

Bringing the Silvics of North America into the 21st Century

By Steven McNulty

History of the Silvics of North America

The *Silvics of Forest Trees of the United States* (SFTUS) (Fowells, 1965) was the first comprehensive guide to tree species management for the United States. The document contained 127 tree species and required ten years to complete (Burns and Honkala, 1990). Most of the SFTUS was written by USDA Forest Service scientists.

Twenty-five years later, the SFTUS was revised. The number of species increased to 195 and new literature was added. The expansion triggered a name change to the *Silvics of North America (SNA)* (Burns and Honkala, 1990). As with the previous version, the document was primarily a product of the USDA Forest Service with assistance from university researchers and extension agents across the US.

As a foreword to the 1990 SNA, then USDA Forest Service Deputy Chief of Research Jerry SESCO wrote, “Our store of silvical and related knowledge has markedly increased since that silvics manual was published 25 years ago. The “Woody-Plant Seed Manual” of 1948 was updated in 1974 and issued as *Agriculture Handbook 450*, “Seeds of Woody Plants in the United States.” New names were added to the literature in 1979 with *Agriculture Handbook 541*, “Checklist of United States Trees (Native and Naturalized),” which superseded *Agriculture Handbook 41*. In 1980, the 1954 *Society of American Foresters’ publication*, “Forest Cover Types of the United States and Canada,” was revised. A six-volume “Atlas of United States Trees” (US Department of Agriculture Miscellaneous Publications 1146, 1293, 1314, 1342, 1361, and 1410) added tree range maps of most major and minor tree species to the literature. It was both appropriate and timely, therefore, to revise the information in the original silvics manual and to add other native and naturalized trees to the compendium.”

The SFTUS and SNA have been a standard for silviculture in the US for over fifty years. The world has changed a lot since 1990. The 1990 SNA was still published as a hard copy document, and only later was a PDF version created for distribution through a USDA Forest Service website. As a PDF, the online version of the SNA has not hyperlinked to more recent silvics information and is just a digital version of the 1990 edition (https://www.srs.fs.usda.gov/pubs/misc/ag_654/table_of_contents.htm).

Modern Changes

Advances in internet access have significantly expanded the type and complexity of the information that can be shared. These advances are critically important because the ecosystems in which these tools are applied are also changing. A recent survey of climate change studies found that over 99.9% of scientists agree that climate change is currently occurring (Lynas et al., 2021). When the SNA was last published (i.e., 1990), the public was just becoming aware

of climate change and scientists were less sure about human-caused warming. Global warming has accelerated over the past 30 years, with the last seven years (i.e., 2015 to 2021) being the warmest years ever recorded globally. Air temperature is not the only ecosystem change. Changes in the timing, distribution, and amount of precipitation lead to increased climate variability, with some regions experiencing more flooding while others experience increasing drought (IPCC, 2021).

Changing air temperature and water conditions, in turn, are shifting tree species distribution. Cold-tolerant species such as black spruce (*Picea mariana*) have shifted northward (Peters et al., 2020). This trend is projected to continue during the remainder of this century (Figure 1, Peters et al., 2020). In addition to changing species range, trees of the 21st century are also subjected to increasing wildfire, flooding and coastal sea-level rise, and insect and disease outbreaks (Dale et al., 2001).

Finally, the public perception of forests has changed since 1990. Traditionally, forests were viewed mainly as sources of timber or pulp. In 1960, the US Congress enacted the Multiple-Use Sustained-Yield Act (Public Law 86-517), expanding the objectives for forest use. This Act was slowly integrated into forest management and included recreational opportunities, species biodiversity, fuel wood, and other uses. Some discussions of these uses were included in the 1990 SNA, but additional ecosystem services have been increasingly important since then. For example, changing demographics toward urban areas coupled with increased drought frequency and intensity has emphasized forests as providers of sustainable, high-quality water. These additional ecosystem service considerations are not part of the existing SNA.

The Need for a Revision

All of the changes listed above initiated the question of whether the SNA should

be revised. A survey was conducted to determine if a revision of the 1990 SNA was needed (Merry et al., 2020; Bettinger et al., 2021), and if so, what information should be included. The survey was distributed to registered foresters in four states and members of other professional organizations. The results indicated that while the level of content in the 1990 SNA was appropriate, there was a need to update all chapters with current information on ecosystem services, adaptive management, and species range (Merry et al. 2020).

Framework for a Revised SNA

Based on need, the Updated Silvics of North America Project (USNAP) was created in July 2021. The goal of the USNAP is to provide a comprehensive revision to the Silvics of North America that will: 1) Make the SNA the keystone reference for North American silviculture, 2) Reflect the most current silviculture science, 3) Provide an expanded ecosystem perspective, 4) Modernize the document to current standards of technological engagement, and 5) Allow for updating.

To facilitate these goals, forest leadership from Mexico, Canada, and the US formed the USNAP Leadership Committee to develop a multi-national community structure by which the SNA could be revised (Figure 2). The resulting draft structure consists of a Core Committee, which oversees several other teams.

Leadership Committee Structure

The Leadership Committee (LC) is divided into co-equal representatives from the Canadian Forest Service, the National Forestry Commission of Mexico, and the USDA Forest Service. There are eleven members (three to four from each country), and an *ex-officio* chair (USNAP Principal Investigator). The primary responsibility of the LC is to provide country-level approval, encourage participation, and solicit funding and personnel to sustain the project.

Core Committee Structure

The Core Committee (CC) will comprise approximately 40 representatives from government (federal, state/provincial), non-government organizations, and private organizations across the three participating countries. The CC is the primary instrument for 1) Developing the structure of the USNA, 2) Overseeing the revision process, 3) Evaluating the species and topics to include, 4) Evaluating topics from the current SNA that need revising, 5) Determining the USNAP timelines, and 5) Soliciting members to the associated teams. All Core Committee members will serve as a Team/Sub-Team Lead or Co-Lead with significant responsibility for a specific topic.

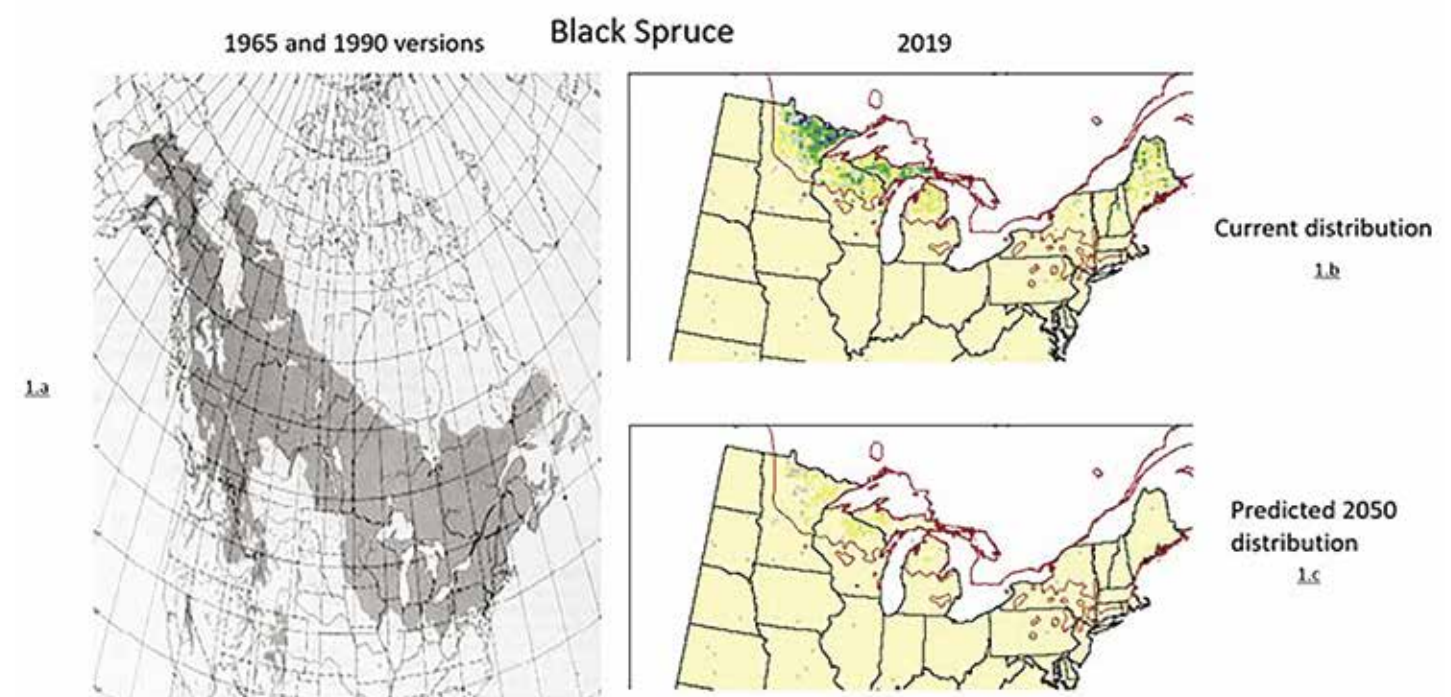
Writing Team Structure

The Writing Team (WT) will be the largest in the USNAP, having 300 plus members. The WT is charged with updating existing species chapters and adding new species. In the previous SNA, the chapters were written by practicing professionals (e.g., primarily federal scientists and land managers). While those individuals will contribute, an additional method for chapter development is also being evaluated.

This secondary process, if deemed appropriate, would provide the opportunity to offer a graduate-level class with participating universities and colleges. Under the guidance of the professor, the individual (e.g., Master’s thesis project) or class would conduct the literature search and develop the chapter as a class project.

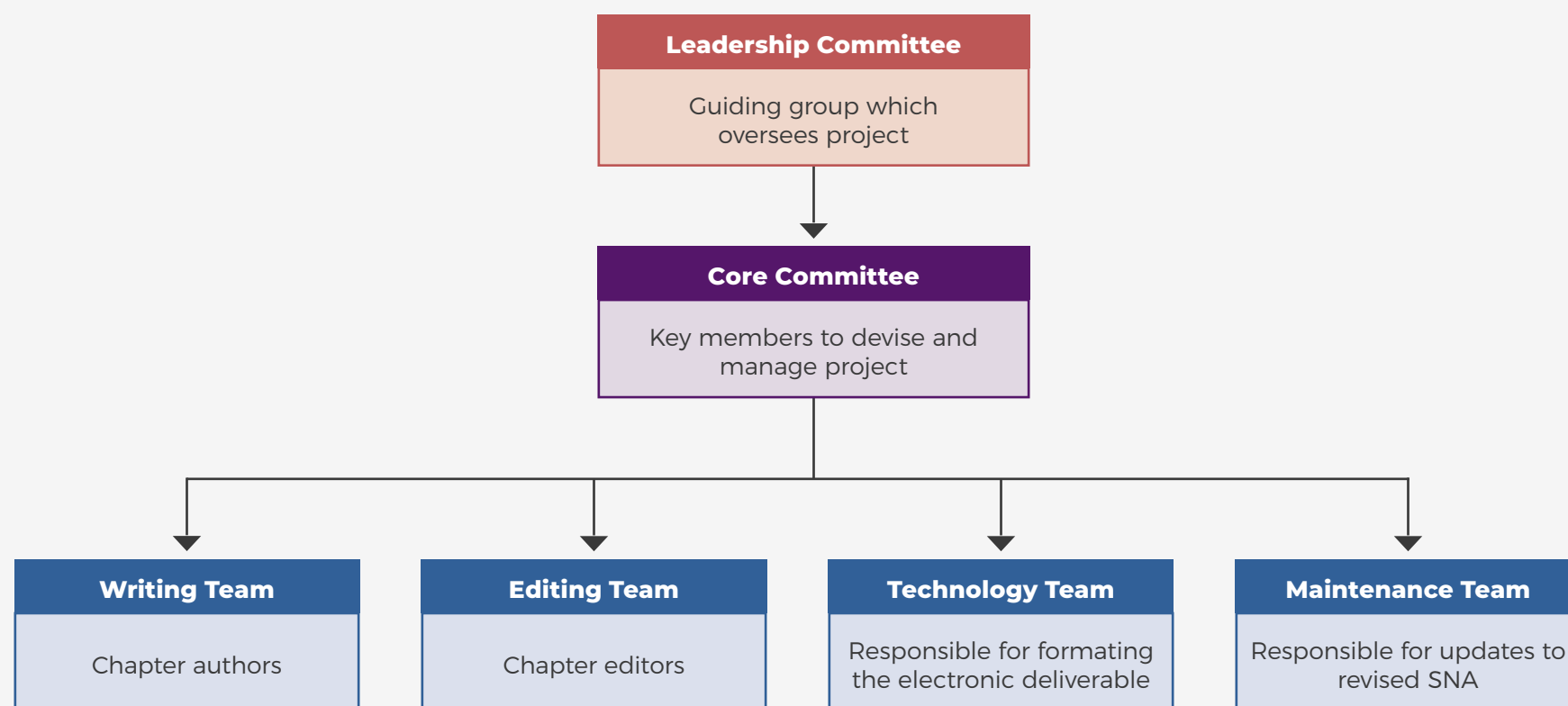
Editing Team Structure

The ten members of the Editing Team (ET) will be tasked with distributing received draft chapters to qualified reviewers. As with a peer-reviewed journal submission, the reviewer may rate the chapter from “Accept as is” to “Reject”, with associated review comments. The ET member will compile the information and decide how best to proceed. Unless rejected, the authors



Distribution of black spruce (*Picea mariana*) as presented in *Silvics of Forest Trees of the United States* (1965) and *Silvics of North America* (1990), as compiled by Little (1.a), and as presented by current distribution (1.b) and projected distribution by 2050 (1.c) from the Tree Atlas. The species range has significantly shifted since first presented and is expected to further shift by 2050.

Updated Silvics of North America Project Organizational Structure



will have the opportunity to address the reviewer's concerns. A maximum of two rounds of feedback will be allowed. If the chapter is not acceptable after two rounds, it will be rejected and the chapter will be open for another group to write.

Technology Team Structure

The Technology Team (TT) will take advantage of the technological advances since 1990. Examples include the development of internal (USNAP members) and external (public-facing) electronic media. The external products include a website and portable-device-compatible versions of the USNA. The TT will also include a sub-team of researchers developing the updated species range and projection maps. The team will fluctuate in size as components are created, but will average approximately 20 members.

Maintenance Team Structure

Given the constantly changing environmental conditions and rapid pace of research knowledge, the establishment of the Maintenance Team (MT) is critical to avoid significant gaps in time between revisions. Currently there are discussions to incorporate the MT into the North American Forest Commission (NAFC), which was established in 1958 by the United Nations Food and Agriculture Organization (FAO) as one of six regional forestry commissions. Its main objective is to provide a policy and technical forum for countries to discuss and address forest issues.

Timeline and Next Steps

Unlike previous versions of the SNA, this revision will be a virtual document that allows easy access and maintenance. In this regard, the timetable for completion is open-ended. Given that Mexico has over

2,900 tree species and climate change is continuously altering tree species' habitat, the development, updating, and revision process will continue for as long as need, interest, and funding are available.

The short-term timetable calls for the structural development and filling of the CC and ET by April 2022. Once these groups are operational, a call will be placed for membership in the WT, with solicitations for species chapter lead authors beginning in May 2022. The goal is to complete the first fully reviewed chapter by August 2023.

Previous versions of the SNA took over a decade to complete. While the first chapters are due in about 18 months, as currently designed, the revised SNA will never be finished, as updates and new species are constantly being added. In much the same way, membership within the project teams will never be finished. Individuals will likely join and leave as their situations dictate. However, now is the time that much of the structure will be decided. Therefore, the USNAP is actively seeking individuals from all backgrounds to participate in one of the committees or teams. **FS**

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