**NSW Native Vegetation Extent (NVE) 5m Raster v1.4: Metadata**

Introduction

The NSW Native Vegetation Extent 5m Raster was developed under the State Vegetation Type Map program (SVTM) and presents a single surface raster that combines the best available information on vegetation extent for NSW. The surface is built on the 2011 5m NSW Woody Vegetation Extent (Fisher et al., 2016), with updates up to 2018 (Fisher et al., 2017), with the addition of native grasslands, woodlands and wetlands from the visual interpretation of high-resolution imagery (OEH, 2017). In addition, the surface also delineates softwood forest plantations and water bodies.

The metadata statement below describes the lineage of the NSW Native Vegetation Extent 5m Raster v1.0 and explains the rule logic behind how each dataset contributes to its core attributes.
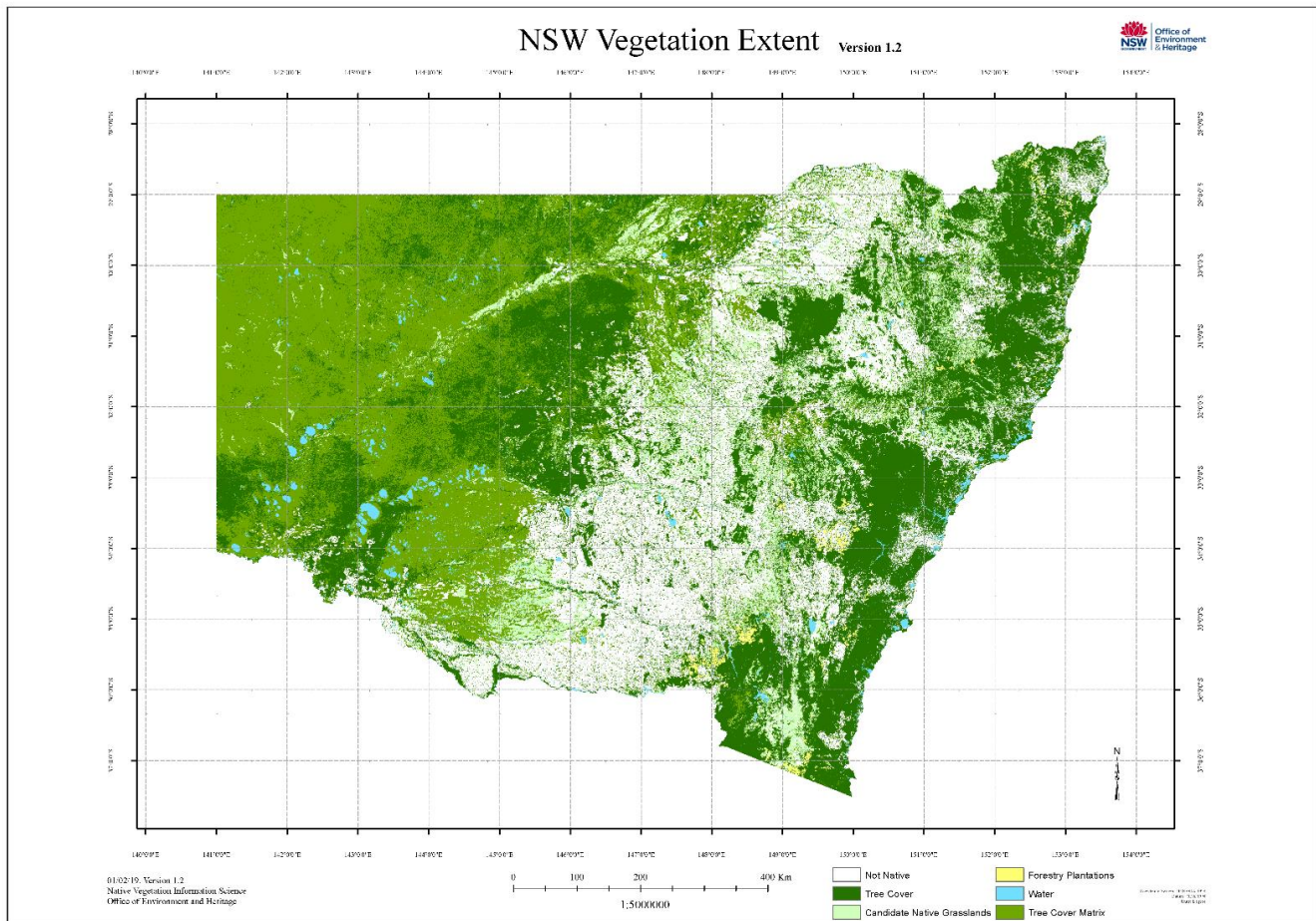
Attribution:

The raster cells contain the following values listed in Table 1.

Pixel Value	Type	Description
0	Not Native	Not Native Vegetation
1	Tree Cover	Trees > 2m in height
2	Candidate Native Grasslands	Potential native grassland visually assessed from a single data 50cm aerial image
3	Forestry Plantations	Softwood plantations
4	Water	All water bodies
5	Tree Cover Matrix	Not woody pixels between native woodland trees.

Table 1. Pixel Values and Categories in the NSW Vegetation Extent 5m Raster v1.2

Product

The NSW Vegetation Extent 5m Raster raster image is a 5m raster dataset. 4 Bit. Nodata value = 15
NSW Lambert projection, GDA94 Datum.
Image name: **NSW_Native_Vegetation_Extent_v1p2_5m_2017.tif**

Use:

The dataset is considered the most complete, accurate and precise map of NSW vegetation extent. It is representative of native vegetation extent between 2011 and 2018. It assumes that all tree cover that is not a forestry plantation is native. This may not be the case in some locations, particularly in urban areas.

Built off the NSW 5m Woody Vegetation Extent 2011 this product contributes the following attribute additions and spatial updates:

1. An update to the 5m Woody Vegetation Extent 2011 tree cover with selective corrections of omission errors through to 2018 (preserved in NSW Woody Vegetation Extent 2017)
2. A one pixel buffer and rounding algorithm on the 5m Woody Vegetation Extent 2011. This enlarged the edges of woody vegetation that was slightly underrepresented in the existing extent (preserved in NSW Woody Vegetation Extent 2017)
3. Additional attributes include Candidate Native Grasslands and a Tree Cover Matrix. The Tree Cover Matrix records pixels that sit under a 'connected' area of open woodland. This allows the identification of woodland areas , isolated tree crowns and areas of contiguous forest cover.
4. The surface also identifies water body extent from the NSW Digital Topographic Database
5. Softwood (pine) plantations from FNSW_Plantations and NSW Landuse 2013 datasets.

Limitations:

Currency of inputs: Woody & API attribution current to 2017 (derived from ADS or SPOT-5 imagery acquisition dates ranging from 2011-2017). Land clearing status to 2015. Forestry to 2013.

Woody/Non-Woody (Layer 1 below) was validated to ~ 90% accuracy at 2011. It is assumed the 2017 revisions will increase this accuracy, particularly improving errors of omission.

No validation statistics available on the API source layer (Layer 2). This was generated mostly from 50cm ADS aerial imagery at 1:15,000 scale.

Accuracies for source layer 4 (water) can be sourced from the NSW Digital Topographic Database (DTDB) and are variable according to water body type.

Vegetation in urban environments were not reviewed during this product development.

Definitions:

Candidate Native Grasslands: A pixel is classified as candidate native grassland if it represents visually discernible grassland vegetation from 50cm ADS imagery (or SPOT-5 where unavailable) at 1:15,000 scale and does not show discernible agricultural management at the time of image acquisition.

Tree Cover: All woody vegetation (native or non-native) great than 2m in height.

Lineage:

The NSW Vegetation Extent 5m Raster is derived from the five input layers listed below. The accompanying lineage raster (also described below) records the relationships between these layers and the NSW Vegetation Extent 5m Raster . Table 2 summarises the precise sourcing rules.

1. **NSW Woody Vegetation Extent 2017**

   This woody layer is a revised version of the NSW Woody Vegetation Extent 2011 (v1.0 and v1.1):

   NSW Woody Vegetation Extent 2011 (v1.0)

   Fisher, Adrian, Day, Michael, Gill, Tony, Roff, Adam, Danaher, Tim and Flood, Neil (2016) Large-area, high-resolution tree cover mapping with multi-temporal SPOT5 imagery, New South Wales, Australia. *Remote Sensing*, 8 6: 515.1-515.23. doi:10.3390/rs8060515 http://data.auscover.org.au/xwiki/bin/view/Product+pages/nsw+5m+woody+extent+and+fpc

   v1.1 contains numerous manual and semi-manual corrections to the v1.0 tree cover extent:
   Revisions:
   a) The corrections are selective across the state and include both corrections to errors of omission and errors of commission. The corrections are not spatially exhaustive (some areas have not been touched). The areas affected are sourced from woody edits made during the production of the Native Vegetation Regulatory map.

      The edits include manual additions/erasures of woody as well as the correction of individual tree crown omissions identified by Fisher et al (2017):

      Adrian Fisher, Tim Danaher, Tony Gill, "Mapping trees in high resolution imagery across large areas using locally variable thresholds guided by medium resolution tree maps", *International Journal of Applied Earth Observation and Geoinformation*, Volume 58, 2017, Pages 86-96, ISSN 0303-2434, https://doi.org/10.1016/j.jag.2017.02.004.(http://www.sciencedirect.com/science/article/pii/S0303243417300302)

   b) 2015 land clearing records are applied to the v1.1 dataset (sourced from IRS SPOT stagecode .bcw)
   c) A single-pixel dilate and 3x3 median filter was applied to the binary surface after a) and b) refinements. This 'smooths' the tree cover boundaries.

   V1.2 contains the following updates to v1.1:

   a) Inclusion of Forster (east of Bulahdelah) and Gralen Point (east of Bega) 100k sheets.
   b) Any further woody omission/commission corrections since v1.1 undertaken under the NVR program.

   Currency: 2018

2. **NSW State Vegetation Type Map (SVTM) Candidate Native Vegetation version 0.3.**
   This is an aerial photo interpreted layer of native vegetation using 50cm ADS40 imagery, or enhanced SPOT-5 2.5m imagery. This is an intermediate product delivered by the SVTM program and contains categories of 'native vegetation', 'candidate native grasslands' and 'non-native'. Note that the manual attributions were performed on polygon features derived from image segmentation. This dataset is a draft under review for coastal regions for an updated 2019. A single polygon feature assigned as 'native vegetation' therefore may include contiguous trees only, or trees in a shrub or grassland matrix. The NSW Native Vegetation Extent 5m Raster v1.0 discriminates this matrix as category '5' by identifying where 'native vegetation' exists in input layer 2 and where tree cover does not exist in input layer 1. Please see Table 2 for the precise sourcing relationships to this layer.

   Currency: 2017

3. **Forestry Plantations.** Plantations attribution sourced from the following two datasets:

   a. OEH's Landuse 2013 dataset:
      P:\Corporate\Themes\Land\Landuse\Landuse.gdb\NSW_Landuse_2013
   b. Forestry NSW Plantations dataset:
      P:\Corporate\Themes\Land\Landuse\Landuse.gdb\FNSW_Plantations

   These plantation attributions are considered true representations of plantation boundaries and override any attributions from input layers 1,2 or 3.

   Currency: 2013

4. **The Digital Topographic Database (DTDB) 'Hydro Area' Dataset**. 'Water Bodies' and 'Water Courses' derived from the 'ClassSubType' field were applied as water masks. This dataset is sourced from Land and Property

Information and is located in the following directory of the Office of Environment and Heritage spatial database: \\lidcona02a\spatialmaster\Corporate\Themes\Water\Drainage\Drainage.gdb

For the purposes of the production dataset, these are considered true representations of persistent water bodies and over-ride attributions from input layers 1,2 and 3. The only exception to this are areas of woody vegetation from **NSW Woody Vegetation Extent 2017 v1.2 (input layer 1)** that exist over 'Water Bodies'. These retain the native woody attribution since they were manually screen on tree cover production.

5. **Landsat derived water mask:** These attributions were collected from the NSW Woody Vegetation Extent 2011 v1.0 (described in input layer No 1 above). Persistent water bodies were identified as part of the tree cover project from time series landsat. These attributions were manually screened on production of the tree cover dataset and are considered true water bodies. These override all attributions from input layers 1,2, or 3.

Lineage Raster

To illustrate the lineage of the NSW Vegetation Extent 5m Raster raster, a separate lineage raster was also generated and can be supplied on request: NSW_ Vegetation_Extent_v1p2_5m_2017_**lineage**.tif Please refer to Table 2 below for the description of the lineage codes and their relationship to the final values in the NSW Native Vegetation Extent 5m Raster v1.0.

*NSW_Vegetation_Extent_v1p2_5m_2017_**lineage**.tif*   *NSW_Vegetation_Extent_v1p2_5m_2017.tif*

Pixel Value Code: Lineage Surface	Description: Lineage Surface	Pixel Value Code: NSW Native Vegetation Extent 5m Raster v1.0	Description (Type): NSW Native Vegetation Extent 5m Raster v1.0
1	Native woody from NSW Woody v1.2 only (input layer 1)	1	Tree Cover
7	Native vegetation from State Vegetation Type Map only (input layer 2)	5	Native Tree Cover Matrix
8	Native vegetation where NSW Woody v1.2 and State Vegetation Type Map agree (input layers 1 & 2)	1	Tree Cover
2	Candidate Native grasslands from State Vegetation Type Map (woody absent from input layers 1 or 2)	2	Candidate Native Grasslands
6	Plantations override (input layer 3)	3	Forestry Plantations
3	Water Pixel overrides (input layer 5)	4	Water
4	Water mask overrides from Hydro Area (input layer 4 - 'Water Courses' only)	4	Water
5	Water mask overrides from Hydro Area (input layer 4 'Water Bodies' only, woody preserved)	4	Water
0	Not Native (from any input layer)	0	Not Native

Table 2. Pixel Values and Categories Sourcing both the lineage and extent rasters.

Version updates:

Version 1.2: NSW Vegetation Extent 5m Raster v1.2,) provides the following updates to the preceding version (v0.3, NSW Native Vegetation 5m Raster v0.3, NSW_NativeVegetation_v0p3.tif):

1. Name change, in addition to version number update (see above paragraph).

2. The Native Vegetation category '1' from v0.3 is now split into two categories. The two new categories are:
   a. '1' – Native Tree Cover only (sourced from input layer 1, NSW Woody Vegetation Extent v1.1)
   b. '5' – Native Tree Cover Matrix. This is sourced where input layer 2 (NSW State Vegetation Type Map (SVTM) Candidate Native Vegetation version 0.3) is assigned as 'native vegetation' and where woody cover from input layer 1 does not exist. This category can be considered a woodland or forest matrix between tree crowns. It is likely to comprise of shrubs or grasses.
3. Version 1.2 updates:
   a. Further manual revision of tree cover extent through to Dec 2018.
   b. Data type demotion to 4bit.
   c. Nodata value reassigned to 15.
   d. Correction of tree dover absence over the Forster and Gralen Point 100k map sheets.
   e. Pixel alignment correction

Version 1.4:

- Ingestion of March 2020 working draft SVTM Plant Community Type categories:
  o Grasslands
  o Apline
  o Shrub
  o Heath
  o Saline Wetlands
  o Freshwater Wetlands
  o Woody PCTs (Tree cover matrix)

- Lidar Woody Refinement
  o Coastal Lidar Woody applied to refine woody via intersect with NSW woody v1.3.

- Landuse 2017 overrides (reverted to non-native):
  https://datasets.seed.nsw.gov.au/dataset/nsw-landuse-2017
  o Irrigated plantation forestry
  o Perennial horticulture
  o Irrigated perennial horticulture
  o Intensive horticulture
  o Plantation forests
  o Transport (within 100m of Builtup Area)

- Built up overrides (reverted to non-native):
  o Geoscape buildings (5m buffer) 2020
  o Classified roads (5m buffer) 2020

Future updates:

This dataset may be revised after the publication of the coastal SVTM PCT vegetation map mid-late 2019. This revision would include updates to the visual image derived candidate native grasslands and woodland matrix categories, land clearing records and any further manual revision of the 5m NSW Woody Vegetation Extent 2011 since 2017.

Custodian:

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References:

NSW Office of Environment and Heritage (OEH) 2017, The NSW State Vegetation Type Map: Methodology for a regional-scale map of NSW plant community types, NSW Office of Environment and Heritage, Sydney, Australia. http://www.environment.nsw.gov.au/resources/vegetation/nsw-state-vegetation-type-map-methodology-170134.pdf

Fisher, Adrian, Day, Michael, Gill, Tony, Roff, Adam, Danaher, Tim and Flood, Neil (2016). Large-area, high-resolution tree cover mapping with multi-temporal SPOT5 imagery, New South Wales, Australia. Remote Sensing 8 (6) 515.1-515.23. https://doi.org/10.3390/rs8060515

Fisher, Adrian, Danaher, Tim and Gill, Tony (2017). Mapping trees in high resolution imagery across large areas using locally variable thresholds guided by medium resolution tree maps. International Journal of Applied Earth Observation and Geoinformation 58 86-96. https://doi.org/10.1016/j.jag.2017.02.004