than 1 year

1-3 years

4-6 years

7-10 years

11-20 years

More than 20 years

How many years have you been a PBA member/participant?

Less than 1 year

1-3 years

4-6 years

7-10 years

11-20 years

More than 20 years

In which state does your PBA primarily conduct burns?

How old are you?

- Under 18
- 18-24 years old
- 25-34 years old
- 35-44 years old
- 45-54 years old
- 55-64 years old
- 65+ years old
- Prefer not to say

What is the highest level of education you have completed?

- Some high school or less
- High school diploma or GED
- Some college, but no degree
- Associates or technical degree
- Bachelor's degree
- Graduate or professional degree (MA, MS, MBA, PhD, JD, MD, DDS etc.)
- Prefer not to say

How do you describe yourself?

Male

Female

Non-binary / third gender

Prefer to self-describe

Prefer not to say

If there is anything else you would like to share, please include it here. Thank you for your time spent taking this survey!

After you click the next arrow button, the survey will close and you will see a link to an optional Google form for a chance to win one of three prizes.



0%  100%



Thank you for dedicating your time to complete this survey! Your input is invaluable.

If you'd like a chance to win one of three hard copies of either *Conducting Prescribed Fires: A Comprehensive Manual* or *Guidebook for Prescribed Burning in the Southern Region*, please fill out [this form: https://forms.gle/rWb9dNZHrZmaSkt76](https://forms.gle/rWb9dNZHrZmaSkt76). This two-step process ensures that your survey responses remain anonymous.

0%  100%

Appendix B: Participating PBAs

Region	State	PBA	Members Invited per PBA ^a	Members Invited per State	Invite Initiator ^b	
					R	L
Northeast	IL	Southern Illinois PBA	119	175		X
		Great Rivers PBA	56			X
	MO	South Central Missouri PBA	62	162	X	
		Upper Meramec PBA	100			X
	VA	Southeast Virginia PBA	6	6	X	
	Total Northeast			343		2
Southeast	AL	Central Alabama PBA	150	150		X
	AR	Central Arkansas PBA	43	91	X	
		Lower Ouachita PBA	48			X
	FL	North Florida PBA	267	335		X
		Northwest Florida PBA	68			X
	GA	Southwest Georgia PBA	107	107		X
	LA	Southwest Louisiana PBA	79	79	X	
	NC	Sandhills PBA	702	1,133		X
		Down East PBA	41		X	
		Triangle PBA	99		X	
		Piedmont PBA	37			X
		Southern Blue Ridge PBA	155		X	
		Bladen Lakes Area PBA	99		X	
	SC	Aiken Prescribed Fire Cooperative	164	245		X
		Piedmont Prescribed Fire Cooperative	81			X
Total Southeast			2,140		6	9

Appendix B (continued)

Region	State	PBA	Members Invited per PBA ^a	Members Invited per State	Invite Initiator ^b	
					R	L
Midwest	KS	Gypsum Hills PBA	20	20		X
	NE	Central Nebraska	60	213		X
		Custer PBA	91			X
		GLW PBA	62			X
	OK	Caddo Grady PBA	24	427	X	
		Creek County PBA	33		X	
		Land Run PBA	107		X	
		Pawnee County PBA	86		X	
		Pontotoc Ridge PBA	78		X	
		North Central Range Improvement Association	99		X	
TX	Upper Llanos	44	44		X	
Total Midwest			704	6	5	
West	CA	Butte PBA	395	3,020		X
		Central Coast PBA	900			X
		Humboldt County PBA	290			X
		Napa PBA	11			X
		Placer PBA	410			X
		Plumas Underburn Cooperative	505			X
		Trinity Integrated Fire Management Partnership	95			X
		Ventura County RCD	68		X	
		Yosemite Gateway Prescribed Burn Cooperative	146		X	
		Yuba-Bear Burn Cooperative	200			X

Appendix B (continued)

Region	State	PBA	Members Invited per PBA ^a	Members Invited per State	Invite Initiator ^b	
					R	L
West	CO	Pile Burn Cooperative	90	90		X
	OR	Rogue Valley PBA	400	432		X
		Umpqua PBA	32			X
	WA	Mount Adams PBA	100	268	X	
		Cascadia PBA	168		X	
	Total West			3,810		4
TOTAL			6,997		18	28
					46	

^a The number of members contacted was provided by PBA leaders for their respective PBAs and only included those members with email addresses or the GroupMe app. ^b The invite initiator is noted as either the researcher (R) or the PBA leader (L) to indicate who sent the survey participation request.

Appendix C: Permission for Use and Modification of the API



Ed Holton <edholton@outlook.com>

to Jennifer ▾

Feb 20, 2024, 6:23 AM



Hi Jenn

You have our permission to make those modifications.

Good luck in your research.

On Feb 19, 2024, at 1:13 PM, Jennifer Fawcett <jennifer_fawcett@ncsu.edu> wrote:



Good afternoon, Dr. Holton.

Thank you for your previous email. It was very helpful towards my understanding of the API. I am moving forward in my dissertation proposal, and would like to slightly modify the API to only use the Andragogical Principles portion (Design Elements do not apply to my study) and also to add some language specific to my program for just a few of the scale items. Would you be able to grant me permission to make these modifications for use in my doctorate work? Thank you and I look forward to hearing from you.

Regards,
Jenn

Jennifer Fawcett
Extension Associate & SERPPAS Prescribed Fire Work Group Coordinator
NC State Extension
[College of Natural Resources](#)

Appendix D: Panel of Experts Determining Survey Instrument Content Validity

Dr. Chris Adlam, Assistant Professor of Practice, College of Forestry, Oregon State University

Dr. Leslie Boby, Director, Southern Regional Extension Forestry

Alison Deak, Fire Advisor, University of California Cooperative Extension

Dr. John Diaz, Associate Professor and Extension Specialist, Department of Agricultural
Education and Communication, College of Agricultural and Life Sciences, University of
Florida

Dr. David Godwin, Director - Southern Fire Exchange, School of Forest, Fisheries, and
Geomatics Sciences, University of Florida IFAS

Dr. Koralalage S. U. Jayaratne, Professor, Program Evaluation Leader, Department of
Agricultural and Human Sciences, College of Agriculture & Life Sciences, North
Carolina State University

Laurel Kays, Fire Learning Network Manager, The Nature Conservancy

Elliot Nauert, Extension Associate in Prescribed Fire and Fire Science, College of Natural
Resources, North Carolina State University

John R. Weir, Extension Specialist, Natural Resource Ecology and Management, Oklahoma
State University

Gary C. Wood, Southeast Regional Coordinator - Cohesive Wildland Fire Management Strategy,
Southern Group of State Foresters, Wildland Fire Leadership Council

Appendix E: Survey Recruitment Narrative

Dear Prescribed Burn Association (or other cooperative burn group) member/participant,

As a follow-up to my earlier email, I am requesting your assistance in a national study of Prescribed Burn Association (PBA) and other cooperative burn group members and participants by completing an anonymous online survey. If you agree to participate, the survey will take about 15-20 minutes to complete. Participation is voluntary, and you can stop at any time. Your responses are anonymous and will be kept confidential, with only aggregated data used in reports. The information you provide will contribute to my doctoral research and will help develop or improve future PBA programs.

At the end of the survey, you'll have the option to enter for a chance to win one of three hard copies of either *Conducting Prescribed Fires: A Comprehensive Manual* or the *Guidebook for Prescribed Burning in the Southern Region*. You'll be directed to a separate link where you can opt to enter your contact information. This two-step process ensures that your survey responses remain anonymous.

If you have any questions about the survey, please contact me at jennifer_fawcett@ncsu.edu and 919-xxx-xxxx.

For questions about your rights as a participant or if you are concerned with your treatment throughout the research process, please contact the NC State University IRB Director at IRB-Director@ncsu.edu, 919-515-8754, or fill out a confidential form online.

If you agree to participate in the study, please click on the following link to the online survey: [https://ncsu.qualtrics.com/\[surveylink\]](https://ncsu.qualtrics.com/[surveylink]).

Thank you in advance for your participation! Your input is greatly valued.

Regards,

Jennifer Fawcett
Extension Specialist - Wildland Fire
PhD Candidate, North Carolina State University
jennifer_fawcett@ncsu.edu

Appendix F: IRB Approval

Date: June 4, 2024

Study Title: Prescribed Burn Association Membership Survey

NC State eIRB #: 27174

Funding Source:

Dear Korallalage Jayaratne,

The research proposal named above has received administrative review and has been approved on June 4, 2024 as exempt from the policy as outlined in the Code of Federal Regulations (Exempt d.2). Provided that the only participation of the subjects is as described in the proposal narrative, this project is exempt from further review.

This approval for this research study does not expire, but any changes must be approved by the IRB prior to implementation in accordance with the NC State university regulation and [IRB unit standards](#).

NOTE:

1. This committee complies with requirements found in Title 45 part 46 of The Code of Federal Regulations. For NC State University projects, the assurance number is: FWA00003429.
2. Any changes to the research must be submitted and approved by the IRB prior to implementation in accordance with the NC State university regulation and [IRB unit standards](#).
3. If any problems occur, they must be reported to the IRB office within 5 business days.
4. For information regarding [study closure](#) or [post approval monitoring activities](#), please refer to the NC State University IRB website.

To request an official, signed approval letter on NC State letterhead, please submit a request on our website under "[Request a Letter](#)"

Sincerely,

Jennie Ofstein, Ph.D.
Institutional Review Board (IRB) Director
North Carolina State University
irb-director@ncsu.edu
919.515.8754