TECHNICAL MEMORANDUM

Reconnaissance Flora and Vegetation Assessment
Garden Lake North-West, Rottnest Island

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PROJECT NAME	Rottnest Island	**CLIENT**	Rottnest Island Authority
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1. INTRODUCTION

Emerge Associates (Emerge) were engaged by the Rottnest Island Authority to characterise the flora and vegetation values within a portion of Rottnest Island, comprising land to the north-west of Garden Lake (15.44 ha). The relevant area is referred to herein as the 'site' and is shown in **Figure 1.**

The scope of work was to undertake a flora and vegetation assessment to the standard required of a 'reconnaissance' survey in accordance with the Environmental Protection Authority's (EPA's) technical guidance (EPA 2016).

As part of this scope of work, the following tasks were undertaken:

- Desktop review of relevant background information pertaining to the site and surrounds, including database searches for conservation significant flora and ecological communities.
- A field survey to record flora and vegetation values.
- Identification of potential habitat for conservation significant flora and vegetation.
- Documentation of the desktop assessment, methodology, field surveys and results into a report.

2. DESKTOP ASSESSMENT

A search was conducted for threatened, specially protected and priority flora and ecological communities that may occur or have been recorded within a 10 kilometre (km) radius of the site using the *Protected Matters Search Tool* (DCCEEW 2023)and the Department of Biodiversity, Conservation and Attraction's (DBCA) conservation significant flora and community databases (reference nos. 48-0424FL and 40-0424EC).

One threatened flora species, four priority flora species, three threatened priority communities (TECs) and ten priority ecological communities (PECs) were identified from database searches and literature sources as occurring or potentially occurring within 10 km of the site. Information on these flora species and communities is provided in **Appendix A** and **Appendix B** respectively.

The distribution and habitat preferences of the threatened and priority flora species and ecological communities identified in database searches and literature sources were reviewed against site context information and preliminary survey results. Likelihood of occurrence of threatened flora species and ecological communities within the site was classified as 'high', 'moderate', 'low' or 'negligible' as outlined below in **Table 1.**

Table 1: Decision matrix for likelihood of occurrence of threatened and priority flora and ecological communities

		Distribution[1]	
		Reliable record within search area	No reliable record within search area
Habitat	Suitable	High	Negligible
	Potentially suitable	Moderate	
	Unsuitable	Low	

[1]Reliable record defined as validated, recent (within the last ~40 years) and spatially accurate (refer DBCA search meta data) in order to exclude unverified range or habitat projections.

2.1. Threatened and priority flora

Based on background information available for the site, four priority flora species was considered to have a high or moderate likelihood of occurring within the site as shown in **Table 2**. The remaining threatened and priority flora identified in database searches were classified as 'low' and 'negligible' and are detailed in **Appendix B**.

Table 2: Summary of conservation significant flora species with high likelihood of occurrence in the site

Species	Level of significance		Life strategy	Habitat	Flowering period
	State	EPBC Act			
Lachnagrostis nesomytica subsp. *nesomytica*	P1	-	A/P	Brown peaty soil over limestone. Edges of saline lakes.	Nov
Lachnagrostis nesomytica subsp. *pseudofiliformis*	P1	-	A/P	Peaty soil over limestone. Coastal areas, edges of saline lakes.	Nov-Dec
Lepidium puberulum	P4	-	A	Sandy soils.	Jul - Aug or Oct - Nov
Myosotis australis subsp. *australis*	P4	-	A	Rocks, bluffs, outcrops, ledges, scree, or banks.	Sep-Dec

2.2. Vegetation

Based on geomorphology, soils and regional vegetation patterns, two TECs and two PECs were considered to have potential to occur in the site:

- 'Subtropical and temperate coastal saltmarsh' TEC which is listed as 'vulnerable' under the *Environmental Protection and Biodiversity Conservation Act 1999.*
- 'Subtropical and temperate coastal saltmarsh' PEC which is listed as priority 3 in Western Australia.
- '*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands, Swan Coastal Plain' TEC which is listed as 'critically endangered' under the *Biodiversity Conservation Act 2016* (BC Act).
- 'Coastal shrublands on shallow sands' PEC which is listed as priority 3 in Western Australia.

In addition, a number of the PECs listed in **Appendix C** are microbial communities that have potential to occur in the southern and western peripheral areas of the site within Garden Land and Herschel Lake. These PECs are not of conservation significance due to flora and vegetation values and thus these communities are not discussed further in this report.

3. METHODS

3.1. Field survey

3.1.1. Flora and vegetation

One botanist from Emerge visited the site on 2 May 2024 to conduct the flora and vegetation surveys and traversed the site on foot.

Detailed sampling of the vegetation was undertaken using non-permanent 10 x 10 m quadrats. The quadrats were established using fence droppers bounded by measuring tape. The position[1] of each sample was recorded with a hand-held GPS receiver (±5 m accuracy).

The data recorded within each sample included:

- site details (site name, site number, observers, date, location)
- environmental information (slope, aspect, bare-ground, rock outcropping, soil type and colour, litter layer, topographical position, time since last fire event)
- biological information (species, plant specimens, vegetation structure, vegetation condition, 'foliage projective cover', and disturbance).

Plant specimens were collected where the identity of flora required further confirmation. Photographic images and notes were recorded as required. Flora was classified as native if indigenous to the IBRA region in which the site occurs. Non-native flora is denoted by '*' in text and raw data. The legal or policy status of flora was denoted using codes outlined in **Appendix C**.

Vegetation condition was mapped on aerial photography based on notes recorded during the field survey to define areas with differing condition and using the EPA (2016) scale (**Table 3**).

Table 3: Vegetation condition scale applied during the field assessment

Category	Definition (EPA 2016)
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks
Very good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

[1] The north-west corner was recorded.

3.2. Analysis and data preparation

3.2.1. Flora and vegetation

Flora were identified through comparison with named material and through the use of taxonomic keys. Plant specimens collected during the field survey were dried, pressed and named in accordance with requirements of the (Western Australian Herbarium 2024).

The vegetation units within the site were identified from the data collected during the field survey. The vegetation was described according to the dominant species present using the structural formation descriptions of the *National Vegetation Inventory System* (NVIS) (NVIS Technical Working Group 2017). The identified vegetation units were mapped on aerial photography during the field survey and boundaries were interpreted from aerial photography and notes taken in the field.

3.2.2. Floristic community type assignment

The identified plant communities were then compared to the regional 'floristic community type' (FCT) dataset *Flora and weed data for the Swan Coastal Plain* (Keighery *et al.* 2012). Each sample was compared to the Keighery *et al.* (2012) dataset separately to limit the influence of spatial correlation when assigning an FCT. FCT analysis was not undertaken for samples located within disturbed vegetation with low native species diversity as the vegetation was considered unlikely to currently represent an FCT.

Sample data (presence/absence) was first reconciled with Keighery *et al.* (2012) by standardising the names of taxa with those used in the earlier studies. This was necessary due to changes in nomenclature in the intervening period. Taxa that were only identified to genus level were excluded, while some infra-species that have been identified since 2012 were reduced to species level. The combined dataset was then imported into the statistical analysis package PRIMER v6 (Clarke and Gorley 2006).

A resemblance matrix was generated using the Bray-Curtis distance measure which provided the percentage similarity between all pairs of samples. Subsequently, a cluster analysis was undertaken using the resemblance matrix and hierarchical agglomerative clustering, to produce a dendrogram.

Where a sample tended to cluster with a grouping of different FCTs, the resemblance matrix was examined. Ultimately a combination of cluster analysis, resemblance matrix and contextual information relating to the soils, landforms and known FCTs within the region was considered in the final determination of an FCT for vegetation within the site.

3.2.3. Threatened and priority ecological community

Areas of native vegetation potentially representing a TEC were assessed against key diagnostic characteristics and, if available, size and/or vegetation condition thresholds.

4. RESULTS

4.1. Flora

4.1.1. Species inventory

A total of 29 native and 16 non-native (weed or planted) species were recorded within the site, representing 18 families and 37 genera. The dominant family recorded was the Chenopodiaceae, with nine native taxa occurring within the site. A species list is provided in **Appendix D**. The raw survey data is provided in **Appendix E**.

A number of native species have been planted in the site, including *Melaleuca huegelii* subsp. *huegelii* and *Eucalyptus gomphocephala* (tuart). While endemic within the City of Cockburn, the individuals of these species are not native vegetation[2] and so have been designated as planted rather than native.

4.1.2. Threatened and priority flora

No threatened or priority flora were recorded. Suitable habitat for priority flora species occurs in parts of the site, as detailed in **Section 5.1**.

4.1.3. Declared pests

No flora species listed as a declared pest pursuant to the BAM Act were recorded.

4.2. Vegetation

4.2.1. Vegetation units

Nine vegetation units were identified within the site, as well as areas of open water. A description and the area of each unit is provided in **Table 4** and representative photographs are provided in **Plate 1** to **Plate 10**. The location of each vegetation unit is shown in **Figure 2**.

Table 4: Vegetation units present within the site

Vegetation units	Description	Area (ha)
ApPp	Forbland of *Acanthocarpus preissii* over sedgeland of *Lepidosperma gladiatum (or layer absent)* and open grassland of *Poa poiformis* on dunes and limestone outcrops (**Plate 1**)	0.78
BvApPp	Shrubland of *Beyeria viscosa*, *Pittosporum ligustrifolium* and *Rhagodia baccata* subsp. *dioica* over forbland of *Acanthocarpus preissii* and **Asphodelus fistulosus* and open grassland of *Poa poiformis* on sand dunes (**Plate 2**)	0.27
EuMl	Woodland of **Eucalyptus utilis* and *Melaleuca lanceolata* over forbland of *Acanthocarpus preissii* and **Asphodelus fistulosus* (**Plate 3**)	0.08
GtBjTS	Open shrubland of *Atriplex cinerea, A. isatidea* and *Rhagodia baccata* subsp. *dioica* over sedgeland of *Baumea juncea* and *Gahnia trifida* over forbland of *Tecticornia indica* subsp. *bidens, Salicornia quinqueflora* and *Samolus repens var. paucifolius* over grassland of *Sporobolus virginicus* and **Cynodon dactylon* along drainage lines (**Plate 4**)	0.50

[2] As defined under the *Environmental Protection Act 1986*

Table 4: Vegetation units present within the site (cont.)

Vegetation units	Description	Area (ha)
Ml	Low woodland of *Melaleuca lanceolata* over sparse forbland of *Acanthocarpus preissii* and forbland of weeds (or layers absent) on sands (**Plate 5**)	1.20
MlCp	Low woodland of *Melaleuca lanceolata* and *Callitris preissii* over open forbland of *Acanthocarpus preissii* and weeds on sand often with underlying limestone (**Plate 6**)	1.22
MlTS	Open woodland of *Melaleuca lanceolata* over closed forbland of *Tecticornia indica* subsp. *bidens* and/or *Suaeda australis* and *Atriplex cinerea* along periphery of salt lakes (**Plate 7**)	0.34
TS	Closed forbland of *Tecticornia indica* subsp. *bidens, Tecticornia halocnemoides, Salicornia quinqueflora* and *Suaeda australis* along periphery of salt lakes (**Plate 8**)	1.35
Non-native/cleared	Heavily disturbed areas comprising bare ground, weeds, turf, planted trees or built structures including buildings and roads (**Plate 9**)	7.50
Open water	Portions of Garden Lake and Herschel Lake (**Plate 10**)	2.20



*Plate 1: Vegetation unit **ApPp** in 'very good' condition*



*Plate 2: Vegetation unit **BvApPp** in 'good' condition*



*Plate 3: Vegetation unit **EuMl** in 'degraded' condition*



*Plate 4: Vegetation unit **GtBjTS** in 'good' condition*



*Plate 5: Vegetation unit **MI** in 'degraded' condition*



*Plate 6: Vegetation unit **MlCp** in 'good' condition*



*Plate 7: Vegetation unit **MlTS** in 'good' condition*



*Plate 8: Vegetation unit **TS** in 'very good' condition*



Plate 9: Non-native vegetation in 'completely degraded' condition



Plate 10: Areas of open water (Herschel Lake) within the site

4.2.2. Vegetation condition

The extent of vegetation by condition category is detailed in **Table 5** and shown in **Figure 3.**

Table 5: Vegetation condition categories within the site

Condition category (Keighery (1994))	Size (ha)
Pristine	0
Excellent	0
Very good	1.25
Good	3.24
Degraded	1.25
Completely degraded	7.50
N/A	2.20

4.2.3. Floristic community type

The floristic analysis tended to identify highest similarity of each samples to multiple FCTs, particularly FCTs S11, S12, S13 and 16. The most similar Keighery *et al.* (2012) samples and the resulting FCTs are shown in **Table 6**.

The relevant portions of the cluster dendrograms are provided in **Appendix F**.

Table 6: Vegetation unit and likely FCT represented within the site for each sample

Vegetation unit	Sample	Most similar Keighery *et al.* (2012) sites	Similarity (%)	Determined floristic community type (FCT)
BvApPp	Q2^	Rott01 (FCT S11)	24	FCT S11: Northern *Acacia rostellifera – Melaleuca systena* shrublands'
		Rott02 (FCT 29a)	19	
ApLg	R3^	Ml08 (FCT S11)	22	
		Ml19(FCT S13)	22	
		Ml11(FCT S13)	20	
Ml	R14	Rott01 (FCT S11)	31	FCT S12: 'Rottnest Island *Melaleuca lanceolata* and/or *Callitris preissii* forests and woodlands'
		Rott02 (FCT S12)	31	
MlCp	R4	Rott03 (FCT S12)	31	
	R5	WOODP-1 (FCT 30a2)	31	
	R7	Rott03 (FCT S12)	32	
	R8	Rott03 (FCT S12)	24	
	R9^	Rott01 (26) S11	26	
		GARD03 (FCT 30a1)	20	
	R11	Rott03 (FCT S12)	32	
TS	Q1^	Rott04 (FCT S12)	13	FCT 16: 'Highly saline seasonal wetlands'
	Q12	NAVB-1 (FCT 16)	30	
	Q13^	Rott04 (FCT S12)	33	
		ALFR01 (FCT 16)	25	
		ROTT05 (FCT 16)	24	
MlTS	R10^	Rott01 (FCT S11)	24	
		Rott06 (FCT S12)	24	
		SANDON-1 (FCT 16)	13	
GtBjTS	R6	NAVB-1 (FCT 16)	30	

^ denotes samples individual similarity to Keighery et al. (2012) dataset sites rather than a cluster within the dendrogram

4.2.4. Threatened and priority ecological communities

The following TECs and PEC was identified within the site:

- Subtropical and temperate coastal saltmarsh TEC
- Subtropical and temperate coastal saltmarsh PEC
- *Callitris preissii* (or *Melaleuca lanceolata*) forests or woodlands TEC.

The locations of the TECs and PEC within the site are shown in **Figure 5**. A summary table of each TEC and PEC present and the area (ha) is provided in **Table 7.**

Table 7: TECs and PECs within the site

TEC/PEC	Area (ha)
'Subtropical and temperate coastal saltmarsh' TEC/PEC	1.35
'Callitris preissii (or *Melaleuca lanceolata*) forests or woodlands' TEC	1.45

The **GtBjTS** and **TS** vegetation met the criteria to represent the Commonwealth listed 'Subtropical and temperate coastal saltmarsh' TEC as detailed in **Table 8**. The **MlTS** vegetation was also assessed against the TEC criteria but did not qualify, as detailed in **Table 8**.

Table 8: Assessment of site conditions against the Subtropical and temperate coastal saltmarsh TEC criteria (adapted from (DSEWPaC 2013))

Criteria	Site implications
Occurs south of 23° 37'	The site occurs south of 23° 37'
Occurs on the coastal margin, along estuaries and on low energy coasts	The site does not occur on the coastal margin, along estuaries or on low energy coasts. However, Garden Lake is a saline lake of an offshore island that is likely that maintains some groundwater connectivity with the sea (DSEWPaC 2013)
Occurs on sandy or muddy substrates and may include coastal clay pans (and the like)	The **GtBjTS**, **MlTS** and **TS** vegetation occur on sandy or muddy substrates
Occurs on places with at least some tidal connection, including rarely inundated supratidal areas, intermittently opened or closed lagoons, and groundwater tidal influences, but not areas only receiving aerosol spray	The **GtBjTS**, **MlTS** and **TS** vegetation occurs adjacent to Garden and Herschel Lake, which are closed lagoons
Consists of dense to patchy areas of characteristic coastal saltmarsh plant species (i.e. salt tolerant herbs, succulent shrubs or grasses, that may also include bare sediment as part of the mosaic)	The **GtBjTS**, **MlTS** and **TS** vegetation tends to comprise a dense layer of *Tecticornia indica* subsp. *bidens*, *Tecticornia halocnemoides* and *Salicornia quinqueflora* with *Suaeda australis* or *Atriplex cinerea* co-occurring. All species are commonly recorded within the TEC.
Proportional cover by tree canopy such as mangroves, Melaleucas or Casuarinas is not greater than 50%, nor is proportional ground cover by seagrass greater than 50%	The **MlTS** vegetation includes a dense canopy of *Melaleuca lanceolata*. As the *M. lanceolata* canopy exceeds 50% cover, the vegetation does not meet this criterion
Result	All of the **GtBjTS** and **TS** vegetation represents the TEC. The site supports 1.35 ha of the subtropical and temperate coastal saltmarsh TEC

DBCA's *Priority Ecological Community* list indicates that the description, area and condition thresholds that apply to the Commonwealth-listed TEC of the same name also apply to the 'subtropical and temperate coastal saltmarsh' PEC (DBCA 2023b). Therefore, a total of 1.35 ha of this PEC occurs within the site as shown in **Figure 4**.

Portions of the **MlCp** vegetation represent the '*Callitris preissii* (or *Melaleuca lanceolata*) forests or woodlands' TEC as they contain key indicator species and meet the TEC description. No official condition thresholds apply to this TEC and so the **MlCp** vegetation in good or better condition is considered to represent this TEC. As such 1.45 ha of this TEC occurs within the site.

5. Discussion

5.1. Flora

Four priority species occur on Rottnest Island: *Lachnagrostis nesomytica* subsp. *nesomytica* (P1), *Lachnagrostis nesomytica* subsp. *pseudofiliformis* (P1), *Lepidium puberulum* (P4) and *Myosotis australis* subsp. *australis* (P4). Both *Lachnagrostis* species are restricted to the edges of salt lakes and thus habitat for both species is present along the southern and eastern portions of the site bordering Garden and Herschel Lakes. Both *Lachnagrostis* species are annual grasses and flower in November thus would not have been discernible at the time of the survey. Additional survey in November would be required to determine the presence or absence of these species.

Lepidium puberulum (P4) occurs on the WA mainland and various islands, with one record on Rottnest Island in *Melaleuca lanceolata* woodland (WA Herbarium 2023). Suitable habitat for *L. puberulum* occurs in parts of the site within the **MI** and **MlCp** vegetation. *Myosotis australis* subsp. *australis* (P4) occurs along the coast of WA between Perth and Esperance with scattered occurrences. Three occurrences of *M. australis* subsp. *australis* have been recorded on Rottnest Island, where it occurs on shallow sands over limestone in the southern portion of the island. Both *L. puberulum* and *M. australis* subsp. *australis* are annuals so additional survey in the flowering period (July-August or October-November) would be required to determine the presence or absence of these species.

5.2. Vegetation

5.2.1. Vegetation condition

The vegetation within the site shows evidence of a high level of historical disturbance through land clearing, grazing and weed invasion. Whilst some planting of native species has been undertaken, a variety of non-native and non-endemic species have also been planted.

The most intact vegetation comprises some of the **ApPp** and **TS** vegetation 'very good' condition where it has high native species cover and low weed cover. The areas in 'good' condition tended to comprise a very low number of native species but with high native cover, and hence lower weed cover than the 'degraded' vegetation. Areas of 'completely degraded' vegetation consist of the golf course, road and tracks with high weed cover and are almost devoid of native species.

5.2.2. Floristic community type assignment

The Gibson *et al.* (1994) dataset is the standard for FCT analysis in the Swan Coastal Plain region (EPA 2016) but does not include any samples on Rottnest Island. Keighery *et al.* (2012) is more appropriate to use for FCT analysis for the site as it provides an updated version of the Gibson *et al.* (1994) dataset with six sites on Rottnest Island. When compared to the Keighery *et al.* (2012) dataset, the samples clustered to a range of FCTs, mostly FCTs defined solely by Keighery *et al*. (2012) and detailed in *Bush Forever* documentation (FCTs 16, 29a, S11, S12 and S13 were assigned to the samples on Rottnest Island).

It should be noted that whilst Keighery *et al.* (2012) defined FCTs S11 to S15 and provided community names, no other details exist as to the defining species and characteristics. Therefore, assignment of some of the vegetation in the site to FCT S11 and S12 is based solely on the FCT analysis and Keighery *et al.* (2012) community name.

The similarity of the sample data to multiple FCTs is likely due to the high level of historical disturbance, very low number of species in each sample (less than ten species for most samples) and the low number of Keighery *et al*. (2012) samples on Rottnest Island. Some plant communities clustered with an FCT with relatively high similarity but that was not considered the most appropriate FCT due to species composition and/or vegetation structure. Ultimately a combination of the FCT analysis results, flora species present and contextual information was used to assign the most likely FCT for each plant community.

Additional flora survey undertaken in the main flowering period may impact the number of annual native and non-native species recorded within the site. Whilst this may also affect the results of the FCT analysis to some extent, it is not considered likely to change the final assignment of FCTs due to the level of historical disturbance.

5.2.3. Threatened and priority ecological communities

The 'subtropical and temperate coastal saltmarsh' TEC/PEC was not included within either the results of the PMST or DBCA database searches. However, it is listed as occurring on the island within the *Terrestrial Conservation Action Plan* (Rottnest Island Authority 2015) and the **TS** and **GtBjTS** vegetation meet the criteria to represent the TEC/PEC.

The DBCA database shows that two occurrences of the '*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands' TEC occur close to the site. Due to the presence of *Melaleuca lanceolata* and *Callitris preissii*, portions of the **MlCp** vegetation are considered to represent the State listed '*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands' TEC. The *Interim Recovery Plan* for the '*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands' TEC refers to S12 'Rottnest Island *Melaleuca lanceolata* and/or *Callitris preissii* forests and woodlands' as a sub-type of the TEC. Samples R4, R7 and R8 in **MlCp** showed high similarity to FCT S12 and also contained *Callitris preissii* which is a key indicator for the TEC (DPaW 2014; DBCA 2023a). *C. preissii* was historically abundant on Rottnest Island but its extent has been reduced and the remainder is generally found as scattered occurrences amongst *Melaleuca lanceolata* closed woodland. Thus, where *C. preissii* and *M. lanceolata* occur together the vegetation is considered to represent the TEC, as are those areas containing *Melaleuca lanceolata* as a dominant species or any sporadic occurrences of *C. preissii*. As there are no condition thresholds for the TEC, vegetation in 'good' or better condition has been classified as the TEC. Some portions of the *Callitris preissii* individuals within **MlCp** vegetation were planted but were still considered to contribute to the TEC.

6. CONCLUSIONS

No threatened or priority flora were recorded in the site.

Four priority flora species have the potential to occur within the site: *Lachnagrostis nesomytica* subsp. *nesomytica* (P1), *Lachnagrostis nesomytica* subsp. *pseudofiliformis* (P1), *Lepidium puberulum* (P4) and *Myosotis australis* subsp. *australis* (P4). Survey in October/November would be required to determine the presence or absence of these species.

Eight vegetation units were recorded within the site, ranging from 'completely degraded' to 'very good' condition.

The majority of the site has been highly disturbed, with 8.75 ha (56.6% of the site) in 'degraded' or 'completely degraded' condition. Vegetation in 'good' and 'very good' condition occurs across 4.49 ha (29.1%), with the remainder of the site comprising open water (2.20 ha, 14.3%).

The 'subtropical and temperate coastal saltmarsh' TEC and PEC of the same name (1.35 ha) and the '*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands' TEC (1.45 ha) occur within the site.

No other TECs or PECs occur.

7. REFERENCES

7.1. General references

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7.2. Online references

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Figures

Figure 1: Site Location

Figure 2: Vegetation Units

Figure 3: Vegetation Condition

Figure 4: Threatened and Priority Ecologicial Communities



Figure 1: Site Location

Project: Reconnaissance Flora and Vegetation Assessment
Garden Lake North-West
Client: Rottnest Island Authority

Plan Number:
EP23-032(06)--F21
Drawn: GAR
Date: 10/06/2024
Checked: SKP
Approved: RAW
Date: 18/06/2024

N

0 40 80 120
Metres
Scale: 1:4,000@A4
GDA2020 MGA Zone 50

emerge ASSOCIATES

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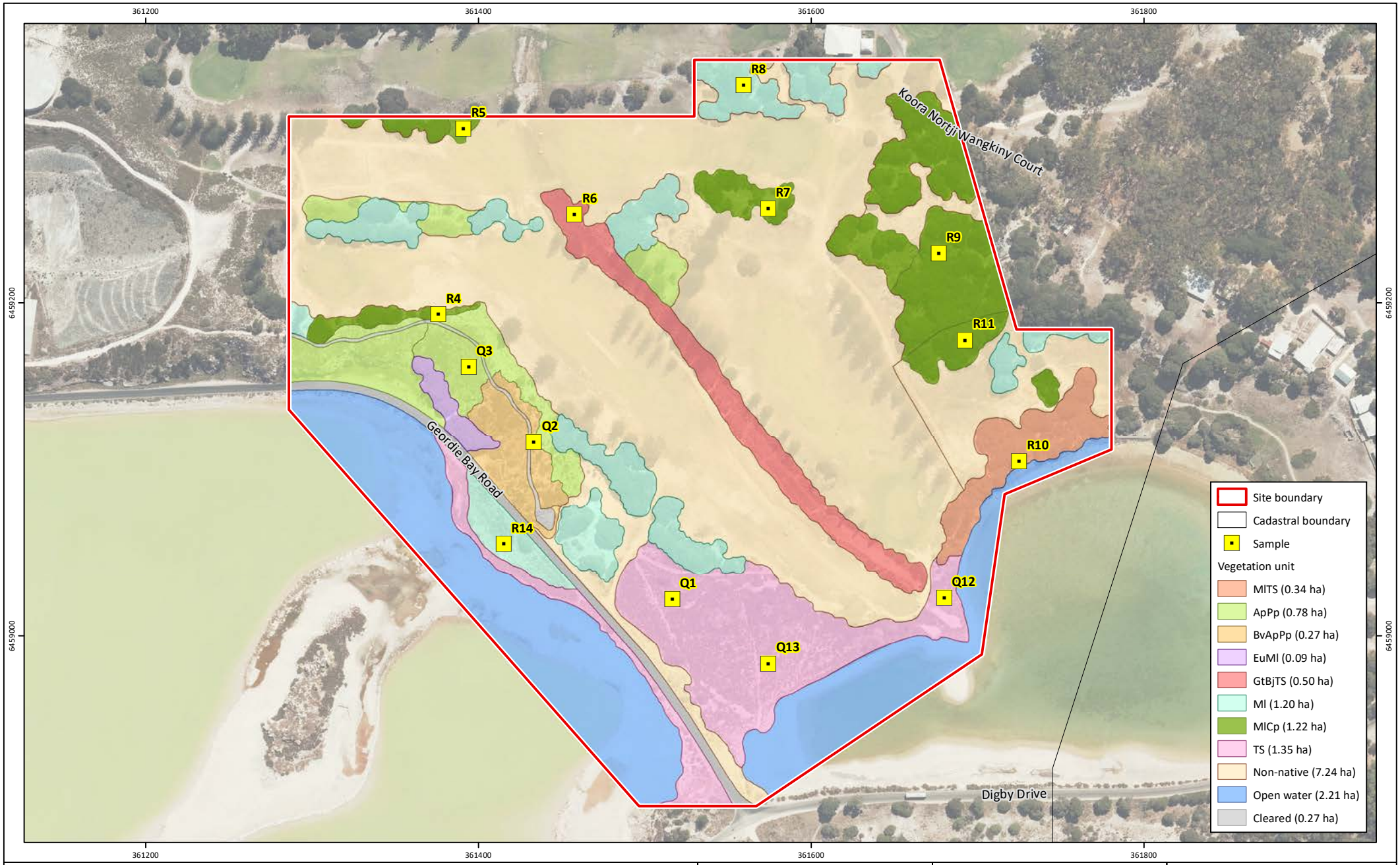


Figure 2: Vegetation Units

Project: Reconnaissance Flora and Vegetation Assessment
Garden Lake North-West
Client: Rottnest Island Authority

Plan Number:
EP23-032(06)--F22
Drawn: GAR
Date: 10/06/2024
Checked: SKP
Approved: RAW
Date: 18/06/2024

N

0 30 60 90
Metres
Scale: 1:3,000@A4
GDA2020 MGA Zone 50

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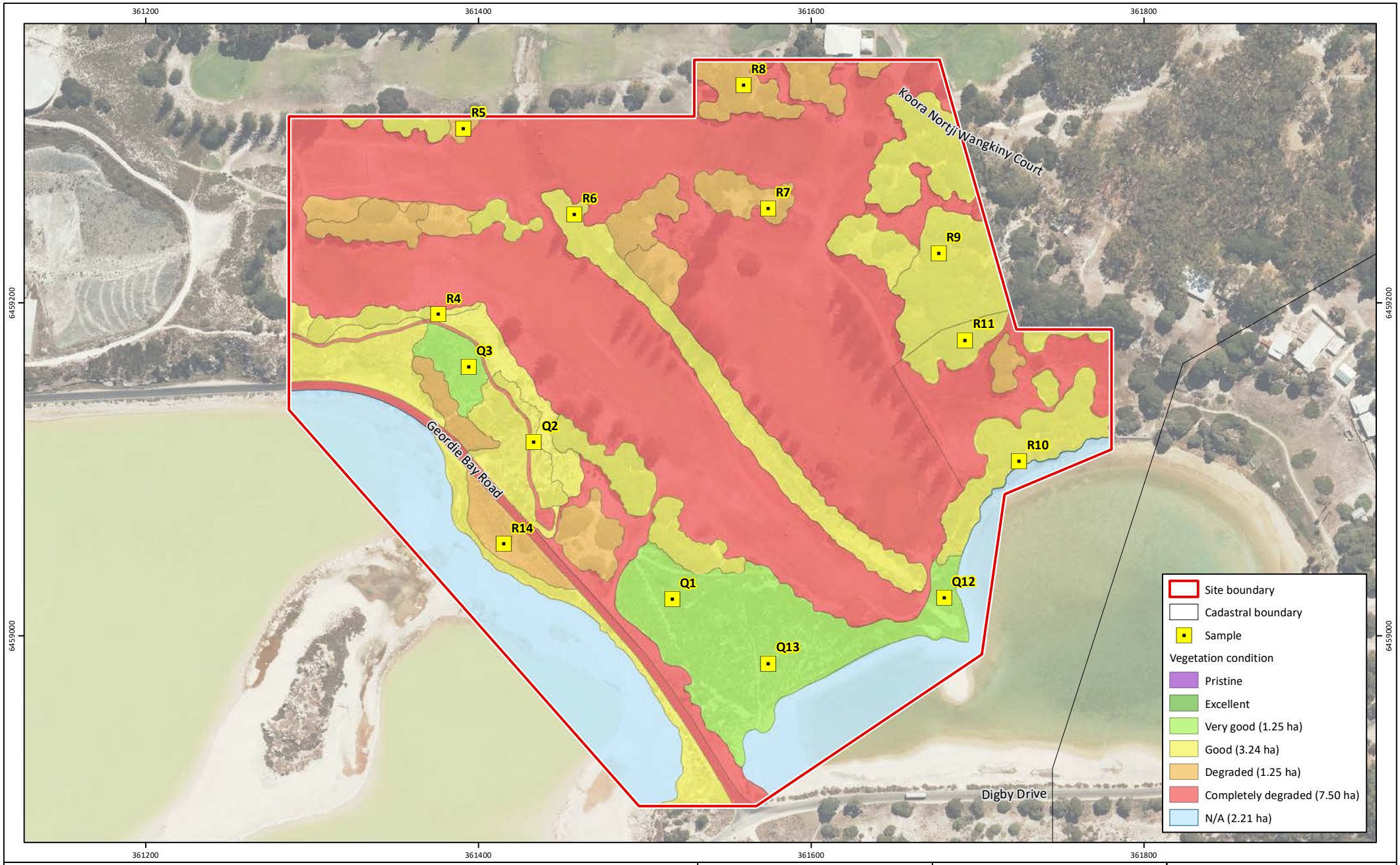


Figure 3: Vegetation Condition

Project:	Reconnaissance Flora and Vegetation Assessment Garden Lake North-West
Client:	Rottnest Island Authority

Plan Number:
EP23-032(06)--F23

Drawn:	GAR
Date:	10/06/2024
Checked:	SKP
Approved:	RAW
Date:	18/06/2024

N

0 30 60 90
Metres

Scale: 1:3,000@A4

GDA2020 MGA Zone 50

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Figure 4: Threatened and Priority Ecological Communities

Project: Reconnaissance Flora and Vegetation Assessment
Garden Lake North-West
Client: Rottnest Island Authority

Plan Number:
EP23-032(06)--F24
Drawn: GAR
Date: 10/06/2024
Checked: SKP
Approved: RAW
Date: 18/06/2024

N

0 30 60 90
Metres
Scale: 1:3,000@A4
GDA2020 MGA Zone 50

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Appendix A

Likelihood of Occurrence - Flora

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Diuris micrantha	VU	VU	PG	Dark grey-black sandy clay-loam in winter wet depressions or swamps. Often in shallow standing water.	Aug/Sep-early Oct	Negligible
Lachnagrostis nesomytica subsp. *nesomytica*	P1	-	A/P	Brown peaty soil over limestone. Edges of saline lakes.	Nov	High
Lachnagrostis nesomytica subsp. *pseudofiliformis*	P1	-	A/P	Peaty soil over limestone. Coastal areas, edges of saline lakes.	Nov-Dec	High
Lepidium puberulum	P4	-	A	Sandy soils.	Jul - Aug or Oct - Nov	Moderate
Myosotis australis subsp. australis	P4	-	A	Rocks, bluffs, outcrops, ledges, scree, or banks.	Sep-Dec	Moderate

Note: T=threatened, CE=critically endangered, E=endangered, V=vulnerable, P1=Priority 1, P2=Priority 2, P3=Priority 3, P4=Priority 4, P=perennial, PG=perennial geophyte, A=annual.

Appendix B

Likelihood of Occurrence - Communities

Conservation Significant Communities Likelihood of Occurrence
Garden Lake north-west, Rottnest Island

Code	Community name	TEC/ PEC	Level of significance		Likelihood of occurrence
			State	EPBC Act	
Banksia woodlands of the SCP	Banksia woodlands of the Swan Coastal Plain	TEC/ PEC	P3	EN	Negligible
SCP30a	*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands, Swan Coastal Plain	TEC	CE	-	High
Subtropical and Temperate Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	TEC/ PEC	P3	VU	High
SCP29a	Coastal shrublands on shallow sands	PEC	P3	-	Moderate
Government House Lake Microbial	Hypersaline microbial community 1 (Government House Lake, Rottnest)	PEC	P2	-	Negligible
Rottnest Island Microbial - Baghdad	Microbialites and microbial mats of coastal hypersaline lakes (Rottnest Island); Lake Baghdad	PEC	P1	-	Negligible
Rottnest Island Microbial - Garden	Microbialites and microbial mats of coastal hypersaline lakes (Rottnest Island). Community 5 - Garden Lake	PEC	P1	-	High
Rottnest Island Microbial - Herschel	Microbialites and microbial mats of coastal hypersaline lakes (Rottnest Island). Community 6 - Herschel Lake	PEC	P1	-	High
Rottnest Island Microbial - Serpentine	Rottnest Island Microbial Lake community 1 - Serpentine Lake	PEC	P1	-	Negligible
Rottnest Island Microbial - Timperley	Microbialites and microbial mats of coastal hypersaline lakes (Rottnest Island): Community 2 - Lake Timperley	PEC	P1	-	Negligible
Rottnest Island Microbial - Vincent	Microbialites and microbial mats of coastal hypersaline lakes (Rottnest Island). Lake community 3 - Lake Vincent	PEC	P1	-	Negligible

Note: TEC=threatened ecological community, PEC=priority ecological community, CR=critically endangered, EN=endangered, VU=vulnerable, P1-P4=priority 1-priority 4

Appendix C

Additional Background Information

Conservation Significant Flora and Vegetation

Threatened and priority flora

Flora species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, flora species can be listed as 'threatened' pursuant to Schedule 1 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In Western Australia, plant taxa may be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act) which is enforced by Department of Biodiversity Conservation and Attractions (DBCA). Threatened flora species are listed under sections 19(1) and 26(2) of the BC Act and published in the Biodiversity Conservation (Species) Order 2022. It is an offence to 'take' or disturb threatened flora without Ministerial approval. Section 5(1)1 of the Act defines to take as including "… to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means" or to cause or permit the same to be done.

Threatened flora are assigned categories under the EPBC Act and BC Act according to their conservation status, as outlined in **Table 1**.

Flora species that may be threatened or near threatened but lack sufficient information to be listed under the BC Act may be added to the DBCA's *Priority Flora List* (DBCA 2018b). Priority flora species are considered during State approval processes. Priority flora are assigned categories as listed in **Table 1**.

Table 1: Definitions of threatened and priority flora species pursuant to the EPBC Act and BC Act and on DBCA's Priority Flora List (DBCA 2023b)

Conservation code	Description
EX†	Threatened Flora – Presumed Extinct Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.
T^†	Threatened Flora – Extant Taxa which are declared to be likely to become extinct or is rare, or otherwise in need of special protection.
CR^	Threatened Flora – Critically Endangered Taxa which are considered to be facing an extremely high risk of extinction in the wild.
EN^	Threatened Flora – Endangered Taxa which are considered to be facing a very high risk of extinction in the wild.
VU^	Threatened Flora – Vulnerable Taxa which are considered to be facing a high risk of extinction in the wild.
P1	Priority One – Poorly Known Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat e.g. road verges, urban areas, farmland, active mineral leases etc., or the plants are under threat, e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2	Priority Two – Poorly Known Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but urgently need further survey.
P3	Priority Three – Poorly Known Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but needs further survey.
P4	Priority Four – Rare Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

^pursuant to the EPBC Act, †pursuant to the BC Act, on DBCA's *Priority Flora List*

Threatened and priority ecological communities

'Threatened ecological communities' (TECs) are ecological communities that are rare or under threat and therefore warrant special protection. Selected TECs are afforded statutory protection at a Commonwealth level under section 181 of the EPBC Act. TECs nominated for listing under the EPBC Act are considered by the Threatened Species Scientific Committee and a final decision is made by the Commonwealth Minister for the Environment. Once listed under the EPBC Act, communities are categorised as either 'critically endangered', 'endangered' or 'vulnerable' as defined in **Table 2**. Any action likely to have a significant impact on a community listed under the EPBC Act requires approval from the Minister for the Environment.

In Western Australia TECs are listed under sections 27(1), 31 and 33 of the BC Act. TECs are determined by the Western Australian Threatened Ecological Communities Scientific Advisory Committee (WATECSAC) and endorsed by the State Minister for the Environment. The WATECSAC is an independent group comprised of representatives from organisations including tertiary institutions, the Western Australian Museum and DBCA. The TECs listed under the BC Act are defined in Schedule 1 of the Biodiversity Conservation (Threatened Ecological Communities) Order 2023. State TECs are also acknowledged through other environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

TECs are assigned to one of the categories outlined in **Table 2** according to their level of threat.

Table 2: Categories of threatened ecological communities (English and Blyth 1997; DEC 2009)

Conservation code	Description
PD	Presumably Totally Destroyed An ecological community that has been adequately searched for but for which no representative occurrences have been located.
CE	Critically Endangered An ecological community that has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
E	Endangered An ecological community that has been adequately surveyed and is not critically endangered but is facing a very high risk of total destruction in the near future.
V	Vulnerable An ecological community that has been adequately surveyed and is not critically endangered or endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future.

An ecological community with insufficient information available to be considered a TEC or which are rare but not currently threatened may be listed as a 'priority ecological community' (PEC). PECs are categorised based on a variety of criteria, as described in **Table 3**. Listed PECs are published by DBCA (DBCA 2023a).

Table 3: Categories of priority ecological communities (DEC 2013)

Priority code	Description
P1	Priority One: Poorly known ecological communities Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2	Priority Two: Poorly known ecological communities Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	Priority Three: Poorly known ecological communities (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4	Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
P5	Priority Five: Conservation Dependent ecological communities Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Reporting

Section 43 of the BC Act requires that an occurrence of a threatened species or threatened ecological community is reported to DBCA where the occurrence has been identified as part of field work completed:

- as part of an assessment under Part IV of the *Environmental Protection Act 1986*; or
- in relation to an application for a clearing permit under the *Environmental Protection Act 1986* section 51E(1)(d).

Penalties apply to individuals and organisations that fail to provide accurate reports of threatened species or communities.

The *Biodiversity Conservation Regulations 2018* (BC Regulations 2018) came into effect on January 1 2019. The BC Regulations include provisions for licencing, charges, penalties and other provisions associated with the BC Act.

Weeds

A number of legislative and policy documents exist in relation to weed management at state and national levels. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the principle legislation guiding weed management in Western Australia and lists declared pest species. At a national level, the Australian government has compiled a list of 32 Weeds of National Significance (WoNS) (DoEE 2018), of which many are also listed under the BAM Act.

Declared Pests

Part 2.3.23 of the BAM Act requires a person must not; "*a) keep, breed or cultivate the declared pest; b) keep, breed or cultivate an animal, plant or other thing that is infected or infested with the declared pest; c) release into the environment the declared pest, or an animal, plant or other thing that is infected or infested with the declared pest; or d) intentionally infect or infest, or expose to infection or infestation, a plant, animal or other thing with a declared pest*".

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 7**. Species assigned to the 'declared pest, prohibited - s12' category are placed in one of three control categories, as described in **Table 8**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the 'declared pest - s22(2)' category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 9**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DPIRD 2020).

Table 4: Legal status of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
Declared Pest Prohibited - s12	May only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions.
Declared Pest s22(2)	Must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia

Table 5: Control categories of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
C1	Exclusion Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2	Eradication Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Table 6: Keeping categories of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
Prohibited	Can only be kept under a permit for public display and education purposes, and/or genuine scientific research, by entities approved by the state authority.
Exempt	No permit or conditions are required for keeping.
Restricted	Organisms which, relative to other species, have a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals.

Wetland Habitat

Geomorphic wetland types

On the Swan Coastal Plain DBCA (2017) have used the geomorphic wetland classification system developed by Semeniuk (1987) and Semeniuk and Semeniuk (1995) to classify wetlands based on the landform shape and water permanence (hydro-period) as outlined in **Table 10**.

Table 7: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017)

Level of inundation	Geomorphology			
	Basin	Flat	Channel	Slope
Permanently inundated	Lake	-	River	-
Seasonally inundated	Sumpland	Floodplain	Creek	-
Seasonally waterlogged	Dampland	Palusplain	-	Paluslope

Wetland management categories

DBCA maintains the *Geomorphic Wetland of the Swan Coastal Plain* dataset (DBCA 2018a), which also categorises individual wetlands into specific management categories as described in **Table 11**.

Table 8: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017)

Management category	Description of wetland	Management objectives
Conservation (CCW)	Support high levels of attributes	Preserve wetland attributes and functions through reservation in national parks, crown reserves and state owned land. Protection provided under environmental protection policies.
Resource enhancement (REW)	Partly modified but still supporting substantial functions and attributes	Restore wetland through maintenance and enhancement of wetland functions and attributes. Protection via crown reserves, state or local government owned land, environmental protection policies and sustainable management on private properties.
Multiple use (MUW)	Few wetland attributes but still provide important hydrological functions	Use, development and management considered in the context of water, town and environmental planning through land care.

The management categories of wetland features are determined based on hydrological, biological and human use features. The DBCA document *A methodology for the evaluation of specific wetland types on the Swan Coastal Plain, Western Australia* (DBCA 2017) details the methodology by which wetlands on the Swan Coastal Plain are assigned management categories based on a two tiered evaluation system, with preliminary and secondary evaluation stages. The preliminary evaluation aims to identify any features of conservation significance that would immediately place the wetland within the CCW management category. Examples of these significant features include presence on significant wetland lists, presence of TECs or PECs (Priority 1 and 2), presence of threatened flora and

over 90% of vegetation in good or better condition based on the Keighery (1994) scale. If such environmental values are identified the wetland would be categorised as CCW without further evaluation.

Should the preliminary evaluation indicate that no such features occur, the secondary evaluation and site assessment are then applied. In the secondary evaluation, an appropriate management category is determined through the assessment of a range of environmental attributes, functions and values.

Wetland reclassification

DBCA have a protocol for proposing changes to the wetland boundaries and management categories of the existing geomorphic wetland dataset (DEC 2007). The procedure involves a wetland desktop evaluation and site assessment which culminates in a recommended management category. Relevant information should be obtained in the optimal season for vegetation condition and water levels, which is usually spring (DEC 2007). In the case of larger wetlands that have undergone a degree of disturbance, a separate management category may be assigned to parts of the wetland in order to reflect the current values.

References

General references

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Keighery, B. 1994, *Bushland Plant Survey: A guide to plant community survey for the community*, Wildflower Society of WA (Inc), Nedlands.

Semeniuk, C. A. 1987, *Wetlands of the Darling System - a geomorphic approach to habitat classification*, Journal of the Royal Society of Western Australia, 69: 95-112.

Semeniuk, C. A. and Semeniuk, V. 1995, *A Geomorphic Approach to Global Classification for Inland Wetlands*, Vegetatio, 118(1/2): 103-124.

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Department of Environment and Energy (DoEE) 2018, Weeds of National Significance, <http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>.

Department of Primary Industries and Regional Development (DPIRD) 2020, The Western Australian Organism List (WAOL), < https://www.agric.wa.gov.au/bam/western-australian-organism-list-waol>.

Appendix D

Species List

Family	Status	Species
Apocynaceae		
		Alyxia buxifolia
	*	*Nerium oleander*
Araucariaceae		
	*, Pl	*Araucaria heterophylla*
Asparagaceae		
		Acanthocarpus preissii
Asphodelaceae		
		Asphodelus fistulosus
		Trachyandra divaricata
Asteraceae		
	*	*Dittrichia graveolens*
		Olearia axillaris
		Senecio pinnatifolius var. *maritima*
Casuarinaceae		
	*, Pl	*Casuarina glauca*
	Pl	*Casuarina obesa*
Chenopodiaceae		
		Atriplex cinerea
		Atriplex isatidea
		Rhagodia baccata subsp. *baccata*
		Rhagodia baccata subsp. *dioica*
		Salicornia blackiana
		Salicornia quinqueflora
		Suaeda australis
		Tecticornia halocnemoides
		Tecticornia indica subsp. *bidens*
Cupressaceae		
		Callitris preissii
Cyperaceae		
		Gahnia trifida
	*	*Isolepis marginata*
		Lepidosperma gladiatum
		Machaerina juncea
Euphorbiaceae		
		Beyeria viscosa
	*	*Euphorbia peplus*
Fabaceae		
		Acacia rostellifera
Lamiaceae		
		Westringia dampieri
Moraceae		
		Ficus macrophylla
Myrtaceae		
	Pl	*Agonis flexuosa*
	Pl	*Eucalyptus gomphocephala*
	*, Pl	*Eucalyptus utilis*
	*, Pl	*Eucalyptus* sp.

Family	Status	Species
	Pl	*Melaleuca huegelii*
		Melaleuca lanceolata
Oleaceae		
	*, Pl	*Olea europaea*
Pittosporaceae		
		Pittosporum ligustrifolium
Poaceae		
		Austrostipa flavescens
	*	*Cynodon dactylon*
	*	*Lagurus ovatus*
		Poa poiformis
		Sporobolus virginicus
Primulaceae		
		Samolus repens var. *paucifolius*
Urticaceae		
	*	*Urtica urens*

*=non-native, Pl=planted

Appendix E

Raw survey data

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: Q1

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, Q1: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	0
NW corner easting:	-31.99642073	NW corner northing:	115.5340013
Altitude (m):	7	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	damp	Landform:	flat
Time since fire:	no evidence	Disturbance:	low - some senescence. low water levels in a
Soil type/texture	sand/silt	Bare ground (%):	15
Rocks (%) and type:	No rocks	Soil colour:	grey/brown
Litter:	5% (branches,,)	Vegetation condition:	good-very good



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: Q1

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, Q1: Page 2 of 3

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Casuarina obesa	opp
	Melaleuca lanceolata	opp
	Tecticornia indica subsp. bidens	90

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: Q2

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, Q2: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	0
NW corner easting:	-31.99555981	NW corner northing:	115.533135
Altitude (m):	13	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	ridge
Time since fire:	no evidence	Disturbance:	moderate - weeds, snails
Soil type/texture	sand/	Bare ground (%):	30
Rocks (%) and type:	20%, limestone	Soil colour:	grey/
Litter:	5% (leaves,twigs,)	Vegetation condition:	good



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: Q2

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, Q2: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acanthocarpus preissii	50
*	*Asphodelus fistulosus*	3
	Beyeria viscosa	20
*	*Dittrichia graveolens*	opp
	Pittosporum ligustrifolium	opp
	Poa poiformis	2
	Rhagodia baccata subsp. dioica	opp

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: Q3

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, Q3: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	0
NW corner easting:	-31.99514549	NW corner northing:	115.5327261
Altitude (m):	12	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	upper slope
Time since fire:	no evidence	Disturbance:	moderate - weeds, snails
Soil type/texture	sand/	Bare ground (%):	15
Rocks (%) and type:	No rocks	Soil colour:	grey/brown
Litter:	10% (leaves,twigs,)	Vegetation condition:	very good



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: Q3

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, Q3: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acanthocarpus preissii	60
*	*Asphodelus fistulosus*	10
	Lepidosperma gladiatum	15
	Poa poiformis	5

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R4

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R4: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	0
NW corner easting:	-31.99486031	NW corner northing:	115.5325378
Altitude (m):	11	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	no evidence	Disturbance:	moderate - weeds, snails
Soil type/texture	sand/	Bare ground (%):	15
Rocks (%) and type:	20%, limestone	Soil colour:	grey/brown
Litter:	10% (leaves,twigs,)	Vegetation condition:	good



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R4

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R4: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acanthocarpus preissii	30
*	*Asphodelus fistulosus*	5
	Callitris preissii	10
*	*Dittrichia graveolens*	0.5
	Melaleuca lanceolata	10
	Poa poiformis	3
	Senenio pinnatifolius var. maritima	5
*	*Trachyandra divaricata*	0.5

*

*

*

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R5

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R5: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	0
NW corner easting:	-31.99385411	NW corner northing:	115.5327126
Altitude (m):	8	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	high - weeds, clearing
Soil type/texture	sand/	Bare ground (%):	5
Rocks (%) and type:	No rocks	Soil colour:	grey/brown
Litter:	5% (leaves,twigs,)	Vegetation condition:	degraded



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R5

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R5: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia rostellifera	2
	Callitris preissii	20
*	*Cynodon dactylon*	50
*, Pl	*Eucalyptus sp.*	1
	Melaleuca huegelii	2
	Melaleuca lanceolata	30
*	*Trachyandra divaricata*	2

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R6

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R6: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	0
NW corner easting:	-31.99432762	NW corner northing:	115.5334121
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	damp	Landform:	waterway
Time since fire:	no evidence	Disturbance:	high - weeds, landform altered
Soil type/texture	sand/silt	Bare ground (%):	0
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	1% (,,)	Vegetation condition:	degraded-good



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R6

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R6: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Atriplex isatidea	10
*	*Cynodon dactylon*	20
*	*Dittrichia graveolens*	0.5
	Gahnia trifida	5
*	*Isolepis marginata*	5
	Olearia axillaris	1
	Rhagodia baccata subsp. dioica	5
	Salicornia quinqueflora	20
	Samolus repens var. paucifolius	10
	Sporobolus virginicus	50
	Tecticornia indica subsp. bidens	10

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R7

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R7: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	0
NW corner easting:	-31.99431147	NW corner northing:	115.5346443
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	hilltop
Time since fire:	no evidence	Disturbance:	high - weeds adj clearing
Soil type/texture	sand/	Bare ground (%):	20
Rocks (%) and type:	60%, limestone	Soil colour:	grey/
Litter:	3% (twigs,leaves,)	Vegetation condition:	degraded



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R7

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R7: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acanthocarpus preissii	10
*	*Asphodelus fistulosus*	5
	Beyeria viscosa	10
	Callitris preissii	opp
*	*Dittrichia graveolens*	2
*, Pl	*Eucalyptus utilis*	opp
	Lagurus ovatus	2
	Melaleuca lanceolata	10
	Pittosporum ligustrifolium	5
	Poa poiformis	10

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R8

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R8: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	0
NW corner easting:	-31.99363888	NW corner northing:	115.534499
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	no evidence	Disturbance:	high - clearing, weeds
Soil type/texture	sand/	Bare ground (%):	30
Rocks (%) and type:	No rocks	Soil colour:	grey/
Litter:	5% (twigs,leaves,branches)	Vegetation condition:	degraded



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R8

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R8: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acanthocarpus preissii	1
Pl	*Agonis flexuosus*	2
*	*Asphodelus fistulosus*	5
	Callitris preissii	3
*	*Cynodon dactylon*	20
	Melaleuca lanceolata	30
	Sporobolus virginicus	1

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R9

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R9: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	0
NW corner easting:	-31.99456437	NW corner northing:	115.5357259
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	upper slope
Time since fire:	no evidence	Disturbance:	moderate -
Soil type/texture	sand/	Bare ground (%):	50
Rocks (%) and type:	5%, limestone	Soil colour:	brown/
Litter:	60% (twigs,branches,logs)	Vegetation condition:	very good



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R9

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R9: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acanthocarpus preissii	5
	Melaleuca lanceolata	90
	Pittosporum ligustrifolium	0.5

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R10

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R10: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	-31.99569971	NW corner northing:	115.5362209
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	damp	Landform:	flat
Time since fire:	no evidence	Disturbance:	high - herbivory, clearing
Soil type/texture	silt/	Bare ground (%):	5
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	% (logs,branches,)	Vegetation condition:	very good



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R10

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R10: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Melaleuca lanceolata	90
	Rhagodia baccata subsp. dioica	2
	Suaeda australis	20
	Tecticornia indica subsp. bidens	30

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R11

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R11: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	-31.99503788	NW corner northing:	115.5358873
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	upper slope
Time since fire:	no evidence	Disturbance:	high - herbivory
Soil type/texture	sand/ with organic layer	Bare ground (%):	1
Rocks (%) and type:	2%, limestone	Soil colour:	brown/
Litter:	90% (twigs,branches,logs)	Vegetation condition:	very good



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R11

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R11: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
*	*Asphodelus fistulosus*	1
	Austrostipa flavescens	opp
	Callitris preissii	opp
*	*Euphorbia peplus*	1
*	*Euphorbia peplus*	0.5
	Melaleuca lanceolata	90
	Rhagodia baccata subsp. baccata	5
*	*Trachyandra divaricata*	1
*	*Urtica urens*	0.5

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: Q12

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, Q12: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	0
NW corner easting:	-31.99643149	NW corner northing:	115.5357312
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	damp	Landform:	depression
Time since fire:	no evidence	Disturbance:	moderate - white snails
Soil type/texture	silt/	Bare ground (%):	20
Rocks (%) and type:	No rocks	Soil colour:	brown/grey
Litter:	5% (twigs,,)	Vegetation condition:	very good



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: Q12

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, Q12: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Atriplex cinerea	opp
	Baumea juncea	opp
	Gahnia trifida	opp
	Melaleuca lanceolata	opp
Pl	*Pittosporum ligustrifolium*	opp
	Salicornia quinqueflora	15
	Sporobolus virginicus	opp
	Suaeda australis	15
	Tecticornia halocnemoides	15
	Tecticornia indica subsp. bidens	60
*	*Trachyandra divaricata*	opp

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: Q13

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, Q13: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	0
NW corner easting:	-31.99677586	NW corner northing:	115.5346067
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	damp	Landform:	depression
Time since fire:	no evidence	Disturbance:	moderate - senescence, white snails
Soil type/texture	silt/	Bare ground (%):	15
Rocks (%) and type:	No rocks	Soil colour:	brown/grey
Litter:	5% (twigs,branches,)	Vegetation condition:	good -very good



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: Q13

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, Q13: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Salicornia blackiana	opp
	Salicornia quinqueflora	5
	Tecticornia halocnemoides	5
	Tecticornia indica subsp. bidens	70

Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R14

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R14: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	0
NW corner easting:	-31.99610865	NW corner northing:	115.5329332
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	no evidence	Disturbance:	high - weeds, snails
Soil type/texture	sand/ with organic layer	Bare ground (%):	20
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	5% (branches,twigs,)	Vegetation condition:	degraded



Vegetation Sample Data

Garden Lake North-West, Rottnest Island

Sample Name: R14

Project no.: EP23-032
Date: 2/05/2024 **Status** Non-permanent
Author: SKP, R14: Page 2 of 2

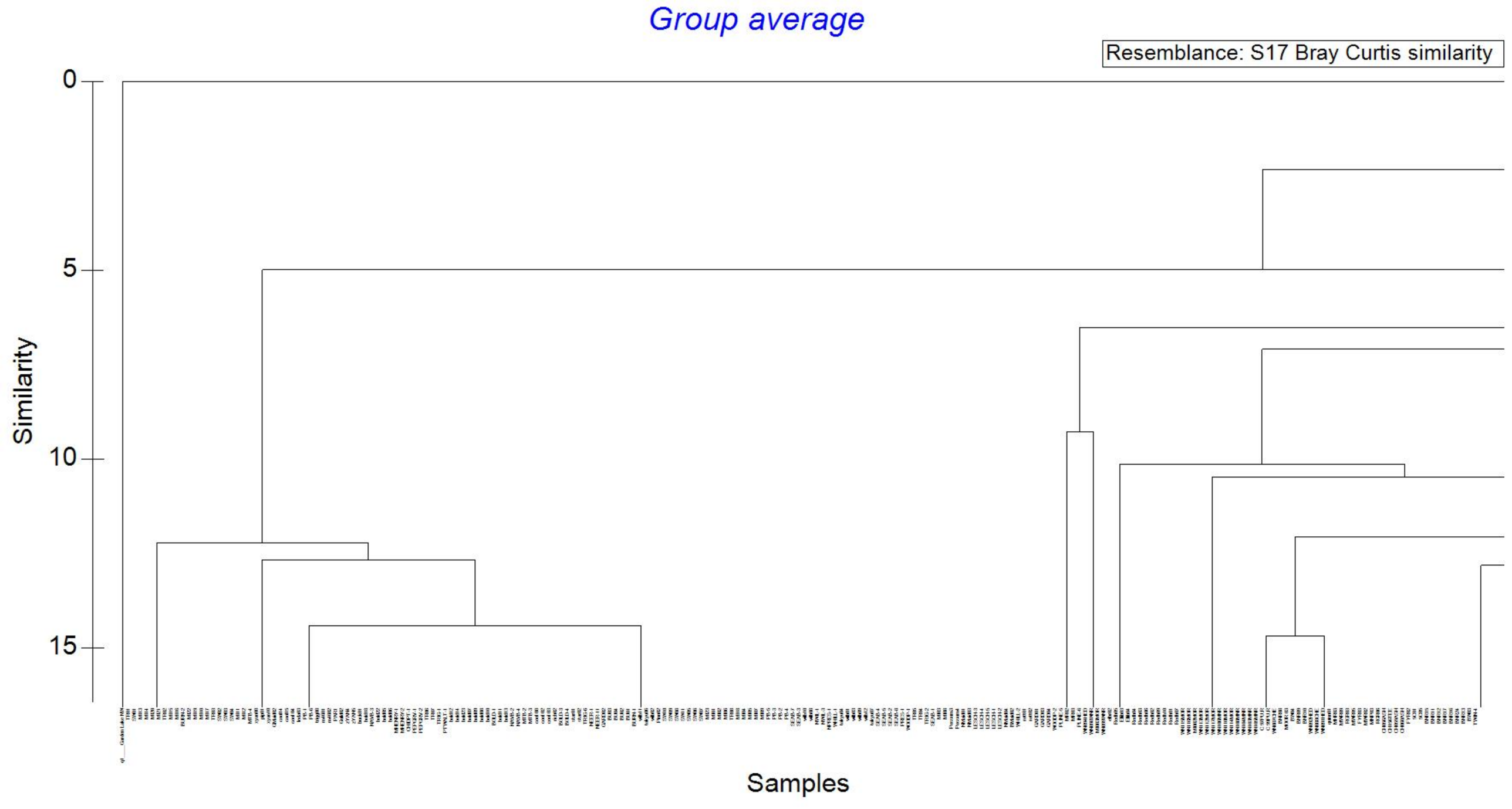
Species Data

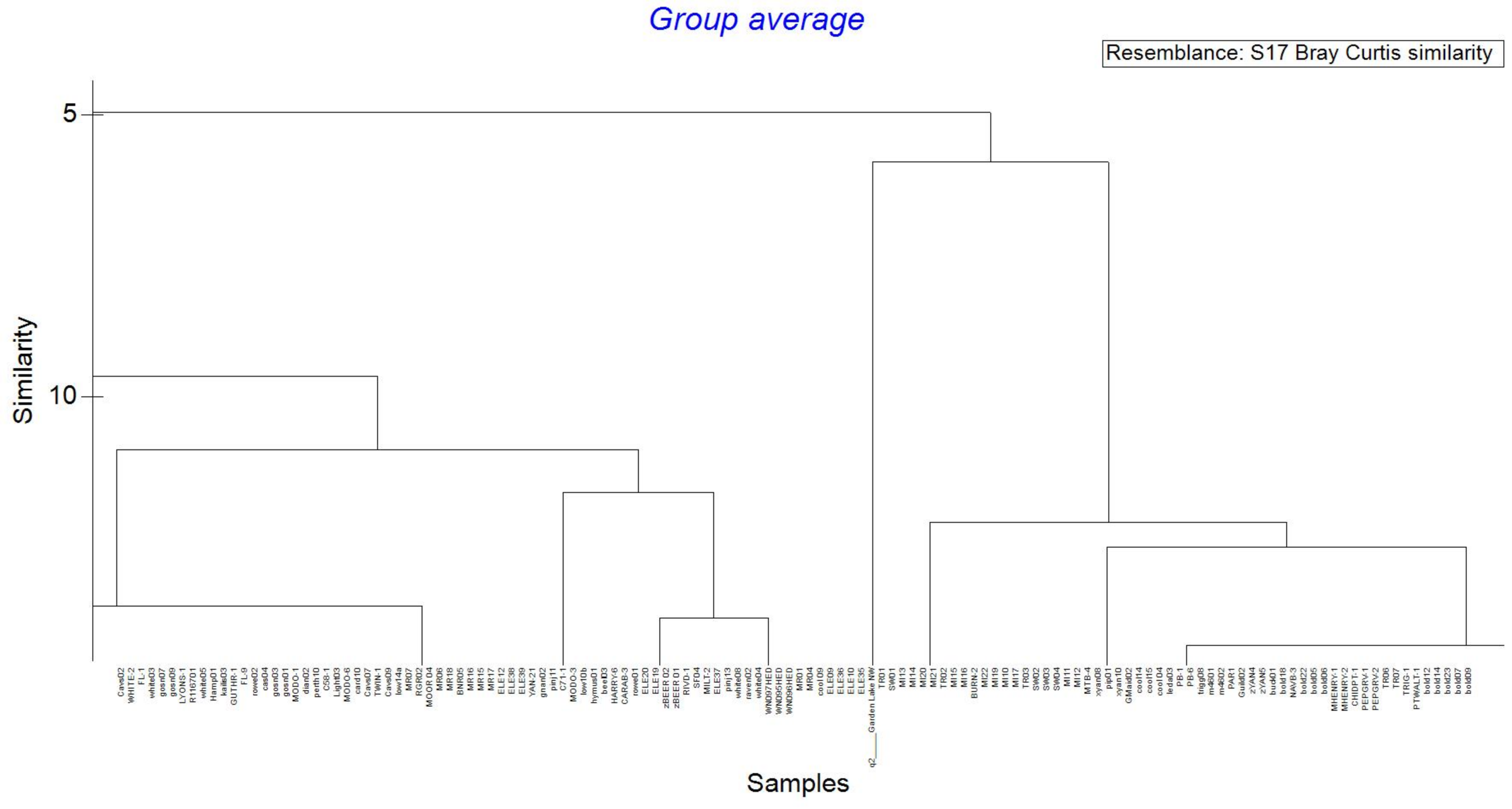
* denotes non-native species

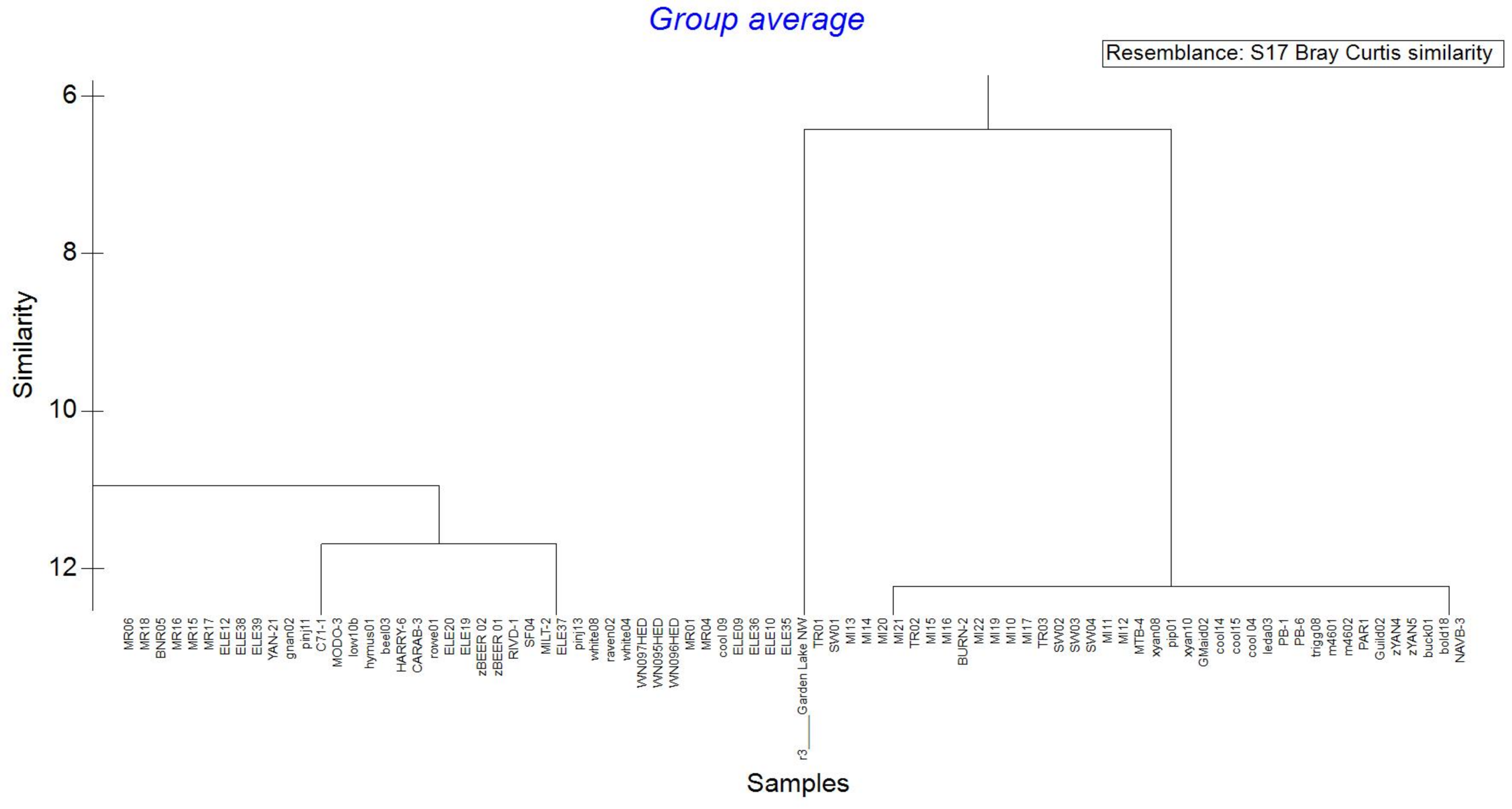
Status	Confirmed name	Cover (%)
	Acanthocarpus preissii	10
*	*Asphodelus fistulosus*	5
	Atriplex cinerea	5
*	*Dittrichia graveolens*	3
	Gahnia trifida	opp
*	*Lagurus ovatus*	0.5
	Lepidosperma gladiatum	5
	Melaleuca lanceolata	10
	Poa poiformis	2
	Rhagodia baccata subsp. dioica	5
	Suaeda australis	5
*	*Trachyandra divaricata*	5

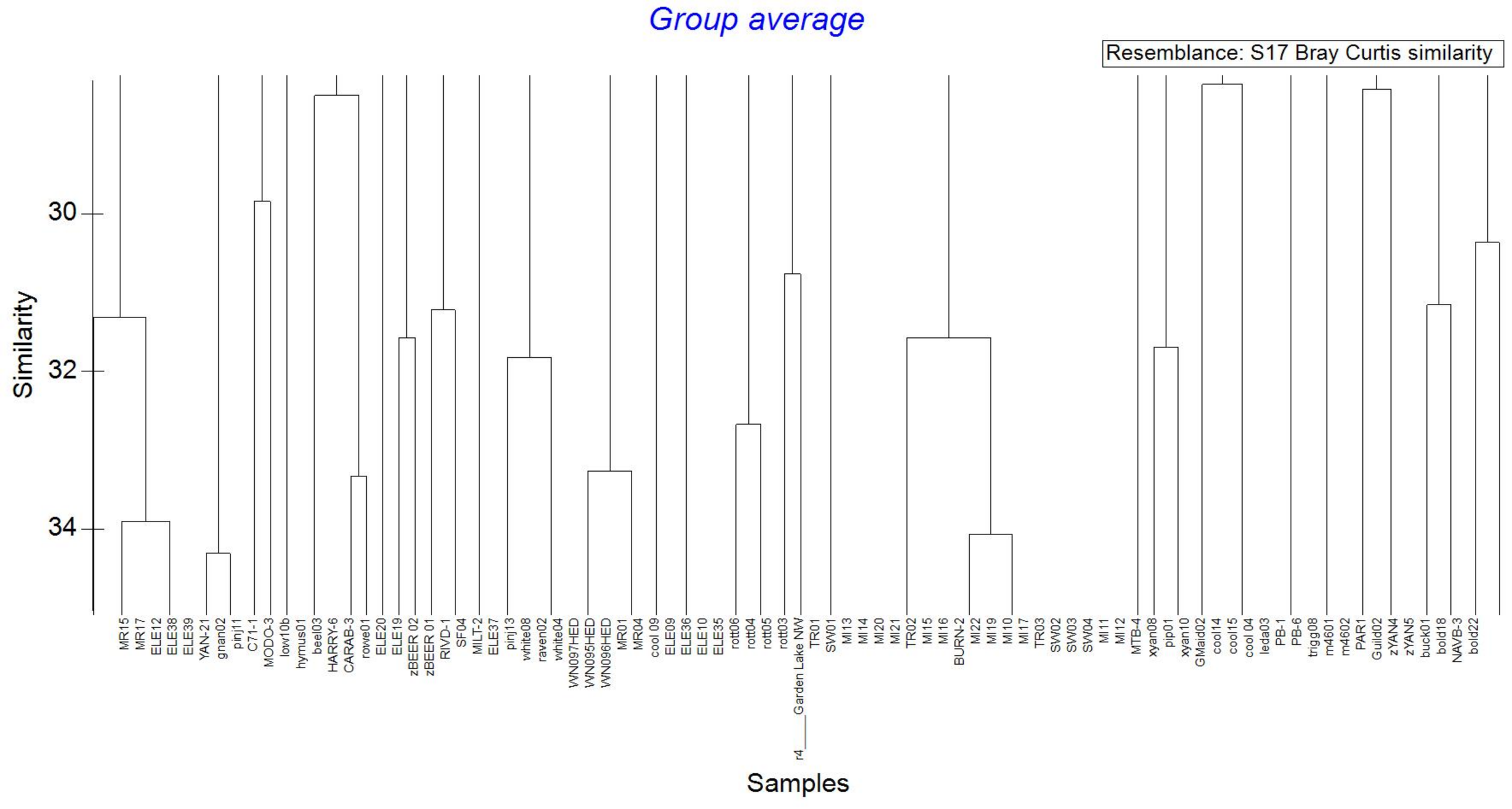
Appendix F

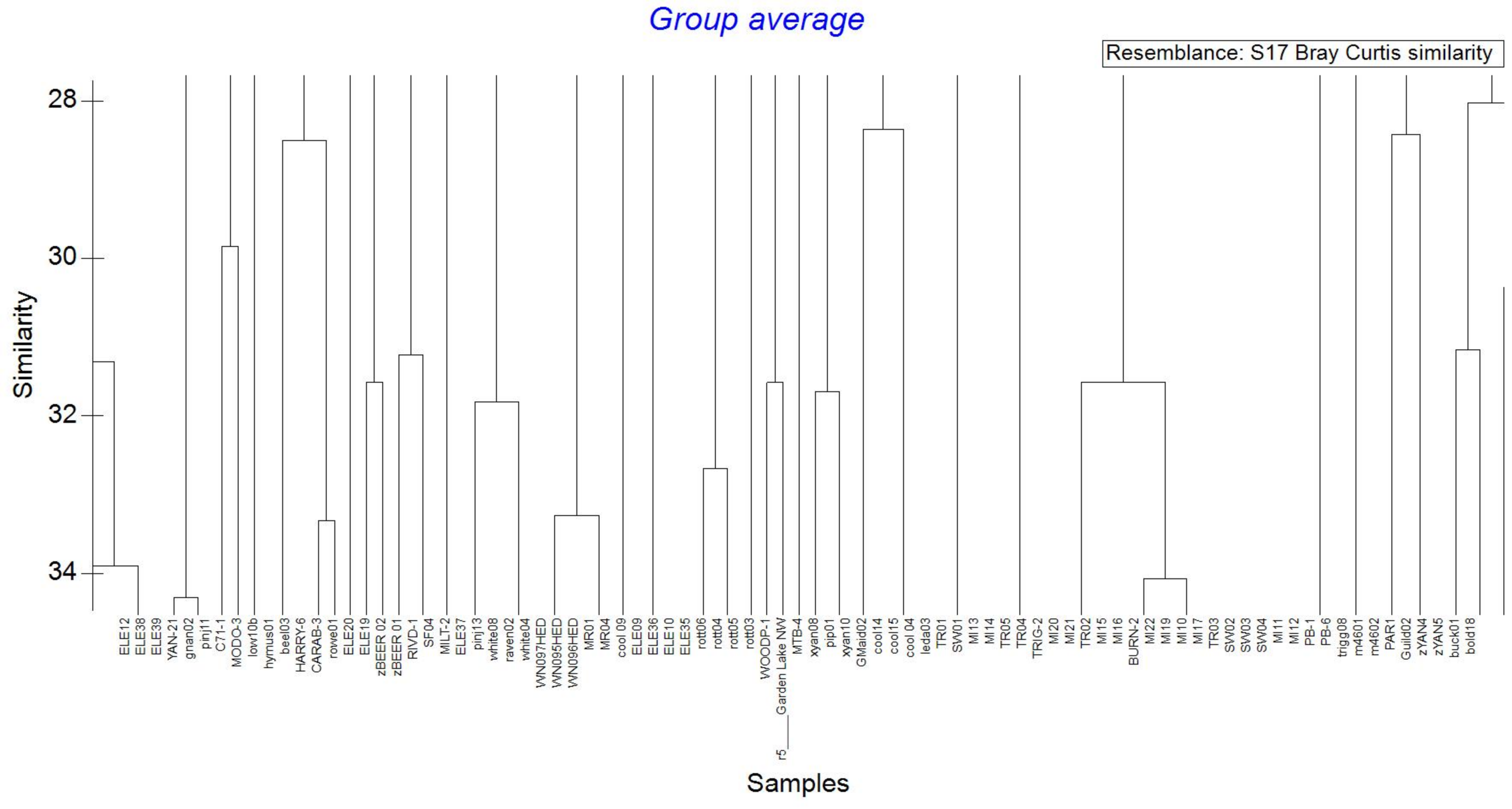
Cluster Dendrograms

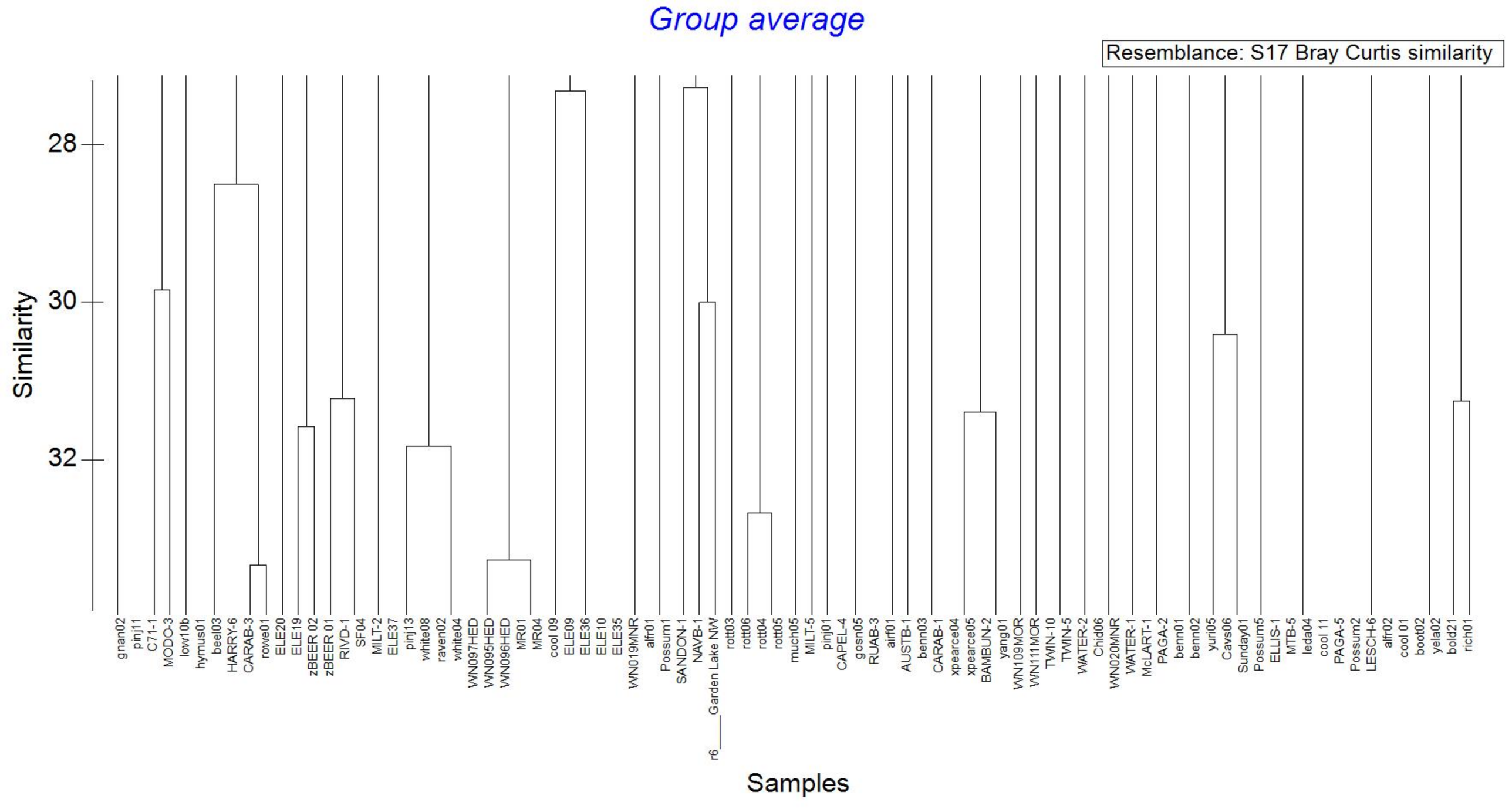

Group average
Resemblance: S17 Bray Curtis similarity
0
5
10
15
Similarity
Samples

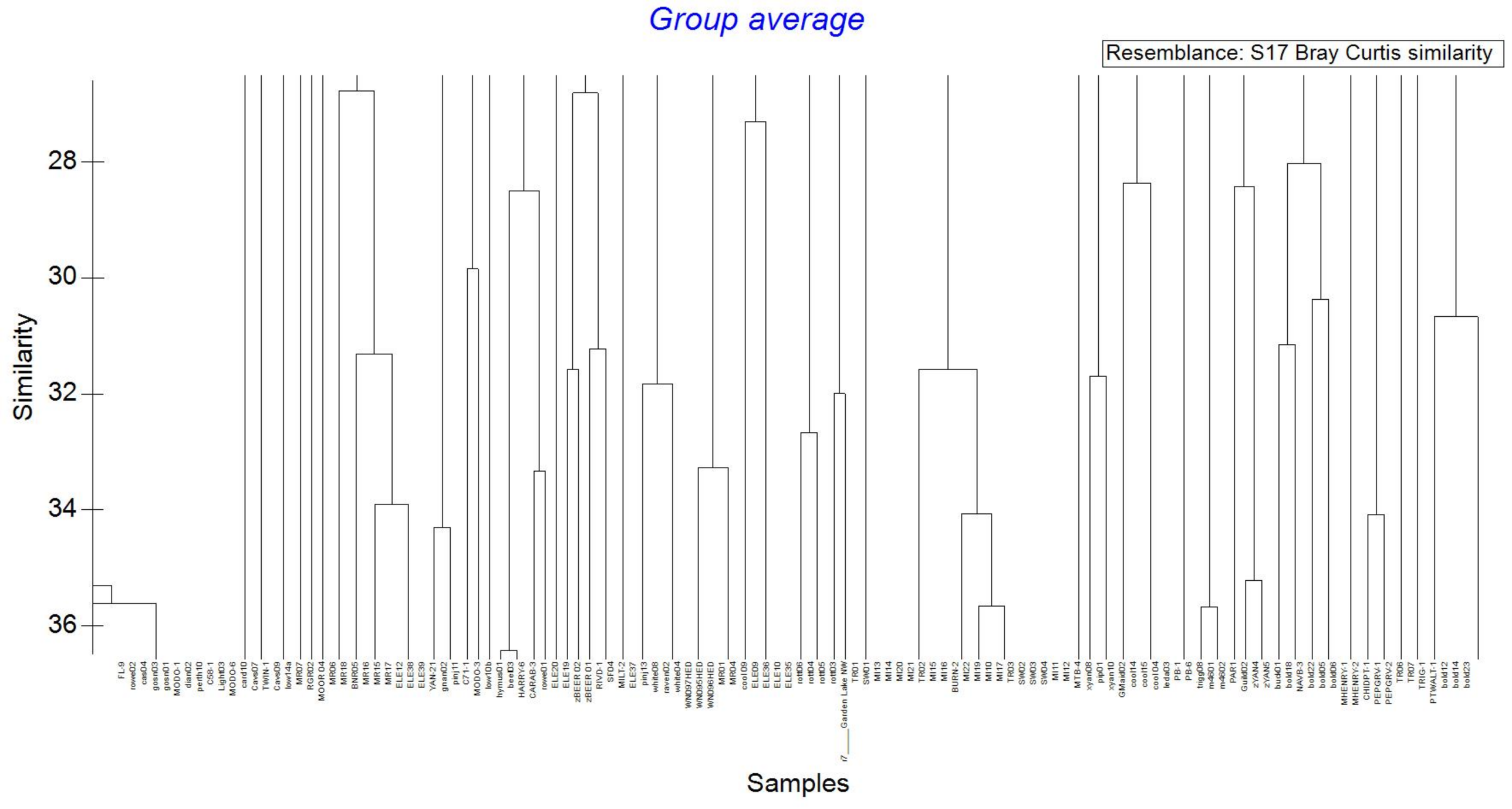

Group average
Resemblance: S17 Bray Curtis similarity
Similarity
5
10
Samples
Caves02
WHITE-2
FL-1
white03
gosn07
gosn09
LYONS-1
R116701
white05
Hamp01
kale03
GUTHR-1
FL-9
rowe02
cas04
gosn03
gosn01
MODO-1
dian02
perth10
C58-1
Light03
MODO-6
card10
Caves07
TWIN-1
Caves09
low14a
MR07
RGR02
MOOR 04
MR06
MR18
BNR05
MR16
MR15
MR17
ELE12
ELE38
ELE39
YAN-21
gnan02
pinj11
C71-1
MODO-3
low10b
hymus01
beeD3
HARRY6
CARAB-3
rowe01
ELE20
ELE19
zBEER 02
zBEER 01
RIVD-1
SF04
MILT-2
ELE37
pinj13
white08
raven02
white04
WND97HED
WND95HED
WND96HED
MR01
MR04
cool09
ELE09
ELE36
ELE10
ELE35
q2
Garden Lake NW
TR01
SW01
MI13
MI14
MI20
MI21
TR02
MI15
MI16
BURN-2
MI22
MI19
MI10
MI17
TR03
SW02
SW03
SW04
MI11
MI12
MTB-4
xyan08
pip01
xyan10
GMaid02
cool14
cool15
cool04
leda03
PB-1
PB-6
trigg08
m4601
m4602
PAR1
Guild02
zYAN4
zYAN5
bud01
bold18
NAVB-3
bold22
bold05
bold06
MHENRY-1
MHENRY-2
CHIDPT-1
PEPGRV-1
PEPGRV-2
TR06
TR07
TRIG-1
PTWALT-1
bold12
bold14
bold23
bold07
bold09

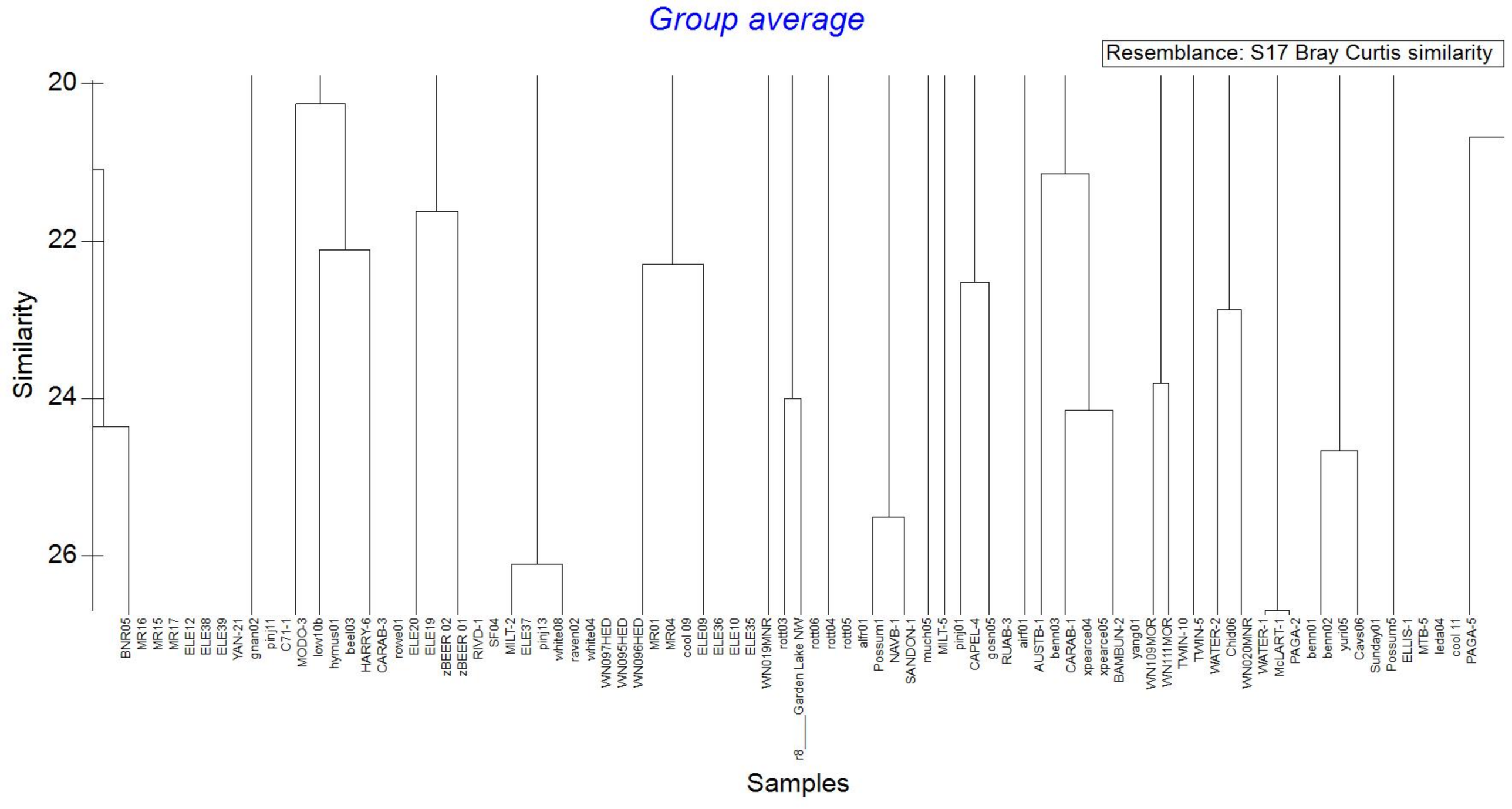

Group average
Resemblance: S17 Bray Curtis similarity
Similarity
6
8
10
12
MR06
MR18
BNR05
MR16
MR15
MR17
ELE12
ELE38
ELE39
YAN-21
gnan02
pinj11
C71-1
MODO-3
low10b
hymus01
beel03
HARRY-6
CARAB-3
rowe01
ELE20
ELE19
zBEER 02
zBEER 01
RIVD-1
SF04
MILT-2
ELE37
pinj13
white08
raven02
white04
WN097HED
WN095HED
WN096HED
MR01
MR04
cool 09
ELE09
ELE36
ELE10
ELE35
r3 Garden Lake NW
TR01
SW01
MI13
MI14
MI20
MI21
TR02
MI15
MI16
BURN-2
MI22
MI19
MI10
MI17
TR03
SW02
SW03
SW04
MI11
MI12
MTB-4
xyan08
pip01
xyan10
GMaid02
cool14
cool15
cool 04
leda03
PB-1
PB-6
trigg08
m4601
m4602
PAR1
Guild02
zYAN4
zYAN5
buck01
bold18
NAVB-3
Samples

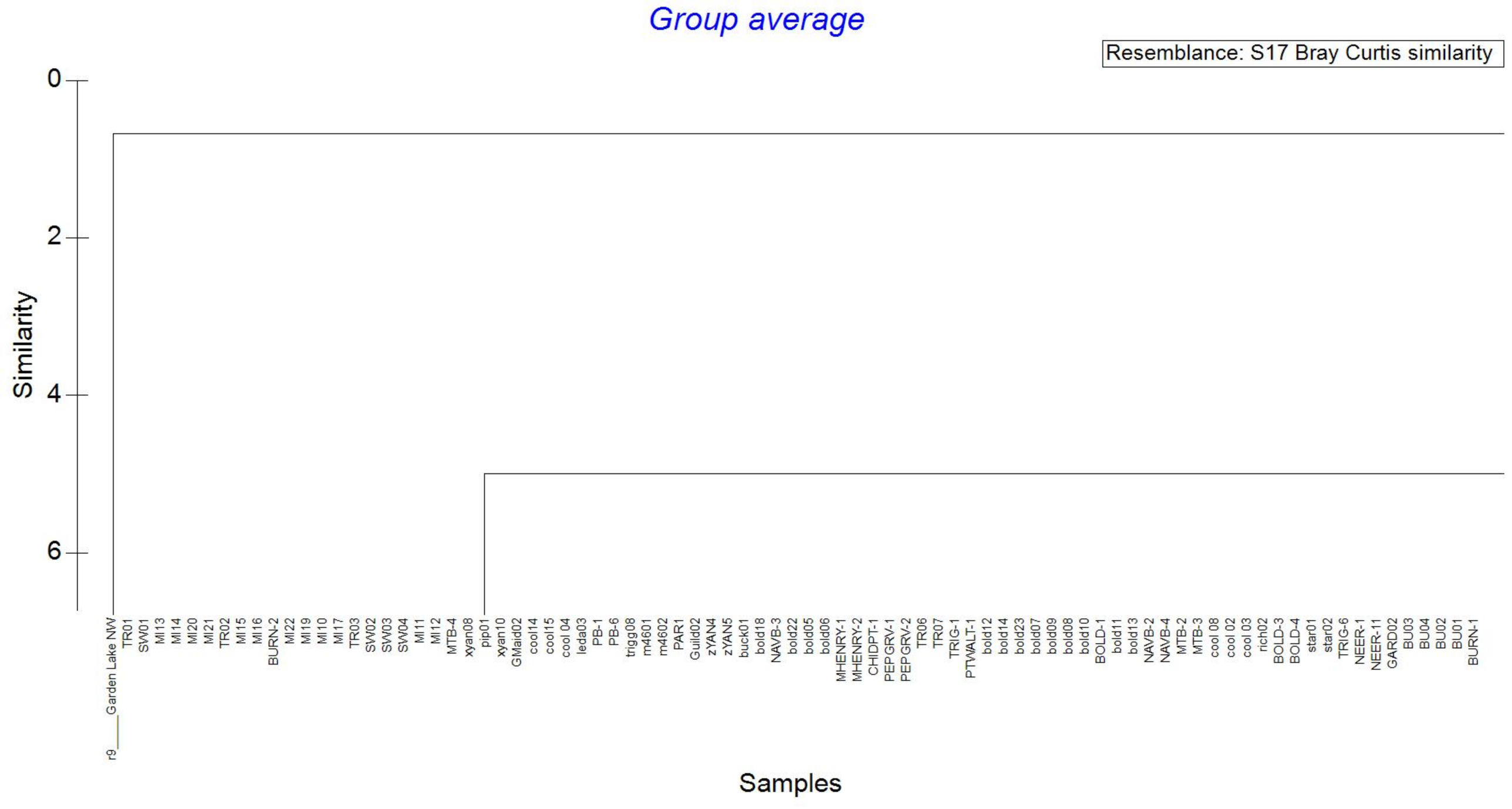

Group average
Resemblance: S17 Bray Curtis similarity
Similarity
30
32
34
MR15
MR17
ELE12
ELE38
ELE39
YAN-21
gnan02
pinj11
C71-1
MODO-3
low10b
hyrnus01
beel03
HARRY-6
CARAB-3
rowe01
ELE20
ELE19
zBEER 02
zBEER 01
RIVD-1
SF04
MILT-2
ELE37
pinj13
white08
raven02
white04
WN097HED
WN095HED
WN096HED
MR01
MR04
cool 09
ELE09
ELE36
ELE10
ELE35
rott06
rott04
rott05
rott03
r4
Garden Lake NW
TR01
SW01
MI13
MI14
MI20
MI21
TR02
MI15
MI16
BURN-2
MI22
MI19
MI10
MI17
TR03
SW02
SW03
SW04
MI11
MI12
MTB-4
xyan08
pip01
xyan10
GMaid02
cool14
cool15
cool 04
leda03
PB-1
PB-6
trigg08
m4601
m4602
PAR1
Guild02
zYAN4
zYAN5
buck01
bold18
NAVB-3
bold22
Samples

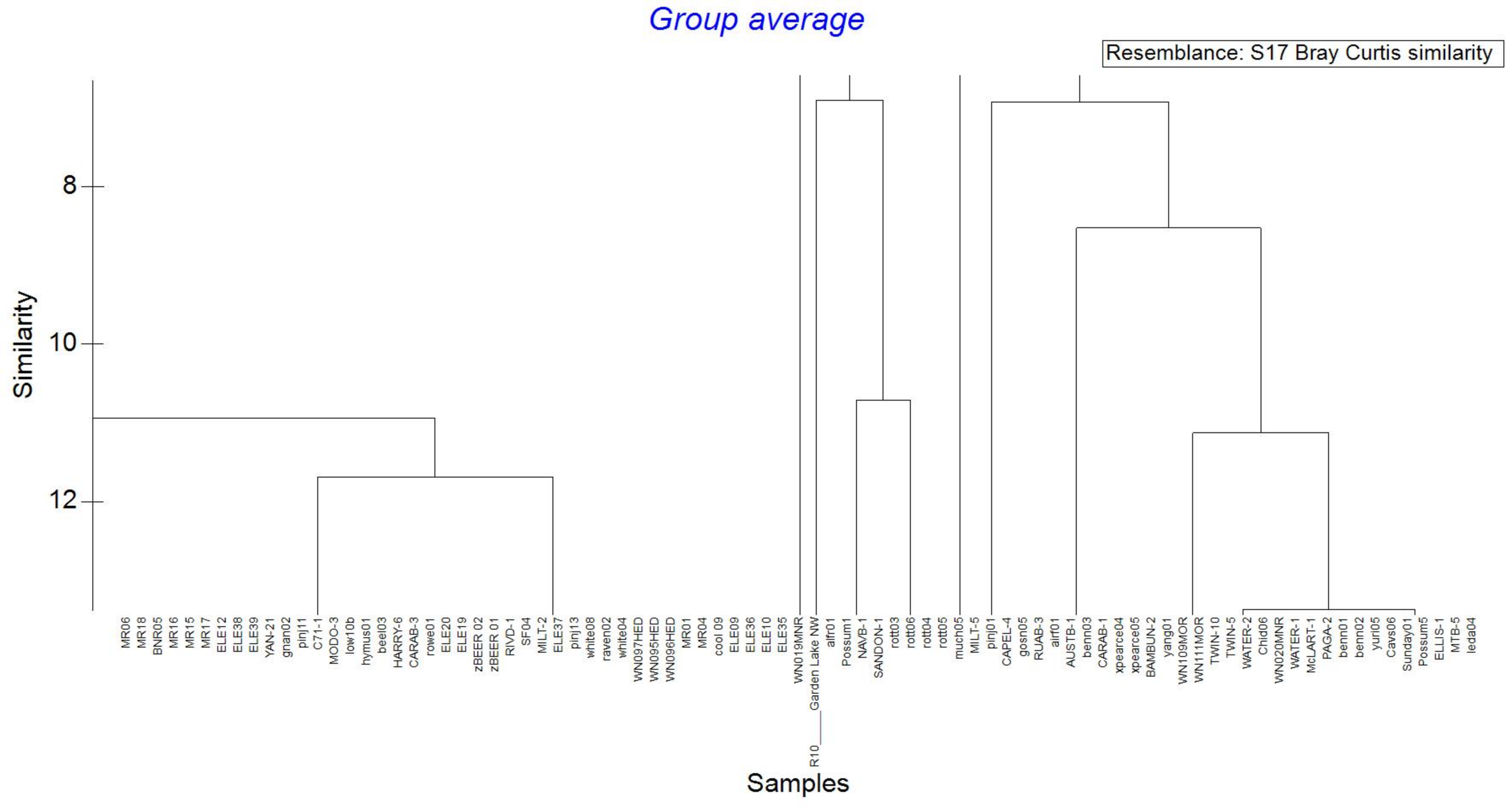

Group average
Resemblance: S17 Bray Curtis similarity
Similarity
28
30
32
34
ELE12
ELE38
ELE39
YAN-21
gnan02
pinj11
C71-1
MODO-3
low10b
hyrnus01
beel03
HARRY-6
CARAB-3
rowe01
ELE20
ELE19
zBEER 02
zBEER 01
RIVD-1
SF04
MILT-2
ELE37
pinj13
white08
raven02
white04
WN097HED
WN095HED
WN096HED
MR01
MR04
cool 09
ELE09
ELE36
ELE10
ELE35
rott06
rott04
rott05
rott03
WOODP-1
r5
Garden Lake NW
MTB-4
xyan08
pip01
xyan10
GMaid02
cool14
cool15
cool 04
leda03
TR01
SW01
MI13
MI14
TR05
TR04
TRIG-2
MI20
MI21
TR02
MI15
MI16
BURN-2
MI22
MI19
MI10
MI17
TR03
SW02
SW03
SW04
MI11
MI12
PB-1
PB-6
trigg08
m4601
m4602
PAR1
Guild02
zYAN4
zYAN5
buck01
bold18
Samples

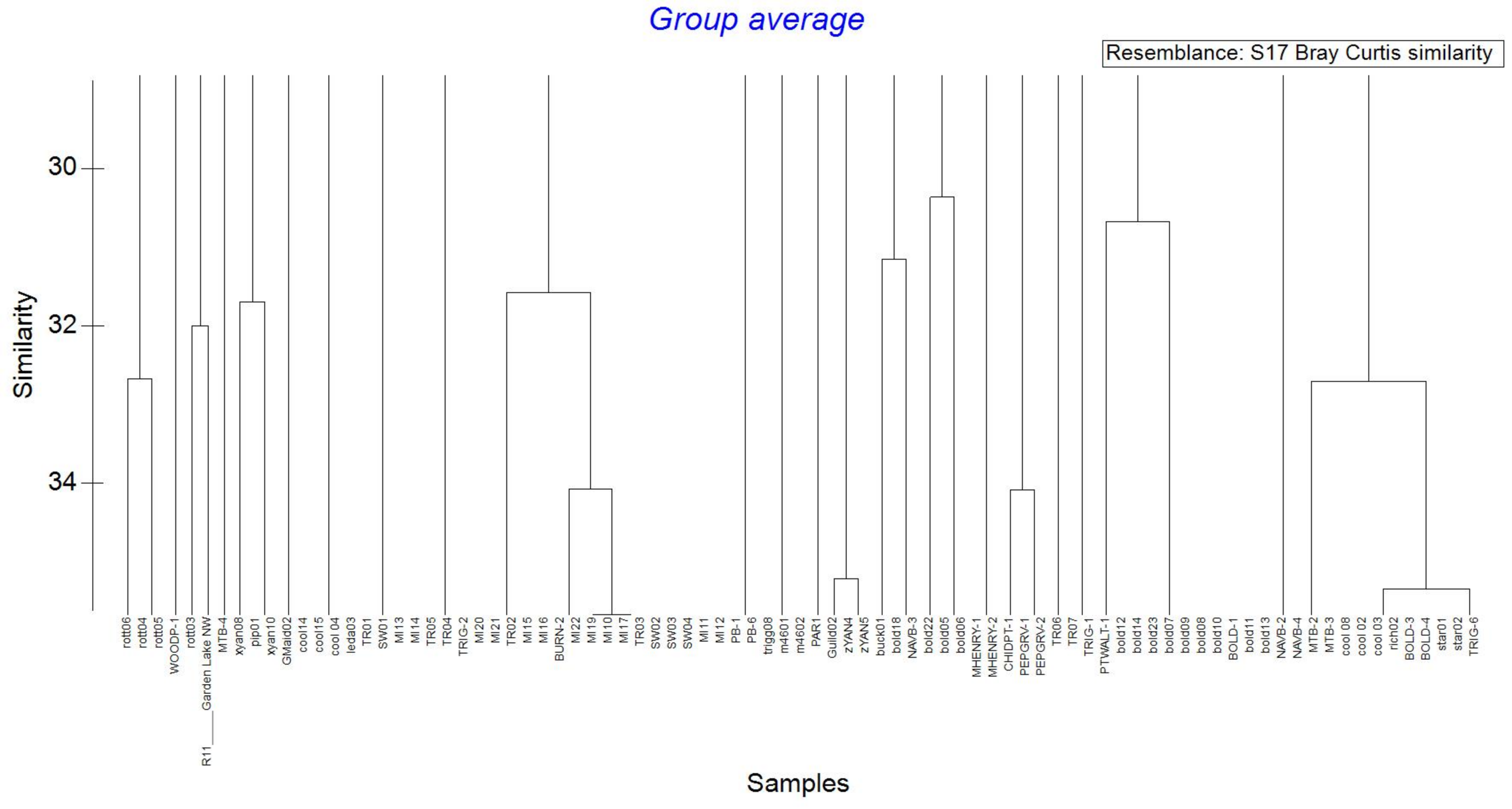

Group average
Resemblance: S17 Bray Curtis similarity
Similarity
28
30
32
gnan02
pinj11
C71-1
MODO-3
low10b
hyrmus01
beel03
HARRY-6
CARAB-3
rowe01
ELE20
ELE19
zBEER 02
zBEER 01
RIVD-1
SF04
MILT-2
ELE37
pinj13
white08
raven02
white04
WN097HED
WN095HED
WN096HED
MR01
MR04
cool 09
ELE09
ELE36
ELE10
ELE35
WN019MNR
alfr01
Possum1
SANDON-1
NAVB-1
r6___Garden Lake NW
rott03
rott06
rott04
rott05
much05
MILT-5
pinj01
CAPEL-4
gosn05
RUAB-3
airf01
AUSTB-1
benn03
CARAB-1
xpearce04
xpearce05
BAMBUN-2
yang01
WN109MOR
WN111MOR
TWIN-10
TWIN-5
WATER-2
Chid06
WN020MNR
WATER-1
McLART-1
PAGA-2
benn01
benn02
yuri05
Cavs06
Sunday01
Possum5
ELLIS-1
MTB-5
leda04
cool 11
PAGA-5
Possum2
LESCH-6
alfr02
cool 01
boot02
yela02
bold21
rich01
Samples

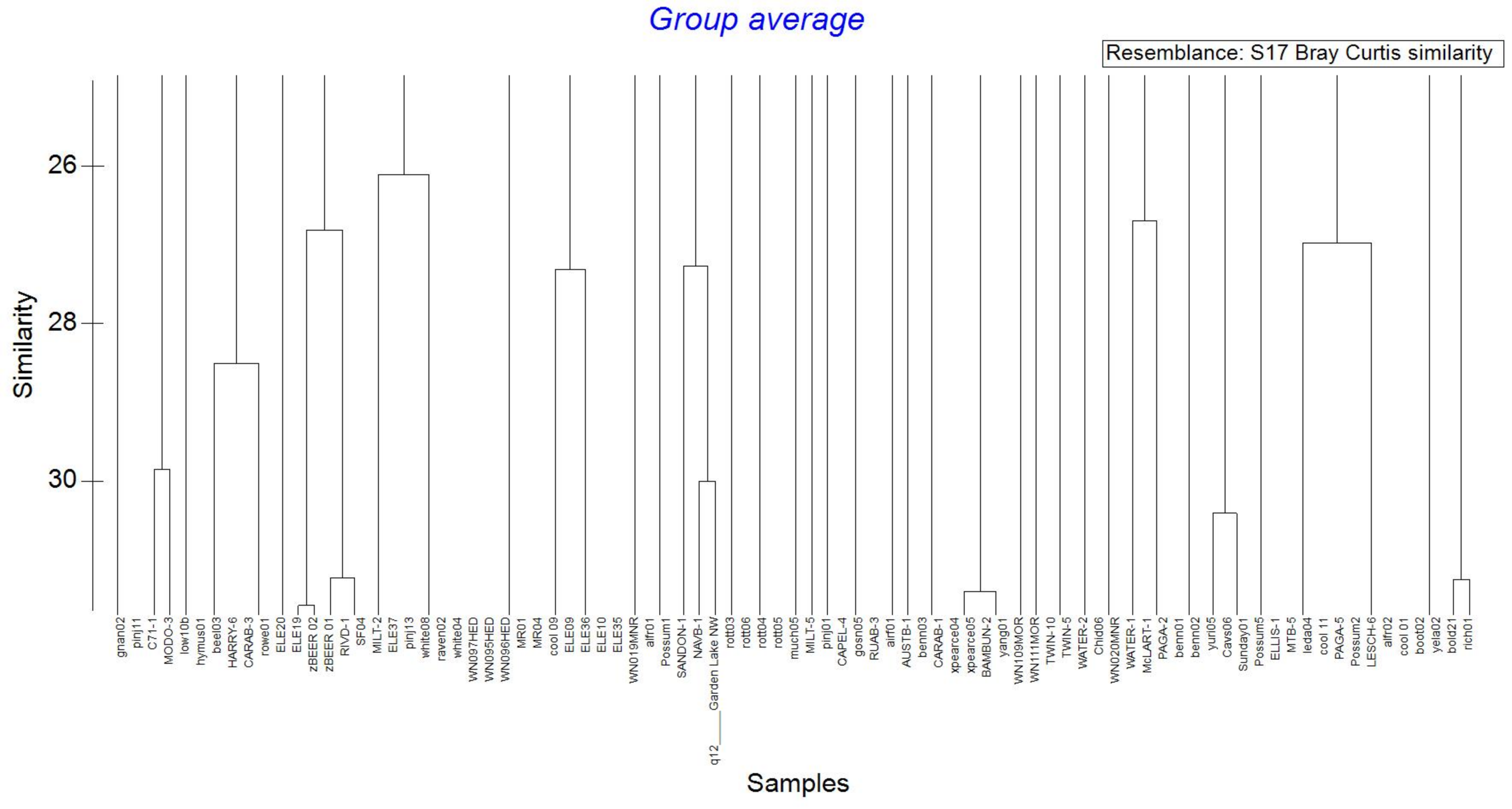

Group average
Resemblance: S17 Bray Curtis similarity
Similarity
28
30
32
34
36
Samples
FL-9
rowe02
cas04
gosn03
gosn01
MODO-1
dian02
perth10
C58-1
Light03
MODO-6
card10
Cave07
TWIN-1
Cave09
low14a
MR07
RGR02
MOOR 04
MR06
MR18
BNR05
MR16
MR15
MR17
ELE12
ELE38
ELE39
YAN-21
gnan02
pinj11
C71-1
MODO-3
low10b
hymus01
beel03
HARRY-6
CARAB-3
rowe01
ELE20
ELE19
zBEER 02
zBEER 01
RIVD-1
SF04
MILT-2
ELE37
pinj13
white08
raven02
white04
WND97HED
WND95HED
WND96HED
MR01
MR04
cool09
ELE09
ELE36
ELE10
ELE35
rotl06
rotl04
rotl05
rotl03
i7____Garden Lake NW
TR01
SW01
MI13
MI14
MI20
MI21
TR02
MI15
MI16
BURN-2
MI22
MI19
MI10
MI17
TR03
SW02
SW03
SW04
MI11
MI12
MTB-4
xyan08
pip01
xyan10
GMaid02
cool14
cool15
cool04
leda03
PB-1
PB-6
trigg08
m4601
m4602
PAR1
Guild02
zYAN4
zYAN5
bud401
bold18
NAVB-3
bold22
bold05
bold06
MHENRY-1
MHENRY-2
CHIDPT-1
PEPGRV-1
PEPGRV-2
TR06
TR07
TRIG-1
PTWALT-1
bold12
bold14
bold23

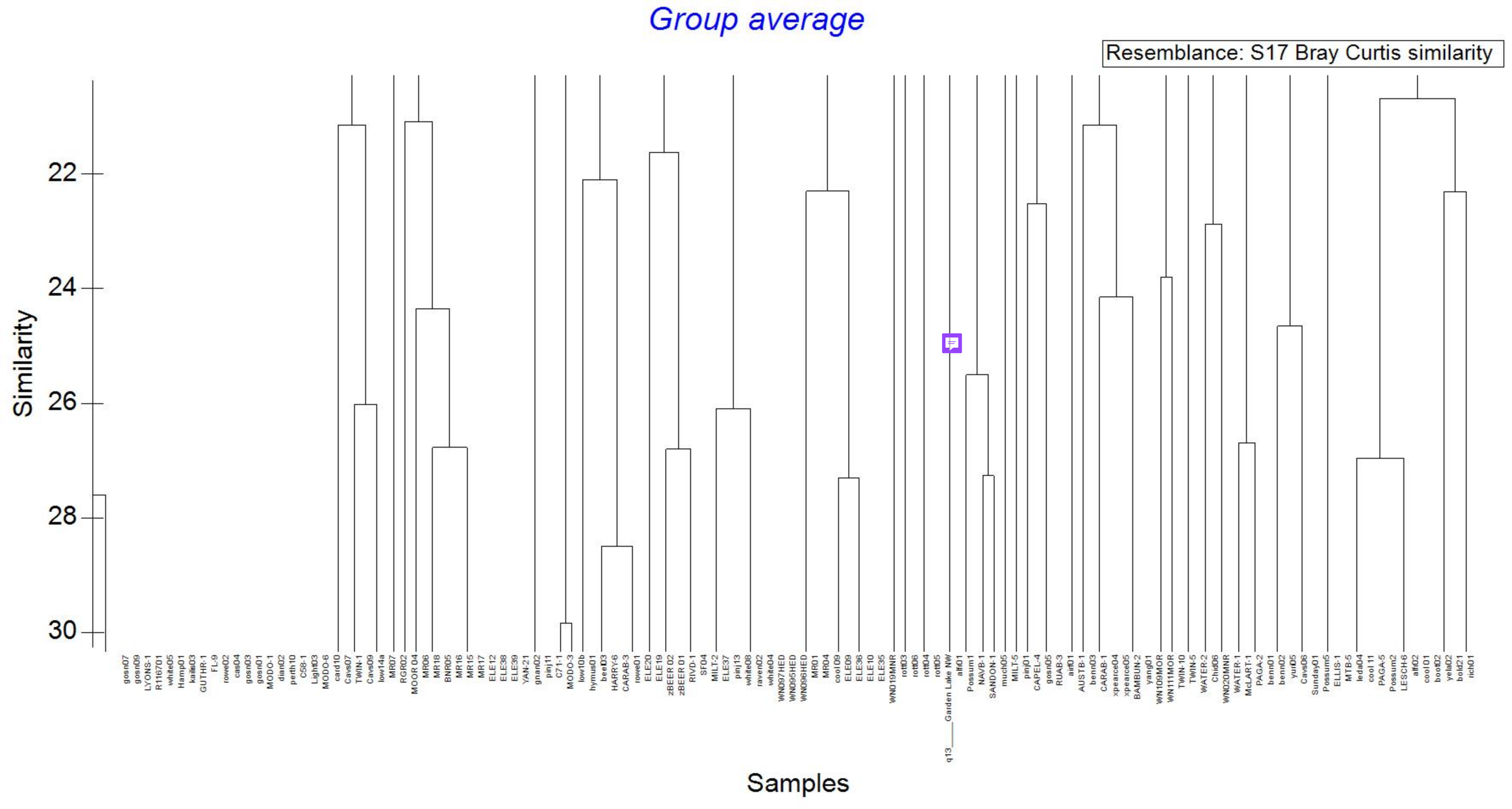

Group average
Resemblance: S17 Bray Curtis similarity
Similarity
20
22
24
26
BNR05
MR16
MR15
MR17
ELE12
ELE38
ELE39
YAN-21
gnan02
pinj11
C71-1
MODO-3
low10b
hymus01
beel03
HARRY-6
CARAB-3
rowe01
ELE20
ELE19
zBEER 02
zBEER 01
RIVD-1
SF04
MILT-2
ELE37
pinj13
white08
raven02
white04
WN097HED
WN095HED
WN096HED
MR01
MR04
cool 09
ELE09
ELE36
ELE10
ELE35
WN019MNR
rott03
r8
Garden Lake NW
rott06
rott04
rott05
alfr01
Possum1
NAVB-1
SANDON-1
much05
MILT-5
pinj01
CAPEL-4
gosn05
RUAB-3
airf01
AUSTB-1
benn03
CARAB-1
xpearce04
xpearce05
BAMBUN-2
yang01
WN109MOR
WN111MOR
TWIN-10
TWIN-5
WATER-2
Chid06
WN020MNR
WATER-1
McLART-1
PAGA-2
benn01
benn02
yuri05
Cavs06
Sunday01
Possum5
ELLIS-1
MTB-5
leda04
cool 11
PAGA-5
Samples

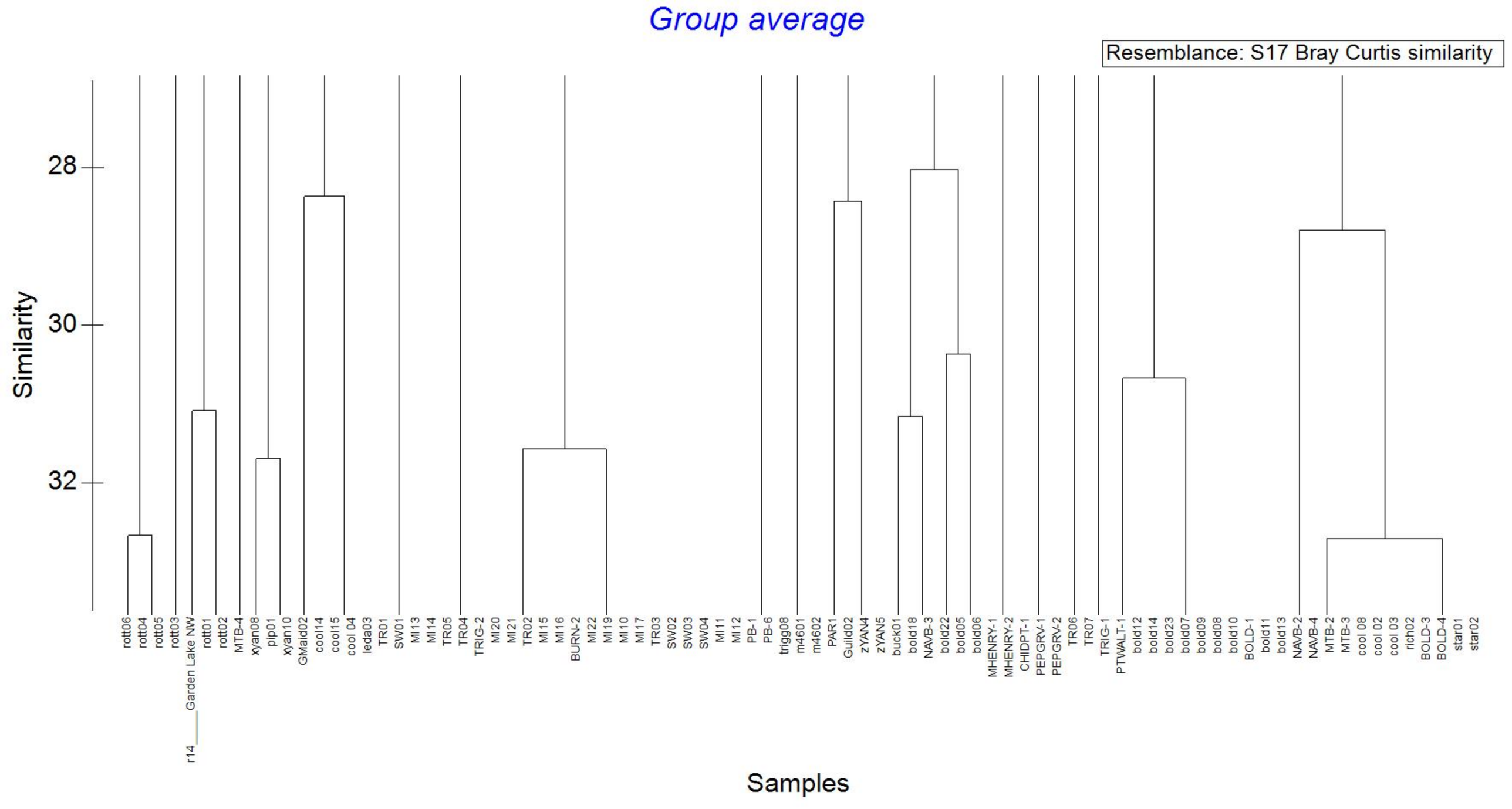

Group average
Resemblance: S17 Bray Curtis similarity
Similarity
0
2
4
6
r9
Garden Lake NW
TR01
SW01
MI13
MI14
MI20
MI21
TR02
MI15
MI16
BURN-2
MI22
MI19
MI10
MI17
TR03
SW02
SW03
SW04
MI11
MI12
MTB-4
xyan08
pip01
xyan10
GMaid02
cool14
cool15
cool 04
leda03
PB-1
PB-6
trigg08
m4601
m4602
PAR1
Guild02
zYAN4
zYAN5
buck01
bold18
NAVB-3
bold22
bold05
bold06
MHENRY-1
MHENRY-2
CHIDPT-1
PEPGRV-1
PEPGRV-2
TR06
TR07
TRIG-1
PTWALT-1
bold12
bold14
bold23
bold07
bold09
bold08
bold10
BOLD-1
bold11
bold13
NAVB-2
NAVB-4
MTB-2
MTB-3
cool 08
cool 02
cool 03
rich02
BOLD-3
BOLD-4
star01
star02
TRIG-6
NEER-1
NEER-11
GARD02
BU03
BU04
BU02
BU01
BURN-1
Samples


Group average
Resemblance: S17 Bray Curtis similarity
Similarity
8
10
12
MR06
MR18
BNR05
MR16
MR15
MR17
ELE12
ELE38
ELE39
YAN-21
gnan02
pinj11
C71-1
MODO-3
low10b
hymus01
beel03
HARRY-6
CARAB-3
rowe01
ELE20
ELE19
zBEER 02
zBEER 01
RIVD-1
SF04
MILT-2
ELE37
pinj13
white08
raven02
white04
WN097HED
WN095HED
WN096HED
MR01
MR04
cool 09
ELE09
ELE36
ELE10
ELE35
WN019MNR
R10
Garden Lake NW
alfr01
Possum1
NAVB-1
SANDON-1
rott03
rott06
rott04
rott05
much05
MILT-5
pinj01
CAPEL-4
gosn05
RUAB-3
airf01
AUSTB-1
benn03
CARAB-1
xpearce04
xpearce05
BAMBUN-2
yang01
WN109MOR
WN111MOR
TWIN-10
TWIN-5
WATER-2
Chid06
WN020MNR
WATER-1
McLART-1
PAGA-2
benn01
benn02
yuri05
Cavs06
Sunday01
Possum5
ELLIS-1
MTB-5
leda04
Samples


Group average
Resemblance: S17 Bray Curtis similarity
Similarity
30
32
34
rott06
rott04
rott05
WOODP-1
rott03
R11
Garden Lake NW
MTB-4
xyan08
pip01
xyan10
GMaid02
cool14
cool15
cool 04
leda03
TR01
SW01
MI13
MI14
TR05
TR04
TRIG-2
MI20
MI21
TR02
MI15
MI16
BURN-2
MI22
MI19
MI10
MI17
TR03
SW02
SW03
SW04
MI11
MI12
PB-1
PB-6
trigg08
m4601
m4602
PAR1
Guild02
zYAN4
zYAN5
buck01
bold18
NAVB-3
bold22
bold05
bold06
MHENRY-1
MHENRY-2
CHIDPT-1
PEPGRV-1
PEPGRV-2
TR06
TR07
TRIG-1
PTWALT-1
bold12
bold14
bold23
bold07
bold09
bold08
bold10
BOLD-1
bold11
bold13
NAVB-2
NAVB-4
MTB-2
MTB-3
cool 08
cool 02
cool 03
rich02
BOLD-3
BOLD-4
star01
star02
TRIG-6
Samples


Group average
Resemblance: S17 Bray Curtis similarity
Similarity
26
28
30
gnan02
pinj11
C71-1
MODO-3
low10b
hymus01
beel03
HARRY-6
CARAB-3
rowe01
ELE20
ELE19
zBEER 02
zBEER 01
RIVD-1
SF04
MILT-2
ELE37
pinj13
white08
raven02
white04
WN097HED
WN095HED
WN096HED
MR01
MR04
cool 09
ELE09
ELE36
ELE10
ELE35
WN019MNR
alfr01
Possum1
SANDON-1
NAVB-1
q12
Garden Lake NW
rott03
rott06
rott04
rott05
much05
MILT-5
pinj01
CAPEL-4
gosn05
RUAB-3
airf01
AUSTB-1
benn03
CARAB-1
xpearce04
xpearce05
BAMBUN-2
yang01
WN109MOR
WN111MOR
TWIN-10
TWIN-5
WATER-2
Chid06
WN020MNR
WATER-1
McLART-1
PAGA-2
benn01
benn02
yuri05
Cavs06
Sunday01
Possum5
ELLIS-1
MTB-5
leda04
cool 11
PAGA-5
Possum2
LESCH-6
alfr02
cool 01
boot02
yela02
bold21
rich01
Samples


Group average
Resemblance: S17 Bray Curtis similarity
Similarity
22
24
26
28
30
gosn07
gosn09
LYONS-1
R116701
white05
Hamp01
kalle03
GUTHR-1
FL-9
rowe02
cas04
gosn03
gosn01
MODO-1
dian02
perth10
C58-1
Light03
MODO-6
card10
Cavs07
TWIN-1
Cavs09
low14a
MR07
RGR02
MOOR 04
MR06
MR18
BNR05
MR16
MR15
MR17
ELE12
ELE38
ELE39
YAN-21
gnan02
pinj11
C71-1
MODO-3
low10b
hymus01
beeD3
HARRY-6
CARAB-3
rowe01
ELE20
ELE19
zBEER 02
zBEER 01
RIVD-1
SF04
MILT-2
ELE37
pinj13
white08
raven02
white04
WND97HED
WND95HED
WND96HED
MR01
MR04
cool09
ELE09
ELE36
ELE10
ELE35
WND19MNR
rott03
rott06
rott04
rott05
q13
Garden Lake NW
alf01
Possum1
NAVB-1
SANDON-1
much05
MILT-5
pinj01
CAPEL-4
gosn05
RUAB-3
airf01
AUSTB-1
benn03
CARAB-1
xpearce04
xpearce05
BAMBUN-2
yang01
WN109MOR
WN111MOR
TWIN-10
TWIN-5
WATER-2
ChidO6
WND20MNR
WATER-1
McLART-1
PAGA-2
benn01
benn02
yurl05
Cavs06
Sunday01
Possum5
ELLIS-1
MTB-5
leda04
cool11
PAGA-5
Possum2
LESCH-6
alf02
cool01
boot02
yela02
bold21
rich01
Samples


Group average
Resemblance: S17 Bray Curtis similarity
Similarity
28
30
32
rott06
rott04
rott05
rott03
r14
Garden Lake NW
rott01
rott02
MTB-4
xyan08
pip01
xyan10
GMaid02
cool14
cool15
cool 04
leda03
TR01
SW01
MI13
MI14
TR05
TR04
TRIG-2
MI20
MI21
TR02
MI15
MI16
BURN-2
MI22
MI19
MI10
MI17
TR03
SW02
SW03
SW04
MI11
MI12
PB-1
PB-6
trigg08
m4601
m4602
PAR1
Guild02
zYAN4
zYAN5
buck01
bold18
NAVB-3
bold22
bold05
bold06
MHENRY-1
MHENRY-2
CHIDPT-1
PEPGRV-1
PEPGRV-2
TR06
TR07
TRIG-1
PTWALT-1
bold12
bold14
bold23
bold07
bold09
bold08
bold10
BOLD-1
bold11
bold13
NAVB-2
NAVB-4
MTB-2
MTB-3
cool 08
cool 02
cool 03
rich02
BOLD-3
BOLD-4
star01
star02
Samples