Maple Program **Proctor Maple Research Center**

Discussion of H.631

Dear Representative Partridge,

Thank you for the opportunity to review and comment on the substance of H.631, an act relating to forestland used for maple production. The bill (H.631) focuses on both tree level and stand/forest level processes. Upon review of the bill's language, and following discussion with colleagues at the University of Vermont Proctor Maple Research Center, we offer the following background, perspective and analysis.

BACKGROUND AND PERSPECTIVE

The University of Vermont, through the Proctor Maple Research Center and Extension Maple Program has broad expertise in the science of maple sap collection, maple syrup production, northern hardwood forest health, and the economics of the maple industry. We work closely with other colleagues at the University, other academic institutions, the maple industry (Vermont Maple Sugar Makers Association, North American Maple Syrup Council, International Maple Syrup Institute), and with State and Federal Government (Vermont Agency of Agriculture, Food & Markets, Vermont Forests, Parks & Recreation, U.S. Department of Agriculture) in our mission to conduct research and to provide education and advice.

Maple production in Vermont has grown nearly fourfold in the last 20 years (NASS data). According to a University of Vermont Center for Rural Studies report, in 2013, the maple industry contributed between 2,734-3,169 full-time equivalent (FTE) positions in the state. According to the latest USDA Census of Agriculture the number of Vermont maple operations rose from 1,310 in 2007 to 1,553 in 2012. Additionally, the number of taps increased from 2,770,392 to 4,348,163 over the same five-year period. The Census of Agriculture occurs every five years and the 2017 report (when released) will give us more current data, but without a doubt, will show continued expansion in terms of taps, farms engaged in maple production, and jobs generated. The 2018 Census is expected to be released sometime in 2019. Collectively, the growth in the maple industry has been attributed to many sources (some from within the state of Vermont and some beyond the state). Perhaps the greatest single explanation for the exponential growth lays to the north in the Federation of Quebec Maple Producers (FPAQ). Quebec maple syrup output equals roughly 70% of the world crop. The producers there have organized, and through a series of initiatives and practices they have implement, the Federation regulates the annual supply of syrup on the world market and set a world price. In order for the Quebec system to work, producers are held to a strict quota system whereby each individual producer is only able to produce a certain amount of syrup based upon a quota system. Maple producers outside of Quebec are not limited by the quota system, but have largely benefited from the relatively stable and high prices established by the Federation. The result was a dramatic expansion in the number of farms and acreage used for maple production which began shortly after the restrictive portions of Federation model were implemented. Maple producers in

P.O. Box 233 ♦ Underhill Ctr., VT 05490 U.S.A.
Telephone: (802) 899-9926 ♦ Fax: (802) 899-5007
http://www.uvm.edu/~pmrc

Vermont were able to capitalize on this until the recent change in U.S./Canadian Currency Exchange Rate reduced the bulk price paid in the U.S.

At the tree level, regardless of the number of taps a given sugar maker employs, maple sugaring involves the harvesting of sap from maple trees. The process of harvesting sap results in two things at the tree level; a tap hole drilled into the stem creates a small and permanent wound, and the extraction of sap results in the removal of a portion of the trees stored energy (sugar and starch hereafter referred to as nonstructural carbohydrates or NSC for short). Unfortunately, the science is far from settled as to the magnitude these two wounds have on both the short and long-term health and vitality of a given tree. We hope to explain in more detail the issues related to maple sugaring and tree health in the following paragraphs.

It is important to note from the onset that tapping guidelines are simply that; they are generally not hard-and-fast rules or regulations that must be strictly followed. In most cases, while they are based in science, there is some leeway for individual producers to adjust or modify the guidelines for local growth conditions, to cope with natural stresses, to meet their individual production needs, or to maintain sustainability goals. Guidelines can vary depending upon where you are located, whether you have an agreement to tap on another person's (or State of Vermont or Federal) land, or to meet certain certifying agency rules.

The fundamentals of making maple syrup require that sap be harvested from various species in the genus *Acer* (practically speaking only red maple and sugar maple are used in Vermont). Although early records are sparse, it is accepted that maple syrup production in Vermont stretches back to before the first Europeans arrived. Even those early sugar makers, using primitive methods of collection, were required to make a new wound in the stem of the tree each spring. A new hole is required to counter the maple tree's natural ability to wall off infection and prevent systemic decay through the process of compartmentalization. Compartmentalization results in a volume of the trees conductive tissue (xylem) becoming stained and nonconductive (no longer able to conduct sap). Due to the nature of wood anatomy, the area of wood rendered nonconductive extends both above and below the tap hole to a much greater extent, but only slightly wider and deeper than the diameter of the tap hole. Existing data suggests that there is some degree of variability as to the volume of the nonconductive wood generated by tapping. It is likely, but to date not fully explained, that some trees are simply genetically superior at compartmentalizing that others. It is also likely that there are other factors (site quality, competition from other trees, annual growing conditions, forest management activities and tree health status) that may influence the formation of nonconductive wood. Modern maple sap collection methods employ plastic tubing and artificially-generated vacuum to increase the total flow of sap in a given season. Data exists to suggest that the level of vacuum applied to the tap hole does not appear to increase the subsequent volume of nonconductive wood produced. In other words, higher vacuum does not result in greater amounts of nonconductive wood in maple stems. The rate of accumulation of nonconductive wood is associated with the size and number of tap holes placed in a given tree each year, as well as the rate of new wood accumulation by the tree. It has been suggested that in order for sap harvesting to be sustainable for a given tree, the tree must grow more wood than is functionally removed as a result of tapping (and the corresponding volume of nonconductive wood). Recent data suggests that if healthy co-dominant or dominant trees growing on good quality sites are tapped using "conservative" tapping guidelines the long-term prospects for sustainability are good.

The second factor that has the potential to influence the sustainability of maple sugaring is the annual removal of a fraction of the trees NSC reserves. It has been well documented in the

literature as well as through years of observation that the use of vacuum sap extraction results in significantly more sap being collected. Unfortunately, the science is far less settled as to how increased sap extraction influences tree health. The limited data that does exist suggests no clear pattern in terms of whole tree NSC reserves. In 2013 the University of Vermont Proctor Maple Research Center established a long-term study to help fill the gap in the scientific understanding related to how modern sap collection methods compare to historical methods. At its most basic, this study looks to compare growth rates over time in a collection of trees not previously tapped as they are subjected to three treatments; tapping without vacuum, tapping with high vacuum (+25" Hg) as well as a no-tap control treatment. This study will begin the 5th year of measurements in the spring of 2018. Very briefly, over the past four years of study there have been no significant changes in the growth rates of trees between the three treatments (untapped, gravity collection, vacuum collection). This result is notwithstanding the fact that the trees in the vacuum treatment produced roughly twice the volume of sap as the trees tapped without vacuum. The plan is to continue this study for 10 years or longer as funding permits.

While the science of whether or not maple sugaring practices produce significant impacts on forest heath at the stand level is not especially broad, there are some results worth reviewing. Perhaps the most comprehensive work to be done to date is from the North American Maple Project (NAMP, administered by Vermont Forests, Parks & Recreation). This project looked at stands that were actively managed for maple syrup production as well as similar stands that were not actively used for maple production. After 10 years of detailed study over a large geographic area, the results suggest that sugar maple mortality is similar in stands managed for maple production compared to stands not managed for maple production.

The issue of species diversity within forests managed for maple syrup production has received some scientific attention. The results of work carried out by the University of Vermont Entomology lab suggests that maple stands which include at least 25% non-sugar maple species have a lower incidence of maple specific insect pests. Although concerns have been raised about how maple tubing systems might affect wildlife, there is no clear understanding in the literature on the subject.

ANALYSIS

H.631 authorizes the Vermont Agency of Agriculture, Food and Markets to report on the "Impact of industrial maple production on Vermont's Forestland". The bill appears to use the term "industrial" and "large-scale" interchangeably. As stated in lines 17-19, these terms are defined by maple operations "that taps more than 100,000 trees in the State annually for the purpose of collecting maple sap." According to the 2017 Maple Syrup Almanac, only four operations in the U.S. would currently fit this definition. Of those, three are within the State of Vermont (Sweet Tree Holdings, LLC of Island Pond, Green Mountain Mainlines of Fletcher and Georgia Mountain Maples of Milton). Applying the term "industrial" or "large-scale" to operations solely based on a specific number of taps appears arbitrary given that it is not necessarily the number of trees tapped that matters as much as the forest management and sugaring practices employed by a given operation. Property that is enrolled in the forestland category of the Use Value Appraisal (UVA) program are compelled to have an approved forest management plan and adhere to acceptable management practices (AMPs) to maintain water quality. The Vermont Department of Forest Parks and Recreation produced a set of sugarbush management standards and tapping guidelines that apply to parcels enrolled in the forestland category in UVA. Additionally, some of those operations are organic maple producers, meaning that they must adhere to further standards pertaining to sustainable tapping, forest management, and diversity than conventional (non-organic) producers.

The information requested in the report also includes the following subparts to Section 1:
(2) an estimate of the total acreage of forestland that is used by large-scale operations. The estimate should be fairly easily obtained by consulting list of properties enrolled in the UVA program, however the density of maple trees/acre can vary from site to site, and thus might not result in an accurate number of total trees tapped for maple production.
(3) a summary of the "adverse forest health, environmental and natural resources effects that can occur from excessive tapping of trees." This section directly relates to the Background/Perspective section above. As such, there are ongoing studies at the University of Vermont Proctor Maple Research Center related to sugar maple tree health and modern sugaring practices.

Section (A) additionally calls for a summary of "adverse environmental" or "natural resources" effects related to "excess tapping". "Excess tapping" is not defined and would need to be clearly defined and based on the current state of the science before any objective analysis could be undertaken.

Section (B) seeks to determine if large-scale maple operations reduce tree species diversity or reduces/eliminates wildlife habitat. In terms of tree species diversity, it is fairly well established that maple producers regardless of the operation size will favor maple at the expense of other species. This practice, also known as "sugarbush management" is the long-accepted practice of generating the highest yield of syrup/acre. It is akin to normal forest management practices that favor some species over others.

Lastly, Section (4) asks for a report on "recommended regulatory or legislative actions" related to "negative effects of large-scale maple production" identified in the reports other sections. This section fails to clearly define what a "negative effect" is and presumes that large-scale maple production does produce "negative" effects on the health and vitality of the State's forestlands despite the fact that to date, research and properly applied maple industry practice show that not to be the case.

Thank you for the opportunity to review and comment on the bill (H.631) as introduced and we look forward to addressing any additional questions that may arise during the committee's deliberations.

Mark Isselhardt, M.S.
Extension Maple Specialist

Timothy Perkins, Ph.D.
Research Professor/Director

P.O. Box 233 ♦ Underhill Ctr., VT 05490 U.S.A.
Telephone: (802) 899-9926 ♦ Fax: (802) 899-5007
http://www.uvm.edu/~pmrc