



Working Party of the International Poplar Commission Gathers in New Zealand

Environmental Applications of Poplars and Willows

Jim Richardson, Technical Director, Poplar Council of Canada

Environmental uses of poplars and willows are presently attracting considerable interest to a field of application for the Salicaceae which is relatively new but growing. This is demonstrated by the activities of the youngest Working Party of the International Poplar Commission (IPC), 'WP6 Environmental Applications', which was formally ratified in 2004. The Working Party has met regularly, most recently in March 2014 in Gisborne on the North Island of New Zealand. It was a small gathering with only about 30 participants, most of who were from New Zealand. There were two Canadians (Jim Richardson and Cees van Oosten), as well as other international participants from Estonia, the Netherlands, Sweden and the USA.

The meeting included a full day of technical presentations, followed by two days of field tours in the surrounding area. Of the 18 technical presentations, two-thirds were given by New Zealanders, primarily from the agriculture sector, discussing the use of poplars and willows in combating soil erosion in the pastoral hill country of New Zealand (Figure 1).

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Planting trees is not universally endorsed by New Zealand farmers as being beneficial to sheep and cattle, many still adhering to the belief that anything that might hinder maximum pasture yields is to be avoided. The presentations and discussion illustrated that this difference of opinion exists, but the workshop participants themselves were quite convinced of the benefits.

The international presentations covered a range of topics from the environmental impact of short rotation forestry on water and soil, to the impact of biogas digestate application on young short rotation willow ecosystems, endophytes for increased rooting and better growth, and the search for grey poplar clones that propagate easily. There was also a presentation on the newly-published book on 'Poplars and Willows: Trees for Society and the Environment', which is discussed in more detail in a separate article in this newsletter. Unfortunately, there are no plans for publishing the proceedings of the workshop; though the full list of workshop presentations as well as abstracts of individual papers are available on request from the author of this article (jrichardson@on.aibn.com). Gisborne is the easternmost city in New Zealand, in fact the easternmost city in the world, being situated just west of the International Date Line. It promotes itself as the 'First place to see the light'. Gisborne is also the site where Captain James Cook first landed in New Zealand, at Poverty Bay, in 1769, an event that is commemorated with a statue on the waterfront (Figure 2). However, the first meeting with the Maori turned nasty after the killing of several Maori by Cook's crew, which hurriedly left the area without fresh provisions, hence the name 'Poverty Bay'. The surrounding countryside close to the city is one of the prime parts of the country for vineyards and for growing citrus fruit. Of more interest to the IPC group, however, was the extensive pastoral farming throughout the Gisborne region in which poplars and willows have an important role to play.

New Zealand is a young country geologically and once the original cover of native woody vegetation has been removed and replaced by predominantly grass cover for pastoral farming, the steep slopes with unstable soils are highly susceptible to erosion. The Gisborne region is particularly prone to such erosion, exacerbated from time to time by tropical cyclones (equivalent to North American hurricanes) which bring very heavy rainfall over a short period of time. Cyclone Bola in March 1988, which brought more than 900 mm of rain, caused considerable flooding, soil erosion and sediment deposition, the memory of which was clearly evident among local farmers and others concerned with the land.

Poplars and willows are not native to New Zealand but have been widely planted since the first European settlement 150 years ago. One of the most favoured poplar clones was the Lombardy poplar (*Populus nigra* 'Italica', a male clone). Its narrow fastigiate form was thought to minimize the impact on forage production. The use of this clone has been discontinued due to disease issues. Another poplar species planted extensively was the white poplar (*Populus alba*). It fell out of favour due to its extensive spread through spontaneous root suckers, causing a decrease of forage production. However, its drought resistance and ability to spread from the root system makes this species very suitable in erosion control. When poplar diseases appeared (*Melampsora* leaf rust) many years ago,

willows were successfully used instead. Currently, there are a number of new and resistant poplar clones, mainly *Populus deltoides*, available for use.

The first field day of the workshop featured visits to two different hill pastoral farms where the owners had been planting poplars and willows for many years as a means of controlling erosion and providing shelter, as well as fodder (from the leaves) during dry periods, for sheep and cattle (Figure 3). Willow is preferred for creek beds and poplar for ridge tops. The presence of livestock means that the trees are planted as ‘poles’, typically 3 m long and with a basal diameter of 55-70 mm, sharpened with a slant cut at the base so they can be driven into the ground and resist rotation by the wind. Shelters are also sometimes used until the trees become well established. The production of such poles is obviously expensive, but in the good growing conditions of New Zealand, planting material of that size can be produced in two (or sometimes three) years. Farmers can buy poles from local nurseries run by regional governments, or in some cases they have their own nursery.

Management of the planted trees often involves regular topping or pollarding to keep the trees from growing too big and reducing forage production. Such cutting can also provide supplemental fodder for livestock. The amount of work required to establish and maintain beneficial tree cover on pastoral hill farms can be quite daunting for New Zealand farmers raised in a farming culture of maximizing forage production. Farmers who understood and appreciated the environmental and stock-production benefits lamented the difficulty of motivating others to follow suit.

On the second field day, a small regional nursery near Gisborne was visited, from which 10,000 willow and poplar poles were to be harvested later in the year (Figure 4). Recent gully erosion was evident at one end of the nursery. The other visit on the second day was to Eastwoodhill Arboretum, which is reputed to be the largest collection of northern hemisphere tree species in the southern hemisphere. It was started over 100 years ago by a farmer who was passionate about trees and who, over a period of 55 years, brought in about 5000 different species and cultivars of trees and shrubs, transforming a typical, essentially treeless, 135 ha hill farm, into a very attractive woodland that has become a major regional tourist destination. It includes the remnants of an old specimen of *Salix matsudana*, the origin of all willows of that widely-planted Japanese species in New Zealand (Figure 5). Eastwoodhill is now managed by a trust.

One of the workshop presentations described another arboretum – ‘Aspendale’ – near the southern end of the North Island, which is particularly, though not exclusively, devoted to poplars and willows. It was started about 1998 by a then-just-retired poplar breeder concerned to preserve the genetic resources from his breeding program which was threatened by cut-backs in government support. While the Aspendale arboretum was not part of the workshop field visits, the author and a colleague had the opportunity to visit it following the workshop and were impressed by the growth on what is a relatively sheltered, bottomland site with peat soil (Figure 6).

The pastoral hill country of New Zealand has no real parallel in Canada. The climate of the country is somewhat similar to that of Vancouver Island and the Lower Mainland of British Columbia, being mild and strongly influenced by the surrounding oceans, but the vegetation, highly modified from the original native ‘bush’, is quite different from that

part of Canada. As such, it is a very attractive landscape in which to observe the environmental benefits of poplars and willows.

The helpful comments and input of Cees van Oosten, who also participated in the workshop in New Zealand, are gratefully acknowledged. They added greatly to the article.

Fig. 1



Fig. 2



Fig. 3



Fig. 4



Figure 1. Poplars and willows planted on hill pastoral farm. (Note gully erosion)

Figure 2. Capt. James Cook statue, Gisborne, North Island, New Zealand. (Photo courtesy of Cees van Oosten)

Figure 3. Cattle browsing poplar foliage.

Figure 4. 3-year-old poplars in pole nursery.

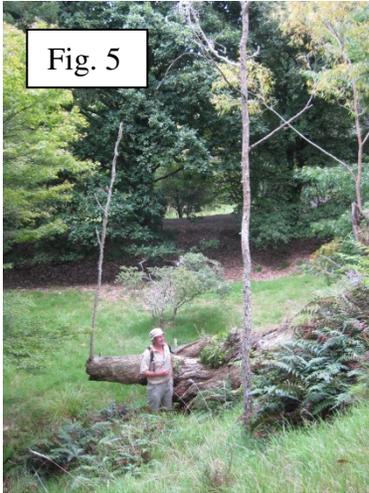


Figure 5. Remnant of original *Salix matsudana* introduction to New Zealand.

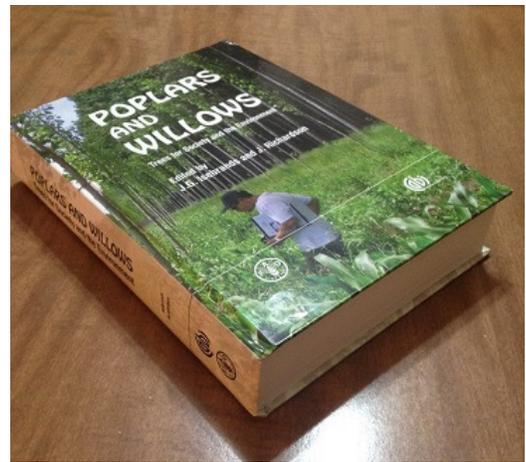


Figure 6. 12-year-old poplars in Aspendale arboretum.

Poplars and Willows: Trees for Society and the Environments

Jim Richardson, Technical Director, Poplar Council of Canada

A new, comprehensive book on poplars and willows has just been published, the result of 12 years of effort by a large number of international experts. The book was originally conceived as a replacement for the FAO publication ‘Poplars and Willows’ which appeared in 1980 and had become out-of-date and out-of-print. The idea for the new book emerged from a meeting of the Executive Committee of the International Poplar Commission which is a subsidiary technical body of the Food and Agriculture Organization (FAO) of the United Nations. The project was sponsored and generously supported by FAO, and the resultant book is a co-publication of FAO and CABI, a UK-based agricultural scientific publisher.



The content of the 13 chapters was prepared by a total of 67 contributing authors from 16 countries and 5 continents under the leadership of about 20 ‘lead chapter authors’ who took primary responsibility for individual chapters. Six Canadians – John Balatinecz, professor emeritus of the University of Toronto and a retired PCC member; Mike Carlson of Vernon, BC (retired from the BC Forest Service); Jim Richardson; Bill Schroeder, Agriculture and Agrifood Canada, Indian Head and a PCC member; Cees van Oosten, SilviConsult, Nanaimo, BC and Vice-chair West of PCC; and Jan Volney, Canadian Forest Service, Edmonton – were among the contributors to the book. The author of this article and his US colleague (and PCC member) Jud Isebrands served as co-editors for

the project, recruiting the lead chapter authors, reviewing and editing the manuscripts of individual chapters as they were prepared, putting together the final complete text and illustrations, and shepherding them through the publication process, which in itself took three years.

‘Poplars and willows...’ by the numbers

Contributing authors:	67
Chapters:	13 (+ 2 Appendices)
Pages:	660
Colour photos:	178
Black and white illustrations:	379
Species range maps:	41
References:	more than 2600
Price (\$US):	\$255

The audience for the book is seen as including both the public and private sectors. It can provide valuable guidance to decision makers and policy makers in forestry, agriculture and environment ministries. It is expected to serve as an encyclopedic reference work on poplars and willows for foresters, ecologists, botanists, agronomists and environmental engineers in both the developing and the developed world. Its scope is certainly worldwide and brings a new focus on environmental uses of the Salicaceae and their role in sustainable rural

development. This focus is reflected in the title of the book: *‘Poplars and willows: trees for society and the environment.’*

The book provides a practical worldwide overview and guide to the basic characteristics, cultivation and use of poplars and willows, as well as issues, problems and trends relating to them. It offers an up-to-date taxonomic classification of *Populus* and *Salix*, though recognizing that, particularly for willows, that must still be a work in progress. The natural occurrence, life history and current status of ecologically important species are described. An overview of domestication and conservation approaches for genetic resources of *Populus* and *Salix* is presented as well as details of domestication and conservation programs in 26 countries worldwide. Current practices in different regions for stand establishment, stand tending and production of poplars and willows are elaborated, identifying practical techniques and successful practices. Substantial treatment is given to environmental applications, including windbreaks and shelterbelts, soil erosion control and riparian culture, land restoration, phytoremediation and other ecosystem services.

Three chapters are devoted to potentially negative influences on poplars and willows. These include abiotic stresses, both edaphic – water deficit, desertification, salinity and nutrient status – and atmospheric – ozone, carbon dioxide, increased temperature and photo-inhibition. Selected important leaf, stem and root diseases are described, as well as disease prevention strategies such as disease resistance, clonal mixtures and biological control. Comprehensive coverage is given to insects and other pests of willows and poplars, including leaf feeders, leaf miners, sucking insects, gall formers, bud and young shoot feeders, wood borers, root feeders, disease vectors and other animal pests, with detailed descriptions of 16 selected examples of major insect pests.

The properties – physical, mechanical, chemical, natural durability, including macroscopic and microscopic wood features – of poplar and willow wood are described, as well as the processing and utilization of the wood in lumber, wood-based composites and panels, glued structural products, pulp and paper, and biomass energy. Overall global market trends in wood products are reviewed with emphasis on poplar and willow resources, and production and trade in products, including the evolution of the poplar

products market in China and Europe, and the economic importance of poplar and willow plantations (with examples from China, Sweden and Chile).

Poplars and willows, wherever they are grown, can have a very important and beneficial role in supporting rural livelihoods and ensuring sustainable development. This is the subject of one of the key chapters of the book, which discusses the whole range of production systems, from natural forests, through plantations (both large-scale industrial and small-scale), agroforestry and bioenergy, to trees without forests. It also highlights the protection of livelihoods through contributing to rural landscapes and urban amenity, and provides 22 case studies from 12 different countries.

‘Poplars and willows: trees for society and the environment’ was published in hard-cover in February 2014. Copies can be ordered from CABI at <http://bookshop.cabi.org>. It is also available in a Kindle edition from Amazon (www.amazon.ca).

Save the Date:

- IPS VI meeting – July 20-28, 2014 – Vancouver, B.C. – organized by Cees van Oosten and the University of British Columbia as the host organization. www.2014ipsvi.com

Annual General Meeting Notice:

Please note that the Poplar Council of Canada will be holding their Annual General Meeting the evening of July 21, 2014 at 5:00 p.m. – 7:00 p.m. in the Ruth Blair C Room at the Gage Residences. At this meeting, a new set of by-laws will be introduced to comply with the transition to the new Canada Not-for-Profit Corporations Act being rolled out in October 2014. As well, there will also be a new name change proposal for the Poplar Council presented at this meeting. All PCC members are encouraged to attend this important meeting.

