



From the Project Leader

This winter has been the biggest test for our tree-planting programme since it began just on 50 years ago. The 200mm of rain that fell over a 10-hour period in early July created flood levels to record heights. We know because fallen logs, from the original native bush that covered this land before European settlement, were picked up and washed away. The rain continued on through July, setting a record level of 390mm for the NIWA rain gauge that has measured rainfall here since 1917.

Reflecting on damage control that tree plantings gave us has been worthwhile, as most slope plantings did their job well. Earth flows remained stable where willow and poplar held the ground together. Open slope planting did a good job of limiting damage, although the slope tops where poplars struggle to establish suffered the most damage. The Eucalyptus trees established on the steepest most erodable country after the 1977 winter, out-performed the poplars and held the hillsides very well.

It is interesting to note that of 30 fences damaged, floodwaters caused 20 and hillside slipping caused only ten. This begs the question – where to from here with erosion on hill country? What lessons have we learnt from this event?

I know the Region Council has studied the damage from a helicopter, but as yet we have had no contact on-farm to discuss the success or otherwise of the many years of work and the investment into land care on this property. My concern is that land management undertaken by these large Regional Councils is conducted increasingly from office desks, with little consultation with farmers who are the people actually living the experience on a daily basis.

I hope you find this issue of *PWNNews* of interest and wish you well for the coming year.

Peter Gawith, Gladstone, Wairarapa



Peter Gawith

Progress Report

From Project Manager Grant Douglas, AgResearch, Palmerston North

We're on the "home straight" with our project, which is planned to end in June 2007.

I'm pleased to report that several project components are in their final stages of producing practically useful outputs. For example, the **Planting and Management Plan** for poplar and willow has undergone several revisions in the last few months by a range of regional council staff, researchers, farmers and consultants in the North and South Islands. Most of the recommended changes/additions have been made, and we're now considering options for printing and distribution. It's planned to have hardcopy and electronic versions available, the latter being on the project's website at the top of this newsletter.

Two of the three **economic analyses** are largely complete, and a second draft of a model for a system involving willows for managing dairy effluent, based on the experiences at Sharpin brothers' farm in Otago, has been produced.

Other progress in the project over the last six months has included:

1) **Hogget mating/grazing trial**: Hogget lambing went well at Riverside Farm, despite



Grant Douglas

the very wet weather. Data are being analysed but initial indications are that mating hoggets on willow browse blocks during a dry summer increased lambing % because of an increase in the number of hoggets that conceived. The increased reproductive performance supports the findings of earlier studies. The latest study also showed that grazing on willow browse blocks was very effective in reducing dag score and hence in reducing the risk of flystrike.

2) **Killing large trees:** The effectiveness of various treatments involving the herbicides “Roundup” and “Escort” in killing large poplars growing on hill country in Manawatu/Rangitikei, was assessed in November. Effectiveness depended on the spacing of drilled holes around the tree trunk into which herbicide was inserted, and the timing (month) and rate of herbicide application. Read more in this issue of *PWNNews*.

3) **Managing dairy effluent:** A work programme for Year 3 of the trial in Otago has been prepared. It has an increased emphasis on the role of the willow/pasture system in managing effluent compared with earlier interest in fodder aspects. The spring component of this programme is being implemented and includes effluent and stream water sampling and analysis for nitrogen.

4) **Project publicity:** Aspects of the project have continued to be promoted in the media including a feature article on Project Leader Peter Gawith in the farming page of the *Dominion Post*. Massey University’s Tom Barry and several other project participants, presented a paper titled *Willow browse blocks for drought protection and for sustainable management of internal parasites* at the recent New Zealand Grassland Association Annual Conference in Dunedin.

In this newsletter, there are a few articles of a technical nature, a feature on one of the regional council staff involved in this project, and a report on last April’s successful field day at a central Hawke’s Bay farm. I hope you enjoy reading Issue No. 5 of *PWNNews*, and don’t forget to view the project’s website, and tell your friends. Good luck with your tree endeavours over the coming summer and autumn.

Killing old conservation trees using chemicals

From Ian McIvor and Carlo Van Den Dijssel, HortResearch

This trial was carried out on poplars of unknown parentage on hill country farms in the Kawhatau Valley near Taihape, and at Kiwitea near Feilding, as reported in *PWNNews* Issue No. 3. We treated selected mature trees with a “diameter at breast height” (DBH) of 70-101 cm for the different treatments.

We used one of two herbicides, either “Roundup” (active ingredient: glyphosate) or “Escort” (active ingredient: metsulfuron). The herbicides were applied at two monthly intervals, starting in October 2005 and finishing in April 2006. Holes each 7 mm in diameter were drilled 30 mm into the trunk, at an angle of approximately 45 degrees downwards (to let the herbicide flow inwards). These were regularly spaced right around the tree at waist height, and 2 ml of herbicide was injected into each hole.

Treatments

1. Escort was applied at three concentrations – 0.5x, 1x and 2x the manufacturer’s recommended application rate (10g/L, 20g/L and 40g/L) and at 10 cm hole spacing. We tried Escort at 40g/L and at 20 cm spacing, i.e. double the recommended application rate but at double the spacing, in February and April only.
2. Roundup was used undiluted but the hole spacing was varied – either 20cm, 10 cm or 5 cm apart, these rates also being 0.5x, 1x or 2x the manufacturer’s recommended application rate. We visited the sites on 14 November 2006 to assess the effectiveness of the treatments. At this stage untreated trees had a full canopy of leaves.

Signs of effectiveness

It was clear from our subsequent measurements that the trees had assimilated the herbicides and that they had circulated throughout the canopy. Treated trees had lost almost all their leaves by the next treatment date. Where branches still retained leaves we considered that the wood conducting herbicide to that branch was carrying insufficient concentration to kill the tissue in that branch. Often this was a single small branch so an assessment for leaf cover of <1%, <10% and <25% is used in the table rather than total absence or presence of leaves.



Ian McIvor shows his method

At the time of assessment there were other significant signs that trees were unhealthy. Smaller branches had fallen off, the bark was easily lifted and had been shed almost completely from some trees. Most trees treated before February had weeping fungal and bacterial infections close to the base of the trunk and other fungal infections.

Timing Treatment undertaken early in the growing season appeared to be more effective than later treatment in April, based on the emergence of leaves in the following spring. There was significant leaf emergence on the trees treated in April, but these leaves were sparsely distributed, had burst bud later, were smaller and showed classic signs of chlorosis (lack of green colour in the leaves). This suggested that water and nutrient conduction from the roots was severely disrupted. Conduction activity is mainly towards the roots in autumn, so if a sparse leaf canopy emerges from trees treated in April (which may be fuelled by resources in the branches), this is unlikely to save the tree.

Application rate The undiluted Roundup was effective at the 10 cm hole spacing and even at the 20 cm spacing, except when applied late in the growing season (April). It is unnecessary to reduce the spacing to less than 10 cm. The recommended rate (20 g/L) applied into holes at 10 cm spacing appears to be sufficient to kill the tree. Doubling the hole spacing at the same concentration reduced the effectiveness of the chemical (based on leaf presence), and though in the end this might be sufficient to kill the tree, we cannot be sure at this stage. The Escort treatment at the recommended rate was effective. Reducing the spacing to less than 10 cm apart is unnecessary, but doubling concentration and hole spacing did not reduce effectiveness when applied in February, though the April treatment showed reduced effectiveness.

A further assessment will be done later in the season.

Poisoning Trees on the farm

From Peter Gawith, Longbush, Wairarapa

Here are some practical tips that I have used on-farm to deal with trees that are no longer required for the original purpose for which they were planted:

First and most important – think before you act. Once a tree has been treated with a poison it cannot be revived. If you are thinning a plantation to open up tree spacing, make sure that the trees are not over-thinned. Too few trees left on a site may allow the land to start moving again.

A tree must be actively growing to take up poison. Any time between October and late February should give good results. If conditions are dry in late summer, the result could be a poor kill.

Take care when selecting trees. Ensure they are not too close to access ways and other important farm infrastructure. As the dead tree decays, limbs will fall off and these may cause damage – or injury.

Use a motorised drill to apply the poison. Drill holes into a tree about a hand span apart around the tree trunk, to a depth of 30mm and angled down at 45 degrees. A motorised drill works longer than a battery drill. Alternatively use a 12-volt cordless drill with a 7mm bit, connected to a small auxiliary battery. This will perform longer than the standard batteries on cordless drills.



Peter Gawith

My “poison of choice” is metsulfuron (sold commercially as *Escort*). Its instructions include injecting trees. Apply 2 ml of the recommended dilution into each drill hole using an old vaccinating gun connected to a supply bottle. Armed with a battery drill connected to an auxiliary battery in one hand, and a vaccinating gun connected to a 1 litre bottle of mixed poison in the other hand, I move around the tree drilling with one hand and injecting with the other. I carry the drill battery and the poison bottle of mixture on my shoulder.

Managing dairy effluent – progress from the Otago trial

From Malcolm Deverson, Clutha Agricultural Development Board, Balclutha

Preparations for the third and final year of the trial are underway at the Sharpin's dairy farm near Balclutha. The programme includes:

- New regime and procedures for the spraying of dairy effluent on site and for the collection of water quality samples for analysis.
- Harvesting procedures to take advantage of available fodder.
- Consequent changes to measurement and analysis of willow fodder quantity and quality.
- Developing computer modelling with John Stantiall (see his report).
- A field day on site featuring Otago Regional Council aspects and related farm issues.
- A simple publication with advice to farmers on best practice as learnt from this trial.



Malcolm Deverson

The trial has required much planning and liaison work this year. Spraying dairy farm effluent via the K-line irrigation has to be undertaken during some wet periods in spring and autumn and has already taken place in September. We are looking for clearer water quality results this year. Our consultants have reviewed the draft of John Stantiall's model of the economics of applying effluent on a willow block. We continue to seek feedback from farmers to develop this concept as a useful tool for any farmer considering such a block.

In this third year we will focus on managing the effluent. We now consider that this is where willows can be valuable for soils susceptible to waterlogging. While there is still fodder value in the trees their harvest needs to be undertaken in and around their primary effluent management role.

The effluent issue

The main advantage we have found relates to effluent management and uptake, and we will request effluent spreading by phone when moisture levels are close to field capacity, with 8-10 hours spraying at each event. Water samples will then be taken (on three occasions in spring only) from the creek before, during and the day after irrigation by the farm staff. These will be measured above, in the middle of the willow site and at the site's end. Samples will be taken within one hour after pump shutdown. An effluent sample will also be collected from underneath the K line system, to be analysed to quantify nitrogen rates being applied.

Harvesting the fodder

We realised last season that the end-of-year tidy-up was impractical for working farmers, so we intend to manage fodder differently this year. Willow stems should not be allowed to grow too large, so two grazings will be carried out, the first after mid-November when growth is approximately a metre high and ground conditions are suitable. We hope that the foliage will be more palatable then and more stems will be eaten. A second grazing will occur from late February onwards, when the willows have regrown. These grazings will be completed within a week, using a break fence if required.

Mulchers have been investigated as a means of tidying up when the season ends. The Sharpin brothers may have up to 350 heifers available to harvest *in situ* if production cows are not used. By recording the effluent irrigation and sampling for water quality we aim to establish guidelines for frequency and effluent volume that can be applied to willow blocks on non-tiled land under moist conditions without creating any problems in adjacent waterways.

Using Browse Willows for Dairy Effluent Disposal

From John Stantiall, Wilson & Keeling Ltd, Feilding

Dick and Tim Sharpin share milk on 480 ha at Clydevale, near Balclutha in South Otago. The primary effluent disposal system they used was through travelling irrigators onto the paddocks. However, because of wet soils, high rainfall and the broken contour of the farm, there is limited land area that is close and easily accessible for expanding the effluent irrigation system. Following the experience of other farmers and consultants in the area, Dick and Tim were encouraged to plant an area in willow trees that could take a greater volume of effluent than straight pasture.



John Stantiall

In September 2004, willow cuttings were planted at 7,200/ha on 0.6 ha and a “K-line” irrigation system was installed (new line only, the base infrastructure was already on the farm). The edible yield in February 2006 was about 0.35 kg DM/tree from the trees planted as cuttings. At about 90% tree survival (6,480 trees/ha), this equates to 2,268 kg DM/ha for the first 18 months. It has been projected that once established, the annual growth of edible material will be about 1.8 kg DM/tree or 11,664 kg DM/ha.

Economic model overview

The economic model endeavours to capture the extra costs and extra benefits of applying effluent to a block of browse willows compared with pasture. The extra costs include the capital cost of establishing the trees, the loss of production from the area during the establishment phase, and the extra cost of the irrigation system. For the analysis, we annualised the capital cost by using the cost of interest on the initial investment at the current market rate. An annual maintenance fee is also included. This covers the maintenance cost of the tree block over and above the cost of a pasture sward. The benefits include the cost savings due to a reduction in fertiliser applied to the area; and the

forage production over and above that produced from pasture alone growing on that particular site. The cost saving by extending the irrigation system to one hectare of trees rather than three ha of pasture further out on the farm is also included. Experience has shown that planting browse willows on previously very wet areas results in drier soils and an increase in pasture growth. The model currently includes an increase in pasture production of 1,000 kg DM/ha.

Net benefit

For the specific case study at Sharpin’s, the model produces a net benefit of over \$372/ha of trees planted, or a benefit over the whole farm of over \$0.93/ha. For a given situation, the relativity between the tree area and the farm size will have a big influence on the overall net benefit to the farming business. The challenge is to test the model in a range of other situations, and also to use it to explore a number of different scenarios. Once we are satisfied that the model includes the range of variables likely to be encountered, and that the technical and costing data are robust, then the model should be available for farmers to use as a prediction tool.

Any farmer interested in testing this system on their property should contact me at Wilson & Keeling Ltd, Feilding (phone (06) 323 8314; email: john@wilsonkeeling.co.nz).

Managing Poplars for Drought Fodder

From Barrie Wills, Central Environmental Services, Alexandra;

John Prebble, Mount Blue, Palmerston

and Murray Harris, Land & Forest Consultants Ltd, Dunedin

The pollarded trees at Mt Blue were re-measured in late September 2006 as an update to the previous harvest (March 2006). Winter has been cold and dry, and this has extended into spring. When the trial was visited in late September the ‘Flevo’ and ‘Tasman’ trees had started leaf emergence, whereas ‘Kawa’ was still dormant.

The pollarded trees were thinned originally in November 2004 and again in mid-March 2005. The three treatments (T) applied were:

- T1 – 6 (2 reps of 3) trees thinned leaving stems >20mm diameter.
- T2 – 6 (2 reps of 3) trees thinned leaving stems <19mm diameter.
- T3 – 6 (2 reps of 3) trees unthinned.

Regrowth on half of these trees was harvested in March 2006 when they were just budding up and producing new branches. The remaining trees are due for harvesting in March 2007.

Branch Size and Diameter Generally there has been more development of branches in the >20mm group, with about 4 or 5 extra branches per tree. However mean branch number per tree has decreased slightly, particularly in T2, mostly because of some smaller branches dying. This is probably because of competition for light and other resources. The mean length of the longest (and often thickest) branches in each treatment increased from March to September 2006 but at differing rates. For T1 at both pollarding times, the increase over the period was less than 1.5m, compared with branches on trees in T2 and T3 which increased 2.0 – 2.3m.



Comparative branch development in (from left) Treatments T1, T2 and T3

Treatment T3 had the longest branches averaging about 7.5m, followed by T1 (~7.0m). Trees thinned in March 2005 had consistently greater branch extension than those thinned in November 2004, of about 0.2-0.3m. In September 2006, trees in Treatment T1 had thicker branches (basal diameter averaging about 73mm) than those in T3 (~65mm) and T2 (~52mm).

Poplar and Willow Field Day in Hawke's Bay

From Deric Charlton, Greenfields Communications, Palmerston North

Back in April over sixty people attended a most successful field day focusing on growing and managing willows and poplars, hosted by the Ennor family on Ranui Farm in Nicholls Road, south of Waipukurau.

While the main focus was on managing willows and poplars for the best results, there was also an interim report on their cost-effectiveness, which always attracts the attention of farmers and landowners. This field day was organised as part of MAF's Sustainable Farming Fund ongoing project.

"Poplars and willows are really valuable for preventing damage to land during storms and floods," says project leader Peter Gawith, who farms near Longbush in Wairarapa. "However we need to prune them regularly to prevent them from becoming big and potentially dangerous, because that's when they frequently fall on buildings and fences, block farm tracks and roads. When they fall the trees or branches can also kill farm animals, not to mention farmers," says Gawith. "We are therefore developing guidelines for farmers and landowners to help them manage willows and poplars more effectively on the land. In the past decade at least a million of these trees have been planted as poles in the lower North Island, making them a huge and important asset – so we need to manage them properly for the best results."

The Ennor family is entering its sixth generation with Ranui Farm. The property has 350 ha of effective pasture supporting over 3000 sheep and 200 cattle.

The farm is on silt loam and argillite clay - rolling to steep hill country and summer-dry, averaging 700-900 mm annual rainfall. January-March and June-July are the pinch periods in Central Hawke's Bay. The farm has much potential, and the Ennors bought an adjoining 200 ha under-developed block several years ago. More subdivision, intensifying pasture management, improving water reticulation and tree planting/management will enhance the business in future. Risk is managed by feeding supplements when needed in summer and winter, water supply is good and is maintained, and the farm has good tree cover where needed, giving soil protection and offering shade, shelter and supplementary fodder.

Like many farmers the Ennors have been planting willows and poplars on their erodable areas over the years, and now have them growing at varying stages. Rob Ennor's sons assist him on the farm. Trevor is a full-time shepherd and Marty works part-time, helping with day-to-day running and administration.

Managing the poplars and willows is part of Marty's farm-forestry responsibilities. The Ennors have planted Lombardy, Argyle and Kawa poplars and Matsudana willow, as well as radiata pine and macrocarpa, *Cupressus lusitanica* and *Acacia dealbata*. The willows and poplars have been planted yearly for soil conservation during the



Marty Ennor pruning trees

past 50 years. Marty says that the 20 to 25 year-old trees are becoming difficult to manage and need to be pruned and shaped. He prunes tree branches with a chainsaw, using an elevated apple bin adapted to a tractor front-end loader.

Field day attendees came from as far away as Taranaki, the King Country and Gisborne, and speakers included Marty Ennor, who gave an outline of his progress on the property, and local land management officer, Neil Faulknor of Hawke's Bay Regional Council who reviewed use of willows and poplars in the region and their benefits and drawbacks.

Professional forester Jaden Herron of HB Forestry in Hastings demonstrated safe methods of tree pruning and felling, and Ian McIvor of HortResearch and farmer Peter Gawith showed how to kill large trees using available equipment and herbicides.

Farm consultant John Stantiall of Wilson & Keeling, based in

Feilding reported on his economic analysis of using these trees as supplementary summer fodder, and farm-forestry contractor Tim Forde told of his successful use of rooted cuttings of poplar and willow on Ranui Farm, and how these established more successfully than poles on dry sites.

Project communications manager Deric Charlton told those attending about the tree management guidelines (now near publication) that cover poplar and willow establishment and management, and sought any farmer experiences that could be included. Finally, Professor Tom Barry of Massey University reported the research findings from the University's Riverside Farm, near Masterton, on managing willow browse blocks for fodder.

Working with trees in Wairarapa

From Deric Charlton, Greenfields Communications, Palmerston North

Stan Braaksma brings a wealth of experience to his work as a Land Management Officer with the Greater Wellington Regional Council (GWRC). He began his career in the early 1970s with a degree in agricultural science from Massey University and started as Assistant Soil Conservator with the Wairarapa Catchment Board, an organisation that had established a strong client relationship to achieve erosion control through its Soil and Water Conservation Plans and Catchment Schemes. That ethic continues today under GWRC with regional grants still available as an incentive to coerce landowners into more sustainable land use. Current annual demand achieves around 100 – 200 ha protected as conservation woodlots and 20-25,000 poplar and willow poles planted to protect a further 300 ha of erosion-prone land. The landowner now contributes more of the costs and so demands a better performance of these trees and advisory services. Many Wairarapa hill country properties have been active in conservation planting for over 40 years.

As Soil Conservator and more latterly Land Management Officer with over 30 years experience, Stan has been involved in many changes to make soil conservation practices more accountable and effective. Using Sustainability Plans, allied with GIS mapping, has enabled smarter methods of evaluating a property's resources and treatments required for sustainability. By working with people like Doug Hicks and Leith Knowles, Stan can now compare a land-class for its pasture dry matter production and for radiata pine harvest potential, a valuable decision tool when comparing grazing-versus-forestry options. He has been directly involved in developing the Dynex seedling and pole protectors, as he felt they could offer greater protection than Netlon sleeves. After initial shedding problems, Dynex sleeves appear to be the preferred option for poplar and willow planting.

“When I first started the poplars available were *I-154*, *Flevo*, *Eridano* and *Kawa*,” says Stan, “and willows were either *Booth* or one of many Matsudana hybrids. In the early 1980s we changed nursery management from running many farmer nurseries to a large centralised nursery – the 20 ha Akura Nursery. The first plantings there were of *Tasman* poplar and the Matsudana hybrids *Moutere* and *Tangoio*.”

“But we were frustrated with pole survival so collaborated with the Aokautere Soil Conservation Centre by evaluating their new material. I often found that new clones were sold mainly on their nursery performance, so in 1986 we began evaluating new and existing clones on hill country. In those days we suffered from large possum populations in addition to wet and dry extremes. We developed a scoring system that covered survival and vigour, and extended to drought tolerance, leader dominance, brittleness and palatability to stock and possums.”

Numerous trials were undertaken, one of the most valuable being the 1987 trial block at Weraiti, established with new 1980 euramericana poplar hybrids. The first poplar to fail in this trial was *Tasman*, which lacked drought tolerance and was highly palatable to possums. This block has since yielded new selections for Akura, such as *Weraiti*, *Otahoua*, *Fraser*, *Selwyn* and *Taueru*. The *Veronese* poplar was first introduced to Akura in 1987 and was then only recommended for riverbed planting in Canterbury. After a very wet spring with strong northwesterly winds, only the rows remaining upright in the nursery were of *Veronese*. This made *Veronese* one of the most popular poplars for slopes in the eastern North Island.

Evaluation of all Matsudana willows and hybrids still finds *Moutere* and *Tangoio* ranked above all others, *Tangoio* accounting for a third of all nursery production. In the early 1980s willow comprised 60 percent of poles planted, but 70 percent are now poplar as more slope planting is being undertaken. Stan still monitors the overall nursery production and rotation for GWRC and represents the Council on the Willow and Poplar Research Collective. Challenges with these trees continue, the most recent being poplar rusts hybridising, and willow sawfly, and these now need pre-emptive spraying to maintain healthy tree growth. Research into new poplar and willow breeding is currently poorly supported, but Stan has selected a new poplar clone named *Pecam* in recognition of long-term service by Akura Nursery manager Peter Cameron.



Stan Braaksma

In February 2004 the storm event that devastated Manawatu, Rangitikei and southern Taranaki was also a testing time for the GWRC Land and River Management Groups. These storm events continued in Wairarapa in August 2004, February 2005 and recently in July 2006. Large tracts of hill country received over 200 mm rainfall in only 48 hours, generally from southerly or easterly rain cells, and the worst deluge exceeded 300 mm.

“Though the meteorological service could give prior warning, a lack of rain gauges along the eastern hills gave no early indication of a major event,” reflects Stan. “Many properties sustained considerable erosion damage, but many other properties showed good resilience thanks to over 30 years of conservation planting on erosion-prone slopes and gullies. The huge demand continues for well-grown, graded poplar and willow poles, and some properties plant 500-1000 annually. Conservation woodlots are still the most effective method of erosion control on land with a moderate to severe erosion potential. Most of these receive silvicultural management to improve harvest potential and the land stability status.”

Stan has long been associated with the local Farm Forestry branch, being president from 1999-2004 and still remains as an active committee member. His interest in native ecosystems has seen many native bush retirements with the QE II National Trust. Another major milestone was his securing the purchase of the property of Rewanui by the Trimble Foundation to further the brief of the Montford Trimble Will for “public afforestation.” He has also been a valuable information source for this SFF Project and has helped in local promotion of poplar and willow use and management.

NB. In using the herbicide brands mentioned in two of the articles we intend no endorsement or criticism of these products or of any others not mentioned. The brand names are only used to make reading easier.

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Want to know more?

If you are interested in this project and its results and would like someone else to receive future issues of *PWNNews*, please contact any of the following:

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