Journal of Rural and Community Development

Fueling Communities into the Future: A Survey of Firewood Banks To Identify Strengths, Weaknesses, Opportunities, and Threats To Organizational Sustainability

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Citation:
Butler, S. M., Griffith, E. E., Harper, R. W., Leahy, J. E., Butler, B. J., Comiskey, J., Hart, C., Dampier, J. E., & Dyer, D. (2025). Fueling communities into the future: A survey of firewood banks to identify strengths, weaknesses, opportunities, and threats to organizational sustainability. *The Journal of Rural and Community Development*, *20*(2), 34–55.

Publisher:
Rural Development Institute, Brandon University.

Editor:
Dr. Doug Ramsey

Open Access Policy:
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ISSN: 1712-8277 © Authors
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Fueling Communities into the Future: A Survey Of Firewood Banks to Identify Strengths, Weaknesses, Opportunities, and Threats To Organizational Sustainability

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Abstract

Firewood banks are community-driven initiatives that aim to reduce fuel poverty by providing firewood to households facing heating insecurity. As firewood bank expansion continues, there is an emergent urgency to understand their operations, processes, capacities, and challenges. We formally surveyed known firewood bank leaders and evaluated the results through the framework of a strengths, weaknesses, opportunities, and threats (SWOT) analysis to better understand the strengths, weaknesses, opportunities, and threats of firewood banks more broadly. Further understanding of firewood bank attributes within a SWOT framework will provide leaders, policymakers, and outreach professionals with valuable insights to assess support needs and ensure long-term organizational sustainability in fuel-poor communities. The results of this research underscore the successes these organizations have achieved, the challenges they may face in the future, and highlight critical areas for future research.

Keywords: wood bank, community resources, SWOT analysis, fuel poverty, local resources

Alimenter les communautés vers l'avenir : Une enquête des banques de bois de chauffage pour identifier les forces, les faiblesses, les opportunités et les menaces vers la durabilité organisationnelle

Résumé

Les banques de bois de chauffage sont des initiatives communautaires qui visent à réduire la précarité énergétique en fournissant du bois de chauffage aux ménages confrontés à l'insécurité thermique. Alors que l'expansion des banques de bois de chauffage se poursuit, il devient urgent de comprendre leurs opérations, leurs processus, leurs capacités et leurs défis. Nous avons formellement interrogé les dirigeants connus des banques de bois de chauffage et évalué les résultats dans le cadre d'une analyse des forces, faiblesses, opportunités et menaces (SWOT) afin de mieux comprendre les forces, les faiblesses, les opportunités et les menaces des banques de bois de chauffage de manière plus générale. Une meilleure compréhension des attributs des banques de bois de chauffage dans un cadre SWOT fournira aux dirigeants, aux décideurs politiques et aux professionnels de la diffusion des informations précieuses pour évaluer les besoins de soutien et assurer la durabilité organisationnelle à long terme dans les communautés pauvres en combustible. Les résultats de cette recherche soulignent les succès obtenus par ces organisations, les défis auxquels elles pourraient être confrontées à l'avenir et mettent en évidence les domaines critiques pour les recherches futures.

Mots-clés : banque de bois, ressources communautaires, analyse SWOT, précarité énergétique, ressources locales

1.0 Introduction

Globally, people face challenges obtaining sufficient resources to fulfill household energy demands (e.g., heating/cooling, cooking; Bhatt et al., 2016; Hiemstra-van Der Horst & Hovorka, 2009; Ngulani & Shackleton, 2022). In high-income countries, (e.g., the United States, Canada, New Zealand, etc.), this often manifests as 'fuel poverty'—also known as 'energy poverty'—defined as spending at least 10% of household income on fuel expenditures for energy services (Boardman, 1991; Moore, 2012). Mohr (2018) estimated that 56% of U.S. households with incomes below 150% of the poverty line were considered fuel poor. In Canada, between 6% and 9% of households experience fuel poverty (Riva et al. 2021). The present study focuses on a specific form of fuel poverty—a lack of funds or access to obtain sufficient materials to adequately heat household living spaces.

Fuel poverty may be precipitated by factors related to income, size of household, age of household members, geographic region, fuel types, and fuel costs (Brabo-Catala et al., 2024). Extended periods of time in an inadequately heated home can be detrimental to a person's physical well-being, resulting in increased risk of (a) infectious disease, (b) respiratory ailments, (c) influenza, (d) pneumonia, (e) asthma, and (f) arthritis (Howden-Chapman et al., 2012; Liddell & Morris, 2010). Fuel poverty may also negatively affect mental health (Bentley et al., 2023; Mohan, 2022).

Heating assistance programs can ease the negative effects of fuel poverty. In a survey of adults and adolescents who had received fuel poverty assistance, feelings of anxiety and depression were reduced by 50% after receiving assistance (Liddell & Morris, 2010). In the United States, current fuel assistance programs include the Low-Income Home Energy Assistance Program and the Weatherization Assistance Program (Bednar & Reames, 2020). Low-Income Home Energy Assistance Program provides direct financial assistance in relation to energy bills, while the Weatherization Assistance Program provides aid for home improvements to upgrade energy efficiency. Even though these programs are available in all 50 U.S. states, 33% of U.S. households still experience fuel poverty (Bednar & Reames, 2020). Cumbersome applications and delays in assistance exacerbate fuel assistance needs, leaving gaps that often require addressing at the local level (Fowlie et al., 2018). Canada has similar fuel assistance programs at the regional level, including the Ontario Energy Assistance Program, Alberta's Direct Energy Regulated Services, and BC Hydro Customer Crisis Fund (https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/programs.cfm).

The present analysis focuses on understanding the issues related to the long-term sustainability of community-based supplements/alternatives to formal heating assistance programs: community firewood banks. Firewood banks are local initiatives that aim to fill gaps in coverage relative to governmental heating assistance programs (see https://doi.org/10.7275/8165 for a list of resources about and for firewood banks). Firewood banks have provided firewood assistance at no charge to community members in need since at least the 1970s (Student fills wood bank, 1979). They are operated through a variety of groups including religious organizations, non-profits, municipalities, and Tribal nations/Indigenous Peoples. Many firewood banks operate through volunteer work, with wood being donated and then processed and distributed by volunteers (Griffith et al., 2024). Wood bank leaders report that they most often provide assistance to older adults, households

experiencing poverty, and individuals with health problems or disabilities. Additionally, emergency need (e.g., an unusually long and cold winter) also drives households to wood banks (Griffith et al., 2022).

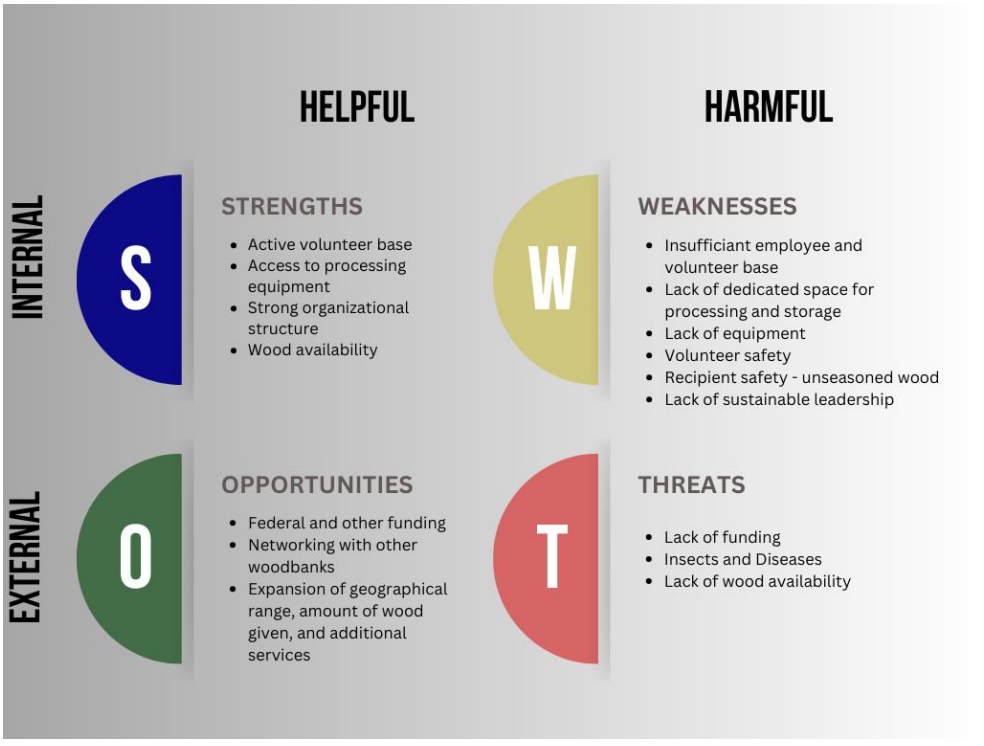
Firewood banks appear to be a burgeoning source for local fuel-assistance, as demonstrated by recent interest from major news organizations (see Graham, 2022; Holloway & Etheredge, 2021 for example), as well as continued reliance on firewood for home heating in rural areas. As of 2020, 2.3 million households in the United States rely on firewood as a primary space heating source, and an additional 8.8 million use firewood as a secondary heating source (U.S. Census Bureau, 2023). Distribution of firewood-reliant homes may vary widely, based on geography and population, with some counties relying on wood to heat up to 60% of households (Ortman & Raglin, 2018). Firewood banks are most prevalent in the northern and eastern parts of the United States (Hart & Dyer, 2023). This may be due to several factors including climate-related differences, availability of forest resources, a historical and current culture of wood home heating, community capacity to operate a wood bank, and local-level governance structures that nurture other community-based initiatives that tend to originate in a decentralized manner (Griffith et al., 2022; Griffith et al., 2024). Though firewood banks may be found in urban areas (Griffith et al., 2022; Hart & Dyer, 2023), they are particularly salient in rural communities, as 22% of rural households in the United States burn firewood compared to only 8% of urban households (Handwerk, 2012). Rural communities are also subject to higher heating costs, having a 33% higher median energy bill than urban communities while earning an average of 4% less in income (MacDonald et al., 2020). In some Indigenous Nations, more than 30% of the households rely on firewood as a source of heat and many of these households are economically challenged (El Kouarti & Morgan, 2023). Thus, it is important to improve understanding of community firewood banks as they work to more fully address the fuel poverty gap in distressed rural communities.

Firewood banks have recently received formal funding and technical support at the federal level through the U.S. Department of Agriculture (USDA). The USDA Forest Service received $8 million in funding from the 2021 Infrastructure Investment and Jobs Act (e.g., Bipartisan Infrastructure Law). This funding includes direct funding to firewood banks, inclusive of those operating on Tribal Lands (see Charnley et al., 2023 for an analysis of the legislation). As financial investment in and social relevance of firewood banks increases, it is important to identify what factors lead to successful functioning of these organizations. Vivian and Leahy (2015) commenced the process of identifying best practices in relation to establishing and operating a firewood bank. Other more formal exploration of dimensions of firewood banks have also been conducted (Griffith et al., 2022; Laleicke & Saffioti, 2024). By interviewing firewood bank leaders, Griffith et al. (In Review) concluded that firewood banks, generally, are interested in improving sustainability and expanding the reach of their organizations. Specifically, medium and long-term goals of community firewood banks included: sustainability and expansion of the wood bank mission, community building, and reducing wood waste. Important questions and knowledge gaps about how those goals can be achieved remain.

1.1 Theoretical Framework

A SWOT (strengths, weaknesses, opportunities, and threats) analysis framework is a tool commonly used by planners and decision makers in non-profit organizations in relation to strategic planning (Bryson, 2018; Helms & Nixon, 2010) and thus has an application in relation to firewood bank operations. A SWOT analysis highlights what organizations are doing well, and where there is room for improvement or growth, with consideration given to both internal and external factors (see Figure 1). Strengths are defined as internal factors that allow organizations to reach their goals, and weaknesses are defined as internal factors that hinder organizations' abilities to reach their goals. Opportunities are defined as external factors that can increase organizations' success, and threats are defined as external factors that create barriers in relation to reaching their goals. It is generally agreed that organizations have more agency over internal factors like strengths and weaknesses, while opportunities and threats are important external considerations that may be more difficult to control. Gaining a better understanding of the range of firewood bank attributes within a SWOT framework will provide firewood bank leaders, policy makers, outreach professionals, agency specialists, and others interested and involved in firewood banks with information regarding how to support firewood banks and fuel-poor communities.

Figure 1. Internal (strengths and weaknesses) and external (opportunities and threats) factors affecting firewood banks constructed from survey data of firewood bank leaders in 2023.



Applying the SWOT analysis framework to firewood banks can help identify the factors that contribute to organizational success, as well as identify the additional resources needed to help firewood banks actualize their goals (Helms & Nixon 2010). Additionally, collecting quantitative data on firewood bank strengths, weaknesses, opportunities, and threats will address a gap in knowledge related to the

challenges and barriers firewood banks face, as well as inform considerations related to organizational sustainability and longevity. Findings from a SWOT analysis will enable better programmatic outcomes by informing support efforts in relation to the formation and function of community firewood banks. Because they are often volunteer-led, firewood banks may not have the capacity for self-reflection, to conduct an organizational assessment, to understand their strengths and weaknesses, or to look for opportunities or threats to their operations. Firewood bank leaders could leverage the results in terms of organizational strengths and weaknesses to better realize how to avoid or mitigate threats and embrace new opportunities to help ensure long-term sustainability in their communities.

2.0 Methodology

We created a questionnaire with the primary objective of formally exploring and quantifying the structure, function, challenges, and barriers of firewood banks. Secondary objectives of the questionnaire included gathering information for communities that may be interested in establishing their own firewood bank operation, as well as for existing wood bank operations that may be interested in improving, focusing, or expanding current practices. Specific topics covered by the questionnaire related to (a) organizational mission, (b) long term goals, (c) volunteer participation, (d) amount of wood processed, (e) allotment to recipients, (f) methods of funding, (g) equipment use and maintenance, (h) organization affiliation, (i) injuries and insurances, (j) concerns and barriers, and (k) future plans (see https://doi.org/10.7275/8165 for the complete Firewood Bank Survey Instrument). Overall, the survey had 57 questions and took approximately 30 minutes to take. We engaged agency and academic specialists with a draft of survey questions to ensure robust question and answer choices, and we formally pre-tested the survey instrument by conducting three cognitive interviews with firewood bank managers. All methods were approved through the University of Massachusetts Amherst Institutional Review Board (IRB: 4291).

In July 2023, the questionnaire was mailed to firewood bank managers and operators of 152 firewood banks in the United States (n=146), Canada (n=4), and New Zealand (n=2). These operations were located by Hart and Dyer (2023) through internet keyword search terms that included (a) 'wood bank,' (b) 'firewood assistance program,' (c) 'firewood for elders,' (d) 'firewood ministry,' (e) 'wood pantry,' (f) 'charity cut,' (g) 'firewood program,' and related terminology. Network sampling was also employed by asking representatives of known firewood banks to provide contact information of other operations they thought would be suitable research participants (Sexton et al., 2011). Finally, firewood banks who had applied for assistance through the Alliance for Green Heat firewood bank grants assistance program were also included in the survey (Ackerly 2023, personal communication). The Alliance for Green Heat is a U.S.-based national non-profit that manages the Bipartisan Infrastructure Law funding for firewood banks.

Survey distribution employed the Tailored Design Method (Dillman et al., 2014). Implementation consisted of a pre-notice postcard informing firewood bank operations that they would be receiving a survey, a mailing of a first round of surveys that included pre-paid return envelopes; a thank you and reminder postcard; and lastly, a second round of surveys were then sent to initial non-respondents. Operations who had still not yet responded and for whom there was a valid email address were then emailed a link to an electronic version of the survey (Qualtrics,

Provo, UT). A final attempt to reach nonrespondent firewood bank operations was then made via telephone. A total of 65 of the 152 firewood banks returned completed surveys; the response rate was 43%.

Data were summarized using descriptive and univariate statistics. Yes–no questions were coded as a 1 for 'yes' and 0 for 'no'. Likert-scale questions were re-coded as a 1 for firewood banks who responded that the item was of great concern or concern and 0 otherwise. Continuous variables are reported using mean, standard deviation, minimum, and maximum. Analyses were conducted in the R statistical environment (R Core Team, 2024).

3.0 Results

3.1 Firewood Bank Characteristics

Sixty-five firewood banks responded out of 143 (nine undeliverable surveys) for a 43% response rate. Geographically, 52.8% of responding firewood banks are in the Eastern United States [1], 41.5% are in the Western United States, and 4.6% are in Canada. Neither of the New Zealand firewood banks responded. Most firewood banks serve a local town or city (89.1%), neighboring towns (76.7%), or within their county (65.5%). Fewer serve neighboring counties (25.5%) or their reservation (18.9%). Of the firewood banks who responded to our survey, 80% considered themselves local or community groups, 76.9% were a registered 501(c) non-profit, 55.4% were faith-based groups, 10.2% were a First Nations–American Indian group, 8.0% were a part of a municipality, no firewood banks were for-profit companies, and 12.5% considered themselves a group not listed (see https://doi.org/10.7275/8165 for complete Firewood Bank Survey results).

Firewood banks process, keep on hand, store, and give out varying volumes of firewood to varying numbers of households a year. The median amount processed is 42.5 cords/year (see Table 1), and the median amount distributed is 40.0 cords/year. The median number of households served each year is 37.5 per wood bank, with the median number of cords given to each recipient being 1.5 cords per year. Overall, the amount of fuel processed ranged from 3.5 - 825.0 cords/year/wood bank; the amount distributed ranged from 3.5 - 707.0 cords/year; the number of households served ranged from 2 - 1,262 households/year.

3.2 SWOT Results

The survey allowed respondents to provide responses about various attributes of firewood banks, which were then categorized into SWOT categories (see Figure 1). Some attributes fell into multiple categories; for example, volunteerism was simultaneously a strength by providing labor and a weakness due to the precarity of relying on volunteers for an organization's essential function. Additionally, not all categories apply for all wood banks; for example, some wood banks purchase wood from suppliers so they may not need processing equipment.

SWOT strengths. Strengths include internal factors that lead to firewood bank success, such as having an effective or dedicated group of volunteers. A large majority of the firewood banks have volunteers (92.3%). Volunteers include people

[1] East: AL, AR , CT, DE, IA, IL, IN, FL, GA, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, NH, NJ, NY, OH, OK, PA, RI, SC, TN, TX, VA, VT, WI , WV; West: AK, AZ, CA, CO, HI, ID, KS, MT, NE, NV, NM, ND, OR, SD, UT, WA, WY.

from the community in general (81.3%), church members (70.0%), high school students (40.7%), youth groups (38.6%), college students (25.5%), and other groups not listed (27.8%). Volunteers donate beyond their labor to firewood banks. For example, 48.2% of firewood banks process wood on volunteers' property, and 43.6% of firewood is stored on volunteers' property. Volunteers also contribute to repairing or maintaining equipment (82.3%) and paying for equipment repair and maintenance (62.1%).

Table 1. *Information on Amounts of Wood Processed, Kept on Hand, Stored, Given Away, Given Away per Recipient, and Number of Households Served Per Year* (n=65)

Question	Mean	Median	SD	Min	Max
Approximately how much wood do you process in a typical year? (cords)	102.6	42.5	141.0	3.5	825.0
Approximately how many cords of wood do you aim to keep on hand in a typical year?	69.3	16.5	142.3	0.0	825.0
Approximately how many cords of wood can you provide dry storage for?	42.2	14.0	53.6	2.5	200.0
Approximately how much total wood do you give away in a typical year? (cords)	97.2	40.0	127.1	3.5	707.0
Approximately how much wood do you give out to each recipient in a typical year? (cords)	3.3	1.5	7.2	0.3	10.0
Approximately how many households do you provide wood to in an average year?	80.7	37.5	170.1	2.0	1262.0

Note that 'recipient' and 'household' is interchangeable.

Having access to the required equipment to ensure efficient operation is also a firewood bank strength (see Table 2). Most firewood banks own or borrow splitters, gas powered chainsaws, trailers, and pickup trucks. Additionally, many firewood banks report having no need for a processor—a machine that bucks and splits firewood, sometimes with a conveyor belt for loading—front-end loaders, electric chainsaws, skid steers, tractors, or backhoes (see Table 2).

The data indicate that affiliation with another community aid group is a strength. Many firewood banks are a part of other broader community-based poverty reduction initiatives including food banks (17.5%), clothing banks (3.6%), heating

assistance groups (17.5%), or other organizations (37.2%). Some firewood banks are also a part of a larger firewood bank network that consult with each other to develop and improve (28.6%).

Table 2. *Equipment Availability and Needs of Firewood Banks*

	Own	**Borrow**	**Need**	**Borrow and need**	**No need**
Splitters	67.6 (50)	25.7 (19)	4.1 (3)	1.4 (1)	1.4 (1)
Gas-powered chainsaws	55.9 (38)	32.4 (22)	4.4 (3)	1.5 (1)	5.9 (4)
Trailers	45.5 (30)	30.3 (20)	9.1 (6)	0.0 (0)	15.2 (10)
Pickup trucks	29.7 (19)	50.0 (32)	14.1 (9)	0.0 (0)	6.3 (4)
Tractors	23.8 (15)	17.5 (11)	12.7 (8)	0.0 (0)	46.0 (29)
Conveyor belts	22.0 (13)	3.4 (2)	20.3 (12)	0.0 (0)	54.2 (32)
Dump trucks	20.3 (13)	18.8 (12)	23.4 (15)	0.0 (0)	37.5 (24)
Processor	13.6 (8)	8.5 (5)	30.5 (18)	0.0 (0)	47.5 (28)
4wheelers	10.5 (6)	8.8 (5)	10.5 (6)	0.0 (0)	70.2 (40)
Other (please specify)	10.0 (2)	0.0 (0)	15.0 (3)	0.0 (0)	75.0 (15)
Front-end loaders	8.5 (5)	8.5 (5)	20.3 (12)	0.0 (0)	62.7 (37)
Electric chainsaws	7.0 (4)	7.0 (4)	7.0 (4)	0.0 (0)	78.9 (45)
Skid steers	6.5 (4)	12.9 (8)	21.0 (13)	1.6 (1)	58.1 (36)
Backhoes	0.0 (0)	5.1 (3)	13.6 (8)	0.0 (0)	81.4 (48)

Note: The survey question was 'Please review the list of equipment below and let us know if the firewood bank owns that piece of equipment, if it borrows the equipment, if the firewood bank does not have it but needs it, and if the bank does not have it and does not need it.' Percent of respondents who answered Yes, with the number of respondents in parentheses.

Having a consistent source of donated wood and prevalent wood donations is a strength of firewood banks. While some firewood banks purchase log-length wood (34.6%) or split firewood (12.7%; see Table 3), most firewood is donated to the bank from various sources, including community members (89.8%), arboriculture service companies, forestry–logging companies or sawmills (73.7%), contractors clearing land for development (55.4%), and donations from town, county, or state land (38.6%).

Table 3. *Wood Sources for Firewood Banks*

Variable/Key	Yes	No
Wood donations from community members	89.8 (53)	10.2 (6)
Wood donations from arboriculture service companies, forestry–logging companies, or sawmills	73.7 (42)	26.3 (15)
Wood donations from contractors who are clearing land for development	55.4 (31)	44.6 (25)
Wood donations from town, county or state land	38.6 (22)	61.4 (35)
Roadside trees	35.8 (19)	64.2 (34)
Purchased log lengths of wood	34.6 (18)	65.4 (34)
Wood donations from federal land	16.4 (9)	83.6 (46)
Purchased split firewood	12.7 (7)	87.3 (48)
Wood donations from utility companies	13.0 (7)	87.0 (47)
Wood donations from a conservation committee	7.1 (4)	92.9 (52)
Other (please specify)	8.1 (3)	91.9 (34)
Wood donations from Tribal Lands	3.6 (2)	96.4 (53)

Note: Survey question reads 'Where does the wood originate?'. Data shows the percentage of respondents who answered Yes or No, with the number of respondents in parentheses.

SWOT weaknesses. Weaknesses are internal challenges that make it difficult for firewood banks to reach their goals. While volunteers are typically a strength of firewood banks, a shortage of volunteers can weaken these programs, impacting their leadership, administration, and labor capacity. Only 13.9% of firewood bank respondents had paid staff and were part of a larger parent organization or Tribe. Without this broader organizational support, firewood banks may have increased

concern (or great concern) about a potential lack of leadership in the future (41.5%; see Table 4). There is also concern (or great concern) over lack of volunteers for wood delivery (50.8%), wood processing (49.2%), and administrative work (32.3%). Another weakness of many firewood banks is sustainable leadership—41.5% of respondents expressed concern (or great concern) about the lack of leadership in the future. While almost all the firewood bank respondents plan on staying in the community over the next 10 years (98.4%), lack of leadership is a potential hindrance to those plans (see Table 4).

An additional identified weakness is not having a dedicated space for wood processing and storage. Processing and storage often occur on volunteers' properties—48.2% and 43.6% respectively—and this leads to some firewood banks having concern (or great concern) about a lack of place to store and lack of place to process wood in the future (16.9% and 7.7% respectively; see Table 4). Additionally, only 38.5% of firewood banks have space for dry storage for firewood, making providing seasoned wood more difficult.

Table 4. *Concerns of Firewood Banks*

Variable/Key	**Yes**	**No**
Lack of volunteers for wood delivery (concern or great concern)	50.8 (33)	49.2 (32)
Lack of volunteers for wood processing (concern or great concern)	49.2 (32)	50.8 (33)
Lack of leadership in the future (concern or great concern)	41.5 (27)	58.5 (38)
Lack of money (concern or great concern)	40.0 (26)	60.0 (39)
Lack of volunteers for administrative work (concern or great concern)	32.3 (21)	67.7 (44)
Lack of equipment (concern or great concern)	27.7 (18)	72.3 (47)
Low wood supply (concern or great concern)	20.0 (13)	80.0 (52)
Lack of a place to store wood (concern or great concern)	16.9 (11)	83.1 (54)
Lack of a place to process wood (concern or great concern)	7.7 (5)	92.3 (60)

Note: Survey question reads 'Please indicate your level of concern about the following barriers to your firewood bank's long-term sustainability in the community.' Data shows percent of respondents who answered Concern or Great Concern, with the number of respondents in parentheses.

Due to the physically demanding nature of firewood bank work and the use of potentially hazardous equipment, there is an elevated risk of injury, which can be seen as a potential weakness. An important component of a successful firewood bank is protecting the volunteers from injury by providing access to personal protective equipment. Most firewood banks have safety equipment available for

volunteers (see Table 5), and many also reported having volunteers bring their own safety equipment when the firewood bank couldn't provide it. In addition to providing a safe environment to the volunteers, providing seasoned firewood to recipients ensures a safer heating source, and 91.5% of firewood banks report seasoning or drying firewood before distributing it. Seasoned wood reduces the chance of chimney fires by reducing the likelihood of excessive creosote buildup in a flue. Additionally, burning seasoned wood can reduce the amount of woodsmoke breathed in and the amount of woodsmoke in the atmosphere causing reduced visibility—haze—https://www.epa.gov/burnwise.

Despite safety precautions that lend to firewood bank success, firewood banks cannot mitigate all risks. Another essential protective measure is for the firewood bank to have liability waivers for volunteers, ensuring they are aware of the risks involved and helping to mitigate potential claims or liabilities associated with injuries. While 46.7% of firewood banks reported some injuries, most of these were reported as being minor. Over half (54.4%) of firewood banks require that volunteers sign liability waivers, and 79.4% of firewood banks—or their parent organization—have liability insurance.

Table 5. *Personal Protective Equipment that Firewood Banks Provide Volunteers*

Variable/Key	**Yes**	**No**
Gloves	77.4 (48)	22.6 (14)
Ear protection	75.4 (46)	24.6 (15)
Eye protection	71.0 (44)	29.0 (18)
Chainsaw chaps	65.0 (39)	35.0 (21)
Hard hat	51.7 (30)	48.3 (28)
Other (please specify):	41.4 (12)	58.6 (17)

Note: Survey question reads 'What, if any, safety equipment is available for the volunteers from the firewood bank?' Data shows percent of respondents who answered Yes or No, with the number of respondents in parentheses

SWOT opportunities. Opportunities are external factors that allow firewood banks to achieve their goals. One such opportunity is when grants are available to and utilized by firewood banks. While the vast majority of firewood banks are financed through donations (81%), more than half of firewood banks have received grant money as part of their financial structure (57.9%). Most of the grants received by firewood banks are between $5,000–$14,999 (60.9%). Firewood banks that have received grant funding have primarily used it to purchase equipment or fuel for their operations (see Table 6).

Table 6. *Items Purchased by a Firewood Bank from Grant Funding*

Variable/Key	**Yes**	**No**
To buy equipment	65.3 (32)	34.7 (17)
To buy fuel for equipment	39.6 (19)	60.4 (29)
To build wood storage	34.1 (15)	65.9 (29)
The firewood bank has not received grant money	30.4 (14)	69.6 (32)
To buy log-length wood	22.2 (10)	77.8 (35)
Other (please specify):	15.4 (6)	84.6 (33)
To fund a paid position	11.6 (5)	88.4 (38)
To buy already split firewood	4.5 (2)	95.5 (42)

Note: Survey question reads 'What has the firewood bank used its grant money for, if it has received any?' Data shows the percentage of respondents who answered Yes or No, with the number of respondents in parentheses.

Another opportunity for firewood banks is to connect with other firewood banks, regionally or nationally. Currently, only 28.6% of firewood banks consult with other operations to develop or improve. However, 60.0% are either interested or very interested in being a part of a network of firewood banks.

Many firewood banks indicated that there is also the opportunity for expansion—77.8% of firewood banks reported that they would want to expand if they had the resources to do so. A majority of firewood banks have identified need in their communities beyond what the firewood banks currently serve (82.5%). Opportunity for expansion of services for most firewood banks may include woodstove installation, repair, and changeouts; chimney cleaning and repair; providing wood pellets; and distributing smoke alarms and batteries. Currently, only a handful of firewood banks offer expanded services (see Table 7).

SWOT threats. Threats facing firewood banks include external factors that prevent or hinder firewood banks from reaching their goals. Potential lack of wood availability or wood supply uncertainty, coupled with increased demand, poses another threat to firewood banks meeting the needs within their communities. Many firewood banks have seen increased demand for wood over the past five years (63.1%). While only 20.6% of firewood banks have concern or great concern for low wood supply currently, this threat may become more pressing with increased future demand.

Table 7. *Additional Services Firewood Banks Provide Beyond Firewood*

Variable/Key	Yes	No
Distribute smoke alarms (yes/no)	8.1 (5)	91.9 (57)
Stove change outs (yes/no)	8.3 (5)	91.7 (55)
Chimney cleaning (yes/no)	8.1 (5)	91.9 (57)
Providing wood pellets (yes/no)	6.7 (4)	93.3 (56)
Chimney repair (yes/no)	6.6 (4)	93.4 (57)
Woodstove installation (yes/no)	3.3 (2)	96.7 (58)
Woodstove repair (yes/no)	3.4 (2)	96.6 (57)
Distribute smoke alarm batteries (yes/no)	3.3 (2)	96.7 (59)
Other (please specify)	17.8 (8)	82.2 (37)

Note: Survey question reads 'Which of the following activities, if any, does the firewood bank help with?' Data shows percent of respondents who answered yes or no, with the number of respondents in parentheses.

A threat to firewood banks may occur in relation to the movement of firewood across state and county lines—a potential issue relative to the introduction of disease and insect pests. Quarantines may limit the supply of available firewood from other jurisdictions. Currently, only 16.9% of firewood banks transport wood across state or county lines; however, as firewood banks expand, this number may increase, posing a threat to unaffected forests (see Table 8).

Table 8. *Information on Wood Transport and Usage of Insect-damaged Wood from Firewood Banks*

Question	Yes	No
Does the firewood bank regularly use wood from insect-damaged standing dead or fallen trees?	61.2 (30)	38.8 (19)
Does the firewood bank transport wood across county or state lines?	16.9 (11)	83.1 (54)

Note: Data shows percent of respondents who answered Yes or No, with the number of respondents in parentheses.

4.0 Discussion

In this study, we evaluated survey data through the lens of a SWOT analysis framework to better understand how firewood banks can meet present and future organizational goals. Some attributes (e.g., volunteer base) may fall into different

categories across all firewood banks and within individual firewood banks. Nevertheless, this SWOT analysis provides a starting point in understanding what makes firewood banks function well and where they might need support, especially as it relates to long-term sustainability.

4.1 Strengths and Weaknesses

Internal factors, meaning strengths and weaknesses, often had simultaneously positive and negative effects on wood banks. A reliance on volunteerism was reported as both a strength and weakness in the SWOT analysis. An active and sufficient volunteer base is a critical component of many successful firewood banks, often serving as a primary labor source. As with many volunteer organizations (Butt et al. 2017, Faletehan et al. 2021) firewood bank volunteers are likely motivated by personal values and beliefs, affiliation, self-satisfaction, and meaningful work. These factors can be highlighted in recruitment and retention strategies to help ensure the long-term viability of the organization.

As a strength, volunteerism contributes to the immediate goal of distributing wood by reducing overall costs and may also contribute to the long-term goal of improving community cohesion. Like other community-led initiatives aimed at poverty reduction, firewood banks address material poverty by distributing fuel for heating and non-material poverty by fostering social cohesion and community participation (Crisp et al., 2016). Providing firewood to those in need allows households to invest resources in other necessities such as food, housing, childcare, and medical needs. Additionally, decreasing fuel poverty for the individual or at the family level can strengthen the local community. For instance, the presence of a firewood bank may also increase a community's social capital. Because firewood banks are largely volunteer-driven they involve substantial interaction from the community through donations, workdays, and outreach. These factors may strengthen community connection and network ties.

In contrast, a reliance on volunteerism may also be a weakness to the long-term sustainability or expansion of wood banks. Like other volunteer organizations, firewood banks face challenges with recruiting and retaining volunteers, as well as issues of volunteer burnout (Poppendieck, 1994). Additionally, there is a risk that some volunteers may age out of the physical capacity required for processing and delivering firewood. Many firewood bank coordinators are older, retired community members, and a plan of succession to train and equip the next generation of leaders is needed to ensure both long-term sustainability and opportunities for expansion of the operation—two priorities that were identified in previous research (see Griffith et al., in review).

Similarly, the improvised nature of many wood banks allows flexibility to meet operational needs in multiple ways, particularly regarding equipment and wood sourcing. Strong wood banks have access to the equipment required for firewood processing. For instance, fewer than 10% of wood banks report needing splitters, chainsaws, or trailers, despite many reporting that they borrow equipment. In some cases, volunteer- owned equipment is used, and in other cases, equipment is owned by the organization. Strong firewood banks also tended to have reliable access to firewood. Most wood banks rely on wood donations from community workers, municipal departments, or local contractors. In some cases, the firewood bank processed the wood themselves, in other cases firewood was purchased. Continued access to both wood and equipment is crucial given that just-in-time production is

not feasible for a firewood bank because of the time necessary to properly cure wood for home use. These features are both strengths in that there are multiple pathways that can satisfy these operational goals with minimal cost.

4.2 Opportunities and Threats

There are many potential opportunities for firewood banks, both to increase their effectiveness within the community, as well as to expand opportunities for the communities they are in. Opportunities to increase effectiveness of the firewood bank include working with state and federally administered forest lands to procure wood donations. In addition to expanding sources for wood donation, recruiting volunteers from new but stable community places, such as high schools and higher education institutions, may increase opportunities for wood processing, stacking, and delivery. While these strategies can somewhat enhance a firewood bank's resources, firewood banks are often located in small communities where financial and work-force resources are limited. In these cases, firewood banks may consider collaborating to create regional networks where equipment and resources are shared. Creating networks of groups like firewood banks in rural areas can lead to increased success as it provides increased access to knowledge, resources, ideas, and innovation (Richter, 2019). Finally, grants are available that provide firewood banks with support to procure equipment, maintain facilities, compensate staff or technical expertise, or to purchase wood, allowing firewood banks to enhance organizational sustainability.

While fostering community connection is already a strength for many firewood banks, there are opportunities to increase firewood banks' influence within the community. Firewood banks can be a conduit for other social services, such as connecting people in need with other forms of fuel or food assistance resources. Very few firewood banks offer additional services, such as chimney cleaning (8.1%), but they would be well-positioned to expand their scope to include these practices with audiences who could benefit from improved public and environmental health outcomes (U.S. Environmental Protection Agency, n.d.). With additional resources, they could expand their services to other heating or fire-related assistance, such as cleaning, repairing, or installing woodstoves, or providing smoke alarms and batteries. Most firewood banks do want to expand, given the resources (77.8%). While the survey data don't articulate the nature of desired expansion, we can speculate that expansion could mean reaching more community members, extending to communities beyond their current footprint, or offering additional services to existing firewood bank recipients.

Research on innovative projects in rural areas has found that external funding is a key element of the success of an innovative project, especially in the initial creation and development stages (Esparcia, 2014). Funding is currently available from grants administered by groups like the Alliance for Green Heat, funded by the USDA Forest Service. These firewood bank assistance grants may support the purchase of equipment (both safety and processing), wood, and storage. Organizations like Alliance for Green Heat also provide information about safety and best wood-burning practices, as well as templates for volunteer waivers and press releases. The USDA grants program has also helped address many of the immediate concerns or weaknesses of firewood banks, including processing and safety equipment, but it does not support succession planning or administrative or organizational costs, or marketing activities; additionally, the Bipartisan Infrastructure Law is only a five-year program and continuity beyond 2026 is not guaranteed.

Another possible opportunity that some firewood banks have reported success with is partnering with a larger organization. Collaborations between public, private, non-profit organizations, and community members, referred to as network structures, are often successful in achieving change within a community (Mandell, 1999). Network structures are typically bound together in a common mission, and the groups work together to achieve a common goal (Mandell 1999). Firewood banks that have partnered with another organization may be strengthened due to those parent organizations having organizational systems in place to ensure the firewood banks goal could be readily met. Furthermore, affiliation with other organizations may mitigate some risks or weaknesses by providing access to resources, such as vetted volunteer waivers, finance systems, and broader support and visibility in the community.

Having a well-resourced and supported firewood bank also increases opportunities for the broader community. For example, firewood banks can help communities prevent wood waste. Sharing information about sources of donations could further help satisfy the goal of reducing wood waste by suggesting possible donation streams that have not yet been considered. Additionally, firewood banks could help prevent the spread of wood-boring insect pests through firewood movement across long distances. While more than 60% of firewood banks distribute wood contaminated with insect damage, a large majority (83%) also report not distributing beyond their immediate geographic area, thereby reducing risk of contamination. Using this contaminated wood locally also supports the reduction of wood waste within a community.

Threats are also external factors that prevent firewood banks from succeeding in reaching their goals. One such threat might be increases in fuel poverty, potentially related to the increase in demand or need for additional firewood, as reported by most firewood banks surveyed (63.1%). This could threaten the firewood banks' ability to meet demand. Another potential threat to the community is that fuel wood derived from a firewood bank is a short-term arrangement to help address fuel poverty within a region that may potentially direct scarce resources away from finding more long-term heating solutions (Poppendieck, 1994).

5.0 Conclusions

The SWOT analysis of the data collected in this exploratory survey of firewood bank operations provides a framework for a general understanding of the strengths, weaknesses, opportunities, and threats that firewood banks in the United States (and Canada) potentially face. There is also great value in understanding individual firewood banks in depth, to help each operation achieve their goals. To increase our understanding of firewood banks at an individual level, future research should include developing a SWOT analysis toolkit for individual firewood banks to employ in their strategic planning process—allowing them to focus on strengths, weaknesses, opportunities and threats that are directly applicable to their bank.

Additionally, while this research provides a snapshot of firewood banks, gaining a longer-term understanding of how firewood banks change (i.e., via a longitudinal survey) would be critical in understanding what resources would help in their long-term sustainability and viability. Another limitation of this study is that the data are self-reported by firewood bank leaders. In future work, an independent source of evaluation would be beneficial in standardizing and verifying firewood bank data.

Future research could focus on firewood bank recipients to assess whether their needs are being met, identify the benefits and barriers they face, and how firewood banks can continue to reduce fuel poverty and increase environmental health and safety outcomes in this population into the future. Additionally, research could also be expanded to include Tribal firewood banks (Magargal et al., 2023a; Magargal et al., 2023b). Our sample size of Tribal firewood banks was small; however, there were some interesting and notable differences seen in the structure and function of Tribal firewood banks that, because of low sample sizes, we could not test for statistical significance. For example, Tribal firewood banks may be more likely to have paid staff than non-Tribal firewood banks. Another opportunity for research lies in a better understanding of the volunteer base of firewood banks; gaining a deeper insight of their experiences will provide substance when thinking about volunteers as a strength and weakness to firewood bank long-term sustainability in communities. While firewood banks warrant more research and a deeper understanding in all facets, this survey provides a baseline understanding of the strengths, weaknesses, opportunities, and threats of firewood banks long-term sustainability in the communities that rely on them.

Acknowledgements

Funding for this project came from the USDA Forest Service, Northern Research Station agreement number 22-DG-11132544-029, USDA Forest Service, Northern Research Station agreement number 22-DG-11132544-048, and USDA National Institute of Food and Agriculture McIntire-Stennis (ME041707) through the Maine Agricultural and Forest Experiment Station. We thank Christine Crago, Mindy Crandall, and Emmalyn Terracciano for considerate reviews that improved the manuscript, as well as the firewood bank leaders who responded to the survey. Procedures for parts of this study that involved human subjects were approved by the University of Massachusetts Amherst Institutional Review Board (UMass IRB No. 4291). We honor with gratitude the Indigenous Peoples whose ancestral homelands all U.S. firewood banks occupy; we will continue to work as allies toward Indigenous community access and self-determination in natural resource management on these lands.

References

Bednar, D. J., & Reames, T. G. (2020). Recognition of and response to energy poverty in the United States. *Nature Energy, 5*(6), 432–439. https://doi.org/10.1038/s41560-020-0582-0

Bentley, R., Daniel, L., Li, Y., Baker, E., & Li, A. (2023). The effect of energy poverty on mental health, cardiovascular disease and respiratory health: A longitudinal analysis. *The Lancet Regional Health–Western Pacific, 35*, Article 100734. https://doi.org/10.1016/j.lanwpc.2023.100734

Bhatt, B. P., Rathore, S. S., Lemtur, M., & Sarkar, B. (2016). Fuelwood energy pattern and biomass resources in Eastern Himalaya. *Renewable Energy, 94*, 410–417. https://doi.org/10.1016/j.renene.2016.03.042

Boardman, B. (1991). Fuel poverty is different. *Policy Studies, 12*(4), 30–41. https://doi.org/10.1080/01442879108423600

Brabo-Catala, L., Collins, E., & Barton, B. (2024). Key fuel poverty indicators and variables: A systematic literature review. *Economics of Energy & Environmental Policy, 13*(1). https://doi.org/10.5547/2160-5890.13.1.lbra

Bryson, J. M. (2018). *Strategic planning for public and nonprofit organizations: A guide to strengthening and sustaining organizational achievement* (5th ed.) WILEY.

Butt, M. U., Hou, Y., Soomro, K. A., & Acquadro Maran, D. (2017). The ABCE model of volunteer motivation. *Journal of Social Service Research, 43*(5), 593–608. https://doi.org/10.1080/01488376.2017.1355867

Crisp, R., McCarthy, L., Parr, S., Pearson, S., & Berry, N. (2016, June). *Community-led approaches to reducing poverty in neighborhoods: A review of evidence and practice.* Sheffield Hallam University, Centre for Regional Economic and Social Research.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.). Wiley.

El Kouarti, J., & Morgan, K. (2023, February 28). *Firewood banks expand access to affordable home heating for tribes*. US Forest Service, U.S. Department of Agriculture. https://www.fs.usda.gov/features/firewood-banks-expand-access-to-affordable-home-heating-for-tribes

Esparcia, J. (2014). Innovation and networks in rural areas: An analysis from European innovative projects. *Journal of Rural Studies, 34*, 1–14. https://doi.org/10.1016/j.jrurstud.2013.12.004

Faletehan, A. F., van Burg, E., Thompson, N. A., & Wempe, J. (2021). Called to volunteer and stay longer: The significance of work calling for volunteering motivation and retention. *Voluntary Sector Review, 12*(2), 235–255. https://doi.org/10.1332/204080520X15929332587023

Fowlie, M., Greenstone, M., & Wolfram, C. (2018). Do energy efficiency investments deliver? Evidence from the Weatherization Assistance Program. *Quarterly Journal of Economics. Volume, 133*(3), August 2018, Pages 1597–1644. https://doi.org/10.1093/qje/qjy005

Graham, G. (2022, December 10). Wood banks in high demand as winter bears down on Maine. *Portland Press Herald*. https://www.pressherald.com/2022/12/10/wood-banks-in-high-demand-as-winter-bears-down-on-maine/

Griffith, E. E., Dampier, J. E. E., Hart, C. M., & Harper, R. W. (2022). Food, medicine, or heat? How firewood banks leverage local natural resources to support fuel-poor households. *Journal of Rural and Community Development, 17*(3), 143–164.

Griffith E. E., Dyer D. D., Dampier J. E. E., Hart C. M., Leahy J., & Harper, R. W. (2024). Organizational structure analysis of community wood banks: Ameliorating fuel poverty through local direct action [Manuscript submitted for publication].

Handwerk, B. (2012, October 23). High fuel costs spark increased use of wood for home heating. *National Geographic*. Retrieved from https://www.nationalgeographic.com/science/article/121022-wood-for-heating

Hart, C. & Dyer, D. (2023). *Firewood assistance programs map*. https://www.google.com/maps/d/u/0/viewer?ll=39.08044302130051%2C-96.04763525000001&z=4&mid=1f8M-22LCbCgzq-nNfqlpKWtg8AY

Helms, M. M., & Nixon, J. (2010). Exploring SWOT analysis–where are we now? A review of academic research from the last decade. *Journal of Strategy and Management, 3*(3), 215–251. https://doi.org/10.1108/17554251011064837

Hiemstra-van der Horst, G., & Hovorka, A. J. (2009). Fuelwood: The "other" renewable energy source for Africa? *Biomass and Bioenergy, 33*(11), 1605–1616. https://doi.org/10.1016/j.biombioe.2009.08.007

Holloway, M., & Etheredge, G. (Feb. 19, 2021). When there's no heat: 'You need wood, you get wood.' *New York Times*. https://www.nytimes.com/2021/02/19/climate/wood-banks-winter-maine.html

Howden-Chapman, P., Viggers, H., Chapman, R., O'Sullivan, K., Telfar Barnard, L., & Lloyd, B. (2012). Tackling cold housing and fuel poverty in New Zealand: A review of policies, research, and health impacts. *Energy Policy, 49*, 134–142. https://doi.org/10.1016/j.enpol.2011.09.044

Laleicke, F., & Saffioti, A. (2024). *Increasing longevity of firewood banks*. NC State Extension Publications. https://content.ces.ncsu.edu/increasing-longevity-of-firewood-banks

Liddell, C., & Morris, C. (2010). Fuel poverty and human health: A review of recent evidence. *Energy Policy, 38*(6), 2987–2997. https://doi.org/10.1016/j.enpol.2010.01.037

MacDonald, S., Winner, B., Smith, L., Juillerat, J., & Belknap, S. (2020). Bridging the rural efficiency gap: Expanding access to energy efficiency upgrades in remote and high energy cost communities. *Energy Efficiency, 13*(3), 503–521. https://doi.org/10.1007/s12053-019-09798-8

Magargal, K., Wilson, K., Chee, S., Campbell, M. J., Bailey, V., Dennison, P. E., Anderegg, W. R. L., Cachelin, A., Brewer, S., & Codding, B. F. (2023a). The impacts of climate change, energy policy and traditional ecological practices on future firewood availability for Diné (Navajo) people. *Philosophical Transactions of the Royal Society B, 378*(1889), Article 20220394. https://doi.org/10.1098/rstb.2022.0394

Magargal, K., Yellowman, J., Chee, S., Wabel, M., Macfarlan, S., & Codding, B. F. (2023b). Firewood and energy sovereignty on Navajo Nation. *Human Ecology, 51*(3), 497–511. https://doi.org/10.1007/s10745-023-00411-2

Mandell, M. P. (1999). Community collaborations: Working through network structures. *Review of Policy Research, 16*(1), 42–64. https://doi.org/10.1111/j.1541-1338.1999.tb00840.x

Mohan, G. (2022). The impact of household energy poverty on the mental health of parents of young children. *Journal of Public Health, 44*(1), 121–128. https://doi.org/10.1093/pubmed/fdaa260

Mohr, T. M. (2018). Fuel poverty in the US: Evidence using the 2009 Residential Energy Consumption Survey. *Energy Economics, 74*, 360–369. https://doi.org/10.1016/j.eneco.2018.06.007

Moore, R. (2012). Definitions of fuel poverty: Implications for policy. *Energy Policy, 49*, 19–26. https://doi.org/10.1016/j.enpol.2012.01.057

Ngulani, T., & Shackleton, C. M. (2022). Fuelwood production and carbon sequestration in public urban green spaces in Bulawayo, Zimbabwe. *Forests, 13*(5), Article 741. https://doi.org/10.3390/f13050741

Ortman, J., & Raglin, D. (2018, February 26). *Who knew? Wood is still main heating fuel for some.* United States Census Bureau. Retrieved from https://www.census.gov/library/stories/2018/02/who-knew-wood-burning-fuel.html

Poppendieck, J. (1994). Dilemmas of emergency food: A guide for the perplexed. *Agriculture and Human Values, 11*(4), 69–76. https://doi.org/10.1007/BF01530418

R Core Team. (2024). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from https://www.R-project.org

Richter, R. (2019). Rural social enterprises as *embedded intermediaries*: The innovative power of connecting rural communities with supra-regional networks. *Journal of Rural Studies, 70*, 179–187. https://doi.org/10.1016/j.jrurstud.2017.12.005

Riva, M., Kingunza Makasi, S., Dufresne, P., O'Sullivan, K., & Toth, M. (2021). Energy poverty in Canada: Prevalence, social and spatial distribution, and implications for research and policy. *Energy Research & Social Science, 81*, Article 102237. https://doi.org/10.1016/j.erss.2021.102237

Sexton, N. R., Miller, H. M., & Dietsch, A. M. (2011). Appropriate uses and considerations for online surveying in human dimensions research. *Human Dimensions of Wildlife, 16*(3), 154–163. https://doi.org/10.1080/10871209.2011.572142

Student fills wood bank. (1979, Dec. 11,). *Lebanon Express*. http://img7.newspapers.com/clip/56456743/the-lebanon-express/

U.S. Census Bureau. (2024). *American Community Survey (ACS) 5-year estimates*. Retrieved from U.S. Census Bureau website https://www.census.gov/data/developers/data-sets/acs-5year.html.

U.S. Environmental Protection Agency. (n.d.). *Burn Wise Program*. Retrieved from https://www.epa.gov/burnwise

Vivian, S., & Leahy, J. (2015). *A community guide to starting & running a wood bank.* Forest Resources Student Scholarship. 1. https://digitalcommons.library.umaine.edu/sfr_studentpub/1