Perceptions of maple producers towards climate change

Principal Investigator:
Diane Kuehn
SUNY ESF
dmkuehn@esf.edu

Co-Principal Investigator:
Lisa Chase
UVM Extension
lisa.chase@uvm.edu

Collaborators:
NYS Maple Producers Association
Vermont Maple Sugar Makers Association

Funding support for this project was provided by the Northeastern States Research Cooperative (NSRC), a partnership of Northern Forest states (New Hampshire, Vermont, Maine, and New York), in coordination with the USDA Forest Service.
Project Summary

- The Northern Forest (NF) region of Vermont and New York is home to over 1,000 commercial maple producers who rely on maple production as a source of income and as the basis for longstanding family and community traditions. Changes in maple production are projected in some studies due to climate change and its potential impacts on forest type (i.e., from maple to oak-hickory-pine; Perkins, 2007), tree health and vigor (Wilmot, 2012), and timing of sap flow (Skinner et al., 2010), although predictions vary. Because maple producers depend on the health of sugar maples for their livelihood and cultural traditions, adapting to changes in maple production will likely be necessary in the future and will require planning. The goal of this study is to engage maple producers in the development of strategies that help them plan for and adapt to the potential impacts of climate change. The research approach for this study includes interviews and a survey of maple producers in the Northern Forest region of NY and VT. Interviews were used to obtain information about producers’ knowledge and perceptions of climate change. A mail survey of producers was then used to assess their ability to adapt to change and to identify the factors that influence this adaptability. Results indicate that more than half of the maple producers who responded to the survey expressed concerns about climate change, and more than two-thirds had already made or were planning to make modifications to their business. The two factors that were identified as most important to respondents when assessing adaptability to climate change are resiliency of the maple producers’ sugar bush and the producers’ ability to adopt new technologies. Despite the uncertainty with the climate, maple producers are highly optimistic about the future, with 90% planning to continue or expand their business within the next five years.
About the maple production industry...

- In 2015:
  - 1,390,000 gallons in VT
  - 601,000 gallons in NY

- In 2014:
  - Nearly $44.6 million in sales in VT
  - Nearly $21.7 million in NY (NASS, 2015)

- Important part of agritourism in NY & VT

- Provides a secondary income source for many maple producers
Purposes of the study

- To identify producers’ perceptions of climate change.
- To identify strategies for dealing with the potential impacts of climate change.

Photo courtesy of Liberty Hill Farm, VT
What are the potential impacts?

- Different researchers have different outlooks...
  - Shift in forests from maple-beech-birch to oak-hickory (Perkins, 2007)
  - As trees become stressed, they may be more susceptible to pests and disease (Wilmot, 2012)
  - No change in number of sap flow days through 2100, but earlier start to season (Skinner, DeGaetano, & Chabot, 2010)
Methods

- Maple producers from the Northern Forest Region of NY and VT were included:
  - 14 producers interviewed
  - 1,011 producers surveyed (269 responses)
  - Two focus groups sessions held in NY & VT

Based on a Northern Forest and Counties map by Conservation Advisory Services, 1994
About the questionnaire...

- Business & demographic characteristics
- Open-ended questions about climate change
- Five-point scaled questions on perceptions:
  - Knowledge about forests & climate change
  - Beliefs about impacts of climate change on production
  - Economic, recreational, and social dependence on their business
  - Connections of business to family, community, & industry
  - Perceptions of current business adaptability in general
  - Perceptions of adaptability to climate change
Respondent characteristics

- Ages: 18 to 88; average of 61
- Education: 14.5 years on average
- Gender: 94% male, 6% female
- Households: 87% had two or more adults
  19% had at least one child
## Business size

<table>
<thead>
<tr>
<th>Number of taps</th>
<th>Percent of producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 500 taps</td>
<td>20%</td>
</tr>
<tr>
<td>501-1,000</td>
<td>17%</td>
</tr>
<tr>
<td>1,001-2,000</td>
<td>14%</td>
</tr>
<tr>
<td>2,001-3,000</td>
<td>14%</td>
</tr>
<tr>
<td>3,001-5,000</td>
<td>13%</td>
</tr>
<tr>
<td>5,001-10,000</td>
<td>14%</td>
</tr>
<tr>
<td>10,001 or more</td>
<td>8%</td>
</tr>
</tbody>
</table>

n = 261
## Tapping methods

<table>
<thead>
<tr>
<th>Method used</th>
<th>Percent of producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubing, mechanical vacuum</td>
<td>62%</td>
</tr>
<tr>
<td>Tubing, no vacuum</td>
<td>21%</td>
</tr>
<tr>
<td>Buckets</td>
<td>16%</td>
</tr>
<tr>
<td>Bags</td>
<td>1%</td>
</tr>
</tbody>
</table>

62% used only one method

n = 258
Current issues for respondents

Factors affecting business

- Harder to predict when to tap
- Increased wind damage to trees
- Tapping earlier than usual
- Ice damage to trees
- Changes in snow cover
- A decline in the health of their maples

n = 252
Future plans of respondents

Plans over next 5 years

- To increase the number of taps I have: 60%
- To keep my business as is: 40%
- To give my business to my children: 20%
- To expand the products I sell: 15%
- To retire, sell, or close my business: 10%

n = 258
Respondents’ definitions of climate change

Definitions

% 30 25 20 15 10 5

0

Change in weather patterns Severe or unusual weather events Increasing temperatures Hype or political ploy

n = 219
Concerns related to climate change

Concerns

- None: 40%
- Weather damages sugar bush: 15%
- Change in season timing: 10%
- Tree health: 10%
- Shorter season: 5%
- Reduced sap flow: 5%

n = 234
Perceptions of producers

How much do you know about climate change in general?

- I know a great deal about climate change in general.
- I know a great deal about the potential impacts of climate change on forests in the northeast.
- I know a great deal about the potential impacts of climate change on the health and vigor of sugar maple trees.
- I know a great deal about the potential impacts of climate change on maple production.

Scale used: -2 = strongly disagree, -1 = disagree, 0 = neither agree nor disagree, 1 = agree, 2 = strongly agree
## Knowledge

<table>
<thead>
<tr>
<th>Concept</th>
<th>Average</th>
<th>Percent D-N-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of northeast forests</td>
<td>0.43</td>
<td>18% - 19% - 63%</td>
</tr>
<tr>
<td>Knowledge of climate change</td>
<td>0.30</td>
<td>18% - 26% - 56%</td>
</tr>
</tbody>
</table>

Scale used: -2 = strongly disagree, -1 = disagree, 0 = neither agree nor disagree, 1 = agree, 2 = strongly agree

n = 170
### Beliefs

<table>
<thead>
<tr>
<th>Concept</th>
<th>Average</th>
<th>Percent D-N-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beliefs concerning impacts on production</td>
<td>-0.62</td>
<td>66% - 17% - 17%</td>
</tr>
<tr>
<td>Beliefs concerning impacts on business operations</td>
<td>-0.70</td>
<td>71% - 17% - 12%</td>
</tr>
<tr>
<td>Beliefs concerning impacts on maple health</td>
<td>-0.90</td>
<td>88% - 8% - 4%</td>
</tr>
</tbody>
</table>

Scale used: -2 = strongly disagree, -1 = disagree, 0 = neither agree nor disagree, 1 = agree, 2 = strongly agree

n = 170
## Dependence on Business

<table>
<thead>
<tr>
<th>Concept</th>
<th>Average</th>
<th>Percent D-N-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income dependence</td>
<td>-0.46</td>
<td>66% - 5% - 29%</td>
</tr>
<tr>
<td>Recreational dependence</td>
<td>1.00</td>
<td>5% - 10% - 85%</td>
</tr>
<tr>
<td>Social dependence</td>
<td>0.46</td>
<td>18% - 13% - 69%</td>
</tr>
</tbody>
</table>

Scale used: -2 = strongly disagree, -1 = disagree, 0 = neither agree nor disagree, 1 = agree, 2 = strongly agree
## Business connections

<table>
<thead>
<tr>
<th>Concept</th>
<th>Average</th>
<th>Percent D-N-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connections with family</td>
<td>0.40</td>
<td>28% - 8% - 64%</td>
</tr>
<tr>
<td>Connections with association</td>
<td>0.41</td>
<td>22% - 11% - 67%</td>
</tr>
<tr>
<td>Connections with community</td>
<td>-0.60</td>
<td>63% - 14% - 23%</td>
</tr>
</tbody>
</table>

Scale used: -2 = strongly disagree, -1 = disagree, 0 = neither agree nor disagree, 1 = agree, 2 = strongly agree

n = 170
## Business adaptability

<table>
<thead>
<tr>
<th>Concept</th>
<th>Average</th>
<th>Percent D-N-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptability in management</td>
<td>0.81</td>
<td>6% - 5% - 89%</td>
</tr>
<tr>
<td>Adaptability in technology</td>
<td>0.23</td>
<td>32% - 13% - 55%</td>
</tr>
<tr>
<td>Adaptability in customer base</td>
<td>0.40</td>
<td>21% - 14% - 65%</td>
</tr>
<tr>
<td>Adaptability (resiliency) of sugar bush</td>
<td>-0.56</td>
<td>66% - 11% - 23%</td>
</tr>
<tr>
<td><strong>Potential adaptability of business to climate change</strong></td>
<td>-0.22</td>
<td>50% - 18% - 32%</td>
</tr>
</tbody>
</table>

Scale used: -2 = strongly disagree, -1 = disagree, 0 = neither agree nor disagree, 1 = agree, 2 = strongly agree

n = 170
Path Analysis

- Age of respondent (years)
- Business’ adaptability in management
- Number of taps of respondent
- Business’ adaptability in technology
- Beliefs concerning impacts of CC on production
- Knowledge of northeastern forests
- Perceptions of adaptability to climate change
- Perceived resiliency of the sugar bush
Implications for the Industry

- Potential changes in the structure of the industry in the future
  - Costs associated with adopting new technologies
  - Size of maple bush and resiliency

- Education about new technologies
  - Cooperative Extension, Producers’ Associations, Farm Bureau
Management Implications

- Tapping earlier

- Utilize technology when possible
  - Vacuum systems
  - Check valve spout adapters

- Improve resiliency of sugar bush & tree health
  - Conservative tapping
  - Thinning as needed
  - Plant saplings
  - Utilize windbreaks
Future Directions

- Maple producers are very positive about the future of the industry

  - Over the next five years...
    - 48% of respondents want to increase number of taps
    - 42% to stay “as is”
    - 18% to expand products and services
    - 10% to retire, sell, or close
List of Reports


List of Presentations


- Two focus group sessions were presented at statewide maple producers conferences in NY and VT in January, 2016.
This project was supported by the Northeastern States Research Cooperative through funding made available by the USDA Forest Service. The conclusions and opinions in this paper are those of the authors and not the NSRC, the Forest Service, or the USDA.

- Thanks to our collaborators:
  - Helen Thomas & Board of Directors, NYS Maple Producers’ Association
  - Matt Gordon, Vermont Maple Sugar Makers’ Association

- Thanks also to:
  - The many maple producers involved in this study
  - Brenda Murphy, Wilfrid Laurier University, Ontario
  - George Cook, UVM Extension
  - Tim Wilmot, UVM Extension
  - Stephen Childs, Cornell CCE
  - Mike Farrell, Cornell CCE
  - Sam Schneski, Schneski’s Maple and Tree Works LLC
  - SUNY ESF Graduate Assistants Tom Sharkey, Sarah Powers, Justin Kindt, and Joel Ramtahal
Citations


