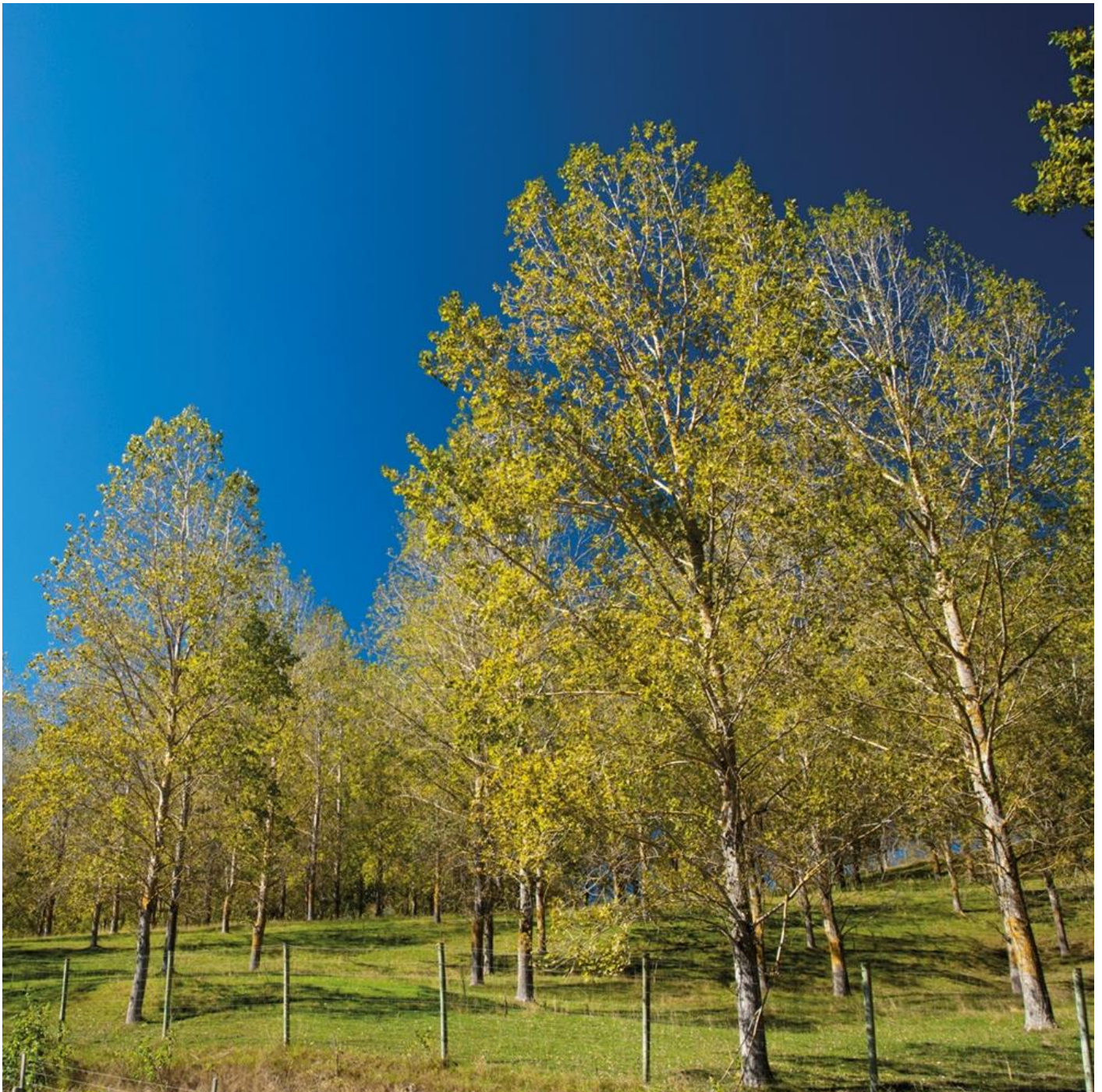

New Zealand NPC (formerly National Poplar Commission) National Report on activities related to poplar and willow cultivation and utilization period 2016–19

Mclvor IR, Jones TH
Plant & Food Research, Palmerston North

April 2020



Report for:

FAO International Poplar Commission

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New Zealand NPC (formerly National Poplar Commission) National Report on Activities Related to Poplar and Willow Cultivation and Utilization Period 2016–2019

Mclvor IR & Jones TH

**26th Session of the FAO IPC
Rome, Italy
October 2020**

**IPC (formerly International Poplar Commission)
26th Session, Rome, Italy**

Activities related to Poplar and Willow Cultivation and Utilisation

NPC of New Zealand

Period 2016–2019

I. POLICY AND LEGAL FRAMEWORK

Changes in the Government research investment process have meant that there has been little opportunity to present research funding proposals to continue our poplar and willow breeding programme. Since 2012 the programme has relied heavily on the financial support of local government (regional and district councils). This support is insufficient to maintain a significant breeding programme.

Despite this, Government attention is focused on erosion control in hill country, (<https://www.mpi.govt.nz/funding-and-programmes/environment-and-natural-resources/hill-country-erosion-programme/>) with a 1BillionTrees Initiative to increase tree planting in all its forms enacted in 2016. This includes encouragement for increased rates of planting of poplars and willows in pastoral land, particularly hill country. It is hoped that this concern will result in additional support for poplar and willow breeding and research.

II. SUMMARY STATISTICS

There is no significant commercial cultivation of poplar or willow for timber, wood products, fuelwood or bioenergy in New Zealand. Planting rates are increasing for environmental purposes; slope and riverbank stabilisation, bee fodder and animal welfare.

Planting rates are low (<1%) compared with commercial forestry. Poplar cultivation in New Zealand is better described as silvopastoralism, rather than agroforestry.

III. TECHNICAL INFORMATION

1. Identification, registration and varietal control

No new poplar or willow clones were commercialised during this period.

2. Cultivation

There has been no change in current practices for stoolbed production of unrooted poles and cuttings, or in plantation practices, from what has been described in previous reports. Planted forests continue to be an insignificant use of poplars or willows in New Zealand. However, new approaches are being tested for establishing unrooted material for erosion control in an endeavour to increase planting rates and reduce sediment transfer to waterways.

Commercial cultivation is dominated by regional councils responsible for environmental management. Within regional councils the general trend is towards expanding nurseries for cultivation of both poplars and tree willows, with some cultivation of osier willows.

3. Selection and Breeding

Poplar selections

Selections of the following **poplar** crosses:

Populus trichocarpa × *P. nigra* PN874 'Blanc de Garonne'

P. trichocarpa × *P. nigra* PN877 'Vert de Garonne'

P. trichocarpa × *P. nigra* PN866 PG2

P. maximowiczii NZ87-008-02 × *P. trichocarpa*

P. maximowiczii NZ87-007-01 × *P. trichocarpa*

P. × euramericana 'Veronese' × *yunnanensis* NZ90-200-009

were planted in wide-spaced field trials on pastoral land in the period 2014–2018. They are being monitored for performance against several widely planted commercial clones, primarily *P. × euramericana* clones.

Willow selections

Selections of the following **tree willow** crosses

Salix matsudana × *S. lasiandra*

S. lasiandra × *S. pentandra*

S. matsudana × *S. pentandra*

and the following osier willow crosses

S. lasiolepis × *S. reichardtii*

S. lasiolepis × *S. viminalis*

S. lasiolepis × *S. opaca*

were planted in wide-spaced field trials on pastoral land and in close-planted riverbank trials in the period 2017–2019. They are being monitored for performance against two commercial *S. matsudana* × *alba* clones.

Two male *Salix matsudana* × *lasiandra* tree willow clones (NZ 03-003-073 and NZ 03-004-022) were released in the winter of 2017 to regional councils for bulking up. The tree willow clones were bred for resistance to the willow sawfly (*Nematus oligospilus*), and have shown tolerance to the giant willow aphid (*Tuberolachnus salignus*). They have bitter leaves and have shown vigorous growth and drought resistance.

Two male *Salix lasiolepis* × *viminalis* osier willow clones (NZ 04-106-026 and NZ 04-106-073) were released in the winter of 2016, to regional council nurseries for local trials and evaluation.

Poplar breeding

Poplar breeding crosses done in 2017 are shown in Table 1. The parents were from sources present in New Zealand.

The seeds of *P. deltoides* × *nigra* cross were recovered from immature capsules (blown off by wind) and germinated on agar plates in tissue culture, then transferred to soil when the leaves and roots had developed.

Table 1. Poplar species crosses that produced seedlings in 2017.

Poplar species	Female parent	Male parent	No. of seedlings
<i>P. deltoides</i> × <i>nigra</i>	PN 909	PN 874	40
<i>P. deltoides</i> × <i>yunnanensis</i>	PN 909	PN 035	90
(<i>P. euramericana</i> × <i>deltoides</i>) × <i>cathayana</i>	NZ 5011	PN 955	44
(<i>P. euramericana</i> × <i>deltoides</i>) × <i>nigra</i>	NZ 5011	PN 874	40
(<i>P. euramericana</i> × <i>deltoides</i>) × <i>simonii</i>	NZ 5011	NZ 81-053-033	156
(<i>P. euramericana</i> × <i>deltoides</i>) × <i>szechuanica</i>	NZ 5011		160
(<i>P. euramericana</i> × <i>deltoides</i>) × <i>yunnanensis</i>	NZ 5011	PN 035	480
<i>P. nigra</i> × <i>cathayana</i>	PN 890	PN 954	24
<i>P. simonii</i> × <i>nigra</i>	NZ 81-053	PN 198	2
<i>P. simonii</i> × <i>nigra</i>	NZ 81-053	PN 874	240
<i>P. trichocarpa</i> × <i>nigra</i>		PN 874	40
<i>P. trichocarpa</i> × <i>simonii</i>		NZ 81-053-033	40
<i>P. trichocarpa</i> × <i>szechuanica</i>			40
<i>P. trichocarpa</i> × <i>yunnanensis</i>		PN 035	200

Willow Breeding

Willow crosses carried out in 2016 (Table 2) were to extend and enrich willow flowering season for the apiary industry and also to enhance resistance/tolerance to giant willow aphid, *Tuberolachnus salignus*, which has become a significant willow pest within two years of its arrival in summer 2014 New Zealand

Table 2. Height growth, flowering period, and percentage of male and female seedlings of the 2016 willow crosses. Different letters represent significant differences among the poplar crosses ($P < 0.05$).

Cross	Species (F × M)	Height (m)	Flowering period	Number of trees	Male (%)	Female (%)
NZ 16-001	<i>S. eriocephala</i> × <i>eriocephala</i>	1.4b	Aug - Nov	118	45	53
NZ 16-002	<i>S. eriocephala</i> × <i>lasiolepis</i>	1.8d	Aug - Sep	40	0	100
NZ 16-006	<i>S. petiolaris</i> × <i>eriocephala</i>	1.5b	Jun - Oct	80	56	39
NZ 16-007	<i>S. petiolaris</i> × <i>lasiolepis</i>	1.7c	Jul - Sep	114	11	82
NZ 16-008	<i>S. tetrasperma</i> × <i>lasiolepis</i>	1.6c	Aug - Oct	70	40	49
NZ 16-003	<i>S. matsudana</i> × <i>lasiolepis</i>	0.6a	Sep - Oct	1	100	0
NZ 16-004	<i>S. matsudana</i> × <i>nigra</i>	2.1e	Aug - Oct	5	20	80
NZ 16-005	<i>S. matsudana</i> × <i>nigra</i>	2.1e	Aug - Oct	6	0	67

Of successful willow crosses carried out in 2017 (Table 3), the early-flowering clones of *S. lasiolepis* and *S. lasiolepis* × *viminalis* were crossed with *S. aegyptiaca*, and *S. tetrasperma* was crossed with *S. lasiolepis* × *viminalis*, to produce some early flowering hybrid willows that may be suitable for bees.

Table 3. Willow species crosses that produced seedlings in 2017.

Willow species	Female parent	Male parent	No. of seedlings
<i>S. lasiolepis</i> × <i>aegyptiaca</i>	PN 697	PN 229	55
(<i>S. lasiolepis</i> × <i>viminalis</i>) × <i>aegyptiaca</i>		PN 229	15
<i>S. tetrasperma</i> × (<i>lasiolepis</i> × <i>viminalis</i>)	PN 392	NZ 04-106-073	38

4. Forest Protection

Not applicable to New Zealand. All plantings are exotic.

5. Logging and Utilisation

Neither poplar nor willow plantings are grown or managed primarily for timber. However, small shipments of poplar were exported to China, often gathered from unmanaged trees. It is difficult to gather meaningful data because of the small scale of logging and the diverse uses.

A series of videos were produced to promote management and utilisation of poplars for multiple uses: soil stabilisation, shade and shelter, stock fodder, and wood products. Poplar wood is an underused resource in New Zealand.

6. Environmental Uses

Poplar and willow use in New Zealand is predominantly for erosion control in pastoral hill country and along river banks. Increased rainstorm frequency has accelerated soil erosion with consequent reduction of water quality. These drivers have prompted increased poplar and willow planting rates.

Animal welfare issues, particularly in relation to shade and shelter, driven by market requirements, are also benefitting planting rates.

Demand for poles, as the primary vegetative propagating mode, is high and demand is difficult to meet. Planting rates were around 200,000 3 m poles per year over the period 2016–19, with a lesser number of 1.5 m stakes (waterway protection and shelterbelt plantings).

IV. GENERAL INFORMATION

1. Administration and operation of the New Zealand NPC

The address for the New Zealand NPC is Plant & Food Research, Private Bag 11600, Palmerston North 4442, New Zealand.

New Zealand NPC operates under the auspices of the New Zealand Poplar & Willow Research Trust which meets twice per year. It does not have representation from central government but does have representation from regional government (both land and river management), landowners, and research institutes.

2. Publications and communications

Jones T and Min Tun K. 2019. Giant willow aphids affect the spring flowering and growth of willow trees. [youtube.com/watch?v=3h_gh3FKhJQ](https://www.youtube.com/watch?v=3h_gh3FKhJQ)

Min Tun K and Jones T. 2019. Host-mediated differences in quantity and chemical composition of honeydew of the giant willow aphid *Tuberolachnus salignus*. [youtube.com/watch?v=3h_gh3FKhJQ](https://www.youtube.com/watch?v=3h_gh3FKhJQ)

Mclvor I, Desrochers V. Tree Willow Root Growth in Sediments Varying in Texture. *Forests* 2019, 10(6), 517

Mclvor I, Douglas G, van den Dijssel C, Hedderley D, Brock S. 2019. Pollarding wide-spaced poplar trees on pastoral hillslopes alters root development. *Agroforest Syst* (2019) 93:2227–2241.

Mclvor I, Hedderley D, Mason K 2020. Effect of pollarding for fodder on fine root dynamics of soil conservation willow trees in New Zealand. *Advances in Environmental Studies* 4 (1), 252-260.

Douglas G, Mackay A, Vibart R, Dodd M, Mclvor I, McKenzie, C. 2020. Soil carbon stocks under grazed pasture and pasture-tree systems. *Science of The Total Environment* 715, 136910. doi: <https://doi.org/10.1016/j.scitotenv.2020.136910>.

Sopow S, Jones T, Mclvor I, McLean J, Pawson S. 2017. Potential impacts of *Tuberolachnus salignus* (giant willow aphid) in New Zealand and options for control. *Agricultural and Forest Entomology*, 19 (3), 225-234.

Our website www.poplarandwillow.org.nz contains numerous reports, videos, fact sheets.

3. Relations with other countries

We exported cuttings of clones of *P. maximowiczii* × *nigra*, and of *P. deltoides* × *ciliata* in 2019 to University of Florida: These clones were bred in New Zealand.

4. Area change in poplar and willow plantings during 2016–19

Annual commercial production and plantings of poplar and tree willow were around 120,000 poles per year and trending upwards. Pole production for slope erosion control comprised 62% poplar and 38% tree willow. Estimates of propagation and planting other than dedicated commercial poplar and willow nurseries are 80,000 per year. In terms of erosion control, the additional erodible land area being protected is of the order of several thousands of hectares, but represents < 5% of sloped pastoral land considered to be needing tree protection. Survival rates of planted material have been measured at 95-70% per annum on a regional basis, survival being mainly influenced by seasonal rainfall. At the production level, availability of nursery irrigation water during the growing season is becoming a limiting factor as it extends the time for pole production by one year.

5. Main cultivars in use in New Zealand

Poplars: _____

Populus × *euramericana* 'Veronese', 'Fraser', 'Weraiti', 'Otahuaio'

P. deltoides × *yunnanensis* 'Kawa'

P. x euramericana × *yunnanensis* 'Toa'

P. x euramericana × *nigra* 'Crownsnest'

P. nigra 'Italica'

P. nigra × *maximowiczii* 'Shinsei'

Willows: _____

Salix matsudana

S. matsudana × *alba* 'Tangoio', 'Moutere', 'Hiwinui'

S. purpurea 'Irette', 'Pohangina', 'Booth', 'Glenmark'

S. schwerinii 'Kinuyanagi'

S. viminalis 'Gigantea'

S. alba var. *vitellina*



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