

Title	Soil carbon sequestration potential with enhanced vegetation cover over NSW
Abstract	<p>Digital soil maps of soil organic carbon (SOC) sequestration potential resulting from hypothetical increases in long-term vegetation cover are presented at 100-m resolution across NSW. This increase could be achieved by strategies such as revegetation, grazing management or crop residue management. By applying a 10% relative increase in vegetation cover, a mean state-wide potential increase of 5.4 t/ha over the 0-30 cm depth interval was modelled. Assuming a 20-year period of re-equilibration, this equates to an average SOC increase of 0.27 t/ha/yr. Maps and data are also derived using a 10% absolute increase in vegetation cover and a maximum potential increase in vegetation cover, being that of geographically equivalent nature reserves. The outputs can be used to identify locations of highest sequestration potential and thereby help prioritise areas and inform decisions on sequestration programs. They can provide approximate estimates of equivalent CO₂ emissions avoided within the soil from these vegetation cover increases. The results could encourage formal incorporation of soil carbon sequestration in programs under Australia's Emission Reduction Fund. The work was undertaken as part of the NSW Government's Primary Industries Productivity and Abatement Program (PIPAP). Methods and results are fully reported in Gray et al. (2021) as provided here.</p>
Resource locator	
Data Quality Statement	<p>Name: Data Quality Statement</p> <p>Protocol: WWW:DOWNLOAD-1.0-http--download</p> <p>Description:</p> <p>Data quality statement for Soil carbon sequestration potential with enhanced vegetation cover over NSW</p> <p>Function: download</p>
Baseline SOC stocks for NSW	<p>Name: Baseline SOC stocks for NSW</p> <p>Protocol: WWW:DOWNLOAD-1.0-http--download</p> <p>Description:</p> <p>Modelled current SOC stocks (t/ha) for 0-30 cm</p> <p>Function: download</p>
SOC stocks under enhanced vegetation 1	<p>Name: SOC stocks under enhanced vegetation 1</p> <p>Protocol: WWW:DOWNLOAD-1.0-http--download</p> <p>Description:</p> <p>Modelled grids of SOC (t/ha) under 10% relative increase in veg cover</p> <p>Function: download</p>
SOC sequestration potential under enhanced vegetation 1	<p>Name: SOC sequestration potential under enhanced vegetation 1</p> <p>Protocol: WWW:DOWNLOAD-1.0-http--download</p> <p>Description:</p> <p>Modelled grids of SOC gain (t/ha) under 10% relative increase in veg. cover</p> <p>Function: download</p>
SOC stocks under enhanced vegetation 2	<p>Name: SOC stocks under enhanced vegetation 2</p> <p>Protocol: WWW:DOWNLOAD-1.0-http--download</p> <p>Description:</p> <p>Modelled grids of SOC and gain (t/ha) under 10% absolute increase in veg cover</p> <p>Function: download</p>
SOC stocks under maximum likely vegetation	<p>Name: SOC stocks under maximum likely vegetation</p> <p>Protocol: WWW:DOWNLOAD-1.0-http--download</p> <p>Description:</p>

Modelled grids of SOC (t/ha) under veg cover equivalent to nature reserves

Function: download

[SOC sequestration potential under maximum likely vegetation](#)

Name: SOC sequestration potential under maximum likely vegetation

Protocol: WWW:DOWNLOAD-1.0-http--download

Description:

Modelled grids of SOC gain (t/ha) under veg cover equivalent to nature reserves

Function: download

[Images for each LLS region](#)

Name: Images for each LLS region

Protocol: WWW:DOWNLOAD-1.0-http--download

Description:

PDF images for each of 11 LLSs and the ACT, including potential sequestration with enhanced veg cover, plus key supporting layers.

Function: download

[Journal paper, 2021](#)

Name: Journal paper, 2021

Protocol: WWW:DOWNLOAD-1.0-http--download

Description:

Gray JM, Wang BA, Waters CM, Orgill SE, Cowie AL, Ng EL, 2021. Digital mapping of soil carbon sequestration potential with enhanced vegetation cover over New South Wales, Australia, Soil Use and Management, <https://doi.org/10.1111/sum.12766>

Function: download

Unique resource identifier

Code 44246716-3e65-4120-983a-0ebfe380e2e1

Presentation form Map digital

Edition version 1

Dataset language English

Metadata standard

Name ISO 19115

Edition 2016

Dataset URI <https://datasets.seed.nsw.gov.au/dataset/44246716-3e65-4120-983a-0ebfe380e2e1>

Purpose Identify priority areas for soil carbon sequestration programs across NSW

Status Completed

Spatial representation type grid

Spatial reference system

Code identifying the spatial reference system 4283

Spatial resolution 100 m

Additional information source Predictive modelling based on soil and environmental data from 2008-2016

Topic category

Keyword set	
keyword value	SOIL CLIMATE-AND-WEATHER-Climate-change VEGETATION LAND-Cover
Originating controlled vocabulary	
Title	ANZLIC Search Words
Reference date	2008-05-16
Geographic location	
West bounding longitude	141
East bounding longitude	154
North bounding latitude	-37.7
South bounding latitude	-28
Vertical extent information	
Minimum value	-100
Maximum value	2228
Coordinate reference system	
Authority code	urn:ogc:def:cs:EPSG::
Code identifying the coordinate reference system	5711
Temporal extent	
Begin position	2008-03-01
End position	N/A
Dataset reference date	
Resource maintenance	
Maintenance and update frequency	Not planned
Contact info	
Contact position	Data Broker
Organisation name	NSW Department of Climate Change, Energy, the Environment and Water
Telephone number	131555
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Responsible party role	pointOfContact

Lineage

The study applied a digital soil mapping 'space-for-time substitution' approach, with a bootstrapping model framework. It involved development of a statistical model of current SOC stocks (to 30 cm depth) under current land use and vegetation cover conditions over NSW, then applying the model to estimate SOC stock under a hypothetical relative 10% increase in vegetation cover (e.g. increasing from 70% to 77%). The difference in SOC stocks between those two modelled scenarios was indicative of the realistic magnitude of feasible sequestration achievable in the long-term. Vegetation cover included live plants, standing dead vegetation and surface litter. An initial dataset of 2153 points was prepared, each with SOC stock (in Mg ha⁻¹) for the 0-30 cm depth interval. The dataset comprised data sourced from NSW Monitoring, Evaluation and Reporting (MER) during 2008-09; the National Soil Carbon Research Program (SCaRP) 2009-2012; and miscellaneous NSW DPI projects (mainly 2014-2016). Maps were generated using a bootstrap procedure was repeated 100 times with MLR models using the same 10 variables and training dataset. This applied a sampling with replacement method, to obtain 100 random subsamples of the training data. Validation of the mean SOC map was undertaken using the originally set aside 20% validation dataset, deriving the coefficient of determination R², Lin's concordance correlation coefficient (CCC, giving level of agreement relative to the 1:1 line), root mean square error (RMSE) and mean absolute error (MAE). The 90% PI limits and range for the current and enhanced vegetation cover scenarios were prepared as direct outputs in R from the bootstrapping process with 100 iterations. For SOC change (sequestration), the PI range map was derived by combining the above prepared PI upper and lower limits (UL and LL).

Limitations on public access

Scope	dataset
DQ Completeness Commission	
Effective date	2021-06-30
Explanation	The maps cover all NSW and the ACT
DQ Completeness Omission	
Effective date	2021-06-30
Explanation	The entire area of NSW and the ACT is covered, with only minor isolated gaps, which usually cover water bodies, salt pans or similar.
DQ Conceptual Consistency	
Effective date	2021-06-30
Explanation	The maps are conceptually consistent
DQ Topological Consistency	
Effective date	2021-06-30
Explanation	The maps are topologically consistent
DQ Absolute External Positional Accuracy	
Effective date	2021-06-30
Explanation	Map validation for current SOC stocks over the 0-30 cm depth interval revealed Lin's concordance values of 0.72 and root mean square errors (RMSE) of 0.38 log units, indicating moderate to good reliability of the initial carbon stock maps. No validation was possible for the maps representing the projected stocks under the hypothetical enhanced vegetation cover and the resulting increase in stocks (ie, sequestration). Reliability of map results are informed by the upper and lower 90% prediction interval maps as provided in this data set. Other data and discussion on the reliability of the final modelled maps are presented in the associated journal paper (Gray et al. 2021).
DQ Non Quantitative Attribute Correctness	
Effective date	2021-06-30
Explanation	The maps are based on modelling with inherent limitations in the spatial patterns, as described in the associated journal paper (Gray et al. 2021)
Responsible party	
Contact position	Data Broker
Organisation name	NSW Department of Climate Change, Energy, the Environment and Water
Telephone number	131555
Email address	data.broker@environment.nsw.gov.au
Web address	https://www.nsw.gov.au/departments-and-agencies/dcceew
Responsible party role	pointOfContact

Metadata point of contact

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Metadata date 2024-02-26T13:37:01.859531

Metadata language