



Welcome to the Soil News

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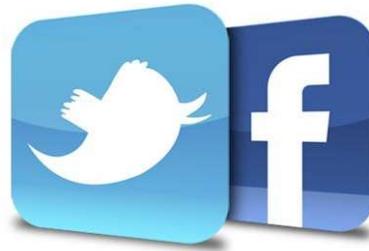
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Your contributions are required - New Zealand Soil News is your newsletter

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Have you liked us on Facebook?
The NZSSS has a Facebook page and Twitter handle (@NZ_Soil_Soc). If you are already a user, please follow us. You can also keep an eye out for new NZSSS posts by checking the feed from our [website](#)

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Letter to the Editor

Professor and former Chair of Department, School of Science, University of Waikato, Private Bag 3105 Hamilton 3240 NEW ZEALAND (Street address: Hillcrest Rd, Hamilton Office:DE.3.02)	Professor David J. Lowe MSc PhD FRSNZ FNZSSS Hon Life Fellow INQUA Ph +64 7 838-4438 (DD) Ph +64 7 856-2889 (ext 4438) (univ. operator) Fax +64 7 838-4352 Mob 021 027 727 07 Email: david.lowe@waikato.ac.nz www.earth.waikato.ac.nz	 THE UNIVERSITY OF WAIKATO <i>Te Whare Wānanga o Waikato</i>
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The editor
NZ Soil News

NZ Soil News digital archives

I wish to congratulate and sincerely thank Thomas Caspari and his team, including Jo Pearce and Isaac ~~Osbaldiston~~, for providing a digital archive of *NZ Soil News* since its inception in 1953. During one of my many shifts between offices, I threw out (recycled) all my printed copies of *NZ Soil News*, which dated back to 1975 when I first joined NZSSS. I have regretted this dumping ever since because time and time again I needed to check something, knowing it'd be somewhere in *Soil News*. In some cases, the *only* record of a field site or section, or some historical information, is in *Soil News*. I have been writing up the history of an organisation recently, and the lack of documentation became a major stumbling block saved only by just one or two notes in newsletters such as *Soil News*.

We have a set of *Soil News* in the University's Library (until we went digital) but this online version, which is searchable, is a fantastic new resource. I have already used the search function to home-in (as an example) on comments from various soil scientists and others about the INQUA Congress held in Christchurch in 1973.

As a record of the society and the wider world of soil science in New Zealand and beyond, the newsletter is invaluable and so from that viewpoint alone is an essential resource.

So, many thanks again to all involved for a great job.

David Lowe
University of Waikato

Society News

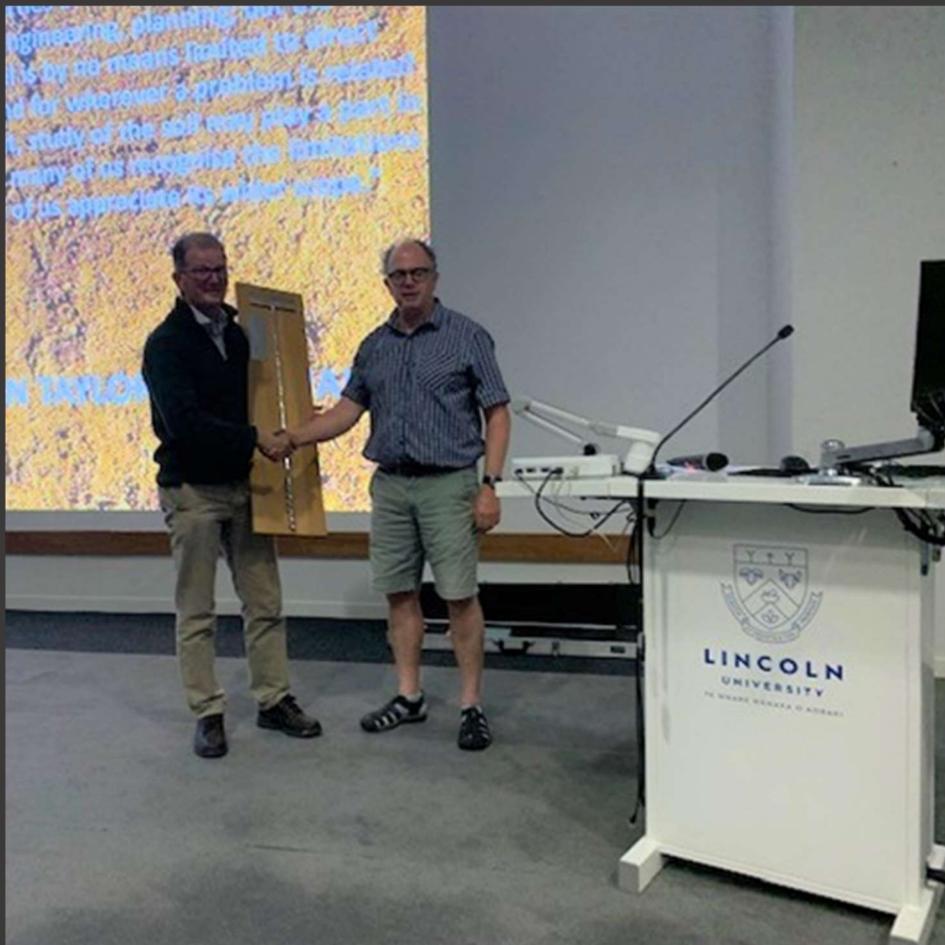
Recipients of the NZSSS Awards for 2021

Compiled by Dr Brendon Malcolm, NZSSS Awards Convenor (2017-present)

The 2021 NZSSS Biennial General Meeting was held in-person and virtually in early December at Lincoln University. We took this opportunity to honour and celebrate the success of those who have made significant contributions to soil science, through our Societies long-established awards portfolio. The awards presented, and the recipients of those awards, are briefly profiled below. On behalf of Council **congratulations** to all those who received awards.

The Norman Taylor Memorial Award

The Norman Taylor Memorial Award (Lecture) is awarded by the President of the NZSSS in recognition of outstanding contributions to soil science in New Zealand. The 2021 recipient of the Norman Taylor Memorial Award was **Professor Leo Condrón**. Leo gave a fascinating, informing and engaging talk on phosphorus in agroecosystems: “Accessing legacy soil phosphorus: a game-changer or red herring for improved phosphorus use efficiency in agroecosystems”.



Leo was appointed as a lecturer at Lincoln University in 1992, and was then promoted to Professor of Biogeochemistry in 2006. He published his first paper in 1985, and his current Web of Science publication profile lists 258 peer-reviewed journal papers that have received nearly 11,000 citations, with a H-Index of 55. Google Scholar lists 365 publications for Professor Condrón, which have received over 19,500 citations, with an H-Index of 73. Professor Condrón has also authored or co-authored 15 book chapters, and contributed to two major reports on the status of New Zealand soils for the United Nations. Leo is currently Associate Editor/Section Editor of six international journals, is a Fellow of the British Society of Soil Science and the New Zealand Society of Soil Science, and has been elected to two 4-year terms as Chair/Co-Vice Chair of different divisions of the International Union of Soil Sciences (2006-10, 2018-22).

Leo's research has focused on investigating the biogeochemistry of organic carbon and major nutrients in natural and managed ecosystems, with an emphasis on the nature, dynamics, and bioavailability of organic and mineral forms of nutrients in the soil-plant system in relation to soil management and land use. His sustained contribution to advancing research on the biogeochemistry of phosphorus in soil-plant systems was recognised by the award of a Doctor of Science degree by the University of Canterbury in 2016. Professor Condrón has developed and maintained an extensive network of research collaborations within New Zealand and across the globe, including Australia, Brazil, Canada, Chile, China, Germany, Sweden, Switzerland, UK, and USA, and to date he has supervised over 100 postgraduate students from 21 countries, together with 11 postdoctoral fellows.

Fellowship of the New Zealand Society of Soil Science

Fellowship of the New Zealand Society of Soil Science is an honour conferred for distinction in any or all of the following areas; research, technology, teaching, extension, and/or the advancement of soil science. In 2021, the Society appointed two new Fellows: **Dr Carolyn Hedley** and **Dr Trish Fraser**.

With over almost 40 years of research experience, Carolyn Hedley has been instrumental in developing a range of new technologies and methods in soil science. Her work has positively impacted on New Zealand farmers and primary industry, as well as the international soil science community. She has particularly contributed to two substantial areas of soil and environmental science: 1) precision agriculture, in particular variable rate irrigation (VRI), and 2) soil carbon characterisation, measurement and accounting. Advances in proximal soil sensing and spatial modelling methods underpinned both areas of major contribution, and she and her team developed rapidly deployable and affordable mapping of soils, and measurement of soil carbon and other soil properties.



Carolyn contributed to significant teaching and extension activity across many sectors, including academia, research, industry organisations, farmers, and students. She has been an examiner and supervisor of several PhD and Masterate candidates, as well as 10 intern students. She contributed greatly to teaching students and helping staff develop their careers.

She has been an active member of the NZSSS, being a Soil News correspondent for Manaaki Whenua for many years. She was a member of the organising committee for the 2018 NZSSS conference in Napier. She was also the science editor of Manaaki Whenua's annual extension publication "Soil Horizons".

Over the past 30 years Trish has been at the fore of research addressing a wide range of soils-related issues, much of which has delivered practical knowledge to the farming community to balance important productivity, environmental, and system resilience outcomes. Her major area of expertise is in soil health, and she has been part of many highly collaborative research and industry teams that have been acknowledged for new discoveries.



Trish has received several notable awards for her contribution to soil research and extension. Last year, Trish received the prestigious NZ Women of Influence Award (Rural Category) in recognition of her three decades of dedication and contributions to the rural sector and rural community. The judges praised her collaborative approach and her rare skill of communicating science to farmers.

Trish has had a key role in shaping the NZSSS for over 30 years. She has been a member since 1989 and contributed as an elected council member for 24 years. Trish served as Executive Secretary, Vice-President, President (becoming the first female president in 2012), and Past President. Recognising her significant contributions to developing the Society and advancing soil science in NZ, she received the Norman Taylor Memorial Award for outstanding service to NZ soil science in 2009, and was made a Life Member of the Society in 2016.

The Fertiliser Association Award

The Fertiliser Association award recognizes the efforts and present, or likely, contribution to New Zealand soil science arising from a Doctorate study. Eligible candidates for this award must be 3rd year PhD students working on the properties, productivity or sustainability of NZ's soil and land resources.

The recipient of The Fertiliser Association award for 2021 went to **Kirstin Deuss** of Lincoln University.

Kirstin is in her final year of a PhD programme supervised by Associate Professor Peter Almond. Her work aims to characterise the hydrology and modification to soil physical conditions of a mole and tile drained catchment in Southland.



Her PhD will contribute to improved management of these “flashy” modified landscapes, and it has trained her to be a highly adept scientist capable of complex quantitative analysis of soil-hydrological systems. The prestige of the award will further her goal of securing a position working professionally in soil science in New Zealand so that she can contribute to environmental sustainability of our primary industries.

We are hugely grateful to the Fertiliser Association of New Zealand for sponsoring this award.

The Morice Fieldes Memorial Award

The Morice Fields Memorial Award recognises a PhD theses from the previous calendar year of exceptional merit. In 2021 the Society awarded this to **Joshua (Joss) Ratcliffe** of University of Waikato for his thesis *‘Carbon dynamics in restiad peatlands across different timescales’*. Judges noted that the thesis showed comprehensive knowledge of the literature relating to the role and functioning of raised peat bogs acting as C sinks, and exceptional understanding of techniques relating to the assessment of C fluxes in soils over a range of time scales.

The Sir Theodore Rigg Memorial Award

The Sir Theodore Rigg Memorial Award recognises a Masterate theses of exceptional merit from the previous calendar year. **Kristyn Numa**, University of Waikato, was our recipient of the award for 2021, for her thesis *‘The Temperature Response of Soil Respiration from Labile and Stable Carbon’*. Judges noted an excellent thesis that was comprehensive and easy to read, that has since gone on to make a nice publication in *Geoderma*.

Undergraduate prizes

Each year the Society awards the best performing third year undergraduate student in each of the three major Universities (Lincoln University, Massey University and University of Waikato). For 2021, the recipients of the undergraduate prizes were **Amy Wells** (Lincoln University), **Ellie Stubbs** (Massey University), and **Robert Brodnax** (University of Waikato).

Congratulations again to all our deserving award winners!

NZSSS Award Recipients

President's Invitation Lecture	1977 -none-	1992 R B Doyle
1972 W A Pullar	1978 A N Sharpley	1993 -none-
1973 T W Walker	1979 K W Steele	1994 P L Carey
1974 A J Metson	1980 -none-	1995 J Moir
1975 H S Gibbs	1981 A G Hogg	1996 -none-
	1982 A W Limmer	1997 S Park
Norman Taylor Memorial Award	1983 A B Cooper	1998 S Thiagarajan
1976 I L Baumgart	1984 A D Mackay	1999 H Jones
1977 G D Smith	1985 R A Petch & P J Tonkin	2000 R Dragten
1978 J D McCraw	1986 I R Phillips	2001 B Robinson
1979 G G Cossens	1987 D J Horne	2002 S Tutua
1980 A C S Wright	1988 J S Rowarth	2003 D J Palmer
1981 C Doring	1989 A W Young	2004 M W Hughes
1982 C G Vucetich	1990 P B Greenwood	2005 R Standish
1983 N Wells	1991 C D A McLay	2006 D Dewar
1984 G M Will	1992 A W Rate	2007 E Hoftsee
1985 J K Syers	1993 L A Schipper	2008 N Watkins
1986 L C Blakemore	1994 D Tambunan	2009 DA Lloyd
1987 W M H Saunders	1995 No award	2010 P Mudge
1988 K R Tate	1996 R Lieffering	2011 DF Wallace
1989 P J Tonkin	1997 H Wang	2012 E Harris
1990 E J B Cutler	1998 P Almond	2013 A Barnett
1991 C Childs	1999 B Robinson	2014 A Robinson
1992 D R Scotter	2000 T J van der Weerden	2015 T Norris
1993 No award	2001 B Miller	2016 N Laubscher
1994 A Sinclair	2002 G Barkle	2017 J Robinson
1995 B Clothier	2003 C Rooney	2018 O Petrie
1996 A Hewitt	2004 J Menneer	2019 J Millar
1997 K M Goh	2005 H Jones / F Moreno	2020 M Kokiri Huirama
1998 A Mackay	2006 D Houlbrooke	2021 K Numa
1999 J Watt	2007 S Gaw	
2000 V Neall	2008 M Hughes	Fertiliser Association Award
2001 S Sagar	2009 M Bloomberg	2019
2002 D J Lowe	2010 S Carrick	Was Bert Quin Award 2014
2003 P Singleton	2011 N Schon	Was Summit Quinphos Bursary
2004 G Sparling	2012 A Eger	(renamed Altum Award 2012)
2005 R McLaren	2013 N Balaine	1993 J Luo
2006 G Yeates	2014 P Mudge	1994 W J Morrell
2007 A Carran	2015 B Welten	1995 I Vogeler
2008 M Balks	2016 D Huang	1996 C W Gray
2009 P Fraser	2017 S McNally & J Owens	1997 B Robinson & B Miller
2010 C de Klein	2018 M Bucci	1998 A Mitchell
2011 T Webb	2019 C Gardiner	1999 A Khan
2012 M McLeod	2020 F Rambags	2000 Chengrong Chen
2013 M Hedley	2021 J Ratcliffe	2001 Suman Mishra
2014 S Ledgard		2002 S Gaw
2015 R McDowell	Sir Theodore Rigg Award for	2003 D Houlbrooke & R Bhandral
2016 L Schipper	Masterate Thesis	2004 D Palmer
2017 T Clough	1976 K D Earl	2005 J Singh
2018 A Roberts	1977 T H Webb & N E Logan	2006 S Khan
2019 M Camps		2007 B Kusomo
2020 C Smith	1978 -none-	2008 S Carrick
2021 L Condron	1979 D A McKie	2009 P Jeyakumar
	1980 C Hedley (née Hubbard)	2010 G Lucci
NZSSS Postgraduate Awards	1981 D Karageorgis	2011 N Wells
1971 D W Ives	1982 D J Lowe	2012 R Dodd
1972 I Naim	1983 L A Benny	2013 No award
1973 -none-	1984 K B Marsh	2014 S McNally
1974 V E Neall	1985 B McLaughlin	2016 J Pronger
1975 -none-	1986 -none-	2018 T Geretharan
	1987 C D A McLay	2019 A Wecking
Morice Fieldes Memorial	1988 B E Green	2020 T Corbett
Award for PhD Thesis	1989 S P Cameron-Lee	2021 K Deuss
1976 J C Ryden	1990 P J de Lange	
	1991 G N A Wigley	

<p>The L C Blakemore Award (Biennial award)</p> <p>1992 N P Smith 1994 H Kettles 1996 No award 1998 L Currie 2000 B Daly 2002 P Theobald 2004 T Hendry 2006 B Toes 2008 C Smith 2010 M Sprosen 2012 C Tregurtha 2014 M Premaratne 2016 J Jiao 2018 B Moorhead 2020 R Cresswell</p>	<p>Undergraduate Prizes</p> <p>1994 R McDowell (Lincoln University) R Hodgson (Massey University) M Boyes (Waikato University)</p> <p>1995 W R Cookson (Lincoln University) A Reyland (Massey University) J C Menneer (Waikato University)</p> <p>1996 R Dragten (Waikato University)</p> <p>1997 J McCaw (Lincoln University) C Eastwood (Massey University) V Gough (Waikato University)</p> <p>1998 L Garrett (Waikato University) N Treloar (Massey University) C Rissman (Lincoln University)</p> <p>1999 A Manderson (Massey University) K McLauchlan (Waikato University) S Petrie (Lincoln University)</p> <p>2000 S Pitcher-Campbell (Massey University) N Dunn (Waikato University) C Ducey (Lincoln University)</p> <p>2001 C Davies-Colley (Waikato University) M Buchan (Lincoln University) P Nelson (Massey University)</p> <p>2002 A Souness (Lincoln University) T A O'Neill (Massey University) D Worthy (Waikato University)</p> <p>2003 S O'Driscoll (Waikato University) F Shanhun (Lincoln University)</p> <p>2004 M Clancey (Waikato University) J Bertram (Lincoln University)</p> <p>2005 Vanessa Coombe (Waikato University) Samuel Dennis (Lincoln University)</p> <p>2006 Laura Buckthought / Georgina Mackie</p>	<p>(Lincoln University) Louise Fisk / Paul Mudge (Waikato University)</p> <p>2007 Paul Bowater</p> <p>(Lincoln University) Hamish Mulcock (Massey University) Georg Kruger (Waikato University)</p> <p>2008 Glen Treweek (Waikato University) Emma Anne Phillips (Massey University) Nicola Jane Kelland (Lincoln University)</p> <p>2009 Rebecca Bylsma (Waikato University) Helen Free (Massey University) Sean Gresham (Lincoln University)</p> <p>2010 Josh Scarrow & Jack Pronger (Waikato University) Louise Anne McCormack (Massey University) Aimee Elizabeth Robinson (Lincoln University)</p> <p>2011 AM Carter (Waikato University) Joel Perry (Massey University) Roshean R Fitzgerald (Lincoln University)</p> <p>2012 L Creswell (Waikato University) J Howes (Massey) A Whitley (Lincoln)</p> <p>2013 H Bredin-Grey (Waikato) Massey – N Hyslop N Mesman – (Lincoln)</p> <p>2014 D Le Lievre – (Waikato) J Winters – (Massey) S Rayner – (Lincoln)</p> <p>2015 T Leabourn (Massey) B Robertson (Lincoln) F Garrity (Waikato)</p> <p>2016 M O'Grady (Waikato) H Jensen (Lincoln) SA Whiteman (Massey)</p> <p>2017 C Tomlinson (Waikato) S Pike (Massey) I Setiawan (Lincoln)</p> <p>2018 M Hall (Waikato) M Van Baarle C Chisholm</p> <p>2019 E Kitchen (Waikato) S Earl-Goulet (Lincoln)</p> <p>2020 A Carrington (Waikato) P Chapman (Lincoln)</p> <p>2021 R Brodnax (Waikato) E Stubbs (Massey) A Wells (Lincoln)</p>
<p>The M L Leamy Award (Biennial award)</p> <p>1992 B E Clothier 1994 A Hewitt 1996 No award 1998 S Cronin 2000 H J Di 2002 K R Tate 2004 N S Bolan 2006 S Saggar 2008 R McDowell 2010 Not awarded 2012 D Curtin 2014 L Schipper 2016 D Selbie, L Buckthought, M Shepherd (jointly) 2018 J Luo 2020 D Curtin, M Beare (jointly)</p>	<p>2000 S Pitcher-Campbell (Massey University) N Dunn (Waikato University) C Ducey (Lincoln University)</p> <p>2001 C Davies-Colley (Waikato University) M Buchan (Lincoln University) P Nelson (Massey University)</p> <p>2002 A Souness (Lincoln University) T A O'Neill (Massey University) D Worthy (Waikato University)</p> <p>2003 S O'Driscoll (Waikato University) F Shanhun (Lincoln University)</p> <p>2004 M Clancey (Waikato University) J Bertram (Lincoln University)</p> <p>2005 Vanessa Coombe (Waikato University) Samuel Dennis (Lincoln University)</p> <p>2006 Laura Buckthought / Georgina Mackie</p>	<p>2010 Josh Scarrow & Jack Pronger (Waikato University) Louise Anne McCormack (Massey University) Aimee Elizabeth Robinson (Lincoln University)</p> <p>2011 AM Carter (Waikato University) Joel Perry (Massey University) Roshean R Fitzgerald (Lincoln University)</p> <p>2012 L Creswell (Waikato University) J Howes (Massey) A Whitley (Lincoln)</p> <p>2013 H Bredin-Grey (Waikato) Massey – N Hyslop N Mesman – (Lincoln)</p> <p>2014 D Le Lievre – (Waikato) J Winters – (Massey) S Rayner – (Lincoln)</p> <p>2015 T Leabourn (Massey) B Robertson (Lincoln) F Garrity (Waikato)</p> <p>2016 M O'Grady (Waikato) H Jensen (Lincoln) SA Whiteman (Massey)</p> <p>2017 C Tomlinson (Waikato) S Pike (Massey) I Setiawan (Lincoln)</p> <p>2018 M Hall (Waikato) M Van Baarle C Chisholm</p> <p>2019 E Kitchen (Waikato) S Earl-Goulet (Lincoln)</p> <p>2020 A Carrington (Waikato) P Chapman (Lincoln)</p> <p>2021 R Brodnax (Waikato) E Stubbs (Massey) A Wells (Lincoln)</p>
<p>The T W Walker Prizes</p> <p>1992 (oral paper)—S T Olykan (poster)—G N Magesan</p> <p>1994 (oral paper)—J Luo</p> <p>1995 J Zanders & S Park</p> <p>1998 (oral paper)—J Menneer (poster)—C P Rooney</p> <p>2000 (oral & poster papers) —L Barton</p> <p>2002 (oral paper)—D Houlbrooke (poster)—K Wilkins</p> <p>2004 (oral paper)—J Singh (poster)—D Dewar</p> <p>2006 (oral paper)—R Parkinson (poster)—F Scherr</p> <p>2008 (oral paper) – P. Mudge (poster) – G M Lucci</p> <p>2010 Not awarded 2012 Not awarded 2014 (oral paper) O Jordan (poster) J Owens</p> <p>2016 (oral paper) – R Woods (poster) – A Carlton</p> <p>2018 (oral paper) – A Tumbure (poster) – K Deuss</p>	<p>2000 S Pitcher-Campbell (Massey University) N Dunn (Waikato University) C Ducey (Lincoln University)</p> <p>2001 C Davies-Colley (Waikato University) M Buchan (Lincoln University) P Nelson (Massey University)</p> <p>2002 A Souness (Lincoln University) T A O'Neill (Massey University) D Worthy (Waikato University)</p> <p>2003 S O'Driscoll (Waikato University) F Shanhun (Lincoln University)</p> <p>2004 M Clancey (Waikato University) J Bertram (Lincoln University)</p> <p>2005 Vanessa Coombe (Waikato University) Samuel Dennis (Lincoln University)</p> <p>2006 Laura Buckthought / Georgina Mackie</p>	<p>2010 Josh Scarrow & Jack Pronger (Waikato University) Louise Anne McCormack (Massey University) Aimee Elizabeth Robinson (Lincoln University)</p> <p>2011 AM Carter (Waikato University) Joel Perry (Massey University) Roshean R Fitzgerald (Lincoln University)</p> <p>2012 L Creswell (Waikato University) J Howes (Massey) A Whitley (Lincoln)</p> <p>2013 H Bredin-Grey (Waikato) Massey – N Hyslop N Mesman – (Lincoln)</p> <p>2014 D Le Lievre – (Waikato) J Winters – (Massey) S Rayner – (Lincoln)</p> <p>2015 T Leabourn (Massey) B Robertson (Lincoln) F Garrity (Waikato)</p> <p>2016 M O'Grady (Waikato) H Jensen (Lincoln) SA Whiteman (Massey)</p> <p>2017 C Tomlinson (Waikato) S Pike (Massey) I Setiawan (Lincoln)</p> <p>2018 M Hall (Waikato) M Van Baarle C Chisholm</p> <p>2019 E Kitchen (Waikato) S Earl-Goulet (Lincoln)</p> <p>2020 A Carrington (Waikato) P Chapman (Lincoln)</p> <p>2021 R Brodnax (Waikato) E Stubbs (Massey) A Wells (Lincoln)</p>

Fellows of the NZ Society of Soil Science	Honorary Fellow	Grange Medal
L C Blakemore R Naidu M R Balks V E Neall N Bolan R L Parfitt K C Cameron J A Pollock I B Campbell AHC Roberts C W Childs S Saggar J Churchman A G Sinclair B E Clothier G Sparling I S Cornforth T W Speir H J Di J K Syers K M Goh K R Tate P Gregg B K G Theng R J Haynes P J Tonkin S F Ledgard T W Walker D J Lowe J H Watkinson J D McCraw G W Yeates A Mackay A Hewitt L Schipper M Beare L Condron M Hedley D Ross C De Klein T Clough R Monaghan R McDowell D Curtin R G McLaren D Houlbrooke T Fraser C Hedley	B Miller Life Members of the N.Z. Society of Soil Science L C Blakemore I B Campbell C W Childs R J Furkert R Lee R B Miller V Orchard W M H Saunders J K Syers P J Tonkin T W Walker J P C Watt J Adams R McLaren P Gregg A Mackay P Fraser B Quin D Lowe	K Tate B Clothier G Rys M Hedley F Curran-Cournane

NZSSS Awards

New Zealand Society of Soil Science Awards 2022

Nominations for the following awards open **1 March 2022** (with the exception of the US/NZ Exchange Award, for which nominations open 25 January). Key details regarding nomination requirements are provided in the table below. Note the newly-established *Early Career Researcher* award and *Soil Judging Stipend* on offer this year as part of the awards portfolio. Please contact the NZSSS Awards Convenor for full award details (Brendon.Malcolm@plantandfood.co.nz).

Award	Presented	Nominations close	Nominee eligibility	Nominator eligibility
<i>NZSSS Fellowship</i>	Annually	31 July 2022	Nominees must be active members of the Society at the time of nomination.	Nominations must be made by two Full Members, or Life Members of the Society.
<i>The Grange Medal</i>	Biennially (conference year)	31 July 2022	Open to both non-members of the Society as well as members, fellows, or life members of the NZSSS.	Nominations must be made by two or more active members of the Society.
<i>The Blakemore Award</i>	Biennially (conference year)	31 July 2022	Open to technicians/support staff who have been employed in the field of science for at least three years.	Any two active members of the NZSSS can nominate an eligible candidate from a university, CRI, or other organisation (e.g. a Regional Council).
<i>The Leamy Award</i>	Biennially (conference year)	31 July 2022	Open to the author or authors of the most meritorious New Zealand contribution to soil science, published in the previous three calendar years.	Any two active members of the NZSSS can nominate an eligible candidate(s) from a university, CRI, or other organisation (e.g. a Regional Council).
<i>The Fertiliser Association Award</i>	Annually	31 July 2022	Open to postgraduate (PhD) students in soil science about to enter their third year of study. Candidates must be either student or full members of the NZSSS and should not be on the academic or technical staff of the department that nominates them.	Nominations must be received in writing from the Head of the Soil or Earth Science Department/Group at a New Zealand University. Only one nomination will be accepted from each University Department/Group.

<i>The Morice Fieldes Award</i>	Annually	31 July 2022	A PhD thesis submitted within the previous calendar year.	The Head of the Soil or Earth Science Department/Group at a New Zealand University may nominate the best PhD thesis from their department/group.
<i>The Rigg Award</i>	Annually	31 July 2022	A Masterate thesis submitted within the previous calendar year.	The Head of the Soil or Earth Science Department/Group at a New Zealand University may nominate the best Masterate thesis from their department/group.
<i>*New* Early Career Researcher (ECR) Award</i>	Biennially (conference year)	31 July 2022	Open to ECR's within eight years of completing their highest research qualification (Masterate or Doctorate).	No more than 2-page written nomination by any two active members of the NZSSS.
<i>Undergraduate Prizes</i>	Annually	31 December 2022	A third-year student in Soil or Earth Sciences.	The Head of the Soil or Earth Science Department/Group at Massey, Lincoln, and Waikato University may each nominate the best third-year student from their department/group.
<i>The US/NZ Exchange Award</i>	Annually	15 April 2022 for initial submission (18 April for final submission)	Nominees are required to have at least seven years of membership in SSSA or the NZSSS. Former recipients of this Award are not eligible.	This award allows self-nominations.
<i>*New* Soil Judging Stipend (\$2,000)</i>	Annually	31 July 2022	Open to student teams for attendance at a conference-related soil judging competition in New Zealand or Australia. Priority will be given to the highest performing team from the previous calendar year.	The Head of the Soil or Earth Science Department/Group at a New Zealand University may nominate a team from their department/group.

Nominations and requests for further information regarding NZSSS awards should be addressed to:

Dr Brendon Malcolm

NZSSS Awards Convenor

C/O Plant & Food Research

Private Bag 4704, Christchurch Mail Centre, Christchurch 8140 (normal post), or

Canterbury Agriculture & Science Centre, Gerald St, Lincoln 7608 (courier)

New Zealand

Email: Brendon.Malcolm@plantandfood.co.nz

NZSSS conference

<p>NZSSS 2022 Conference 28 November - 2 December Marlborough Convention Centre</p> <p><i>Soil: Aotearoa's most precious natural resource – past, present, future</i></p>	
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Book the dates!

The NZSSS conference will be held at the Marlborough Convention Centre from 28th November - 2nd December 2022. Abstracts will shortly be called for. Topics and programme are currently being developed but sessions will include, but will not be limited, to topics such as: Regenerative Agriculture, Carbon Sequestration, Catchment Management, Climate Change, Contaminated Land and Waste Issues, Wine, Urban Sprawl and High Class Soils, Productive, Soil Health/Quality, NZ's Soil Science Legacy, S-map, etc.

On behalf of the NZSSS Conference organising team.
Tim Clough

22nd World Congress of Soil Science

The 22nd World Congress of Soil Science (WCSS) is being hosted by the British Society of Soil Science (BSSS) on behalf of the International Union of Soil Science (IUSS) at the Glasgow SEC 31 July - 5 August 2022. The WCSS will have scientific and policy sessions and presentations, exhibitions, keynote speakers, and outreach events and is expected to attract an international audience of over 1,500 soil scientists, professionals, and policy makers. Alongside the main event there are soil tours, a soil judging competition, and arts and culture programme. It is the main event in the calendar for those with an interest in soil science. This is the premier global Soil Science event and a wonderful opportunity to meet soil scientists from around the world and to gain a global view of current progress in soil science. If you are planning to attend, please can you let Megan Balks (megan.balks@earthbrooke.co.nz) know, as we will need someone from New Zealand to represent us at the IUSS Council meetings.

WCSS22 Website- [22nd World Congress of Soil Science - Glasgow 2022 \(22wcss.org\)](https://22wcss.org)

WCSS22 Media Pack- [Media - 22nd World Congress of Soil Science \(22wcss.org\)](https://22wcss.org)

WCSS22 Soil Judging Information- [Soil Judging - 22nd World Congress of Soil Science \(22wcss.org\)](#)

WCSS22 Tours Information- [Tours - 22nd World Congress of Soil Science \(22wcss.org\)](#)

BSSS Website- [Home - British Society of Soil Science](#)

OLS Website- [Our Living Soil | An art & science programme to understand the importance of soils.](#)

If you have any queries about the WCSS feel free to contact Christine.Berrill@cranfield.ac.uk who is the British Soil Science Society contact for the conference.

11th International Drainage Symposium, August 30-September 2, 2022, at Marriott Des Moines Downtown in Des Moines, Iowa

Presenting at the International Drainage Symposium is an opportunity to share your work with drainage researchers, professionals, and practitioners from around the world. The Symposium will include both oral presentations and poster sessions. The deadline to submit is **March 15, 2022**.

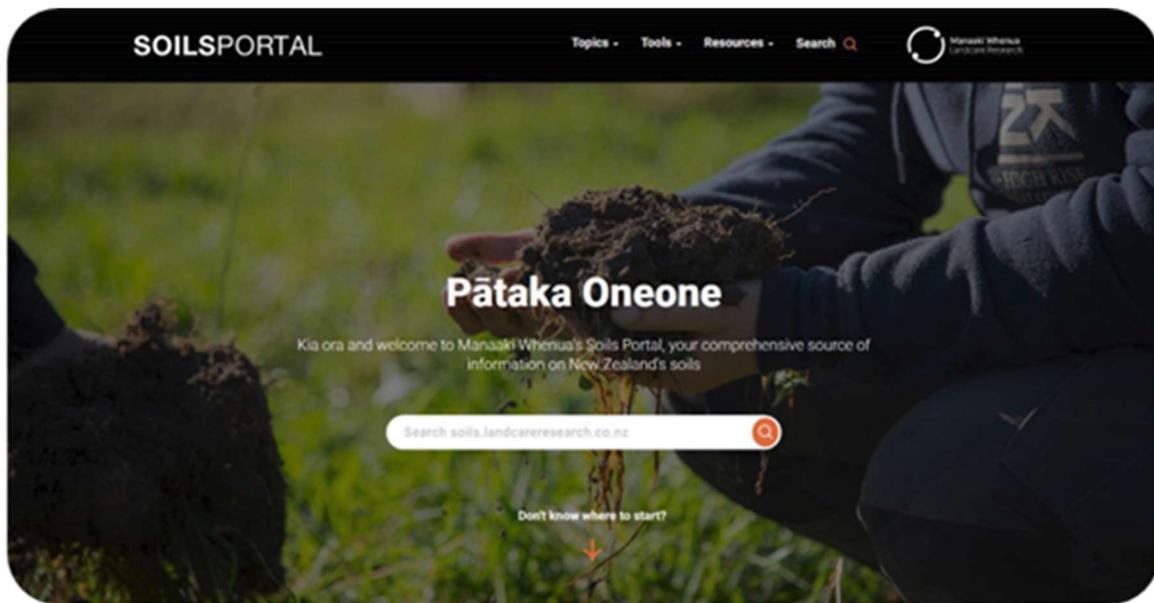
Visit www.swcs.org/22IDS for additional details on the event, including Exhibitor and Sponsorship opportunities.

Update of popular Soils Portal has been released

The Soils Portal is Manaaki Whenua's website for comprehensive information about New Zealand's soil resources. It has been up and running for 15 years, and currently attracts some 40,000 visitors per year.

The major re-refresh has been implemented over the past four months, through a collaboration between MWLR Soils & Landscapes and Informatics teams, as well as digital marketing agency Mint Design. The new Soils Portal service was launched on 6 December 2021 as part of the World Soil Day celebrations.

You are most welcome to have a browse: <https://soils.landcareresearch.co.nz/>



Here's what's new:

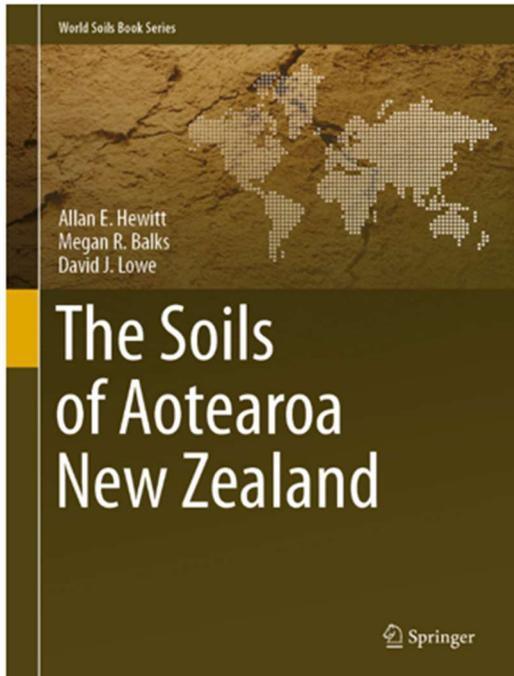
- Fresh design, and simplified navigation
- Tailored information for different user groups
- Content 'quiz' for visitors new to the site
- A news section

The LINK Online webinar recording (30 mins) of the release is available from <https://www.youtube.com/watch?v=-mSH1YW4P1k>

Don't hesitate to get in touch with feedback. Suggestions for new content and news items are always welcome!

Thomas Caspari, Manaaki Whenua - Landcare Research

Reduction in cost of “The Soils of Aotearoa New Zealand” in 2022



The authors are delighted to advise that the cost for this book as a hard-cover printed book has been reduced this year to EUR 69.99 (i.e., it is now half the price advertised in 2021). This new price excludes GST but shipping is free. Note that the hard-cover book is 'printed on demand' and may take up to around two months to get to New Zealand under current Covid-affected transport systems. See the online website of the book's publisher Springer to purchase.

<https://link.springer.com/book/10.1007/978-3-030-64763-6>

Reviews of the book and a report

Soil Horizons newsletter (by Dr Bill Lee):

<https://www.landcareresearch.co.nz/publications/soil-horizons/soil-horizons-articles/book-review-the-soils-of-aotearoa-new-zealand/>

Kete (independent website devoted to new books from Aotearoa) (by Jim Eagles):

<https://www.ketebooks.co.nz/all-book-reviews/review-the-soils-of-aotearoa-new-zealand-gffd9>

Article in NZ Farmers' Weekly (by Richard Rennie):

<https://farmersweekly.co.nz/s/fw-article/book-highlights-soils-value-to-nz-MCTEXKB2KAHVWBWBODVCFQCZMEMYA>

Vacancy: Open PhD Position in Biogeochemistry / Earth Science / Soil Science

This fully funded three-year PhD studentship based at Te Aka Mātuatua - School of Science, Waikato University in Hamilton, New Zealand. As part of a Marsden Fund fast-start research project, the successful candidate will be an integral part of laboratory and fieldwork in the North Island of New Zealand. A mid-year 2022 start is anticipated; with flexibility in responding to COVID-19 related travel restrictions.

Chief Supervisor Dr. Dorisel Torres-Rojas (University of Waikato - Hamilton)

Collaborators: A/Prof Thea Whitman (University of Wisconsin - Madison)
Dr. Rachel Hestrin (University of Massachusetts - Amherst)
Dr. Jordan Goodrich (University of Waikato-Hamilton)

Description: Most studies addressing nitrous oxide emissions from soils focus on intercepting or slowing the biological pathway leading to N₂O generation. However, little attention has been paid to the important N₂O-precursor, ammonia (NH₃), and its potential to be retained in organic soil horizons. Following [recent work](#) by our group on NH₃-bonding to charcoal under ambient conditions, this research programme will explore a neglected pathway toward N retention in soil with the potential to mitigate N₂O emissions to the atmosphere.

We are looking for a rigorous and passionate scientist to join the newly-formed Torres-Rojas laboratory at the University of Waikato, New Zealand. With a broad interest in chemistry, biology, and environmental sciences, you will be just as enthusiastic as we are about understanding the intricate reaction pathways involved in SOM-NH₃ bonding. This project draws heavily on quantitative ¹⁵N-NMR and Synchrotron X-ray Absorption Spectroscopy. Therefore, we are searching for a budding researcher who gets a kick out of advanced analytical techniques and approaches science from a fundamental, mechanistic perspective.

This Ph.D. project investigates the abiotic interaction between ammonia and soil organic matter, working across an environmental gradient of drained peats in New Zealand's North Island. As part of this project, the Ph.D. student will execute a combination of fieldwork in the Waikato region of New Zealand, experimental adsorption studies, and advanced analytical techniques with a well-rounded and internationally connected supervisory team of early-career scientists. This project is in collaboration with the University of Massachusetts Amherst, the University of Wisconsin-Madison, and the Australian Synchrotron. There is scope for the right candidate to lead the way in shaping the bulk of the thesis and forming strong international collaborations.

Prior experience: Prior experience in any of the following fields: biogeochemistry, isotope (or other) geochemistry, analytical chemistry, soil science, or a related field is highly valued.

As part of your application package, kindly include:

1. CV (including 2-3 referees' information)
2. Cover Letter (this can include: a description of why you want to undertake a Ph.D.; how your previous experiences have prepared you for the research project that you are applying for; what your passions are within or outside of academia)

Applications will be accepted until the position is filled.

Contact and email address for applications: doriselt@waikato.ac.nz

Vacancy: Lecturer/Senior Lecturer in Soil and Environmental Physics

The Faculty of Agriculture and Life Sciences is the largest academic faculty within Lincoln University and is made up of four research-driven Departments: Soil and Physical Sciences; Agricultural Sciences; Wine, Food and Molecular Biosciences; and Pest Management and Conservation.

We are inviting applications for an academic appointment as a Lecturer or Senior Lecturer in Soil and Environmental Physics within the Department of Soil and Physical Sciences. The Department has a global reputation for research excellence. For further detail on this opportunity, please see the website link below. <https://careers.lincoln.ac.nz/jobdetails/ajid/LnBk7/Lecturer-Senior-Lecturer-in-Soil-and-Environmental-Physics,2022-5950.html>

News from the Regions

Waikato/Bay of Plenty

Lincoln Agritech

Critical Pathways Programme

The Hamilton-based Environmental team have been out sweltering in the summer conditions, collecting core information and installing shallow (<10m) wells (Figure 1) in our Upper Piako study catchment. This information will help 'ground truth' the electromagnetic survey information (SkyTEM and t-TEM), and provide water table and groundwater chemistry data for the catchment models. The core information gathered includes standard soil description of colour, texture, mottling etc, and also tests for the presence of reduced iron (Fe^{2+}) using the Childs test reagent, which indicates reduced conditions in the subsoil (Figure 2). Reduced conditions are important for understanding the potential transformation of nitrate as it moves from the soil surface through the groundwater system and into surface waters.



Figure 1: The drilling rig operated by James Owers in the Piako study catchment, January 2022.

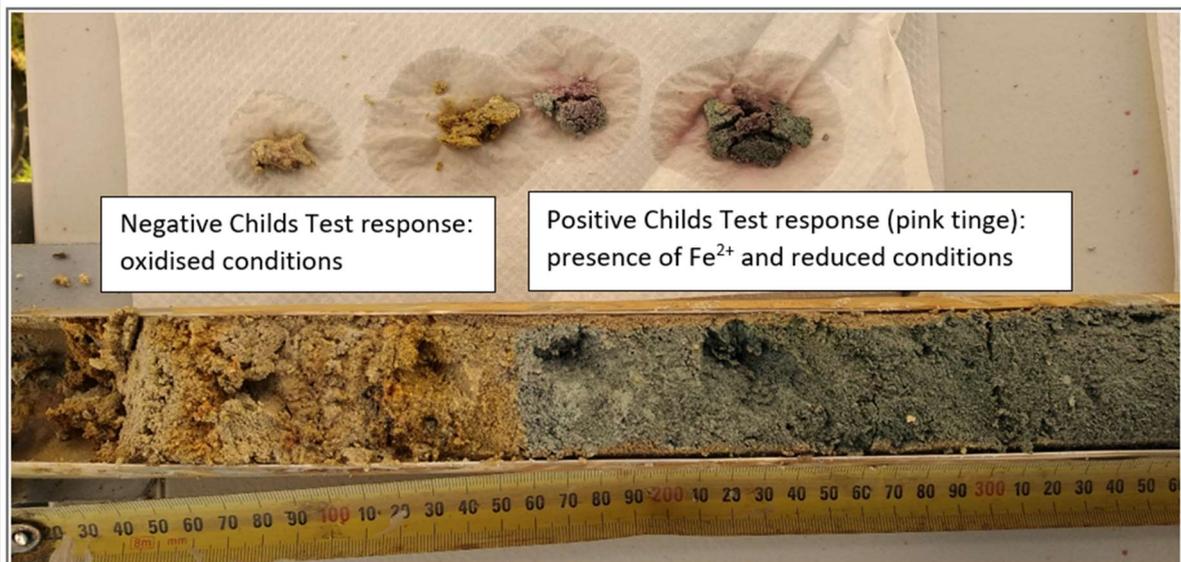


Figure 2: Testing for the presence of reduced iron (Fe^{2+}) to indicate reduced conditions in the subsurface, January 2022.

The Hamilton office has also hosted two interns over the summer (Figure 3). The Ngāti Hauā students are from Te Wharekura o Te Rau Aroha, which is just outside our Upper Piako study catchment. They have been learning about stream ecology and performing stream health assessments, so we introduced them to stream gauging and water quality sampling for some real-world science in action.



Figure 3: Te Wharekura o Te Rau Aroha interns Pare Wilson (left) and Reuben Gillett (right), January 2022.

Manaaki Whenua-Landcare Research

Scott Fraser, Jonno Rau and Emily McKay, with help from 2nd year BSc tech. student **Helen Western**, have been completing field work for a 2 ½ year project updating S-map coverage in the eastern Waikato and BOP. A new digital soil map (DSM) covering more than 750,000 ha including the Hauraki Plains, Coromandel Peninsula, Kaimai Ranges and Mamaku Plateau will be available online in August this year. The new soil map will replace 6 legacy maps and fill in gaps in the existing S-map coverage to provide a seamless fit across the Waikato/BOP boundary while addressing some inconsistencies between adjoining legacy maps. This project has allowed new pedologist Emily to learn the ropes, while providing Helen her first taste of field work after 2 years of online learning under covid restrictions.



Photo 1: Some of the mapping area - looking North along the Kaimai Ranges towards the Coromandel Peninsula with the Hauraki Plains to the left.



Photo 2: Scott Fraser discussing the Tuhua tephra with pedologist in training Emily McKay in the Tirua forest

Sampling for the national soil carbon monitoring programme has progressed well for the Hamilton-based sampling team (**Jonno Rau**, **Emily McKay** and **Georgie Glover-Clark**) over the past few months, although has proven challenging at times with COVID-19 related constraints and more recently, dry summer conditions preventing soil coring. Jonno also travelled to Otago and Southland for a two-week

sampling trip with **James Arbuckle**, a Dunedin based colleague. Sampling should resume shortly following recent rainfall. An overview of the project and preliminary results were presented at the (online) FLRC conference.



Photo 3: Soil cores collected from a Waikato kiwifruit site on a beautiful fine day.

Manawatu **AgResearch Grasslands**

Sheep dung disappearance from grazed hill country landscapes has taken on additional interest.

Two field experiments designed to explore the effects of dung chemical composition, slope, and aspect (Experiment 1) and dung chemical composition and deposition site (Experiment 2) on the rate of disappearance of dung from sheep grazing hill country pastures has taken on additional interest with the recent upward trend in fertiliser costs, given the single biggest determinant of annual nutrient requirements in a grazed system is the nutrient transfer factor.



Emma securing the sheep dung bags on the high fertility farmlet.

The research team that includes Ronaldo Vibart, Franco Bilotto, Alec Mackay, Brian Devantier, Emma Noakes and Paul Maclean, has been working over the last several years on improving through modelling our ability to better capture long-term soil phosphorus (P), organic carbon (C) and nitrogen (N) dynamics under hill country grazing. Using above-ground dung disappearance as a proxy, the current project is examining the effects of both biological (e.g., dung chemical composition and deposition site) and topographic (e.g., slope and aspect) factors leading to dung disappearance. It was hypothesised that both biological and topographic factors would affect the rate of sheep dung disappearance over time. The initial findings of the research have been pulled together and included in a paper for presentation to the New Zealand Grasslands Conference (Ronaldo Vibart, Alec Mackay, Brian Devantier, Emma Noakes and Paul Maclean. 2021 Sheep dung disappearance from grazed hill country landscapes. *Journal of New Zealand Grasslands* 83 195-201)

Review and update of a nutrient transfer model used for estimating nitrous oxide emissions from complex grazed landscapes

Nitrous oxide emissions from grazed hill pastures are estimated using different emission factors for urine and dung deposited on different slope classes. Allocation of urine and dung to each slope class needs to consider both the distribution of slope classes within a landscape and animal excreta return. For the allocation of excretal nitrogen to each slope class, a Nutrient Transfer (NT) model has recently been incorporated to the New Zealand Agricultural GHG Inventory Model. The predictive ability of the transfer function within the NT model was explored using three urine deposition datasets collected using urine sensor and GPS tracker technology from paddocks that had areas in low ($<12^\circ$), medium ($12-24^\circ$) and high slopes ($>24^\circ$) often outside of the range originally used to develop the model. Despite these differences, the model showed a good overall predictive ability for two of the three datasets. However, if the urine emission factors (EF3) were to be further disaggregated by all three slope classes, more precise data would be required to accurately represent farms and farm production regions. We have identified the need for more geospatial data on urine deposition and animal location for farms that are topographically out of the range used to develop the

model. These new datasets would provide livestock urine deposition data on a more continuum basis across all slopes (as opposed to broad ranges), a unique opportunity to improve the performance of the model.



Core ideas

- The NT model allocates urine from grazing livestock to different slope classes.
- The predictive ability of the model was explored using urine sensor and tracker data of grazing livestock.
- The model showed a good overall predictive ability for two of the three datasets explored.
- There is a need for more geospatial urine deposition and animal location data on complex landscapes.

Paper submitted to the Journal of Environmental Quality by Ronaldo Vibart, Donna Giltrap, Surinder Saggar, Alec Mackay, Keith Betteridge, Des Costall, Mike Rollo and Ina Draganova.

Manaaki Whenua - Landcare Research

Our field pedology team have been busy with soil mapping and carbon monitoring projects. Lauren O'Brien, Shana Dooley and Anthony Ward have been working on soil mapping in the Manawatu and Wellington regions. Shana Dooley and Lauren O'Brien had a recent trip to Hauraki for S-map. Lauren and Peter Singleton 'reviewed' Scott Fraser's current mapping in the Hauraki area. It involved two days of looking at soil profiles from near Hamilton, plus the Coromandel and Rotorua areas. Other participants were university student Helen Western and others from the Manaaki Whenua team learning and discussing soils. Several photos are below.



Photo: Waikato soil profile with Scott Fraser, located off Tapapa Road, off State Highway 5 between Rotorua and Hamilton. It shows one of the cuttings west of Rotorua with loess and tephra well characterised by the University of Waikato.



Photo: A forestry block east of Mayor Island with a uniquely thick layer of lapilli, classified as a Pumice Soil.



Photo from student Helen Western, showing of the elusive Mamaku podzol.

Shane Cox started as our new soil physics technician in the soil physics laboratory, and Zach MacDonald started as our new technician in the environmental chemistry laboratory.

A LINK webinar was presented by John Drewry on “ Digging deeper on soil compaction and pugging’. This webinar is available on: <https://www.landcareresearch.co.nz/events/linkonline/>

Massey University

Celebrating World Soil Day in Massey University

A contingent of staff and students from the Environmental Sciences Group attended an in-house celebration of the World Soil Day last December. An excellent excuse to safely get together for a very special morning tea. In this occasion, we were encouraged to bring a soil themed item, so we end up with elaborated cakes and some sweets to share (*see photos below*).

Dr **Kate Holt** presented a fantastic piece that deserves highlight. She chose to make a podzol sequence as there are such a diversity of different horizons in a podzol. On top of the cake is a forest of fondant conifer trees, which have contributed to the organic-rich chocolate icing litter (O horizon). Underlying this is a chocolate sponge A horizon, followed by a white buttercream E horizon. Caramel forms the illuvial Bhs horizon, and vanilla sponge is the C horizon below. Yummy soil science indeed!

a)



b)



c)



Celebrating World Soil Day at Massey: the crew (a), the offer (b), the Podzol (c). Credits: C. Anderson, R. Calvelo, K. Holt.

FLRC Workshop 2022

The 34th Annual FLRC Workshop was held from 9th-11th February. Although the FLRC team had big plans for another fabulous few days at Massey, plans were disrupted by covid restrictions, and the entire event was moved online. This meant some rapid 'pivoting of plans' but the 3-day Workshop, delivered entirely by Zoom webinar from a professional AV studio, was a great success. Almost 90 papers were presented with around 240 'delegates' registered for viewing. This year, we engaged the services of Event Dynamics, to assist with the facilitation and administration of the workshop. It was a good idea at the time, and then with the online platform, having the Event Dynamics team on board was the best decision. A special thanks to our family of sponsors who continue to be supportive of FLRC and our activities as the world changes at a rapid pace.



*Above: intense activity at the AV studio to ensure that FLRC Workshop goes smoothly while **Christine Christensen** and **Lucy Burkitt** (FLRC, Massey University) are waiting for the event kick-off; below: everything ok with so many screens. Photo credits: FLRC.*

FLRC looks forward to welcoming all delegates back to Massey in February 2023, for our 35th Annual Workshop - keep an eye out in future Soil News publications for dates and details.

Happy Retirement to Lance Currie

A stalwart of FLRC and the administrator of our professional development courses, Lance Currie, has now 'fully retired' from his role as Senior Technical Manager within the soils group. Lance's semi-retirement was celebrated 2 years ago, but as

many will be aware, he has been working part-time to facilitate and administrate the many Sustainable Nutrient Management courses that FLRC deliver over the year. This 2-year period has seen the delivery of the courses go fully online, and Lance has been instrumental in ensuring this transition has been smooth and trouble-free, with a particular interest in ensuring all course participants were receiving a great online learning experience. The Farmed Landscapes Research Centre (FLRC) wishes Lance all the very best for a happy and long retirement.

PhD completion

Dr Abhiram Gunaratnam has completed his Ph.D. degree and his thesis titled “Design and fabrication of a climate-controlled lysimeter and testing of new controlled-release fertilizers”. He designed and fabricated a novel climate-controlled lysimeter system and coupled it with a climate-controlled unit. The system can control the rainfall duration and intensity, light intensity, temperature, and relative humidity of the plant growing space. It allows mimicking a specific field climatic condition in a controlled experimental unit. He was supervised by Dr **Miles Grafton**, Dr **Paramsothy Jeyakumar**, Dr **Peter Bishop**, Professor **Clive Davies** from Massey University, and Dr **Murray McCurdy** from Verum Group, Lower Hutt.

Tasman District

Celebrating the Revival of Soil and Land in Te Tai-o-Aorere

It was a silent celebration, the birthday party of one of Aotearoa’s oldest soil maps. The *Soil Map of Waimea Plains (Nelson)* from the Cawthron Institute turned one hundred years and its anniversary in 2020 seemed to have passed by mostly unnoticed. One might say that celebrating a soil map’s birthday in face of a global pandemic would appear fairly unimportant, and truly this applies even more so to the Tasman District Council as their soil scientist, Bernard Simmonds, passed away in the same year. The soil and land space remained vacant, and it was not before May 2021 that the position was filled. Wisely, given the workload, Council employed two new staff: Mirka Langford, a Senior Resource Scientist and now leader of Council’s *Te Whenua me Te Hau* team, and Anne Wecking, a Resource Scientist mainly responsible for everything related to this amazing world underneath all our feet - soil.

For us, the revival of Te Tai-o-Aorere soils could not be more exciting. Proudly we would like to let the New Zealand soil community know that soils in the Tasman have a voice again, with ambassadors who speak up to safeguard these valuable resources within the legal framework. You might be aware that the next NZSSS conference is hosted by our lovely neighbours in the Marlborough District. So, what could be better than familiarising yourself with the pedology of the top of the South Island in advance? We like to provide you with this opportunity and here share some of our recent work. Be invited to enjoy the photos and text as a first aperitif and celebrate with us the occasion that we - back then in 2020 - missed.

Anne Wecking - representing *Te Whenua me Te Hau*

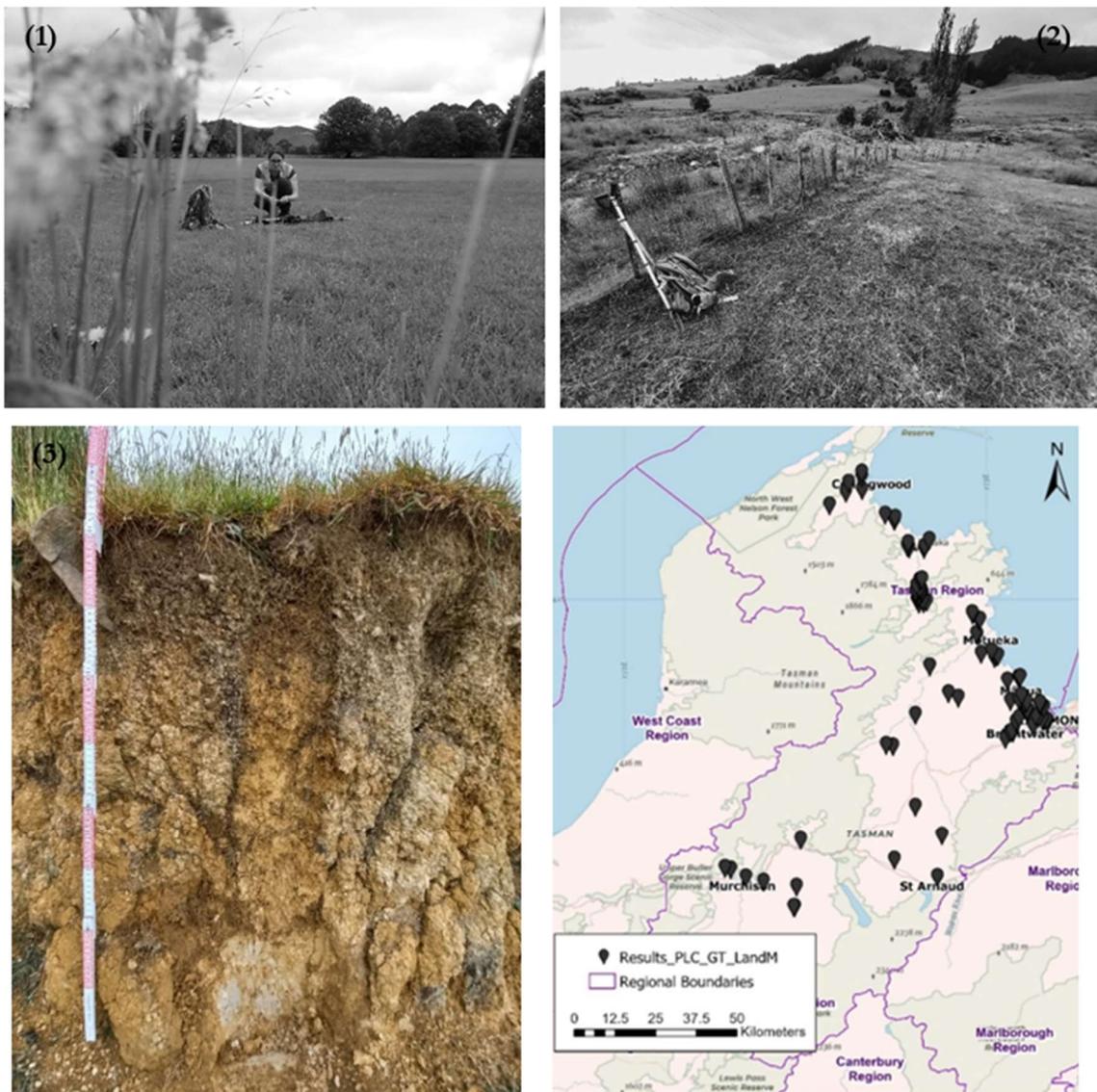


Figure 1 Impressions from the productive land ground-truthing work leading Anne across the Tasman District in November and December 2021. Sites visited ($n = 103$) are indicated by black markers on the map. The black and white photography is a creative attempt to set the undertaking into the right 'light'. Coming across a range of different *Ultic Soils* in Moutere and north of Motueka (photo) was a personal highlight.

Productive Land Classification

One of our most pressing issues is to identify and protect areas of productive land. The urban sprawl from Richmond out into the Plains is highly controversial and how the implementation of the anticipated National Policy Statement for Highly Productive Land might look like, is still a question mark. Different to the Land Use Capability framework, the Tasman District Council established its own **Productive Land Classification** (PLC) in 1994. The recently reviewed, 2021 version of the PLC is based on a model taking into account district-specific climate and land qualities and is now available also in a digitalised format. The above photos were taken in

November-December last year when the PLC model was ground-truthed across 103 sites. Looking at the photographs, did you notice the *Ultic Soil*?

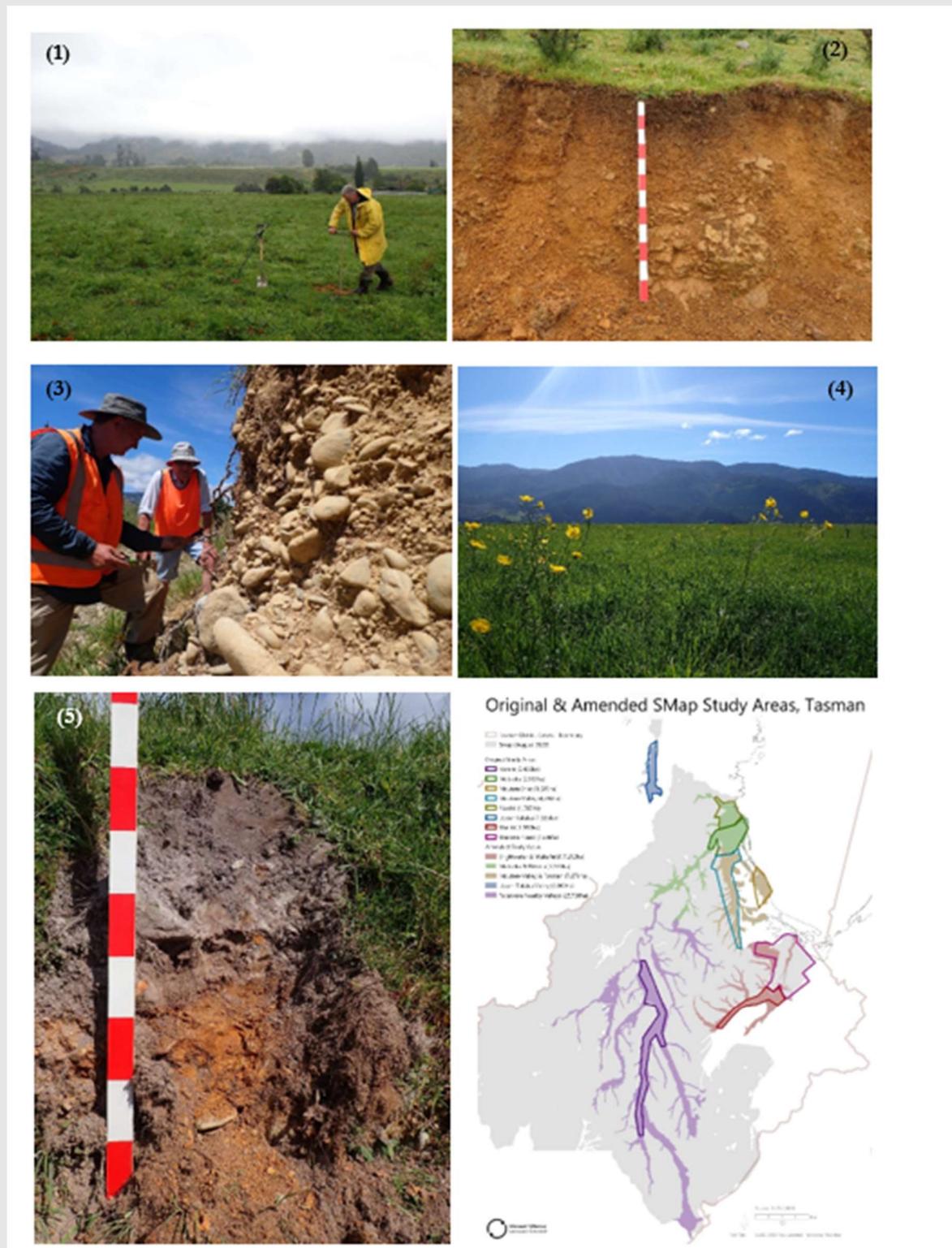


Figure 2 (1) Gerard working hard in the field. (2) A *Terra-rossa*-like soil? Analysis of the samples will hopefully tell us more. (3) Iain and Gerard discussing what an *Ikamatu* soil would translate to in the NZSC taxonomy. (4) Scenery in the Upper Takaka Valley. (5) Locals call this soil *Pakihi*.

S-map expansion

The Tasman District comprises an effective land area of 954,143 hectares (water bodies and estuaries excluded), with 27% of the area included in S-map. Soil legacy data are fairly abundant e.g., found in the maps of the Cawthron Institute, the tobacco industry, South Island surveys in the mid-20th century and, of course, the thousands of soil auger and pit observations by Iain Campbell (2005-2018) including 4,494 observations alone in the Waimea Plains. However, this information has not been fully validated, translated and updated into S-map. There is lots to do and soil surveyors will certainly be busy in 2022 and 2023. Of particular interest for the upcoming work is the land under pressure on the plains and terraces of the Motueka, Waimea, Wai-iti, and Buller Rivers. This soil survey work is jointly funded by Tasman Regional Council and Ministry for Primary Industries S-map Expansion Programme.

Some impressions from the initial fieldwork are summarised in Figure 2: (1) Landcare Research's Gerard Grealish in action. Gerard was responsible for leading the S-map survey in Upper Takaka at the end of 2021. From 2022 onwards, Thomas Caspari will take over. (2) The photo does not do the soil profile justice. In reality, the brown colour was of a deeper red-brown and the soil type visually similar to how a Terra rossa soil would look like in the limestone landscapes of the Mediterranean. (3) Gerard and Iain discussing the characteristics of an Ikamatua soil (i.e., the stony variant of an Acidic Orthic Brown Soil). With his 80 years, Iain is still comfortably handling auger and spate. We could not be more grateful that he is supporting the soil survey work with his decades of local experience and always willing to catch up in the field and discuss a soil profile over a cup of tea! Thank you, Iain, for being such a treasure! (4) Upper Takaka landscape, the view east from one of high terraces. (5) This is what farmers and locals call a *Pakihī* soil formed on the highest outwash terraces and under a high rainfall and leaching regime. The soil on the photo shows initial signs of podzolisation with an iron pan just starting to form. Further towards the north, in the Aorere valley, Podzols and perch-gley Podzols become even more frequent and are quite distinct.

Soil awareness and soil educational walkway

Our team's belief is inspired by the Māori proverb *whatungarongaro te tangata toitū the whenua* - while the people come and go, the land endures. This proverb highlights the insignificance of humanity in the grand scheme of things; we might have forgotten about this for too long. Detaching ourselves from the ordinary circle of life on Earth resulted in that we did not treat the treasures of the land with the respect and understanding that they deserve. We degraded, eroded, and wasted land resources. Yet, we are still continuing to do so. Clearly to our disadvantage.

To highlight the importance of land and soil as a *taonga* of all our well-being (and that of the planet), we would like to increase the awareness in the collective memory of the public. Our approach is to simply make visible what otherwise remains hidden underground. Inspired by overseas examples, a council interest group has formed and now aspires to build the first 'soil educational walkway' in Aotearoa New Zealand. The walkway will include having selected soil profiles open and accessible at public locations such as reserves or along cycleways. Project plans have been initiated and at the moment we are working on writing the project proposal, scoping out potential locations and budget the whole undertaking. Collaborators are most welcome as well as would be access to funding. If you have any ideas, please, do

not hesitate to get in touch with Anne (anne.wecking@tasman.govt.nz)! Once established, we aim to share our project templates with everyone, especially those who are inspired by the idea and wish to install something similar.



Figure 3 Inspiration from overseas: These examples are only a few of many named in the "[Soil Travel Guide](#)" published on the website of the German Ministry for the Environment.

Nearly every district in Germany has its own array of geological theme parks and soil walkways. Keep an eye out when you are in Europe next.

Photo left: © <https://www.umweltbundesamt.de/themen/boden-landwirtschaft/un-jahr-des-bodens/bodenlehrpfad-kalchreuth-wolfseiden-mittelfranken>

Photo right © <https://www.umweltbundesamt.de/themen/boden-landwirtschaft/un-jahr-des-bodens/bodenlehrpfad-buchenberg-schwaben>

Canterbury and Otago

Manaaki Whenua - Landcare Research

As part of a larger Beef and Lamb MBIE funded project called Regenerating Hill Country, MWLR have a minor role in supporting Lincoln University/Plant & Food to develop a national scale APSIM model of Lucerne, by providing suitable soils data to match the NIWA Virtual Climate Network. MWLR led the farm-scale mapping of soil temperature and moisture to validate the down-scaling of empirical legume models, to provide information suitable for supporting planning decisions at the farm scale.

Jagath Ekanayake has designed and built six sensor networks that allow remote, near-real time access of data from soil moisture and temperature data sensors. These networks have been installed on farms across NZ. The photos below were taken during a recent maintenance check of the soil sensor network on Banks Peninsula.





AgResearch

Ross Monaghan, Chris Smith, Andrew Searle, Ahmed El-Naggar and Ben Monaghan spent three weeks before Christmas doing a Visual Soil Assessment (VSA) on 83 paddocks at the Southern Dairy Hub (SDH). This survey was undertaken to help the paddock selection for the four new farmlets that will be set up on SDH from August 2022. It was also hoped to identify any effects of the current SDH farmlet (two intensity levels x two wintering cop selections) study on soil physical health.



Ross and Ben Monaghan completing a VSA at SDH in front of an appreciative audience



Example of a good structured soil at SDH



Example of a badly compacted and mottled soil at SDH.

Publications related to erosion on NZ soils

Recent publication related to erosion on NZ soils (also see M. Donovan's abstract below):

<https://www.sciencedirect.com/science/article/pii/S136481522100270X>

Recent media article published about the erosion paper: <https://ourlandandwater.nz/news/a-more-accurate-picture-of-where-surface-erosion-is-likely/>

An interview with Farmers Weekly: <https://farmersweekly.co.nz/s/fw-article/mapping-surface-erosion-on-a-national-scale-MC4R4HCUJO3NHCPIQXOTGBQFXWUE>

Abstracts

Modelling soil loss from surface erosion at high-resolution to better understand sources and drivers across land uses and catchments; a national-scale assessment of Aotearoa, New Zealand

Mitchell Donovan

Soil erosion is a significant challenge for agricultural regions, with cascading impacts to waterways, land productivity, soil carbon, and ecological health. We provide the first national-scale soil erosion model that incorporates the impacts of grazing on ground cover (Cgr) and soil erodibility (Ktr) into the RUSLE framework. Surface erosion rates for winter-forage paddocks ($11 \text{ t ha}^{-1} \text{ y}^{-1}$) were substantially higher than pastoral grasslands ($0.83 \text{ t ha}^{-1} \text{ y}^{-1}$), woody grasslands ($0.098 \text{ t ha}^{-1} \text{ y}^{-1}$), forests ($0.103 \text{ t ha}^{-1} \text{ y}^{-1}$) and natural soil production rates ($\leq 1\text{--}2 \text{ t ha}^{-1} \text{ y}^{-1}$). Validation with empirical measurements from sediment traps, sediment cores, and chemical fingerprinting demonstrated strong linear regressions ($r^2 = 0.86$). Terrain impacted soil erosion directly through slope steepness and flow convergence and indirectly through strong orographic effects on rainfall erosivity ($r^2 = 0.39\text{--}0.83$). Annual surface erosion across Aotearoa New Zealand could reach 16.5–29.2 Mt y^{-1} , representing \sim \\$20M annually and up to 24–31% of sediment yield for two catchments.

Donovan, M. *Environmental Modelling & Software* 147, January 2022, 105228.
<https://doi.org/10.1016/j.envsoft.2021.105228>

Montmorillonite-hydrochar nanocomposites as examples of clay-organic interactions delivering ecosystem services

Guodong Yuan, Jing Wei, Benny K.G. Theng

The clay-organic interaction is an important natural process that underpins soil ecosystem services. This process can also be tailored to produce clay-organic nanocomposites for industrial and environmental applications. The organic moiety of the nanocomposites, typically represented by a toxic surfactant, could be replaced by hydrochar formed from biomolecules (e.g., glucose) via hydrothermal carbonization. The effect of montmorillonite (Mnt) and glucose dosage on hydrochar formation, however, has not been clarified. In addition, the mechanisms by which Mnt-hydrochar nanocomposites (CMnt) can detoxify and remove carcinogenic Cr(VI) from aqueous solution are not well understood. In the current study, research milestones in terms of clay-organic interactions are summarized, following which the synthesis and characterization of CMnt for Cr(VI) adsorption are outlined. Briefly, 1 g of Mnt was reacted with 75 mL of glucose solution (0.1, 0.2, 0.3, 0.4, 0.5, and 0.6 mol L^{-1}) by hydrothermal carbonization at 200 °C for 16

h. The resultant CMnt samples were analyzed for chemical composition, functional groups, morphological features, and Cr(VI) adsorptive properties. Mnt promoted the conversion of glucose to hydrochars, the particle size of which (~80 nm) was appreciably smaller than that formed in the absence of Mnt (control). Furthermore, the hydrochars in CMnt had an aromatic structure with low hydrogen substitution and high stability (C/H atomic ratio 0.34-0.99). The weakened OH (from hydrochar) and Si-O-Si stretching peaks in the Fourier-transform infrared (FTIR) spectra of CMnt are indicative of chemical bonding between Mnt and hydrochar. The CMnt samples were effective at removing toxic Cr(VI) from acidic aqueous solutions. Several processes were involved, including direct reduction of Cr(VI) to Cr(III), complexation of Cr(III) with carboxyl and phenolic groups of hydrochar, electrostatic attraction between Cr(VI) and positively charged CMnt at pH 2 followed by indirect reduction of Cr(VI) to Cr(III), and Cr(III) precipitation.

Guodong Yuan, Jing Wei, Benny K.G. Theng. *Clays and Clay Minerals* 69: 406–415 (2021)

Quantification of multiple soil trace elements by combining portable X-ray fluorescence and reflectance spectroscopy

G.Shrestha, R. Calvelo-Pereira, P. Roudier, A.P. Martin, R.E. Turnbull, G. Kereszturi, P. Jeyakumar, C.W.N. Anderson

Several combinations of proximal sensors, portable x-ray fluorescence spectroscopy (pXRF), visible-near-infrared spectroscopy (vis-NIR), and mid-infrared spectroscopy (MIR) are assessed to quantify multiple soil trace elements (TE) with reliable accuracy. A total 622 topsoil samples (0-20 cm depth) collected at regular 8 km spacing across southern New Zealand were analysed for TE concentrations by a reference laboratory method and scanned with pXRF, vis-NIR, and MIR. The laboratory results and spectral information were used to develop robust models that enable prediction for soil concentrations of arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), and zinc (Zn). Chemometric approaches including spectral data fusion, partial least squares - support vector machine (PLS-SVM) model fusion, and model averaging were tested to obtain optimal quantitative TE predictions in the samples. Validation of PLS-SVM based models on held-out samples showed the combination of pXRF and MIR performed optimally for predicting As, Cr, and Pb concentrations with concordance correlation coefficient (CCC) of 0.97 and root mean square error (RMSE) of 0.57 mg As/kg, 1.14 mg Cr/kg, and 1.05 mg Pb/kg respectively. Fusion of pXRF and vis-NIR data performed optimally for quantifying Cu, Ni, and Zn concentrations with CCC of 0.98 and RMSE of 1.09 mg Cu/kg, 0.63 mg Ni/kg, and 3.90 mg Zn/kg respectively. For Cd and Hg, Granger-Ramanathan model averaging of outputs from PLS-SVM based pXRF, vis-NIR, and MIR models performed optimally with CCC > 0.80 and RMSE of 0.03 mg Cd/kg and 0.01 mg Hg/kg respectively. This study showed that quantitative prediction models for As, Cd, Cr, Cu, Hg, Ni, Pb, and Zn can be successfully implemented at local- and

national-scale and for long-term monitoring of soil trace elements at concentrations below pXRF detection limits and with reduced matrix interference from organic matter than from individual techniques alone.

G Shrestha, R Calvelo-Pereira, P Roudier, AP Martin, RE Turnbull, G Kereszturi, P Jeyakumar, CWN Anderson, 2022. Quantification of multiple soil trace elements by combining portable X-ray fluorescence and reflectance spectroscopy. *Geoderma* 409, 115649.

Biochar in climate change mitigation

Johannes Lehmann, Annette Cowie, Caroline A. Masiello, Claudia Kammann, Dominic Woolf, James E. Amonette, Maria L. Cayuela, Marta Camps-Arbestain and Thea Whitman

Climate change mitigation not only requires reductions of greenhouse gas emissions, but also withdrawal of carbon dioxide (CO₂) from the atmosphere. Here we review the relationship between emissions reductions and CO₂ removal by biochar systems, which are based on pyrolysing biomass to produce biochar, used for soil application, and renewable bioenergy. Half of the emission reductions and the majority of CO₂ removal result from the one to two orders of magnitude longer persistence of biochar than the biomass it is made from. Globally, biochar systems could deliver emission reductions of 3.4-6.3 PgCO₂e, half of which constitutes CO₂ removal. Relevant trade-offs exist between making and sequestering biochar in soil or producing more energy. Importantly, these trade-offs depend on what type of energy is replaced: relative to producing bioenergy, emissions of biochar systems increase by 3% when biochar replaces coal, whereas emissions decrease by 95% when biochar replaces renewable energy. The lack of a clear relationship between crop yield increases in response to fertilizer and to biochar additions suggests opportunities for biochar to increase crop yields where fertilizer alone is not effective, but also questions blanket recommendations based on known fertilizer responses. Locally specific decision support must recognize these relationships and trade-offs to establish carbon-trading mechanisms that facilitate a judicious implementation commensurate with climate change mitigation needs.

J Lehmann, A Cowie, CA Masiello, C Kammann, D Woolf, JE Amonette, ML Cayuela, M Camps-Arbestain, T Whitman, 2021. Biochar in climate change mitigation. *Nature Geoscience* 14, 883-892.

Biochar-based fertilizer effects on crop productivity: a meta-analysis

Leônidas Carrijo Azevedo Melo, Johannes Lehmann, Jefferson Santana da Silva Carneiro Marta Camps-Arbestain

Aim Biochar-based fertilizers (BBF) have gained increasing interest in recent years, yet their effects on crop productivity have not been reviewed.

Methods We conducted a meta-analysis of the published literature (2011-2021) using 148 pairwise comparisons between crop productivity after additions of BBF, of conventional fertilizers (fertilized control), and a non-fertilized control.

Results On average, BBF applied at very low application rates (mean of 0.9 t ha⁻¹) increased crop productivity by 10% compared with fertilized controls and 186% compared with non-fertilized controls. This mean crop productivity increase is comparable to that reported when biochar is used as a soil conditioner (i.e., 15 t-30 t ha⁻¹ to increase crop productivity by 10%). This crop yield increase suggests that biochar acts as a matrix to increase fertilizer use efficiency to a larger extent than conventional fertilizer alone. Cluster analysis revealed that BBFs have the potential to increase crop productivity by 15% when added to soils that are not responsive to conventional fertilizers. BBF produced at a highest heating temperature (HHT) of >400 °C increased crop productivity by 12% as opposed to those produced at a HHT of ≤400 °C that showed no increase. BBF with C contents >30% in the final mixture caused the largest increase in crop productivity by 17%, whereas those with C contents ≤30% had no effect.

Conclusion This study has shown that biochar can be an effective constituent of novel fertilizers with enhanced efficiency, which may contribute to lower nutrient losses and lower negative environmental impacts.

LCA Melo, J Lehmann, JSdS Carneiro, M Camps-Arbestain, 2022. Biochar-based fertilizer effects on crop productivity: a meta-analysis. *Plant and Soil*, DOI: 10.1007/s11104-11021-05276-11102.

Priming of carbon decomposition in 27 dairy grazed soils after bovine urine additions.

Lambie SM, Mason NWH, Mudge PL

Context: Soil organic matter (SOM) plays a vital role in carbon (C) storage and agricultural sustainability. Additions of bovine urine to soils can cause positive priming of soil C decomposition and represents a pathway for SOM loss. However, data is limited to a few soils.

Aims: We investigated the priming response to bovine urine of 27 dairy grazed pasture soils from the North Island of New Zealand.

Methods: Soils from Allophanic, Gley, Recent and Brown soil orders were collected. ¹⁴C-labelled dairy cow urine was applied (1000 kg N ha⁻¹) to undisturbed soil cores and carbon dioxide (CO₂) fluxes measured (25°C) for 21 days. Urine applications were repeated, and CO₂ measured for a further 21 days (25°C). Water was the control treatment.

Key results: CO₂ fluxes rapidly increased after both urine additions by 86 ± 1% 24 h after the first urine addition, and 68 ± 4% after the second. Positive, negative and no priming were observed, and the mean absolute deviation of priming ranged between 200 and 1000 µg C g⁻¹, and variability was greater after the second urine addition. Urine induced changes in pH and electrical conductivity (EC) had no

effect on priming, and soil C contents were correlated to cumulative CO₂, but not priming, and varied over time.

Conclusions: Factors affecting soil priming remain elusive and priming was highly variable within and between soil types.

Implications: The impacts of bovine urine on C pools requires further investigation to determine if, or when, urine patches are potential pathways for soil C loss.

Lambie SM, Mason NWH, Mudge PL 2021. Priming of carbon decomposition in 27 dairy grazed soils after bovine urine additions. *Soil Research* 60(2) 124-136
<https://doi.org/10.1071/SR20313>.

Microbial community composition and activity in paired irrigated and non-irrigated pastures in New Zealand.

Lambie SM, Mudge PL, Stevenson BA

Context: Microorganisms are key for carbon (C) and nitrogen (N) cycling in soils supporting agricultural production.

Aims: We investigated the impacts of irrigation on microbial community structure and activity in New Zealand on 28 paired non-irrigated and irrigated grazed pasture sites where C and N had decreased under irrigation.

Methods: Microbial community structure and microbial biomass (phospholipid fatty acids) and activity (basal respiration, substrate-induced respiration (SIR), aerobically mineralisable N (AerMN)) were assessed.

Key results: Microbial biomass did not differ between irrigated and non-irrigated soils, but irrigated soils had increased gram-negative bacteria ($P < 0.05$), lower gram-positive:gram-negative ratio ($P < 0.001$) and lower fungal:bacterial ratio ($P < 0.001$) compared to non-irrigated soils. SIR and AerMN were greater in irrigated compared to non-irrigated soils. There were no differences in basal respiration between irrigation treatments. Greater prevalence of gram-negative bacteria (r-strategist) as well as decreases in actinomycetes and fungal to bacterial ratio, and increased SIR and AerMN suggest more rapid cycling of C and nutrients in irrigated systems where C had been lost.

Conclusions: We found clear evidence that irrigation alters microbial community structure and activity in New Zealand pasture systems.

Lambie SM, Mudge PL, Stevenson BA 2021. Microbial community composition and activity in paired irrigated and non-irrigated pastures in New Zealand. *Soil Research*, <https://doi.org/10.1071/SR21149>.

Trade-offs between environmental and economic factors in conversion from exotic pine production to natural regeneration on erosion prone land

Lambie SM, Awatere S, Daigneault A, Kirschbaum MUF, Marden M, Soliman T, Spiekermann RI, Walsh PJ.

Background: Some of New Zealand's exotic pine (*Pinus radiata* D.Don) forests were planted for erosion mitigation but cultural, legislative, environmental, and

profitability limitations in some parts of the landscape have led to reassessment of their suitability. There is limited information to support landowner decisions on the viability of natural regeneration of native forest post-pine-harvest.

Methods: We evaluated scenarios of post-harvest natural regeneration, compared to remaining in pine production, using erosion susceptibility determined from historical occurrence of landslides, gullies and earthflows, biophysical growth modelling of mānuka-kānuka (*Leptospermum scoparium*-*Kunzea ericoides* (A.Rich) Joy Thomps.) shrubland using the process-based CenW model, and cost-benefit analyses using NZFARM with two land use change scenarios, at two levels of erosion mitigation \pm honey profits.

Results: In our study area, the Gisborne Region (North Island of New Zealand), ~27% of the land has moderate-very high susceptibility to landslides, 14-22% a high probability of contributing material to waterways, and 19% moderate-very high gully erosion susceptibility. Pines grow 10 times faster than naturally regenerating mānuka-kānuka shrubland, but mānuka-kānuka is used for honey not wood production. Natural regeneration resulted in losses of \$150-250 ha⁻¹ yr⁻¹ compared to the current profitability of pine production. Honey production offset some reduction in pine revenue, but not fully. Thus, the viability of shifting from pines to native forest is highly dependent on landowner impetus and value for non-market ecosystem services (such as cultural and biodiversity values) provided by native forest.

Conclusions: A mosaic of land uses within a property may sufficiently offset income losses with other benefits, whereby highly erosion-prone land is shifted from rotational pine forest production to permanent native forest cover with honey production where possible. At the regional scale in Gisborne, the conversion of the most highly susceptible land under production forestry (315-556 ha) to natural regeneration has the potential for wider benefits for soil conservation reducing erosion by 1-2.5 t yr⁻¹ of sediment facilitating achievement of cleaner water aspirations and habitat provision.

Lambie SM, Awatere S, Daigneault A, Kirschbaum MUF, Marden M, Soliman T, Spiekermann RI, Walsh PJ. 2021. Trade-offs between environmental and economic factors in conversion from exotic pine production to natural regeneration on erosion prone slopes. *New Zealand Journal of Forestry Science* 51: 14. <https://doi.org/10.33494/nzjfs512021x163x>.

News from the European Soil Data Centre ESDAC

https://esdac.jrc.ec.europa.eu/public_path/newsletter/202201.pdf

The ESDAC Newsletter No 137 (January 2022) is available, with information on soil erosion, land cover, C-factor modelling, a new online course on soil biodiversity, protecting and restoring soils in Europe and beyond. The first ever EU Soil Observatory (EUSO) Stakeholders Forum has been organised. You can download the presentations of the Working Groups (WG) on soil pollution, soil biodiversity, soil erosion and data integration.

Other information includes:

Joint PhD of JRC with Aarhus University:

“Strategies to reduce greenhouse gas emissions from agricultural soils in Europe” (deadline for applications 15.3.2022). The PhD candidate will integrate field studies outputs with large-scale process modelling to reach sound recommendations about GHG mitigation practices in agricultural soils at regional scale.

Phosphorus plant removal: In a recent [publication](#), we estimated the Phosphorus (P) removal from agricultural lands of EU and UK (ca. 173 million ha). This takes into account the P removed by crop harvesting and the plant residues.

Surface Water Assessment eNabler (SWAN): The FOCUS landscape and mitigation report states that the SWAN tool can be utilised to implement mitigation of the spray drift and runoff routes of exposure to surface water.

Rainstorms erosivity indexes: Heavy rainstorms play a central role in the water soil erosion processes. In a recent publication, we provide the spatiotemporal distribution of more than 300,000 erosive events measured at 1181 locations as part of the Rainfall Erosivity Database at European Scale (REDES) database.

Obituaries

Obituary - Gary Orbell

Gary Edward Orbell MSc (Hons), MNZIAHS, MRSNZ
12 February, 1936-17 October, 2021

Philip Tonkin¹ and David J. Lowe²

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Gary in conversation with John McCraw.

Photo: Phil Tonkin

Gary died after a prolonged period from cancer. He was one of the last remaining pedologists from the days of the Soil Bureau, DSIR, to have been employed by Dr Norman Taylor.

Gary was born in Hastings, the son of Nina and Arthur Orbell. The family owned a small dairy farm between Napier and Hastings that was impacted by a storm in early February, 1936, just before Gary was born. Only two years later the farm was very badly affected by flooding associated with the extreme 'Esk Valley' storm and floods over three days from 23-25 April, 1938. The family subsequently owned an orchard near Hastings (on Twyford soils) and agricultural contracting business, and Gary grew up helping in both businesses. The Orbells originated from a pioneering family settling in 1849 at Waikouaiti in North Otago.

Joining Soil Bureau, DSIR

Gary attended Victoria University College in Wellington, graduating BSc in 1959. It was at the suggestion of his Professor Bob Clark that he was interviewed for a position as a pedologist at Soil Bureau, then based in Molesworth Street, Wellington, opposite the Parliament Buildings. There had been a number of pedologists recruited since the appointment of Mike Leamy but they had all left, and so Soil Bureau staff were desperate to find replacements. Gary was offered a DSIR scholarship to complete an MSc at Victoria University College with a project in the northern Wairarapa supervised by Professor Harold Wellman. He graduated with MSc (Hons) in Geology in 1961. Then he began a three-month period of training with the Soil Bureau, Molesworth Street and Taita. From Taita he spent time with Harry Gibbs, visiting an area of western Wellington being surveyed by Mike Leamy, and also the Greytown Horticultural Station in the Wairarapa. The training in soil survey was minimal until Des Cowie and Mike Leamy gave Gary instruction. In the summer vacation of 1958-59, Gary was sent up to Huntly to assist Bill Ward who was working on the survey of Raglan County. During this time Gary witnessed a major disagreement between Bill Ward and Harry Gibbs, the Chief Pedologist. In addition to the Raglan survey, Bill Ward was also undertaking an MSc in geology from the University of Auckland with a focus on the Hamilton Ash beds. For this field work Bill carried a geological hammer in his car and this was the focus of the dispute with Harry. The dispute was resolved by Bill completing his MSc and taking up a job offer as a pedologist with the CSIRO in Australia.

Palmerston North

Following his period of training Gary married Mary Gibson on New Year's eve, 1960, and together they moved to Palmerston North. Gary assisted Des Cowie on the survey of the Kairanga County, and they were later joined by Brian Kear, a geographer from Britain. Des Cowie was a good instructor, assisting both Gary and Brian. Brian subsequently moved to Christchurch to write up the Downs and Plains of Canterbury and North Otago survey although he had not been involved with the original soil survey team.

Alexandra office

Gary's next appointment was to the Soil Bureau office in Alexandra, for many years the seat of John McCraw together with others such as Des Cowie, Bill Ward, and Mike Leamy. Mike was in the finishing stages of the Upper Clutha survey prior to his taking up a Colombo Plan assignment in Malaysia. While in Alexandra, Gary had vivid memories of a winter trip by Landrover to the Upper Shotover catchment with

Mike Leamy, Graham Anderson of the Otago Catchment Board, and two *Otago Daily Times* reporters. The road was icy and covered in snow and they ended up doing their survey in a foot [30 cm] or more of snow. The journey in and out by road under these conditions made quite a story for the reporters. Gary was to become the sole pedologist in the Alexandra office, working on the survey of the mid-Manuherikia Valley, a survey initiated by Cliff Thompson on exchange from CSIRO Queensland.

The year in Scotland

The next move was a year in Scotland. This came about following a South Island soil science bus tour in 1962 (associated with the International Soil Conference held at Massey University that year) where Gary met up with Bob Glentworth of the Scottish Soil Survey. Subsequently Gary was asked by Dr Keith Dixon if he would like to go to Scotland in exchange with Martin Ragg, who was to be based in Dunedin with Ted Cutler. Soil surveyors in Scotland spent their summers working from caravans and in the winter went back to Aberdeen to write up. The survey Gary was working on was for Livingston Newtown between Glasgow and Edinburgh. This survey was to be used for interpreting soil information for a variety of land uses. The Orbell family had a twenty-two-foot caravan (about 7 m) equipped with a coal stove for heating. The family did a lot of touring in Scotland and Gary attended the British Society of Soil Science conference in Wales. At the end of the year the family travelled back to New Zealand on a five-week voyage by sea.

Pukekohe and Hamilton

Back in New Zealand, the Orbell family was sent to Pukekohe, an outpost of the Hamilton office with John McCraw, to undertake a soil survey of Franklin Country. This survey was identified by Harry Gibbs as a key to safeguarding the important horticultural soils around Pukekohe from a proposed motorway. This objective crystallized as they were completing the first set of maps when the planner for the Franklin County Council requested the draft soil maps for a council meeting. The matter of the motorway was resolved at this council meeting as it was moved elsewhere. Soon after this there were big changes in the Hamilton office of Soil Bureau with John McCraw moving to the University of Waikato (in 1969) as foundation Professor of the Department of Earth Sciences, soon to be followed by Harry Gibbs (in 1970). Joe Bell, the replacement (in early 1969) for Phil Tonkin, who had moved to Lincoln College at the end of 1968, was killed in a motor accident. Joe was the only remaining pedologist in Hamilton and so his unfortunate death meant Gary and family would be on the move again, this time to Hamilton. The Soil Bureau was not going to close the Hamilton office. Gary had been given an undertaking that the family would be in Pukekohe for at least five years, and at this time they had only been there three years. Gary had to go down to Taita for a meeting and Bill Hamilton, the Director General of DSIR, was there and enquired after Gary and family and the prospective move to Hamilton. There were some financial problems regarding house loans and Bill undertook to look into it and get things sorted which he did. This was in line with Gary's reputation as a master of the Public Service Manual and how to get the best out of the system. The family finally moved to Hamilton in 1971.

In Hamilton, Gary became the District Soil Scientist taking over the vacated role of John McCraw. After a period of grace used to familiarise himself with the geography and soils of the Waikato and wider King Country regions, Gary began with the completion of the soil survey (at a scale 1: 25,000) of the Waikato lowlands north and east of the Waikato River. This survey had a long and checkered history

beginning in the mid-1930s and restarted by John McCraw and Phil Tonkin from the mid-1960s. With the departure of McCraw and Tonkin from Soil Bureau, and the other changes in the Hamilton office, it fell to Gary to pick up the unfinished survey and bring it to completion. Ironically, although the map was formally published (as two sheets) as late as 1992 (Orbell, 1992), the associated bulletin (text) seems to have never been published, and only came to light when Gary gave David Lowe the original typescript (and maps) in a ring-binder during David's visits to see him in early 2021. (With Gary's permission, David had the text and maps scanned, with files of both then being sent to Manaaki Whenua and to the Library, University of Waikato, to provide a secure, permanent record.) Malcolm McLeod did publish two Waikato District soil maps (at scale 1: 31,680) and text as a district office report (McLeod, 1984), and so the near-equivalent maps have been available since then. Gary's 1992 bulletin summarises the mapping history, with all those involved with the survey being named and acknowledged on the maps, and provides a detailed taxonomic key to identify the soil series and types.

During Gary's time as a district soil scientist he was at times joined by Colin Pain, Alistair Wilson, Beryl Barratt, Peter Singleton, and Malcolm McLeod, who were all involved in soil surveys. Colin subsequently moved to Havelock North with Elwyn Griffin, Alistair moved back to Britain before rejoining the Soil Bureau in Kaikohe and Auckland, Beryl finally moved to Auckland with Ted Cox and Alistair Wilson, and Peter Singleton moved to Environment Waikato (Waikato Regional Council), with Malcolm McLeod the sole remaining pedologist from the Soil Bureau days.

The role of the district soil scientist was varied. In addition to soil surveys of Franklin, Waikato, Hauraki, and Matamata regions there were many smaller maps prepared for Hamilton City, Bay of Islands, and Mangere Environs as well as the interpretation of soils for various land uses. Gary also prepared the tour programme and guides for tours of Northland for the 1968 and 1981 International Soil Conferences held in Adelaide, Australia, and Palmerston North, respectively. Prior to the shift to Hamilton, Gary was invited to join the Royal Society Cook Bicentennial expedition to the South Pacific in 1969 and this was his introduction to and subsequent involvement in soil surveys in the islands of Tonga. He presented a paper on this topic at the 12th ANZAAS conference in Canberra in 1971. After the conference, Gary took a side trip to Brisbane to see Bill Ward and Cliff Thompson.

Soil surveys in the Kingdom of Tonga

Following on from earlier surveys by Dr Les Grange, Dr John Widdowson and Harry Gibbs, and Gary's Royal Society trip, David Ives, together with Gary and John, were asked by the Director of Soil Bureau to carry out further work in the Kingdom of Tonga as part of a bilateral programme. A large team was assembled with Dave Ives as logistical director and Gary as Pedologist in Charge. Once the survey phase was completed there was a continuing series of trips back to Tonga to conduct field trials overseen by Dr John Widdowson and Dr Phil Hart. Gary recalled some 20 visits to Tonga over the years. As well as around half-a-dozen soil survey reports, Gary published a small book on the soils of Tonga (Orbell, 1983). The last workshop in which Gary was involved was in 1992 just prior to his retirement from Soil Bureau, with Cowie et al. (1991) one of his final outputs. David Leslie took over the supervision of soil surveys in the Pacific and was for a period based in Fiji.

King Country soil resource survey

In the late 1970s after Gary had taken time to familiarise himself with the soils and landscapes of southern Waikato and King Country, a request was made by the Lands and Survey Department for a National Soil Survey of the King Country at a scale of 1: 500,000. The general Soil Survey of the North Island had been mapped at a scale of 1: 254,000, and so these maps were used to generalize information as soil associations and the resulting soil map at 1: 500,000 was published as a National Resource Survey. Gary had to produce a legend for the map rating soils for preferred land use. This went through to Des Cowie, the Chief Correlator, Mike Leamy, the Chief Pedologist, and Bruce Miller, the Director of Soil Bureau. The interpretation was controversial as a lot of the land was being developed by the Lands and Survey Department for farming. Gary's interpretation of the generalized soil information caused an uproar and Federated Farmers and the politicians got involved. The then National Prime Minister Muldoon implemented a more detailed survey to resolve the conflicts. The new survey was to be multidisciplinary involving Soil Bureau, Geological Survey, Botany Division, Lands and Survey (for the land holdings), Māori Affairs (for Māori lands), and the Ministry of Works Water and Soil Division. Gary's task was to oversee and correlate the soil survey. There was a big team of soil surveyors drawn from throughout New Zealand and many from the South Island had little previous experience of soils formed in tephra. Groups were given individual blocks to survey and this was to present problems when correlating between surveying parties. Des Cowie and Gary had the task of bringing the survey information together. At the same time, the leader of the Water and Soil Division was requesting soil map information as the template for their Land Use Capability (LUC) mapping. This conflict led all the way up to questions being asked in the House of Parliament. The outcome of the soil survey was that the original interpretation of marginal land more suited to forestry or conservation management was upheld. Further, the Treasury became involved and associated staff recognized that there was significant overlap between the work of the soil surveyors and the LUC survey team.

Within the decade following the publication of this survey, with three soil maps prepared by Wim Rijkse and Hugh Wilde, there were major changes afoot with the demise of the DSIR, and the reorganization of other agencies such as the Soil Bureau and Botany Division of DSIR, and elements of the Water and Soil Division and the Forest Service into reconstructed new Crown Research Institutes (CRIs) such as Landcare Research (Manaaki Whenua). That change took place on 30 June-1 July, 1992.

Gary retired from Soil Bureau in 1991 (after 33 years of service) and for several decades (25 years in total) worked as a private consultant from Hamilton, preparing >2000 reports.

Comments by David Lowe

I first encountered Gary when our lecturer in pedology in the Department of Earth Sciences, Prof Harry Gibbs, introduced Gary to us on a visit to the University of Waikato campus, probably in 1974. From memory, Harry simply introduced "Mr Orbell" as the district pedologist. Gary was presumably visiting the campus for other reasons. I recall he was smartly dressed in a dark suit and with an umbrella, and looking compact and assured. At the time, I thought that he did not seem dressed

for field work (despite the umbrella), not really appreciating that his job would entail more than 'simply' mapping soils.

It was two years later that Gary offered summer work out of the Hamilton office (which was at the corner of Anglesea and Collingwood Streets, now demolished, but with some desk-derived rimu timber salvaged by Malcolm McLeod serving as a mount for the N.H. Taylor Auger from 2013, given temporarily to the N.H. Taylor Memorial Lecturer each year as part of the award). Two Waikato graduates, Peter King and David Burns (known as Davey), worked with Gary over the summer of 1976-77 on the Waikato lowlands survey. The following year, I (David Lowe) joined Davey Burns and we worked for Gary over the hot and dry summer of 1977-78 on the Matamata County survey. Beforehand, Gary interviewed us and took us into the field to check our soil texturing skills. We may have looked at a Kainui soil (previously known as Hamilton soil) and so a 'silty clay loam' may have been the correct answer for one test. I recall Gary asking me what experience I had and my response, something like, "The same as Davey Burns", was met with a typical Gary retort, "No, he has had a summer working for me and so has more experience".

Gary explained that although draft maps for Matamata had been prepared, he lacked underpinning detailed soil profile descriptions of the many map units and so our job was to generate them. Gary told us that Matamata County was one of the largest in New Zealand and the only one in which every road was tar-sealed, implying the wealth derived from farming the extensive Allophanic Soils (Yellow-brown loams in those days) in the county was partly responsible for that state. Davey and I used to set out from the Hamilton office each morning and head to Matamata, starting in the far north of the county near Waitoa and Waihou and, once we got going, managed to dig (by hand) and describe a pit each, sometimes two, per day, before having to head home to meet the approximate 5 pm deadline set by Gary. We used to take turns talking to farmers before entering their properties and soon learned they had a wealth of information about their soils and landscapes. Invariably they asked, "When will we get the results?".

Gary introduced us to two dominant series, Waihou and Waitoa, and said these could be compared with the approximately equivalent series in the Hamilton lowlands, Horotiu and Te Kowhai, respectively (the trick to remembering, never forgotten, being the 'h' and 't' letters common to each series pair). The Matamata survey results were later published by Malcom McLeod (McLeod, 1992). In chatting to Malcolm recently, he said the descriptions are on file and were helpful.



Representative of Waihou series (Allophanic Soil) exposed in a gravel and sand quarry in the Hinuera Valley on the corner of SH29 and Taotaoroa Road (the quarry is the type location of the Hinuera Formation). The soil is formed from about 0.8 m of accumulatory tephra (weathered partly to form allophane) overlying volcanogenic alluvium (Hinuera Formation), i.e. the soil to 1 m depth is formed in both parent materials. The upper profile formed by developmental upbuilding pedogenesis (i.e. the soil horizons, weakly developed, were forming whilst thin tephra layers accumulated slowly, millimetre by millimetre over c. 23,500 years) so that the land surface has been rising slowly since the Hinuera Surface was abandoned c. 23,500 years ago when the ancestral Waikato River switched direction (avulsed) to flow into the Hamilton Basin. Photos: David Lowe.

One thing we learnt working for Gary was how we could wangle a day in the office when we felt like a bit of a break from the field work, perhaps on a miserable rainy day (not that there were many that summer). We would simply ask Gary a ‘political’ question. His answer and discussion would potentially extend to an hour or so, at which point Gary would state, “Oh, boys, look at the time. There is no way you can go into the field now and be back in time to clock off at 5 pm and so, because that would breach the labour laws, you’d better stay in the office for the rest of the day”.

Another aphorism from Gary was framed in a question, “How much office time is required to take in the results of a day in the field?” His answer was two, the idea being a day in the field generated two days (or more I suspect) in the office as a rule of thumb.

On another occasion, Gary was asked to undertake a large-scale soil survey of a farm property near Hamilton (possibly off the Morrinsville Road). We were able to follow him around as he marked an air photo, picking up valuable tips, before he then assigned us precise spots to dig pits to undertake soil profile descriptions. Gary’s most important and firmly stated comment has stuck with me ever since then (and has been conveyed to countless students subsequently): the scale of a soil map can be reduced to generalise about map units, but a map cannot be enlarged to gain more detail - instead, accuracy will be lost. I note that nowadays in digital mapping the concept of scale changes with the ability to zoom in and out (as available in Smap). By zooming in (enlarging scale), it is the *scale of visualisation* that is changing, not the data density nor intervals of observations of the original on-ground surveys or modelling. Although the scale can be changed visually, the

accuracy remains dependant on the scale of the original mapping and the degree of soil spatial variability.

That work along with the Matamata descriptions gave me the confidence to take on a contract, my first, to undertake a large-scale (1: 1,250) survey of Steele Farm, near Hamilton Airport, in 1979 (the redrawn map was published in Lowe and Balks, 2018, p. 11). The survey was commissioned by Bruce Willoughby who was leading a research programme at the Ministry of Agriculture and Fisheries, Hamilton, into grass grubs (brown beetle larvae, *Costelytra zealandica*).

At another time, when we were driving through the Karapiro area, Gary remarked that Hamilton should have been built on the tephra-draped greywacke hills nearby (Whitehall area) rather than on the highly-productive and easily managed soils on the flat land in the Hamilton Basin. At the time I did not really follow his reasoning but understand now.

Gary was asked by Head Office to collect a set of samples from the 'Hamilton soil'. We went to the Soil Bureau reference site for the so-called (at the time) Hamilton clay loam in Church Road, Te Rapa, then a gravel country road but now a well-to-do suburban street flanking a sea of houses and manicured lawns. The Hamilton soil (NZ Soil Bureau 1968, pp. 90-91) is now referred to as a Kainui silt loam (see Lowe, 2019). Davey and I were intrigued and impressed by the way Gary sampled the profile: he worked systematically and carefully downwards, sampling each horizon from top down (rather than sampling the vertical profile horizontally), then cleared soil material from near the boundary before exposing the top of the next horizon for sampling. He used a hearth brush to sweep it entirely clean before sampling, studiously avoiding the boundaries.

My path subsequently crossed that of Gary's from time to time in the next 40+ years, mainly at conferences, where his presence was always reassuring, and he invariably made solid contributions. When we met at the annual N.H. Taylor Memorial Lecture on campus, he was proud to mention that he was one of the few pedologists left in New Zealand who had met and been in the field with Norman Taylor (also Les Grange). He admired both, Grange being undoubtedly a 'good guy'. Taylor, he said, was rather brusque and distant in the office situation but transformed into a completely different person in the field where he was a caring and decent colleague only too pleased to pass on his wisdom and knowledge. Maurice Fieldes, another director, was described by Gary as 'tough but very helpful with students' (including helping Gary during his MSc thesis work that involved some XRD analysis and interpretation).

Sometimes we met in the field, including in the 1980s. The photo below of Gary with Roger Parfitt was taken in the early 1980s and is at the reference location for the Tirau silt loam in Hetherington Road near Tirau (NZ Soil Bureau, 1968, p. 80-81). Gary contributed the soil stratigraphy (following Pullar and Birrell, 1973) and was a co-author of what I consider to be a benchmark paper outlining the silicon leaching model for the formation of allophane (Parfitt et al., 1983; summarized in Churchman and Lowe, 2012). I featured this work by Parfitt et al. in my N.H. Taylor Memorial Lecture in 2002 in Wellington (Lowe, 2002), including the photo of Gary, whom I later learnt was very appreciative of the acknowledgement and was heard to say with some justifiable pride, "I was his [David's] first boss!". I did learn a lot from Gary in

that single summer and have always appreciated his support, steadfastness, and reliability.



*Gary Orbell (left), compact and assured, and Roger Parfitt at the Hetherington Rd reference site for the Tirau soil. The seminal paper, Parfitt et al. (1983), was to emerge soon after.
Photo: David Lowe.*

In the early 1980s, I invited Gary to give a talk entitled ‘What was the King Country survey?’ to our departmental Graduate Colloquia series and I recall he was asked a question by Harry Gibbs. Gary (unlike some) was not at all intimidated by Harry, and responded by commenting words to the effect “Harry, we don’t use thick black beauty pencils these days for drawing map unit boundaries - we use dotted lines to indicate gradational boundaries or uncertainty”. In the 1990s, Gary gave a lecture to my third-year pedology class on the application of GIS. Despite being somewhat ‘old-school’ and even perhaps old-fashioned (in terms of being ‘by the book’ and consistently reliable), Gary also had a modern outlook and embraced new technology including buying his own GIS system well before GIS became widely used.

I also spent another fruitful time with Gary in 2011 when we set up a new farm-scale soil and LUC mapping programme for our graduate soils paper based at Tokanui Farm (about 10 km south of Te Awamutu), where Gary had mapped the soils and LUC classes on behalf of AgResearch who ran the property as a research dairy farm. I spent a morning with Gary asking him about the intricacies of LUC definitions and other aspects of LUC surveys. We still run that very successful graduate paper today.

It was a privilege and pleasure to visit Gary from time to time over about nine months after he was diagnosed with terminal cancer in 2020. My visits would tend to start with Gary just a little morose but within a few minutes he was full of life and just as he was >40 years ago. We never ran out of conversation despite being of different generations, our common interests in soils and landscapes and other topics, including classical music, history, and politics, made for chats that I found always interesting and compelling.

I gave Gary a copy of our new book “The Soils of Aotearoa New Zealand”, with a little bit of trepidation (Hewitt et al., 2021). Although he was not keen on the use of ‘Aotearoa’ in the title, that was not dwelt upon at all, and he seemed to appreciate

the book and our efforts in writing it (although Gary never told me directly what he actually thought of it - I never quite got around to asking him!).

At one point I said to Gary that he was very brave the way he was handling himself in the wake of his negative prognosis. Gary's response: "I don't feel brave" - which clearly indicates to me that his demeanour and steadfastness over the last few months of his life were courage personified. At Gary's funeral service (Thursday 21 October, 2021, held under Covid-19, level-3 conditions), Gary's grandson, Callum McKenzie, read two quotes by Wendell Berry and Charles Kellogg. I was familiar with the words of Kellogg but must confess I had not heard of Berry. (So, still learning from Gary even at his funeral.)

Wendell E. Berry (American writer, poet, farmer, and environmental activist):
"The soil is the great connector of lives, the source and destination of all. It is the healer and restorer and resurrector, by which disease passes into health, age into youth, death into life. Without proper care for it we can have no community, because without proper care for it we can have no life" (from 'The Unsettling of America - Culture and Agriculture', 1977).

Dr Charles E. Kellogg (third Chief of USDA's Bureau of Chemistry and Soils and instrumental in shaping the National Cooperative Soil Survey Program of today):
"Essentially, all life depends on soil. There can be no life without soil and no soil without life; they have evolved together" (from 'USDA Yearbook of Agriculture', 1938)

I appreciate how Gary generously helped shape my own career, I respected him greatly, and I miss him.

Graham Shepherd

Gary was present at my interview with Michael Leamy for the Soil Bureau position I applied for in 1976. Mike thought that my masterate thesis was a bit too analytical and theoretical for what he was looking for, but Gary pointed out that the study did include quite a bit of profile description work and field work, so I guess I have Gary to thank for my appointment. In hindsight, the Earth science and chemistry papers I took at the University of Waikato prepared me well for the years ahead.

I was appointed to the Palmerston North office to map and trial the USDA 'Soil Taxonomy' at Moutoa, an area where Wim Rijkse had been working. Gary was also familiar with this area having spent a bit of time in the Palmerston North office (noted above). While I was not at all that keen on Palmerston North, Mike did mention that the appointment could be for just 3 to 4 years and then the department would send me to somewhere where there were volcanic ashes, possibly the Rotorua office. Being in close association with the other DSIR divisions and Massey University in Palmerston North, however, they decided to leave me where I was. I was reasonably happy with this because I had become quite absorbed with the effects of monoculture cropping on the soil compared to pastoral grazing and developing indicators of soil quality.

Gary will be missed and I always enjoyed popping in to see him.

Conclusion

Philip, David, and Graham join together in this farewell to our colleague and friend Gary Orbell. Gary's wife, Mary, died in 2020 only a few weeks before Gary was diagnosed with cancer and he was devastated by her loss. Our condolences go to his three daughters, Alison, Kathryn, and Claire, who always greeted David warmly on his visits, and to other family members. We also thank these three generous sisters for providing information helpful in our compilation of this obituary.

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Obituary - Janice Callum (Jan) Heine

Soil pedologist and environmentalist

Jan Heine, who died on 28 December 2021 at Woburn, Lower Hutt, aged 81, was a pioneer in soil science and New Zealand's first woman pedologist.

Jan was New Zealand's first woman pedologist in the N.Z. Soil Bureau and was also well known in the tramping, mountaineering, botany, and conservation worlds.

A recent Stuff (2022) obituary describes her many personal, outdoor tramping and conservation interests. It is available below, and some information in this obituary is sourced from it:

<https://www.stuff.co.nz/national/127480371/obituary-jan-heine-environmentalist-who-was-a-slave-to-the-planet>

The article reports Jan was born in Lyttelton, moved to the top of the South Island, and attend Nelson College for Girls. This region is where she developed her interest in tramping. “She studied science at Canterbury University and was a keen member of the tramping club. After finishing her degree, she returned to Nelson Girls to teach. At a time when tramping was largely seen as a pastime for boys, she encouraged the girls to give it a go. After two years, she decided teaching was not for her, and she moved to Wellington, joining the Soil Bureau as a scientist” (Stuff 2022).

Iain Campbell studied at Canterbury University, and said “I knew Jan first as Jan Hardwick, when she was at Canterbury University in the late 1950s/early 1960s. She and Jocelyn Adamson (later Jocelyn Campbell who later worked in Geological Survey) may have been the first female students to get to BSc or Hons level at Canterbury”. [This has not been confirmed].

Soil science and pedology

Jan Heine joined the Department of Scientific and Industrial Research’s ‘Soil Bureau’ at the Taita office, Upper Hutt on 29 October 1963. Soil Bureau records show Jan (née Hardwick) started in ‘science administration/soil survey’ (Simmonds et al. 1980). She worked in areas of soil survey and pedology. She also contributed to many soil maps, soil reports, and information, including use of soil and pedology information for soil management, such as with the Town and Country Planning Act. Jan did considerable work over several years compiling lists of Soil Bureau publications (see publications list). Iain Campbell recalls “Jan was an in-house editor and was always very meticulous”.

She thrived on outdoors work as a pedologist, being involved with a number of local surveys in the Wellington and Wairarapa areas. David McQueen recalls, “one time while working in a field near Judgeford, we were approached by a herd of bulls and steers. Jan’s advice was “don’t run as that will only make things worse”. We ended up both running flat out downhill and over a fence with the herd skidding to a halt behind us”.

With Derek Milne, Jan led the Mangaroa Valley Survey, which was undertaken in the era when the DSIR was being politically driven to become more 'business-like', with 'user-pays' requiring DSIR Soil Bureau, Division of Land and Soil Sciences, and then Land Resources to charge for soil information. As a consequence, it appears the publication of the Mangaroa Valley Map and Report was held back, perhaps in the hope that it would generate revenue.

The surveyed soils map and report of Mangaroa area and Whitemans Valley, Upper Hutt, were published over 30 years later. Jan was very keen to get the work published. David McQueen recalls Jan had contacted him in 2017, and “Jan was determined that the report should be available to the public and interested parties

as well as being more accessible with today's technologies. She coordinated staff and students from Victoria university to contribute with GIS digitalisation and graphics. In 2018 we went back to the field to update soil profiles". Upper Hutt City Council now hosts an interactive GIS map of the area where the soil attribute table can be queried to answer questions, control+click (<https://arcg.is/0fa1Dm0>).

After a lot of persistence, at much of her own expense, she finalised it in 2020. The report was co-authored by David McQueen and acknowledges some assistance from Upper Hutt City Council and Victoria University, with several people editing. Trevor Webb said, "It was an excellent survey". It is:

Heine, J.C.; McQueen, D. 2020. Soils of Mangaroa-Whitemans Valley, Upper Hutt, New Zealand. Unpublished report produced for Upper Hutt City Council. 255 p.
<https://arcg.is/0fa1Dm0>
<http://digitallibrary.landcareresearch.co.nz/digital/collection/p20022coll4/id/99/rec/1>

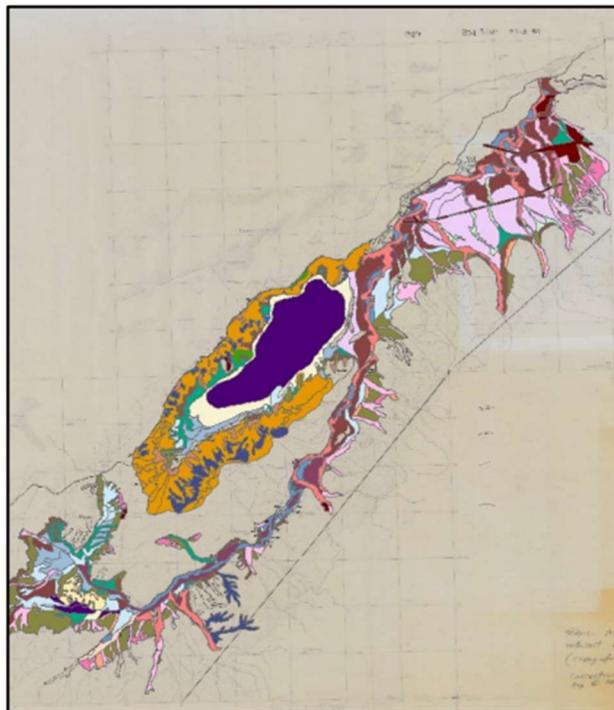


Photo: Screen image of the page 3 map image of the 2020 'Soils of Mangaroa-Whitemans Valley, Upper Hutt, New Zealand'.

Jan's first foray into soil surveying on the West Coast was in Southern Westland with James Raeside in the late 1960s. This culminated in the 1970 *Soils: Westland County Southern Part*, as part of the Department of Lands and Survey's *Land Inventory Survey*.

Jan was involved in the Upper Waitaki Basin survey. She also was part of soil surveying teams on several 'Team Surveys' (which became a feature in Soil Bureau in the 1970s and 80s). In 1972/73 she mapped soils in one of the six blocks of the 155, 000 ha mapped in the McKenzie Basin. The survey was later finished and published by Trevor Webb. An early photo shows the team at Balmoral Army Base in the McKenzie Basin.



Photo: The Tekapo team at Balmoral Army Base in the McKenzie Basin. The 'clown' in front was David Ives, the team survey leader (who also happened to be a major in the army territorials at the time). From left to right: Peter Rankin, Jan Heine (seated and shown holding knee), Peter White (Soil and Water Division of Ministry of Works), Gail Kennedy (now Craig Ross's wife!), John Bruce, Randall Gibson, Hugh Wilde, Neil ("Chopper") Kennedy, Craig Ross, Trevor Webb (on Land Rover), and the Dunedin Office Land Rover. (Photo from Manaaki Whenua -

Landcare Research collection (via Thomas Caspari). Craig Ross provided the good memory listing the team.)

Trevor Webb said, “Jan did significant work in exploring and sampling in some way-out places”. He has compiled all the Soil Bureau soil analysis data he could find, and these are in the latter part of this article.

The Mokihinui-Orikaka Survey, which Jan authored with Geoff Mew, was part of a suite of West Coast Soil (Team) Surveys initiated by the proposed New Zealand Forest Service’s *Beech Forest Utilisation Scheme*. N.Z. Soil Bureau had a policy at the time of carrying out regional surveys, rather than focussing on just one land use or land issue (in this case, forestry). This proved to be advantageous, as the *Beech Forest Utilisation Scheme* didn’t go ahead in its entirety. However, the soil maps and information have been very valuable for agricultural developments, mining, and environmental issues on ‘The Coast’.

In addition to her pedological research on soils, Jan was also very enthusiastic about indigenous botany. She may have been involved in a 1977 report with Les Molloy on *Forest Parks in NZ - an evolving concept*. (This report was authored by her husband, A.J. Heine). The Stuff (2022) article says “The pair [Jan and Arnold Heine] enjoyed botany and had a particular interest in the Kahurangi National Park. Together with botanist Tony Druce , they spent 250 days on a botanical survey of the park, where at one point they thought they had discovered a long-lost kākāpō population”.

Craig Ross remembers Jan “as a very sincere and hard-working lady. She was easy to get along with. Her fondness for the outdoors, especially mountainous areas and natural environments, shone through in her work at Soil Bureau”. She assisted Allan Pullar with the soil survey and was a co-author of the 1978 *Soils and Land Use of Whakatane Borough and Environment*.

Table 1 provides a list of Jan’s soil surveys and maps. She surveyed the soils of Mangaroa and Whitemans Valley during the 1980s, surveyed soils data of Wairarapa, and collated various soils data and information in Wairarapa. The ‘interim’ Wairarapa soil survey and report is:

JC Heine. 1975. Interim report on soils of Wairarapa Valley, New Zealand. Soil Bureau Record 40.

<https://dx.doi.org/10.7931/DL1-SBREC-040>

Table 1 Jan Heine's soil surveys and maps

Author (s)	Date	Report title	Report no.	Soil Bureau map no	Map scale
Heine, J.C.	1985	Fitzherbert area, Wainuiomata	Soil Bureau District Office Report	Unpublished	5,840
Heine, J.C.		Mangaroa Valley	Unpublished	Unpublished	15,000
Heine & Jarman	1984	Porirua, Wellington Block 16	Soil Bureau District Office Report WN 12	Unpublished	15,000
Pullar W A, Hewitt S R, Heine J C	1978	Whakatane borough and environs, Bay of Plenty	Soil Bureau Bulletin 38	73/1-2	31,680 & 15,840
Heine J.C., Mew G.	1981	Mokihinui-Orikaka region, South Island	Soil Bureau Record 59	195	50,000
Heine, J.C.	1975	Interim report on soils of Wairarapa Valley, New Zealand	Soil Bureau Record 39		
Heine, J.C.	1975	Interim report on soils of Wellington Region, New Zealand	Soil Bureau Record 40		
Heine, J.C.; McQueen, D.	2020	Soils of Mangaroa-Whitemans Valley, Upper Hutt, New Zealand. Report on soil survey carried out 1980-1988	Unpublished report produced for Upper Hutt City Council.		



Photo: Jan Heine transferring field data to map base. (Photo from Manaaki Whenua - Landcare Research collection.)



a



b



c

Photo: (a) Jan Heine taking an 'A horizon' soil sample for soil analysis. (Photo from Manaaki Whenua - Landcare Research collection.) (b) Jan describing a soil profile during a Botanical Society trip in 2019. (Photo from Philippa Crisp.) (c) Jan Heine

examining Gollans silt loam profile, Mangaroa Valley, November 2018. (Photo from David McQueen.)

Jan helped many new staff or was involved in their early introduction to work at Soil Bureau. John Claydon recalls on his second day at Taita, he and Noel Kendall went out into the Orongorongo Valley with Jan to collect samples for a few days. Matt Taylor recalls, “Jan was the first pedologist I went out in the field with and had a friendly personality along with a quick mind”.

Iain Campbell recalls, “her husband, Arnold, worked in the Antarctic in the early 1960s and she would have wanted to be able to share some of those experiences”. The Stuff (2022) article reports “At the Hutt Valley Tramping Club, she encountered Arnold Heine, whom she later described as ‘a big Antarctic explorer’. When she completed the Schormann -to-Kaitoke, she sent Arnold, who was in Antarctica, a Christmas card proudly telling him what she had achieved. He must have been impressed, and they soon became engaged. They had a strong bond that would last 53 years”.

Antarctic soils

Jan worked in Antarctica with Tom Speir, a soil biochemist. Tom led two summer research events at Cape Bird, Ross Island - 1981/82 and 1983/84 - to study the ornithogenic soils of the Adelie penguin rookeries. The focus was soil chemistry and biology. Jan undertook very detailed soil profile descriptions at four sites comprising an age sequence of penguin occupation, and a control site unaffected by birds.

Tom commented, “I was struck by the meticulous attention to detail of Jan’s work, covering the site characteristics, the soil description and the very detailed particle size analysis - everything from large boulders to fine sand in every soil horizon”.

This aspect of the work is published in:

Heine, J.C and Speir, T.W. Ornithogenic soils of the Cape Bird Adelie penguin rookeries, Antarctica. *Polar Biology* 10: 89-99 (1989).

<https://doi.org/10.1007/BF00239153>

On their second visit to Antarctica, Jan and Tom were accompanied by Dr Val Orchard, a Soil Bureau microbiologist and Hans Kohnlechner, a Canterbury University Honours student. Tom recalls, “Hans was a very keen climber and he and Jan took the opportunity to climb Mt Bird, an 1800-m shield volcano dominating the northern end of Ross Island. It turned out to be an easy climb but a long slog with, typically for a shield volcano, no view of anything from the top except the surrounding plain of ice”.

The two Antarctic visits were very successful scientifically, due in no small part to Jan’s rigorous site and soil description work, resulting in five peer-reviewed publications (includes two on soil in the publications list).

Tom says “I was struck by Jan’s bubbling enthusiasm for the Antarctic environment and its wildlife. We would often spend hours, usually in the middle of the ‘night’, sitting, admiring and photographing the changing light, the distant Antarctic mainland mountains, the ever-changing seascape and the birds and mammals, and especially enjoying the absolute silence. My abiding memories of Jan were

that she was incredibly fit and enthusiastic, always had a smile on her face and was very affable and easy going”.

Later on

In 1988, Jan was made redundant from the N.Z. Soil Bureau. The Stuff (2022) article reports on many other aspects of her life since then.

Philippa Crisp commented, “Jan did some fieldwork for Greater Wellington Regional Council, as she had backcountry skills and was a very tough and determined field worker, (even in her later years). She regularly completed rodent monitoring lines for the care-group, ‘MIRO’ in the hills behind Eastbourne”. Owen Spearpoint said that she also volunteered for the small mammal monitoring programmes and fine-minute bird counts in the Tararua ranges (Hutt catchment) and Wainui for Greater Wellington Regional Council. Jan also volunteered for the Department of Conservation regularly, including Codfish, Breaksea, Matiu/Somes and Stewart Islands, plus Fiordland, Kahurangi, Aspiring National Parks, to name a few.

The Stuff (2022) article also indicates (Motor Neurone Disease) “MND ended her life abruptly, but even when she was very ill and disabled, she was still clearing trap lines and doing breakfasts at a local school”. The funeral and family notice are available here: <https://www.legacy.com/nz/obituaries/dominion-post-nz/name/janice-heine-obituary?pid=201032342>

David McQueen recalls, “after Jan’s diagnosis of MND she really wanted to get the [Mangaroa] report sent out as soon as possible which we managed to do last year. I see the report completion as a tribute to Jan’s determination, energy and desire to put things right, which was so much a part of her life”. The Stuff (2022) article reported “Fellow scientist and trumper Murray Presland noted” “that she had a deep concern for the community she lived in, both its human inhabitants and its flora and fauna. With it came a huge willingness to pass on her experience and knowledge”.

Jan Heine will be fondly remembered by many who were fortunate to know her in the soil science, environmental, and tramping communities. Jan contributed greatly to soil and environmental science in New Zealand.

Publications list of Jan Heine

Please note this is not an exhaustive list. Readily available or key publications are listed below. Many Soil Bureau reports are freely available on the Manaaki Whenua - Landcare Research soils portal website (<https://soils.landcareresearch.co.nz/>). Publications up to 1979 were sourced from Davin (1980).

Publications by Soil Bureau Staff:

Heine, J.C. 1971. Publications by Soil Bureau Staff. 1966. Titles and Abstracts. N.Z. Soil Bureau Bibliographic Report 4. 76 p.

Heine, J.C. 1972a. Publications by Soil Bureau Staff, 1967. Titles and Abstracts. N.Z. Soil Bureau Bibliographic Report 5. 53 p.

Heine, J.C. 1972b. Publications by Soil Bureau Staff, 1968. Titles and Abstracts. N.Z. Soil Bureau Bibliographic Report 6. 90 p

Heine, J.C. 1972c. Publications by Soil Bureau Staff, 1969. Titles and Abstracts. N.Z. Soil Bureau Bibliographic Report 7. 39 p.

Heine, J.C. 1973a. Publications by Soil Bureau Staff, 1970. Titles and Abstracts. N.Z. Soil Bureau Bibliographic Report 9. 47 p.

Heine, J.C. 1973b. Publications by Soil Bureau Staff, 1971. Titles and Abstracts. N.Z. Soil Bureau Bibliographic Report 10. 101 p.

Heine, J.C. 1974. Publications by Soil Bureau Staff, 1972. Titles and Abstracts. N.Z. Soil Bureau Bibliographic Report 11. 98 P.

Soil reports and maps:

Raeside, J.D.; Heine, J.C. 1970. Soils. Westland County (Southern part). Pp. 21-40 in "Land Inventory Survey, Westland County (Southern Part)". (Department of Lands and Survey). Department of Lands and Survey, Wellington. 57 p. 16
Includes N.Z. Soil Bureau Maps 91/1,2 and 92/1,2.

Heine, J.C. 1975. Interim report on soils of Wellington Region, New Zealand: compiled from reports and records of soil surveys held at Soil Bureau. Soil Bureau Record 39.

<http://digitallibrary.landcareresearch.co.nz/digital/collection/p20022coll3/id/251/>

Heine, J.C. 1975. Interim report on soils of Wairarapa Valley, New Zealand. Soil Bureau Record 40. <https://dx.doi.org/10.7931/DL1-SBREC-040>

Pullar, W.A.; Hewitt S.R.; Heine, J.C. 1978. Soils and Land Use of Whakatane Borough and Environs, Bay of Plenty, New Zealand. N.Z. Soil Bureau Bulletin 38. 100 p. Includes N.Z. Soil Bureau Maps 73/1-2.

Heine J.C.; Mew G. 1981. Soils of Mokihinui-Orikaka region, South Island, New Zealand. New Zealand Soil Survey Report no. 59. Map 1:50 000.

Heine J.C.; Jarman, S. 1984. Porirua, Wellington Block 16. Soil Bureau District Office Report WN 12.

Heine, J.C. 1985 Fitzherbert area, Wainuiomata. Soil Bureau District Office Report. Unpublished

Heine, J.C.; Mew, G. 1988. Characteristic features of soils of Wellington Region for their recognition and rating. NZ Soil Bureau Contract Report 88/06.

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Sampled soil profiles

Trevor Webb has compiled all the Soil Bureau soil analysis data he could find. Listed below are her sampled profiles. The codes refer to Soil Bureau site references.

Cape Kidnappers, 1981 W21
CK1

Kahurangi National Park, 1987 S18
87/1-5 Shelter Rock Basin
87/6 Stag Flat
87/7 Taipo Area
87/8, 9, 10-24 Arthur Range

Matiri Tops

Older version SPD [soil profile description] cards, 1979: S25

MT 1/1, 1/2-15

OBS 17, 21, 22, 24-30

New version SPD cards, 1979-1982: S25

MT 1/1, 1/2]

MT 2-10]

MT 11-20] 1000 Acre, Mt Misery

MT 21-30]

MT 31-35]

MT 36-40 Hurricane Hut-Nugget Knob, Marino Range S18

MT 41-45 Pikes Peak S17/18

MT 46 Karamea S17/18

MT 47-51 Mt Luna area S17/18

MT 52-56 Kiwi Saddle S19

MT 60 Patriarch - John Reid

+ KS 1/1 = MT52

Orongorongo Res. Station 1978-1981

0015 27/74628244

001-0010

0011-0020

0021-0030

0031-0040 (0035, obs, 38)

0041-0050

0051-0060

0061-0063 + notes

0064-0066

0067 (notes only) R27/7502 8270

0071-0080

0082

Oo67 - Lab. 9697 A-E DSIR Map 9823 6747, R27/7467 8232

Oo68 - Lab. 9696 A-F 9827, 6750

Oo73 - T246A-E N164/498104

Sivermine - Pyramid, 1983, S17/S18

S61-63

S67

S73

Balloon hill, 1979 S13

Soils on various rocks: On quartzose sandstone 561;

Coal measures/quartzose sandstone/ coal; Granite (*Mt Kendall & 24 Tarn Basin*); Tertiary limestone + mudstone; Ordovician limestone; Lockett conglomerate; Alluvium Karamea River (used by P. Williams in NZJ Botany)

1984

Devil R. Peak/Lonely Lake

Fenella Saddle

Soil samples analysed for taxonomic classification

From Mangaroa survey

T21 Podzol inclusion in Belmont

T25 Judgeford

T26 Taita zcl

T27 Maymorn

T87 Waikanae sl

T94	Cooleys
T95	Maymorn
T96	Colletts
T97	Cooleys
T98	Maymorn
T99	Cooleys spilitic variant
T186	Makara
T235	Wainuiomata
T246	Rimutaka
T318	Wainuiomata
T319	Taita hill
T331	Taita red weathered variant
T332	Taita colluvial
T416	Colletts
T417	Waikanae

From Matiri Tops survey

T353	MT1/2	GR736883
T127	MT16	GR716856
T126	MT1/2	GR736883
T128	MT18	GR725889

Soil Taxonomy Memoranda (these are Soil Bureau reports)

1/83
 7/79
 8/79
 4/82
 34/83
 35/83
 Index
 3/82
 33/83

NZ Soil Bureau Soil Resources Report

Studies at Cape Bird (see publications list)

Miscellaneous soil profile description

Domett Range, 1985

DRI	S12/807599
DR2	80699
DR3	808589
DR4	790593
DR5	824605

Glasgow Range, 1986

GG1	L8/3205560
GG2	31955575
GG3	32005545
GG4	31875550
GG5	32005570
GG6	31205715
GG7	31555715

Matemateaonga Walkway, 1985

MM1	R20/63401175
MM2	64401100
MM3	66400855
MM4	69650580

MM5 72800275
MM6 72800275

Prepared by John Drewry, Manaaki Whenua - Landcare Research. I met Jan Heine at the Greater Wellington Regional Council and she left an impression. Jan was particularly keen to get her early work on Mangaroa soil survey published in a usable form, and provide several early publications to benefit the soil mapping knowledge in the Wellington region. It is great to see her map and report published. This obituary was collated from information provided by many people. Special thanks to Craig Ross, Trevor Webb, Thomas Caspari, David McQueen and Tom Speir who supplied detailed information. Snippets of information were also provided by John Claydon, Bob Lee, Megan Balks, Iain Campbell, Matt Taylor, Philippa Crisp and Owen Spearpoint. Thanks to Anne Austin for editing.

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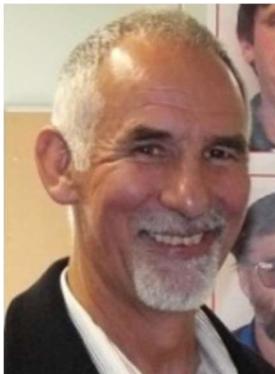
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Obituary - Greg Lambert



Dr Greg Lambert, pasture researcher with DSIR Grasslands and then AgResearch in Palmerston North, died on 7 January 2022.

Greg was born in Gore in 1948 and brought up in Northland where his father, Jim Lambert, had established the DSIR Grasslands Regional Station at Kaikohe. After graduating with a BAgSci and then a MAgSci (Hons1), both at Massey University, he began his research career at DSIR Grasslands, Palmerston North in 1971 based at the Ballantrae Hill Country Research Station near Woodville. After eleven years Greg was appointed Officer-in-Charge of Ballantrae, and in 1982 he travelled to Pennsylvania to study for a PhD working with the US Department of Agriculture. He

obtained his doctorate at the University of Pennsylvania and resumed as OIC Ballantrae on his return in 1985.

Greg carried out many significant hill country studies including the influence of fertiliser and sheep and cattle grazing management on pastures; soil fertility, biology and nutrient losses in run-off under sheep and cattle grazing; pasture botanical composition; performance of introduced and resident legumes; comparative performance of Grasslands Ruanui and Grasslands Nui perennial ryegrass cultivars on hill country; nitrogen fixation during hill country improvement, strategic use of N fertiliser and the long-term implication of withholding fertiliser on soil fertility, on soil biology, soil organic matter, pasture composition and animal production.

Greg also studied the use of forage shrubs on hill country including their production and sheep and goat browsing preferences, their forage digestibility and chemical composition. With colleagues he studied pasture composition under mixed sheep and goat grazing on hill country. Later he looked at the efficient use and morphological variation of white clover in hill pastures, and the distribution of lotus in North Island hill pastures.

Greg was awarded the Ray Brougham Trophy in 2011, a fitting tribute to his outstanding 40 years of work on NZ hill country, mostly undertaken at the Ballantrae Hill Country Research Station.

Greg was appointed a Science Manager at DSIR Grasslands in 1988 and was a senior scientist at AgResearch until 1998, when he was appointed leader of the Farm Systems Unit, AgSystems Group. From 2004 to 2011 Greg was section manager of Agricultural Systems in AgResearch, based in Palmerston North. He served as AgResearch client manager with Landcorp during 2001-04 and then with the Ravensdown Fertiliser Cooperative in 2004. Greg supervised many post-graduate students and throughout his career and a mentor for young staff members. He was good at spotting talent and finding a role for them. Greg always backed his staff to seek opportunities, be agile, form collaborations and take risks. He also encouraged his staff to listen to farmers and industry.

He recruited Tanira Kingi laying the foundation research with Māori agribusinesses. Greg also contributed to growing the social science research team started by Gavin Sheath.

He was a welcoming host for the numerous visiting scientists that passed through the Institute. In his youth Greg was a very good competitive hockey player and he later became an integral part of the Grassland's running group.

He was a member of RSNZ and NZAPS and served on the NZGA Executive Committee from 2002 for eight years. Greg was on the NZGA LOC for the Palmerston North 2003 Conference. Greg's passion and drive to ensure the science we did was relevant to and going to make a difference to what farmers did. Hence his emphasis on working with farmers and including them in the science we did.

Therefore, he was active in extension throughout his career and one of his great skills was the ability to communicate easily with both researchers and farmers across all aspects of the farm systems starting with the soil. He recruited Margaret Brown to the social science team to challenge the organisations thinking in in adoption and practice change.

Since retiring in 2012 Greg has been a part-time farmer at Halcombe, and a research consultant. He is survived by his wife Maureen and their two sons.

This tribute was prepared by colleagues and friends.

Deadline..... For the May 2022 issue of Soil News is 11 May.

We are the New Zealand Soil News:

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