



## Transportation and Marketing Acer Access and Development Program

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### *Fiscal Year 2022*

### *Description of Funded Projects*

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**Number of Grants Awarded:** 12

**Amount of Funds Awarded:** \$5,873,175.06

For more information, please visit the grant program's website: <https://www.ams.usda.gov/acer>

**NOTE:** The below project descriptions were provided by the grant recipients.

## Illinois

**Recipient:** Northwestern University  
Chicago, IL

**Project Type:** Producer and Landowner Education

**Award Amount:** \$499,990.00

### ***Increasing Production Capacity, Metabolomic Understanding, and Knowledge of Cancer Survivor Consumer Attitudes of Maple-Based Products for Health Promotion***

This producer/landowner education-focused project will leverage multiple, long-standing university/community-based partnerships to 1) expand maple-sugaring activities at a national, nature-based cancer support nonprofit; 2) increase metabolomic understanding of sap chemical composition variation related to sap harvest timing and geographic region; and 3) advance producer knowledge of cancer survivor consumer attitudes and perceptions of using sap-related products for hydration and health promotion purposes. This proposed project involves a multidisciplinary scientific team of maple/forestry research experts from Michigan State University (MSU), food science chemists from the Illinois Institute of Technology (IIT), cancer survivorship outcomes researchers from Northwestern University (NU), and young adult cancer support non-profit partners from True North Treks (TNT). In partnership with MSU, Year 1 activities will focus on the expansion of existing maple-sugaring activities and infrastructure supports at TNT's nature retreat facility on 127 acres of forestland in the Upper Peninsula of Michigan. In partnership with IIT, Year 2 activities will focus on metabolomic analyses to understand sap nutrient composition unique to this geographical region (UP) and potential changes related to harvest timing. Finally, in partnership with NU, Year 3 activities will focus on engaging TNT's young adult cancer survivor constituents from across the United States regarding their attitudes, perceptions, taste preferences, and opinions about using sap-related products for health promotion purposes. This multi-level, stakeholder-centered initiative holds great promise to advance our understanding and knowledge of regional/seasonal influences on sap nutrient composition and novel applications of sap-related products for health-conscious consumers, such as young adult cancer survivors.

## Michigan

**Recipient:** Regents of the University of Michigan  
Ann Harbor, MI  
**Project Type:** Producer and Landowner Education  
**Award Amount:** \$500,000.00

### ***Life Cycle Carbon Footprint Analysis and Improvement Strategies for US Maple Syrup Production***

Maple syrup producers can influence greenhouse gas (GHG) emissions associated with production practices. University of Michigan (U-M) will conduct a Life Cycle Assessment (LCA) of maple syrup production, focusing on energy and GHG impacts. They partnered with the North American Maple Syrup Council to recruit producers and inventory their operations over two production seasons, estimating energy use and GHG emissions associated with their production systems. Variables considered include method of sap collection, processing technology, and fuels. These estimates will be used to develop an online calculator for any producer to determine the GHG emissions per gallon of syrup they produce. Inventory of a third production season will evaluate the effects of altered practices. U-M will also explore the carbon storage and sequestration potential in maple forests, including opportunities to increase this potential. The calculator will help any producer understand the impact that changes in production practices will have on GHG emissions and will highlight opportunities for reducing this impact. Producers will be able to lower fuel costs, increase their profitability, and move the maple industry to be more climate conscious. U-M will present this work at the NAMSC Annual Meeting and to state maple associations, as well as in academic and maple syrup trade journals. The audience for this work is all maple syrup producers, who will benefit by using the GHG calculator to understand where to make process changes to reduce their emissions, fuel use, and costs.

## Montana

**Recipient:** Montana State University  
Bozeman, MO  
**Project Type:** Producer and Landowner Education  
**Award Amount:** \$449,283.00

### ***Smart Farming to Improve Maple Syrup Quality Control and Cleaning Procedures***

A team comprised of engineers and microbiologists from Montana State University (Center for Biofilm Engineering), and academic foresters with outreach expertise from Michigan State University (Forestry Innovation Center (sub-awardee)) was assembled to improve producer knowledge, awareness, and understanding of the importance of sensors for maple syrup quality-control throughout harvesting since forming biofilms in sap lines reduces the economic syrup value. A state-of-the-art sensor network will be integrated into sap lines to continuously measure biofilm growth, planktonic biomass, temperature, and microbial-specific concentrations, allowing producers to accurately track sap quality in real-time and make management decisions on sanitation practices to maintain/improve returns in the high-end confectionery marketplace. Multiple sensor nodes in sap lines will be enabled with the Internet of Things compatible electronics that communicate with a field station and allows stakeholders to improve cleaning and disinfection procedures to reduce biofilm load in the sap line network. This smart farming approach for maple syrup harvesting and cleaning can improve production efficiency and establish an in-situ quality control system. The objectives are to establish a multi-sensor platform in sap lines; assess Internet of things (IoT) concepts for maple forests; investigate biomass and biofilm growth in sap lines; develop a decision algorithm that informs about best disinfection practices using the developed sensor network; and interact with and educate producers and university maple specialists on sensor technology advantages in maple syrup production.

# New Hampshire

**Recipient:** NH Department of Business and Economic Affairs  
Concord, NH

**Project Type:** Market Development and Promotion

**Award Amount:** \$388,080.00

## ***Beyond Pancake's Best Friend: A Market Development Program to Highlight New Hampshire Maple's Many Uses to Expand Sales and Production***

New Hampshire Department of Business and Economic Affairs (BEA) will develop a marketing strategy to promote maple syrup/sap products, support producers year-round and promote sustainability in production, and adapt to climate change. Funding will advertise the uses of maple as a minimally refined ingredient that can be used in everyday recipes in the United States and around the world. Once the strategy is developed, BEA will encourage and support maple producers in attending domestic and international trade events, identified after market research, and incorporate the marketing strategy into their business promotion plans. BEA will partner with the New Hampshire Maple Producers Association (NHMPA), a non-profit trade association dedicated to promoting the high quality of New Hampshire's maple tradition. BEA anticipates this award will benefit consumers around the world by promoting New Hampshire maple production, including best practices for sustainability, while directly assisting more than 350 producers with increased sales and increased production to meet the demand for high-quality maple syrup/maple sap products. The Office of International Commerce (OIC) will lead this project for BEA, with a focus on expanding New Hampshire's exports of maple products. This will build on a successful 2021, where New Hampshire was the #1 exporter of maple syrup and maple sugar in the United States.

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**Recipient:** University of New Hampshire  
Durham, NH

**Project Type:** Producer and Landowner Education

**Award Amount:** \$487,245.00

## ***How Does Non-Conductive Wood Formation Relate to Sap and Sugar Yields Across Five Maple Species?***

Trees vary widely in both sap yield and sugar concentrations for reasons that are not well understood. Compartmentalization of taphole wounds is critical to long-term tree health. University of New Hampshire (UNH) hypothesizes that trees yielding more sap are less effective at taphole wound compartmentalization because wood traits conducive to high flows do not allow efficient compartmentalization, while trees with greater sugar concentrations are more efficient at compartmentalization because the process requires carbohydrates. A better understanding of these relationships would inform the selection of trees for breeding and planting. Nonconductive wood column (NWC) formation is under-studied in species other than sugar maple, so we will study four maple species in addition to sugar maple, to generate evidence-based tapping guidance for these under-utilized species. UNH will also validate the use of a non-destructive tomographic approach to measuring sapwood depth and nonconductive wood development, which if successful would greatly expand options for future studies. We will partner with Extension, NAMSC, and state producer associations to communicate findings with producers using a variety of formats, including talks, workshops, and various publication formats. Short-term benefits to producers will include improved tapping guidelines for red maple, silver maple, Norway maple, and boxelder. Longer-term benefits will derive from a better understanding of the tradeoffs between sap and sugar yield vs nonconductive wood formation for selecting improved trees and from a validated non-destructive method to study NWC and heartwood formation. Anticipated outcomes include greater, more sustainable, and optimized utilization of several maple species across a wide geographic range.

## New York

**Recipient:** Cornell University  
Ithaca, NY  
**Project Type:** Producer and Landowner Education  
**Award Amount:** \$499,549.00

***Improving The Resilience of The Maple Industry in A Warming Climate Through Revised Sap Harvesting Practices and Increased Understanding of Sensory Characteristics and Consumer Preferences for Late Season Syrup Flavor Defects***

Climate change poses a significant threat to the continued health of the maple products industry. This proposal addresses two challenges to production and profitability created by warmer weather conditions associated with climate change: the development of off-flavors which decrease crop, and diminished sap production due to spoilage in the sap collection system. This project will identify sensory signatures of consumer liking in maple syrup, quantify the drop in perceived value arising from sap collected late in the season when sensory defects are more prevalent, and provide maple farmers with strategies to preserve sap quality and maximize taphole productivity in a warming climate through collection system design, maintenance, and sap management.

## Oklahoma

**Recipient:** Oklahoma State University  
Stillwater, OK  
**Project Type:** Market Development and Promotion  
**Award Amount:** \$499,965.00

***Exploring The Potential of Alternative Maple Species for Syrup Production***

Supported by tribal entities, state, and U.S. Forestry Service, Oklahoma State University (OSU) will examine the syrup production potential of five maple species: sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), boxelder (*Acer negundo*), and Florida maple (*Acer barbatum*). An Extension program will be provided to current and potential maple producers with training through workshops, demonstration areas, and multi-state horticultural shows seeking to build a robust producer network. Tribes in eastern Oklahoma have a history of collecting maple sap, but the local maple syrup has a limited presence in the commercial market. OSU preliminary data in Spring 2022 further proved the climate in Oklahoma is suitable for maple sap collection. However, the information of optimized tapping time, tree size, volume collected from each species, and proper collecting method need to be established for local producers. Forest maple trees in three vicinities in or near Idabel (south-east), Talihina (mid-east), and Quapaw (north-east) will be used as experimental fields. The research will focus on two objectives: 1. to determine the sap production potential of the five maple species in Oklahoma based on geographic location, method of sap collection, and tree species and size. 2. to educate potential maple syrup producers and landowners who wish to use their woodlots for maple syrup production. The success of the project will bring additional income and diversity to local farming and forestry operations in Oklahoma and adjacent states with a similar climate.

## Oregon

**Recipient:** Oregon State University  
Corvallis, OR  
**Project Type:** Market Development and Promotion  
**Award Amount:** \$499,837.00

***Consumer Awareness and Education of Bigleaf Maple Sap-based Foods: Sensory and Nutritional Qualities, Culinary Uses, and Product Safety***

This market development and promotion project focuses on research to build consumer awareness and confidence for bigleaf sap-based foods through research and education on sensory and nutritional qualities, increasing culinary awareness and use, and best practices for creating food safe products for markets and consumer confidence. This project fills significant

gaps in knowledge that are impeding the growth of commercial bigleaf maple food industries. The project includes 1) Multiple large-scale sensory consumer tests of bigleaf maple syrup; 2) Promoting bigleaf maple syrup, water, and fermented products through trade show exhibiting, public festivals and culinary professional collaborations; 3) Publication of a culinary guide in collaboration with specialty food chefs; 4) Testing of a broad sample of bigleaf maple syrups, waters, and other sap-based products for nutrient profiles and soil nutrient relationships; and 5) The creation of food safety guides and training courses. The results of the project will be disseminated widely to commercial producers of bigleaf foods, private and public marketing specialists, culinary professionals including chefs and food processors, state food safety regulators, and the general public through a wide range of publications and outreach materials. The project will benefit producers, researchers, development agencies, and consumers alike.

## Rhode Island

**Recipient:** University of Rhode Island  
Kingston, RI

**Project Type:** Market Development and Promotion

**Award Amount:** \$499,999.00

### ***Maple Syrup as a Functional, Hero Ingredient: Leveraging Culinary Nutrition, Food Science Innovation, and Chemistry Insights to Increase Maple Syrup Consumption***

Most published cookbooks on maple syrup focus on its savory and sweetener properties. Consumers are seeking 'better-for-you' foods and the creation of recipes and products that capitalize on maple syrup's health-promoting properties has immense market opportunity. This collaborative project between the University of Rhode Island (URI) and Johnson and Wales University (JWU) will: 1) Create and design guidelines for recipe and product development focusing on maple syrup's health-promoting properties based on targeted food pairings for synergistic biological effects; 2) Develop, refine, and validate a range of innovative, accessible, delicious recipes and products that feature maple syrup as a 'hero ingredient' with food pairings and formulations that target both home cooks/consumers and industry professionals; 3) Create webinars, podcasts, and symposia (live-streamed and recorded) focused on maple syrup's culinary versatility and health-promoting properties, featuring product demonstrations, sensory panels, tastings, and expert science/culinary nutrition/food science/culinary presentations; and 4) Capture the insights, recipes, and demonstration contents in publications and websites with accompanying social media and consumer network, including JWU's alumni network, many of whom are powerful influencers in the food and hospitality industries. Ultimately, by building out maple syrup's evidence base, showcasing its 'untapped' potential, demonstrating its innovative and expanded applications, and disseminating this rich content to experts, influencers, and the general public, this project will raise maple syrup's profile, stimulate curiosity, and generate visibility globally. It will increase maple syrup utilization as a 'functional food ingredient' through the application of recipes highlighting its functionality and health-promoting benefits, spurring increased awareness, demand, and sales.

## Utah

**Recipient:** Utah State University  
Logan, UT

**Project Type:** Producer and Landowner Education

**Award Amount:** \$499,639.06

### ***Developing a Maple Syrup Industry for the Interior West Through Extension and Research (Phase II: Expansion)***

Increasingly, consumers demand locally sourced agricultural foodstuffs and are willing to pay premium prices for unique products. In the United States (U.S.) maple syrup is such a product, with an annual total value of \$131.73 million in 2020. However, maple syrup production timing and yield vary widely among years and regions and depend heavily on climatic conditions. Expanding maple syrup production to western states could help supply the ever-increasing demand for syrup in the U.S. and could also provide additional income for landowners in locations where maple resources have not traditionally been developed. Bigtooth maple (*Acer grandidentatum*) and boxelder maple (*Acer negundo*) are native to the Intermountain West and other non-native maple species are common in the urban and suburban areas of the region. However, very little research has assessed the potential of these species for syrup production, which is greatly needed to advance this fledgling industry. The objectives of this proposal are to expand current efforts: 1) to educate landowners and homeowners in Idaho, Utah, and Wyoming on maple sap collection and syrup production through targeted Extension

programs and to develop an annual Maple Festival for the region; and 2) to determine sap yields using traditional buckets/bags and natural gravity-based 3/16" tubing systems for tapping bigtooth maple, boxelder maple, and other maples in Idaho, Utah, and Wyoming. The overall goal is to spark the development of a robust maple syrup industry in the Intermountain West.

## Vermont

**Recipient:** University of Vermont and State Agricultural  
Burlington, VT  
**Project Type:** Producer and Landowner Education  
**Award Amount:** \$499,588.00

### ***Increasing Crop Value and Income of U.S. Maple Producers Through Education and Research on Practices to Increase the Production of Maple Syrup with Grade A Flavor***

The high economic value of maple syrup is derived primarily from its unique and desirable flavors. However, between 5 to 10% of producers' annual crops do not meet the flavor standard for Grade A maple syrup, resulting in significant economic losses from 50 to 100% loss of syrup value. Most of this is the result of the production of syrup with preventable off-flavors. However, there are numerous known practices to prevent these flavor defects and direct production towards more desirable flavors. Thus, there is a critical need to educate producers throughout the maple-producing areas of the U.S. about existing practices to prevent the production of off-flavored syrup and promote the production of syrup with desirable flavors. This project will conduct the research and education necessary to increase producer knowledge, awareness, and understanding of practices to maximize crop value by promoting the production of good-flavored syrup and preventing the production of off-flavored syrup. Maple producers throughout the U.S. will use this knowledge to increase their total annual production of Grade A maple syrup, maximize the value of their syrup crops annually, and increase their annual incomes. Ultimately this will increase the total production of Grade A maple syrup in the U.S. maple industry, helping to improve the sustainability of domestic maple production and increase the competitiveness of domestically produced syrup in the global marketplace.

## West Virginia

**Recipient:** Future Generations University  
Franklin, WV  
**Project Type:** Producer and Landowner Education  
**Award Amount:** \$500,000.00

### ***Designing and Operating Natural Vacuum Sap Collection Systems: A User Manual for 3/16-inch Diameter Tubing***

This project will research, create, and test a user's manual specific to natural vacuum sap collection systems. Future Generations University and its partners will then conduct an extension program in the use of the manual. The purpose is to create the much-needed natural vacuum corollary to the Cornell University New York State Tubing Notebook, which primarily addresses 5/16-inch tubing systems using artificial vacuum. Future Generations University will work with both West Virginia University and West Virginia State University to conduct the needed technical and field research to test and write this best practice manual. The research will be conducted on the engineering of natural and hybrid vacuum systems utilizing 3/16-inch tubing. Sanitation studies will also be conducted on 3/16-inch tubing to determine effective practices for preserving tubing longevity. Lastly, lab-based analysis of microbial growth will be used to test and validate field-based sanitation studies. The extension of research findings will reach approximately 500 maple syrup producers who are using natural vacuum sap collection systems in mountainous regions of Appalachia and New England. Individual study research reports will be presented at regional and national gatherings of maple syrup researchers and producers throughout the project period. During the final year of the project, education activities will center on increasing the adoption and use of the natural vacuum manual through regional workshops and national online extension. Approximately 250 producers in West Virginia, Maryland, Virginia, and Pennsylvania are expected to adopt improved tubing and sanitation methods.