A Visit to Finland - An Opportunity to See with "New Eyes"

by Thomas D. Landis and R. Kasten Dumroese

Last August, we were invited to Finland to attend the 40th anniversary of the Suonenjoki Research Station. The small town of Suonenjoki, located in the Lake District of south-central Finland (Figure 1A**)**, is home to one of 8 research stations of the Finnish Forest Research Institute. Dr. Marja Poteri helped us get through the governmental paperwork, made local arrangements, and was the consummate host and local guide. The trip would not have been possible without the financial support of Dr. Heikki Smolander who, in addition to being the station director, takes an active role in research projects.

"Suomi maailman huippua taimitutkimuksessa"

Suonenjoella vierailut, maailman johtavin taimitarha- ja metsänuudistamistutkijoihin lukeutuva yhdysvaltalainen Tom Landis ihasteli suomalaisen metsäntutkimuksen tasoa.

Yhdysvaltain metsähallinnosta eläkkeelle ja konsultiksi siirtynyt Tom Landis osallistui seuraajansa, tutkija Kasten Dumroesen kanssa Suonenjoen tutkimusaseman 40-vuotista taivalta juhlistaneeseen seminaariin. Taimitarhojen ja taimitarhatutkimuksen toimintaedellytykset mielsivät kotimaahan Yhdysvaltojen lähestymiskoilla ovat muuttuneet.

"Taimitarhat ovat saaneet rahoituksessa liittovaltion metsien hakkuutuloista. Oregonissa valtion metsien hakkuut ovat romahtaneet 1980-luvun vajaasta viidesti nykyisestä konifeerietsiä kymmenen osaan. Taimien kysyntä on jopa pudonnut vielä enemmän, koska istutuksesta on päätetty luopua suuressa suhteessa", Landis selvitti.

Hakkuita on rajoitettu kiristyneiden suojelu-vaatimusten vuoksi. Kokonaisuudessaan länsimaisen hakkuut eivät ole vähentyneet siitä voimakkaasti. Muut metsäomistajaryhmät ovat lisänneet puunkorjuuta.

Dumroese kertoo, että jäljellä olevat liittovaltion taimitarhat ovat keskittyneet paljolti luonnonvaraisten pensaiden ja heinien tuottamiseen.

"Liittovaltion metsistä on siirrytty metsänhoidosta on siirrytty metsäluonnon ennallistamiseen."

"Ei meillä ole näin hienoja laitteita"

Michet ihastelivat suomalaisen metsäntutkimuksen puitteita.

"Ei meillä ole näin hienoja laitteita, vaikka tulemmekin ilmeisin maailman mahtavimpana pitävästä maasta. No, ehkäpä kaikki Amerikan rahat menevät Irakiin", Landis heitti.

Michet kiittelivät myös suomalaisten metsäntutkijoiden tulokset. Muun muassa keskitutkinta tutkineen **Jaana Luoranen** työt saivat ameerikkalaistutkijat vaikuttuneiksi.

"Taimi- ja metsänuudistamistutkimuksenne on maailman huippua. Seuraan eri puolilla maailmaa tehtävä tutkimuksia. Esimerkiksi Ruotsissa ei julkaista läheskään yhtä paljon kuin täällä."

"Äitkää heitelkö taimitaatikoita"

Landisin mukaan taimitutoisto ja metsänviljely Suomessa vaikuttaa helpolta Amerikan länsimaikkoon verrattuna.

"Ensimäkin teillä on vain muutama kasvallisesti tärkeä puulaji. Meillä erät tarhat tuottavat jopa 300 eri puulajin taimia."

Myös olosuhteet ovat meille suuria haasteet. Tärkeimmät – kesäkuivuus – kostut kesät luovat taimille otsiljaet kasvuolosuhteet.

"Meillä ei voisi minnään tapauksessa käyttää noin pienipuukuisia taimia kuin täällä. Ne kuivuisivat ennotta."

Myöskään meillä parhaaksi maatmoukkommenerotmiksi osoittautunut määräys ei Oregonin maisemissa luonnisi.

"Teillä on kylmät, kostut maat, ja määräykselllä luodaan ympäristöään ilmpenkepi kasvuympäristö taimien juurille. Meillä taimet pyritään istuttamaan mahdollisimman kylmään maahan, jotta ne eivät lähäbtyisi."

Yksi yhteinen ja suoraan myös meillä käytäntöön sovellettava asvo metsänviljelyn varmistamiseksi Landisilla oli. Hän korosti, että taimien huolellinen käsitely markalla taimitarhalta istutusalalle ratkaisee pitkälti istutuksen onnistumisen.

"Mitä enemmän taimia siirrellään ja käsitellään, sitä enemmän ne stressaantuvat ja menettävät juurtumiskykyään. Meillä tehtiin

Yhdysvaltalaiset taimitutkimuksen huippuosaajat Tom Landis ja Kim Dumroese ihastelivat suuruisiaisen metsätutkimuksen puitteita ja tuloksia.

tutkimus, jossa taimilaatikkoa pudotettiin toistuvasti metrin korkudelta maahan. Taimien juurtumiskyky verrattuna heillävienen käsittelyihin taimin heikkeni merkittävästi."

Teksti ja kuva
MIKKO RIKKILÄ

Figure 1 - The Suonenjoki Research Station is located in southcentral Finland (A), and is their center for nursery and reforestation research. Our interview in the national forestry magazine (B) shows the importance of nurseries and reforestation in Finnish life.

Our visit began with a reception and tour of the research station that, in addition to state-of-the-art laboratories and research equipment, also has large production greenhouses. These facilities allow researchers at Suonenjoki to "ramp-up" research done in small growth chambers to the operational level. These exceptional facilities and caliber of the scientists make Suonenjoki a world-class research institute.

We've both traveled extensively but it was nice to visit a country like Finland where forestry is a major industry, and nursery and reforestation research are so well-supported. This was evidenced by an interview with the national forestry magazine where they were interested in our impressions of Finland's nursery and reforestation program (Figure 1B).

After giving presentations at a research symposium, we were escorted on a field trip of forest nurseries and outplanting sites. We would also like to express our gratitude to all the nursery managers: Anne Immonen and Riitta Väisäinen at the UPM nursery in Joroinen, Jari Peteri of the Fin Forelia Saarijärvi nursery, and Markku Räsänen of the Tuomiahon Tamaisto nursery. It was a great learning experience for us to observe nursery practices with "new eyes". Each of these nurseries was very well run, and the color and quality of seedlings appeared to be very good. We were impressed by the coordination between the operational nurseries and Suonenjoki Research Station, which is an excellent example of how technology transfer should work.

Of all that we saw and experienced in our short visit, we were particularly impressed by the following 3 nursery cultural practices which we thought were worth sharing:

1. Problems with "holdover" nursery stock - We've preached for years about the dangers of holding plants over from one season to the next in the same containers. These holdover plants have shoots too large for their root systems, which become woody and "rootbound". One concept that we stress during training sessions with novice growers is that nursery plants, like all perishable products, have a "shelf-life" and should be shipped and outplanted by their "expiration date". If that's not possible, plants should be transplanted to larger volume containers or to bareroot beds where they can be grown as plug transplants.

Very little research has been done showing the hazards of outplanting holdover stock. Therefore, we were excited when Dr. Risto Rikala presented data from Sweden at the research symposium which demonstrated that outplanting performance suffers when nursery stock has been held too long in the container (Figure 2).

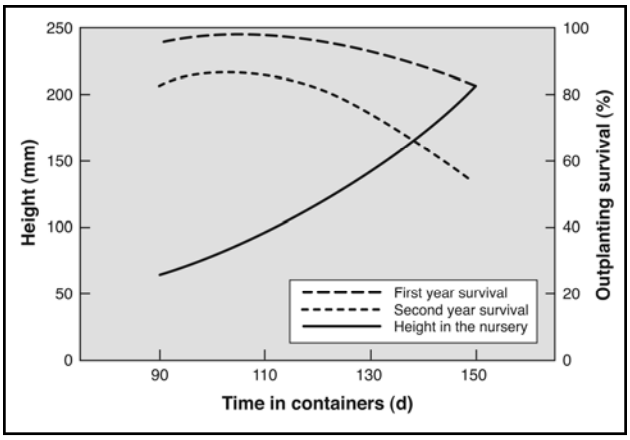

Figure 2 - Because it becomes "rootbound", the quality of "holdover" nursery stock is severely reduced. Work done in Sweden shows that survival is significantly reduced for several years after outplanting (courtesy of R. Rikala).

2. Rehydrating nursery stock before outplanting - It only makes sense to send nursery stock to the field fully-hydrated to minimize moisture stress after outplanting. However, after harvesting, nursery storage, shipping, and on-site storage, plants undoubtedly suffer some amount of desiccation. We discussed the benefits of root dipping bareroot stock in the Winter 2006 issue of FNN, but we have wondered why no research had been done with container plants.

To test the benefits of watering plants before outplanting, Jaana Louranen and her colleagues at Suonenjoki set-up a research trial with silver birch (*Betula pendula*) container stock that was hot-lifted and outplanting during summer (Luoranen and others 2004). You would think that this would increase post-planting moisture stress because the birch seedlings would be in full leaf. However, they found that survival and growth was significantly improved when the moisture content of the root plugs was greater than 30 to 40% (Figure 3). A companion study with Norway spruce (*Picea abies*) showed that it is possible to plant spruce container seedlings in summer as long as they are well watered before planting (Luoranen and others 2006). Dr. Juha Heiskanen and Risto Rikala investigated the water relations of irrigating plugs before outplanting and found that dry container plugs actually absorbed water from the surrounding soil, whereas wet plugs had significantly better root egress (Heiskanen and Rikala 2000).

3. Widening outplanting windows with container stock - An outplanting window is defined as the period of time during which environmental conditions on the project site favor survival and growth of nursery stock. The start and end dates are constrained by limiting factors of the environment on the planting site. Soil moisture and temperature are the usual constraints on most sites and therefore, in most of the continental US and Canada, nursery stock has traditionally been outplanted during late winter or early spring when soil moisture is high and evapotranspirational losses are low.

In Finland, seedlings have traditionally been stored under refrigeration or outdoors under snow and then outplanted while still dormant during May and early June. With such a short outplanting window, it is often difficult to get all the seedlings in the ground. In addition, more and more nursery stock is being planted mechanically due to the high labor costs and a wider outplanting window would make mechanical planting more economical. So, Finnish researchers have been conducting outplanting research on hot-lifted Norway spruce and silver birch for several years (Louranen and others 2006).

To investigate the effect of drought on outplanting performance, hot-lifted Norway spruce seedlings were subjected to up to 6 weeks of water stress in a research plot (Helenius and others 2002). They found that hot-lifted stock with wet plugs that were outplanted in July had better root egress than those planted later that year or stored and outplanted the following spring (Figure 4).

Amazingly enough, summer outplanting has even been successful with silver birch plants that were leafed-out and actively growing. When container birch seedlings were outplanted in mid-summer, they survived and grew

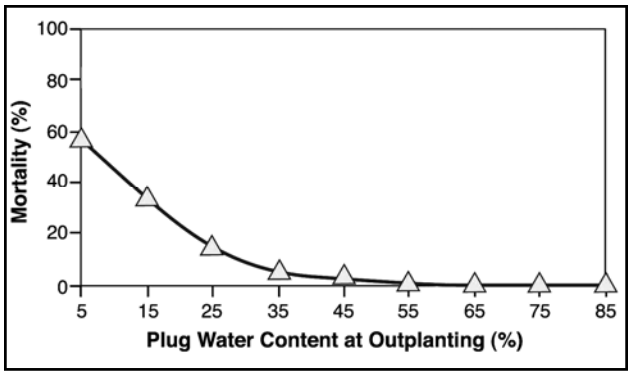

Figure 3 - The relatively simple procedure of fully-hydrating root plugs immediately before outplanting has proven beneficial for hot-planted silver birch (modified from Luoranen and others 2004)

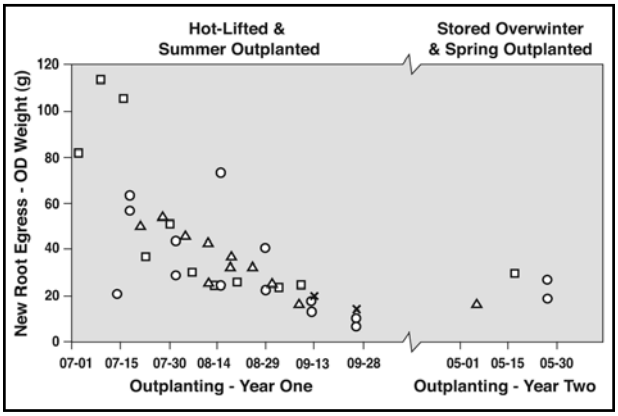

Figure 4 - The rapid outgrowth of new roots ("root egress") is critical for survival and growth after outplanting. Hot-lifted Norway spruce outplanted in early summer had more root egress than those planted later that year, or even overwintered stock planted during the traditional spring outplanting window (modified from Louranen and others 2006).

as well as those planted during the traditional outplanting windows. This was attributed to warmer soil temperatures that stimulated high root egress and rapid establishment (Luoranen and others 2004).

Of course, summer outplanting should only be attempted on appropriate sites without extended drought conditions but these experiences support the notion that well-conditioned container stock with fully hydrated root plugs may have a wider outplanting window than originally thought.

Summary and Recommendations

We feel that growers and seedling users in North America could learn some things from our Finnish friends:

1) Avoid holding-over container stock. Either plant it at the proper time, or transplant it into larger containers or bareroot beds.

2) Make sure that root plugs of stock shipped to the field are at field capacity. Nursery managers should ensure that their stock is fully hydrated before processing and that roots do not become desiccated during storage or shipping. Nursery customers should consider watering their plants during "on-site" storage, and encourage planters to minimize root exposure during outplanting.

3) Consider broader outplanting windows with container stock. Summer planting on sites with adequate soil moisture and low evaporative demand or those that receive summer precipitation has several advantages, including improved seedling survival growth and serving to "even out" nursery and outplanting scheduling demands.

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