



*Salix reinii* PN688

## Winning with Willows

*Linda Newstrom-Lloyd, Ian McIvor, Trevor Jones,  
Manon Gabarret, Blandine Polturat, Ashleigh Paap,  
Berit Mohr, Conal Richardson*



Ministry for Primary Industries  
Manatū Ahu Matua



Sustainable Farming Fund



NZ Apiculture Conference  
Taupo, June 24<sup>th</sup> 2015

# The Trees for Bees Willow Team



Top Row Left to Right: Manon Gabarret, Blandine Polturat, Ashleigh Paap  
Bottom Row L to R: Ian McIvor, Trevor Jones, Linda Newstrom-Lloyd, John Dymond

# **Willows are** **THE backbone of bee colony build up in spring**

Abundant trees/shrubs throughout NZ  
Attractive pollen and nectar for bees  
Large pollen loads easily collected

*Salix reinii* PN688

Photo: Manon Gabarret © Landcare Research





# The Willow Project

- Living germ plasm collection in Aokautere Nursery
  - 200 genotypes
  - 38 species
  - 21 hybrids
- Rural Supplies Technology Environmental Solutions
- Observations from July 2014 to January 2015

# The Aokautere Willow Collection Palmerston North



# More flowering on outside margins of Willow Collection





THE NEW ZEALAND  
POPLAR & WILLOW RESEARCH TRUST

# NZ Poplar and Willow Research Trust

Ian McIvor and Trevor Jones -- Plant and Food Scientists



# Rural Supply Technologies Environmental Solutions Conal Richardson



Winter scene



Summer scene



# Two Student Interns from France

Manon Gabarret and Blandine Polturat arrived August 26<sup>th</sup>



# Two Students from New Zealand

Berit Mohr and Ashleigh Paap



# **Willow Evaluation Goals**

## **Pollen Quality and Quantity**

- abundance of pollen per catkin
- density catkins per tree/shrub
- protein content of pollen

## **Flowering Times (male and female)**

- start and stop times
- duration

# Timing of Flowers and Leaves

2X a week recorded stage of flowering  
175 trees and shrubs  
35 recording days  
From end July to begin Jan





# Fast tracking in September October



# Pulling down branches for study



For measurements of  
catkin density

For photographs  
of catkins



# Even big branches break easily



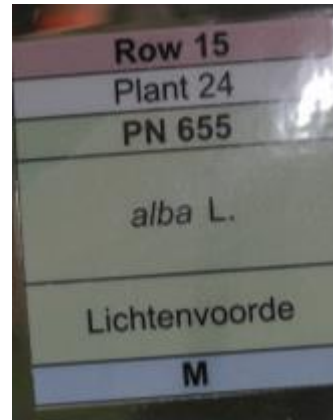


# Photographs of catkins



# S. Alba PN655

Stages of Catkin Flowering  
from bud to finished



# Catkin Density and Branch Diameter



# Quadrat for Catkin Density



# Linear Measure Catkin Density



# Herbarium Reference Collection

3 sets of vouchers



# Collecting Pollen Samples in Jars

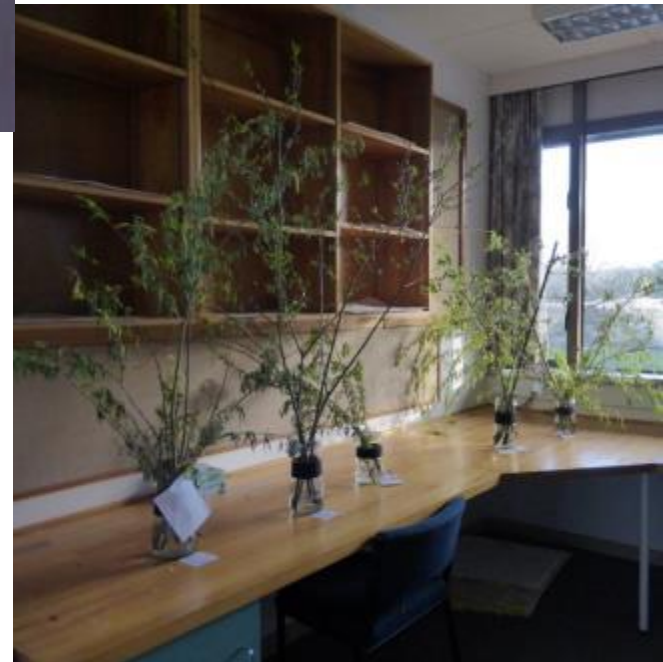


# Collecting Pollen for Lab Work



Landcare Research  
Palmerston North  
hosted lab work

Willows root  
easily  
in vases of  
water







# Processing Pollen Samples

Dried pollen on glass sheet to get pollen



Tapping anthers

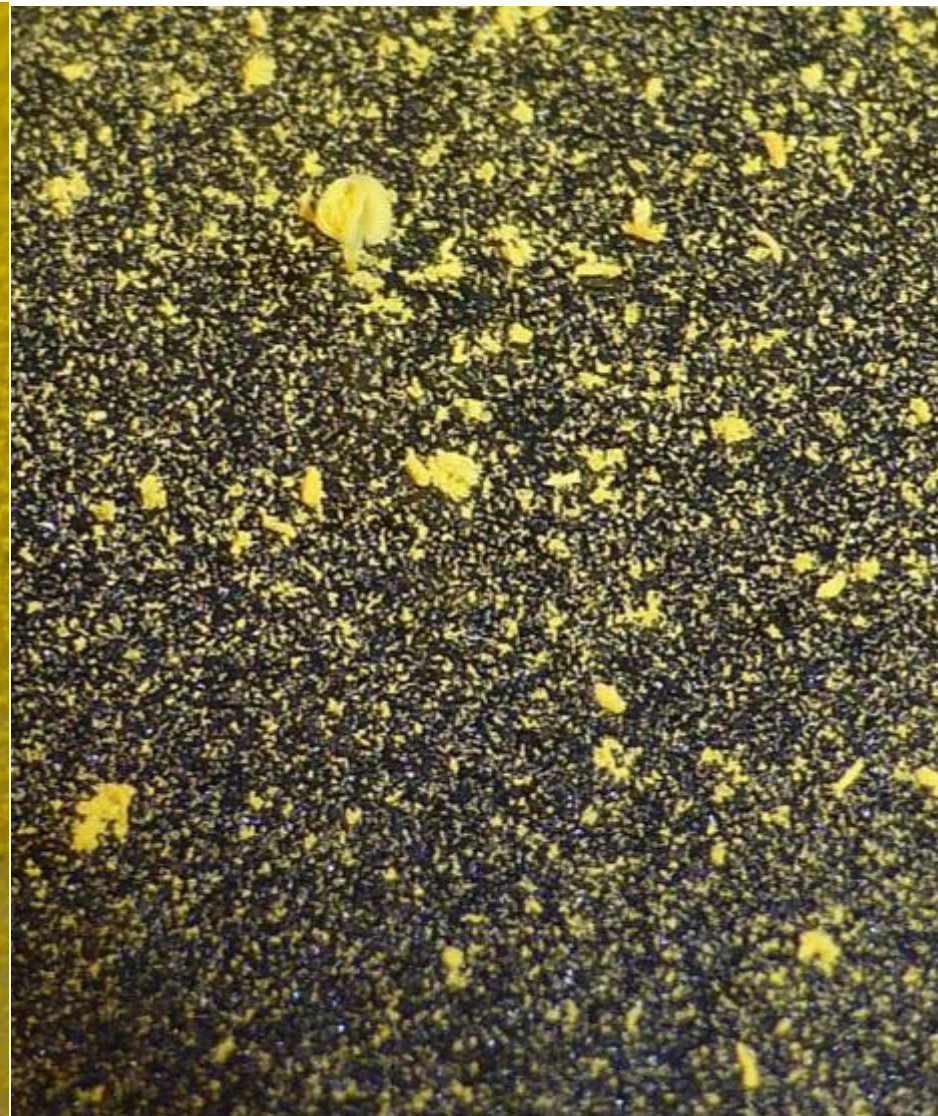


# Purification of Pollen for Protein Analysis



First stage to  
remove large  
impurities

# Removing Plant and Insect Parts



# Final purification under microscope

Vial of pure gold to us



# Summary of Data collected

## In field

- flowering times
- photos of tree, branch, catkin flowering stages
- branch diameter and catkin density
- catkin density in quadrat and linear
- herbarium specimens X 3

## In Lab

- vial of pure pollen for protein analysis
- catkin size (length, width, shape = surface area)
- frozen flowers for anther/floret density later
- vial of catkin in alcohol to count pollen later

# *S. aegyptiaca* first willow to flower



# ***S. eriocephala* is longest flowering species**





# *S. triandra* late flowering



Younger catkins

Older catkin elongated

Progressive  
Pollen  
Production



# *S. hookeriana* 'Furry Ness' has largest catkins



Photos: Manon Gabarret © Landcare Research

But anthers are not densely packed



*S. hookeriana* 'Furry Ness' PN685

# Pussy Willows: largest catkins more dense anthers



*S. caprea* group has more dense anthers on the catkins so more pollen



For example: *S. caprea* derivatives such as *caprea* X *cinerea* = *S. x reichardtii*

# *S. alba* (I 8 59A) PN361

had highest density catkins of alba genotypes

Total pollen/tree  
is a function of:

1. Branch/tree
2. Catkin/branch
3. Florets/catkin
4. Anthers/floret
5. Pollen/anther

Quadrat photos X3



Photos: Manon Gabarret © Landcare Research



# Nectar in male and female florets



*S. purpurea* Rubra PN221



# *S. purpurea* good nectar source

*S. purpurea* (Links Dutch) PN382



# Photos for Identification Key



Photos of:

1. Male Catkin stages
2. Female Catkins
3. Leaf Scans High Res
  - Flushing
  - Medial
  - Proximal

# Questions remaining

- Sterility of some accessions
- Gender of some accessions
- Nectar production
- Protein variability in pollen



# The FUTURE

- Select best genotypes
- Distribute to farmers and beekeepers
- Prevent weediness
- Manage Giant Willow Aphid
- Identification app

