Opportunities to Expand Maple Syrup Production in Wisconsin

Results from a Statewide Survey of Maple Syrup Producers

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Introduction

Maple syrup production has been a beloved hobby and business opportunity for generations of Wisconsinites. By enabling woodland owners to diversify income streams, it can contribute to rural economic development, in some cases even serving as a family's primary source of income. Wisconsin's maple syrup production is ranked fourth in the nation, behind Vermont, New York, and Maine, and Wisconsin's maple industry still has significant potential to grow.[1] [2] Additionally, maple sugaring originated as an important cultural practice for Indigenous peoples throughout the sugar maple's range and holds ongoing significance for Indigenous food sovereignty in the state.

As part of the University of Wisconsin–Madison Division of Extension Maple Syrup Program, supported in part by the USDA Agricultural Marketing Service (AMS) through the Acer Access and Development Program, we surveyed Wisconsin maple syrup producers to identify motivations and barriers for expanding production, perceived educational needs, trust in and use of various information sources, and experiences related to the changing climate.

Findings presented in this report are intended to empower foresters, rural economic development professionals, and community leaders to support Wisconsin's woodland owners to engage in or expand sustainable maple sugaring activities. Extension and partners, such as the Wisconsin Maple Syrup Producers Association, can also use these insights to develop educational programming and resources to support maple syrup producers in the state as they strive to reach their potential.

Additional analyses of the survey results are available in peer-reviewed papers published by the research team.[3] [4] [5]

List of Abbreviations

Throughout this report, the following abbreviations are used:

n – Number of respondents who answered the question; when given as a range, represents the minimum and maximum number of responses across the set of questions.

M – Mean response (omitting missing data)

DATCP – Department of Agriculture, Trade and Consumer Protection

DNR – Department of Natural Resources

NRCS – Natural Resources Conservation Service

USFS – United States Forest Service

WMSPA – Wisconsin Maple Syrup Producers Association

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Report Highlights

▸ The majority of maple syrup producers surveyed have produced maple syrup for fewer than 10 seasons, are first-generation producers, and self-identified as hobbyists who produce only for themselves and family or friends without selling any products.

▸ About 90% of respondents are private landowners who tap trees in their own sugarbush to produce maple syrup. Most have a primary residence on their property (64%), and 46% own between 10-99 acres of woodlands where they tap their trees.

▸ Respondents are interested in managing forest health in the next five years and learning about forest health, such as unwanted insects and diseases. They are also moderately confident in their forest management ability and do not see forest health management as a barrier to expansion.

▸ The majority of the woodland owners surveyed are not currently enrolled in the state's landowner property tax incentive program (the Managed Forest Law program) that encourages sustainable forestry, do not have a written forest management or stewardship plan for any of the land where they tap trees, or have not taken any actions in the past five years to manage the land that they tap trees on.

▸ Most maple syrup producers do maple sugaring activities because they enjoy being in the forest and the harvest, as well as because it is a tradition and an opportunity to bond with their family or community.

▸ Although a lack of time and difficulty collecting and handling sap efficiently are key barriers to expansion, most producers are interested in increasing production quantity and adopting energy-efficient sugaring technology in the next five years. They are also interested in learning about collecting and handling sap efficiently and using efficient concentrating and cooking technologies such as reverse osmosis.

▸ Commercial producers are interested in market expansion in the next five years. They are interested in learning about marketing skills, product diversification, industry regulations, and climate change impacts.

▸ The five main sources where most respondents receive information on how to manage their sugarbush or maple sugaring activities are:

1. equipment dealers and suppliers
2. landowners/producers on the internet
3. landowners/producers in the local community
4. large producers
5. WMSPA

▸ The five most trusted information sources are:

1. WMSPA
2. University and Extension specialists
3. landowners and producers in the local community
4. state foresters
5. equipment dealers and suppliers

▸ Among respondents with Tribal affiliations, the five most trusted information sources are:

1. WMSPA
2. University and Extension specialists
3. landowners and producers in the local community
4. NRCS
5. Wisconsin DNR

▸ About one-third of respondents agree that climate change will affect their maple sugaring activities negatively in the next 10 years, particularly in terms of prevalence of invasive species and timing of sugaring season.

▸ Respondents with Tribal affiliations are generally certain about the impact of climate change—either positively or negatively—on their maple sugaring activities in the next 10 years, especially regarding prevalence of invasive species and sap production per tap. Respondents with Tribal affiliations are confident in their ability to adapt to potential climate change impacts, and they have undertaken or planned to take actions in the next 10 years specifically out of concern for a changing climate.

Methods

To better understand and evaluate barriers, challenges, and learning opportunities around maple syrup production in Wisconsin, we developed a comprehensive needs assessment survey. The survey underwent multiple rounds of reviews and revisions by the research team and the research project's Advisory Board, which comprises maple syrup producers and natural resource professionals such as foresters and silviculture researchers.

Survey Design

After the informed consent, the survey began with a screening question to exclude respondents who have never produced maple syrup. The survey had six parts:

1. Producer experience and attitudes, including questions about production type, experience, motivation, and product distribution;
2. Woodland owner experience and attitudes, including questions about sugarbush management and educational needs;
3. Sources of information, including questions about trust in sources, preference of communication channels, and judgment of advice;
4. Producer educational and information needs, including questions about expansion motivations, barriers, challenges, learning orientation, and topics of interest;
5. Climate change adaptation readiness, including questions about attitudes and actions toward climate change impacts;
6. Demographic information.

We used a variety of sources to develop the set of questions, including established question sets from national or regional woodland owner surveys.[6][7][8] Additional questions and scales were developed by the research team and pilot tested with seven maple syrup producers in Wisconsin in June 2022. Based upon feedback received in the pilot test, the survey underwent additional review and revision.

Survey Distribution and Final Sample

The final survey was administered through Qualtrics, an online survey platform, in summer 2022. The survey was distributed to existing maple syrup producers, woodland owners, and farmer email lists, websites, and social media sites from current UW–Madison Division of Extension programs and partners. Partners involved in recruiting participants include the WMSPA, Wisconsin Woodland Owners Association, Wisconsin Farmers Union, Wisconsin Tribal Conservation Advisory Council, Forest Data Network, Great Lakes Indian Fish and Wildlife Commission, UW–Stevens Point Forestry Center, and some of the maple syrup equipment suppliers in the state: Roth Sugarbush, Maple Hollow, Maple Dude, and Smokey Lake Maple Products. Participants were compensated for participation with the opportunity to enter a lottery to win one of ten $50 gift certificates for maple syrup equipment from one of four maple syrup equipment providers based in Wisconsin.

The final sample includes a total of 682 valid responses from maple syrup producers. An initial review of the raw data identified electronic signatures of bot-responses. Multiple coders thoroughly reviewed the data, removed respondents based on screening questions and coding schemes to determine bot-responses, and reached consensus on the final sample. Respondents were allowed to skip any questions that they felt uncomfortable answering. In the present report, percentages are calculated using the total number of responses to each question excluding missing data, and percentages may not add to 100% due to rounding.

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Respondent Characteristics

Of the 551 respondents who provided their state of residence, 92% are Wisconsin residents. Of the 548 respondents who indicated where they engage in sugaring activities, all but 17 respondents (3%) indicated that they tap trees in Wisconsin, even if they are not a resident of the state. Most respondents produce maple syrup in the northern (33%), west central (27%), or northeastern (25%) regions of Wisconsin (**Table 1**). The few respondents who do not tap trees in Wisconsin mostly tap in nearby states and Canadian provinces, and they are included in the analyses throughout this report.

Most of the respondents, 83%, are males (14% females; 3% prefer not to answer; n=547), 84% are White (out of n=547), and 89% are non-Hispanic (4% Hispanic; 6% prefer not to answer; n=545). About 9% (41 out of n=431) indicated that they are a member of a Tribal Nation (**Table 2**). The median age for the sample is the response choice of "55-64 years old." The majority of respondents have a college degree. Thirty-two percent of the respondents have a degree from a college, technical, or trade school, 31% completed a four-year college degree with a bachelor's degree, and 20% completed a graduate or professional degree (out of n=550). Twenty-three percent (out of n=549) are members of the WMSPA, and 27% of respondents (out of n=550) are farmers who do other agricultural work in addition to producing maple syrup.

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Table 1

Percentage of respondents by region(s) in Wisconsin in which they tap trees.

Respondents answered a multiple-select question, *In which region of Wisconsin do you tap trees and/or produce maple syrup? Check all that apply.* n=548.

Region of Wisconsin	% Respondents
Northern Region	33%
West Central Region	27%
Northeastern Region	25%
South Central Region	9%
Southeastern Region	7%
Outside Wisconsin Region	4%

Table 2

Number of respondents by membership of federally recognized Tribal Nations in Wisconsin.

Respondents with self-identified tribal affiliations (n=41) answered a multiple-select question, *Check all of the following Tribal Nations that you are a member of. Check all that apply.* Of the 41 respondents, 11 are members of more than one Tribal Nation.

Tribal Nation	# Respondents
Menominee Tribe of Wisconsin	10
Bad River Band of Lake Superior Chippewa	8
Forest County Potawatomi	6
Ho-Chunk Nation	5
Lac du Flambeau Band of Lake Superior Chippewa	5
Oneida Nation	4
Lac Courte Oreilles Band of Lake Superior Chippewa	3
Red Cliff Band of Lake Superior Chippewa	3
Sokaogon Chippewa (Mole Lake)	2
Stockbridge-Munsee	2
St. Croix Chippewa	0
Other or Tribal Nation outside of Wisconsin	4

About 90% of respondents are private landowners who tap trees on their own land to produce maple syrup. Twenty-four percent of the respondents tap trees on their family or friend's private land, 17% tap on Tribal land, 11% purchase sap to produce maple syrup, 5% lease private land, 3% tap on public, non-tribal land, and 4% receive sap for free to produce maple syrup.

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About half of landowners in our sample, 46%, own 10-99 acres of wooded land in Wisconsin, and 51% tap trees on 10-99 acres of land that they own (**Table 3**). About half of landowners, 46%, have owned the land that they tap trees on for more than 20 years (**Table 4**). The majority of landowners, 64%, have a primary residence on their sugarbush property, 18% have a vacation residence on their sugarbush property, and the other 18% have no residence on their property.

Most of the landowners are not currently enrolled in the Managed Forest Law (MFL) program (no=71%, yes=26%, not sure=3%), do not have a written forest management or stewardship plan for any of the land where they tap trees (no=69%, yes=27%, not sure=4%), or have not taken any actions in the past five years to manage their land that they tap trees on (no=55%, yes=45%).

Table 3

Cross-tabulation of acreage of wooded land owned and acreage of land where owners tap trees.

Total n=595 for respondents who are woodland owners that tap trees on their own land; percentages in Table 3 are calculated using the total number of responses to the two questions: *How many acres of wooded land do you currently own in Wisconsin?* and *How many acres of land do you currently own in Wisconsin that you tap your trees on?*, excluding missing data.

	Under 1 acre tapped	1-9 acres tapped	10-99 acres tapped	100-999 acres tapped	Over 1,000 acres tapped	Total acres (n=554)
Under 1 acre owned	7.22%	0.36%	0.00%	0.00%	0.00%	7.58%
1-9 acres owned	1.62%	17.15%	1.44%	0.00%	0.00%	20.22%
10-99 acres owned	2.17%	10.65%	37.18%	1.08%	0.00%	51.08%
100-999 acres owned	1.44%	3.61%	7.40%	7.76%	0.00%	20.22%
Over 1,000 acres owned	0.00%	0.18%	0.18%	0.36%	0.18%	0.90%
Total (n=554)	12.45%	31.95%	46.21%	9.21%	0.18%	100.00%

Table 4

Percentage of respondents by years of land ownership.

Respondents answered a single-choice question, *How long have you owned the land that you tap trees on?*, n=558.

Years of land ownership	% Respondents
<1 year	3%
1-5 years	16%
6-10 years	13%
11-20 years	22%
>20 years	46%

Production Experience & Scale

In the survey, hobbyists are defined as those who produce only for themselves, family, or friends, and do not sell any products. Small commercial producers are those who sell some products, either sap or syrup, but selling maple-related products is not their primary income. Large commercial producers are those who sell maple products as the primary or substantial component of their income. The majority of the respondents fall into one of three groups: (1) hobbyists who tapped under 100 trees on average in a season in the past five years (41%), (2) hobbyists who tapped under 101-1,000 trees (13%), and (3) small commercial producers who tapped 101-1,000 trees (23%; **Table 5**).* In terms of gallons of maple syrup produced in 2022, the majority of respondents are hobbyists who produced fewer than 10 gallons (28%), hobbyists who produced 11-100 gallons (23%), and small commercial producers who produced 11-100 gallons (20%; **Table 6**).

Table 5

Cross-tabulation of type of maple syrup producer and number of trees tapped on average in a season.

Percentages in Table 5 are calculated using the total number of responses to these two questions: *What type of maple syrup producer do you consider yourself to be?* and *In the past 5 years, how many trees have you tapped on average in a season?*, excluding missing data.

	0 taps	<100 taps	101-1000 taps	1001-3500 taps	>3500 taps	Total (n=660)
Hobbyist	0.45%	40.91%	12.88%	0.15%	0.00%	54.39%
Small commercial producer	0.45%	6.67%	23.48%	5.91%	2.27%	38.79%
Large commercial producer	0.15%	0.00%	0.15%	0.91%	2.88%	4.09%
Other	0.00%	1.21%	1.21%	0.15%	0.15%	2.73%
Total (n=660)	1.06%	48.79%	37.73%	7.12%	5.30%	100.00%

* We acknowledge that these three categories do not reflect the full range of identities of maple syrup producers, for example Tribal communities for whom sugarmaking is a key cultural tradition contributing to food sovereignty.

Table 6

Cross-tabulation of type of maple syrup producer and number of gallons produced in the 2022 season.

Percentages in Table 6 are calculated using the total number of responses to these two questions: *What type of maple syrup producer do you consider yourself to be?* and, *How many gallons of maple syrup did you produce in 2022?*, excluding missing data. n=660.

	0 gallons	<10 gallons	11-100 gallons	101-1000 gallons	1001-10,000 gallons	>10,000 gallons	Total (n=660)
Hobbyist	2.42%	27.58%	23.03%	1.21%	0.00%	0.15%	54.39%
Small commercial producer	1.36%	2.42%	20.00%	8.94%	5.61%	0.45%	38.79%
Large commercial producer	0.30%	0.00%	0.15%	0.15%	3.33%	0.15%	4.09%
Other	0.00%	0.30%	1.97%	0.15%	0.15%	0.15%	2.73%
Total (n=660)	4.09%	30.30%	45.15%	10.45%	9.09%	0.91%	100.00%

Most respondents, 62%, are first-generation producers (**Table 7**). Most of the respondents, 57%, have produced maple syrup for fewer than 10 seasons, whereas 43% have produced maple syrup for more than 10 seasons (**Table 8**). About half of the respondents tapped fewer than 100 trees on average in a season in the past five years (49%), and more than one third tapped 101-1,000 trees on average in a season (38%; **Table 9**).

Table 7

Percentage of respondents by family generation in terms of maple syrup production.

Respondents answered a single-choice question, *Which generation are you in your family in terms of maple syrup production?*, n=659.

Generation	% Respondents
1st generation	62%
2nd generation	20%
3rd generation	13%
4th generation	3%
5th generation or above	2%

PICKPIK

Table 8

Percentage of respondents by seasons of doing maple sugaring activities.

Respondents answered a single-choice question, *How long have been doing maple sugaring activities? Think about the total time even if you have taken a break?*, n=676.

Seasons of Experience	% Respondents
1-2 seasons	13%
3-5 seasons	21%
6-10 seasons	23%
>10 seasons	43%

Table 9

Percentage of respondents by number of trees tapped on average in a season.

Respondents answered a single-choice question, *In the past 5 years, how many trees have you tapped on average in a season?*, n=660.

Average Trees Tapped	% Respondents
I don't tap trees	1%
<100 taps	49%
101-1000 taps	38%
1001-3500 taps	7%
>3500 taps	5%

Most of the respondents use "sap sacks/bags" (n=307; 53%) and "buckets" (n=243; 42%) in their sugaring operation in 2022 or the most recent season that they tapped (**Figure 1**, **Table A1**). The most commonly used types of sap or syrup processing equipment are hydrometers (n=394; 77%), evaporator (n=325; 63%), and flat pans (n=278; 54%), as they were used by more than 50% of the respondents (**Figure 2**, **Table A2**). The primary fuel used by most producers for processing sap in 2022 or the most recent season that they tapped is wood (76%), followed by other sources (12% gas, 7% oil, 5% other).

Figure 1

Percentage of respondents by sap collection equipment used in sugaring operation.

Respondents answered a multiple-select question, *What types of sap collection equipment did you use in your sugaring operation in 2022 or the most recent season you tapped? Check all that apply*, n=575.

Equipment used	% Respondents	0% | | | | 100%
Sap sacks/bags	53%	
Buckets	42%	
Tubing—gravity	25%	
Tubing—vacuum pump >18" Hg	13%	
Tubing—vacuum pump ≤18" Hg	9%	
Other	3%	

Figure 2

Percentage of respondents by sap or syrup processing equipment used in sugaring operation.

Respondents answered a multiple-select question, *What types of sap or syrup processing equipment did you use in your sugaring operation in 2022 or the most recent season you tapped? Check all that apply.* n=512.

Processing Equipment Used	% Respondents
Hydrometer	77%
Evaporator	63%
Flat pan	54%
Reverse osmosis	39%
Pre-heater	38%
Filter press	33%
Automatic draw-off	20%
Other	9%
Air injection	6%
UV sanitizer	4%

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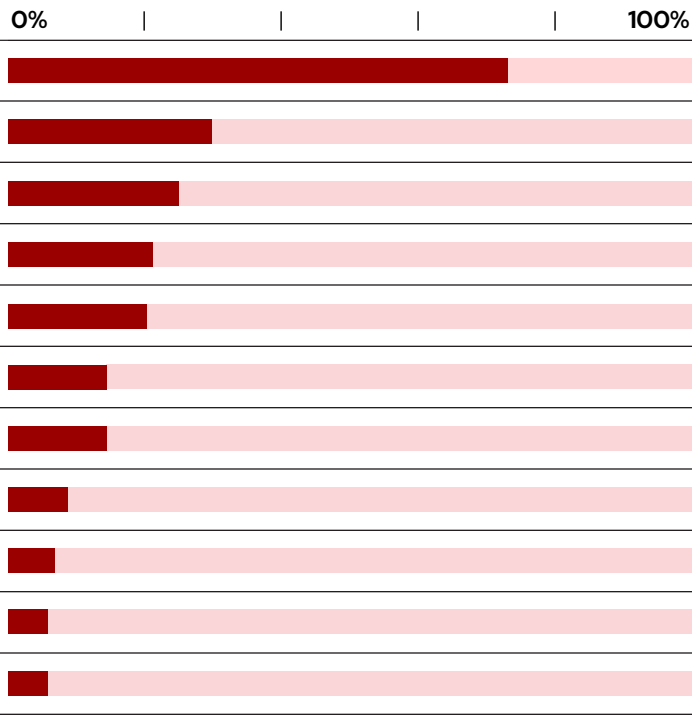
Most respondents use their maple syrup products for home consumption (n=570) or give them away as gifts (n=520). Some respondents sell for income (n=269) or trade for other goods or services (n=244). Among respondents who sell maple products for income (n=269), the majority, about 94%, produce maple syrup, while 36% sell maple sap, and 21% sell other maple products. Selling to friends and neighbors (n=205; 76%) is the primary way producers sell for income (**Figure 3**, **Table A3**).

Figure 3

Percentage of respondents by way(s) they sell for income.

Respondents who sell their maple syrup products for income (n=269) answered a multiple-select question, *What is the primary way that you sell your maple syrup products?* Check all that apply. n=269.

Income Sources	% Respondents
Selling to friends and neighbors	76%
Bulk to other maple syrup producers	31%
Local farmers' markets	26%
Grocery and other stores	22%
Online website	21%
Restaurants	15%
Shows, events, and fairs	15%
Distributors	9%
Community-supported agriculture	7%
Cooperatives	6%
Other	6%



Motivations for Producing Maple Syrup

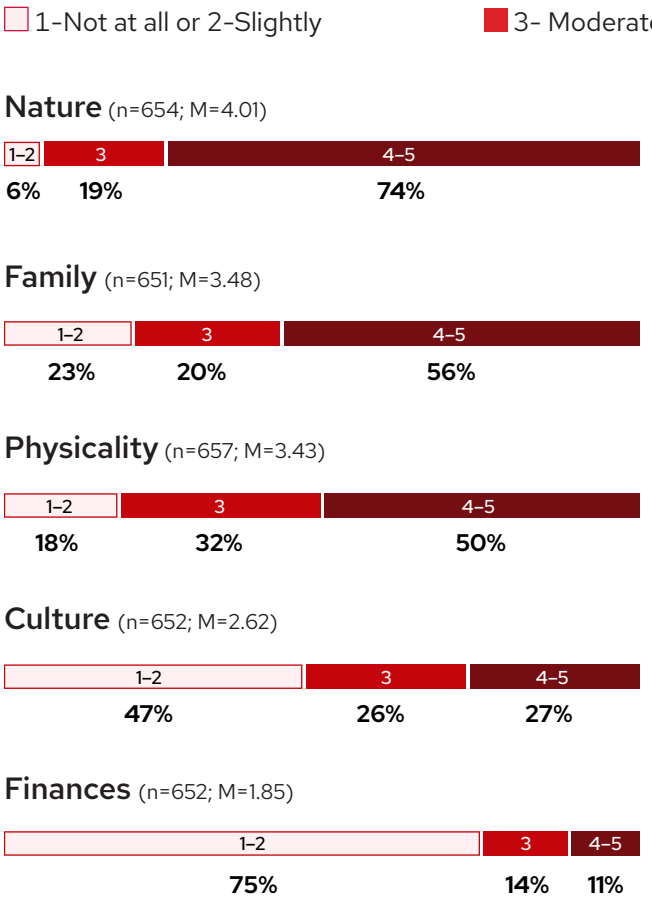
Most of the respondents indicated that they are very or extremely motivated by "nature" (74%) or "spending time with family" (56%) to produce maple syrup, and half of respondents, 50%, indicated that they are very or extremely motivated to engage in maple sugaring activities to stay physically active and get exercise. Further, 27% of respondents are very or extremely motivated to produce maple syrup because it is a cultural tradition. Most respondents, 56%, indicated finances were not at all the reason why they produce maple syrup (**Figure 4**, **Table A4**).

Our findings showed that most respondents do maple sugaring activities because they enjoy being in the forest and participating in the harvest, and because it is a tradition and an opportunity to bond with their family or community.

Figure 4

Percentage of respondents by extent of motivations for engaging in maple sugaring activities.

Respondents rated the extent to which each reason motivates them to engage in maple sugaring activities on a scale of 1 (not at all) to 5 (extremely), n=651–657.



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Learning & Innovation Orientation

Most of the respondents, 81%, either strongly or somewhat agree that they enjoy learning about new ideas and methods related to maple syrup operation. More than half of respondents, 68%, strongly or somewhat agree that they try out new ideas and methods related to maple syrup operation, and nearly half of respondents, 45%, strongly or somewhat agree that they implement innovations related to maple syrup operation even if it involves risk (**Figure 5**, **Table A5**).

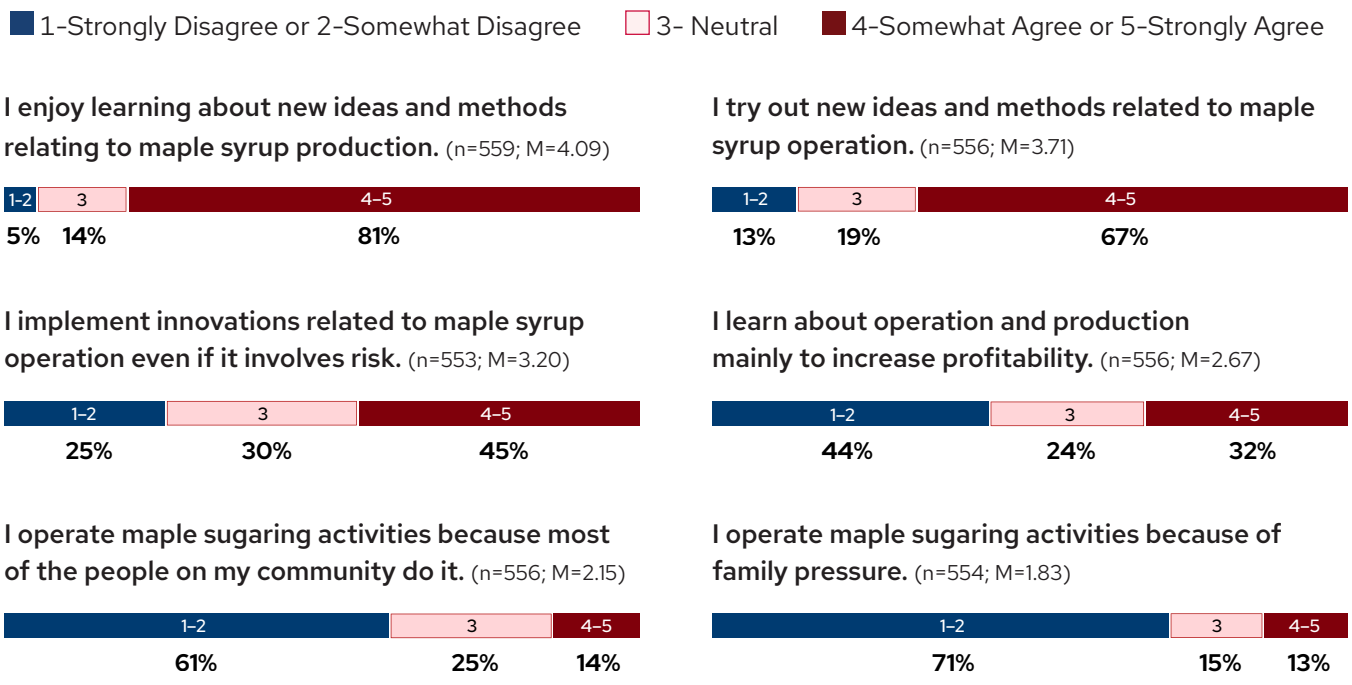
Learning Motivations

Some respondents, 32%, strongly or somewhat agree that they learn about maple syrup operation and production mainly to increase profitability. Many respondents strongly disagree that they operate maple sugaring activities because other people in their community do it (42%) or due to family pressure (61%). See **Figure 5** and **Table A5**.

Figure 5

Learning and Innovation Orientations.

Respondents rated the extent to which they agreed or disagreed with statements about their experience in maple sugaring activities and sugaring management on a scale of 1 (strongly disagree) to 5 (strongly agree), n=553–559.



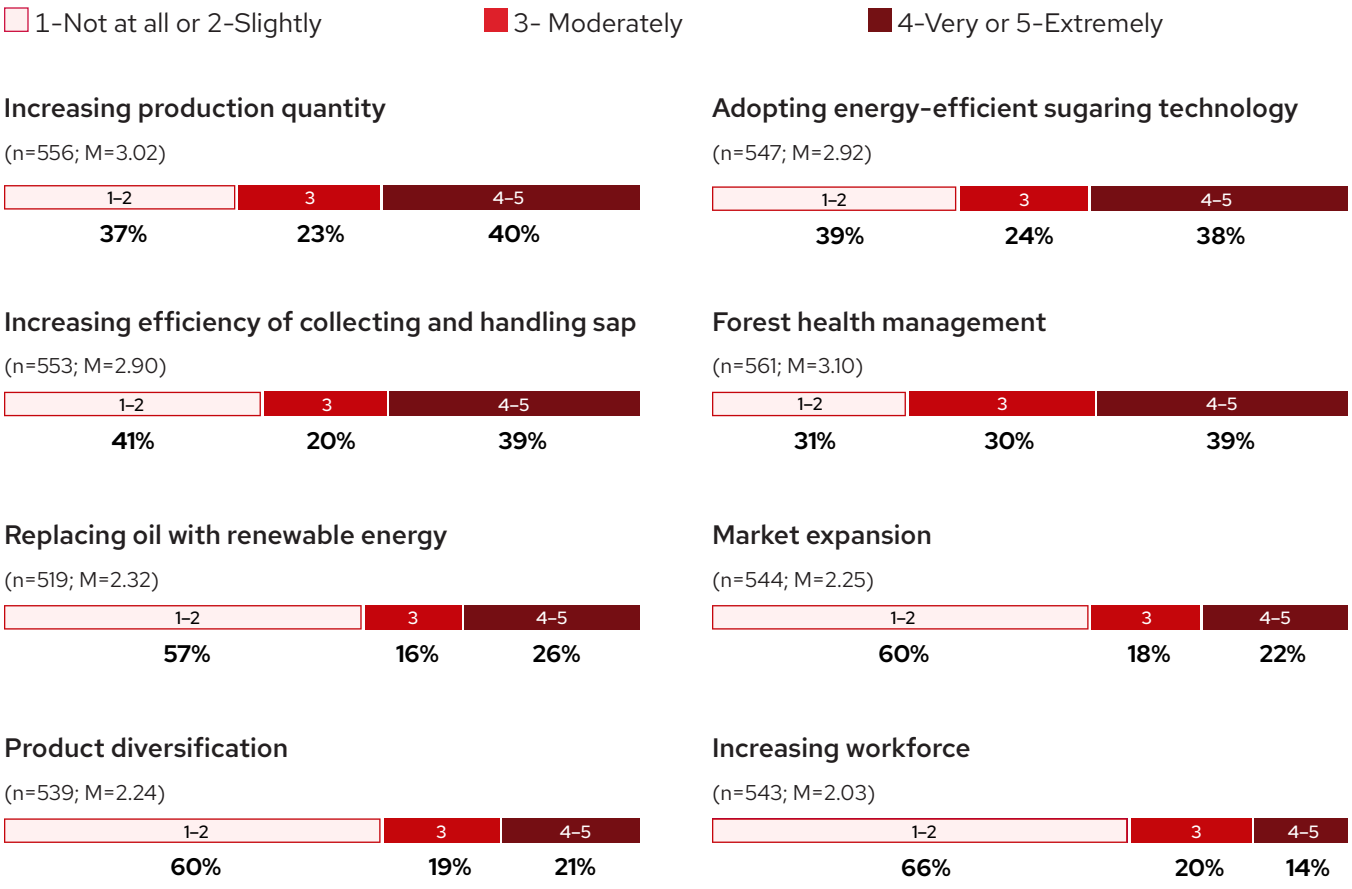
Expansion Interest & Barriers

Nearly half of respondents, 48%, indicated that they are interested in expanding their maple sugaring activities in the next five years, and 46% of respondents are motivated to expand and perceive that it is likely they will expand their operations in the next five years. Further, when asked to indicate how interested they are in doing various sugaring activities in the next five years, about 40% of the respondents are *very* or *extremely* interested in increasing production quantity (40%), managing forest health (40%), increasing efficiency of collecting and handling sap (e.g., upgrade by using tubing; 39%), and adopting energy-efficient sugaring technology such as reverse osmosis (38%; **Figure 6**, **Table A6**).

Figure 6

Percentage of respondents by extent to which they are interested in doing various activities.

Respondents rated the extent to which they are interested in doing each maple sugaring activities in the next five years on a scale of 1 (not at all) to 5 (extremely), n=519–561.



Maple syrup producers face unique challenges at different production scales, and production scale influences maple syrup producers' decision-making and educational needs. We compare survey results from respondents who self-identify as hobbyists with results from respondents who are commercial producers (including respondents who self-identify as small commercial producers, large commercial producers, and others*) to understand differences in terms of expansion barriers, interests, and educational needs. Hobbyists account for 54% of respondents (male=80%, median age=55-64 years old), and 95% of the hobbyists are landowners that tap trees on their own land. Among commercial producers (male=88%, median age=45-54 years old), 91% are landowners that tap trees on their own land.

In terms of expansion interest, *more* commercial producers than hobbyists are interested in expanding their maple sugaring activities in the next five years (59% of commercial producers; 38% of hobbyists). More commercial producers than hobbyists are motivated to expand (60% of commercial producers; 34% of hobbyists) and likely to expand (58% of commercial producers; 34% of hobbyists). On average, the extent to which commercial producers are interested in doing various maple sugaring activities in the next five years is higher than hobbyists. For example, while commercial producers are *moderately* interested in market expansion, the extent to which hobbyists are interested in market expansion is between *not at all* and *slightly* interested (**Figure 7**, **Table A7**).

Figure 7

Comparison between commercial producers and hobbyists: Mean extent to which respondents are interested in doing various activities.

Respondents rated the extent to which they are interested in doing each maple sugaring activity in the next five years on a scale of 1 (not at all) to 5 (extremely). For for commercial producers, n=246–26; hobbyists, n=273–296.

Activity	Commercial Producers	Hobbyists	Not at all 1 2 3 4 5 Extremely
Replacing oil with renewable energy	2.40 (n=246)	2.26 (n=273)	CP H
Forest health management	3.20 (n=265)	3.01 (n=296)	CP H
Adopting energy-efficient sugaring technology	3.26 (n=255)	2.62 (n=292)	CP H
Increasing workforce	2.40 (n=255)	1.71 (n=288)	CP H
Increasing efficiency of collecting and handling sap	3.29 (n= 260)	2.56 (n=293)	CP H
Increasing production quantity	3.43 (n=261)	2.66 (n=295)	CP H
Product diversification	2.79 (n=256)	1.75 (n=283)	CP H
Market expansion	3.06 (n=259)	1.51 (n=285)	CP H

* We asked respondents who selected "other" to specify what kind of maple syrup producer they are. They are mostly maple syrup producers who operate a non-profit organization (e.g., church or educational program) where maple products are sold for fundraising to support the local community.

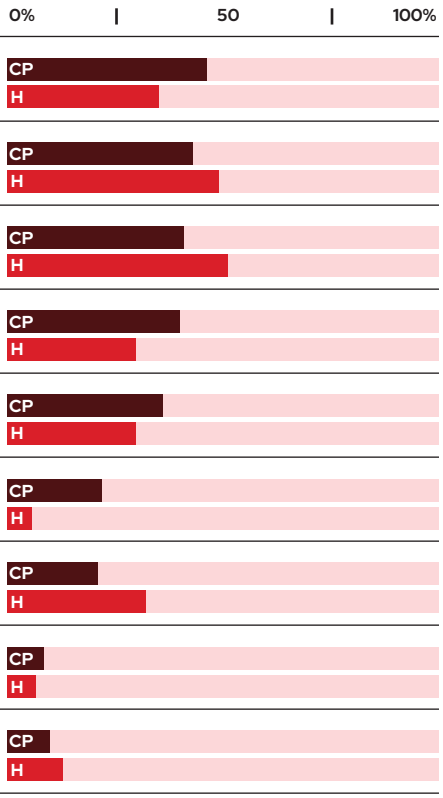
When asked about barriers to expanding their maple syrup production capacity, both hobbyists and commercial producers most frequently selected "lack of time," "collecting and handling sap efficiently" (e.g., using tubing, transporting sap), and "workforce availability." "Forest health management" is the least common barrier (**Figure 8**, **Table A8**).

Figure 8

Comparison between commercial producers and hobbyists: percentage of respondents who perceived various aspects as barriers to expanding their maple sugaring activities.

Respondents answered a multiple-select question, *Thinking about your ability in doing maple sugaring activities and knowledge on forest management, technology, and regulations, which of the following aspects are barriers to expanding your production capacity? Check all that apply.* For commercial producers, n=271; for hobbyists, n=295.

Perceived Barrier	Commercial Producers	Hobbyists
Workforce availability	46%	35%
Lack of time	43%	49%
Collecting and handling sap efficiently	41%	51%
Capital to upgrade or purchase equipment	40%	30%
Access to land/trees	36%	30%
Meeting Wisconsin DATCP regulations	22%	6%
Operating concentrating and cooking technology	21%	32%
Forest health management	9%	7%
Other	10%	13%



Information Sources

The five main sources where most maple syrup producers receive information on sugarbush management or maple sugaring activities are equipment dealers and suppliers, landowners/producers on the internet (e.g., Facebook groups, hobbyist websites), landowners/producers in the local community, large producers, and the WMSPA (**Figure 9**, **Table A9**). When using mean scores to compare the extent to which respondents trust each source of information, the five sources that received the highest mean scores are WMSPA, university and Extension specialists, landowners and producers in the local community, state foresters, and equipment dealers and suppliers (**Figure 10**, **Table A10**).

Figure 9

Percentage of respondents who have received information on sugarbush management from various sources.

Respondents were asked *To what extent do you trust the following foresters, government employees, or researchers as sources of information on how to manage your sugarbush and/or maple sugaring activities?* and *To what extent do you trust the following government departments, other producers, or suppliers as sources of information on how to manage your sugarbush and/or maple sugaring activities?* on a scale from "I have never received information from this source" to "Extremely." Data includes the percentage of respondents who chose any answer except "I have never received information from this source," n=573–588.

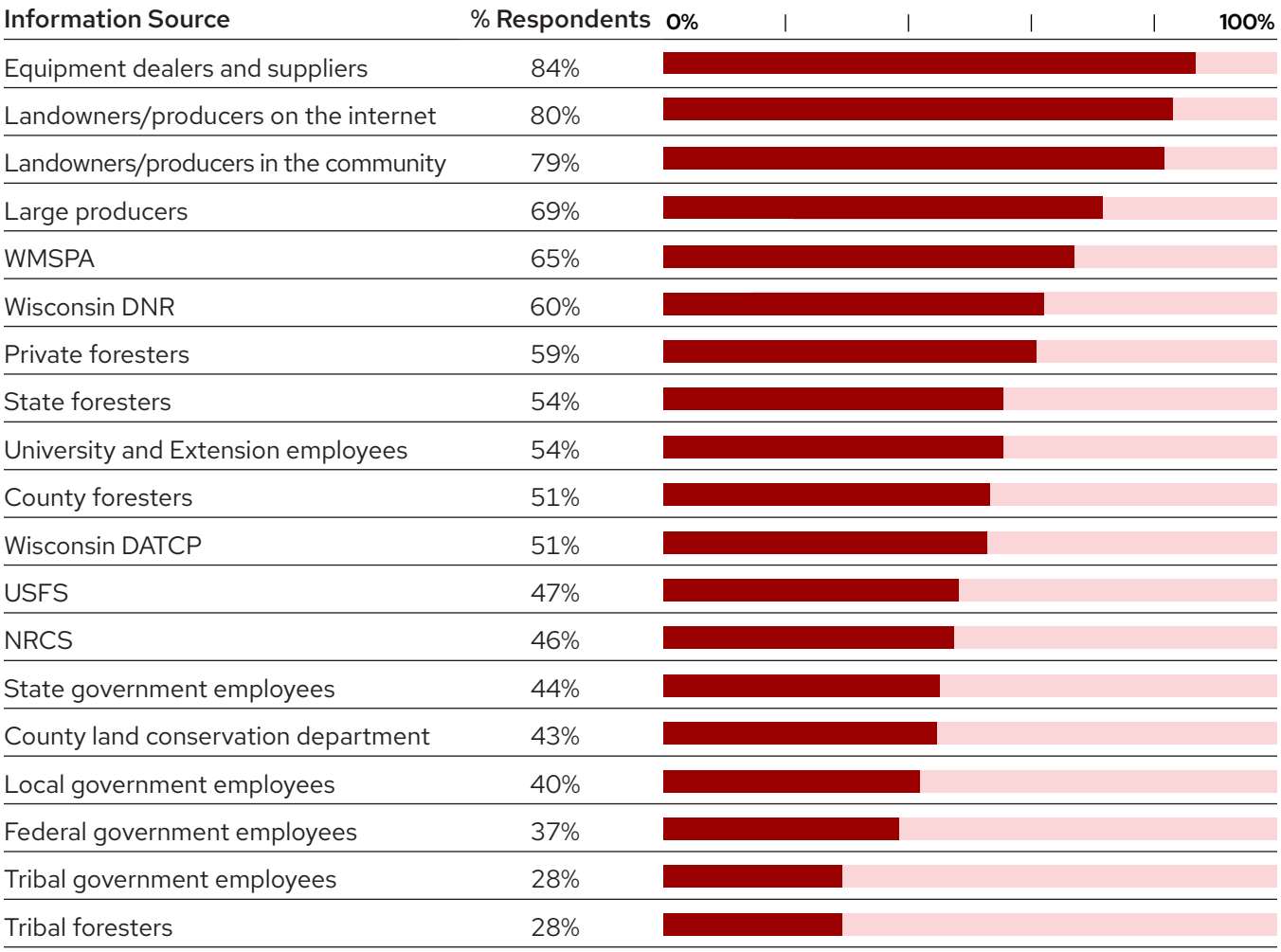
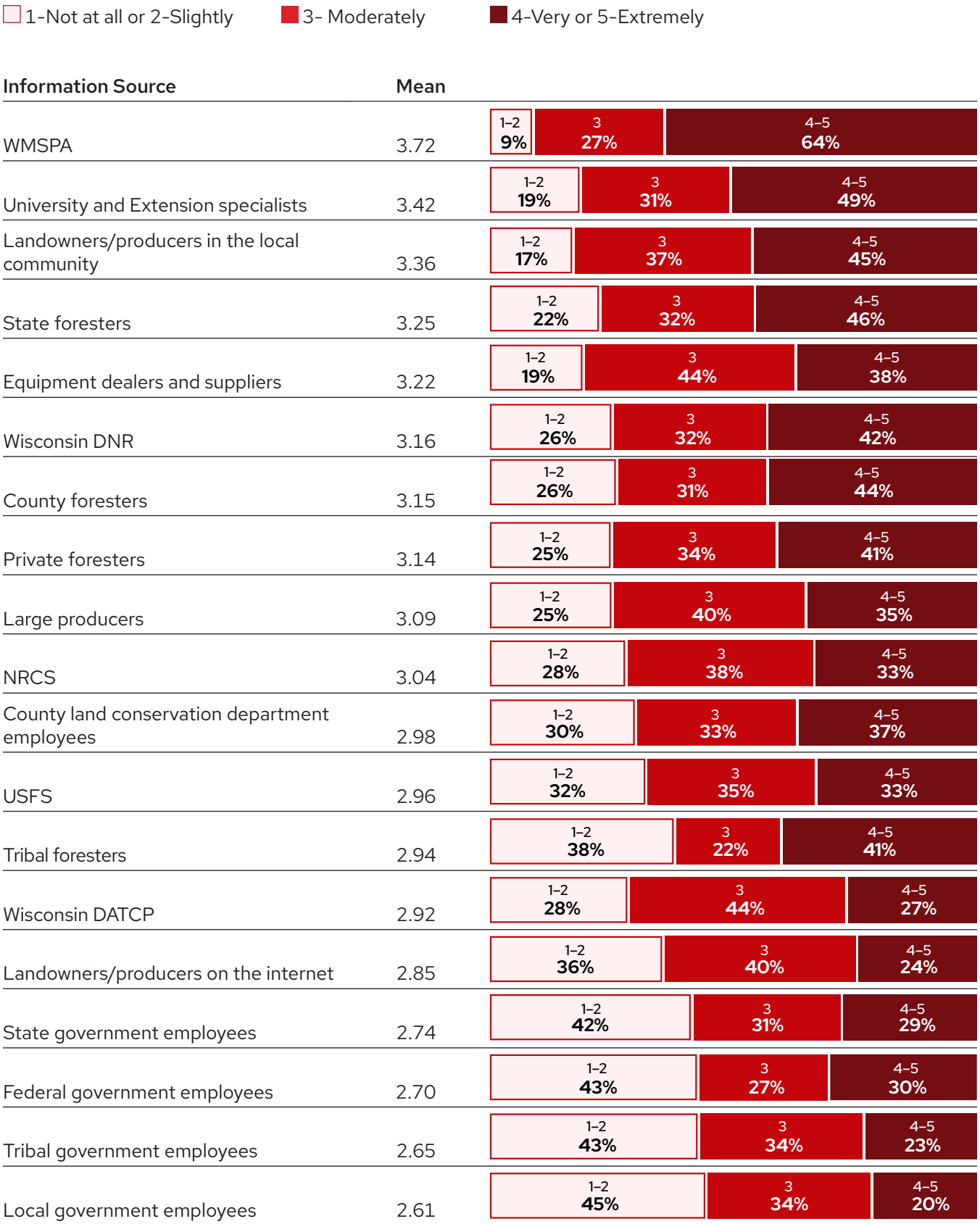


Figure 10

Percentage of respondents by the extent to which they trust various information sources.

Respondents rated the extent to which they trust each source of information on sugarbush management and/or maple sugaring activities on a scale of 1 (not at all) to 5 (extremely), n=161–488.



Written materials (64%), email or e-newsletter (62%), and browsing websites (57%) are the three channels preferred by most maple syrup producers for receiving information or advice on their maple sugaring activities or sugarbush management (**Figure 11**, **Table A11**).

Figure 11

Percentage of respondents by type of communication channels from which they prefer to receive information about maple sugaring activities.

Respondents answered a multiple-select question, *How do you prefer to get information or advice that affects your maple sugaring activities or sugarbush management? Check all that apply.* n=590.

Communication Channels	% Respondents
Written materials	64%
Email or e-newsletter	62%
Browsing websites	57%
In-person land visit	44%
Joining groups on social media	40%
Educational workshops	37%
Conferences	25%
Talk on the phone	22%
Other	4%

PRIYA JAISHANKER/FLICKR

Information Sources: Tribal Perspectives

One of the goals of the maple syrup producer survey was to understand the educational resource needs of audiences in Wisconsin that have been underserved by traditional forestry outreach, such as Tribal communities. To understand sources of information that Tribal maple syrup producers rely on, we analyzed responses given by respondents with Tribal affiliations (n=41, male=75%, median age=35-44 years old). Among these respondents, 49% self-identify as small commercial producers, 42% self-identify as hobbyists, and 71% are landowners that tap trees on their own land. Similar to the results of our main analysis, equipment dealers and suppliers are the main sources of information for respondents with Tribal affiliations (**Figure 12**, **Table A12**). The five sources that received the highest mean trust ratings are the WMSPA, university and Extension specialists, landowners and producers in the local community, the NRCS, and the Wisconsin DNR (**Figure 13**, **Table A13**).

Figure 12

Percentage of respondents with Tribal affiliations who have received information on sugarbush management from various sources.

Respondents were asked *To what extent do you trust the following foresters, government employees, or researchers as sources of information on how to manage your sugarbush and/or maple sugaring activities?* and *To what extent do you trust the following government departments, other producers, or suppliers as sources of information on how to manage your sugarbush and/or maple sugaring activities?* on a scale from "I have never received information from this source" to "Extremely." Data includes the percentage of respondents who chose any answer except "I have never received information from this source," n=39–40.

Information Source	% Respondents
Equipment dealers and suppliers	95%
Landowners/producers in the community	90%
Landowners/producers on the internet	87%
WMSPA	87%
Large producers	85%
Wisconsin DNR	85%
University and Extension specialists	85%
State government employees	85%
Local government employees	85%
County land conservation department	85%
County foresters	85%
State foresters	85%
Private foresters	85%
NRCS	84%
Wisconsin DATCP	82%
USFS	82%
Tribal government employees	82%
Federal government employees	79%
Tribal foresters	79%

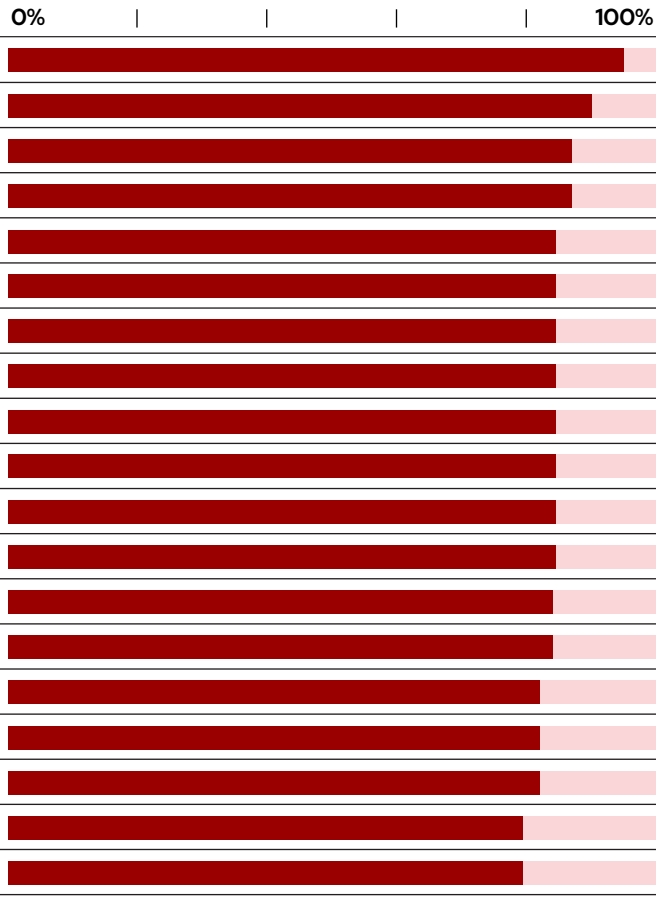


Figure 13

Percentage of respondents with Tribal affiliations by the extent to which they trust various information sources.

Respondents rated the extent to which they trust each source of information from which they learn about how to manage their sugarbush and/or maple sugaring activities on a scale of 1 (not at all) to 5 (extremely), n=31–37.

Information Source	Mean	1–2	3	4–5
WMSPA	3.62	18%	24%	59%
University and Extension specialists	3.45	21%	27%	51%
Landowners/producers in the local community	3.28	20%	39%	41%
NRCS	3.25	22%	31%	47%
Wisconsin DNR	3.24	21%	39%	39%
Tribal government employees	3.19	19%	50%	31%
Tribal foresters	3.16	32%	26%	42%
County land conservation department employees	3.12	30%	27%	42%
State foresters	3.12	24%	42%	33%
County foresters	3.09	24%	45%	30%
Landowners/producers on the internet	3.09	30%	32%	38%
Federal government employees	3.03	39%	16%	45%
Large producers	3.03	33%	33%	33%
Local government employees	3.00	30%	36%	33%
State government employees	2.97	33%	36%	30%
Equipment dealers and suppliers	2.95	30%	41%	30%
USFS	2.91	38%	31%	32%
Private foresters	2.85	33%	44%	24%
Wisconsin DATCP	2.81	32%	44%	25%

Perceptions of Advice About Maple Syrup Production

We asked respondents to recall their last experience when they received advice about the care, management, or protection of their sugarbush. Thirty percent of the respondents indicated that they have never received advice, while 5% of the respondents cannot recall. The three most frequent types of advisors were landowners or producers in the local community (20% of respondents who had received advice), equipment dealers (15%), and private foresters (13%) (**Figure 14**, **Table A14**). Generally, respondents evaluated both the advisor and the advice they received positively, and they used or intended to use the advice (**Figure 15**, **Table A15**). Respondents were invited to expand on their experience of receiving advice in an open-ended question. For example, one respondent expressed their gratitude to the advisor, writing that the advisor provided "many practical ways and methods" and "answered many difficulties" the respondent met in caring for their sugarbush.

Figure 14

Percentage of respondents by type of advisor from whom they received advice about sugarbush management.

Respondents were asked to recall who the advisor was the last time they received advice about the care, management, or protection of their sugarbush (n=584). Percentages were calculated with respect to the total number of respondents who could recall their advice receiving experience (n=382). Respondents who could not recall (n=28) or have never received advice (n=174) were excluded from the calculation.

Type of Advisor	% Respondents
Landowners/producers in the local community	20%
Equipment dealers and suppliers	15%
Private foresters	13%
State foresters	10%
Landowners/producers on the internet	9%
County foresters	8%
Other	6%
University and Extension specialists	4%
Large producers	4%
Tribal foresters	3%
Local government employees	2%
State government employees	2%
Federal government employees	1%
County land conservation department employees	1%
Tribal government employees	0.5%

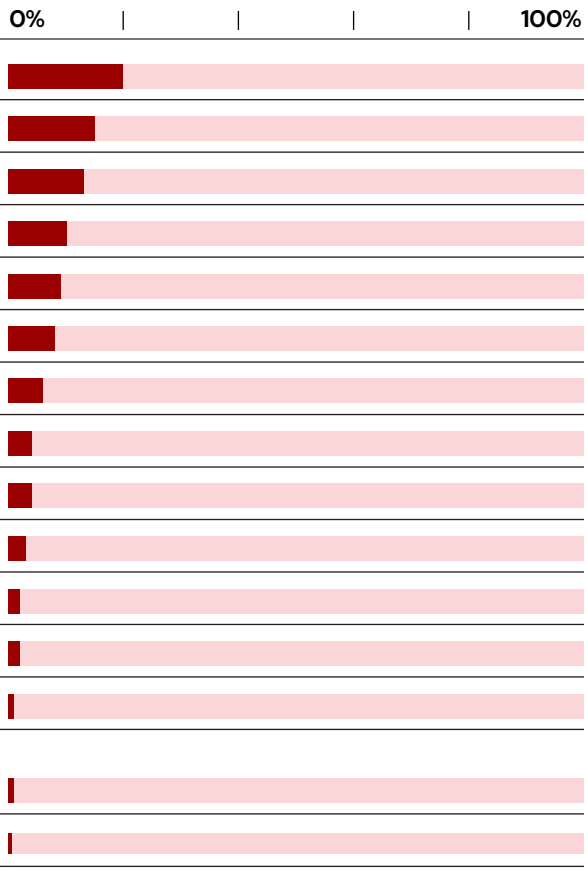
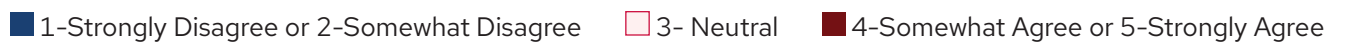


Figure 15

Percentage of respondents by the extent to which they (dis)agreed with statements about their experience receiving advice.

Respondents rated the extent to which they agreed or disagreed with statements about their last experience in receiving advice about the care, management, or protection of their sugarbush on a scale of 1 (strongly disagree) to 5 (strongly agree), n=358–365.



The advisor was interested in my maple syrup production experience and stories. (n=360; M=3.78)

The advisor was trustworthy.

(n=362; M=4.05)

The advisor's values regarding forest management were similar to mine. (n=362; M=3.79)

The advisor was knowledgeable.

(n=358; M=4.07)

The advisor was confident.

(n=361; M=4.05)

The advisor was capable.

(n=360; M=3.96)

The advice was high quality.

(n=361; M=3.85)

The advice was useful.

(n=365; M=3.95)

The advice was helpful.

(n=364; M=3.98)

I utilized the advice.

(n=361; M=3.83)

I intended to use the advice.

(n=360; M=3.61)

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Woodland Owner Educational Needs

Respondents who are woodland owners indicated how confident they are about their knowledge on sugarbush management based on their experience in caring for their forest and trees. The three topics that received the highest mean confidence scores are "tree and plant identification," "trail construction or maintenance," and "sustainable silvicultural management." For almost all topics, the most frequently selected response was *moderately confident*, compared to *not at all, slightly, very,* and *extremely confident*. For one topic, "tree and plant identification," *very confident* was the most frequently selected response.(**Figure 16**, **Table A16**)

Similarly, when respondents were asked how interested they are in learning about sugarbush management, the most frequently selected response was *moderately interested* on all but two topics. Landowners are most interested in learning about "unwanted insects or diseases," as *very interested* was the most common response. Landowners are least interested in learning about "road construction or maintenance," as *not at all interested* was the most common response. The three topics that received the highest mean scores are "unwanted insects or diseases," "invasive plants," and "sustainable silvicultural management." (**Figure 17**, **Table A17**)

Figure 16

Percentage of respondents by the extent to which they are confident about their knowledge on sugarbush management topics.

Respondents who are woodland owners (n=595) were asked to rate the extent to which they are confident about various aspects of their knowledge on sugarbush management on a scale of 1 (not at all) to 5 (extremely), n=528–545.

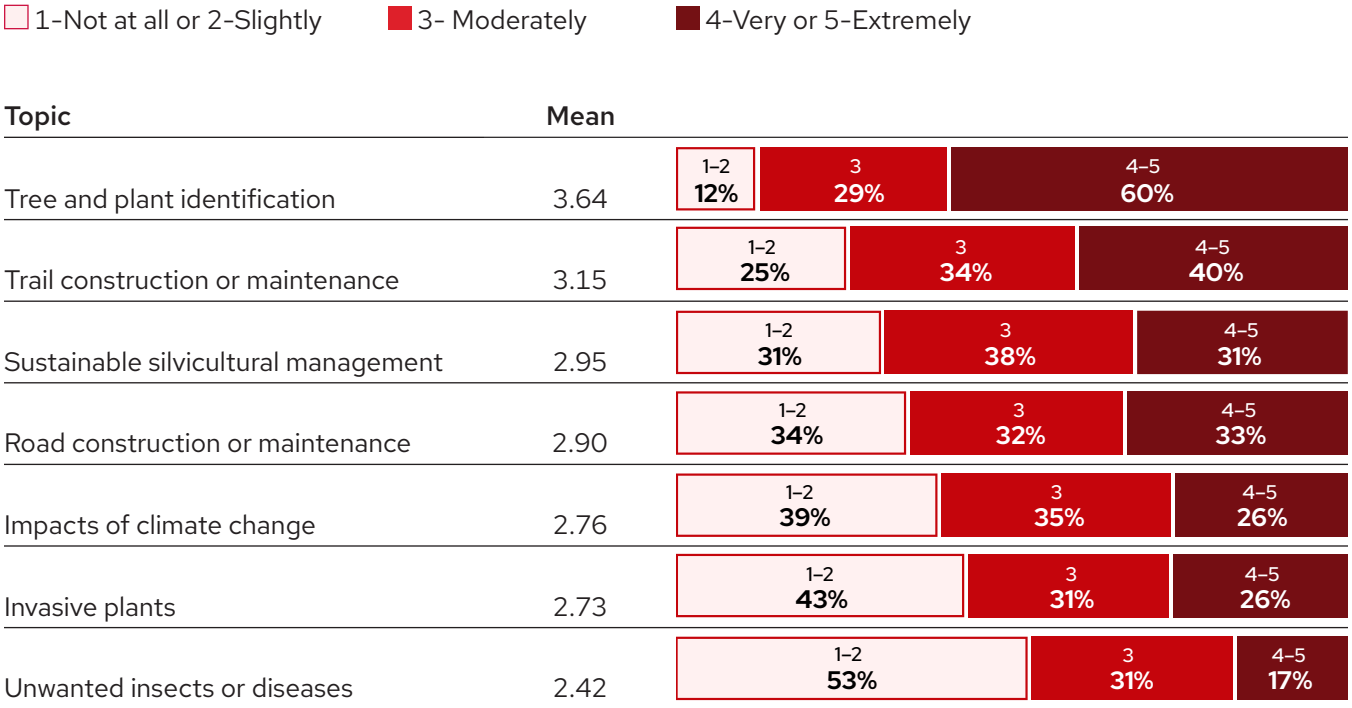

Figure 17

Percentage of respondents by the extent to which they are interested in learning about sugarbush management topics.

Respondents who are woodland owners (n=595) were asked to rate the extent to which they are interested in learning about various topics about sugarbush management on a scale of 1 (not at all) to 5 (extremely), n=527–537.

Topic	Mean	1–2	3	4–5
Unwanted insects or diseases	3.33	20%	32%	47%
Invasive plants	3.23	24%	34%	43%
Sustainable silvicultural management	3.14	27%	33%	41%
Tree and plant identification	2.95	36%	29%	36%
Impacts of climate change	2.76	43%	26%	31%
Trail construction or maintenance	2.66	45%	30%	25%
Road construction or maintenance	2.39	56%	23%	21%

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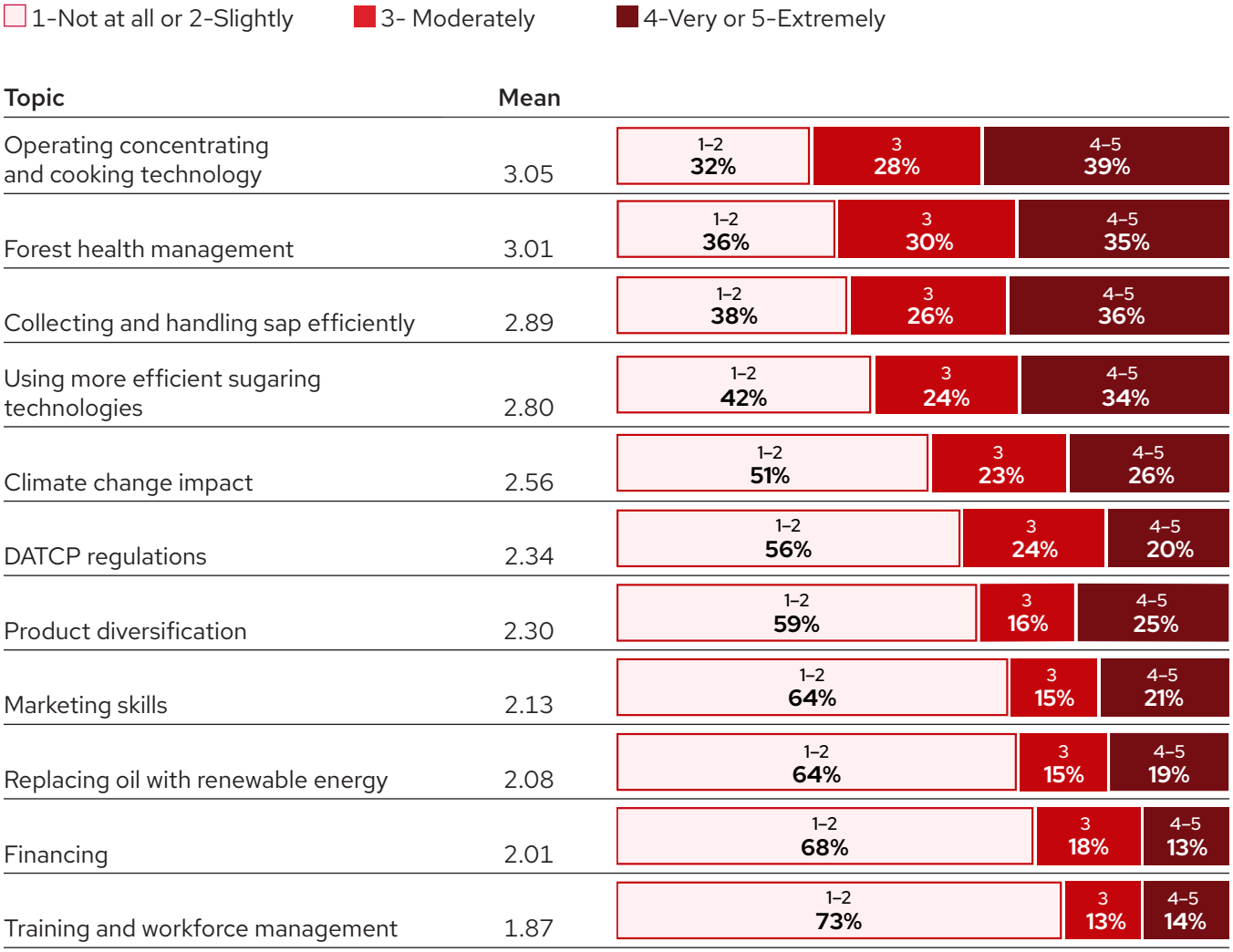
Producer Educational Needs

Respondents indicated the extent to which they are interested in learning about various maple sugaring activities. "Operating concentrating and cooking technology," "collecting and handling sap efficiently (e.g., using tubing)," "forest health management," and "using more efficient sugaring technologies such as reverse osmosis" were the topics with the highest average interest, and at least one-third of respondents (35-39%) reported being *extremely* or *very interested* in learning about them. (**Figure 18**, **Table A18**)

Figure 18

Percentage of respondents by the extent to which they are interested in learning about various maple sugaring topics.

Respondents rated the extent to which they are interested in learning about various topics about maple sugaring activities on a scale of 1 (not at all) to 5 (extremely), n=536–560.

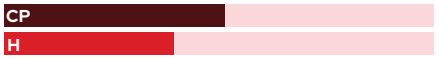
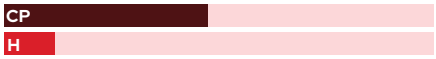


Given that maple syrup producers who self-identify as hobbyists and commercial producers may have different educational needs, we compared the mean scores between the two types of maple syrup producers. On average, while commercial producers are *slightly* or *moderately interested* in learning about all kinds of maple sugaring activities, the extent to which hobbyists are interested in learning is between *not at all* and *slightly* for most activities. Specifically, hobbyists are not as interested as commercial producers in learning about "marketing skills," "product diversification," "DATCP regulations," "financing," or "workforce management." (**Figure 19**, **Table A19**)

Figure 19

Comparison between commercial producers and hobbyists: Mean extent to which respondents are interested in learning about maple sugaring activities.

Respondents rated the extent to which they are interested in learning about each maple sugaring activity in the next five years on a scale of 1 (not at all) to 5 (extremely). For commercial producers, n=252–263; for hobbyists, n=263–297.

Activity	Mean for Commercial Producers	Mean for Hobbyists	Not at all 1 2 3 4 5 Extremely
Forest health management	3.11 (n=263)	2.92 (n=297)	
Replacing oil with renewable energy	2.19 (n=252)	1.99 (n=263)	
Climate change impact	2.69 (n=259)	2.45 (n=293)	
Operating concentrating and cooking technology	3.22 (n=255)	2.90 (n=293)	
Using more efficient sugaring technologies	3.05 (n=256)	2.58 (n=292)	
Collecting and handling sap efficiently	3.14 (n=259)	2.66 (n=295)	
Training and workforce development	2.31 (n=252)	1.49 (n=290)	
Financing	2.45 (n=255)	1.63 (n=292)	
DATCP regulations	2.85 (n=255)	1.89 (n=290)	
Product diversification	2.83 (n=254)	1.84 (n=291)	
Marketing skills	2.89 (n=255)	1.48 (n=292)	

Climate Change Perceptions & Adaptation

Maple syrup production is vulnerable to changes in climate because the timing of tapping, including the start and length of season, is dependent on weather conditions. Further, climate change impacts such as warming temperatures and unpredictable changes in freeze and thaw cycles can influence tree health and sap quantity and quality. Actions to adapt to climate change can help maple syrup producers prepare for potential negative climate impacts on forest health and sap production, while sustainable management methods can enhance the contribution of forests to mitigating climate change. We investigated perceptions of climate change risk among maple syrup producers in Wisconsin to understand their climate change perceptions and adaptation readiness.

When asked whether a changing climate will affect their maple sugaring activities in the next 10 years, 32% of respondents agree it will impact their maple syrup production, while 35% disagree and 33% adopt a neutral position. Nearly half of respondents perceive that climate change will affect their maple sugaring activities negatively in terms of prevalence of invasive species (46%) and timing of sugaring season, including start and length of season (45%). Respondents are *unsure* of how climate change will affect their sap production per tap (41%) and profitability (37%). In terms of tree health, 34% expect a negative impact, 33% are not sure, 24% indicated there will be no impact, and 9% expect a positive impact (**Figure 20**, **Table A20**).

Twelve percent of respondents indicated they have undertaken actions or planned to undertake actions in the next 10 years specifically out of concern for climate conditions. Respondents were invited to specify the actions they have undertaken or plan to undertake; examples include learning about future trends, switching from buckets to tubing, using reverse osmosis, planting more trees, using artificial irrigation, and installing solar panels.

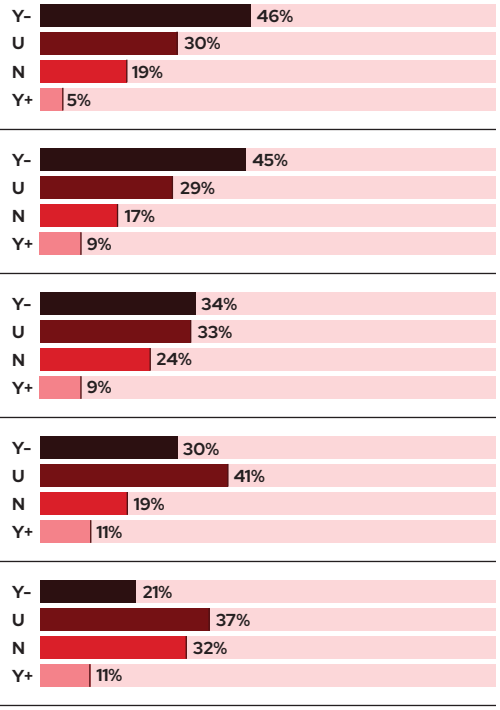
When asked about their ability to adapt (if needed) to any potential climate change impacts on their maple sugaring activities in the next 10 years, more respondents adopted a neutral position or disagreed compared to those who agreed that they would be able to adapt. Further, more respondents agree that new maple syrup technologies will help them face the challenges resulting from climate change (32%) and that new ways to adapt to climate change are needed in the maple syrup industry (38%) than the number of respondents who disagree (21% and 18%, respectively; **Figure 21**, **Table A21**).

Figure 20

Percentage of respondents by perceptions of climate change impacts.

Respondents answered a single-choice question, *Do you think a changing climate will affect your maple sugaring activities in regard to each of the following aspects in the next 10 years?*, n=546–560.

	Yes, negatively	Unsure	No	Yes, positively
Prevalence of invasive species	46%	30%	19%	5%
Timing of sugaring season	45%	29%	17%	9%
Tree health	34%	33%	24%	9%
Sap production per tap	30%	41%	19%	11%
Profitability	21%	37%	32%	11%

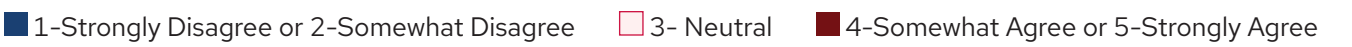


CHESAPEAKE BAY PROGRAM

Figure 21

Percentage of respondents by the extent to which they (dis)agree with statements about their ability to adapt to climate change.

Respondents rated the extent to which they agreed or disagreed with statements about how easily they would be able to adapt (if needed) to any potential impacts of a changing climate on their maple sugaring activities in the next 10 years on a scale of 1 (strongly disagree) to 5 (strongly agree), n=537–539.



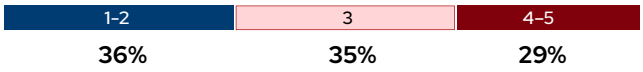
I could change how I collect and/or obtain sap.

(n=539; M=2.74)

New ways to adapt to climate change are needed in the maple syrup industry. (n=537; M=3.20)

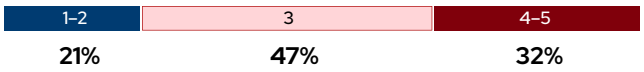
I could afford to quickly adopt new technologies.

(n=537; M=2.74)



New maple syrup technologies will help me face the new challenges coming from climate change.

(n=537; M=3.04)



I can quickly adapt to changes in labor.

(n=537; M=2.72)

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Climate Change Perceptions & Adaptation: Tribal Perspectives

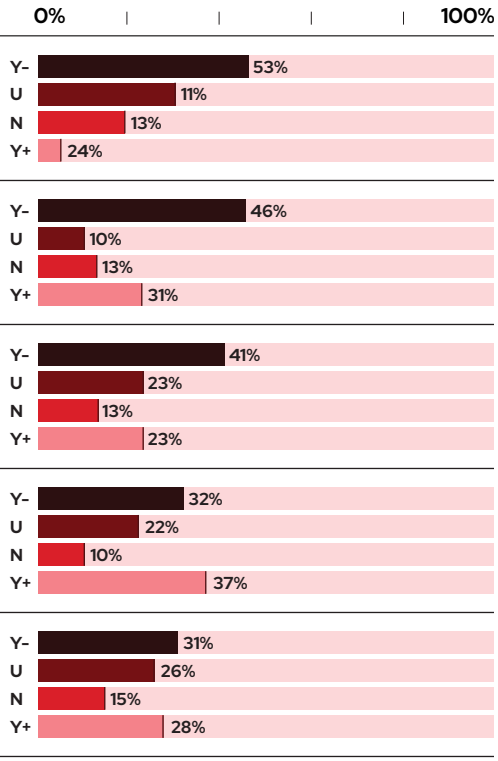
Tribal communities may be especially vulnerable to the impacts of climate change because Indigenous cultures and livelihoods are deeply rooted in relationships with the natural environment. To better support maple syrup production in Tribal Nations, it is important to understand Indigenous perspectives on climate change risk and climate adaptation planning related to maple syrup production. We analyzed responses given by respondents with Tribal affiliations (n=41, male=75%, median age=35-44 years old). Among respondents with Tribal affiliations, 49% self-identify as small commercial producers, 42% as hobbyists, and 71% are landowners who tap trees on their own land. Forty-one percent of respondents with Tribal affiliations agree climate change will impact their maple syrup production in the next 10 years, while 33% disagree and 26% adopt a neutral position. Respondents with Tribal affiliations are generally more certain about the impact of climate change than respondents in the main analysis—either positive or negative. Half or almost half of respondents with Tribal affiliations agree that climate change will have a negative impact on their maple sugaring activities in terms of prevalence of invasive species (53%), sap production per tap (46%), and timing of sugaring season (41%), while about one third of respondents anticipate a negative impact on tree health (32%) and profitability (31%; **Figure 22**, **Table A22**).

Figure 22

Percentage of respondents with Tribal affiliations by perceptions of climate change impacts.

Note. Respondents answered a single-choice question, *Do you think a changing climate will affect your maple sugaring activities in regard to each of the following aspects in the next 10 years?*, n=38–41.

	Yes, negatively	Unsure	No	Yes, positively
Prevalence of invasive species	53%	11%	13%	24%
Sap production per tap	46%	10%	13%	31%
Timing of sugaring season	41%	23%	13%	23%
Tree health	32%	22%	10%	37%
Profitability	31%	26%	15%	28%

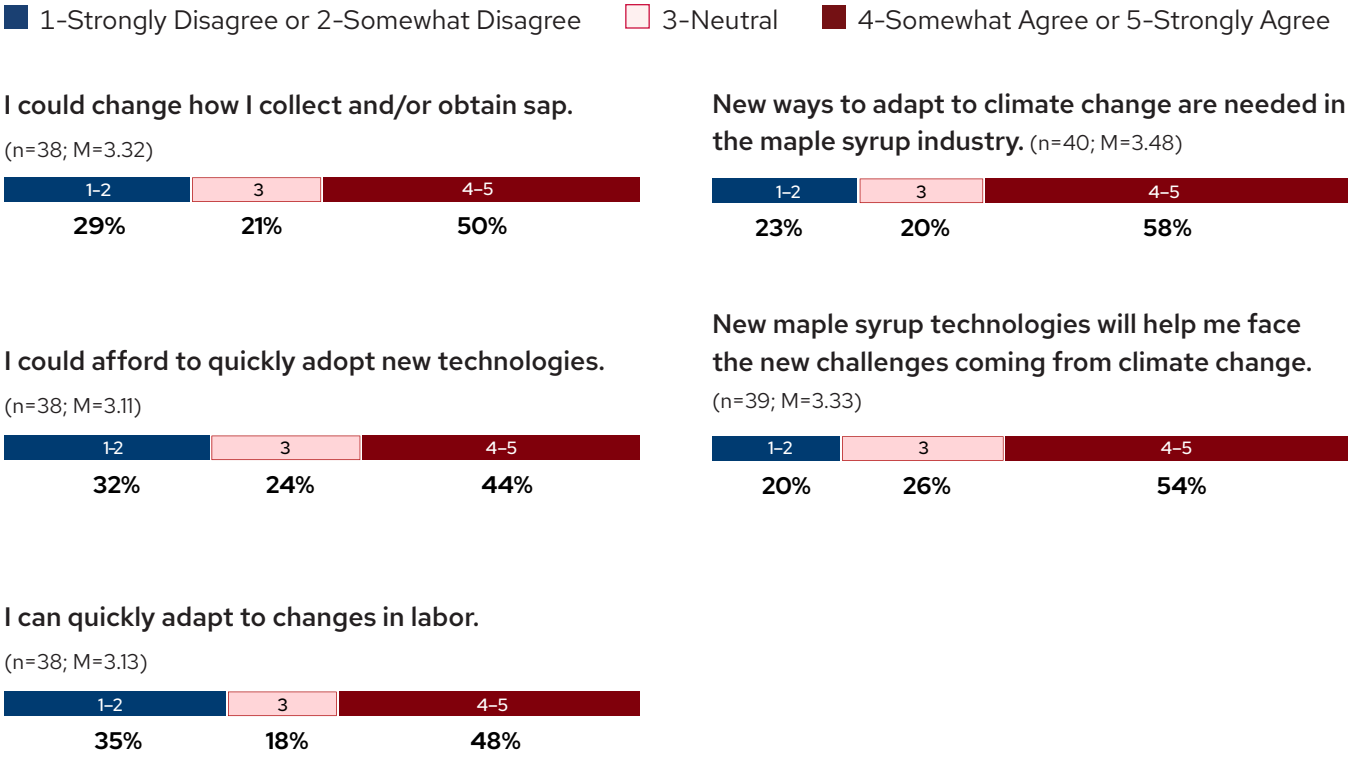


Further, respondents with Tribal affiliations are more prepared for climate change impact, as half of the respondents (49% compared to 12% of respondents in the main analysis) have undertaken actions or planned to undertake actions in the next 10 years specifically out of concern for climate conditions. Correspondingly, respondents with Tribal affiliations generally showed confidence in their ability to adapt in terms of collecting sap, adopting new technologies, and increasing workforce, as more respondents agree that they have the ability to adapt in response to climate change than the number of respondents who disagree or adopt a neutral position. More than half of respondents with Tribal affiliations somewhat or strongly agree that new technologies (54%) and new ways to adapt to climate change (58%) are important for advancement in the maple syrup industry (**Figure 23**, **Table A23**).

Figure 23

Percentage of respondents with Tribal affiliations by the extent to which they (dis)agree with statements about their ability to adapt to climate change.

Respondents rated the extent to which they agreed or disagreed with statements about how easily they would be able to adapt (if needed) to any potential impacts of a changing climate on their maple sugaring activities in the next 10 years on a scale of 1 (strongly disagree) to 5 (strongly agree), n=38–40.



Conclusion

This survey report is geared toward understanding Wisconsin maple syrup producers, particularly through identifying the motivations and barriers related to expanding their maple-sugaring activities.

Maple syrup producers in our sample are interested in increasing production quantity and adopting energy-efficient sugaring technology in the next five years. Correspondingly, producers are interested in learning about operating concentrating and cooking technology, collecting and handling sap efficiently, and using more efficient sugaring technologies such as reverse osmosis. In addition, commercial producers are generally interested in market expansion in the next five years, and they are interested in learning about topics that can help them expand, including marketing skills, product diversification, regulation rules, and climate change impacts. Both hobbyists and commercial producers are interested in managing forest health in the next five years and are interested in learning about forest health, even though they do not perceive forest health management as a barrier to expansion. In particular, maple syrup producers who are woodland owners are most interested in learning about unwanted insects or diseases.

In general, respondents are interested in learning about how climate change will impact their maple sugaring activities, though only about one-third of respondents agree climate change will affect their maple sugaring activities in the next 10 years—we note, however, that 10 years is a relatively short timeframe that may have affected responses. Respondents with Tribal affiliations are more certain about the impact of climate change, as compared to respondents in the general sample. Respondents with Tribal affiliations are also confident in their ability to adapt to potential climate change impacts, and they have undertaken or planned to take actions in the next 10 years specifically out of concern for climate conditions.

Respondents mostly rely on informal social interactions, such as equipment suppliers and other maple syrup producers, to gain and exchange knowledge to maintain and expand their knowledge on maple sugaring activities. Although top-down information acquisition such as advisory services from university Extension specialists or state and private foresters are not the main sources where respondents receive information on how to manage their sugarbush or maple sugaring activities, these information sources are highly trusted by respondents.

By showing the perspectives of maple syrup producers in the state, this report seeks to provide insights into expanding maple sugaring outreach and education efforts in Wisconsin. We hope our findings can help natural resource professionals and other stakeholders tailor educational programming and materials to better serve maple syrup producers in Wisconsin.

Acknowledgments

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We thank the advisory board and pilot testers for reviewing our survey and providing valuable insight and expertise that greatly assisted the research. We also thank the Wisconsin Maple Syrup Producers Association, Wisconsin Woodland Owners Association, Wisconsin Farmers Union, Wisconsin Tribal Conservation Advisory Council, Forest Data Network, Great Lakes Indian Fish and Wildlife Commission, UW-Stevens Point Forestry Center, Roth Sugarbush, Maple Hollow, Maple Dude, Smokey Lake, and Sippl's Sugarbush for administering the survey. Finally, we wish to thank numerous others who provided valuable insight into this initiative.

Appendix

Table A1

Sap collection equipment used.

Respondents answered a multiple-select question, *What types of sap collection equipment did you use in your sugaring operation in 2022 or the most recent season you tapped? Check all that apply*, n=575.

Collection Equipment Used	% Respondents
Sap sacks/bags	53%
Buckets	42%
Tubing—gravity	25%
Tubing—vacuum pump >18" Hg	13%
Tubing—vacuum pump ≤18" Hg	9%
Other	3%

Table A2

Sap/syrup processing equipment used.

Respondents answered a multiple-select question, *What types of sap or syrup processing equipment did you use in your sugaring operation in 2022 or the most recent season you tapped? Check all that apply*, n=512.

Processing Equipment Used	% Respondents
Hydrometer	77%
Evaporator	63%
Flat pan	54%
Reverse osmosis	39%
Pre-heater	38%
Filter press	33%
Automatic draw-off	20%
Air injection	6%
UV sanitizer	4%
Other	9%

Table A3

Ways producers sell for income.

Respondents who sell their maple syrup products for income (n=269) answered a multiple-select question, *What is the primary way that you sell your maple syrup products? Check all that apply,* n=269.

Income Source	% Respondents
Selling to friends and neighbors	76%
Bulk to other maple syrup producers	31%
Local farmers' markets	26%
Grocery and other stores	22%
Online website	21%
Restaurants	15%
Shows, events, and fairs	15%
Distributors	9%
Community-supported agriculture	7%
Cooperatives	6%
Other	6%

Table A4

Percentage of respondents by extent of motivations for engaging in maple sugaring activities.

Respondents rated the extent to which each reason motivates them to engage in maple sugaring activities on a scale of 1 (not at all) to 5 (extremely), n=651–657.

	1- Not at all	2- Slightly	3- Moderately	4- Very	5- Extremely	Mean Response
Nature	1%	5%	19%	41%	33%	4.01
Family	11%	12%	20%	31%	25%	3.48
Physicality	6%	12%	32%	33%	17%	3.43
Culture	26%	21%	26%	19%	8%	2.62
Finances	56%	19%	14%	7%	4%	1.85

Table A5

Percentage of respondents by the extent to which they (dis)agree with statements about their experience in maple sugaring activities.

Respondents rated the extent to which they agreed or disagreed with statements about their experience in maple sugaring activities and sugaring management on a scale of 1 (strongly disagree) to 5 (strongly agree), n=553–559.

	1- Strongly disagree	2- Somewhat disagree	3- Neutral	4- Somewhat agree	5- Strongly agree	Mean Response
I enjoy learning about new ideas and methods related to maple syrup operation.	2%	3%	14%	47%	34%	4.09
I try out new ideas and methods related to maple syrup operation.	4%	9%	19%	47%	20%	3.71
I implement innovations related to maple syrup operation even if it involves risk.	12%	13%	30%	32%	13%	3.20
I learn about maple syrup operation and production mainly to increase profitability.	31%	13%	24%	22%	10%	2.67
I operate maple sugaring activities because most of the people in my community do it.	42%	19%	25%	11%	3%	2.15
I operate maple sugaring activities because of family pressure.	61%	10%	15%	10%	3%	1.83

Table A6

Percentage of respondents by extent to which they are interested in doing various activities.

Respondents rated the extent to which they are interested in doing each maple sugaring activities in the next five years on a scale of 1 (not at all) to 5 (extremely), n=519–561.

Activity	1- Not at all	2- Slightly	3- Moderately	4- Very	5- Extremely	Mean Response
Forest health management	13%	18%	30%	26%	13%	3.10
Increasing production quantity	18%	19%	23%	23%	17%	3.02
Adopting energy-efficient sugaring technology	24%	15%	24%	22%	16%	2.92
Increasing efficiency of collecting and handling sap	23%	18%	20%	24%	15%	2.90
Replacing oil with renewable energy	49%	8%	16%	13%	13%	2.32
Market expansion	47%	13%	18%	11%	11%	2.25
Product diversification	45%	15%	19%	13%	8%	2.24
Increasing workforce	47%	19%	20%	10%	4%	2.03

Table A7

Comparison between commercial producers and hobbyists: Mean extent to which respondents are interested in doing various activities.

Respondents rated the extent to which they are interested in doing each maple sugaring activity in the next five years on a scale of 1 (not at all) to 5 (extremely). For commercial producers n=246–265; for hobbyists, n=273–296.

Activity	Commercial Producers	Hobbyists
Replacing oil with renewable energy	2.40	2.26
Forest health management	3.20	3.01
Adopting energy efficient sugaring technology	3.26	2.62
Increasing workforce	2.40	1.71
Increasing efficiency of collecting and handling sap	3.29	2.56
Increasing production quantity	3.43	2.66
Product diversification	2.79	1.75
Market expansion	3.06	1.51

Table A8

Comparison between commercial producers and hobbyists: Percentage of respondents who perceived various aspects as barriers to expanding their maple sugaring activities.

Respondents answered a multiple-select question, *Thinking about your ability in doing maple sugaring activities and knowledge on forest management, technology, and regulations, which of the following aspects are barriers to expanding your production capacity? Check all that apply*. For commercial producers, n=271; for hobbyists, n=295.

Perceived Barrier	Commercial Producers	Hobbyists
Workforce availability	46%	35%
Lack of time	43%	49%
Collecting and handling sap efficiently	41%	51%
Capital to upgrade or purchase equipment	40%	30%
Access to land/trees	36%	30%
Meeting Wisconsin DATCP regulations	22%	6%
Operating concentrating and cooking technology	21%	32%
Forest health management	9%	7%
Other	10%	13%

Table A9

Percentage of respondents who have received information on sugarbush management from various sources.

Respondents were asked *To what extent do you trust the following foresters, government employees, or researchers as sources of information on how to manage your sugarbush and/or maple sugaring activities?* and T*o what extent do you trust the following government departments, other producers, or suppliers as sources of information on how to manage your sugarbush and/or maple sugaring activities?* on a scale from "I have never received information from this source" to "Extremely." Data includes the percentage of respondents who chose any answer except "I have never received information from this source," n=573–588.

Information Source	% Respondents
Equipment dealers and suppliers	84%
Landowners/producers on the internet	80%
Landowners/producers in the local community	79%
Large producers	69%
WMSPA	65%
Wisconsin DNR	60%
Private foresters	59%
State foresters	54%
University and Extension specialists	54%
County foresters	51%
Wisconsin DATCP	51%
USFS	47%
NRCS	46%
State government employees	44%
County land conservation department employees	43%
Local government employees	40%
Federal government employees	37%
Tribal government employees	28%
Tribal foresters	28%

Table A10

Percentage of respondents by the extent to which they trust various information sources.

Respondents rated the extent to which they trust each source of information on sugarbush management and/or maple sugaring activities on a scale of 1 (not at all) to 5 (extremely), n=161–488.

	1- Not at all	2- Slightly	3- Moderately	4- Very	5- Extremely	Mean Response
WMSPA	2%	7%	27%	45%	19%	3.72
University and Extension specialists	6%	13%	31%	31%	18%	3.42
Landowners/producers in the local community	2%	15%	37%	35%	10%	3.36
State foresters	9%	13%	32%	37%	9%	3.25
Equipment dealers and suppliers	3%	16%	44%	31%	7%	3.22
Wisconsin DNR	9%	17%	32%	35%	7%	3.16
County foresters	10%	16%	31%	37%	7%	3.15
Private foresters	7%	18%	34%	35%	6%	3.14
Large producers	5%	20%	40%	29%	6%	3.09
NRCS	9%	19%	38%	26%	7%	3.04
County land conservation department employees	12%	18%	33%	31%	6%	2.98
USFS	12%	20%	35%	28%	5%	2.96
Tribal foresters	20%	18%	22%	29%	12%	2.94
Wisconsin DATCP	11%	17%	44%	24%	3%	2.92
Landowners/producers on the internet	8%	28%	40%	20%	4%	2.85
State government employees	19%	23%	31%	23%	6%	2.74
Federal government employees	25%	18%	27%	22%	8%	2.70
Tribal government employees	22%	21%	34%	16%	7%	2.65
Local government employees	18%	27%	34%	16%	4%	2.61

Table A11

Percentage of respondents by type of communication channels from which they prefer to receive information about maple sugaring activities.

Respondents answered a multiple-select question, *How do you prefer to get information or advice that affects your maple sugaring activities or sugarbush management? Check all that apply*. n=590.

Communication Channel	% Respondents
Written materials	64%
Email or e-newsletter	62%
Browsing websites	57%
In-person land visit	44%
Joining groups on social media	40%
Educational workshops	37%
Conferences	25%
Talk on the phone	22%
Other	4%

Table A12

Percentage of respondents with Tribal affiliations who have received information on sugarbush management from various sources.

Respondents were asked *To what extent do you trust the following foresters, government employees, or researchers as sources of information on how to manage your sugarbush and/or maple sugaring activities?* and *To what extent do you trust the following government departments, other producers, or suppliers as sources of information on how to manage your sugarbush and/or maple sugaring activities?* on a scale from "I have never received information from this source" to "Extremely." Data includes the percentage of respondents who chose any answer except "I have never received information from this source," n=39–40.

Information Source	% Respondents
Equipment dealers and suppliers	95%
Landowners/producers in the local community	90%
Landowners/producers on the internet	87%
WMSPA	87%
Large producers	85%
Wisconsin DNR	85%
University and Extension specialists	85%
State government employees	85%
Local government employees	85%
County land conservation department employees	85%
County foresters	85%
State foresters	85%
Private foresters	85%
NRCS	84%
Wisconsin DATCP	82%
USFS	82%
Tribal government employees	82%
Federal government employees	79%
Tribal foresters	79%

Table A13

Percentage of respondents with Tribal affiliations by the extent to which they trust various information sources.

Respondents rated the extent to which they trust each source of information from which they learn about how to manage their sugarbush and/or maple sugaring activities on a scale of 1 (not at all) to 5 (extremely), n=31–37.

	1- Not at all	2- Slightly	3- Moderately	4- Very	5- Extremely	Mean Response
WMSPA	0%	18%	24%	38%	21%	3.62
University and Extension specialists	6%	15%	27%	30%	21%	3.45
Landowners/producers in the local community	3%	17%	39%	33%	8%	3.28
NRCS	6%	16%	31%	41%	6%	3.25
Wisconsin DNR	3%	18%	39%	30%	9%	3.24
Tribal government employees	3%	16%	50%	22%	9%	3.19
Tribal foresters	6%	26%	26%	29%	13%	3.16
County land conservation department employees	9%	21%	27%	33%	9%	3.12
State foresters	9%	15%	42%	21%	12%	3.12
County foresters	6%	18%	45%	21%	9%	3.09
Landowners/producers on the internet	6%	24%	32%	32%	6%	3.09
Federal government employees	16%	23%	16%	32%	13%	3.03
Large producers	6%	27%	33%	24%	9%	3.03
Local government employees	15%	15%	36%	21%	12%	3.00
State government employees	9%	24%	36%	21%	9%	2.97
Equipment dealers and suppliers	8%	22%	41%	27%	3%	2.95
USFS	16%	22%	31%	19%	13%	2.91
Private foresters	9%	24%	44%	21%	3%	2.85
Wisconsin DATCP	19	13	44	19	6	2.81

Table A14

Percentage of respondents by type of advisor from whom they received advice about sugarbush management.

Respondents were asked to recall who the advisor was the last time they received advice about the care, management, or protection of their sugarbush (n=584). Percentages were calculated with respect to the total number of respondents who could recall their advice receiving experience (n=382). Respondents who could not recall (n=28) or have never received advice (n=174) were excluded from the calculation.

Type of Advisor	% Respondents
Landowners/producers in the local community	20%
Equipment dealers and suppliers	15%
Private foresters	13%
State foresters	10%
Landowners/producers on the internet	9%
County foresters	8%
University and Extension specialists	4%
Large producers	4%
Tribal foresters	3%
Local government employees	2%
State government employees	2%
Federal government employees	1%
County land conservation department employees	1%
Tribal government employees	0.5%
Other	6%

Table A15

Percentage of respondents by the extent to which they (dis)agreed with statements about their experience receiving advice.

Respondents rated the extent to which they agreed or disagreed with statements about their last experience in receiving advice about the care, management, or protection of their sugarbush on a scale of 1 (strongly disagree) to 5 (strongly agree), n=358–365.

	1- Not at all	2- Slightly	3- Moderately	4- Very	5- Extremely	Mean Response
The advisor was knowledgeable.	1%	3%	23%	38%	36%	4.07
The advisor was confident.	1%	1%	24%	40%	34%	4.05
The advisor was trustworthy.	1%	2%	24%	36%	36%	4.05
The advice was helpful.	1%	3%	23%	43%	30%	3.98
The advisor was capable.	2%	3%	24%	39%	34%	3.96
The advice was useful.	1%	4%	22%	43%	30%	3.95
I intended to use the advice.	1%	4%	26%	41%	28%	3.91
The advice was high quality.	1%	5%	27%	39%	27%	3.85
I utilized the advice.	1%	5%	29%	39%	26%	3.83
The advisor's values regarding forest management were similar to mine.	2%	4%	33%	26%	25%	3.79
The advisor was interested in my maple syrup production experience and stories.	3%	4%	33%	33%	27%	3.78

Table A16

Percentage of respondents by the extent to which they are confident about their knowledge on sugarbush management topics.

Respondents who are woodland owners (n=595) were asked to rate the extent to which they are confident about various aspects of their knowledge on sugarbush management on a scale of 1 (not at all) to 5 (extremely), n=528–545.

	1- Not at all	2- Slightly	3- Moderately	4- Very	5- Extremely	Mean Response
Tree and plant identification	2%	10%	29%	42%	18%	3.64
Trail construction or maintenance	10%	15%	34%	31%	9%	3.15
Road construction or maintenance	17%	17%	32%	25%	8%	2.90
Impacts of climate change	18%	21%	35%	18%	8%	2.76
Invasive plants	18%	25%	31%	18%	8%	2.73
Sustainable silvicultural management	13%	18%	38%	24%	7%	2.95
Unwanted insects or diseases	26%	27%	31%	13%	4%	2.42

Table A17

Percentage of respondents by the extent to which they are interested in learning about sugarbush management topics.

Respondents who are woodland owners (n=595) were asked to rate the extent to which they are interested in learning about various topics about sugarbush management on a scale of 1 (not at all) to 5 (extremely), n=527–537.

	1- Not at all	2- Slightly	3- Moderately	4- Very	5- Extremely	Mean Response
Unwanted insects or diseases	4%	16%	32%	36%	11%	3.33
Invasive plants	7%	17%	34%	32%	11%	3.23
Impacts of climate change	22%	21%	26%	20%	11%	2.76
Sustainable silvicultural management	8%	19%	33%	32%	9%	3.14
Tree and plant identification	12%	24%	29%	28%	8%	2.95
Trail construction or maintenance	19%	26%	30%	19%	6%	2.66
Road construction or maintenance	30%	26%	23%	17%	4%	2.39

Table A18

Percentage of respondents by the extent to which they are interested in learning about various maple sugaring topics.

Respondents rated the extent to which they are interested in learning about various topics about maple sugaring activities on a scale of 1 (not at all) to 5 (extremely), n=536–560.

	1- Not at all	2- Slightly	3- Moderately	4- Very	5- Extremely	Mean Response
Operating concentrating and cooking technology	14	18	28	27	12	3.05
Forest health management	12	24	30	22	13	3.01
Collecting and handling sap efficiently	20	18	26	25	11	2.89
Using more efficient sugaring technologies	26	16	24	20	14	2.80
Climate change impact	30	21	23	16	10	2.56
DATCP regulations	38	18	24	13	7	2.34
Product diversification	44	15	16	17	8	2.30
Marketing skills	51	13	15	14	7	2.13
Replacing oil with renewable energy	54	12	15	10	9	2.08
Financing	50	18	18	8	5	2.01
Training and workforce management	57	16	13	9	5	1.87

Table A19

Comparison between commercial producers and hobbyists: Mean extent to which respondents are interested in learning about maple sugaring activities.

Respondents rated the extent to which they are interested in learning about each maple sugaring activity in the next five years on a scale of 1 (not at all) to 5 (extremely). For commercial producers, n=252–263; for hobbyists, n=263–297.

Activity	Commercial Producers	Hobbyists
Forest health management	3.11	2.92
Replacing oil with renewable energy	2.19	1.99
Climate change impact	2.69	2.45
Operating concentrating and cooking technology	3.22	2.90
Using more efficient sugaring technologies	3.05	2.58
Collecting and handling sap efficiently	3.14	2.66
Training and workforce management	2.31	1.49
Financing	2.45	1.63
DATCP regulations	2.85	1.89
Product diversification	2.83	1.84
Marketing skills	2.89	1.48

Table A20

Percentage of respondents by perceptions of climate change impacts.

Respondents answered a single-choice question, *Do you think a changing climate will affect your maple sugaring activities in regard to each of the following aspect in the next 10 years?*, n=546–560.

	Yes, negatively	Unsure	No	Yes, positively
Prevalence of invasive species	46%	30%	19%	5%
Timing of sugaring season	45%	29%	17%	9%
Tree health	34%	33%	24%	9%
Sap production per tap	30%	41%	19%	11%
Profitability	21%	37%	32%	11%

Table A21

Percentage of respondents by the extent to which they (dis)agree with statements about their ability to adapt to climate change.

Respondents rated the extent to which they agreed or disagreed with statements about how easily they would be able to adapt (if needed) to any potential impacts of a changing climate on their maple sugaring activities in the next 10 years on a scale of 1 (strongly disagree) to 5 (strongly agree), n=537–539.

	1- Not at all	2- Slightly	3- Moderately	4- Very	5- Extremely	Mean Response
New ways to adapt to climate change are needed in the maple syrup industry.	11%	7%	44%	29%	9%	3.20
New maple syrup technologies will help me face the new challenges coming from climate change.	11%	10%	47%	28%	4%	3.04
I could afford to quickly adopt new technologies.	17%	19%	35%	25%	4%	2.79
I could quickly change how I collect and/or obtain sap.	19%	24%	29%	23%	6%	2.74
I can quickly adapt to changes in labor.	20%	15%	44%	16%	5%	2.72

Table A22

Percentage of respondents with Tribal affiliations by perceptions of climate change impacts.

Respondents answered a single-choice question, *Do you think a changing climate will affect your maple sugaring activities in regard to each of the following aspects in the next 10 years?*, n=38–41.

	Yes, negatively	Unsure	No	Yes, positively
Prevalence of invasive species	53%	11%	13%	24%
Sap production per tap	46%	10%	13%	31%
Timing of sugaring season	41%	23%	13%	23%
Tree health	32%	22%	10%	37%
Profitability	31%	26%	15%	28%

Table A23

Percentage of respondents with Tribal affiliations by the extent to which they (dis)agree with statements about their ability to adapt to climate change.

Respondents rated the extent to which they agreed or disagreed with statements about how easily they would be able to adapt (if needed) to any potential impacts of a changing climate on their maple sugaring activities in the next 10 years on a scale of 1 (strongly disagree) to 5 (strongly agree), n=38–40.

	1- Not at all	2- Slightly	3- Moderately	4- Very	5- Extremely	Mean Response
I could quickly change how I collect and/or obtain sap.	13%	16%	21%	26%	24%	3.32
I could afford to quickly adopt new technologies.	8%	24%	24%	39%	5%	3.11
I can quickly adapt to changes in labor.	11%	24%	18%	37%	11%	3.13
New ways to adapt to climate change are needed in the maple syrup industry.	10%	13%	20%	35%	23%	3.48
New maple syrup technologies will help me face the new challenges coming from climate change.	10%	10%	26%	44%	10%	3.33

References

1 National Agricultural Statistics Service. (2023). Wisconsin Ag News – Maple Syrup. United States Department of Agriculture. https://www.nass.usda.gov/Statistics_by_State/Wisconsin/Publications/Crops/2023/WI-Maple-Syrup-06-23.pdf

2 Farrell, M. L. (2013). Estimating the maple syrup production potential of American forests: An enhanced estimate that accounts for density and accessibility of tappable maple trees. Agroforestry Systems, 87(3), 631–641. https://doi.org/10.1007/s10457-012-9584-7

3 Chang, C.-T., Gorby, T. A., Shaw, B. R., Solin, J., Robinson, P., Tiles, K., & Cook, C. (2023). Influence of learner characteristics on optimal knowledge acquisition among Wisconsin maple syrup producers. The Journal of Agricultural Education and Extension, 1–23. https://doi.org/10.1080/1389224X.2023.2254286

4 Chang, C.-T., Shaw, B. R., Solin, J., Gorby, T. A., & Robinson, P. (2023). Influence of Forester Traits and Advising Approaches on Landowners' Intention to Follow Recommendations About Maple Sugarbush Management among Sap Producers in Wisconsin. Journal of Forestry, fvad027. https://doi.org/10.1093/jofore/fvad027

5 Hershberger, S., Shaw, B., Gorby, T. A., Solin, J., Robinson, P., Tiles, K., Cook, C., & Chang, C.-T. (2023). Comparing Motivations, Learning Interests, and Barriers to Expansion Among Non-commercial and Commercial Maple Syrup Producers in Wisconsin. Small-Scale Forestry, 23, 127–157. https://doi.org/10.1007/s11842-023-09557-9.

6 Butler, B. J., Butler, S. M., Caputo, J., Dias, J., Robillard, A., Sass, E. M. (2021). Family Forest Ownerships of the United States, 2018: Results from the USDA Forest Service, National Woodland Owner Survey (NRS-199, General Technical Reports). U.S. Department of Agriculture, Forest Service, Northern Research Station. https://doi.org/10.2737/NRS-GTR-199.

7 Legault, S., Houle, D., Plouffe, A., Ameztegui, A., Kuehn, D., Chase, L., Blondlot, A., & Perkins, T. D. (2019). Perceptions of U.S. and Canadian maple syrup producers toward climate change, its impacts, and potential adaptation measures. PLOS ONE, 14(4), e0215511. https://doi.org/10.1371/journal.pone.0215511.

8 Snyder, S. A., Kilgore, M. A., Emery, M. R., & Schmitz, M. (2018). A Profile of Lake States Maple Syrup Producers and Their Attitudes and Responses to Economic, Social, Ecological and Climate Challenges (248; Staff Paper Series). Department of Forest Resources, University of Minnesota. https://www.fs.usda.gov/research/treesearch/55904.

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