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Evaluation of Maine Resident Perceptions on Community Resilience, Conservation, and Natural Resource Industries

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ABSTRACT

Maine faces a period of socio-economic transition as it contends with a shift in natural resource utilization. From the declining contribution of natural resource industries to the rise of conservation lands, the state's relationship with its natural capital is increasingly influenced by a multitude of factors. Meanwhile, Maine's rural communities may struggle to adapt. In order to gain better insight, a statewide web-based survey was used to collect data on perceptions of community resilience, natural resource industries, and conservation. Analysis revealed divergences largely based on demographic characteristics. Politically conservative respondents expressed a belief that their communities are resilient but are concerned that conservation lands reduce economic productivity. Rural residents tend to believe natural resource industries remain important but do not perceive their communities to be economically diverse. Respondents in urban areas instead perceive a lack of social cohesion and trustworthiness of local elected leadership. Communities across the state contend with a diverse array of vulnerabilities for which no single resilience building solution will suffice.

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Introduction

Maine Communities and Natural Resource Industries

Maine currently occupies a period of transition. Its largely rural makeup contributes to a continued reliance on natural resource industries even as global shifts in markets and the environment threaten the longevity of resource-based economies. Historically, Maine's forests, covering roughly 90% of all land area, have furnished the keystone timber and paper industries of its rural communities (Ferguson and Longwood 1960; McWilliams et al. 2005). In recent decades, forest-based industries across the United States have experienced increased sensitivity to volatility as technology, demand, and global competition pressure US producers (Keegan et al. 2011). With the advent of the digital age, electronic marketing and communication replaced traditional print media (Hujala et al. 2013). Simultaneously, competition in pulp and paper arose internationally in South and Latin America as well as Asia (Hujala et al. 2013). Although paper and paperboard production rose 139% between 2000 and 2019 alongside a surging global

demand for packaging and sanitation products, the contribution of paper-based products to the US economy continued its decades-long trend of decline (Brandeis and Guo 2016; Food and Agriculture Organization (FAO)) 2020). Domestically, demand has either waned outright or shifted toward a preference for recovered paper (Hujala et al. 2013). These trends are reflected in Maine especially, following the closure of half of all paper mills between 2012 and 2017 (Crandall, Anderson, and Rubin 2017). This dramatic shrinkage of the state's forest products industry is only the most recent of industry contractions as overhauls in the management of Maine's forests have continued since the spruce budworm outbreak of the 1970s (Correia 2010). The forest product industry's response to the epidemic entailed extensive clearcutting across the state, but in turn spurred controversy over the implications of extensive forestland liquidation to conservation efforts (Acheson 2000; Correia 2010). State legislative actions soon followed in order to define new priorities for Maine's forests in the wake of major land sales as timberlands were split and sold as parcels amongst a variety of buyers. Specifically, the Land for Maine's Future Program in 1987 and the Forest Practices Act of 1989, which respectively aimed to incentivize and more strictly regulate forest management practices, encouraged the proliferation of conservation easements. In the years since, conservation lands have expanded from only 5% of total land area in 1987 to nearly 20% in 2014 (Banks et al. 2019; Cronan et al. 2010; Schlawin and Cutko 2014).

The trends of the last century reshaped the character of Maine's forests and economy and set pulp and paper back as a major state contributor. However, more recent losses of pulp and paper processing facilities have not translated into a substantial loss to the total state economy, with the closure of seven Maine paper mills amounting to only a 0.5% loss of state GDP (Crandall, Anderson, and Rubin 2017). At the local scale, however, these closures represent significant burdens to rural livelihoods. With less than 40% of Maine's population living within urban areas, the impacts are potentially wide-reaching (US Census Bureau 2020). Rural communities may experience economic dependence on natural resource industries due to their propensity to supply higher wages relative to service sector jobs while simultaneously promoting underinvestment in education and skill building amongst the working class according to the theory of rational underinvestment (Freudenburg and Gramling 1994; Johnson and Stallmann 1994). Natural resource industries, subject to market and environmental factors outside of direct human control, tend already to be volatile by nature even in the absence of major global-scale events (Gamu, Billon, and Spiegel 2015; Slack and Jensen 2004). As a result, communities reliant upon them experience persistent states of uncertainty, inhibiting the ability to respond appropriately to challenges (Johnson and Stallmann 1994).

However, there are instances of transformability demonstrated within Maine. Those communities which have rallied themselves tend to either transition away from natural resource industries or seek out alternative markets to help boost failing sectors. Where transitions away have occurred, service and tourism sector jobs frequently appear in their place (Breece 2016; Palmer et al. 2009). Maine contains a mosaic of communities of varying development patterns. Irregularity in response is likely attributable to features unique to each community that allow them to mobilize assets and mitigate risks. The capacity for a community to respond and adapt is often examined through the

framework of resilience. Identification of features which promote resilience or increase susceptibility to harm is essential for understanding actionability.

Overview of Resilience

Communities harboring social and institutional inhibitors to adversity preparedness are especially vulnerable to shocks. The exact degree of vulnerability is determined by the inherent sensitivity of the system to harm (Cutter, Ash, and Emrich 2014). In recent years, interest in the resilience of communities has grown following divergent responses to hardship such as economic downturn, natural disaster, and social-political shifts (Berkes and Ross 2013; Cutter et al. 2008; Cutter, Ash, and Emrich 2014; Cavaye and Ross 2019). Resilience has been conceptualized within various frameworks as an embedded feature of a system which enables adaptation and recoverability in the post-disturbance environment or as the adaptive process which manifests in response to the exposure event (Holling 1973; Adger 2000; Nguyen and Akerkar 2020). Community resilience emphasizes the identification of vulnerabilities deriving from both internal and external influences and the features of a community which mitigate them, such as social cohesion, economic development trajectory, and capital management (Nguyen and Akerkar 2020; Norris et al. 2008). Magis (2010) broadly identifies eight domains which characterize the community capacities and assets which collectively promote the resilience building process. These include the presence of community resources, the ability to develop resources, the engagement and application of resources, the presence or emergence of active agents within the community's social or organizational infrastructure, collective action allowing for self-organization, strategic action addressing stressors or vulnerability to stressors, equity, and impact (Magis 2010).

A community hosting these domains is positioned to adapt more quickly and more substantially to stressor events, but inevitably remains unable to control all conditions which may emerge to challenge the system (Berkes and Ross 2013). Uncertainty remains a key driver of vulnerability. As such, discourse on resilience has uncovered a notable distinction regarding the character of community preparedness and resilience. Folke et al. (2010) describe the division between specified and general resilience within social-ecological frameworks and their likely outcomes in the face of uncertainty. Specified resilience emerged as a response to the framing question posed by Carpenter et al. (2001), which asks "resilience of what, to what?" Phrased differently, this line of reasoning asks one to consider both the system of interest and the specific shock which has emerged to disrupt the equilibrium. Within the context of a community setting, specified resilience, defined as adaptability to expected and typical shocks, involves strategies to mitigate risks which are plainly identifiable or frequently experienced. Monitoring of hazards, implementation of early warning systems and communication networks, protection of key infrastructure, and disaster response training are examples of how communities and their surrounding regions may prepare themselves for anticipated hazards (Carpenter et al. 2012). Communities with financial resources and proactive development plans build resilience in the face of future shocks by anticipating their effects and adapting the system to accommodate. It is important to note, however, that- this method of resilience building is not without shortcomings.

Specified resilience building may be a less effective safeguard against future uncertainty and unanticipated shocks. In fact, a system may inadvertently overcorrect in response to frequent or easily identifiable stressors and lessen its ability to respond to those which are rare (Cifdaloz et al. 2010; Folke et al. 2010). Prevention of this fragility entails a reassessment of the goals associated with resilience building and a movement toward general resilience. As opposed to the more context-specific approach of specified resilience, general resilience does not attempt to identify the so-called weak link within a system or anticipate certain risks. Instead, general resilience is a response to any and all forms of uncertainty (Folke et al. 2010; Carpenter et al. 2012). General resilience, being a capacity to respond to the novel and unforeseen, is more challenging to plan for and deliver given its system-wide scope. Carpenter et al. (2012) describe conditions which contribute to general resilience. These include the capacity for diverse responses, modularity of the system to prevent the spread of impacts, openness among interconnected networks and economies, the ability to recover lost system components through reserves, adequate feedback from decision-making and transactions, cross-scale linkages within nested systems of governance, monitoring of variables, effective leadership, and trust amongst collaborative parties (Carpenter et al. 2012). Hosting these conditions improves response effectiveness and mitigates the initial risk of irrational or inconsistent decision-making in the post-shock environment (Carpenter et al. 2012).

To date, the majority of community resilience research has emphasized the impact of disaster, thus shaping its conceptualization around disaster events and the response to them (Matarrita-Cascante et al. 2017; Wilson 2012; Cutter, Burton, and Emrich 2010). In alignment with general resilience, other stressors are now studied in economic and social contexts. The operational scale of resilience research has also narrowed. Formerly, resilience research frequently utilized a “top-down” viewpoint that emphasized extra-local planning and resource distribution (Matarrita-Cascante et al. 2017; Rapaport et al. 2018). To better assess resilience of small, isolated populations, “bottom-up” strategies are employed to capture responses contingent upon realized inaccessibility of external aid and resources (Matarrita-Cascante et al. 2017).

Modifications to the community resilience framework emerged to denote the interplay between a generalized suite of stressors and a more location-specific array of response indicators. The effect of events such as boom-bust cycles typical of extractive industries, globalization, and recession are increasingly examined within rural contexts (Matarrita-Cascante and Trejos 2013; Matarrita-Cascante et al. 2017). The features which facilitate community function and the stressor events that disrupt it require an interdisciplinary lens to grasp fully (Rapaport et al. 2018).

Research Questions

Specific to Maine, perceptions of community resilience are necessary indicators of the ongoing impacts generated by statewide and local changes. To date, the impressions of these changes held by residents are largely unexamined within the body of literature. Examining how community residents judge risks and the preparedness of their communities to manage changes may reveal forces that shape the state at the local level. Such data may address quality of life concerns and strategies for adaptability.

Furthermore, although drawing from a Maine-based sample, the community conditions at work are thought to be present within rural communities across the United States. To that end, this research explores resident perceptions of their communities' resilience as well as their opinions on socio-economic capital access, natural resource industries, and the impacts of conservation land designations on local economies and natural amenities. Responses may be influenced by a perceived presence of economic security, cultural unity, or from past experiences with local stressor events.

Factors which influence respondent impressions of their community are also of interest. As such, this paper investigates whether or not demographic characteristics such as age, gender, income, educational level, political ideology, and urban or rural dwelling influence responses. To investigate these points of interest, this paper addresses the following research questions:

1. What impact do regional and demographic characteristics have on Maine resident perceptions of community resilience?
2. What do Maine residents identify as their most valuable local resources and capitals?
3. What factors represent barriers to community development, wellbeing, and resilience according to Maine residents?

Materials and Methods

Survey Design

The research questions established for this paper pertain to views, values, and opinions held by persons of various backgrounds living throughout Maine. As such, a statewide survey is a suitable mechanism for eliciting data from a wide range of participants. A web survey was designed to collect opinion data from persons above the age of 18 residing within the state of Maine. The questionnaire consisted of Likert-scale style statements divided amongst several development topics. Respondents indicated the extent of their agreement within a range of options from "strongly disagree" (-2) to "strongly agree" (2). The first section on community vulnerability and resilience consisted of fourteen statements on the general ability of communities to adapt to stressors, as well as perceived capacity for future adaptation. The following section pertained to community resources and capital. This portion of the questionnaire included fifteen statements gauging perceptions of agency in managing capital assets as described within the community capitals framework (Emery and Flora 2006). The statements asked respondents to consider the economic performance and diversity of their communities, the reliability of local government, and the ability of community members to cooperate and support each other.

The third section covered natural resource industries and contained fifteen statements on how natural resource industries contributed economically and culturally to respondents' communities. This section also asked respondents to evaluate the status of natural resource industries, whether or not they remained important job creators and community fixtures, and if transitioning away from them would be of benefit. The fourth section of the questionnaire included eleven questions pertaining to land management, the

importance of conservation, potential tradeoffs associated with conserved lands, and the role of landowners in matters of stewardship.

Respondents provided demographic data which included factors such as age, gender, zip code, political ideology, income level, and education. Age classifications included 18–34, 35–54, and 55 or older. For political ideology, the groups are conservative, moderate, and liberal. Next, the income groupings are \$39,999 or less, \$40,000–\$69,999, and \$70,000 or more. Education groupings include High school or less, some college or associate degree, and 4-year degree or higher. Prior to distribution, all questions received institutional review board approval.

Survey Distribution

The Qualtrics online panel service was used to reach a sample of 502 respondents from across the state of Maine. The Qualtrics service randomly distributed the survey to its own exclusive pool of available respondents. Qualtrics respondents are enlisted from website intercepts, member referrals, targeted email lists, customer loyalty web portals, permission-based networks, gaming sites, and social media. Our approach to using the Qualtrics panel for a general perception survey is not unique, particularly during the Covid-19 pandemic (Landry et al. 2021). Prior to participation in the online panel service, the names, addresses, and dates of birth of these respondents are validated through third-party verification measures. For this survey, in order to ensure that only residents of Maine participate in the study, potential respondents first indicated their state of residence through a screening question. Only those self-identifying as Maine residents could access the body of questions.

Online web panels provide certain advantages and disadvantages over traditional mail-based surveys, including cost reduction and rapid access to recorded data, but diminished response rates and increased incidences of incomplete questionnaires (Couper and Miller 2008). To diminish the potential likelihood of these shortcomings, the Qualtrics service offers compensation to those who complete the survey and answer a requisite number of questions. Respondents who completed the survey in exceptionally low amounts of time, or who provided the same response to every Likert-scale statement were flagged as low quality. Amongst those responses deemed to be of adequate quality, stratification of the sample is organized by geography, education, and race in order to capture potential differences in perspective present across subsections of the population. Data collection spanned two months between July 2020 and August 2020. Partial responses to the questionnaire form are not recorded and the exact number of invitations delivered to eligible respondents is not reported by the panel. However, Qualtrics reports a mean response rate of 8.5%. Low response rates are an increasingly prevalent issue for researchers and introduce the possibility of non-response bias. However, as noted by Stedman et al. (2019), the influence of this bias is not guaranteed if the choice to decline participation in the survey is unrelated to the topic and questions themselves.

Data Analysis

We utilized Kruskal–Wallis tests in SPSS to detect differences in response for different demographic groups. Tests indicating that at least two groups differed significantly from

each other were followed by subsequent *post-hoc* tests to parse specific differences. Bonferroni corrections addressed the likelihood of Type I error. In the event that only two groups existed for comparison, as was the case with the gender category, a Mann–Whitney *U* test was performed instead.

Results

Overview of Respondent Sample

The questionnaire returned a total of 502 responses from Maine residents distributed across the state (Figure 1). This sample was drawn from the Qualtrics service pool of respondent candidates self-identifying as Maine residents above the age of 18. As such, it is necessary to note that this sample is representative of the respondent population recruited by the service. A summary of sample demographic characteristics is provided in Table 1 alongside a comparison to statewide demographics in order to demonstrate similarities between the sample and the total state population. The margin of error calculated for this sample is approximately 4%. Certain respondent characteristics had

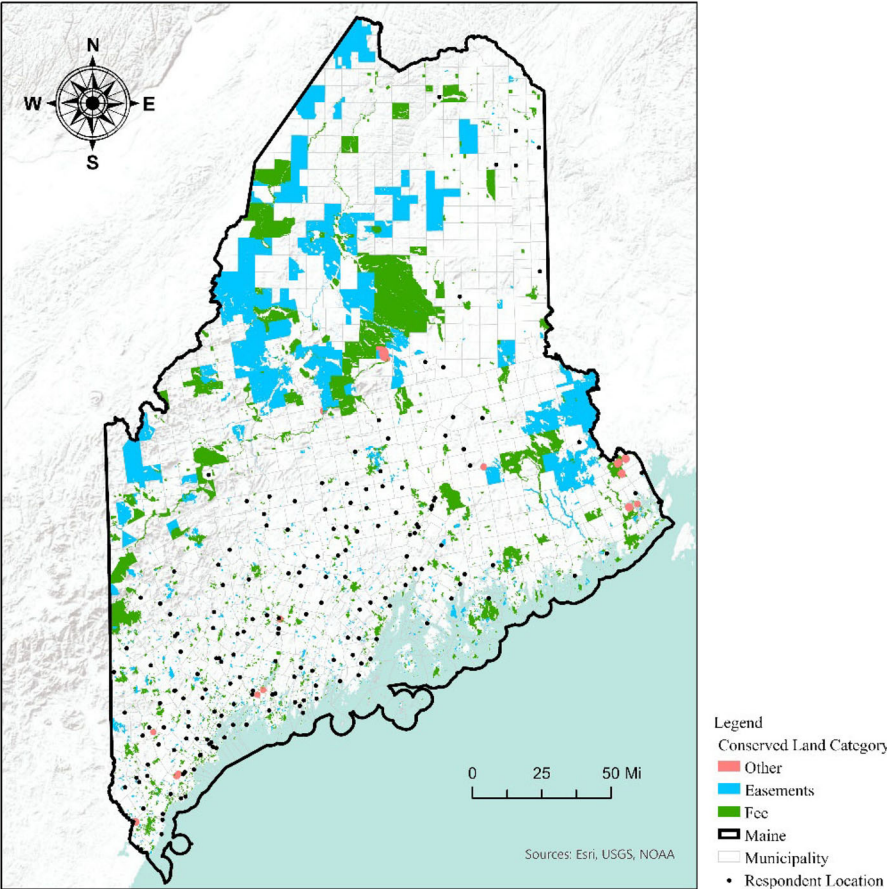


Figure 1. Overview of study area. The distribution of respondent locations as well as the location and classification of conserved lands is provided.

Table 1. Summary of survey sample and Maine demographic characteristics.

Demographic	Survey respondents ($n = 502$)	Maine population*
Median age	35–44	44.7
Median personal income range	<\$20,000	\$32,647
Median length of residence in community	10–19 years	n/a
Population female (%)	50.3	51.0
Education: high school graduate or higher (%)	94.3	92.6
Education: bachelor's degree or higher (%)	25.4	31.8
Labor force participation (%)	47.2	62.8
Unemployed (%)	9.0	7.2
Rural population (%)	49.4	40.5
Political ideology: conservative (%)	30.2	27.8
Political ideology: liberal (%)	26.0	36.4
Geography: Southern Maine (%)	34.0	39.7
Geography: Central Maine (%)	33.8	30.0

*Sources: US Census Bureau; US Bureau of Labor Statistics; USDA economic research service; Maine Bureau of Corporations, Elections & Commissions

associations with other demographic features. A small association between rural or urban residence and political ideology existed within the sample ($\chi^2(2) = 6.376$, $p = 0.041$) (Cramer's $V = 0.118$). Those living within rural settings had a small association with conservative ideology (adj. residual = 2.3). A small association was also found to exist between respondent age and political ideology ($\chi^2(2) = 16.280$, $p = 0.003$) (Cramer's $V = 0.134$). Younger respondents tended to identify more with liberal ideology (adj. residual = 3.7).

Respondent Impressions of Community Resilience

Respondents differed in their perceptions of their community's resilience across a number of demographic factors. All values refer to mean ranks unless stated otherwise. When asked to agree or disagree with the statement "my community is resilient", responses amongst groupings of "conservative", "moderate", and "liberal", differed when evaluating the mean ranks of CWSWS scores ($\chi^2(2) = 10.264$, $p = 0.006$). Subsequent pairwise comparisons utilizing the Dunn (1961) procedure revealed a significant difference between the conservative (252.61) and moderate (210.31) groups ($p = 0.005$).

When considering whether or not a respondent's community was adaptable, differences existed amongst political ideology groups ($\chi^2(2) = 10.806$, $p = 0.005$). *Post hoc* tests indicate that liberal (205.47) respondents do not agree as frequently that their communities are adaptable compared to conservative respondents (253.75) ($p = 0.004$).

Next, respondents considered if their communities are capable of resolving their own local problems ($\chi^2(2) = 11.150$, $p = 0.004$). Conservative respondents (256.06) signaled stronger agreement with the statement over moderate (222.02) ($p = 0.036$) and liberal (207.25) ($p = 0.004$) respondents. Furthermore, when asked whether their communities are prepared to face future hardship, conservative respondents differed from those identifying as moderate and liberal ($\chi^2(2) = 16.765$, $p = 0.000$), with conservatives (260.85) agreeing with the statement more so than moderate (219.92) and liberal respondents (201.22) ($p = 0.007$, 0.000). Differences in perception exist amongst those reporting their highest level of education as "high school or less", "some college or associate degree", and "4-year degree or higher" ($\chi^2(2) = 6.204$, $p = 0.041$). Respondents within the high school or less group (231.01) differed from those having a four-year degree or above

(266.92) when asked to rate their agreement with the statement that their community is resilient. Residents with a 4-year degree or greater were more likely to agree ($p=0.041$).

Difference amongst age groups emerged. When evaluating community resilience, differences emerged amongst all three age groups ($\chi^2(2) = 6.802$, $p=0.017$). The respondents of the “18-34” group (229.32) differed from those of the “55 or older” group (269.03) ($p=0.019$). Younger respondents less readily agreed that their community is resilient. Respondent income was observed to be another variable influencing the perceptions of community resilience. Respondents earning \$39,999 or less, between \$40,000 and \$69,999, and \$70,000 or above differed ($\chi^2(2) = 12.403$, $p=0.002$). Those earning more than \$70,000 (264.90) agreed more that their community is resilient as compared to those earning less than \$40,000 (214.99) ($p=0.001$).

Community Resources

Responses to the statement “My community is economically diverse” varied between groups. Respondents within rural communities differed from those living in urban areas ($U=24,853.5$, $z=-3.507$, $p=0.000$). The median reported response of rural residents was 0, while the median of the urban group was 1. This result indicates that urban respondents more regularly agree that their communities are economically diverse. Urban and rural respondents also tended to differ when asked if their communities are able to attract new business ($U=36,127.0$, $z=-2.757$, $p=0.000$). Urban respondents more widely agreed with the statement.

Urban and rural respondents differed in response for statements involving their communities’ leadership. Rural respondents are more likely to agree that their local representatives are trustworthy as compared to urban counterparts ($U=25,580.5$, $z=-3.747$, $p=0.006$). A difference in perspective on the trustworthiness of local government was also detected between respondents of different education and income groups. Respondents with higher levels of education (284.48) are most likely to agree that local leadership is trustworthy ($p=0.001$; 0.001). Additionally, the 4-year degree or higher group differed significantly from both other education groups in reference to a statement asserting that local elected officials act in the best interests of their communities ($\chi^2(2)=9.343$, $p=0.009$). Those with the highest level of education (278.32) more readily agree with the statement as opposed to the high school or less group (238.40) and the some college or associate degree group (228.98). ($p=0.022$; 0.008).

Amongst the income groups, respondents earning \$39,999 or less differed significantly from those earning above \$70,000 in regard to the perceived trustworthiness of leaders ($\chi^2(2)=11.870$, $p=0.003$). Residents in the lowest income tier (214.18) are less likely to agree that their community’s leaders are trustworthy than those in the highest income tier (263.7) ($p=0.002$).

Respondents also indicated their impressions of their community’s social capital. The opinion of liberal respondents (206.02) differed significantly from that of conservative respondents (243.75) when considering if they believe members of their community support each other ($\chi^2(2)=6.274$, $p=0.043$). Liberal respondents are less likely to agree that this is the case ($p=0.037$). A significant difference was also detected for this statement when comparing those from the rural and urban groups ($U=26,452.0$,

$z = -2.859$, $p = 0.004$). The median for both groups was 1, whereas the rank mean of the rural group was calculated as 265.03 and that of the urban group was 231.31. The rural group is more likely to express agreement with the idea that their community members support one another.

When presented with the statement “my community has a unique local culture”, responses differed amongst political groups ($\chi^2(2) = 8.238$, $p = 0.016$). Conservative (243.77) and liberal respondents (199.20) differed in outlook, with conservatives tending to more frequently believe that their community’s culture is unique ($p = 0.012$). Opinions on this subject also diverged between male (258.21) and female (228.10) respondents ($U = 33,050.0$, $z = 2.485$, $p = 0.013$). Ranked means suggest a greater tendency amongst male respondents to believe their communities’ cultures are unique as opposed to female.

Natural Resource Industries

Rural (254.86) respondents agreed with a statement asserting that natural resource industries are important to their communities over urban respondents (226.49) ($U = 25,391.5$, $z = -2.35$, $p = 0.016$). Rural respondents (257.09) also more frequently agreed natural resource industries will play a future role in their communities (230.25) ($U = 26,259.5$, $z = -2.247$, $p = 0.025$).

Another factor impacting interpretation of the role of natural resource industries is gender. Female respondents (252.89), as opposed to male respondents (225.05) agreed more readily that natural resource industries are important to their communities ($U = 25,120.5$, $z = -2.315$, $p = 0.021$). Female (254.07) and male (228.51) respondents also differed on the future importance of these industries ($U = 25,953.5$, $z = -2.149$, $p = 0.032$). When asked to consider if communities should transition away from natural resource industries, male (249.31) respondents agreed more often than female respondents (218.75) ($U = 30,828.5$, $z = 2.542$, $p = 0.011$). The median score for female respondents was -1 , whereas it was 0 for males.

Conservative respondents (242.84), when compared to liberal respondents (201.82), differed when asked to consider whether natural resource industries are a reliable source of jobs in their communities ($\chi^2(2) = 7.705$, $p = 0.021$). Conservative respondents tended to agree with this idea more consistently ($p = 0.024$). Conservative respondents (247.35) differed significantly from both other political groups when asked to consider their attachment to local natural resource industries ($\chi^2(2) = 14.184$, $p = 0.001$). Both moderate (206.17) and liberal (194.51) respondents less readily indicated a sense of attachment ($p = 0.007$; 0.002).

Amongst respondents of different education groups, those having received four-year degrees or higher differed significantly from those having received a high school education or less when considering whether communities should transition away from natural resource industries ($\chi^2(2) = 7.013$, $p = 0.030$). The respondents in the four-year degree or above group (259.89) more typically agreed with this sentiment as compared to those having received less education (229.49) ($p = 0.024$). Additional differences of opinion were detected amongst age groups when respondents considered whether natural resource industries should be transitioned away from ($\chi^2(2) = 18.711$, $p = 0.000$).

This idea is most strongly supported by those between the ages of 18–34 (270.54). Responses of this group differed from both those between the ages of 35–54 (232.08) and those over the age of 55 (206.27) ($p = 0.027$; 0.000). Curiously, those between the ages of 18 and 34 differed significantly in opinion from those respondents aged 55 or older when presented with a statement claiming that young persons within their communities are interested in pursuing careers in natural resources ($\chi^2(2) = 8.039$, $p = 0.018$). The youngest cohort of respondents (257.21) tended to agree more regularly with the sentiment than those within the oldest cohort (215.88) ($p = 0.014$).

Conservation within Maine

Different age groups held different opinions on whether conservation of Maine's natural resources was important ($\chi^2(2) = 8.852$, $p = 0.012$). Those between the ages of 18 and 34 (229.17) differed significantly from those aged 55 or older (270.93). Respondents belonging to the oldest cohort tended to agree more with the statement than those of the youngest ($p = 0.010$). Respondents above the age of 55 (211.60) also differed from those between the ages of 35–54 (259.58) in regard to the potential economic impacts of conservation land designations ($\chi^2(2) = 11.577$, $p = 0.003$). Respondents within the 55 or older age group did not as readily agree that conservation land designations reduce the economic productivity of their communities ($p = 0.003$).

Of note are differences in opinion on the effect of conservation lands on natural resource industries themselves. Differences exist amongst those with four-year degrees or higher (268.80) and those who belonged to either the high school education or less group (231.18) or the some college or associate degree group (213.48) ($\chi^2(2) = 12.371$, $p = 0.002$). The 4-year degree group tended to agree that conservation land designations do not impair natural resource industries relative to both other groups ($p = 0.031$; 0.002).

Political ideology consistently appeared as a factor influencing perceptions of conservation. In the case of respondents' general impression on the importance of conservation, liberal respondents (258.62) were found to differ significantly from both the moderate (220.58) and conservative (208.77) groups ($\chi^2(2) = 12.620$, $p = 0.002$). Liberal respondents were more likely to believe that conservation is important than both other groups ($p = 0.015$; 0.002). Conservative and moderate respondents did not differ significantly from each other. Political ideology groups also differed when asked to agree or disagree with the statement that conservation land designations reduce their communities' economic productivity ($\chi^2(2) = 22.864$, $p = 0.000$). Liberal respondents (176.14) were not as likely to agree as those identifying as moderate (227.15) and conservative (249.05) ($p = 0.001$; 0.000).

Conservative (196.16) and liberal (258.04) respondents then differed on whether conservation lands within the state of Maine ought to be expanded ($\chi^2(2) = 15.949$, $p = 0.000$). Liberal respondents tended to favor this idea (245.42). Conservative (208.38) responses differed also on whether conservation lands provided noneconomic benefits to their communities ($\chi^2(2) = 6.319$, $p = 0.042$). Liberal respondents agreed that these benefits existed more so than conservative counterparts ($p = 0.05$). One final divergence was detected when respondents were asked to consider whether or not the conservation

of ecosystems should be a priority ($\chi^2(2) = 30.725$, $p = 0.000$). All three political groups differed from each other. Liberal respondents (270.29) tended to support conservation priorities more than both moderate (224.50) and conservative (186.14) respondents ($p = 0.003$; 0.000). Moderate respondents were more likely to agree than conservatives ($p = 0.013$).

When asked to consider if access to the outdoors had improved respondent ability to cope with the Covid-19 pandemic, age influenced response ($\chi^2(2) = 6.802$, $p = 0.033$). The 55 or older group (263.18) differed from the 34 to 54 group (225.61), with the older respondents indicating greater overall agreement ($p = 0.029$). Rural and urban residents also differed ($U = 24.853.5$, $z = -3.507$, $p = 0.000$). Rural respondents (266.87) reported more readily that outdoor access improved their coping ability over urban respondents (224.81). The overall median for this statement was 1, indicating that respondents on the whole agree that access to the outdoors is an asset to them during an ongoing contemporary stressor. The full results of the Kruskal–Wallis and Mann–Whitney U tests are included in [Table 2](#).

Discussion

Maine residents hold varied beliefs about their communities and their functionality. Rural respondents report more hospitable neighborhood relations alongside greater approachability of local leadership. This implies a development of social and political capital occurring in rural settings. As discussed by Carpenter et al. (2012), trustworthiness and effective leadership are crucial conditions for general resilience. Diverse economies and entrepreneurial opportunity are identified as assets by urban respondents. Conversely, urban leadership does not garner the same degree of public trust as their rural counterparts, and respondents do not report a tendency for neighbors to lend aid in times of hardship. Norris et al. (2008) remark that community resilience is maintained through adaptive capacities relating to key community functions such as economic development and social support. Urban respondents report confidence in the former but not the latter. It is apparent that urban respondents identify the strengths of their community to be economic in nature while weakness are present within social bonding and local leadership. Meanwhile, the inverse was found for rural locations.

Respondent perceptions of community capital access reflect, in part, political ideology. Conservative respondents expressed that their communities are more able to cope with hardship than liberal counterparts. Conservatives also believed that their communities possessed a unique local culture and a more supportive population. This, coupled with conservative respondents' belief that their community members are self-sufficient, suggests they view individual independence and magnanimity as valuable community assets. Active agents within a community who emerge to direct and coordinate efforts in times of hardship are advantageous toward resilience as stated by Magis (2010).

In general, there was a small association between conservative ideology and rural residence. However, rural residence was not significantly related to the ability of communities to cope with change. Of note, however, is that designations of rural and urban residence are based upon census population reporting by zip code rather than direct input from respondents. Furthermore, regions reported by the census as "urban

Table 2. Results of analysis for Mann–Whitney *U* tests and Kruskal–Wallis post hoc tests for survey response data.

Statement	Geography		Political Ideology			Education			Income		Age			
	Urban	Rural	Conservative	Moderate	Liberal	High School or Less	Some College	4-yr Degree +	Below \$40K	\$40–70k	\$70k and Above	18–34	35–54	55 or older
Community vulnerability and resilience														
My community is resilient	224.81	266.87	252.61**	210.31**	221.52	231.01*	248.52	266.92*	214.99***	237.74	264.9***	229.32*	239.75	269.03*
U/χ^2	24,853.50		10,264				6,204			12,403			8,149	
My community is adaptable	244.61	254.41	253.75**	223.65	205.47**				222.36**	229.87*	270.81**			
U/χ^2	26,763.00		10,806				2,332			12,129			5,061	
My community can resolve its own local problems	239.76	260.45	256.06**	220.02*	207.25**									
U/χ^2	28,542.00		11.15				0.03			4,929			4,505	
Community resources and capital														
My community is economically diverse	258.18*	232.5*												
U/χ^2	33,153.50		3,739				0.003			0.723			0.114	
My community is able to attract new business	269.93***	223.21***							226.49	223.24	260.95	270.91	234.45	238.28
U/χ^2	36,127.00		2,964				4,064			6,347			6,745	
My community's leaders are trustworthy	227.73**	261.02**							214.18**		267.7**	239.93	225.14*	257.74*
U/χ^2	25,580.50		3,452				15,978			11.87			8.74	
My community's leaders act in the best interest of its people	228.51**	263.34**	246.03*	212.88*	222.6	238.4**	228.98*	278.32**	217.62**	235.05	261.77**	242.51	226.44*	268.43*
U/χ^2	25,730		6,034				9,343			9,343			8,387	
Members of my community support each other	231.31	265.03	243.75*	227.8	206.02*									
U/χ^2	26,452.00		6,274				2,187			1,046			1,886	
My community has a unique local culture	250.97	237.92	243.77*	225.06	199.2*									
U/χ^2	31,357.50		8,238				3,221			3,117			1,811	
Natural resource industries														
Natural resource industries are important to my community	226.49*	254.84*												
U/χ^2	25,391.50		3,835				0.643			0.44			1,622	
I believe that NR industries are important to my community's future	230.25*	257.09*												
U/χ^2	26,259.50		5,61				2,918			0.098			1.07	
NR industries provide reliable jobs to residents of my community	240.41	238.54	242.84*	214.16	201.82*									
U/χ^2	28,766.00		7,705				0.552			1,179			3.36	
I feel a strong attachment to my community's NR industries	228.57	241.92	247.35**	206.17	194.51**									
U/χ^2	25,895.50		14,184				0.924			3,884			1,466	

(continued)

Table 2. Continued.

Statement	Geography		Political Ideology			Education		Income		Age		
	Urban	Rural	Conservative	Moderate	Liberal	High School or Less	Some College	4-yr Degree +	Below \$40K	\$40–70k	\$70k and Above	
My community should transition away from NR industries $U/I\chi^2$	238.27	232.63	217.75	201.02**	244.78**	229.49*	234.78	259.89*			270.54***	232.08*
Young people in my community are interested in pursuing NR industry jobs $U/I\chi^2$	229.54	243.89		9.329			7.013		2.478		257.21*	237.81*
Conservation Lands Conservation of Maine's natural resources is important $U/I\chi^2$	241.64	254.6	208.79**	220.58*	258.62**		0.451		1.892			8.039
Conservation land designations reduce the economic productivity of my community $U/I\chi^2$	243.47	233.36	249.05***	227.15***	176.14***		5.781		3.101		247	8.852
Maine's conservation lands do not seriously impair NR industries $U/I\chi^2$	231.7	241.47		22.864		231.18*	3.166	268.8**	3.145			11.577
I support the expansion of conservation lands in Maine $U/I\chi^2$	244.61	243.35	196.16***	3.252	258.04***	240.91	12.371	269.40*	2.126			0.568
Conservation lands provide significant non-economic benefits to Maine and its residents $U/I\chi^2$	240.95	238.03	208.38*	15.549	245.42*		7.825		0.923			4.659
Conserving natural landscapes and ecosystems should be a priority for Maine $U/I\chi^2$	240.25	246.77	186.14***	6.319	270.29***		4.631		3.44		253.09	0.784
Access to the outdoors has enhanced my ability to cope with Covid-19 restrictions $U/I\chi^2$	224.81***	266.87***		30.725		237.19	234.39	270.67	2.981		249.09	222.62
	24,853.50			0.512			6.399		4.588			6.802

Inclusion of *, **, or *** indicates the detection of a significant difference corresponding to a p-value less than 0.05, 0.01, or 0.001, respectively.

clusters” may still represent small, isolated communities. Given Maine’s largely rural makeup and limited urbanized areas above a population of 50,000 individuals, the contextual meaning of urban and rural in this instance should be considered.

Factors influencing perceptions of resilience or adaptability appeared more closely tied to individual factors such as age, education, and income. Those with more personal agency – via educational and career prospects – tended to then interpret their community at large as being more resilient. Respondents indicating a belief that their communities are resilient also expressed a more optimistic outlook regarding their communities’ futures, and a belief that their communities are actively taking steps to prepare for future uncertainty. These findings may be reflective of the fact that individuals with higher income and more education tend to live in communities of higher resource accessibility and affluence, as well as a possible tendency to project one’s own circumstance onto the community at large.

The relationship between respondents and natural resources appeared a multifaceted one. Those valuing their own local natural resource industries and who are opposed to transitions away from these sectors tended to be conservative, female, older, and possessing limited post-secondary education. Despite shrinkages within natural resource industries, statewide economic declines have not been as dramatic as many perceive (Crandall and Anderson 2016; Bailey and Green 2021). This is largely supported through recent initiatives undertaken to diversify the state’s forest products sector. Examples include Maine DECD’s (2019) promotion of bio based technologies such as advanced building materials and bioplastics to attract investment and the industry-wide FOR/Maine (2018) initiative’s goal to diversify wood manufacturing and increase sector revenue by 40% by 2025 (Maine Department of Economic and Community Development 2019). A summary of this paper’s key findings is supplied in Table 3.

Conservative respondents and those between the ages of 18 and 34 did not tend to agree that conservation of Maine’s natural resources ought to be a priority within the state. Some of this perception may be attributed to recent debates over the designation of the Katahdin Woods and Waters National Monument in 2016, which had a polarizing effect on residents of nearby communities and Maine citizens at large, largely around the benefits and costs of expanded federal land ownership, and the potential use changes that go with it (Ignatiadis et al. 2021). Conservative respondents also expressed a belief that regulatory pressure had led to the decline of natural resource industries. There is some validity to this perception, particularly with respect to the decline of the pulp and paper industry across the Northeast US (Gray et al. 2014). Given their expressed support of these industries, it may be indicative of a belief that conservation and utilization of natural resources are at odds. Conservation lands in Maine often arise from privately owned parcels of property. In fact, 85% of the privately conserved forestland in the state are still managed as “working forest” that provide timber products (Maine Legislature 2018). The true impacts of conservation on local industries should be demonstrated to conservation decision makers. This is particularly important given the state’s commitment in 2021 to expand funding for its Land for Maine’s Future Program for the conservation of working forest, farms, commercial waterfronts, and public access (Maine Legislature 2021).

Table 3. Summary of key survey findings.

Category	Subgroups	Key findings
Education	High school or less	• Respondents with a 4-year degree were more likely to agree that their community was resilient as compared to those with a high school level education or less
	Some college or associate degree	• Respondents with a 4-year degree are most likely to describe their local leaders as trustworthy
	4-Year degree or higher	• Respondents without a 4-year degree believe conservation lands impair natural resource industries
Age	18–34	• The youngest cohort of respondents are less likely to agree that their communities are resilient than the oldest
	35–54	• Younger respondents believe their communities ought to transition away from natural resource industries
	55 or Older	• The 18-34 group agrees more readily than those 55 or older that young people in their communities are interested in natural resource industry careers
Gender	Female	• Male respondents are most likely to believe that their community has a unique local culture
	Male	• Female respondents report that natural resource industries remain important contributors to their communities and should not be transitioned away from
Income	\$39,999 or less	• Respondents belonging to the highest earning income tier are more likely to agree that their community is resilient
	\$40,000–\$69,999	• Those of the lowest earning income group reported less trust in local elected leaders than those reporting an annual income of \$70,000 or above
	\$70,000 or more	• Conservative respondents agree most readily that their communities are capable of resolving local hardships
Political Ideology	Conservative	• Liberal respondents do not tend to agree that their community members offer support to one another
	Moderate	• Conservative respondents are more likely than liberal respondents to agree that natural resource industries reliably supply jobs to their communities
	Liberal	• Liberal respondents believe that conservation is an important priority for Maine, and do not agree that conservation efforts hamper economic activity
Urban/Rural residence	Urban	• Urban respondents report that their communities are economically diverse and can attract new businesses
	Rural	• Rural respondents express trust in local elected leadership and report greater community support
		• Rural respondents agree more that their communities will continue to rely on natural resource industries

Developments pertaining to natural resource management, economic growth, and social values will shape the future of the forest resource dependent communities. Rural communities frequently are lacking in economic complexity due to small populations, low skill and education investment, and considerable distances from major centers of business activity (Johnson and Stallmann 1994). These locations are often found to be dependent upon their own local resources and networks to supply support in the immediate aftermath of a stressor event (Rapaport et al. 2018). The results of this research accordingly indicate that residents of rural Maine communities do identify a lack of diversified economic activity. However, they are also more likely to believe that natural resource industries will continue to be important community keystones even amid declining outlooks nationwide. These findings align with prior research examining transitioning economies, given that many rural communities retain these industries as dominant employers even in the wake of mounting international competition and the

consolidation of primary commodity production (Hibbard and Lurie 2013). These continued relationships expose rural communities to stressors associated with boom bust cycles typical of extractive industries and growing industry redundancies which increase the likelihood that bust periods become permanent (Hirt 1996; Johnson and Stallmann 1994; Hibbard and Lurie 2013). Ongoing dependence on natural resource industries may incur vulnerability in rural systems, while being coupled with additional barriers to resilience such as imperfect local knowledge of global market trends (Johnson and Stallmann 1994).

However, while it is evident that economic vulnerabilities abound in resource dependent areas, community resilience remains an interdisciplinary subject, and thus factors including but not limited to economic viability determine a given location's capacity to respond (Rapaport et al. 2018). According to Beggs, Haines, and Hurlbert (2010), personal networks within nonmetropolitan communities are denser and more locally oriented and feature a greater degree of familial connection over metropolitan counterparts. This research corroborates such findings, as rural respondents are more likely to express both a sense of trust in local elected officials and a belief that members of their communities support each other.

Previous research has indicated that community networks built upon trust contribute to social bonding, volunteerism, and collective action, all of which contribute directly to community resilience (Marwell, Oliver, and Prael 1988; Wellman and Wortley 1990; McPherson, Popielarz, and Drobnic 1992; Beggs, Haines, and Hurlbert 2010; Rapaport et al. 2018). Rapaport et al. (2018) further assert the value of community perspectives when identifying aspects of resilience, especially those relating to social bonding and networks. Direct examination of resident attitudes allows for a more data-driven understanding of community assets, leadership, and cohesive forces. Expanding this examination outside of rural communities alone, as was the case with this research, provides further contextualization through comparisons of resilience within rural and urban settings (Rapaport et al. 2018). Within-community perspectives provide insight into the interconnectedness of different domains of community resilience. Payne et al. (2021) discovered that respondents to perception surveys tended to emphasize the strength of one local capital more strongly in instances where another was perceived to be lacking. In our own findings, neither urban nor rural respondents interpreted the overall resilience of their communities as low or inadequate even though both noted their communities to be lacking in specific capitals.

Conclusion

This research aimed to examine perceptions of community resilience and community resources held by Maine residents in order to reveal if differences in perceived community preparedness and performance were detected based on demographic and geographic characteristics of respondents. We also investigated how rural and urban residence influenced our study results. Additionally, the state of Maine's woodlands and waters will continue to evolve as usage trends and conservation priorities impact management decisions. Developments such as these will both affect and be affected by the presence and activities of resource-based industries. Determining how residents of

different backgrounds perceive communities and resources may shed light on avenues for change both in Maine and beyond. Communities of different circumstances and population character are interpreted by their residents to have different vulnerabilities and advantages. Residents may be more amenable toward resilience building strategies that align with their own perceptions of community needs. Our findings may signify no single resilience building strategy with be both applicable and locally acceptable across all communities.

Overall, future investigations on community resilience may aim for a less generalized approach to resident perceptions. In order to form a more comprehensive understanding of a community's condition, results such as the ones produced in this survey ought to be considered in conjunction with measurable community resilience and development indicators. The statewide trends in perception identified in this paper provide a starting point for more locally specific explorations of resilience and vulnerability. This data did not reveal significant differences in response by region or county, however this may represent a limitation of this study's sample size. Future research on the subject of resilience may benefit from a larger pool of subjects or a more restricted study area which enables more specific local conclusions to be drawn. Furthermore, future research drawing upon quantitative metrics of community assets, especially those measured over time, could allow for allow mutual corroboration, critique, or explanation of results generated (Payne et al. 2021).

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