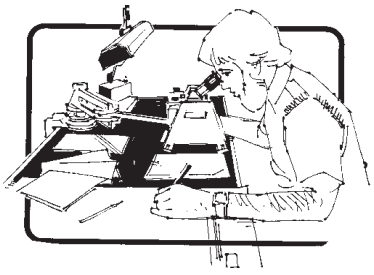
LAND & WATER CONSERVATION

Standard Classification for Attributes of Land (SCALD) Code Set



Landscape Assessment Unit

"Planning our sustainable future..."

Contents

INTRODUCTION

The codes shown on the following pages are the standardised set to be used for Department of Land and Water Conservation (DLWC) attribute mapping exercises. They represent the current stage of a process of ongoing development and this list should therefore, be viewed as a living document. Many of these codes have their origins in the "yellow book" - the "Australian Soil and Land Survey - Field Handbook" (McDonald et al. 1990) and its related publications (Rayment and Higginson 1992 & Gunn et al. 1988). However, as the scale of mapping carried out by DLWC and as the end uses of such mapping vary considerably from these nationally focussed texts, additional codes and attributes have been added.

The codes are designed to be used in conjunction with the SCALD computer program or equivalents, to produce standardised computer files (see Figure 1) which facilitate more rapid and accurate transfer of attribute data to the Genamap™ Geographic Information System (GIS). Operation of the SCALD program is detailed in the user manual, which accompanies the program. The most recent version of the SCALD program (Version 2.03) was produced in October 1994. Recently, the author, to facilitate storage of attribute data in the SCALD format has provided the ATTCAP© computer program, with additional functions above the original SCALD program. Any ASCII file with the attributes arranged as shown in Figure 1 can be used to enter the data into DLWC's Genamap™ GIS program.

Enquiries regarding these codes can be directed to the compiler of this document:-

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This document should be referenced as:

Taylor, S.S.W., (2000). *Standard Classification for Attributes of Land (SCALD) – Code Set Ver. 4.0.* (Internal Manual). NSW Department of Land and Water Conservation: Grafton.

Previous version dates have been:

Version 3.0 – 21/5/1997
Version 2.03 – 1/8/1994

NB: Some versions were dated (as opposed to being numbered) between versions 3.0 and 4.0 and therefore some copies of Version 3.0 will contain codes not found in other copies – include the date of the version when using copies of Version 3.0.

IMPORTANT NOTES:

Addition of new codes

Mappers should consult with the custodians of the list before any additional codes can be added. This will prevent duplication of codes and confusion in their subsequent use. This has happened in the past!

A considerable level of **interchangeability** is built into the codes. This allows for various combinations to describe a particular characteristic of the land and should enable most situations to be adequately addressed without the need to define additional codes. For example, timbered areas can be addressed by use of various combinations of the land use and community codes. The code set also allows for the recording of different levels of **complexity**. As an example, the landform/terrain codes allow for the mapping of specific stream features in large scale mapping exercises, but also include a category of "stream/river" for smaller scale reconnaissance surveys.

Metadata relating to attribute information

Metadata is data about data. It is strongly recommended that the following information be forwarded to the GIS with the attribute file:-

- map sheet mapped and its scale
- date of mapping,
- date of aerial photography used,
- mapper's name,
- details of specific codes used (eg. geology and soil landscapes)
- specific project of which mapping forms part (if applicable).

This will enable the GIS to place appropriate disclaimers outlining the limitations of the data on the digital information or on output products. The ATTCAP© program stores metadata with the attribute data.

*** Updates from previous version*

This update of the attribute codes sees new codes *(italicised in text)* in land use and land use sub codes. For example,

- a new category of wetlands has been added to the land use codes,
- several codes associated with riparian areas have also been inserted,
- soil limitations and user defined attributes have also been added which are designed to permit the determination of land capability from multiple attribute mapping in association with slope, terrain and rockiness codes. In association with the soil limitations codes, two user-defined spaces have been entered into the code string to permit mappers some freedom for special projects. The attributes have been renumbered to accommodate these changes,
- a new attribute of North West Vegetation Associations has been added to pull together a range of different systems used west of the ranges into one system. Bruce Peasley has defined the set of codes used and should be consulted on (02) 6722 1800 for more information,
- a subsurface salinity/salt store code has been added to the erosion codes (it is determined by EMI measurements),
- tunnel erosion codes have also been added here and
- the codes for rabbit activity have been *removed*,
- a new attribute of Australian Soil Classification (Order & sub-order level only) has been added.

These new codes may be subject to additions or alterations and should be viewed as interim only whilst italicised in the text. Changes will be advised in this section of subsequent releases of the codes.

Additional Notes

The SCALD codes will now be limited in expansion to 100 characters (leaving 8 spaces currently available). This is to permit the GIS units in each region to place characters at positions beyond the attribute string to facilitate labelling of data - eg. catchment name codes or the like. This has proven necessary when handling large data sets in order to prevent any possibility of corruption of the base data.

National Land Use Classification equivalency

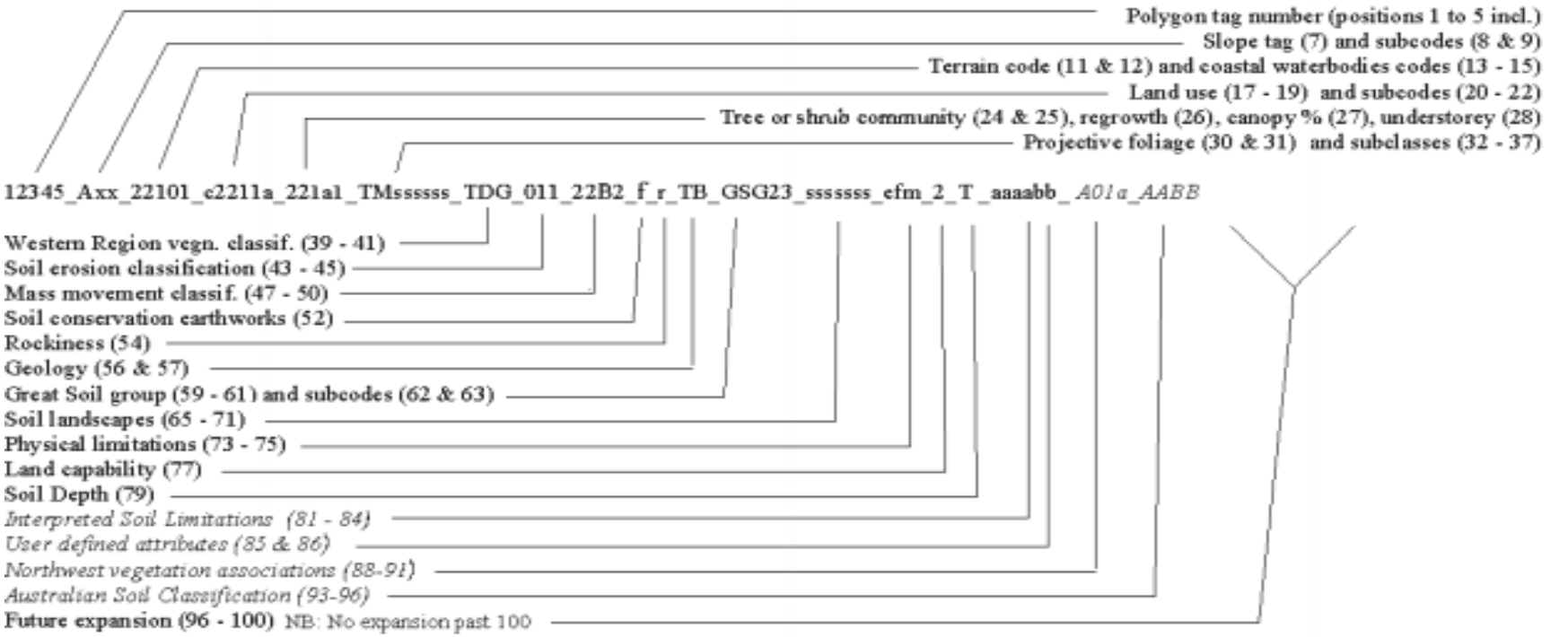
Included at the end of this document is a summary of the draft land use classification developed as part of the National Land and Water Resources Audit being undertaken by the Federal Government's Bureau of Rural Sciences. The audit has provided funds for detailed land use mapping in key areas in several states. Details can be found on the World Wide Web at:

http://www.brs.gov.au/land&water/landuse/landuse.html.

The summary included here has been expanded to show approximate SCALD equivalents. Each classification contains codes not found in the other. SCALD codes tend to be more specific in some such cases, reflecting the use of the SCALD classification at larger scales (usually 1:25000) than scales generally used in national mapping projects (often 1:100 000 or 1:250 000 or smaller).

Figure 1. The SCALD attribute code set - positions in code string...

(underscores indicate locations of required spaces, tag descriptions include location in string)



For example:- 00001.A...02....c22..c.221a1.....011.....b.n (note that dots indicate presence of spaces and do *NOT* appear in the final data)...would be an "A" sloping sideslope with volunteer/naturalised pasture, bracken fern mapped as a weed, no mature trees, no regeneration, <1% canopy density, no understorey, no appreciable erosion, effective soil conservation earthworks and no stones or rock. This selects several of the full range of attributes for the given project.

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STANDARD ATTRIBUTE CODES FOR SLOPE: (ATTRIBUTE 1)

A = 0% TO 2% level to very gently inclined
B = 2% TO 5% gently undulating
C = 5% TO 10% undulating
D = 10% TO 20% rolling
E = 20% TO 33% hilly
F = 33% TO 50% mountainous
G = >50% precipitous

SUBCODES - user specific, none defined

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STANDARD ATTRIBUTE CODES FOR LANDFORM/TERRAIN (ATTRIBUTE 2)

Landform - hillslope

01 = hillcrest/ridge
02 = sideslope
03 = footslope
04 = escarpment *(duplicated – see 12)*
05 = structural bench
06 = rock sideslope
07 = scree slope
08 = talus slope
09 = sinkhole */ doline*
10 = landslip debris
11 = cliff
12 = scarp
13 = Colluvial drainage depression / *hillslope drainage depression*
14 = plateau

Landform - plain

20 = flood plain
21 = terrace
22 = drainage depression *(NB. on plain) [formerly drainage plain or depression use in conjunction with 35]*
23 = scald
24 = dune
25 = dune swale
26 = blow-out
27 = playa
28 = plain (generic)
29 = levee - natural
30 = prior stream
31 = alluvial fan *(+ coalesced fans - piedmont plain)*
32 = lunette
33 = scroll plain
34 = *closed depression (reallocated from previously duplicated code)*
35 = drainage plain
36 = channel bench
37 = terrace scarp (steep slope joining terrace to floodplain)

Landform - stream feature

40 = incised drainage channel
41 = stream channel *(incl. bed and banks)*
42 = stream bed *(dry)*
43 = stream bank
44 = stream bar *(lateral or point bars or islands)*

45 = flood channel (*chute)
46 = gully
47 = waterfall/rapids *(rock bars or gravels)*
48 = stream/river *(water or wetted perimeter)*
49 = submerged sediment body

Landform - waterbody

50 = swamp (permanent or intermittent) *(see also 34 – closed depression)*
51 = lake (permanent or intermittent)
52 = ox-bow
53 = drain canal
54 = dam/reservoir
55 = embayment
56 = estuarine lake
57 = entrance channel
58 = groundwater discharge basin
59 = salina

Landform - coastal feature

60 = foredune
61 = hind dune
62 = dune
63 = dune swale
64 = coastal sand plain
65 = beach ridge plain
66 = blow out
67 = mobile sand
68 = washout
69 = beach
70 = spit
71 = tombolo
72 = stack
73 = rock platform
74 = coastal depression - wet sand plains

Landform - artificial surface

80 = causeway*/bridge*
81 = constructed waterway
82 = cut face
83 = embankment
84 = groyne
85 = land fill
86 = levee - constructed
87 = disturbed terrain
88 = seawall/bulkhead
89 = training wall
90 = breakwater
91 = artificial wetland
92 = land planed

Using the above system, tidal and non-tidal coastal waterbodies fall into one of the following categories:-

stream channel, waterbody, swamp, lake, embayment, estuarine lake, entrance channel.

For assessment of coastal waterways, a finer level of detail is generally required. The following sub-units allow an additional layer of terrain information to be recorded...

Landform sub-units for Coastal Waterbodies

101 = creek delta

102 = high tide flat
103 = intertidal flat
104 = rocky reef
105 = tidal bar
106 = tidal channel
107 = tidal creek
108 = tidal delta
109 = tidal flat
110 = washover delta

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STANDARD ATTRIBUTE CODES FOR LAND USE (ATTRIBUTE 3)

In the standard classification to date, land use codes have consisted of a letter and a two digit numeric code (eg. c23). The letter represents the "major activity" and the numeric code the "detailed activity". This means that a maximum of 9 classes can be included in any given land use category, eg. “Timber”. In some areas this has proven to be inadequate.

It is suggested that the third (presently) numeric code be replaced with a letter (eg. c2c) to allow addition of future codes (26 options instead of 9) and to maintain unique detailed activity codes. For the present the original alphanumeric codes can be used concurrently with the expanded set of “alpha-numeric-alpha” codes however in future preference should be given to the latter.

The maintenance of unique detailed activity codes will also facilitate greater cross-linking of codes to discern land use from land cover if necessary. For example to map a golf course, the land use is recreation but the land cover is grassland/pasture. The standard code set has historically been used to maintain the major and detailed acitvity codes from each subsection together eg. i82 (recreation - semi natural) or c23 (grazing/grassland - improved pasture. A better alternative might be, for example, i23 (recreation - improved pasture) or i2c under the revised code set.

Some land use sub-codes have also been defined, (*irrigation, horticulture, grassland & waterway*) they are shown where appropriate. Note that there are three (3) sub-code characters available (positions 20-22 inclusive). The first two characters (positions 20 & 21) are numeric allowing 99 options for general use. The third code (position 22) is alphabetic allowing for 26 weed/other options.

The bracketed [ ] figures shown below indicate the new alphabetic equivalents/extensions of the original alphanumeric code set.

Major activity = cropping / cultivation (code = a)

Detailed activity [Land cover]	Cropping subcodes
a01 [a0a] = continuous or rotation cropping	
a02 [a0b] = strip cropping	
a03 [a0c] = irrigation cropping	*04 = spray irrigation*
a04 [a0d] = fodder cropping	*05 = flood irrigation*
a05 [a0e] = turf growing	
a06 [a0f] = sugar cane cropping	
a07 [a0g] = opportunity cropping	
a08 [a0h] = reduced tillage cropping (as indicated by herbicide spraying etc.)	

Major activity = horticulture (code = b)

Detailed activity [Land cover]	Horticulture subcodes (positions 20 & 21)
b11 [b1a} = orchard	11 = banana
b12 [b1b] = vineyard/trellis planting	12 = previous banana
b13 [b1c] = vegetable/flower	13 = avocadoes
b14 [b1d] = plant nursery	14 = macadamia/*nut tree (eg. pecan, walnut)*
b15 [b1e] = plantation	15 = peaches/nectarines/stone fruit
	16 = mangoes
	17 = coffee
	18 = tea
	19 = citrus
	20 = melaleuca (tea tree)

Major activity = grazing or grassland (code = c)

Detailed activity [Land cover]	Land use subcodes (position 22 only)
c21 [c2a] = native pasture	
c22 [c2b] = volunteer or naturalised pasture	a = generic woody weed
c23 [c2c] = improved pasture	b = bladey grass
c24 [c2d] = tussock	c = bracken
c25 [c2e] = sedge/rush/fern/wet species	d = lantana
c26 [c2f] = irrigated	e = camphor laurel
c27 [c2g] = chenopod	f = briar
c28 [c2h] = bare surface	g = blackberry
c29 [c2i] = weed	h = sifton bush
c30 [c2j] = coastal dune complex	i = privet
[c2k] = cultivation to establish/improve pasture	j = bitou bush
	k = _____ (formerly tea tree - deleted - see Horticulture subcodes)
	l = (see waterbodies codes)
	m = tobacco bush
	p = pinus species
	q = algae/aquatic weed
	r = cumbungi/phragmites/other reeds
	t = crofton weed
	v = exotic vine
	w = generic wet species
	_ = undefined weed

Major activity = intensive animal production (code = d)

Detailed activity [Land cover]

d31 [d3a] = piggery *or dairy shed*
d32 [d3b] = poultry farm
d33 [d3c] = cattle feedlot
d34 [d3d] = native fauna production
d35 [d3e] = aquaculture
d36 [d3f] = introduced fauna production

Major activity = Mining and quarrying (code = e)

detailed activity [Land cover]

e41 [e4a] = open cut
e42 [e4b] = soil dump
e43 [e4c] = gravel extraction by surface scraping
e44 [e4d] = shafts/pit heads
e45 [e4e] = alluvial mining
e46 [e4f] = restored lands
e47 [e4g] = sand mining

Major activity = Waterbodies & related features (code = f)

Detailed activity [Land cover] — *Related Land use subcodes for waterbodies*

f51 [f5a] = waterway — *51 = aggrading reach [positions 20 & 21]*
f52 [f5b] = conservation (nature) — *52 = degrading reach*
f53 [f5c] = navigation — *53 = stable reach*
f54 [f5d] = berth mooring — *l = large woody debris (in streams) [position 22]*
f55 [f5e] = bathing
f56 [f5f] = artificial/aesthetic waterbody (reassigned - formerly aquaculture - duplicated in intensive animal production)
f57 [f5g] = water supply
f58 [f5h] = drainage
f59 [f5i] = wastewater
f60 [f5j] = salinity abatement (eg. evaporation basisns)
[f5k] = river
[f5l] = swamp
[f5m] = river gravels
[f5n] = sand or beach (river or coastal)
[f5o] = mudflat

Major activity = timber/forest (code = g)

Detailed activity [Land cover]

g61 [g6a] = native forest
g62 [g6b] = native forest - logged/disturbed
g63 [g6c] = windbreak
g64 [g6d] = tree or wood lot
g65 [g6e] = softwood plantation
g66 [g6f] = softwood plantation - logged
g67 [g6g] = hardwood plantation
g68 [g6h] = hardwood plantation - logged
g69 [g6i] = weed species
g70 [g6j] = regrowth
[g6k] = woodland
[g6l] = riverine
[g6m] = recently cleared
[g6n] = recently burnt
[g6o] = native tree or shrub plantation
[g6p] = exotic tree or shrub plantation (not softwoods)
[g6q] = mangrove
[g6r] = coastal heath complex - dry
[g6s] = coastal heath or sedge complex - wet
[g6t] = native woody shrub community

Major activity = urban / residential (code = h)

Detailed activity [Land cover]

h71 [h7a] = industrial/commercial
h72 [h7b] = residential
h73 [h7c] = community building/facility
h74 [h7d] = caravan park
h75 [h7e] = rural residential
h76 [h7f] = heritage building/area
h77 [h7g] = land fill

Major activity = recreation (code = i)

Detailed activity [Land cover]

i81 [i8a] = natural
i82 [i8b] = semi natural
i83 [i8c] = intensive urban
i84 [i8d] = tourism development

Major activity = utilities/other (code = j)

Detailed activity [Land cover]

j90 [j9a] = service easement/utility corridor
j91 [j9b] = road
j92 [j9c] = road reserve
j93 [j9d] = railway
j94 [j9e] = coastal structure
j95 [j9f] = flood/irrigation structure
j96 [j9g] = cemetery/crematorium
j97 [j9h] = trig. station/beacon
j98 [j9i] = solid waste disposal
j99 [j9j] = airstrip/airport
[j9k] = sewage treatment works
[j9l] = military facility
[j9m] = cliff/rock

Major activity = wetlands (code = k)

(Note that wetland vegetation is coded using attributes 4 and 5 (community & regeneration), 6 (canopy density of tree or shrub species), 7 (understorey) and land use subcode 3 (weeds, eg. w = wet species, q = aquatic weed). (example final code for polygon = k0b w 172d2). Where erosion mapped, show wetlands as depositional environments (erosion code = 012).

Detailed activity [Land cover]	*Wetland subcodes*
[k0a] = floodplain swamp - backswamp, flood chute	***01** = free standing water - unbroken surface*
[k0b] = floodplain swamp - billabong	***02** = free standing water - emergent vegetation*
[k0c] = floodplain swamp - ponded tributary	
[k0d] = floodplain swamp - terrace swamp	***03** = subsurface water*
[k0e] = floodplain swamp - creek swamp	
[k0f] = (reserved for expansion)	
[k0g] = (reserved for expansion)	
[k0h] = dunal swamp - marginal (at margin of dunes along intersect with bedrock/upland - g'water fed)	
[k0i] = dunal swamp - perched (above local watertable)	
[k0j] = dunal swamp - watertable window (intersects local watertable)	
[k0k] = (reserved for expansion)	
[k0l] = upland swamp -pluvial (rainfall/runoff fed)	
[k0m] = upland swamp - phreatic (groundwater fed)	
[k0n] = (reserved for expansion)	
[k0o] = estuarine wetland	
[k0p] = artificial wetland - nutrient stripping	
[k0q] = artificial wetland - conservation	
[k0r] = (reserved for expansion)	

(Note that code is k0a (k zero a), not koa, or kOa.) [classification adapted from Winning & King 1995]

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TREE OR SHRUB COMMUNITY / STRUCTURAL FORM... (ATTRIBUTE 4)

Forest...

01 = Dry sclerophyll forest
02 = Wet sclerophyll forest
03 = Woodland
04 = Rainforest
05 = Mixture
06 = Native pine - cypress
31 = Littoral rainforest
33 = Sub alpine forest
34 = Coastal Banksia complex

Plantations...

07 = cypress
08 = eucalypt
09 = rainforest
10 = exotic pine
11 = poplar
12 = other native
13 = other exotic

Shrubs

14 = mallee shrub
15 = heath shrub
16 = shrub - other
29 = mallee
99 = other

General

19 = landscaped
20 = exotic weed trees (camphor laurel, tree of heaven)
21 = agroforestry
22 = no mature trees
23 = treelot
24 = windbreak or tree row
25 = scattered trees
26 = trees in clumps

Wet species

17 = swamp complex (Casuarina sp. Melaleuca sp. - “Swamp sclerophyll” complex)
18 = littoral complex (mangrove etc.)
27 = riverine natives
28 = riverine exotics
30 = swamp box (aka swamp mahogany - Lophostemon suaveolens or formerly Tristania suaveolens)
32 = sub alpine swamp
35 = riverine mixed
36 = cumbungi/phragmites/other reeds

Note: Structure of the forest and related communities above generally adheres to Forestry Commission of NSW (1989) Research Note 17.

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CODES FOR TREE OR SHRUB REGROWTH (ATTRIBUTE 5)

0 = other - user defined
1 = no regrowth present
2 = regrowth present
3 = replanting
4 = dominance of invasive weed species

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CODES FOR TREE AND SHRUB CANOPY DENSITY (ATTRIBUTE 6)

z < 0.25%
a < 1%
b = 1 to 5%
c = 5 to 10%
d = 10 to 20%
e = 20 to 50%
f = > 50%
g = > 80%

Alternative codes for riparian vegetation...

h = continuous canopy on both sides of watercourse
i = continuous one side, discontinuous on the other
j = discontinuous on both sides
k = continuous on one side, absent on the other
l = discontinuous on one side, absent on the other
(absence of all vegetation is coded using the "no mature trees" community (Attrib. 4) code and the "a" or "z" canopy codes)

NB. Invasive weeds can be mapped using the land use subcodes.

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CODES FOR UNDERSTOREY (ATTRIBUTE 7)

1 = not present
2 = present
3 = discontinuously present
4 = native grasses
5 = naturalised grasses
6 = chenopods (xeromorphic halophytes)
7 = bare areas under trees
8 = heath / heath shrub

(codes 4-7 incl. have primarily been included for use with attribute 23 N. West Veg. Assoc. but can be used in any context)

ATTRIBUTE CODES FOR PROJECTIVE FOLIAGE COVER (ATTRIBUTE 8)

These classes are based on the Australian Soil and Land Survey field handbook [McDonald et al. (1990)]. See this series for full information. Table 14a and Table 14b pages 60 & 61 the "yellow" book.

Structural formation classes are defined by growth form and crown separation.

Codes are defined with growth form then crown separation - see examples below...

Woody plants

CODE Crown separation	D Closed or dense	M Mid dense	S Sparse	V Very sparse	I Isolated/sparse	L Isolated clumps
Field criteria	Touching - overlap	Touching, slight separation	Clearly separated	Well separated	Isolated	Isolated
Crown separation ratio	<0	0 - 0.25	0.25 - 1	1 - 20	>20	>20
CODE - Growth form	Structural form classes					
T - tree	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees
M - Tree mallee	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clump of mallee trees
S - shrub	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs
Y - mallee shrub	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clump of mallee shrubs
Z - heath shrub	closed heathland	heathland	open heath	sparse heath	isolated heath shrubs	isolated clump of heath shrubs
C - chenopod shrub	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clump of chenopod shrubs

Example:- TD = closed forest.

Projective foliage cover classes (cont.)

Ground covers

CODE Crown class	D Closed or dense	M Mid dense	S Sparse	V Very sparse	I Isolated/sparse	L Isolated clumps
Foliage cover	>70	30-70	10-30	<10	<1	<1
CODE - Growth form	Structural form classes					
G - tussock grass	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of tussock grasses
H - hummock grass	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses
D - sod grass	closed sod grassland	sod grassland	open sod grassland	sparse sod grassland	isolated sod grassland	isolated clumps of sod grasses
V - sedge	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges
R - rush	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes
F - forb	closed forbland	forbland	open forbland	sparse forbland	isolated forbs	isolated clumps of forbs
E - fern	closed fernland	fernland	open fernland	sparse fernland	isolated ferns	isolated clumps of ferns
O - moss	closed mossland	mossland	open mossland	sparse mossland	isolated mosses	isolated clumps of mosses
L - vine	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines

Example:- GD = closed grassland.

ATTRIBUTE CODES FOR WESTERN REGION VEGETATION CLASSIFICATION (ATTRIBUTE 9)

Dry sclerophyll or woodlands

WCP = White cypress pine
M_I = Mugga ironbark
G_B = Grey box
R_B = Red box
RRG = Red river gum
SLI = Silver-leaf-ironbark
YAP = Yapunyah
B_B = Black box
CLP = Coolibah
C_B = Coolabah/Blackbox
TDG = Tumbledown gum/Dwyer's mallee/Grey mallee
BIM = Bimble box
BBP = Bimble box - white cypress pine
MUL = Mulga
GID = Gidgee
CUR = Currawang
IRN = Ironwood
BRG = Brigalow
MYL = Myall
WGL = Wilga - leopardwood
B_R = Belah - rosewood
BEL = Belah
B_C = Belah - cabbage tree wattle
NEL = Nelia
G_M = Green mallee
MAL = Mallee
ROS = Rosewood
P/W = Prickly Wattle
NED = Needlewood
HOP = Hopbush
YAR = Yarran
ACA = Acacia

Shrublands (Heath and Scrub)

BSB = Bladder saltbush
BBB = Black bluebush
OMS = Old Man Saltbush
PBB = Pearl Bluebush
N_B = Nitrebush
SGL = Samphire/Glasswort
PIT = Pituri
COT = Cottonbush
COP = Copperburrs
ASB = Annual saltbush
STP = Saltbush (Attriplex-other)
D_B = Dillon bush
BSO = Bluebush-shrub other

Grasslands

BSP = Buck spinifex
MIT = Mitchell grass
WTP = White top
BWS = Common bottlewashers/variable species
PLY = Plains grass - yanganbil
WRG = Wiregrass/Prickly Wattle
FAL = Fallow weeds

A_H = Annual herbage
STI = Stipa
BRL = Barleygrass
MED = Medics
PIG = Pigface
BRP = Black Roly poly
P_P = perennial pasture

Swamplands (Riverine)

LGN = Lignum
NGF = Nitre goosefoot
CUG = Canegrass
SWP = Swamp and marsh communities
S_B = Swamp box
BAR = Bare ground eg salt lakes

****

ATTRIBUTE CODES FOR EROSION (ATTRIBUTE 10)

(Special note regarding tunnel erosion:- ***Areas*** of ***subsurface tunnel erosion*** due to dispersible soils, ***should be classified class 46***. Where tunnels have resulted in slumps and have subsequently formed open rills as an advanced form of the tunnel they should be coded as class 44 - ***extreme rilling***.

Where dispersible soil and associated tunnels are present as a larger ***linear*** feature, they should be preferentially classified into one of the class 80 gullies. However, a new code has been added into each gully category to allow for extraordinary situations where tunnels exist but the overall gully morphology would be more accurately represented under a category other than class 80.)

CODE	CLASS	SUBCLASS	
AREAL (POLYGON) FEATURES			
011	No appreciable erosion		
012	No erosion classification due to land use		
014	*Subsurface salinity/salt store (as determined by Electromagnetic Induction surveys)*		
015	Saline indications (eg. vegetation change)		
021	Sheet erosion	minor	
022		moderate	
023		severe	
024		extreme	
025		salting	
031	Wind erosion	minor	
032		moderate	
033		severe	
034		extreme	
041	Rill erosion	minor	
042		moderate	
043		severe	
044		extreme	
045		salting	
046		*Series of small tunnels exist within area. No obvious signs of gullies but fans of sediment may be evident at mouths of tunnels*	
111	Scalding		Minor - annual grass
112			Minor - bare
113			Severe
091	Mass movement		slump
092			slide
093			avalanche - soil debris
094			avalanche - rock debris
LINEAR FEATURES (mapped separately - preferred colour indicated for consistency) [green]			
051	Minor gully erosion: isolated		<1.5m deep
052	discontinuous linear gullies,		1.5m - 3m deep
053	confined to primary or minor		3 - 6m deep
054	drainage lines		>6m deep

055		salting
056		*Presence of tunnels within gully features or within structures built in gullies or along sidewalls of gullies*

[orange/brown]		
061	Moderate gully erosion:	<1.5m deep
062	continuous linear gullies to	1.5m - 3m deep
063	primary or minor drainage lines	3 - 6m deep
064		> 6m deep
065		salting
066		*Presence of tunnels within gully features or within structures built in gullies or along sidewalls of gullies*
[red]		
071	Severe gully erosion:	<1.5m deep
072	discontinuous or continuous	1.5 - 3m deep
073	gullies branching into minor	3 - 6m deep
074	drainage lines, or multiple	>6m deep
075	branching within primary drainage lines	salting
076		*Presence of tunnels within gully features or within structures built in gullies or along sidewalls of gullies*

[blue]		
081	Extreme gully erosion:	<1.5m deep
082	discontinuous or continuous	1.5m - 3m deep
083	multiple branching gullies, or	3 - 6m deep
084	sub-parallel gullies *in dispersible soils,*	>6m deep
085	*frequently feature tunnels in surrounding soils and structures*	salting

*** <u>do not use</u> "086" (superfluous as class 80 gullies are dispersible by definition – use depth or salinity indicating codes)**

[pink]		
101	Streambank erosion	<1.5m deep
102		1.5 - 3m deep
103		3 - 6m deep
104		>6m deep

(Rabbit activity codes deleted)

ATTRIBUTE CODES FOR MASS MOVEMENT (ATTRIBUTES 11, 12, 13 & 14)

(This code set is separate from the mass movement codes in the erosion classification.)

Area of mass movement (11)

1 = 1 to 10%
2 = 10 to 30%
3 > 30%
****

Type (12)

1 slide
2 slump
3 flow
4 slump-flow
5 translational
****

Stage (13)

A active - recent
B mixture
C old - ancient
****

Severity (14)

1 slight
2 moderate
3 severe

****

SOIL CONSERVATION MANAGEMENT:- (ATTRIBUTE 15)

f = treated with soil conservation works but additional work required to complete erosion control or work at end of lifespan
b = treated with soil conservation works - not requiring any significant additional work

****

ATTRIBUTE CODES FOR ROCKINESS (ATTRIBUTE 16)

n = no rock or stone
s = loose stones or boulders
r = soils with a high proportion of fractured rock throughout the profile, depth usually < 10cm
w = rock outcrop < 20% of area
v = rock outcrop 20 to 50%
t = rock outcrop 50 to 70%
d = rock outcrop > 70% of area

****

ATTRIBUTE CODES FOR GEOLOGY (ATTRIBUTE 17)

These codes are derived from the geology maps of the area being mapped. The source should be specified and forwarded to the GIS with the attribute file(s).

****

ATTRIBUTE CODES FOR GREAT SOIL GROUP (ATTRIBUTE 18)

CODE	GROUP

Soils Showing No Profile Development

SK	Solonchaks
A	Alluvial Soils
L	Lithosols
CS	Calcareous Sands
SS	Siliceous Sands
ES	Earthy Sands

Soils Showing Minimal Profile Development

GBK	Grey-brown Calcareous Soils
RK	Red Calcareous Soils
DL	Desert Loams
RBH	Red and Brown Hardpan Soils
GC	Grey Clays
BC	Brown Clays
RC	Red Clays

Mildly Leached Dark Soils

BE	Black Earths
R	Rendzinas
CM	Chernozems
PS	Prairie Soils
W	Wiesenboden

The Mildly Leached Brown Soils

SZ	Solonetz
SDS	Solodized Solonetz
SC	Solodic Soils
YS	Yellow Solodic Soil
RS	Red Solodic Soil
SM	Soloths
SB	Solonized Brown Soils
RBE	Red-brown Earths
NKB	Non-calcic Brown Soils
C	Chocolate Soils
BRE	Brown Earths

Soils and Profiles Dominated by Sesquioxides

KRE	Calcareous Red Earths
RE	Red Earths
YE	Yellow Earths
TR	Terra Rossa Soils
E	Euchrozems
X	Xanthozems
K	Krasnozems

The Mildly to Strongly Leached Highly Differentiated Soils

GBP	Grey-brown Podzolic Soils
RP	Red Podzolic Soils
YP	Yellow Podzolic Soils
BP	Brown Podzolic Soils
LP	Lateritic Podzolic Soils

GP	Gleyed Podzolic Soils
P	Podzols
HP	Humus Podzols
PP	Peaty Podzols

The Organic Soils

AH	Alpine Humus Soils
HG	Humus Gleys
NP	Neutral Peats
ALP	Alkaline Peats
ACP	Acid Peats
NSG	No Suitable Group

Optional Additional Soil Descriptor sub codes

0	Shallow
1	Deep
2	Scalded
3	Stony
4	Gravelly
5	Hard Setting
6	Earthy
7	Bleached
8	Coarse
9	Fine

****

SOIL LANDSCAPES:- (ATTRIBUTE 19)

This uses the codes for soil landscapes used in the mapping. The codes vary from area to area. The source should be cited and forwarded to the GIS with the attribute file.

****

PHYSICAL LIMITATIONS TO LAND USE:- (ATTRIBUTE 20)

a = acid soils
b = flood irrigation
e = erosion hazard
f = flooding
m = soil moisture availability
p = soil limitations
r = rock outcrop
s = saline seepage
t = terrain element
w = wetness
z = groundwater intake zone

****

LAND CAPABILITY:- (ATTRIBUTE 21)

1 = I
2 = II
3 = III
4 = IV
5 = V
6 = VI
7 = VII
8 = VIII

****

SOIL DEPTH:- (ATTRIBUTE 22)

T = Very shallow	<0.25m
U = Shallow	0.25 to 0.5m
V = Moderate	0.5 to <1.0m
W = Deep	1.0 to 1.5m
X = Very deep	1.5 to 5m
Y = Giant	> 5m

SOIL LIMITATIONS V2.6 (ATTRIBUTE 23)

1. CHEMICAL AND PHYSICAL LIMITATIONS

Two (Primary and Secondary) codes...[position 81 & 82]

nn	*NIL PROBLEM*
cd, ca, ck, cw	*CLAY MINERALOGY PROBLEMS (eg. Dispersibility, Aggregation, shrinK/swell, low Wet strength)*
ts, ta, te	*TOXICITY PROBLEMS, (incl. Salinity, Acidity, Effluent/other)*
id, iy, ip, ie	*INFILTRATION PROBLEMS, harDsetting or hYdrophobic, low Permeability, Excessively free drained (eg. sands)*
sh, si, ss...	*SHALLOW/POOR/ROCKY SOILS sHallow, Infertile, siliceous Sands...*
st, sr, so, sm, sx, su	*sTony (=rock 's'), Rocky (=rock 'r'), rock Outcrops [rocky area<=20%] (=rock 'w'), Many rock outcrops [rocky area 20 to 50%] (=rock 'v')], eXtreme rock outcrop [rocky area 50% to 70%] (=rock 't')], Unviable due to rockiness [rocky area>70%] (=rock 'd')*
md	*MINED OR DISTURBED soils*

2. DRAINAGE LIMITATIONS

Single character code [position 83]

n	*nil problems/not applicable*	
e	*excessively drained*	*(eg. siliceous sands)*
i	*imperfectly drained*	*(some drainage depressions, flood chutes, footslopes etc.)*
w	*waterlogged - seasonally*	*(swamps, floodplain features etc.)*
x	*waterlogged - perennially/extended periods*	*(swamps etc.)*
a	*acid sulphate likely*	*(coastal plains/swamps)*

3. RESULTANT OVERALL SOIL LIMITATION RANKING

(Designed to assist land capability assessments when considered alongside slope, terrain and degree of rockiness) [position 84]

a	*few if any limitations on any landuse [good]*
b	*moderate limitations - restrictive for some landuses, manageable problems [fair]*
c	*severe limitation(s) - usage restrictions on all landuses [poor]*
d	*extreme limitations - limited uses even with good management [very poor]*
e	*n/a due to landuse/terrain - eg. road, river etc. [unusable]*

OVERALL EXAMPLE:-

shnb = shallow soil; no drainage limitations; moderate limitations overall.

****

USER DEFINED ATTRIBUTES (ATTRIBUTES 24 & 25)

These are two alphanumeric characters that mappers can define for specific projects. They remain unique to each project and therefore no codes are allocated. The "ATTCAP" program automatically stores these characters or alternatively they occur adjacent to the interpreted soil limitations at positions 85 and 86 in the attribute string.

NORTH WEST VEGETATION ASSOCIATIONS:- (ATTRIBUTE 26)

after B. Peasley 1998 (unpub.)
(INTERIM)

Tree type or Association	*Code*	*Research Note 17 No's. (St. Forests)*	*Features/Comments*
EUCALYPTS (E)			
Scribbly Gums	***E01***	*117-120*	*Dry type, Various species*
Bloodwoods	***E02***		*Coastal, western slopes, Drier sites, variable*
Smooth Barked Apple	***E03***	*100,105,106,108,126, 127,130*	*Coastal, western slopes, Drier sites, variable*
Apple Box	***E04***	*103*	*Tablelands*
Rough barked apple	***E05***	*129*	*Rough-barked apple >50%*
Grey Box	***E06***	*82*	
Grey Box - Iron bark	***E06a***	*83*	
Ironbark	***E07***	*84*	
Peppermint	***E08***	*111*	*Various peppermints >50%*
New England Peppermint	***E09***	*142*	*E.nova-nagliea*
Narrowleaved Black Peppermint	***E10***	*111*	*E. nicholi*
Snow Gum	***E11***		*Low height, frost exposed sites*
Black Sallee	***E12***	*136-140*	*Low height, frost exposed sites*
Mountain/Manna Gums	***E13***	*158-160,164*	*if >50%*
Dorrigo White Gum	***E14***	*98*	*E. dorrigoensis*
Cold tableland gum spp.	***E15***		
Candlebark dominant	***E15a***		
Swamp Gum dominant	***E15b***		
Black Gum dominant	***E15c***		
Broadleaved Sallee dominant	***E15d***	*141,143*	
Messmate	***E16***	*150-155*	*Various tableland species in close association*
Brown Barell	***E17***		*Various tableland species in close association*
Silvertop Stringybark	***E18***	*167,168*	*Silvertop Stringybark >50%*
New England Blackbutt	***E19***	*163*	*New England Blackbutt >50%*
New England Stringybark	***E20***	*122*	*Dry types, northern & central tablelands*
Red Stringybark	***E21***	*124*	*Dry types, western tablelands*

Yellow box	***E22***		
Red Box	***E23***		
Red Gum	***E24***	*99,103,171-173*	*Tableland drier sites and towards woodland.*
White Box	***E25***	*174,175,176*	*Tablelands & west*
Red Gums	***E26***	*177,178*	*Western tablelands/slopes/plains*
Dwyers Red Gum	***E27***		
Dwyers Red Gum/Pine	***E27a***		
River Red Gum	***E28***	*199*	*Western Streams*
River Red Gum-Black box/Coolibah	***E28a***	*200*	*Inland streams only*
River Red Gum-Carbeen	***E28b***	*200*	*North western NSW*
River Red Gum-Yellow Box	***E28c***	*200*	*North western NSW*
River Red Gum-Western Grey Box	***E28d***	*200*	*North western NSW*
Silverleaved Iron bark	***E29***	*207*	*E.melanophloia*
Silverleaved Ironbark / Poplar Box	***E29a***		
Western Ironbark complex	***E30***	*206,209,210*	*Western tablelands*
Western Box (Poplar Box)	***E31***	*203**	
Poplar Box/Wilga	***E31a***		
Poplar Box/Coolibah	***E31b***		
Poplar Box / Belah	***E31c***		
Poplar Box / Gidgee	***E31d***		
Poplar Box / Leopardwood	***E31e***		
Western Box (Pilliga Box)	***E32***	*203**	
Western Box (Fuzzy Box)	***E33***	*203**	
Grey Box	***E34***	*203**	*Incl. E.microcarpa (Inland Grey Box) and E. woollsiana (Narrowleaved Box)*
Grey Box/Ironbark	***E34a***		

Ironbark	***E35***	*204*	*Western tablelands*
Black Box	***E36***	*202*	*Western watercourse*
Black Box-Coolibah	***E36a***		
Narrowleaved Ironbark	***E37***		
Narrowleaved Ironbark-Bull Oak	***E37a***	*208*	*North western slopes*
Broadleaved Ironbark	***E38***		
Mugga Ironbark	***E39***		
Ironbark- / Red Gum	***E40***	*205*	
Coolibah	***E41***		
Coolibah/Belah	***E41a***		
Baradine Gum	***E42***		
Tumbledown Gum	***E43***		
Carbeen	***E44***		
Brown Bloodwood	***E45***		
NON EUCALYPTS (N)			
River Oak	***N01***	*211*	*Adjacent streams*
Belah	***N02***	*212*	*Western slopes/plain*
Belah/Rosewood	***N02a***		
Bull Oak	***N03***	*213*	*Western NSW*
Bull Oak/Belah	***N03a***		
Wattle	***N04***	*214*	*Extensive range*
Brigalow	***N05***	*214*	*Western slopes/plain*
Brigalow/Belah	***N05a***		
Myall	***N06***	*214*	*River floodplains*
Myall/Rosewood	***N06a***		
Wilga	***N07***	*203,224*	*Dominance through selective clearing*
Wilga/Leopardwood	***N07a***		
Rosewood	***N08***	*212,224*	*Dominance through selective clearing*
Kurrajong	***N09***	*174,175,194,224*	*Dominance through selective clearing*
Cypress Pine spp.	***N10***		
Cypress Pine - Poplar Box	***N10a***		
Black Cypress Pine	***N11***	*180,185*	*Dry ridge, tablelands*
Black Cypress Pine-Eucalypts	***N11a***	*181-184*	*Western tablelands*
White Cypress Pine-Mallee	***N12a***	*	*Western plains*
White Cypress Pine-Carbeen	***N12b***		
White Cypress Pine	***N12***	*188,194*	*Western tablelands*

White Cypress Pine-Eucalypts	***N12c***	*189-193,195*	*Western tablelands*
Gidgee	***N13***		
Ironwood	***N14***		
Cooba	***N15***		
River Cooba	***N16***		
SHRUB DOMINANT (S)			
Scrub (Teatree)	***S01***	*224**	
Scrub (Leopardwood)	***S02***	*224**	*Elevated western floodplains*
Scrub (Budda)	***S03***	*224**	*West slopes & plains*
Scrub (Wild Lime)	***S04***	*224**	*Western floodplain & plains*
Scrub (Emubush)	***S05***	*224**	*West slopes & plains*
Scrub (Mulga)	***S06***	*224**	*Western plains*
Scrub (Mallee)	***S07***	*225*	*West slopes & plains*
Grey Mallee	***S07a***		
Scrub (Lignum)	***S08***	*224*	*West slopes & plains*
Chenopods (saltbush)	***S09***	*226*	*West slopes & plains*
Grass Tree	***S10***	*227*	*Slopes & tablelands*
Turpentine	***S11***		
Whitewood	***S12***		
HERBACEOUS DOMINANCE (H)			
Native & Naturalised Grasslands	***H01***	*230*	*<0.25% Trees*
Swamps/Lagoons/Wetlands	***H02***	*231*	*?*
OTHER (EXTRANEOUS) SITES (X)			
Sand Ridge	***X01***	*233*	*?*
Rock	***X02***	*234*	*?*
Water Surface	***X03***	*235*	*?*
Standing dead trees	***X04***		
Improved pasture & crop land	***X05***	*216*	*<0.25% tree/shrub*
Ag. plantation, orchards, vineyards	***X06***	*217*	

Forestry plantations	***X07***	*218*	
Urban, roads, pits	***X08***	*219*	
Exotic "weed" Trees	***X09***	*221*	*Blackberry, Hawthorn Tree of Heaven*
Heath	***X10***	*223*	
Bare/Barren areas	***X11***		

****

AUSTRALIAN SOIL CLASSIFICATION:- (ATTRIBUTE 27)

This 4 character field in SCALD is used to store the codes for Order and sub-order in the Australian Soil Classification (Isbell 1996).

As a full description of soils under this classification system is unnecessary for most multiple attribute applications, only the order/suborder codes are included in SCALD. The classification codes form positions 93 to 96 inclusive in the SCALD character "string" (see diagram p8). The order and sub-order codes are entered without spaces (in that order), eg. "CAEL" is a Calcarosol, shelly. Refer to Appendix 1 in Isbell (1996) for more comprehensive details on soil descriptions using this system.

****

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APPENDIX 1 – NATIONAL LAND AND WATER RESOURCES AUDIT DRAFT LAND USE CLASSIFICATION

DRAFT LAND USE CLASSIFICATION - Summary				
Primary Class		Secondary Class	Tertiary Class	Nearest Scald Equivalent
l Conservation	1.1	Strict nature reserves	Marine and estuarine reserves	f5b (f52)
(predominantly natural vegetation)			Land reserves	j9c in some cases
minimal management	1.2	Wilderness area		n/a
	1.3	National Park		n/a
	1.4	National monument		n/a
	1.5	Habitat/species management area		n/a
	1.6	Protected landscape	Marine	n/a
			Land	n/a
	1.7	Managed resource protected area	Biodiversity	n/a
			Surface water supply	f5g
			Groundwater	n/a
			Landscape	n/a
	1.8	Unmanaged land	Vacant Crown lands	n/a
			Aboriginal lands	n/a
			Defence lands	j9l
			Rehabilitated lands	e4f after mining only
			Stock routes	n/a
	1.9	Water	Lakes/dams	f5b
			Rivers	f5a
			Wetlands	k_ _
			Coastal	no equiv
ll Production from relatively natural	2.1	Grazing	Shrubland	c
environments			Grassland	c
(predominantly natural vegetation)			Grassy woodlands	g6k
intermittent intervention)			Tablelands	n/a
			Alpine	n/a
			Riverine	n/a
			Montane	n/a
	2.2	Production Forests	Commercial native forest production	g6a, g6b
			Native forest nurseries and services	b1d - all nurseries

lll Primary production from drylands agriculture	3.1	Plantations	Plantation forest production	g6e => h
and plantations			Plantation nurseries and services	b1d - all nurseries
(predominantly introduced vegetation	3.2	Grazing improved and fertilised pastures	Pure lucerne	a0d
single and multiple uses)			Lucerne/pasture mixtures	c2c
			Pasture legumes	c2c
			Perennial grasses/lucerne mixture	c2c
			Annual grasses/lucerne mixture	c2c
			Sown grasses	c2c
	3.3	Farm forestry	Windbreaks	g6c
			Woodlots	g6d
			Production of trees and crops	g6d
	3.4	Cropping/pasture rotations	Crop/pasture rotations	90a
	3.5	Permanent cropping	Cereals	90a
			Beverage and spice crops	90a
			Hay and silage	a0d
			Oil seeds	a0a
			Sugar Cane	a0f
			Tobacco	a0a
	3.6	Horticulture	Vegetables	b1c
			Fruit	b1a
			Nuts	b1f
			Oleaginous fruits	?
			Flowers and bulbs	b1c
lV Primary production from irrigated agriculture	4.1	Irrigated Plantations	Irrigated plantations	a0c
and plantations			Irrigated plantation nurseries	b1d - all nurseries
predominantly introduced vegetation	4.2	Irrigated improved and fertilised pastures	Irrigated pure lucerne	a0d/c2f
			Irrigated lucerne/pasture mixtures	
			Irrigated pasture legumes	c2f

			Irrigated perennial grasses/lucerne mixture	c2f
			Irrigated annual grasses/lucerne mixture	c2f
single and multiple uses			Irrigated sown grasses	c2f
	4.3	Irrigated Farm Forestry	Irrigated production of trees and crops	a0c/c2f
	4.4	Irrigated Cropping/pasture rotations		
	4.5	Irrigated Permanent cropping	Irrigated cereals	a0c
			Irrigated beverage and spice crops	
			Irrigated hay and silage	
			Irrigated oil seeds	
			Irrigated sugar cane	
			Irrigated tobacco	
	4.6	Irrigated Horticulture	Irrigated vegetables	b1c
			Irrigated fruit	b1a
			Irrigated nuts	b1c
			Irrigated oleaginous fruits	
			Irrrigated flowers and bulbs	b1c
				d**
(landscape modification			Processing plants	?
extensive management and intervention	5.2	Rural residentual living		h7e
	5.3	Urban uses	Residential	h7b
			Manufacturing and industrial	h7a
			Commercial services	h7a
			Public services	h7c
			Recreation and culture	i8b,i8c
	5.4	Institution uses	Defence facilities	j9l
			Research facilities	?
	5.5	Utilities	Electricity generation/ transmission	j9a,h7c
			Water storage and treatment	f5i
			Gas treatment, storage and transmission	h7a,h7c

	5.6	Transport and communication	Airport/ aerodromes	j9j
			Roads	j9b
			Railways	j9d
			Ports and water transport	f5d
			Navigation and communication	f5c
	5.7	Mining	Mines	e4*
			Quarries	e4*
	5.8	Waste treatment and disposal	Trailings	e4*
			Stormwater	f5i?
			Landfill	h7g
			Solid garbage	j9i
			Incinerators	h7c
			Sewage	j9k
			Evaporation basins	f5j