Sugarbush Mapping

Finding information to assist in forest management and planning in the sugarbush

Technological advances by maple equipment manufacturers, continued outreach and education by local, state, federal, and provincial maple organizations, and widespread adoption of new management practices by producers have revolutionized the maple industry over the last 20 years. The design and layout of sap collection systems and advances in vacuum pumps and releasers has resulted in higher per tap sap yields well beyond the old standards. Increased per tap volume has been matched with modern high brix reverse osmosis systems and efficiency gains in evaporators, pushing the economic potential of making maple syrup to new heights. Value-added products, niche marketing and branding, and social media and online platforms, coupled with health conscious and savvy consumers, have altered the retail sales landscape and linked rural maple producers to consumers around the world.

While the retail and production areas of maple syrup operations have changed significantly, much of the forest

management and silvicultural arena has not kept pace. The majority of today's producers approach the woodland management side of their business operations just like the producers from 30 or more years ago. Forest management normally stops after removing the dead, down, broken trees and those species not critical to the operation (i.e. not maples), with little regard to stand stocking & tree spacing. All too often, living maple trees are viewed as being all equal and a potential resource with a "more must be good" focus.

In reality, this "more must be good" thinking is a liability and can reduce a woodlot's productivity and long-term health and functioning. The science behind forestry operations (silviculture) has a long history of detailed research from which to draw. Routine thinning of trees based on criteria such as stand density and size of tree stems completed in a well thought out and scientifically defensible manner, as well as taking into account the site's soil productivity and its ability to regrow/respond to increased resources, all lead to stronger, healthier and more productive stands in the future. Periodic harvestings of the over-mature, weak, and/or declining trees not only provides the producer with some income but also moves the entire stand farther into the positive side of the growth and vigor equation.

For the most part, this routine maintenance of thinning and harvesting has not entered the mainstream in the industry. Cutting what appears to be a perfectly good but "small" maple tree is perhaps so terrifying to maple producers that the option of doing nothing in the sugarbush is preferred. The potential of damaging mainline and tubing installations with a usable life of 10+ years often factors into the "do nothing" decision. Add in the horror stories – unscrupulous loggers, devastated woodlots after unsupervised or unprofessional harvest operations, the messy look and hard-to-navigate terrain – and you have plenty of excuses to not conduct any substantial harvesting activities.

This guide will walk a producer through the steps of locating usable information on the Internet to map your woodlands (trails, forest canopy, soils, etc.), and measure and evaluate the trees you have based on what size class and density those trees fall into and where they are located. Future publications will discuss how to layout sample plots, conduct a quick cruise, and interpret the data. We will also work to show how to use the data to inform your forest management decisions and, if the information and gathering of data becomes too overwhelming, where a producer can go to hire a consulting

forester for assistance and how to evaluate if that consulting forester is proficient in managing a sugarbush.

Always know as much as you can about the past history and where the property resides in the larger picture

Start by gathering as much information as you can from a variety of online sources. The internet has a tremendous amount of detailed information and the level of precision is increasing daily. Start with Google Earth, which gives fairly recent images and a general sense of the overall forest layout. It often also has historical photos back 15 to 20 years and occasionally from several different seasons, including winter leaf off conditions which are helpful to see trails and natural features. Images taken in different years can show changes in the forest over time and can help later when trying to delineate stand boundaries and trails.

Pairing those images with topographic and soils maps is essential to delineate stand boundaries and will help during forest management and future sugarbush construction projects. One of the best online topographic map tools is the United States Geologic Survey (USGS) website called TopoView (https://ngmdb.usgs.gov/topoview/viewer/). The TopoView site covers the entire

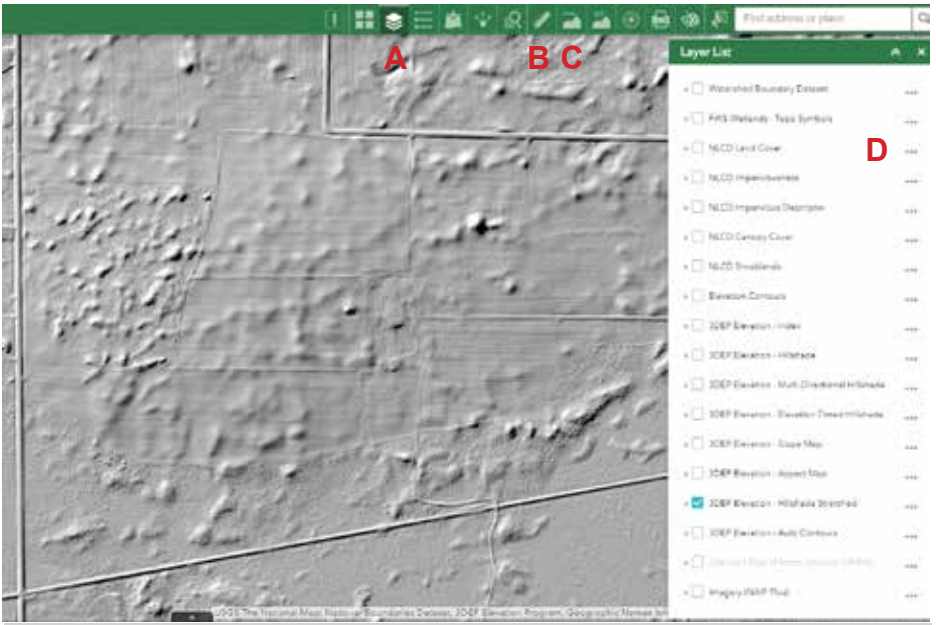

Figure 1: USGS National Map Advanced Viewer.

US and allows the user to zoom to specific locations. Once at the location of interest the user can drop a pin on the farm or woodlot in questions. Once the location is defined it will automatically generate all the historical data available for that location. For example, selecting MSU's Forest Biomass Innovation Center provides data as recent as 2017 and as far back as 1932. From these historical photos we are able to get a better sense of past forest management activities that have translated into the stands of trees and ages that we now have.

Another powerful tool from the USGS is the National Map Advanced Viewer (https://viewer.nationalmap.gov/advanced-viewer/). This site lets you zoom into the area of interest and instead of just offering topographic maps showing contour lines the advanced viewer allows the user to select and overlay several variables (Figure 1, A). It can seem overwhelming at first but one can prioritize the most useful layers and minimize the rest. The #DEP Elevation buttons (specifically the "Hillshade Stretched") is a higher resolution image showing the micro-topography on a site, and can highlight old field boundaries, stone walls, and other features that are not always visible or recognizable while walking in the woods. These sites can also be culturally sensitive sites (burial mounds, effigy mounds) and once known should be taken into account in the planning stages.

Figure 1 shows small variations in elevations across fields, field edges built up over the years, roads and ditches, moraines, and other features. The three stars to the right of each layer (Figure 1, D) in the list gives the user several choices in terms of the transparency of each layer and the priority given to each layer (meaning that several layers can be active at the same time, such as the hillshade and photo imagery). Letters B and C in Figure 1 point to two of the most important and useful tools. B is the Measurement tool allowing users to measure overall line distances, while C gives the elevation change across a user defined segment.

In Figure 2 the elevation change of a mainline segment that was drawn in allows the user to accurately estimate if there is enough elevational fall to naturally move the sap thru the mainline to the tank or pump station. On the left side of Figure 2 is the user defined mainline segment and to the right is the elevation profile as the user moves across the mainline segment. In this example, the tank is to be located on the west side of the image and the ground rises 14.5 feet over roughly 1,000 feet of distance or roughly 1.45% as you go left to right (west to east) in the woods. We have proposed

to bury our collection tanks to gain an extra 5 feet of fall which should bring us to just under 2% slope. Not premium levels of fall but with vacuum and good line maintenance acceptable results are anticipated.

No one knows your sugarbush better than you. If you are like most producers you have walked the woods hundreds of times and know where there are unique features such as logging trails, outcroppings, wolf trees etc. Start with a simple printed map with hand drawn boundaries of the property. Begin to draw in known trails and start to delineate where past harvests or thinnings were completed. Circle wet areas in blue ink. Sketch in stands of trees that appear to be different either in species composition (aspen, maple, spruce, oak, etc.) and/or of different size classes (less than 10 inches Diameter at Breast Height (DBH), 10-16 DBH, mature or over mature etc.). Make the map as detailed as possible and as necessary.

Where to Find Soils maps for your woods

Soils are a primary driver

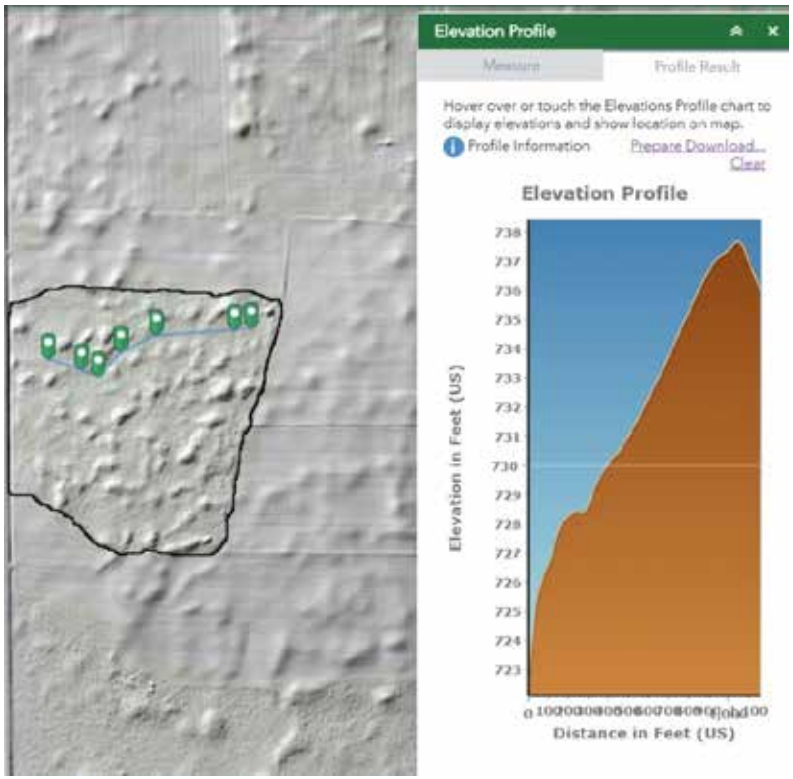

Figure 2: Mapping elevation change.

of stand characteristics, tree productivity, health, and sugar production. Knowing where different soils are in the woods can help with stand delineation and also allows for a better understanding of the drainage potential, productivity, water tables, and slopes. Having a soil survey book for your location (normally they are produced at the county scale) is invaluable when you are cross referencing proposed stand boundaries, old harvest maps, topography, etc., and can be carried in the woods.

New online resources aid in pre-planning and are now very user friendly. The Web Soil Survey maintained by the USDA NRCS (https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx) is particularly helpful. Again, be prepared to spend some time with the website to learn the ins and outs.

You will find the site has 5 tabs across the top (Area of Interest (AOI), Soil map, Soil data explorer, Download soils data, and shopping cart). The AOI tab allows the user to zoom in on their farm or woodlot and then define their Area of Interest, which may just be the area that is forested. After the AOI is defined, the

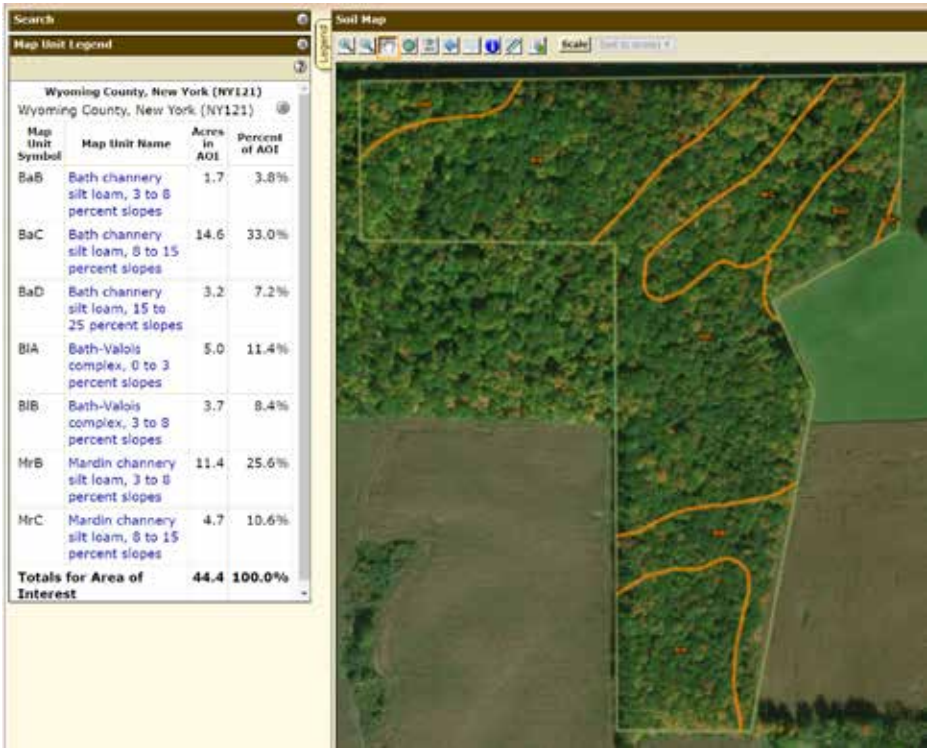

Figure 3: USDA NRCS Web Soil Survey

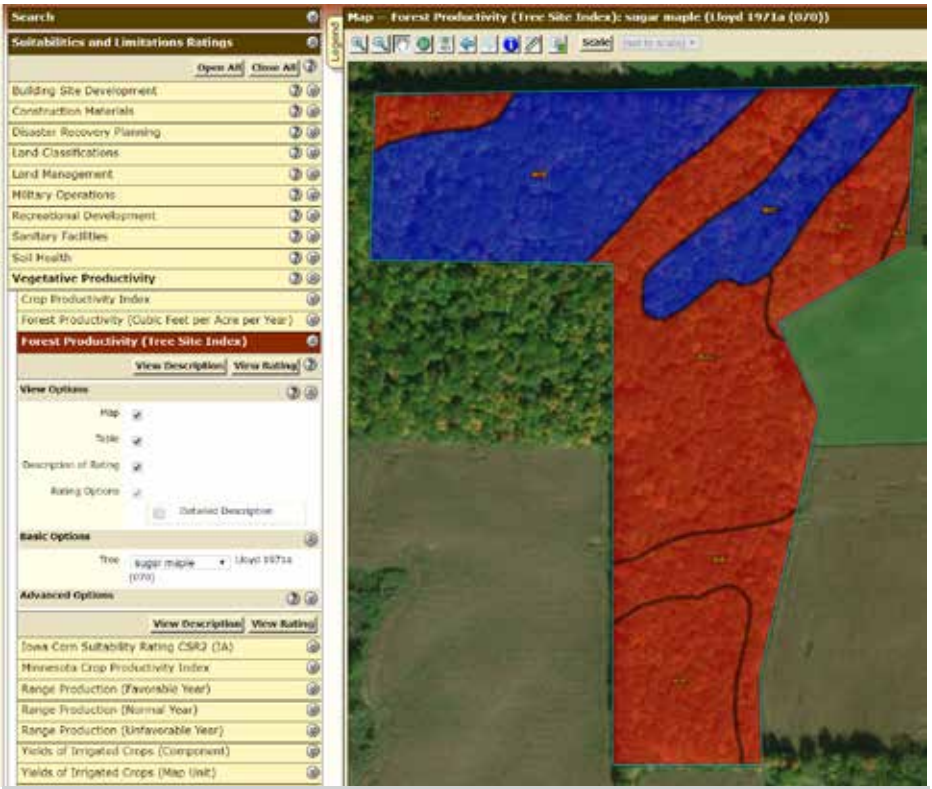

Figure 4: USDA NRCS Web Soil Survey

website only returns data within those boundaries. Clicking on the Soil Map tab will automatically populate the AOI with pertinent soils data. It will define the map unit symbols. Contained within the name are the % slope and how many acres are within that soil type. These soil lines are pretty accurate and give you the first glimpse into potential stand types. Mapped soil differences are important but it still takes on the ground work to adjust the boundaries, especially where soils make an abrupt change (for example where Bath Channery soils transition to Mardin Channery etc. in Figure 3).

Next, one should use the Soil Data Explorer tab to begin to drill down into the specific soils data. Within the Soil Data Explorer tab there will open another 5 tabs (intro to soils, suitabilities and limitations for use, soil properties and qualities, ecological site assessment, and soil reports). Under the Vegetative Productivity tab there are tree site productivity index values where the user can specify sugar maple. This will give you rating values for each of the soils. The example in Figure

4 shows how closely related the soils in this sugar bush are ranging only from 65 to 70 ft. Because of the amount of data available at your fingers take the time to try the various tabs, and if questions arise contact the author.

Producers should also explore what resources their respective states have to offer. Most state Land Grant Universities are repositories for aerial photos, with most being available online for free. Some even go back into the 1950's or earlier. Increasingly they are adding more new technology and sensors to the databases, so check the sites often.

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