# Norway Spruce: Christmas Trees or Timber Resource?

BY LLOYD IRLAND

On December 16th of 2019, newspapers throughout Central Maine reported that Portland's municipal Christmas tree had just been raised and prepared for its lights at Monument Square. City Arborist Jeff Tarling was quoted in the papers with more details about the chosen tree: After planting at age eight in a city park, Tarling reported, the tree grew 46 feet in 30 years – 1.5 feet per year – before becoming the city's official tree. Tarling also noted that the tree was a Norway Spruce – not a heritage American softwood, but a naturalized import from Europe.

Readers of the *Northern Logger* will be aware that recently, Norway Spruce was approved for sale along with association-graded spruce-fir "SPF" structural framing lumber. This entailed a lot of expense for board-breaking and strength testing. Questions that arose in the industry were natural – why bother, some asked, when there is so little of this species? Also, why do all this work again: Isn't a lot already known, since it is a staple species in Europe? Some wondered whether we want to encourage use of this exotic species in the US, since "everybody knows" that exotics are bad.

I had some of these questions myself, and did a bit of homework, which I will share here. I have seen Norway Spruce on its native ground in Slovenia, Belgium, Austria and Bavaria, and Ukraine, so it was fun to rummage through old pictures and old memories to prepare for this article.

So, does Norway Spruce have promise in the United States for anything other than Christmas trees? How much Norway Spruce is out there? How well does it grow?

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on paper company land around 1900 were Norway Spruce. Planting stock was brought over from Europe. It could be that the foresters of the day were familiar with it from studies or travel in Europe and from the European literature, since little American forestry literature existed at that time. After a time, local species began to be used rather than European stock, especially white pine in the southerly areas of the region. A 1936 Harvard Forest Paper estimated that in New York and New England, 120,000 acres had been planted to Norway Spruce by that time.

It has long been recognized that Norway outgrows our native spruces, although US forestry researchers have paid it little attention, due to its small footprint on the landscape. In a 1976 University of Maine Symposium, Hal Klaiber, a Scott Paper forester, presented data showing growth since planting in 1940 (54 years) at 1.5 cds/a/yr. This included yields from 2 thinnings. This 54 years of growth counted yields from 2 thinnings. This was not representative, however, because few if any stands were being thinned over those years, and little attention was paid to this interesting result.

One thing is certain: Norway Spruce wood quality is very good, as is now attested by its grading certification. With its height growth, its internodes are widely spaced. It is suited to framing lumber as well as pulp.

In a rare example of supply assessment, a 2018 New York study estimated that 54,000 acres of Norway Spruce stands exist on state lands alone, and given their maturity, they could support an annual harvest of 50 million board feet per year. (Is anybody listening out there?)

## Norway Spruce Back Home in Europe

Norway Spruce's natural range includes only higher elevation areas of Norway, and extends into the Balkans. It also grows across higher elevations in central France, the Alps, Germany, and Poland, and on eastward to Ukraine and Belorussia.
Individual trees in virgin stands have been aged at more than 500 years – they would have been thumb-high seedlings when Columbus arrived in America. In Central Europe, growth rates of 8 cubic meters per hectare are common. This would be about 1.4 cords per acre, which is three times the average growth rates across the Northern forest of the United States.

Norway Spruce gained a strong role in forest management in Europe during the late 18th and 19th centuries, for different reasons in different places. Everywhere, though, the species was recognized as tractable in nurseries, and hardy once planted. In higher elevation areas, it was planted to restore eroding overgrazed slopes and often to stabilize snow avalanches. Still other areas were managed to protect water quality of city watersheds. In the valleys, it was used to bring unused pastures to productive condition. In some countries, it was encouraged because it promised to supply needed raw materials for growing populations. During Enlightenment times, in places as far-flung as Austro-Hungary and Russia to Britain, it was seen as an up-to-date farm practice to grow wood efficiently on slopes not suited to field crops. Many aristocratic and propertied families included spruce forests on their estates. I once visited the forests of the Prince von Thurn und Taxis near Regensburg. The carefully managed spruce stands had one principal management objective: to support a herd of wild boar for the Prince and his buddies to hunt. Aldo Leopold also wrote an interesting essay reporting on his visit to such an estate in Silesia.

Over the generations, doubts arose in some quarters. Some of the stands began showing signs of declining vigor, often termed "spruce sickness". In other places and in more recent times, we have seen destructive bark beetle outbreaks. Some of these stands were, in retrospect, clearly planted off-site, with predictable results. In many areas, farmers raked up the needles to use as livestock bedding. You can imagine what a century or two of this would do to a forest's productivity.

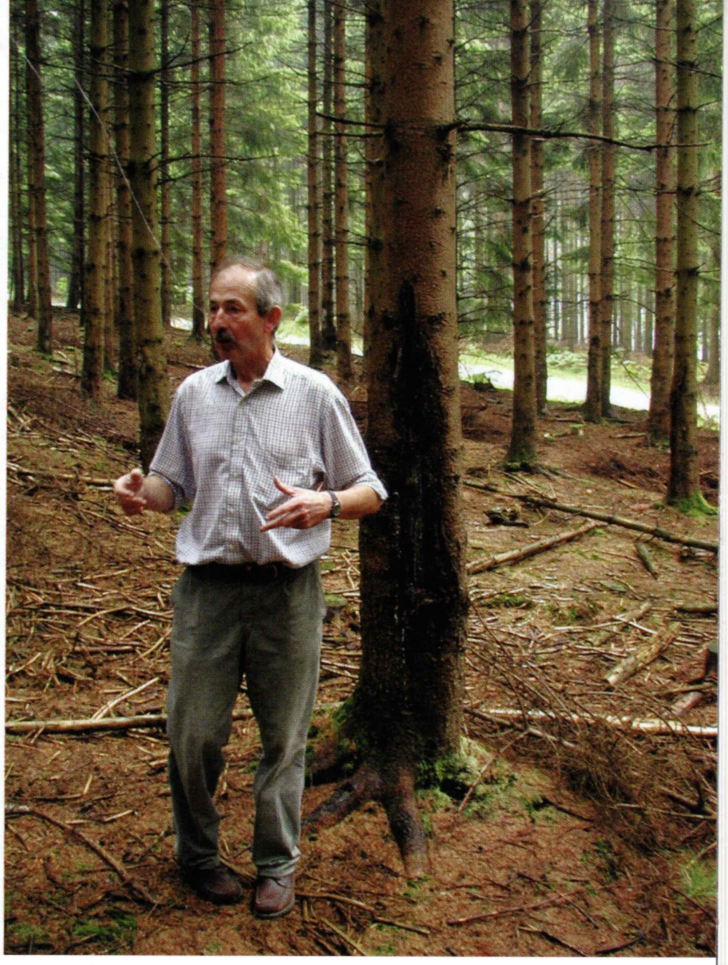
It is now believed by many scientists that warming temperatures in the future will render many of the lowland areas inhospitable to spruce. Moves are afoot everywhere to manage existing stands so as to boost representation of silver fir, oak, and beech, depending on the local situations. Add to this a growing distaste for monocultures and plantations on ecological and aesthetic grounds among the public and many landowners, and a wave of "nature-based forestry" is taking hold in many places. Studies confirm that these conversions can be profitable, even though future growth rates go down. The reason is that to make space for the oaks and beeches, they accelerate the planned cuts of the heavily stocked and large trees, which are very valuable. These large trees are gaining very low value increment relative to their own stumpage values. So, there is something to be said for past management methods after all!

Another aspect of climate change is noteworthy as it relates to Norway Spruce: In southern Sweden, long term measurements show increasing growth rates in spruce stands. This is attributed to atmospheric nitrogen deposition from the 1950s to the present.

Clearly, though, just as in American forestry, there has been inadequate effort in Europe to build experience in establishing mixed stands that would sustain productivity and also meet other important forest values. The few available studies suggest significant gains are possible. Plenty of negative experiences with mixtures are cited by foresters, but a general mood of discouragement has set in far too early for my taste.

When the older stands were planted, competition for land and the need for wood placed a premium on high annual growth rates. But now, production and financial goals are being de-emphasized. Perhaps it's a good thing, then, that the German foresters seem to have convinced people that annual returns of 1 to 2% are good business when it comes to forests.

I have visited Norway Spruce stands in Ukraine, many a century old, on steep slopes, going back to the old Austro-Hungarian days. I came away thinking that many of spruce's perceived problems were in fact self-inflicted by the humans who cultivated these stands. Managing monocultures on steep slopes where partial cuts are difficult, keeping them heavily stocked and holding them for 120 years – as is fundamental to German forestry – is a splendid recipe for insect and disease problems. A Europe-wide enthusiasm for "continuous cover forestry" is also part of the story. The fault is not in the spruce. Many Ukrainian foresters say they want to mix up



Clockwise from top left: A stand of Norway Spruce. Forester Charles de Harenne, with Norway spruce on family estate near Stoumont, Belgium. Beautiful Norway spruce logs, Ukrainian Carpathians, 2008. Professor Ihor Soloviy of University of Lviv Forestry College on right. Unfortunately, this beautiful wood was run through a substandard mill producing poor quality lumber. One reason why Ukraine exports a lot of its logs to Turkey where presumably they know how to make lumber. Portland's 2019 Norway Spruce Christmas Tree."

forest composition a bit and also move to all-age Swiss style silviculture. But it is not clear to me that Ukraine can afford the front-end costs of these conversions, the lower growth rates, and the higher logging costs this would entail.

Norway Spruce responds well to thinnings, as Klaiber's results show, and as validated by a century or more of German practice. It can regenerate abundantly in its own shade if given a bit of light. It is possible that for generations, the German and Austrian foresters never saw natural regeneration because they kept their stands with such tightly closed canopies that no light reached the ground to allow seedling survival.

Windthrow can afflict Norway Spruce, especially on thin soils. Also, I suspect, when the spruce is kept to ripe old ages. I was told in the Foret de Haye, near Nancy, in France, that Norway is no longer planted due to this issue. In the US, white pine weevil attacks Norway Spruce. A Canadian study, however, showed lower damage with stands on the higher sites. On balance, most writers seem to agree that Norway does not suffer notable insect and disease risks.

## Imports and Reasons Why

During the housing recovery of the early 00s, strong demand and the import duties on Canadian spruce led lumber distributors to look closely at Norway Spruce from Europe. It was already going to world markets elsewhere. Western Europe and Scandinavia had large, modern mills and could readily grade to NELMA standards. The mills had plenty of logs, of large size and high quality, that any Maine millowner would kill for. More wood was coming west in the wake of the collapse of lumber demand in the late and unlamented USSR. I once saw Norway Spruce in a log cabin plant in New York, and I could buy it in a lumber yard in Monmouth, Maine, a few miles from our home. The folks in Monmouth told me that local builders paid a premium for the European stock – its quality was head and shoulders above eastern SPF in terms of straightness, knots, and absence of wane. (Sometimes you wonder if the Germans even know what wane is – perhaps it's illegal there!) Part of this superior quality is down to high quality manufacturing and drying. The negligible wane is made possible by the larger log sizes than we enjoy in the Northeast US. Klausner, a leading Austrian lumber company, now operates two dimension mills in the US South. As of 2008, they had been selling 50% of their European production in the US.

By the mid 00s, three times as much European spruce was coming into the US as Maine could turn out running its mills flat out. But by 2005, the housing peak was reached and construction collapsed, so the US used a lot less softwood, produced less, and bought less from others. In 2005, imports of softwood from Europe, mostly Norway spruce, exceeded $900 million; this fell to $65 million by 2010, but rebounded to reach $632 million by 2018.

## Exotics Issues

I was once working on a certification team for a large northeastern landowner who had been planting Norway Spruce and liked its yields very much. We were discussing issues with a group of ecologists, who raised the issue of "Exotic" Norway Spruce, which they did not like at all. I was completely surprised. An exotic? Where I grew up in the Midwest, you see it everywhere, often on farmsteads in shelterbelts, in front yards and small patches here and there. It is described as "naturalized" in some of the handbooks. Is Norway Spruce invasive? That is, does it spread and suppress native ecosystems? For years, I never noticed the species to reproduce outside of its plantings. More recently, I have seen that it does. Most agree, though, that when this occurs it does not take over adjacent sites. An exception does exist in Massachusetts where it is taking over frost pockets inhabited by an endangered plant.

**"WE CAN NOT AFFORD TO DISREGARD A TREE CAPABLE OF ATTAINING MAGNIFICENT FORM, PRODUCING PULPWOOD FROM THINNINGS AT 30 YEARS, AND LESS AN EXOTIC THAN NATIVE SPRUCE FROM PARTS OF THE LAKE STATES REGION. IT CAN PLAY AN IMPORTANT PART IN OUR FORESTRY."**

**Prof. R. I."Pop" Ashmann**
**University of Maine**
(from undated research note, likely written in the '60s)

This is a large subject. Certainly, some serious empirical research on the "exotic" issue is warranted, both to guide managing existing stands, and to make decisions about planting more. The long-standing and widespread presence of Norway Spruce as a street and yard tree, and even on wildlife refuges and parks, suggests that if adverse impacts existed, they'd have been noticed by now.

## Potential for Future Wood and Other Uses

I believe the productive potential of Norway Spruce is great, and not just for Christmas trees. We are wasting potential for value growth by lax management of existing stands on good sites. Good guidance can now be found in the forestry literature. We are missing chances to develop productive mixtures, and also chances to expand the tree's use in applications such as shelterbelts and living snow fences. Pennsylvania forester Gary Gilmore reports positively on his experience growing Norway spruce on old coal mine spoil banks – surely a hostile site if there ever was one. While the great days of planting in the North are now over, there remain bits and patches of arable land here and there, and landowners who would like to plant. Even in Maine's largely de-industrialized ownership pattern, owners are planting thousands of acres per year, stubbornly clinging to species with less value growth potential than the Norway can offer. Reasonable accommodations to concerns about monoculture are limited only by our own imaginations. Whatever direction the forestry community and landowners want to take, however, this naturalized species is with us. Google "Norway Spruce" and you'll see dozens of local nurseries wanting to sell you some.

I would answer the question in the title of this essay with "both!" Norway Spruce is Christmas tree and timber material, as well as many other things. Which is what makes forestry so interesting, right? NL