Title	Soil carbon sequestration potential with enhanced vegetation cover over NSW
Abstract	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.

Resource locator

Data Quality Statement	Name: Data Quality Statement Protocol: WWW:DOWNLOAD-1.0-http--download Description: Data quality statement for Soil carbon sequestration potential with enhanced vegetation cover over NSW Function: download
Baseline SOC stocks for NSW	Name: Baseline SOC stocks for NSW Protocol: WWW:DOWNLOAD-1.0-http--download Description: Modelled current SOC stocks (t/ha) for 0-30 cm Function: download
SOC stocks under enhanced vegetation 1	Name: SOC stocks under enhanced vegetation 1 Protocol: WWW:DOWNLOAD-1.0-http--download Description: Modelled grids of SOC (t/ha) under 10% relative increase in veg cover Function: download
SOC sequestration potential under enhanced vegetation 1	Name: SOC sequestration potential under enhanced vegetation 1 Protocol: WWW:DOWNLOAD-1.0-http--download Description: Modelled grids of SOC gain (t/ha) under 10% relative increase in veg. cover Function: download
SOC stocks under enhanced vegetation 2	Name: SOC stocks under enhanced vegetation 2 Protocol: WWW:DOWNLOAD-1.0-http--download Description: Modelled grids of SOC and gain (t/ha) under 10% absolute increase in veg cover Function: download
SOC stocks under maximum likely vegetation	Name: SOC stocks under maximum likely vegetation Protocol: WWW:DOWNLOAD-1.0-http--download Description:

	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
Email address	data.broker@environment.nsw.gov.au
Web address	https://www.nsw.gov.au/departments-and-agencies/dcceew
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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Responsible party role	pointOfContact

Metadata date

2024-02-26T13:37:01.859531

Metadata language