## A Tribute: Robert John van den Driessche, Tree Physiologist, 1933-2018

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A Tribute: Robert John van den Driessche, Tree Physiologist, 1933-2018

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Abstract:
Robert (Bob) John van den Driessche passed away on July 19, 2018 leaving a legacy of research in tree physiology and nutrition that will continue to influence forest regeneration in British Columbia for years to come. This tribute outlines Bob’s career in the context of forest history in the province, and the many significant contributions Bob made to our understanding of conifer seedling nutrition and stress tolerance.

Keywords:
Tree physiology, tree nutrition, forest regeneration, forest nursery practice, obituary
Robert John van den Driessche was born in Worcestershire, England in 1933. He attended
Rendcomb College, a progressive boarding school for boys, in Gloucestershire from 1945-1952,
and after National Service in the Suez Canal zone in Egypt, spent three years at the University
College of North Wales, Bangor, graduating with a B.Sc. in Forestry in 1957. He then moved to
the University of Toronto and obtained a M.Sc.F. in 1958 under the co-supervision of Profs. Ken
Armson (Order of Canada) and Jack Farrar. Robert conducted his PhD work in tree seedling
physiology with Prof. Philip Wareing, OBE, FRS at the University College of Wales,
Aberystwyth during a two-year leave from the B.C. Forest Service, and obtained his doctorate in
1965.

Robert (“Bob”, to his colleagues) joined the B.C. Forest Service Research Division in 1959 as a
nursery practice research officer, and was the second research scientist in Canada to work full-
time on stock production (Glerum 1990). Bob began his career working out of the Mesachie
Lake Research Station, an active centre of forest research. His appointment was part of a wave of
new personnel hired after the 1956 Sloan Report criticized the B.C. government for its poor
performance in forest regeneration. In his Royal Commission Report, the Honourable Gordon
Sloan stated that the 7 million trees planted on the coast in 1955 were totally inadequate (Sloan
1956). Furthermore, almost all of the trees planted at that time were a single species, Douglas-fir.
Sloan suggested an annual planting program of 38.4 million seedlings was required to meet
reforestation needs and to reclaim the backlog NSR (not satisfactorily restocked land) on the
coast (Brown 1995). Forestry research had been hard hit by the depression and by World War II,
and there were few resources allocated to forest regeneration challenges (Schmidt and Parminter
2006). To address the concerns, the B.C. Forest Service expanded research in forest regeneration
and tree breeding in the late 1950s (Schmidt and Parminter 2006) and Bob was recruited as part
of that expansion.

Bob and his colleagues faced a considerable challenge. Despite Sloan’s objective of 38.4 million
seedlings, by 1962, on average only 6.9 million 2-0 Douglas-fir seedlings were grown each year
(van den Driessche 1963), and survival was poor. All planting stock was bareroot stock, and
seedling size and quality were highly variable (van den Driessche 1963). Nursey locations were
not chosen for soil quality, and the lack of soil nutrients, poor drainage and unsuitable soil pH negatively affected seedling quality (B. Devitt, Aug. 7, 2018, pers. comm.). Bob tackled the challenge head-on, preparing a report on optimal sowing times in 1962 (van den Driessche 1962), and publishing his first manuscript on nursery experiments with Douglas-fir in 1963 (van den Driessche 1963). This paper outlined improved sowing density and fertilization practises, leading to increased seedling size - themes that resonated throughout his work for five decades.

Seedling production in the province increased slowly in the early 1960s, with only 18 million seedlings grown by 1965. That year, an annual target of 75 million seedlings was adopted (Brown 1995). In response, Bob accelerated his work to improve nutrient availability in nurseries (van den Driessche and Wareing 1966, van den Driessche 1968), and by 1969, he had acquired a sufficient body of knowledge to publish the first British Columbia Forest Nursery Handbook (van den Driessche 1969). This publication characterized Bob’s approach to practical problems, where he designed experiments based on a thorough understanding of the literature and sought to understand the physiological mechanisms underlying seedling response to experimental treatments. The results were recommendations based on physiological principles, backed up by experiments and scientific literature, for all aspects of seedling production - from stratification and sowing through to dormancy and lifting. This handbook led the field in North America for many years and was not supplanted until the USDA Forest Nursery Manual: Production of Bareroot Seedlings was published in 1984, in which Bob wrote the chapter on soil fertility (van den Driessche 1984a).

Bob’s early work focused primarily on improving the quality of bareroot seedlings, particularly Douglas-fir and Sitka spruce. By 1970, however, there was a growing appreciation that bareroot stock production could not meet the annual goal of 75 million seedlings and a move to container stock was advocated (Robinson 1970). Collaborative studies between the B.C. and Canadian Forest Services investigated the “BC/CFS STYROBLOCK” system (Robinson 1970). Growing tree seedlings in containers presented very different issues from field-grown bareroot stock, including restricted rooting volume and inconsistency of nutrient supply. Bob’s was amongst the earliest published research on container seedling nutrition (Brix and van den Driessche 1974), which was, in part, based on his earlier work, and he continued to study and compare nursery
practises for both container and bareroot stock over the ensuing years (e.g. van den Driessche 1982, 1988a, 1992). In 1970, the Forest Service Research Branch Laboratory was constructed on North Rd. in Saanich, including greenhouse and laboratory facilities and a plant physiology nursery (Schmidt and Parminter 2006) and Bob was active in the design and utilization of this facility.

Bob is best known for his extensive work on tree seedling nutrition. Nitrogen, phosphorus, and potassium are the primary elements applied by all nurseries, and Bob studied all aspects of frequency and rate of application (e.g. van den Driessche 1984a, 1984b, 1989), and formulation of these elements (e.g. van den Driessche 1988a) for tree seedling crops grown in B.C. Bob investigated optimal foliar concentrations for most essential mineral elements to maximize seedling growth and survival (van den Driessche 1974, 1980, 1988b, 1989) and his most highly cited paper is on the prediction of mineral nutrient status of trees by foliar analysis (van den Driessche 1974). He published more than 25 papers on tree nutrition and fertilization, and contributed a chapter on nutrient storage and retranslocation in “Nutrition of Plantation Forests” (Bowen and Nambiar 1984). His interest in the subject culminated in his editorship of the book “Mineral Nutrition of Conifer Seedlings” (van den Driessche 1991). This text presented the most current research in the field, including several chapters by Bob and co-authors (including his wife, Pauline, an internationally renowned mathematician).

A concern often related to nursery practises is the effect fertilization may have on seedling phenology, cold hardiness and drought hardiness. Bob studied the interactions of fertilization, and drought and cold tolerance, demonstrating that N and P fertilization had no significant effect on cold hardiness (van den Driessche 1980) when the fertilization regime was well synchronized with the phenological development of the seedlings (van den Driessche 1984a). Bob published more than 15 papers on seedling drought and cold tolerance, including experiments testing new methods of cold hardiness assessment (van den Driessche 1973, 1976).

In addition to seedling nutrition and fertilization, Bob continued his work on bareroot production practices, including work on root wrenching, several papers on seedbed and growing density, and studies on the timing of lifting. He also published several papers on the physiology of rooted
cuttings, the effects of soil compaction and a number of papers on basic processes and
mechanisms of seedling growth. The foresight of the B.C. Forest Service to combine the
knowledge of seedling physiology and nursery cultural practices gained through Bob’s work and
that of others, with an aggressive program of tree improvement contributed to the high seedling
survival (> 85%, Brown 1995) and growth rates achieved in B.C. by the late 1980s.

In 1997, Bob retired from his position of Senior Tree Physiologist with the Ministry of Forests,
only to turn to greener research fields. He founded New Dendrology Inc. and continued to work
as an independent research consultant, mainly with poplar in Alberta. Bob wrote or co-authored
12 papers between 1997 and 2008 on the physiology and nutrition of poplars. During that time,
he was an Associate Editor for the journal New Forests and continued his teaching and service
contributions to the University of Victoria Centre for Forest Biology until 2013.

Bob was a pioneer in the field of tree physiology, particularly tree seedling nutrition. The volume
of his work is impressive, with over 65 papers in the primary literature, 10 government reports
(more than half being single-author contributions), plus symposium proceedings. Bob was
internationally respected and his impact is clearly evident, with more than 1230 articles by other
authors citing his work (Web of Science, Aug. 8, 2018). His papers are notable for their
thoroughness and attention to detail, their strong experimental design (a feature about which he
was adamant) and for their practical application to the forest nursery industry. As a B.C.
Registered Professional Forester, Bob was keenly aware of the applied nature of his work, but
his interest in the physiological mechanisms underlying seedling response to experimental
treatments was consistently demonstrated. His work is an outstanding example of how an
understanding of basic science can improve solutions to practical problems and continue to be
applied over decades. Applied work of this nature is unlikely to be conducted in academia, but is
too academic for industry and epitomizes the value of investment in long-term government
research programs. Bob’s dedication to his work and to improving forest regeneration success
shine through his impressive body of literature. The testament to his efforts is the ranks of young
trees growing vigorously across the green slopes of coastal British Columbia.
Acknowledgements:
With thanks to the colleagues and family members who provided information, recollections and suggestions for this tribute, including Mr. Bruce Devitt, Mr. Ev Van Eerden, Dr. Kevin Brown, Dr. Sylvia L’Hirondelle and Dr. Pauline van den Driessche.

Photo credit: Dr. Sylvia L’Hirondelle

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