Department of Primary Industries

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All the dirt

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This issue features articles on soil carbon in pasture systems and improving the ways of delivering soil information. There have been a lot of changes to our subscriber list recently so if you are a subscriber and you have a new email address please please let me know so you can continue to receive All the Dirt.

In this edition:

Soil carbon within perennial pasture systems

Susan Orgill (NSW DPI)

Environmental factors such as parent material and climate can have a large effect on soil carbon (C) stocks, yet unlike vegetation type, fertiliser use and grazing pressure, these cannot be changed by management. A newly published paper in Geoderma shows the relative effects of these environmental and land management factors across 52 sites in the Monaro and Boorowa regions of New South Wales.

The paper finds that carbon stocks are largely influenced by parent material, soil depth and climate. The implication of this finding is that not all agricultural land has the same potential to increase C stocks. The study also indicates that restricting soil carbon measurements to the surface 0.30 m of soil may not indicate the true effect of land management on the accumulation of carbon in soil.

Soil C stocks, to a depth of 0.7m, were shown to vary widely, with over 28% of the C stock in the subsoil (0.30 to 0.70 m) at all sites. The influence of soil type is shown in the Monaro where soils derived from basalt had on average 159 Mg.C.ha compared with, 77, in deep granite-derived soils and 43 in shallow granite-derived soils. Climates influence on mean C stock is shown when comparing soils in the Monaro and Boorowa regions. The Monaros deep granite-derived soils have 76.5 compared with 51.8 Mg.C.ha to 0.70 m in the Boorowa region.

The study showed that fertiliser management can be used to increase C stocks under perennial pastures. Carbon stocks were positively correlated with total nitrogen, cation exchange capacity and extractable sulfur, suggesting that for a given parent material and climate, maintaining adequate pasture nutrition may substantially increase soil carbon stocks. Continuous grazing was associated with greater C stocks compared with rotational grazing management; however, it was not possible to separate grazing management from fertiliser management as the two were confounded in this study.

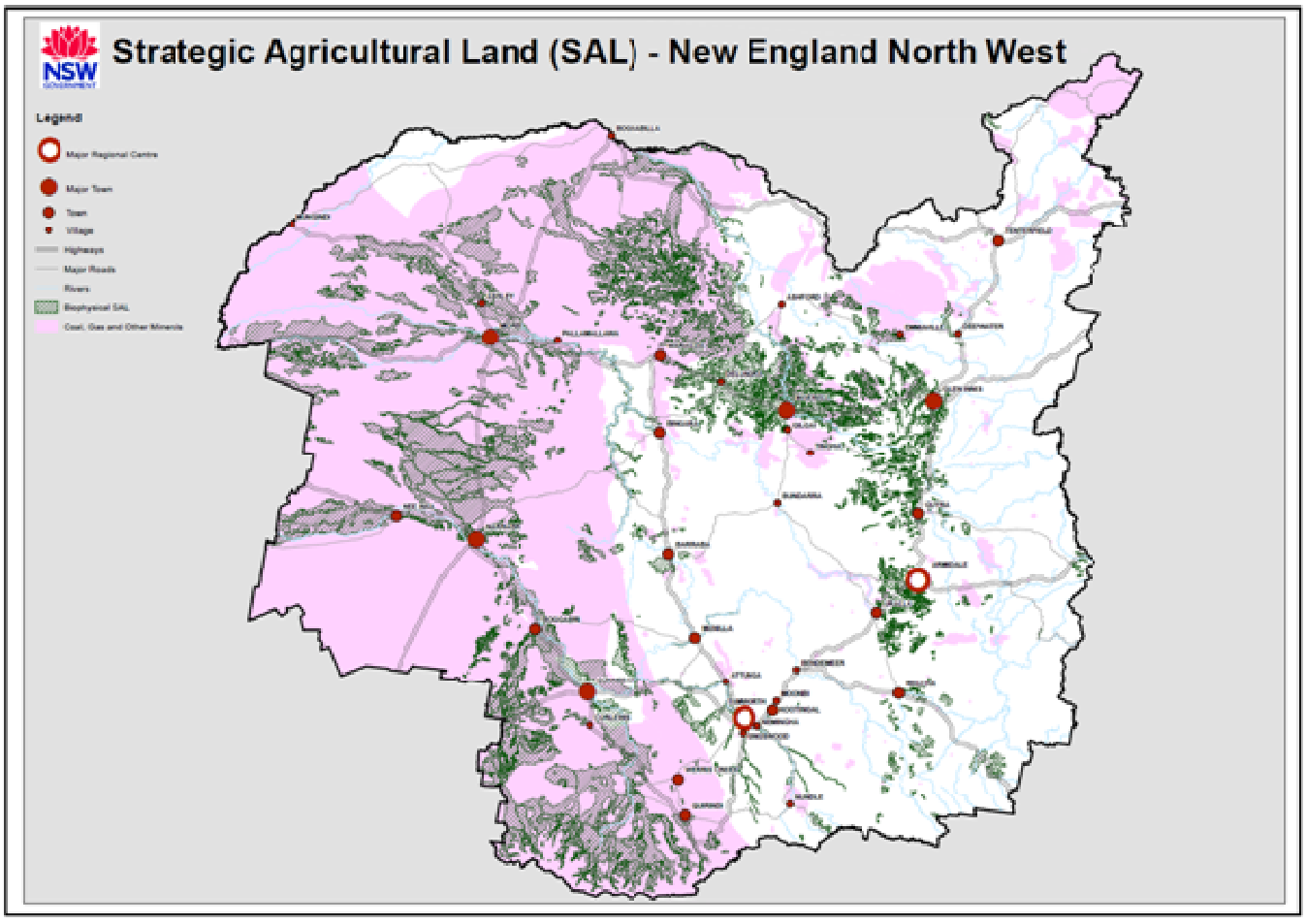
Improved Soils Information Delivery

Dacre King (OEH, Armidale), Mark Young (OEH, Parramatta), David Morand (OEH, Alstonville)

The Assessment Team (Ecosystem Management Science Branch) of the NSW Office of Environment and Heritage (OEH) is currently engaged in an ongoing process to revise and update mapping of important biophysical strategic agricultural land (BSAL) in the Hunter and New England Northwest regions. BSAL is highly productive land that has specific natural resource characteristics (such as soil quality and reliable water access).

The Improved Soil Information Delivery Project (ISID) aims to improve baseline soil and landscape data for the Moree Plains and Merriwa Plateau so updated BSAL maps can be produced.

The maps will provide the framework for the protection of key agricultural assets in relation to mining and it is hoped that their use will be incorporated into future regional Strategic Land Use Plans, thus ensuring that adequately identified quality agricultural is considered when balancing the needs of mining and agriculture in NSW.



BSAL of New England North West as currently mapped (black hatch). Extensive areas of good quality land in the Moree plains area (predominantly consisting of Vertosols) have been excluded due to the limitations of the available base data.

The BSAL maps provide a trigger for the gateway process that aims to reduce conflict between mining and agriculture. If proponents do not accept these regional scale maps, a local assessment can be made via the BSAL site verification process.

The project is funded by the National Partnership Agreement (NPA) and is being conducted by the the Assessment Team (Ecosystem Management Science Branch) of the OEH.

Regional BSAL mapping steps

- OEH delivered draft broadscale BSAL maps to the Department of Planning and Infrastructure in 2012 as an input into the Strategic Regional Land Use Plans for the Upper Hunter and New England North West (Figure 1).
- The maps were prepared using a combination of draft Land and Soil Capability (LSC) maps and draft inherent soil fertility maps. LSC and fertility were prepared using the best available soil and land information at the time.
- Following on from public consultation and submissions, the need for improved, more accurate mapping products for highly productive areas of the Moree Plains and Merriwa Plateau were identified as a priority for the NSW Government.

Soil as art: A soil mosaic from Southend gardens, a business in USA

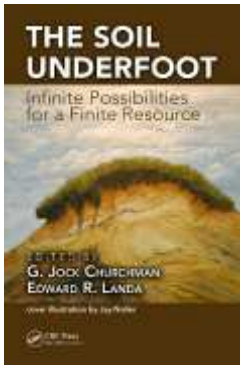
"Man takes root at his feet, and at best he is no more than a potted plant in his house or carriage till he has established communication with the soil by the loving and magnetic touch of his soles to it."

— John Burroughs (American naturalist and essayist)

New Publications

The soil underfoot: Infinite possibilities for a finite resource

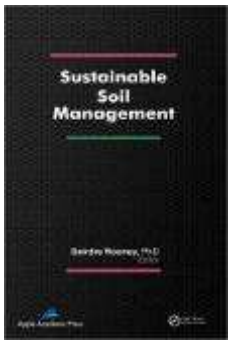
Churchman JG and Landa ER (Ed)



With 30 contributions from 13 different countries this book provides an expert analysis of challenges faced by humankind and their implications for the availability and sustainability of soils worldwide.
Chapters cover climate change, diminishing plant nutrients and soil loss; religious views of soil; cultural/historical views and uses of soil; uses of soils for optimal production and conservation.

Sustainable soil management

Deirdre Rooney (ed)

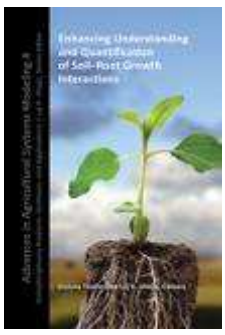


The focus of this UK book is soil management for agriculture and the environment, covering land use effects on soil carbon storage, and interactions between soil properties, plant species, and the soil biota.

http://www.appleacademicpress.com/title.php?id=9781926895215<

Enhancing Understanding and Quantification of Soil–Root Growth Interactions,

Dennis Timlin and Laj R. Ahuja, editors.

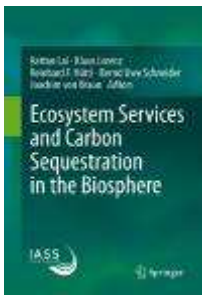


This book brings together scientists from different disciplines, worldwide, to encourage synthesis of transdisciplinary knowledge and further research and developments in the area of root-soil interactions.

https://dl.sciencesocieties.org/publications/books/tocs/advancesinagric/enhancingunder

Ecosystem services and carbon sequestration

Lal, R.; Lorenz, K.; Hüttl, R.F.; Schneider, B.U.; von Braun, J. (Eds)



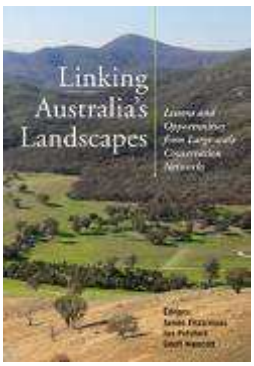
Interactions between carbon sequestration and ecosystem services
such as food security, water security, timber production and soil biodiversity are discussed in this new book.

http://www.springer.com/life+sciences/agriculture/book/978-94-007-6454-5

Linking Australia's Landscapes: Lessons and Opportunities from Large-scale Conservation Networks

James Fitzsimons, Ian Pulsford and Geoff Wescott (ed)

This book draws out lessons from a variety of established and new connectivity conservation initiatives from around Australia, and is complemented by international examples.



Chapters are written by leaders in the field of establishing and operating connectivity networks, as well as key ecological and social scientists and experts in governance.

Managing for healthy soils goes interactive on the ipad. You can purchase a copy at itunes for $9.99

Web Resources

Info re **Australia land management activities** available from ABS at **http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4630.0Main%20Features112011-12?opendocument&tabname=Summary&prodno=4630.0&issue=2011-12&num=&view**

Uncover a wealth of data for 2011 - 2012 on land management and agricultural resource management in Australia from the **Australian Land management practices survey (LaMPS) and the Agricultural resource management survey (ARMS)** with interactive maps at **http://www.abs.gov.au/websitedbs/c311215.nsf/web/Agriculture+-+Agricultural+Resource+and+Land+Management**

Sustainable and regenerative agriculture
Bathurst farmer Michael Inwood has written a report on ways to make agriculture more sustainable and regenerative following his Nuffield Scholarship.
http://www.nuffieldinternational.org/rep_pdf/1360018512MichaelInwoodfinalreport.pdf

Dairy Australia's **fertsmart website** has lots of interesting and helpful information about nutrient management for dairy farms **http://fertsmart.dairyingfortomorrow.com.au/**

There's a new app for that……for compost check out the **compost benefits calculator** at the Australian Organic Recycles Association (AROA) website **http://www.aora.org.au/index.php?id=39&utm_source=August+2013+C4S+E-newsletter&utm_campaign=C4S+August+2013&utm_medium=email**

Listen to Dr Karen Barry TIAR talking about the **untapped potential of soil biology** in her interview on the ABC at **http://www.abc.net.au/news/2013-10-15/karen-barry-soil-mycorrhiza-agriculture-beneficial-fungi/5023218**

We need to talk about……soils
New research for the university of Nottingham, UK has found a way to put N fixing bacteria in the roots of cereals to harvest N from the atmosphere like legumes
http://www.nottingham.ac.uk/news/pressreleases/2013/july/world-changing-technology-enables-crops-to-take-nitrogen-from-the-air-.aspx

Check out Vanessa Wongs and Robert Edis piece for the conversation, **A more sustainable Australia: we need to talk about our soils** at **http://theconversation.com/a-more-sustainable-australia-we-need-to-talk-about-our-soils-16555**

Intergovernmental Technical Panel on Soils
This FAO panels aim is to promote sustainable soil management and protection to ensure food security. There are 27 soil experts to provide scientific and technical advice and guidance on global soil issues. Our local representatives are Dr Marta Camps Arbestain (New Zealand), and Dr Neil McKenzie (Aust).
http://www.fao.org/fileadmin/user_upload/GSP/docs/Plenary_Assembly/GSPPA_I_2013_2_13june.pdf

Where art and soil meet take a look at **Filomena Coppolas installation** using, as the artist writes, a carpet of Mildura dirt. See **http://www.filomenacoppola.com/wallflower-mirror-rorrim/**

Confused about what **soil structure** is or how to explain it simply to someone else? Take a look at the European soil science system division blog by Antonio Jordán at **http://gsoil.wordpress.com/2013/08/19/what-is-soil-structure/**

Soil is Awesome BLOG
http://www.organicsoilguide.com/category/Blog/

Research Papers

An estimate of the global sink for nitrous oxide in soils
William H. Schlesinger
Global Change Biology Volume 19 (10)

Biochar and denitrification in soils: when, how much and why does biochar reduce N2O emissions?
Maria Luz Cayuela, Miguel Angel Sánchez-Monedero, Asunción Roig, Kelly Hanley, Akio Enders & Johannes Lehmann
Scientific Reports 3,Article number:1732
http://www.nature.com/srep/2013/130425/srep01732/full/srep01732.html

Changes in soil phosphorus availability and potential phosphorus loss following cessation of phosphorus fertiliser inputs
R. J. Dodd , R. W. McDowell and L. M. Condron
Soil Research 51(5)

Hillslopes Record the Growth and Decay of Landscapes,
Martin D. Hurst, Simon M. Mudd, Mikael Attal, George Hilley
Science Vol. 341 no. 6148 23 August 2013
http://www.sciencemag.org/content/341/6148/868.full

The hidden organic carbon in deep mineral soils
R. J. Harper, M. Tibbett
Plant and Soil 368:1-2

Predictions of watertable depth and soil salinity levels for land capability assessment using site indicator species
Sarita Jane Bennett and E. G. Barrett-Lennard
Crop and Pasture Science 64(3)

Quantifying Beetle-Mediated Effects on Gas Fluxes from Dung Pats
Penttilä A, Slade EM, Simojoki A, Riutta T, Minkkinen K, and Roslin T. (2013).
PLoS ONE 8(8) http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0071454

Soil food web properties explain ecosystem services across European land use systems
Franciska T. de Vries, Elisa Thébault, Mira Liiri, Klaus Birkhofer, Maria A. Tsiafouli, Lisa Bjørnlund, Helene Bracht Jørgensen, Mark Vincent Brady, Søren Christensen, Peter C. de Ruiter, Tina d'Hertefeldt, Jan Frouz, Katarina Hedlund, Lia Hemerik, W. H. Gera Hol, Stefan Hotes, Simon R. Mortimer, Heikki Setälä, Stefanos P. Sgardelis, Karoline Uteseny, Wim H. van der Putten, Volkmar Wolters, and Richard D. Bardgett..
Proceedings of the National Academy of Science of the united states of America, vol. 110 no. 35 10.1073/pnas.1305198110

Untangling the confusion around land carbon science and climate change mitigation policy
Brendan Mackey, I. Colin Prentice, Will Steffen, Joanna I. House, David Lindenmayer, Heather Keith & Sandra Berry
Nature Climate Change Volume: 3, (2013) doi:10.1038/nclimate1804

Valuing the soil natural capital: a New Zealand case study
Oshadhi Samarasinghe and Suzie Greenhalgh
Soil Research 51(4)

Interested in the **role freezing, thawing and snow have on soils** check out the latest edition of the **Canadian Journal of Soil Science** (volume 93 No 4).It is devoted to just that.
http://pubs.aic.ca/toc/cjss/93/4

Some interesting articles about soils appear in the latest edition of **ECOS** see **http://www.ecosmagazine.com/paper/EC13216.htm** re nitrification inhibition using plants and **http://www.ecosmagazine.com/paper/EC13217.htm** re using human waste to lock up carbon in soil.

Don't forget WORLD SOIL DAY this year!
How will you celebrate?

Events

World Soil Day
December 5
http://www.iuss.org/index.php?option=com_content&view

The third Australian Regolith Geoscientists Association Conference
6th-7th February 2014.
Perth/Bunbury
http://regolith.org.au/

20th World congress of soil science
June 8(Sun) ~ 13(Fri), 2014
ICC Jeju, Jeju, Korea
http://www.20wcss.org/sub03_1.php

Soil Change Matters.
24-27 March 2014
Bendigo, Victoria,
www.soilmatters.org

4th National Acid Sulfate Soil Conference
May 20-21 2014
Perth WA
http://scu.edu.au/nationalassconference/

International conservation agriculture congress,
Winnipeg, Canada,
June 22-26, 2014
www.ctic.org/WCCA.

The 29th International Horticultural Congress: Sustaining Lives, Livelihoods and Landscapes,
17-22 August 2014
Brisbane
http://www.ihc2014.org/call_for_abstracts.html

The Earth Living Skin 2014: Soil, Life and Climate Changes
September 22-25 2014
Apulia, Italy
EGU conference series see http://www.els2014.eu/d/101/Scientific_Programme/
The venue for this conference is on the limit of "Stornara", the biogenetic reserve between Bari and Brindisi.

Enquiries

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