NSW GOVERNMENT

Department of Planning and Environment

Evaluation of BioNet Plant Community Types (2018) of Eastern New South Wales

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1. Introduction

Plant community types (PCTs) represent the finest level of a hierarchy applied to the classification and description of native vegetation across NSW. The master list of PCTs is managed by the Department of Planning and Environment (DPE). This report describes a review of the PCTs for eastern NSW, as listed in the BioNet Vegetation Classification public application on 1 November 2018.

The review has been completed as a preliminary step in a major project aimed at improving PCTs for biodiversity assessment practitioners operating in eastern NSW. PCTs are a focal point for methods that assess land and biodiversity values. The availability of consistently defined PCTs brings rigour and transparency to decisions that rely on them. NSW Government initiatives to improve PCTs and mapping accompanied the introduction of new biodiversity and land management legislation in 2016. Eastern parts of NSW have a strong demand for vegetation information due to high land-use pressures, and this part of the state is the subject of a major project to review and improve PCTs and their mapping.

PCTs are a component of an integrated native vegetation information system that includes maps, condition benchmarks, threatened species and community data. The integrated system supports a wide range of land management and biodiversity assessment applications in NSW.

This report describes the background to the development of the set of Approved PCTs (2018) for eastern NSW, and evaluates the methods, data sources and data content used for their definition. It provides a summary of limitations of eastern NSW Approved PCTs (2018) and identifies potential areas for improvement.

2. Background

2.1 NSW Integrated BioNet Vegetation Data

NSW Integrated BioNet Vegetation Data (IBVD) is a major program within the DPE Remote Sensing and Landscape Science Branch Strategy. This program coordinates the development and management of native vegetation classification data and maps for NSW. The program is recognition of the need to provide consistent statewide vegetation data to support the implementation of NSW legislation, regulations and policies. It moves from a previously fragmented, regionalised and patchy history of investment to a centrally managed program underpinned by scientific standards and methods. IBVD includes:

- the 3-tiered NSW native vegetation classification hierarchy (vegetation formations, vegetation classes and PCTs)
- the State Vegetation Type Map (SVTM) (including extant and 1750 PCT maps)
- threatened species, population and ecological community to PCT association data
- estimates of clearing loss (%) for PCTs
- condition benchmark data
- the BioNet systems that store and deliver data content.

2.2 What are PCTs?

PCTs are the finest level of classification in the NSW vegetation classification hierarchy. They identify and describe recurring patterns of native plant species assemblages in relation to environmental conditions; that is, sets of species that commonly occur together in association with particular combinations of soil, temperature, moisture and other factors. PCTs fit within broader units known as vegetation classes. There are 99 vegetation classes representing broader-scale vegetation patterns across NSW. These in turn are nested into 12 vegetation formations at the top of the hierarchy. The 2 upper levels of the hierarchy are drawn from the independently constructed schema of Keith (2004).

The PCT master list is defined in BioNet, the NSW biodiversity data repository administered by DPE. Each PCT is assigned a ‘PCT definition status’ of Approved, Draft-Working, Decommissioned or Withdrawn (there are also other statuses not relevant to this report). Approved PCTs represent the master set of native vegetation communities recognised for NSW and applied in a number of NSW legislative planning and assessment tools, and in vegetation mapping programs. As at November 2018 the BioNet Vegetation Classification applications held over 200 fields of text-based descriptions of PCT composition, structure and distribution.

In this report we use a November 2018 export of Approved PCT data from the BioNet Vegetation Classification public application as the basis for assessment. We refer to these data as ‘Approved PCTs (2018)’ and limit the review in this report to these Approved types. Draft-Working PCTs are not visible to the public nor used in planning and assessment tools, however they do represent significant past investment of classification effort. Although not considered in this report, a subset of Draft-Working PCTs (OEH 2012 and Griffith et al. 2003) are assessed in later stages of this project (see DPE 2022a, b).

2.3 How is vegetation classified?

The vegetation at any particular location may be described in terms of the plant species present (from tallest trees to smallest herbs), and the relative 'importance' of each species based on a combination of abundance (number of individuals) and cover (how much of the area they occupy). Plant species composition and relative importance varies across the landscape, and vegetation classification is an artificial framework used to subdivide and describe the patterns of composition and importance observed along complex continua of environmental and other gradients, including moisture, temperature, soil fertility and disturbance history. Because of the importance of plants to all other elements of biodiversity, vegetation classification units are commonly used as surrogates for broader biodiversity classification.

Traditional vegetation classifications relied on the interpretations and opinions of ecologists and naturalists who had accumulated extensive personal observations of the vegetation patterns of a district or region, and from these developed descriptions of the different sets of co-occurring species they perceived to be distinct types. This approach is completely reliant on the individual involved: how much of the region they have seen or not seen, their accumulated memories of those observations, their perceptions of different types, and their ability to describe each type to allow consistent identification by different users.

Since the late 1980s, a new approach has been developed involving the systematic collection of plot-based standard floristic survey data followed by numerical classification of these data to identify distinct vegetation types and describe them based on the underpinning plot data. This approach has been applied to a number of vegetation classification and mapping projects in different parts of NSW. These have ranged from large bioregional studies to smaller study areas such as conservation reserves or local government areas. Other studies have focused on thematic subsets of widely distributed native vegetation types such as coastal heaths, tableland wetlands, and treeless alpine vegetation.

To date, most systematic plot-based regional classification projects completed in NSW have been located in eastern parts of the state – the coast, escarpment, tablelands, alps and western slopes. Central and western parts of the state remain relatively poorly sampled by standard floristic survey plots.

2.4 Recent history of fine-scale vegetation classification in NSW

Prior to 2003, a centrally managed fine-scale statewide vegetation classification schema was not available for NSW. Previous native vegetation information consisted of a patchwork of published and unpublished studies using purpose-built classification systems that applied independent thematic scales, methods and map techniques (Keith 2004). A statewide native vegetation mapping program was established in 1999 with the intention of classifying and mapping native vegetation across NSW as a series of map-sheet blocks; however, the program concluded before comprehensive mapping was completed. Other investments in new vegetation data followed local or regional demands for vegetation information particularly associated with regional-scale conservation planning, reserve management and local government planning.

2.4.1 NSW vegetation classification and assessment

Efforts to prepare a consolidated master list of vegetation types for NSW commenced with the development of the NSW vegetation classification and assessment (NSW VCA) project (Benson 2006). That project built an inventory of types by interpreting summary data from available classification sources, conducting field validation traverses and documenting the

interpretations in a database. The database included over 200 fields to describe the composition, structure, environment and conservation status of each type. The circumscription of each type relied on an expert synthesis of available classification and mapping data, with multiple sources cited as guiding the description of primary attributes and distribution information. Vegetation patterns not described by existing literature were interpreted from field traverses. The source data cited for types reflects the diverse legacy of vegetation classification approaches that have been applied across NSW. The project commenced in the western plains regions of NSW (Benson et al. 2006) and incrementally extended east into the NSW South Western Slopes (Benson 2008) and the Brigalow Belt South and Nandewar bioregions (Benson et al. 2010).

2.4.2 NSW BioMetric vegetation types

New decision support tools for natural resource management were introduced under NSW legislation in 2003. Operation of these tools required an inventory of fine-scale vegetation classification units to be compiled for each of the 14 catchment administrative areas defined in NSW at that time. The inventory sourced the best available fine-scale classification data at the time, which was then assembled and interpreted by regional ecologists to define plausible units representing recognisable vegetation patterns within each catchment. The classification schema, named BioMetric vegetation types (BVTs), relied on an interpretation of data and descriptions drawn from the primary classification sources as a basis for definition. A unique catchment identifier and number was assigned to each individual BVT in each catchment.

The NSW VCA units were immediately adopted as BVTs in catchments of the western plains and slopes. Initially a subset of information fields for each vegetation type were incorporated into the BVT schema, then in 2011 the 210 information fields used by that work to describe each vegetation type were incorporated into the BioNet Vegetation Classification applications.

In eastern NSW, a number of separate large regional plot-based classification projects covered most of the area. As in the west, these projects varied in classification scale (i.e. how finely or coarsely they had subdivided the types they recognised), and at their margins either overlapped with other projects or had undescribed gaps. Within large classified regions, smaller thematic classifications, such as rainforests and heaths, offered alternative interpretations of patterns at different scales. The process of converting classification units from multiple competing classification projects into a single set of types involved interpretations applied by ecologists working within each catchment area. No overarching classification framework or method applied to the derivation of units within catchments, and some within-catchment classifications remained independent of adjoining areas. Coverage of classification information was not consistent across each catchment and required the addition of expert opinion and other map data sources to resolve gaps in information.

Periodic revisions to the NSW BVT data were undertaken to add to the inventory for each catchment and modify or replace existing types. Revisions drew on new survey and classification work, expert opinion and revised interpretations of classification data. In eastern NSW, the catchment focus of classification investment continued with detailed scientific studies in the Hunter-Central Rivers (Somerville 2009), Northern Rivers (OEH 2012), Upper Murrumbidgee (Armstrong et al. 2013) and Sydney Metropolitan (OEH 2013) catchments.

2.4.3 NSW plant community types

In 2011, DPE (then the Office of Environment and Heritage) adopted a new schema, referred to as plant community types (PCTs). PCTs were created by combining related BVTs across adjoining catchments and assigning a unique PCT identifier to the new units. The process involved the alignment of classification units used in catchment BVTs, and expert review. Duplicate PCTs were commonly created due to the inability to reconcile all BVTs across catchment boundaries. BVTs continued to be used in regulatory tools until August 2017, when they were entirely replaced by PCTs. Among other benefits, the change from BVTs to PCTs removed some of the complexity of managing a classification system against administrative boundaries that were vulnerable to amendment.

PCTs have been subject to ongoing revisions and edits over time, based on user and other expert feedback including external consultant review. The majority of Approved PCTs (2018) in eastern NSW cite classification units from plot-based regional classification projects as their source. However, due to the complex history of interpretations applied during development and revisions of the PCT master list, Approved PCTs (2018) may differ from their cited classification units in a variety of important but undocumented ways, including the description of species composition and the stated distribution.

A wide variety of land management and biodiversity assessment applications in NSW now rely on the PCT classification framework. In 2014, the independent panel undertaking a NSW biodiversity legislation review recommended the Government ‘prioritise improvements to the plant community types classification system and the development of maps to support decision making (including threat and risk assessment for ecological communities)’ (Byron et al. 2014). The recommendation identified the central role PCTs play in an expanded Biodiversity Offsets Scheme, among other initiatives accompanying the new legislation.

2.5 Review area – eastern NSW

The focus of this review is the set of Approved PCTs (2018) of eastern NSW. This includes PCTs with a distribution in 2018 that included any one or more of 10 IBRA v7 bioregions (DAWE 2021): the Australian Alps, New England Tablelands, NSW North Coast, South East Corner, South Eastern Highlands, South Eastern Queensland, Sydney Basin, Brigalow Belt South, Nandewar and NSW South Western Slopes bioregions. The first 7 of these bioregions together represent coastal, escarpment, tableland and alps environments, and are collectively referred to in this document as ‘coast and tablelands bioregions’. The latter 3 bioregions are collectively referred to in this document as ‘western slopes bioregions’. The inclusion of all 10 bioregions in the review acknowledges that vegetation patterns are likely to cross bioregional boundaries.

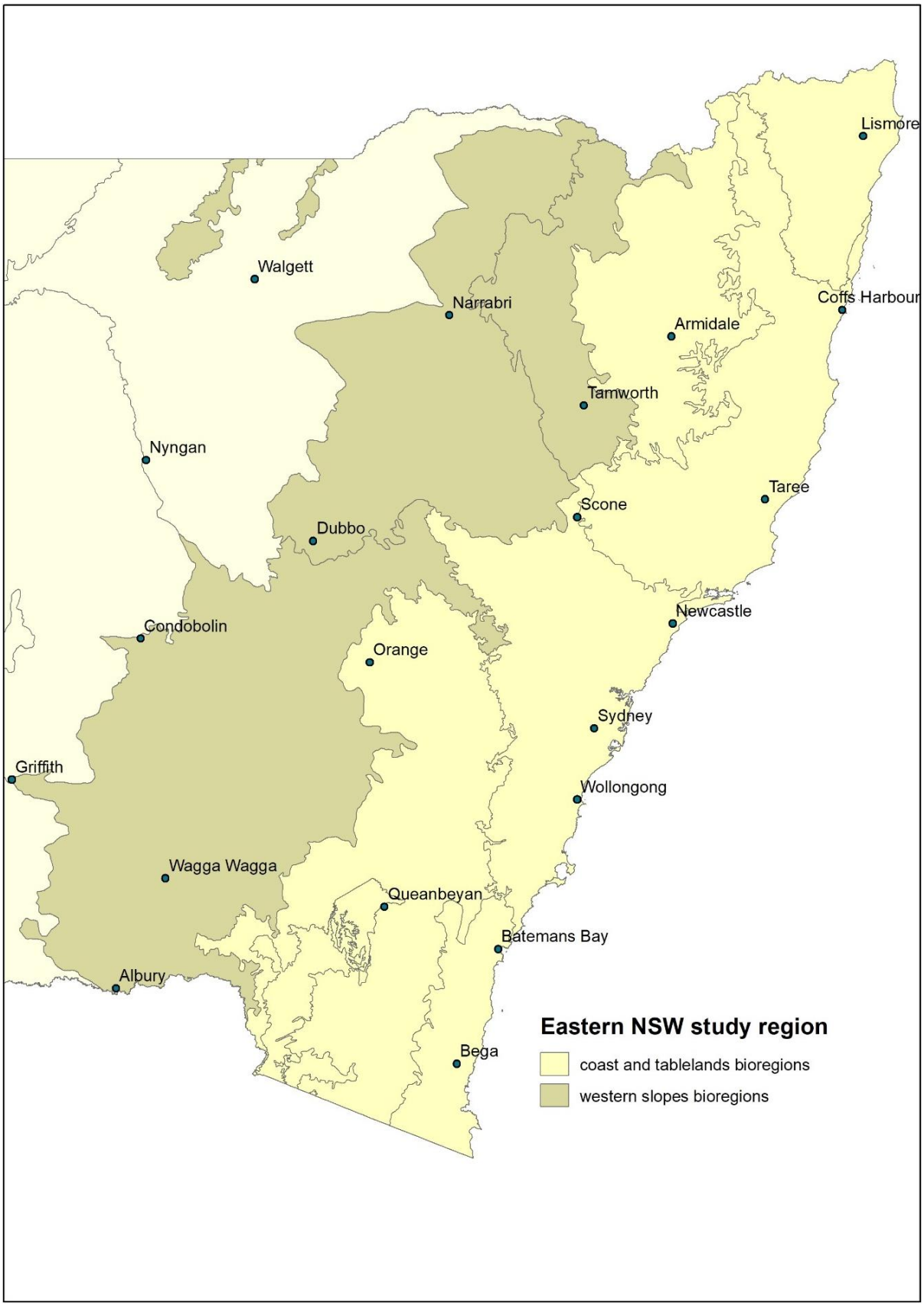

Figure 1 **Project study region**

2.6 Project reports

This report is one of a series of 4 describing the context, methods and results, implementation steps and new tools arising from recent vegetation classification work in eastern NSW. Report 1 (this report) evaluates the set of Approved PCTs in eastern NSW as at 1 November 2018. It identifies strengths and weaknesses of these PCTs and proposes steps for improvements. Report 2 (DPE 2022a) is a detailed technical document describing the methods applied to the development of a new plot-based classification for eastern NSW and concluding with the identification of 1,067 coast and tablelands groups (ENSW v1.1 groups) and 138 western slopes groups. Report 3 (DPE 2022b) describes the assessment and adoption of the ENSW v1.1 groups into the PCT master list. Report 4 (DPE 2022c) describes a new online identification tool that assists users to identify PCTs in the coast and tablelands bioregions using standard floristic survey plots.

Figure 2 Project reports in this series

3. Evaluation of Approved PCTs (2018) of eastern NSW

3.1 Inventory of Approved PCTs (2018)

As at 1 November 2018 there were 1,289 Approved PCTs in the BioNet Vegetation Classification public application with stated distributions that included one or more of the 10 eastern NSW bioregions (DPIE 2018). A summary of the number of Approved PCTs (2018) within each vegetation formation and vegetation class is presented in Appendix A.

Information presented in the 'IBRA bioregion' field of the BioNet Vegetation Classification public application indicated that a total of 991 approved PCTs (2018) had a stated distribution that included one or more of the coast and tablelands bioregions. Of these, 624 PCTs were restricted to these coast and tablelands bioregions and the remaining 367 were considered to occur in some combination of coast and tablelands and western slopes bioregions. An additional 298 PCTs were recorded as occurring in one or more of the 3 western slopes bioregions but not in coast and tablelands bioregions.

3.2 Assessment of Approved PCT (2018) information

Users interpret and identify PCTs using the information presented in the BioNet Vegetation Classification public application. The information presented to assist in the recognition of PCTs includes:

- compositional data that describes the plant species that characterise the assemblage. Guidance may include lists of frequent or abundant species or species that are useful in distinguishing related PCTs
- the physiognomy of the PCT including growth form, height and cover of each vertical stratum
- environmental and geospatial data that identifies the habitat and distribution of the PCT
- descriptions that synthesise all of the above.

Our review evaluates a set of PCT attributes from the BioNet Vegetation Classification public application in 2018 that contained the above information.

3.2.1 Vegetation descriptions

Each PCT is accompanied by a descriptive text field ('vegetation description') that provides an overview of the dominant compositional, structural and environmental attributes of the type.

The content of the vegetation description field for Approved PCTs (2018) varies in completeness, with 28 PCTs (2%) having a description of fewer than 10 words and 528 (41%) fewer than 50 words. There is a spatial trend in the length of descriptions, with those PCTs in coast and tablelands bioregions typically half the length of PCTs in the western slopes bioregions (Table 1). The latter are dominated by the interpreted units described by Benson (2008) and Benson et al. (2010).

Table 1 'Vegetation description' mean word count per PCT by bioregion

Bioregion group	Bioregion	'Vegetation description' mean word count
Coast and tablelands bioregions	Australian Alps	73
	New England Tablelands	101
	NSW North Coast	62
	South East Corner	57
	South Eastern Highlands	95
	South Eastern Queensland	29
	Sydney Basin	94
Western slopes bioregions	Brigalow Belt South	185
	Nandewar	152
	NSW South Western Slopes	163

3.2.2 Species summary data

The species composition of Approved PCTs (2018) is conveyed to users through 3 'species by stratum' fields that present lists of plant species in the 'upper stratum', 'middle stratum' and 'ground stratum'. Search functions in the BioNet Vegetation Classification public application return PCT lists based on species contained in the 'species by stratum' fields and are an important diagnostic tool applied by users.

PCT 'species by stratum' do not indicate the frequency with which each species can be expected in samples of the type, nor the relative importance (cover or abundance) of each species. The information sources for the species lists are variable, and commonly compiled through interpretation rather than from standard data. For Approved PCTs (2018) of the NSW South Western Slopes, Nandewar and Brigalow Belt South bioregions, the lists of species were derived from a range of sources including map unit descriptions, plot data, expert knowledge and field checking (Benson 2006). In other bioregions the lists were likely based on lists provided by cited classification units.

The mean number of species listed in each stratum for Approved PCTs (2018) assigned to bioregions within eastern NSW is shown in Table 2. The number of species included in 'species by stratum' lists is lower for PCTs of the coast and tablelands bioregions than those of the western slopes.

Table 2 'Species by stratum' mean list length per PCT by bioregion

		Mean number of species listed by stratum			
Bioregion group	Bioregion	Upper stratum	Middle stratum	Ground stratum	Mean total
Coast and tablelands bioregions	Australian Alps	3.3	5.8	14.1	23.3
	New England Tablelands	5.8	9.1	16.4	31.2
	NSW North Coast	4.2	6.9	9.8	21.0
	South East Corner	3.7	6.4	9.1	19.2
	South Eastern Highlands	4.2	8.9	17.2	30.4
	South Eastern Queensland	8.2	7.6	3.8	19.6
	Sydney Basin	3.9	8.3	11.7	24.1

Bioregion group	Bioregion	Mean number of species listed by stratum			Mean total
		Upper stratum	Middle stratum	Ground stratum	
Western slopes bioregions	Brigalow Belt South	6.1	15.0	26.8	48.0
	Nandewar	7.0	13.0	24.5	44.6
	NSW South Western Slopes	5.1	12.4	25.7	43.2

3.2.3 Species taxonomy

Plant species names embedded in the various text fields of the BioNet Vegetation Classification applications remain as entered when the fields were populated, and may be inconsistent between PCTs. The architecture of the system did not provide a mechanism to update and maintain scientific names in these text fields. Revisions to plant taxonomy or nomenclature maintained in other parts of BioNet do not flow through into these text fields.

3.2.4 Location data

The distribution of PCTs (2018) was expressed in the BioNet Vegetation Classification public application by assignment to a set of 'IBRA bioregion(s)' and 'IBRA sub-region(s)'. There are no georeferenced location data accessible for Approved PCTs (2018), and the list of IBRA subregion assignments represents the finest spatial precision regarding PCT distribution available in BioNet. Assigned bioregion and subregion lists for Approved PCTs (2018) are taken to have been inferred or interpreted from the mapping sources and vegetation descriptions cited by each PCT or assigned following expert review.

For some Approved PCTs (2018), finer information is available indicating distribution within local government areas, however this field has not been consistently populated. The primary spatial search functions of the BioNet Vegetation Classification public application rely on the IBRA region and IBRA subregion assignments. This can be an impediment for users seeking to select or identify PCTs within areas at a finer spatial resolution.

3.2.5 Classification confidence level

For Approved PCTs (2018) 'classification confidence level' is a qualitative categorisation that was applied using definitions provided by Benson (2006). The data in this field suggests regional variation in the quality of Approved PCTs (2018). Table 3 shows that PCTs of coast and tablelands bioregions have the highest proportion of PCTs in the Very Low classification confidence level.

Table 4 indicates that classification confidence levels also vary across vegetation formations. Wet Sclerophyll Forest formations and the Alpine Complex have the highest proportion of Very Low classification confidence level PCTs. The Semi-arid Woodlands and Arid Shrublands formations have the highest classification confidence level scores, with most PCTs in these formations assigned to the Medium or High category.

Table 3 Percentage of Approved PCTs (2018) assigned to each 'classification confidence level' by bioregion

Bioregion group	Bioregion	Very High (%)	High (%)	Medium (%)	Low (%)	Very Low (%)
Coast and tablelands bioregions	Australian Alps	0	15	10	2	73
	New England Tablelands	0	45	11	3	41
	NSW North Coast	0	51	4	1	43
	South East Corner	0	15	2	1	81
	South Eastern Highlands	0	14	17	6	63
	South Eastern Queensland	0	3	1	0	95
	Sydney Basin	0	63	8	3	26
Western slopes bioregions	Brigalow Belt South	0	47	28	13	12
	Nandewar	0	54	19	8	19
	NSW South Western Slopes	0	37	32	12	20

Table 4 Percentage of Approved PCTs assigned to each 'classification confidence level' by vegetation formation

Vegetation formation	Very High (%)	High (%)	Medium (%)	Low (%)	Very Low (%)
Alpine Complex	0	0	20	0	80
Arid Shrublands (Acacia sub-formation)	0	38	44	18	0
Arid Shrublands (Chenopod sub-formation)	0	28	52	21	0
Dry Sclerophyll Forests (Shrub/grass sub-formation)	0	36	18	8	38
Dry Sclerophyll Forests (Shrubby sub-formation)	0	42	14	9	35
Forested Wetlands	0	55	30	4	19
Freshwater Wetlands	0	54	16	6	23
Grasslands	0	25	17	2	56
Grassy Woodlands	0	34	19	11	36
Heathlands	0	46	10	2	43
Rainforests	0	52	8	4	35
Saline Wetlands	0	48	20	8	24
Semi-arid Woodlands (Grassy sub-formation)	0	39	57	4	0
Semi-arid Woodlands (Shrubby sub-formation)	0	43	45	12	0
Wet Sclerophyll Forests (Grassy sub-formation)	0	44	2	3	52
Wet Sclerophyll Forests (Shrubby sub-formation)	0	31	3	1	65

3.3 Assessment of Approved PCT (2018) sources

The majority of Approved PCTs (2018) in eastern NSW do not represent primary data, but instead their content and descriptions were interpreted and compiled from a range of published and unpublished vegetation classification and mapping sources. For each PCT, these sources are acknowledged in the BioNet Vegetation Classification public application fields 'classification source', 'profile source' and 'full reference details'. These sources are taken to have provided the information underpinning the PCT 'vegetation description', 'species by stratum' lists and environmental and spatial data where available.

3.3.1 Frequently cited classification projects

Based on analysis of text data extracted from the relevant fields, Table 5 lists the legacy classification projects that are most frequently cited by Approved PCTs (2018) in eastern NSW, and indicates whether the classification project applied quantitative plot-based methods.

Table 5 Legacy classification projects cited in the circumscription of 5 or more Approved PCTs (2018) for eastern NSW

Classification project (area/reference)	No. of PCTs citing classification project in coast and tablelands bioregions ONLY	No. of PCTs citing classification project in coast and tablelands bioregions AND western slopes bioregions	No. of PCTs citing classification project in western slopes bioregions but NOT coast and tablelands bioregions	Plot-based classification methods used
NSW vegetation classification and assessment (VCA) (Benson 2008; Benson et al. 2010)[1]	15	217	271	No
South Western Slopes, Brigalow Belt South, Nandewar bioregion field observations (Benson JS 1999–2006)	0	86	159	No
Greater Hunter region (Somerville 2009; Sivertsen et al. 2011)	145	100	1	Yes
NPWS reserves or rock outcrops of the New England Tablelands and Nandewar regions (various reports by Hunter JT and others)	4	67	131	Yes
South coast – Illawarra region (Tozer et al. 2010)	180	6	0	Yes

Classification project (area/reference)	No. of PCTs citing classification project in coast and tablelands bioregions ONLY	No. of PCTs citing classification project in coast and tablelands bioregions AND western slopes bioregions	No. of PCTs citing classification project in western slopes bioregions but NOT coast and tablelands bioregions	Plot-based classification methods used
North east Comprehensive Regional Assessment (CRA) regions (NPWS 1999)	135	42	0	Yes
Brigalow Belt South bioregion (RACAC 2004)	0	49	93	Yes
Nandewar bioregion (DEC 2004)	2	78	30	Yes
Central west region (Ismay et al. 2004 and/or Lewer et al. 2003)	0	28	68	Yes
NPWS reserves of the western slopes (Porteners various)	0	22	54	Yes
Southern forests (Gellie 2005)	38	46	2	Yes
NSW South Western Slopes bioregion (Priday 2006)	0	24	25	Yes
Sydney metropolitan catchment (OEH 2013)[2]	42	0	0	Yes
Southern wheatbelt (Sivertsen & Metcalfe 1995)	0	2	26	Yes
North coast wallum (Griffith 2002; Griffith et al. 2003)	2	0	0	Yes
Lower Macquarie-Castlereagh region (Kerr et al. 2003)	0	4	29	No
Rainforests (Floyd 1990)[3]	23	5	3	No
Reserves of the south west slopes (Gellie & Fanning 2004)	0	26	4	Yes
Northern wheatbelt (Metcalfe et al. 2003)	0	0	21	Yes

Classification project (area/reference)	No. of PCTs citing classification project in coast and tablelands bioregions ONLY	No. of PCTs citing classification project in coast and tablelands bioregions AND western slopes bioregions	No. of PCTs citing classification project in western slopes bioregions but NOT coast and tablelands bioregions	Plot-based classification methods used
Coolah Tops (Binns 1997)	0	13	4	Yes
Western Blue Mountains (DEC 2006)	16	15	3	Yes
Pilliga forests (Binns et al.1999)	0	0	15	Yes
Guyra area – New England Tablelands (Benson & Ashby 2000)	8	9	1	Yes
Australian Alps treeless vegetation (McDougall & Walsh 2007)	5	0	0	Yes
Individual TEC final determinations (NSW Scientific Committee)	41	11	2	No
Various expert opinions, workshops or personal communications	20	6	3	No

Notes:

[1] The majority of Approved PCTs (2018) in western slopes bioregions are types interpreted by Benson (2008) and Benson et al. (2010) that in turn cited other sources, frequently applying qualifying conditions.

[2] OEH (2013) V2.0 was cited in the BioNet Vegetation Classification public application, but was ultimately released as OEH (2016) V3.0.

[3] Although the rainforest classification of Floyd (1990) included field samples, these were non-standard random meander species lists rather than systematic plot-based data.

Table 5 indicates that plot-based classification projects are frequently cited sources for Approved PCTs (2018). Several large regional classification projects (Tozer et al. 2010; Sivertsen et al. 2011; NPWS 1999) are each cited by over 150 PCTs. Numerous smaller plot-based classification projects have also been cited but with lower frequency (e.g. DEC 2006; Priday 2006).

Other sources cited in smaller numbers of PCTs include individual threatened ecological communities (TECs) determinations made by the NSW Scientific Committee. There are also 29 Approved PCTs (2018) with sources that include expert opinion, workshops and/or personal communications from an expert ecologist as a basis for circumscription of the type.

3.3.2 Classification scale

Classification scale describes the level of species and environmental variation contained within a classification unit. Broad units include higher levels of heterogeneity in species composition, and physiognomic and environmental characteristics. PCTs are the finest level of classification in the NSW vegetation classification hierarchy; however, there is no single definition of scale for Approved PCTs (2018). Cited classification units range from broad groupings of plant communities united by dominant genera and shared environmental factors, to a single community with uniform floristic characteristics and dominant species in the upper stratum. For example, Approved PCTs (2018) in the Rainforests vegetation formation are defined at different classification scales depending on the region in which they occurred, despite many citing the same classification project (Floyd 1990). On the NSW north coast the alliance level (Floyd 1990) is adopted by 4 PCTs, each encompassing between 5 and 10 sub-alliances (e.g. PCT 1302), while on the south coast PCTs reference individual sub-alliances (e.g. PCT 1128). Wetland PCTs have similar variation in classification scale, ranging from broadly defined non-woody aquatic assemblages circumscribed across the north coast floodplains (PCT 780) to local headland sedgelands on the far south coast (PCT 779).

3.3.3 Completeness

Completeness indicates the extent to which the complete set of classification units identified by cited classification projects is incorporated into and referenced by the Approved PCT (2018) classification. Classification units not cited may represent vegetation patterns that are better represented by alternative classification projects, or they may indicate data and plant communities that were overlooked and are 'missing' from the Approved PCTs (2018).

The total numbers of classification units identified by the 10 most frequently cited plot-based legacy classification projects were tallied, then these tallies compared against the number of each classification project's units that are cited by Approved PCTs (2018). The results are provided in Table 6 below.

The level of completeness varies across legacy classification projects. Over 90% of the classification units from the south coast – Illawarra classification of Tozer et al. (2010) are cited in Approved PCTs (2018), while fewer than 50% of the classification units from the southern forests classification of Gellie (2005) are cited in Approved PCTs (2018).

In BioNet there is no reference to classification units that were excluded or how these units are treated in the 2018 PCT schema.

Table 6 Comparison of the number of classification units in legacy classification projects against the number of classification units cited by Approved PCTs (2018) in eastern NSW

Classification project	Total number of classification units	Number of classification units cited by Approved PCTs (2018) in eastern NSW	Percentage of classification units cited (%)
South coast – Illawarra region (Tozer et al. 2010)	191	173	91
Southern forests (Gellie 2005)	206	87	42
Brigalow Belt South bioregion (RACAC 2004)	115	101	88

Classification project	Total number of classification units	Number of classification units cited by Approved PCTs (2018) in eastern NSW	Percentage of classification units cited (%)
Sydney metropolitan catchment (OEH 2013)	79	42	53
Western Blue Mountains (DEC 2006)	57	22	39
Greater Hunter region (Somerville 2009; Sivertsen et al. 2011)	254	221	87
Nandewar bioregion (DEC 2004)	113	91	81
North coast wallum (Griffith 2002; Griffith et al. 2003)	42	2	5
North east CRA regions (NPWS 1999)	179	150	84
Australian Alps treeless vegetation (McDougall & Walsh 2007)	34	7	21

3.3.4 Consistency

Consistency measures the degree to which a PCT retains a one-to-one relationship with a cited classification unit. Inferences about the scale of each PCT can be made based on its cited source data.

Text data extracted from the ‘classification source’ and ‘profile source’ fields in the BioNet Vegetation Classification public application were analysed to determine the number of plot-based classification units cited by each Approved PCT (2018). Of the 991 Approved PCTs (2018) assigned to coast and tablelands bioregions, 51% cite a single legacy classification unit with traceable plot data. A further 7% amalgamate multiple plot-based legacy classification units, either from the same classification project or a different project. The remaining 42% of coast and tableland PCTs are said to have been assembled from multiple data sources, including combinations of quantitative and qualitative data sources, expert opinion, classification units constructed from non-systematic data, or interpretations of mapping data.

Of the 298 Approved PCTs (2018) limited to western slopes bioregions and further west, almost all are assembled from multiple classification projects and data sources.

Table 7 presents the results of an assessment of the consistency of treatment for 10 frequently cited plot-based legacy classification projects from eastern NSW.

Table 7 Percentage of legacy classification units amalgamated versus retained as a single Approved PCT (2018) in eastern NSW

Classification project	Number of classification units cited by Approved PCTs	Number of classification units amalgamated when cited by an Approved PCT	Percentage of classification units cited by a single Approved PCT (%)
South Coast – Illawarra region (Tozer et al. 2010)	173	13	92
Southern forests (Gellie 2005)	87	19	78
Brigalow Belt South bioregion (RACAC 2004)	101	15	85
Sydney metropolitan catchment (OEH 2013)	42	11	74
Western Blue Mountains (DEC 2006)	22	12	45
Greater Hunter region (Somerville 2009; Sivertsen et al. 2011)	221	0	100
Nandewar bioregion (DEC 2004)	91	23	75
North coast wallum heath (Griffith 2002; Griffith et al. 2003)	2	0	100
North east CRA regions (NPWS 1999)	150	27	82
Australian Alps treeless vegetation (McDougall & Walsh 2007)	7	0	100

3.3.5 Interpretation

A subset of Approved PCTs (2018) represent an interpretation of the cited classification unit(s). Interpretations vary in the degree to which cited legacy classification units were modified in the circumscription of the PCT. Where a legacy classification unit was reconfigured in the development of Approved PCTs (2018), this is most obvious in the language used in the BioNet Vegetation Classification application fields ‘classification source’ and ‘profile source’. Table 8 summarises the number of instances where various qualifying terms are applied in the set of Approved PCTs (2018) to constrain the degree of match to a cited legacy classification unit. Qualifying terms are undefined but applied to over 900 citations, a subset of which are used in combination to circumscribe an Approved PCT (2018).

Other interpretation factors are almost certainly present across the assessed PCTs, but the effects of these factors are difficult to document. There are many examples of Approved PCTs (2018) that cite a legacy classification unit or units, but on closer inspection have applied modifications to the cited units in the development of ‘vegetation descriptions’, ‘species by stratum’ lists and distribution information. For example, a legacy classification unit may have been described by a project in the Sydney Basin bioregion, but the Approved PCT (2018) that cites the unit has distribution information indicating it occurs beyond the

Sydney Basin and into adjoining bioregions. A modification such as this suggests there may also have been interpreted changes applied to Approved PCT (2018) vegetation descriptions and species by stratum lists to accommodate the broader distribution than the cited legacy classification unit.

Table 8 Frequency of qualifying terms used in the 'classification source' and 'profile source' fields for Approved PCTs (2018) of eastern NSW

Qualifying term	Number of PCTs
Part(s) of	309
Possibly	49
Some of	31
Probably	141
Similar to	79
Most of	69
Includes	277

3.3.6 Duplication

The master list of Approved PCTs (2018) contains duplication. Duplication includes instances where a legacy classification unit is cited by more than one PCT. It also exists where underlying plot data contributed to the definitions of classification units in multiple legacy classification projects, which were subsequently cited by different PCTs.

An assessment of the largest plot-based classification projects indicates instances of both forms of duplication (Table 9), particularly at the interface of PCTs constructed from the NSW VCA and those from eastern bioregions.

Table 9 Duplicated classification units and plots

Classification project	Number of classification units cited in multiple PCTs	Percentage of plots also assigned by other cited classification projects (%)
South Coast – Illawarra region (Tozer et al. 2010)	0	33
Southern Forests (Gellie 2005)	14	53
Brigalow Belt South bioregion (RACAC 2004)	54	38
Sydney Metropolitan catchment (OEH 2013)	0	38
Western Blue Mountains (DEC 2006)	0	4
Greater Hunter region (Somerville 2009; Sivertsen et al. 2011)	27	13
Nandewar bioregion (DEC 2004)	56	35
North coast wallum heath (Griffith 2002; Griffith et al. 2003)	0	15
North east CRA regions (NPWS 1999)	3	10
Australian Alps treeless vegetation (McDougall & Walsh 2007)	0	0

3.4 Approved PCT (2018) associations with TECs

3.4.1 NSW TECs

A total of 110 TECs were listed on Schedule 2 of the NSW *Biodiversity Conservation Act 2016* (BC Act) as at 1 November 2018. Of these, 101 are associated with one or more of the 10 eastern NSW bioregions.

Data extracted from the BioNet Vegetation Classification public application indicate that a total of 385 (39%) of the coast and tablelands Approved PCTs (2018) are associated with one or more TECs listed under the BC Act. An additional 105 Approved PCTs (2018) of the western slopes bioregions (but not the coast and tablelands bioregions) are associated with one or more BC Act TECs.

Of the 101 NSW TECs recognised for the 10 eastern NSW bioregions at 1 November 2018, 93 have associated Approved PCTs (2018) listed in the BioNet Vegetation Classification public application. Eight TECs of eastern NSW bioregions did not have any Approved PCTs (2018) recognised as associated with them in the BioNet Vegetation Classification public application (Blue Mountains Basalt Forest in the Sydney Basin Bioregion, Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions, Low woodland with heathland on indurated sand at Norah Head, Mount Kaputar high elevation and dry rainforest land snail and slug community in the Nandewar and Brigalow Belt South Bioregions, Pilliga Outwash Ephemeral Wetlands in the Brigalow Belt South Bioregion, Snowpatch Feldmark in the Australian Alps Bioregion, Snowpatch Herbfield in the Australian Alps Bioregion, Windswept Feldmark in the Australian Alps Bioregion).

3.4.2 Commonwealth TECs

A total of 32 TECs listed on the Commonwealth *Environment Protection and Biodiversity Conservation* Act *1999* (EPBC Act) as at 1 November 2018 had a distribution that included one or more of the eastern NSW bioregions. Data extracted from the BioNet Vegetation Classification public application indicated that a total of 154 (16%) of Approved PCTs (2018) from the coast and tablelands bioregions were associated with one or more TECs listed under the EPBC Act. An additional 47 Approved PCTs (2018) of the western slopes bioregions (but not the coast and tablelands bioregions) are associated with one or more EPBC Act TECs.

Of the 32 Commonwealth TECs recognised for the 10 eastern NSW bioregions as at 1 November 2018, 28 have associated Approved PCTs (2018) listed in the BioNet Vegetation Classification public application. Four TECs of eastern NSW bioregions did not have any Approved PCTs (2018) recognised as associated with them in the BioNet Vegetation Classification public application (Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community, Illawarra and South Coast Lowland Forest and Woodland ecological community, Lowland Grassy Woodland in the South East Corner Bioregion, Warkworth Sands Woodland of the Hunter Valley).

4. Conclusions and recommendations

4.1 Conclusions

This review has summarised the complex history of development of PCTs in NSW. Approved PCTs (2018) in the BioNet Vegetation Classification public application represent expert interpretations of a diverse patchwork of past classification and mapping sources. For eastern NSW a large proportion of Approved PCTs (2018) cite plot-based classification projects, while smaller numbers cite other sources including TEC determinations, classifications based on non-standard surveys, expert workshops or personal observations by expert ecologists. Source classifications represented the best available data, but varied widely in clustering methods, scale of classification and underlying data coverage. The process of building the many different and overlapping classifications into a single PCT master list required unavoidable application of expert interpretations.

For eastern NSW, although many Approved PCTs (2018) are ostensibly based on plot-based legacy classification units, the vegetation descriptions, species lists and distributions of the cited classification units were widely modified in undocumented ways in the process of developing BVTs and subsequently PCTs. This produced a variety of complications including issues with completeness, consistency, duplication, imprecise qualifiers, and potential for duplication at the margins of overlapping classification projects and undescribed gaps between other classification projects. In addition, each time the PCT master list has been updated to incorporate new knowledge, further subjective interpretations were applied. Most Approved PCTs (2018) do not have a traceable, accessible link to any floristic survey plot data that might underpin their definitions, and the only means by which users can assign a new field observation to a type is by subjective comparison with interpreted descriptions.

As a result of these complications, the data required by users to diagnose, map and understand Approved PCTs (2018) are not consistently available, and users face various difficulties in identifying and justifying the selection of current PCTs during field-based assessment tasks (Jungbluth et al. 2019).

4.2 Recommendations

The many biodiversity assessment and management processes across NSW that reference PCTs will be improved by development of a robust and data-driven fine-scale vegetation classification framework. Vegetation classification based on clustering of standard floristic survey plots has significant advantages over traditional expert-interpreted classifications, where adequate plot data are available. The Flora surveys module of the BioNet Atlas application holds approximately 50,000 standard floristic survey plots from eastern NSW. This dataset provides an opportunity to develop such a robust and data-driven classification framework in eastern NSW. The advantages of plot-based classification can be harnessed in the PCT master list for eastern NSW by undertaking a single classification applying consistent clustering methods and classification scale to all available standard floristic survey plot data, then incorporating the results directly into a revised set of PCTs for eastern NSW. Revised PCTs defined by standard floristic survey plot data in BioNet would allow consistent descriptions of PCT composition, structure, habitat and distribution using common terminology. Plot assignments to types in BioNet would allow the presentation of PCT species summaries to be standardised, and support the development of consistent PCT identification processes for users. Clearly defined and accessible plot assignments would also provide a firm evidence base for describing the spatial distribution and environmental range of PCTs. With plots sourced from BioNet, standard taxonomic treatment (and future updates) could also be applied to all PCT species summary data.

Table 10 Summary of issues and recommendations, as at November 2018

Issue	State in 2018	Recommendation	BioNet enhancement required as at 2018
Vegetation descriptions	Variable length and completeness.	Standardise vegetation descriptions with common terminology following Benson (2006) and Sivertsen (2009).	None
Species taxonomy	Inconsistent taxonomic treatment across PCT species summaries and text fields.	Standardise taxonomic treatment across all PCT species summary data, based on BioNet Atlas species names (from CAPS (Census of Australian Plant Species)).	Modify BioNet to enable standard species taxonomy to be applied.
Species summary data	The number of species presented in 'species by stratum' lists is variable across bioregions. No method is defined for the selection of species. Data do not indicate relative importance of species.	Standardise presentation of species summary data and apply a defined method using PCT member plots. Include species frequency and cover.	Modify species summary data tables and draw data from PCT member plots.
Location data	IBRA bioregion and subregion data are interpreted from available mapping, vegetation descriptions, expert observations and opinions. Other location data (e.g. local government areas) are incomplete.	Apply a defined evidence-based method for population of location data using PCT member plots.	Modify BioNet to draw location data from PCT member plots.
Classification confidence level	Inconsistent use of classification confidence level categories.	Revise category definitions and apply standard treatment to all PCTs.	None
Classification scale	Very high variability in PCT-level classification scale. Scale is dependent upon available classification sources, regional interpretations and synthesis.	Implement standard classification methods and rules to guide similar within and between PCT variation and environmental distinctiveness.	None
Data source relationships	Associations are made to primary classification units; however, some relationships contain qualifying conditions, some include multiple classification sources and are interpretations. Classification sources are duplicated across alternative PCTs.	Construct PCTs from standard floristic survey plots and store plot membership in BioNet. Use plots from legacy classification projects as well as new plots.	Modify BioNet to enable PCT plot membership to be stored in and easily retrievable from the Flora surveys module of the BioNet Atlas application.

Issue	State in 2018	Recommendation	BioNet enhancement required as at 2018
NSW TECs	Incomplete associations to TEC listings, undocumented association method.	Revise PCT–TEC associations using standard comprehensive methods. Ensure all relevant TECs are assessed.	None
Commonwealth TECs	Incomplete associations to TEC listings, undocumented association method.	Revised PCT–TEC associations using standard comprehensive methods. Ensure all relevant TECs are assessed.	Modify BioNet so Commonwealth TECs are independent of NSW TECs.

5. Glossary

Term	Definition
BioNet	The NSW biodiversity data repository administered by DPE
BioNet Vegetation Classification public application	The application (user interface) where public users can access the PCT master list and PCT summary data
Flora surveys module of the BioNet Atlas application	The application (user interface) where users can access and edit flora survey data in the Systematic Surveys data collection
PCT	Plant community type. The finest level of classification in the NSW vegetation classification hierarchy
PCT master list	The cumulative set of PCTs in the BioNet Vegetation Classification applications, including 'PCT definition status' of Approved, Draft-Working, Decommissioned
Approved PCT (2018)	An Approved PCT in the BioNet Vegetation Classification public application on 1 November 2018
legacy classification project	Any previous classification effort, some of which have been cited by Approved PCTs (2018)
legacy classification unit	A unit (type) defined by a legacy classification project. Unit(s) may be cited by Approved PCTs (2018). Units may be plot-based or qualitative
cited classification project	A classification project cited by PCT(s) in the BioNet Vegetation Classification application fields 'classification source', 'profile source' and 'full reference details'
cited classification unit	The individual classification units in the original classification project cited by the PCT.
standard floristic survey plot	A plot that represents a search of a bounded area, usually in the range of 400–1,000 m^2, within which all vascular plants are identified to the finest taxonomic level possible, with standardised estimates made of the abundance and projected foliage cover of each taxon present, and where those estimates can be reliably converted to a common cover–abundance scale of modified Braun-Blanquet (BB) cover–abundance 1–6. This includes plots that follow the survey standards defined by Sivertsen (2009)
group	A set of plots that comprise the defined membership of a plant assemblage pattern following cluster analysis and/or assessment of environmental factors
member plot	A plot that is part of the defined membership of a legacy classification unit, group or quantitative PCT
eastern NSW	Parts of NSW that fall within one of the following 10 IBRA v7 bioregions (DAWE 2021): the Australian Alps, New England Tablelands, NSW North Coast, South East Corner, South Eastern Highlands, South Eastern Queensland, Sydney Basin, Brigalow Belt South, Nandewar and NSW South Western Slopes. 'Eastern NSW' is comprised of the 'coast and tablelands bioregions' and the 'western slopes bioregions'. Note that although plot data from the Australian Capital Territory was included and classified, the PCT classification does not apply under ACT legislation

Term	Definition
coast and tablelands bioregions	Parts of NSW that fall within one of the following 7 IBRA v7 bioregions (DAWE 2021): the Australian Alps, New England Tablelands, NSW North Coast, South East Corner, South Eastern Highlands, South Eastern Queensland, Sydney Basin
western slopes bioregions	Parts of NSW that fall within one of the following 7 IBRA v7 bioregions (DAWE 2021): Brigalow Belt South, Nandewar, NSW South Western Slopes

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7. More information

- BioNet
- BioNet Vegetation Classification public application
- NSW Integrated BioNet Vegetation Data program

Appendix A: Number of Approved PCTs (2018) in each vegetation formation and vegetation class in eastern NSW

Vegetation formation and vegetation class	Number of Approved PCTs (2018) in eastern NSW
Alpine Complex	
Alpine Bogs and Fens	1
Alpine Fjaeldmarks	1
Alpine Heaths	1
Alpine Herbfields	2
Alpine Complex total	**5**
Arid Shrublands (Acacia sub-formation)	
Gibber Transition Shrublands	3
North-west Plain Shrublands	3
Sand Plain Mulga Shrublands	3
Stony Desert Mulga Shrublands	2
Arid Shrublands (Acacia sub-formation) total	**11**
Arid Shrublands (Chenopod sub-formation)	
Riverine Chenopod Shrublands	9
Arid Shrublands (Chenopod sub-formation) total	**9**
Dry Sclerophyll Forests (Shrub/grass sub-formation)	
Central Gorge Dry Sclerophyll Forests	9
Clarence Dry Sclerophyll Forests	13
Cumberland Dry Sclerophyll Forests	3
Hunter-Macleay Dry Sclerophyll Forests	18
New England Dry Sclerophyll Forests	31
Northern Gorge Dry Sclerophyll Forests	16
North-west Slopes Dry Sclerophyll Woodlands	52
Pilliga Outwash Dry Sclerophyll Forests	8
Southern Hinterland Dry Sclerophyll Forests	6
Upper Riverina Dry Sclerophyll Forests	28
Dry Sclerophyll Forests (Shrub/grass sub-formation) total	**184**
Dry Sclerophyll Forests (Shrubby sub-formation)	
Coastal Dune Dry Sclerophyll Forests	11
North Coast Dry Sclerophyll Forests	13
Northern Escarpment Dry Sclerophyll Forests	10

Vegetation formation and vegetation class	Number of Approved PCTs (2018) in eastern NSW
Northern Tableland Dry Sclerophyll Forests	36
South Coast Sands Dry Sclerophyll Forests	6
South East Dry Sclerophyll Forests	25
Southern Tableland Dry Sclerophyll Forests	24
Southern Wattle Dry Sclerophyll Forests	2
Sydney Coastal Dry Sclerophyll Forests	29
Sydney Hinterland Dry Sclerophyll Forests	23
Sydney Montane Dry Sclerophyll Forests	7
Sydney Sand Flats Dry Sclerophyll Forests	10
Western Slopes Dry Sclerophyll Forests	124
Yetman Dry Sclerophyll Forests	20
Dry Sclerophyll Forests (Shrubby sub-formation) total	**340**
Forested Wetlands	
Coastal Floodplain Wetlands	19
Coastal Swamp Forests	24
Eastern Riverine Forests	17
Inland Riverine Forests	12
Forested Wetlands total	**72**
Freshwater Wetlands	
Coastal Freshwater Lagoons	14
Coastal Heath Swamps	14
Inland Floodplain Shrublands	10
Inland Floodplain Swamps	18
Montane Bogs and Fens	15
Montane Lakes	5
Freshwater Wetlands total	**76**
Grasslands	
Maritime Grasslands	6
Riverine Plain Grasslands	3
Semi-arid Floodplain Grasslands	6
Temperate Montane Grasslands	20
Western Slopes Grasslands	14
[no class assigned]	2
Grasslands total	**51**

Vegetation formation and vegetation class	Number of Approved PCTs (2018) in eastern NSW
Grassy Woodlands	
Coastal Valley Grassy Woodlands	23
Floodplain Transition Woodlands	12
New England Grassy Woodlands	27
Southern Tableland Grassy Woodlands	14
Subalpine Woodlands	10
Tableland Clay Grassy Woodlands	20
Western Slopes Grassy Woodlands	60
Grassy Woodlands total	**166**
Heathlands	
Coastal Headland Heaths	10
Northern Montane Heaths	16
South Coast Heaths	2
Southern Montane Heaths	8
Sydney Coastal Heaths	10
Sydney Montane Heaths	8
Wallum Sand Heaths	7
Heathlands total	**61**
Rainforests	
Cool Temperate Rainforests	6
Dry Rainforests	18
Littoral Rainforests	7
Northern Warm Temperate Rainforests	16
Southern Warm Temperate Rainforests	5
Subtropical Rainforests	11
Western Vine Thickets	8
Rainforests total	**71**
Saline Wetlands	
Inland Saline Lakes	2
Mangrove Swamps	7
Saltmarshes	3
Seagrass Meadows	1
Saline Wetlands total	**13**

Vegetation formation and vegetation class	Number of Approved PCTs (2018) in eastern NSW
Semi-arid Woodlands (Grassy sub-formation)	
Brigalow Clay Plain Woodlands	4
Inland Floodplain Woodlands	5
North-west Floodplain Woodlands	6
Riverine Plain Woodlands	3
Semi-arid Woodlands (Grassy sub-formation) total	**18**
Semi-arid Woodlands (Shrubby sub-formation)	
Inland Rocky Hill Woodlands	24
North-west Alluvial Sand Woodlands	5
Riverine Sandhill Woodlands	5
Sand Plain Mallee Woodlands	5
Semi-arid Sand Plain Woodlands	2
Subtropical Semi-arid Woodlands	3
Western Peneplain Woodlands	6
Semi-arid Woodlands (Shrubby sub-formation) total	**50**
Wet Sclerophyll Forests (Grassy sub-formation)	
Montane Wet Sclerophyll Forests	2
Northern Hinterland Wet Sclerophyll Forests	26
Northern Tableland Wet Sclerophyll Forests	17
Southern Lowland Wet Sclerophyll Forests	7
Southern Tableland Wet Sclerophyll Forests	12
Wet Sclerophyll Forests (Grassy sub-formation) total	**64**
Wet Sclerophyll Forests (Shrubby sub-formation)	
North Coast Wet Sclerophyll Forests	47
Northern Escarpment Wet Sclerophyll Forests	27
South Coast Wet Sclerophyll Forests	8
Southern Escarpment Wet Sclerophyll Forests	16
Wet Sclerophyll Forests (Shrubby sub-formation) total	**98**
Total number of Approved PCTs (2018)	**1,289**