

## Online Appendices

**Appendix S1.** List of datasets and number of plots used for the classification of New Zealand's non-forested vegetation communities. Dataset names correspond with the names used in the National Vegetation Survey databank. More information about these datasets can be obtained by searching for the name provided below at <https://nvs.landcareresearch.co.nz/Data/Search>. The acronym 'DTZ' stands for DTZ New Zealand Limited. DTZ inherited the monitoring records of the Department of Lands and Survey and archived them in the NVS databank.

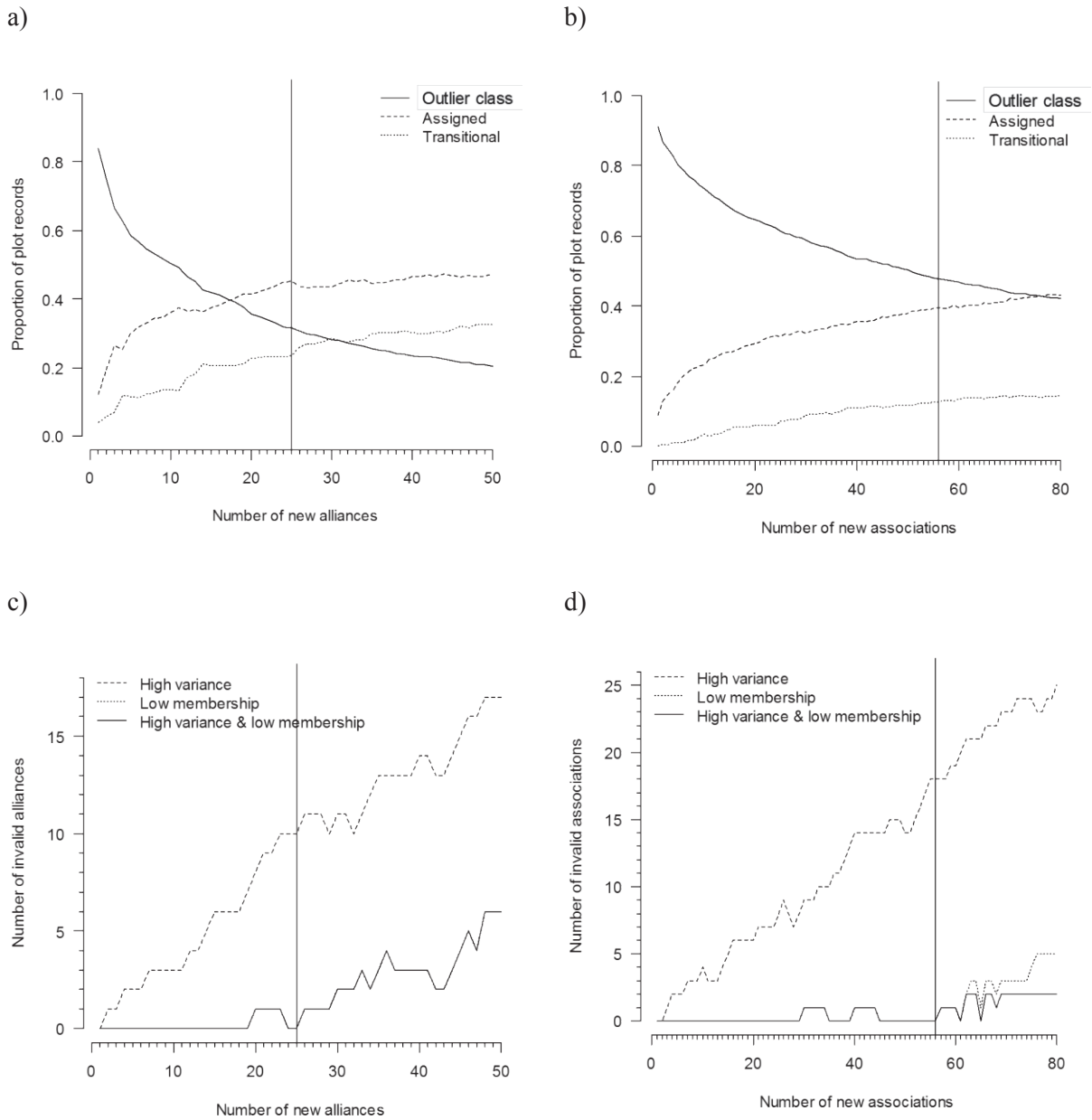
Dataset name	Number of plots used
AORANGI FOREST PARK FOREST 1985-1986	1
AORANGI FOREST PARK SCRUB 1986	1
ARROWSMITH FOREST 1985	19
ASHLEY/PUKETERAKI GRASSLAND 1978	60
ASPIRING GRASSLAND 1977-1978	86
AWATERE GRASSLAND 1993	57
BANKS PENINSULA BOTANICAL SURVEY MIXED 1983-1988	1227
BANKS PENINSULA OUTCROPS MIXED 1998-2000	38
BANKS PENINSULA OUTCROPS MIXED 2001	40
BIRCHWOOD WETLAND 2009	107
BLENHEIM ECOLOGICAL DISTRICT PNAP SURVEY MIXED 2001	2
CAMP CREEK FOREST 1982-1983	4
CAMP CREEK FOREST 1983-1984	1
CAPLES GRASSLAND 1984	11
CARNEY'S CREEK MIXED 1991	33
CASS FOREST 1988	11
CDRP EARNCLEUGH STATION 2008	10
CHEVIOT SCRUB 1994	2
COAL CREEK GRASSLAND 1976	4
COASTAL TURFS OF NEW ZEALAND OTHER 2003-2004	10
COLERIDGE FOREST 1987-1988	6
CRAIGEBURN WILDING PINES 2007	4
CRAIGIEBURN FOREST 1987-1989	25
DINGLE BURN GRASSLAND 1976	4
DTZ AOTEA CLMA TRANSECTS 1984	1
DTZ BARGOUR TRANSECTS 1997	3
DTZ BEN NEVIS TRANSECTS 2007	6
DTZ BENDIGO TRANSECTS 1994	12
DTZ BERWEN TRANSECTS 1999	1
DTZ BERWEN TRANSECTS 2006	3
DTZ BIRCHWOOD TRANSECTS 1997	3
DTZ BIRDWOOD TRANSECTS 1997	1
DTZ BLACK FOREST TRANSECTS 1987	6
DTZ BOG ROY TRANSECTS 1990	4
DTZ CAMBRIAN HILL TRANSECTS 1987	2
DTZ CARDRONA TRANSECTS 1986	2
DTZ CASTLE DENT TRANSECTS 1996	1
DTZ CASTLE DENT TRANSECTS 1999	12
DTZ CLOUDY PEAKS TRANSECTS 1996	1
DTZ CLOUDY PEAKS TRANSECTS 2005	8
DTZ CLUDEN TRANSECTS 2007	6
DTZ CONE PEAK TRANSECTS 1992	2
DTZ CONE PEAK TRANSECTS 1996	1
DTZ DART VALLEY TRANSECTS 1984	1
DTZ DEEP CREEK TRANSECTS 2005	3
DTZ DOUBLE HILL TRANSECTS 1984	2
DTZ EARNSCLEUGH TRANSECTS 1984	1
DTZ EARNSCLEUGH TRANSECTS 1986	9
DTZ FRASER BASIN TRANSECTS 1998	2
DTZ FRASER BASIN TRANSECTS 2005	10
DTZ GALLOWAY TRANSECTS 1986	5
DTZ GLAZEBROOK TRANSECTS A,B & C 1988	14
DTZ GLAZEBROOK TRANSECTS E & F 1986	11
DTZ GLEN ROCK TRANSECTS 1995	4
DTZ GLENFOYLE TRANSECTS 2005	3
DTZ GLENROY TRANSECTS 1996	2
DTZ GLENROY TRANSECTS 2007	2
DTZ GORGE CREEK TRANSECTS 1984	1
DTZ GRAFTON HILLS TRANSECTS 2007	2
DTZ GREENSTONE TRANSECTS 1986	4

Dataset name	Number of plots used
DTZ GREENSTONE TRANSECTS 1999	1
DTZ GREENSTONE TRANSECTS 2007	3
DTZ HALDON TRANSECTS 1985	1
DTZ HALDON TRANSECTS 1988	5
DTZ HAWEA TRANSECTS 2005	2
DTZ HERRONS TRANSECTS 2006	2
DTZ HUNTER VALLEY TRANSECTS 1985	12
DTZ IRISHMAN CREEK TRANSECTS 1983	6
DTZ JORDAN TRANSECTS 1990	12
DTZ KAWARAU TRANSECTS 2007	2
DTZ KILLERMONT TRANSECTS 2006	5
DTZ KIRKLISTON CLMA TRANSECTS 1982	17
DTZ KIRKLISTON TRANSECTS 2006	6
DTZ LAKE TAYLOR TRANSECTS 1997	6
DTZ LITTLE VALLEY TRANSECTS 1995	1
DTZ LITTLE VALLEY TRANSECTS 1998	8
DTZ LOCHABER TRANSECTS 1991	5
DTZ LONG GULLY TRANSECTS 2005	1
DTZ LONGSLIP TRANSECTS 1990	6
DTZ MAVORA TRANSECTS 1989	9
DTZ MICHAEL PEAK TRANSECTS 1984	6
DTZ MIDDLEHURST TRANSECTS 1989	7
DTZ MORVEN HILLS TRANSECTS 2007	3
DTZ MOTATAPU TRANSECTS 1996	8
DTZ MT AURUM TRANSECTS 1983	9
DTZ MT DOBSON TRANSECTS 1983	7
DTZ MT PISA TRANSECTS 1985	4
DTZ MT POTTS TRANSECTS 1998	2
DTZ MT ROSA TRANSECTS 2007	3
DTZ MT SOHO TRANSECTS 1989	1
DTZ MT SOHO TRANSECTS 1999	9
DTZ MT STUDHOLME CLMA TRANSECTS 1983	2
DTZ MT STUDHOLME CLMA TRANSECTS 1985	3
DTZ MT STUDHOLME TRANSECTS 2006	5
DTZ NINE MILE TRANSECTS 2006	2
DTZ NOKOMAI TRANSECTS 1997	6
DTZ OBELISK TRANSECTS 2006	3
DTZ OHAU RANGE CLMA TRANSECTS 1983	28
DTZ OHAU RANGE CLMA TRANSECTS 1997	1
DTZ OHAU SKIFIELD TRANSECTS 1982	1
DTZ OHAU SKIFIELD TRANSECTS 1986	6
DTZ OHAU TRANSECTS 2006	8
DTZ PAHAU CLMA TRANSECTS 1984	3
DTZ PAHAU CLMA TRANSECTS 1996	2
DTZ PORTER CLMA TRANSECTS 1984	3
DTZ PORTERS TRANSECTS 2006	8
DTZ REMARKABLES SKIFIELD TRANSECTS 1993	12
DTZ RICHMONDALE TRANSECTS 1983	4
DTZ RIVERSIDE TRANSECTS 1984	5
DTZ ROBROSA TRANSECTS 2007	4
DTZ ROSTRIEVOR TRANSECTS 1984	2
DTZ ROUTEBURN TRANSECTS 1986	6
DTZ ROUTEBURN TRANSECTS 2007	4
DTZ SANDY POINT TRANSECTS 2005	1
DTZ SHINGLEBURN CLMA TRANSECTS 1990	2
DTZ STONY CREEK TRANSECTS 1991	36
DTZ STONY CREEK TRANSECTS 2005	6
DTZ TEME BASIN TRANSECTS 1990	2
DTZ THE DOWNS TRANSECTS 1984	2
DTZ THE FORKS TRANSECTS 2006	1
DTZ TREBLE CONE SKIFIELD TRANSECTS 1982	1
DTZ TREBLE CONE SKIFIELD TRANSECTS 1986	13
DTZ TREBLE CONE SKIFIELD TRANSECTS 1996	5
DTZ TWINBURN TRANSECTS 1988	4
DTZ TWINBURN TRANSECTS 1993	1
DTZ TWINBURN TRANSECTS 2006	7
DTZ UPPER LAKE HERON TRANSECTS 1991	6
DTZ UPR LK HERON-NEW HUT TRANSECTS 1984	2

Dataset name	Number of plots used
DTZ WAIKERIKERI TRANSECTS 1987	1
DTZ WAITIRI TRANSECTS 1995	5
DTZ WENTWORTH TRANSECTS 1996	4
DTZ WEST WANAKA CLMA TRANSECTS 1984	11
DTZ WEST WANAKA CLMA TRANSECTS 1986	4
DTZ WHITECOMBE TRANSECTS 1995	1
DTZ WHITECOMBE TRANSECTS 1998	9
DTZ WITHER HILLS TRANSECTS 1993	5
DTZ WITHER HILLS TRANSECTS 1995	1
DTZ WITHER HILLS TRANSECTS 1997	10
DTZ WYE VALLEY TRANSECTS 1986	7
DUNSTAN FOREST 1984-1985	9
EBEX - DRY BUSH MIXED 2001	1
EBEX AUDIT - KURUNUI SCRUB 2006	3
FIORDLAND NTH GRASSLAND 1984-1985	57
FOX RIVER FOREST 1982	4
FOXTON FOREST 1989-1991	1
GLENDHU MIXED 1992	5
GODLEY FOREST 1985	1
GRASMERE ECOLOGICAL DISTRICT PNAP SURVEY MIXED 2001	3
GREBE/HAUROKO GRASSLAND 1976	35
GUMLANDS SURVEY	71
HAAST/ARAWATA FOREST 1998-2000	2
HAAST/ARAWATA GRASSLAND 1970-1971	95
HAKATERE FOREST 1984-1985	35
HARPER/AVOCA GRASSLAND 1975-1976	13
HARPER/AVOCA GRASSLAND 1980-1982	40
HARPER/AVOCA GRASSLAND 1985-1986	3
HARPER/AVOCA GRASSLAND 1990-1991	28
HILLERSDEN ECOLOGICAL DISTRICT PNAP SURVEY MIXED 2002-2003	1
HOKITIKA GRASSLAND 1971-1972	32
HURUNUI GRASSLAND 1975	47
HURUNUI/JOLLIE BROOK GRASSLAND 1975	11
KAIMANAWA/RANGITIKEI GRASSLAND 1981-1982	47
KAIMANAWA/RUATEA FOREST 1987	3
KAIPO GRASSLAND 1977	9
KARAMEA FOREST 1984-1985	6
KAWEKA GRASSLAND 1981-1982	12
KAWEKA/NGARURORO GRASSLAND 1980-1981	43
KNOBS FLAT 2008	1
KOKATAHI FOREST 1983	2
KOKATAHI MIXED 1999	13
LONG SOUND GRASSLAND 1977	20
LOOKOUT RANGE GRANITE SAND PLAINS OTHER 2008	72
MANAGING FOR MULTIPLE ECOSYSTEM SERVICES 2010	2
MANAWATU PLAINS FOREST 1993	1
MANORBURN GRASSLAND 1989	113
MATHIAS FOREST 1989	15
MCKENZIE MIXED 1984	10
MFE CARBON TRANSECT MIXED 1998-1999	3
MID DOME GRASSLAND 1979	10
MIKONUI RIVER MIXED 1985-1986	1
MOAWHITU CNPS CARBON SEQUESTRATION SITE D'URVILLE ISLAND 2008	10
MOLESWORTH MIXED 1987	1
MOTU FOREST 1983-1984	1
MOTUNAU SCRUB 1994	6
MOUNT COOK NATIONAL PARK BOTANICAL SURVEY MIXED 1968-1970	503
MT BARKER WILDING PINES FOREST 2007-2010	1
MT HUTT FOREST 1988-1989	28
NELSON, WEST MIXED 1982-1983	23
NELSON, WEST/ALPINE GRASSLAND 1982-1983	139
NELSON, WEST/MATIRI SLIPS MIXED 1982-1983	4
NELSON, WEST/VALLEY GRASSLAND 1982-1983	30
NHMS INVENTORY AND MONITORING FRAMEWORK PILOT STUDY 2008-2009	3
NZICMS: MAIN 2002-2007	38
PARINGA-OTOKO WILDLIFE FOREST 1984-1985	1
PASTORAL LEASE TENURE REVIEW SURVEY MIXED 1996	1
PASTORAL LEASE TENURE REVIEW SURVEY MIXED 2002-2007	103

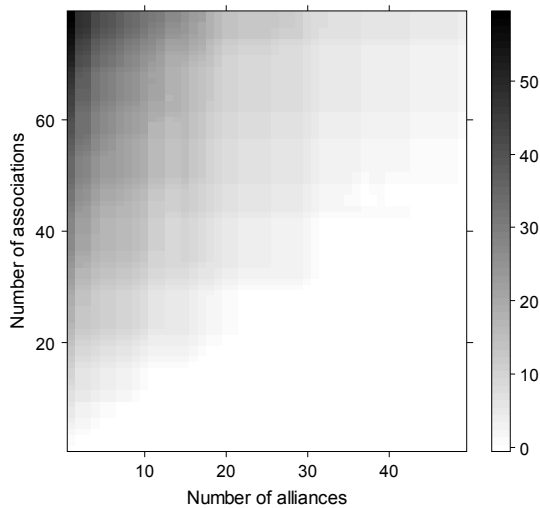
Dataset name	Number of plots used
PISA FOREST 1984-1985	12
POERUA FOREST 1984-1985	4
RAKAIA/MATHIAS FOREST 1986-1987	1
RANGIPO VOLCANIC DUNES 2009-2011	20
RANGITAIKI FROSTFLAT HABITAT INVENTORY SCRUB 2006	1
RANGITIKEI FOREST 1993	1
REWANUI - MONTFORD TRIMBLE FOUNDATION 2009	2
RICHMOND, MOUNT GRASSLAND 1978-1979	48
ROARING LION/BEAUTIFUL RVRS FOREST 1986	1
RUAHINE GRASSLAND 1975-1976	14
RUAHINE NORTH/KAWEKA FOREST 1983	17
RUAHINE, SOUTH GRASSLAND 1969-1970	4
S. W. M. E. P. FOREST 1983-1985	166
S. W. M. E. P. MAHITAHU RIVER FOREST 1984-1985	1
S. W. M. E. P. MOERAKI FOREST 1985	1
S. W. M. E. P. PARINGA-OTOKO FOREST 1984-1985	3
SKIPPERS RANGE GRASSLAND 1980-1981	30
SOUTH ISLAND COASTAL MIXED 1997-1998	90
SOUTHLAND PLAINS MIXED 1995	5
STEWART ISLAND BOTANICAL SURVEY MIXED-1984 1978	242
STEWART ISLAND EAST CHEW TOBACCO BAY FOREST 1985	2
STEWART ISLAND EAST PORT ADVENTURE FOREST 1985	2
STEWART ISLAND NORTH (STEWRT) 2008-2009	1
STEWART ISLAND/ANGLEM GRASSLAND 1976	23
TAIPO RIVER FOREST 1983-1984	1
TAKITIMU FOREST 1986	1
TARAMAKAU GRASSLAND 1973	49
TARARUA GRASSLAND 1984-1985	3
THOMAS, MOUNT FOREST 1986	1
TIMARU MIXED 1998-1999	20
TITIROA GRANITE FELLFIELDS 2009	90
TWO THUMB FOREST 1985	7
UPPER WAITAKI BASIN RIVERBED GRASSLAND 2002-2003	417
WAIMAKARIRI GRASSLAND 1972	79
WAIMANGARARA FOREST 1985-1986	2
WAINGARO-ANATOKI FOREST 1986-1987	2
WAIPAPA MIXED 1983-1984	2
WAIPOUA FOREST 1984-1985	1
WAIRAU BRANCH/LEATHAM GRASSLAND 1971	33
WAIRAU GRASSLAND 1972-1973	47
WAITAHA RIVER FOREST 1984-1985	2
WAITAKERE FOREST 1989	8
WAITAKI GRASSLAND 1985-1986	234
WAITUTU GRASSLAND 1978-1979	22
WANAKA FOREST 1984	4
WANGANUI RIVER FOREST 1983	1
WESTLAND NATIONAL PARK GRASSLAND 1977-1978	19
WHANGAMARINO WETLAND PLOT TRIAL MAY 2009	1

**Appendix S2.** Evaluation statistics for the classification of New Zealand’s non-forested vegetation communities at the level of alliance (a, c) and association (b, d). (a) and (b) proportion of plots belonging to the three categories (Outlier class, Assigned, Transitional). (c) Number of new alliances with high cluster variance (>0.6), low membership ( $\leq 20$ ), or both. (d) Number of new associations with high cluster variance (>0.5), low membership ( $\leq 10$ ), or both. The vertical lines indicate the number of alliances and associations adopted.

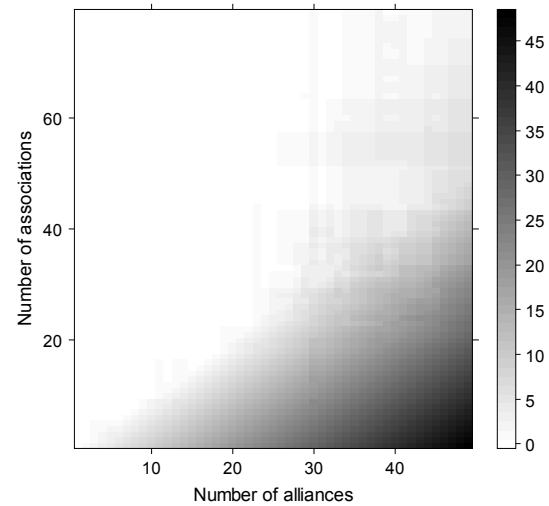


**Appendix S3.** Assignment of associations into alliances for a classification of New Zealand’s non-forested vegetation communities. For different combinations of numbers of alliances and associations, we plot (a) the number of alliances with no component associations, after all associations were assigned to the alliance to which they had the greatest membership (associations assigned to the alliance-level outlier class were excluded), and (b) the number of associations with membership  $>0.5$  to the outlier class and having  $\geq 20$  records.

a)



b)



**Appendix S4.** Plot record assignment for a classification of New Zealand’s non-forested vegetation communities. Final assignment of plot records used for the new classification based on rank data.

All plot records	
Total number of plots	6362
Assigned to pre-existing alliances/associations % cover	178
Assigned to pre-existing alliances/associations % ranks	327
Total assigned to pre-existing alliances/associations	505
<b>Alliance level (%)</b>	
<i>New alliances</i>	2643
Transitional	1368
Outlier	1846
<b>Association level (%)</b>	
<i>New associations</i>	2315
Transitional	741
Outlier	2801



