

The vegetation ecology of municipal Durban, Natal. Floristic classification

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ABSTRACT

The vegetation of municipal Durban is classified according to the Braun-Blanquet method, using the PHYTOTAB program package. Five major vegetation types with 18 communities are described, as are the major environmental factors influencing vegetation composition and structure.

UITTREKSEL

Die plantegroei van Durban se munisipale gebied is volgens die Braun-Blanquet-metode met behulp van die PHYTOTAB-programpakket geklassifiseer. Vyf hoof plantegroeitipes met 18 gemeenskappe word beskryf, asook die bepalende omgewingsfaktore wat plantegroeisamestelling en -struktuur beïnvloed.

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INTRODUCTION

In order to facilitate ecologically effective open space planning and management within municipal Durban, a comprehensive survey of all the remaining vegetated areas within the city was undertaken. This excluded landscaped or formally managed areas (e.g. parks, gardens and agricultural lands). The study included classification of the vegetation in terms of both floristics and structure, as well as correlation of the vegetation classification with a range of environmental parameters. This latter facilitated a more accurate interpretation of the current ecological status and conservation value of the City's urban open space resources.

STUDY AREA

The study area incorporates two local authority areas: namely municipal Durban and Yellowwood Park. Although Yellowwood Park is administered by an independent health committee, it is completely encircled by municipal Durban, and is included within the boundaries of the study area to ensure physical continuity (Figure 1). At the commencement of the study in 1983, municipal Durban and Yellowwood Park together covered an area of approximately 300.13 km² (P. Johnson pers. comm.); 8.5 km² of which was covered by open water in Durban

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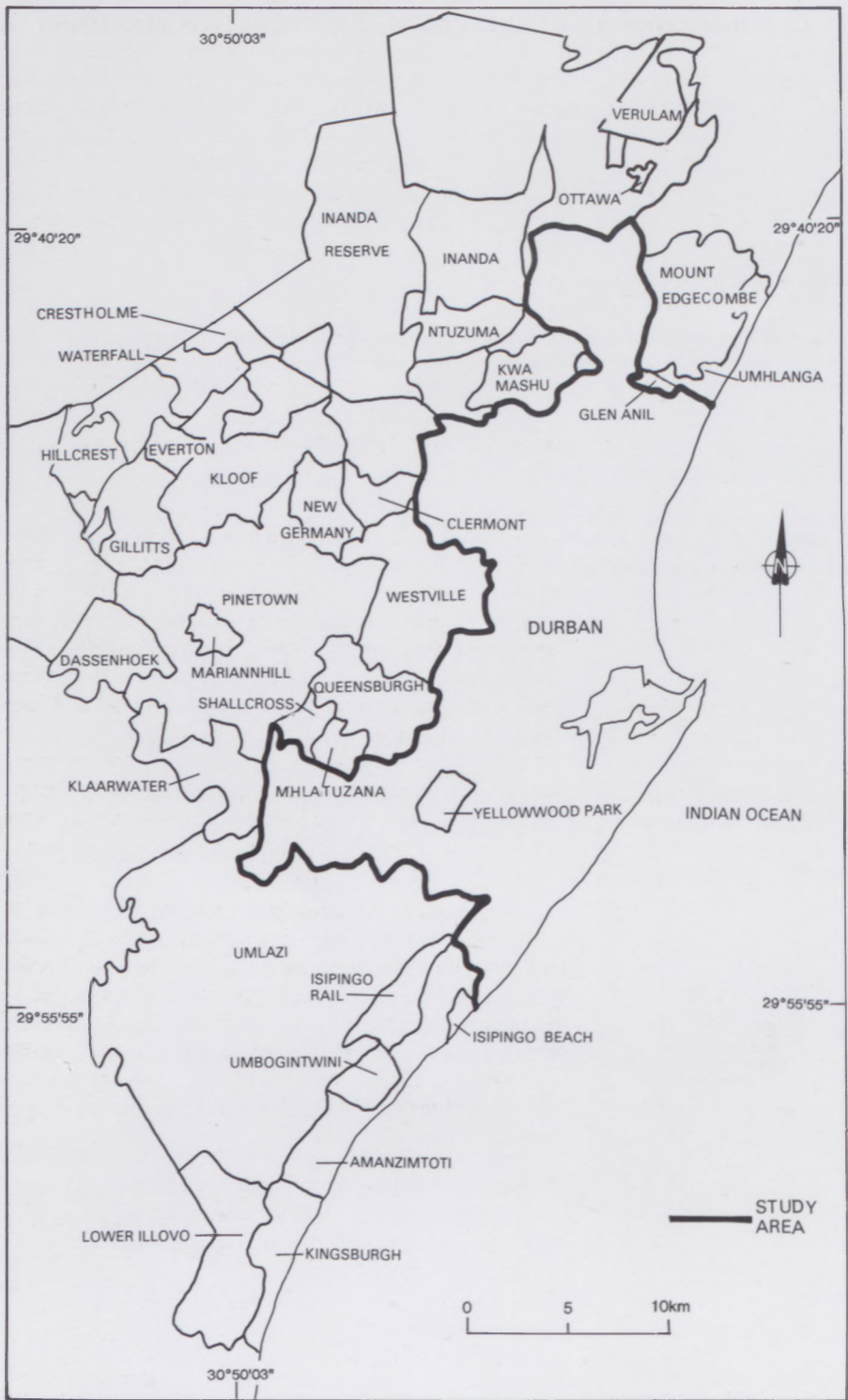


FIGURE 1.—Location of the study area.

Harbour. In 1985/1986, the Durban municipal boundaries were altered as a result of extensions made in the Isipingo and Phoenix areas. Because of the difficulty of altering the boundaries of the study area midway through the research, and the fact that these changes would not significantly affect or compromise the outcome of the study, the original municipal boundaries were retained.

Accordingly, the Umlaas River marks the southern limit of the study area as far as the Umlaas canal, from whence the boundary follows the route of the previously uncanalised river to the coast at Isipingo. To the west and north the study area is flanked by the districts of Klaarwater, Pinetown, Shallcross, Umhlatuzana, Queensburgh,

Westville, Chesterville, Clermont, KwaDabeka, Kwa-Mashu, Duffs Road, Inanda, Mount Edgecombe, Glen Anil and Umhlanga. This area is bounded by latitudes 29° 40' 20" and 29° 55' 55" south, longitude 30° 50' 03" east and the Indian Ocean (Figure 1).

Low rolling hills characterise most of the study area, with the terrain varying in altitude from sea level along the eastern boundary to over 350 m above sea level in Chatsworth, a distance of approximately 15 km. A major topographic feature of the area is the steep-sided sand ridge known as the Bluff Ridge. This ridge stands over 80 m (maximum height 108 m) in altitude and diverges from the normal line of the coast at an angle of about 14

degrees (Preston-Whyte 1980). Inland and parallel to the Bluff Ridge is a second, smaller ridge with a maximum height of 91 m above sea level, which is often regarded as part of the Bluff Ridge (Preston-Whyte 1980; King 1982). For the purposes of this study this ridge was regarded as a distinct land form and referred to as the Wentworth Ridge (Alexander 1987). Both the Bluff and the Wentworth Ridge trend in a southwest to northeast direction.

West of the Bluff and Wentworth Ridges, a third ridge, known as the Berea Ridge, parallels the coast and rises to about 130 m (maximum height 151 m above sea level) in altitude. Natal Bay, about which the city of Durban has grown, lies between these two sets of ridges and is enclosed by a curved spit which extends from the Umgeni River estuary to the Point, and never exceeds 6 m in altitude (King & Maud 1964). The floor of the corridor between the ridges is flat and low-lying and consists largely of alluvial deposits from rivers draining into the bay. These rivers have entrenched deep, youthful valleys through the Berea Ridge but the coast of the Bluff Ridge is unbroken in the bay area (Preston-Whyte 1980).

West of the Berea Ridge, away from the foreshore and central city area, the terrain rises rapidly and becomes progressively more rugged towards the interior (King & Maud 1964). Here a low-lying hill and valley region slopes up to interfluvial crests separated by the entrenched east-west valleys (Preston-Whyte 1980) of the Umlaas, Umhlathuzana, Umbilo and Umgeni Rivers. The valley sides of these major rivers are steep, and where they cross Natal Group Sandstone, gorges have been formed. These large rivers have greatly influenced the topography of the study area (Cawood 1980).

The geological units found within the study area are considerably diverse and are discussed in detail by King & Maud (1964). Archaean granite-gneiss underlies the whole of the study area and is unconformably overlain by: the arenaceous Natal Group Sandstones; the glacial Dwyka Series and the argillaceous and arenaceous Pietermaritzburg Shale and Vryheid Formations, both of the Karoo sequence. There are several minor intrusions (dykes and sills) of Karoo Dolerite scattered throughout these formations. All other geological formations within the Durban area have accumulated during the Quaternary Era. These are: the Bluff Sandstones; the Berea Red Sand and boulderbed; and sundry unconsolidated sand, grit and clay associated with the harbour and city area; with alluvia along the major river courses (King & Maud 1964).

The range of soils found in the Durban area is linked not only to the nature of the parent geological material from which they are derived, but also to the topography of the land. The soils represented include: Arcadia Rydalvale, Cartref Cartref, Dundee Dundee, Fernwood Fernwood, Glenrosa Williamson, Hutton Clansthal, Katspruit Katspruit, Kroonstad Avoca, Kroonstad Mkambati, Longlands Waldene, Milkwood Milkwood, Mispah Mispah, Rensburg Phoenix, Shortlands Shortlands and Swartland Swartland (MacVicar *et al.* 1977).

According to Acocks (1988) the study area contains elements of both Coastal Forest and Thornveld (Veld Type

1) and Valley Bushveld (Veld Type 23), but both have been badly disturbed by the process of urbanisation. The climate in Durban is generally warm and humid with a wet summer season, but with some form of precipitation in all seasons (Cawood 1980). The main form of precipitation is rain, with an average of between 1 000 mm and 1 250 mm per annum (Preston-Whyte 1980). According to Köppen's classification (Schulze 1947), Durban falls within the C_{fw} unit. The mean annual temperature is 20.5°C with an annual range of 8.3°C (Preston-Whyte 1980).

METHODS

The Braun-Blanquet method of sampling and synthesis followed in the study is described by Westhoff & Van der Maarel (1973), Mueller-Dombois & Ellenberg (1974) and Werger (1974).

The study area was stratified into physiognomic-physiographic units using 1:1 750 aerial photography. Sampling intensity was determined using the relationship between mapping scale, vegetation structure and floristic community described by Rutherford & Westfall (1986). Sample sites were located by means of random co-ordinates within each physiognomic-physiographic unit identified. A total of 345 sample sites, each of 113 m² (as determined by Rutherford & Westfall's (1986) proposed relationship between mapping scale and smallest mappable unit area) were sited in homogeneous stands representing the different physiognomic-physiographic units.

At each sample site all plant species were listed together with their Domin-Krajina cover abundance values and growth forms. The total canopy cover and height range of each stratum of vegetation was also recorded for the purpose of physiognomic-structural classification (Edwards 1983). The environmental parameters recorded were altitude, aspect, slope, geological formation and lithology, soil texture, soil depth, soil form and series, geomorphology and land use.

The vegetation was classified according to the Braun-Blanquet method using the PHYTOTAB program package (Westfall *et al.* 1982; Westfall & De Wet 1988). The main environmental factors influencing the communities were derived from gradients determined by an ordination of floristic data by detrended correspondence analysis (DCA) (Hill & Gauch 1980) using the DECORANA program (Hill 1979). Species diversity for each community was expressed as a function of average species number per relevé/area of the relevé. Furthermore, because of the significant impact of alien invasive species on the plant ecology of municipal Durban, figures for percentage occurrence and average cover of the two predominant species: *Chromolaena odorata** and *Lantana camara** are recorded for all community types. (**Note:** * denotes alien species).

Community structure is illustrated by means of layer diagrams (Ito 1979) whereby vegetation height classes are grouped into three strata, namely a herb/grass stratum (0–0.5 m), a shrub stratum (0.5–5.0 m) and a tree stratum (>5.0 m), and determining the highest mean percentage cover in each stratum. The following symbols, determined

by the highest mean cover in a stratum, are used to classify each layer diagram type.

Layer diagram type	Cover of strata
L-type	herb>shrub>tree
rL-type	herb<shrub<tree
D-type	herb<shrub>tree
C-type	herb>shrub<tree
I-type	herb=shrub=tree

RESULTS

Classification of the vegetation, according to the Braun-Blanquet method, revealed 18 plant communities within five major vegetation types. Communities are named according to the preliminary rules and recommendations for a standardised South African syntaxonomic nomenclature system proposed by the South African Syntaxonomic Nomenclature Committee (Scheepers *et al.* unpubl.). Each name comprises a diagnostic species followed by a dominant species and a physiognomic structural term (Edwards 1983). Because of the highly disturbed nature of most of the remnant plant communities found within the Durban area, it is not possible to assign a single physiognomic structural term to many of the groupings described. A long history of disturbance, varying spatially, temporally and in intensity, has produced a mosaic of structural types within each distinct floristic grouping. In order to accommodate this variation and give a truer representation of the nature of the plant communities involved, each community is described as a physiognomic mosaic where appropriate. Edwards' (1983) structural classification makes provision for this through the use of / 'where straddling of height classes occurs' and // 'where mosaics of classes are found'.

The phytosociological classification of communities is shown in the synoptic Appendix (p. 304). Diagnostic species are listed in groups 1–45, and non-diagnostic and infrequent species in groups 46–52**. The taxa on the left of the matrix, are grouped into simplified lifeform classes to facilitate 'veld condition' assessment (Westfall *et al.* 1983); the life form classes are based on Dyer's (1976) description of the genera of South African flowering plants.

In cases where various life forms, such as trees and shrubs have adopted a scandent growth form, these are referred to as climbers. A distinction is also made *within* species in terms of developmental stage; with seedlings, saplings and fully grown forms of each species being clearly differentiated from one another. In instances where plants could not be identified beyond the generic level, the epithet sp. is appended (e.g. *Ipomoea* sp.). It should be noted that such a name may not necessarily refer to a consistent species concept, but may include various species within the genus. The structural classification of each community together with appropriate layer diagram type is shown in Figure 2.

** complete phytosociological tables for both the diagnostic species and the non-diagnostic species are available from the author or Dr R.H. Westfall, Agricultural Research Council, Roodeplaat Grassland Institute, Private Bag X05, Lynn East 0039, Pretoria.

DESCRIPTION OF THE PLANT COMMUNITIES

In the community descriptions woody and herbaceous species are both listed in order of constancy followed by mean percentage cover, with the respective values indicated next to each species. The general species characteristics of each community are omitted from the community descriptions because they are directly apparent from the Appendix (p. 304). Where species occurrences have special significance, however, these are noted.

MANGROVE FOREST

Community 1: *Avicennia marina*–*Bruguiera gymnorrhiza* Mangrove Short Forest (Figure 3)

This short mangrove forest (Edwards 1983) is found along the Natal coast in bays, lagoons and at river mouths where suitable mudflats occur (0–5 m). It is represented by relevés 11, 13, 14, 201 and 202, with 2–5 species per relevé. This short forest community has a rL structure (Ito 1979; Figure 2A) with the greatest average cover of 51.6% in the upper height class of higher than 5 m. The two lower height strata are comprised almost exclusively of the saplings and seedlings of the three dominant tree species.

Habitat

The soils are of the Fernwood Form, Fernwood Series and are derived from grey sands of the Berea System and recent alluvial deposits. The terrain is generally flat with a slight easterly (Beachwood Nature Reserve) or westerly (Bayhead mangroves) aspect.

Floristics

The community is diagnosed by the *Avicennia marina* species group (Appendix .1), and has no species in common with any other species group listed in the Appendix. The character species for this group consist exclusively of three halophytic mangrove tree species: *Avicennia marina*, *Bruguiera gymnorrhiza* and *Rhizophora mucronata*. The species diversity per unit area for this community is therefore low, with an average of 0.03 species per m², and an average of three species per relevé.

Trees and shrubs

	% Occurrence	Mean cover
<i>Chromolaena odorata</i> * (shrub)	0.0%	0.0%
<i>Lantana camara</i> * (shrub)	0.0%	0.0%
Conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing this community are:		
<i>Avicennia marina</i> (tree)	100.0%	45.8%
<i>Bruguiera gymnorrhiza</i> (tree)	100.0%	38.6%
<i>Rhizophora mucronata</i> (tree)	60.0%	20.4%

Herbs

The only herb species present in more than 20% of the relevés representing the community is:

Arthrocnemum perenne (undershrub) 20.0% 0.002%
(non-diagnostic)

The presence of this genus as the only representative of the herb stratum (other than seedlings of the three dominant tree species) indicates the saline, mesic conditions experienced in this community.

Saplings and seedlings

Saplings and seedlings occurring in more than 20% of the relevés representing the community are:

<i>Bruguiera gymnorhiza</i> sapling (tree) (non-diagnostic)	20.0%	18.2%
<i>Avicennia marina</i> seedlings (tree)	40.0%	10.4%
<i>Bruguiera gymnorhiza</i> seedlings (tree)	40.0%	7.4%
<i>Rhizophora mucronata</i> seedlings (tree)	40.0%	6.4%

General

Community 1 is floristically unrelated to any of the other vegetation types identified within the study area, and thus shares no common species groups with any of the

other communities. It is equivalent to Acocks's (1988) Mangrove Forest, Moll's (1976) Mangrove Swamp and allied communities and Ward's (1980) Mature Mangrove Communities.

Because of its floristic isolation, and the fact that this community depends entirely on within-community dynamics for long-term survival, the mangroves are considered to have a high conservation status. This ranking is further re-inforced by the restricted occurrence of this community within the municipal Durban area. Only two sites remain: the first and largest at Beachwood Nature Reserve, and the second in a limited area on the mudflats of Durban Bay to the west of Salisbury Island. A small, threatened community occurs at the Isipingo Lagoon, just outside of Durban. If these remaining sites are lost, there is little or no potential for re-establishment of similar communities elsewhere in the municipal area due to loss of suitable habitat.

The ecological autonomy of this vegetation type may be attributed to the specific habitat requirements of the community (Hutchings & Saenger 1987). Mangroves

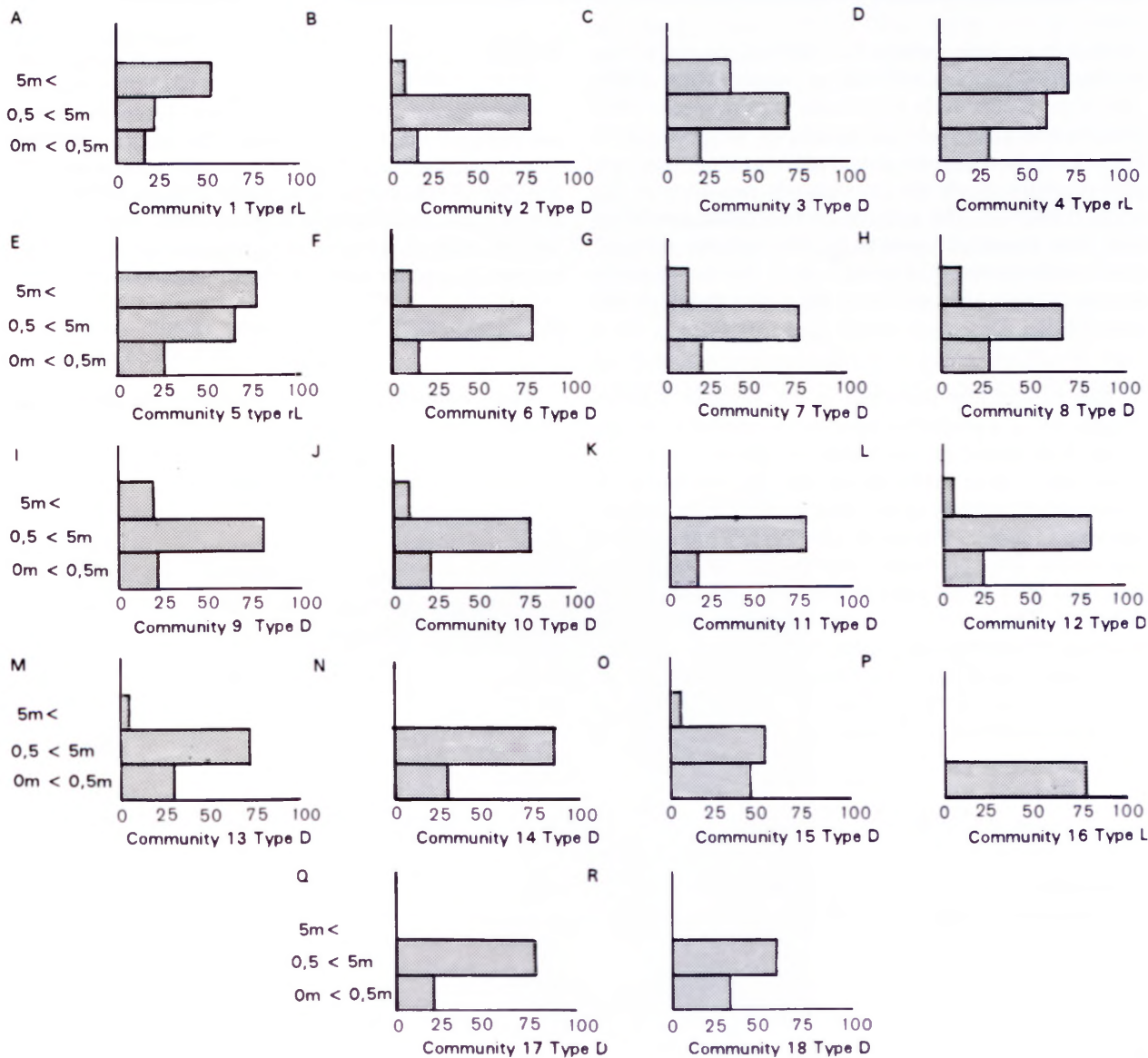


FIGURE 2.—Average community structure of the vegetation of municipal Durban, showing height classes, strata, mean percentage cover and layer diagram types (see Methods).



FIGURE 3.—Community 1: *Avicennia marina*–*Bruguiera gymnorhiza* Mangrove Short Forest. Note continuous canopy of *Avicennia marina* and large number of establishing *Avicennia marina* propagules in foreground. Location: Bay-head Mangroves.

occur only on shores where the vigour of the surf is broken by sand bars or coral reefs or islands (White 1983). This niche is effectively unavailable to plant species other than the specifically adapted halophytes which occupy it. As a result the mangrove community has the lowest species diversity of all the communities described in this study (Figure 4). The extreme environmental conditions have also prevented invasion by *Chromolaena odorata** and *Lantana camara** (Figures 5 & 6), the two most important invasive alien species in Natal (Macdonald & Jarman 1985).

The rL structure illustrated in the structure diagram (Figure 2A) is a product of these environmental restraints, as the limit placed on the number of species capable of surviving in these areas means that the community is dominated exclusively by the three mangrove tree species, *Avicennia marina*, *Bruguiera gymnorhiza*, *Rhizophora mucronata*. This produces a community structure characterised by a single layer of trees with little or no understorey. The cover within the 0.5–5.0 m category is made up of saplings and young individuals of the three tree species. Seedlings and/or saplings for all three dominant tree species were recorded only within the relevés sampled at Bayhead in the harbour.

COASTAL FOREST COMPLEX

Community 2: Transitional *Eugenia capensis*–*Maytenus procumbens* High Closed Shrubland (Figure 7)

This high closed shrubland/low thicket community mosaic (Edwards 1983) is found between 5 and 75 m above sea level. It is represented by seven relevés (Appendix) with 4–10 species per relevé. This community has a D structure (Ito 1979; Figure 2B) with the greatest average cover of 75.3% in the 0.5–5.0 m height class.

Habitat

The soils are of the Fernwood Form, Fernwood Series, and Hutton Form, Clansthal Series. The latter occur in the two atypical relevés found within this community, 205 and 219, and should not be regarded as characteristic. The terrain varies from flat to a slope of 26.6°. Aspect is also variable, with all points of an eight-point rose equally represented except for north, northeast and southwest.

Floristics

This community is differentiated by the absence of character species. The species diversity per unit area is low and averages 0.06 species per m² for the community, with an average of 6.6 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

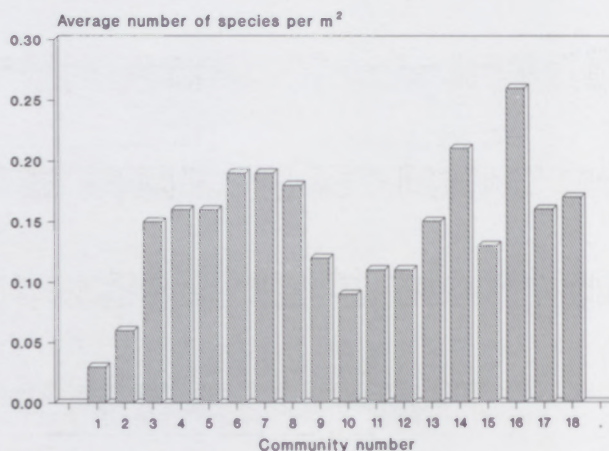


FIGURE 4.—Species diversity for Communities 1–18.

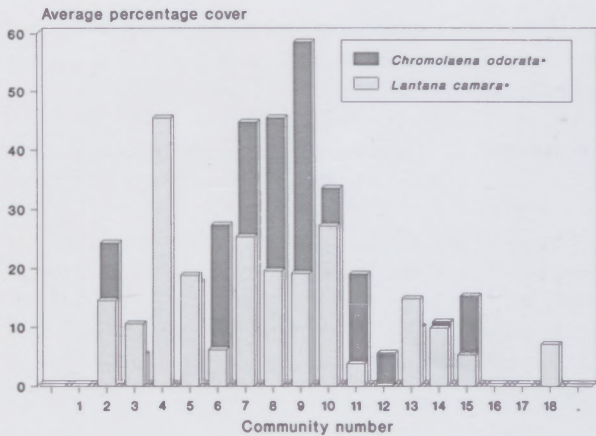


FIGURE 5.—Average percentage cover of *Chromolaena odorata** and *Lantana camara** in Communities 1–18.

<i>Chromolaena odorata*</i> (shrub)	42.9%	23.9%
<i>Lantana camara*</i> (shrub)	28.6%	14.6%

Conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing this community are:

<i>Ficus burtt-davyi</i> (shrub)	28.6%	23.9%
<i>Rhus nebulosa</i> (shrub)	28.6%	14.6%
<i>Albizia adianthifolia</i> (tree)	28.6%	8.1%

Herbs

There are no herb species occurring in more than 20% of the relevés representing the community.

Climbers

The only climber present in more than 20% of the relevés representing the community is:

<i>Rhoicissus digitata</i> (shrub)	28.6%	28.6%
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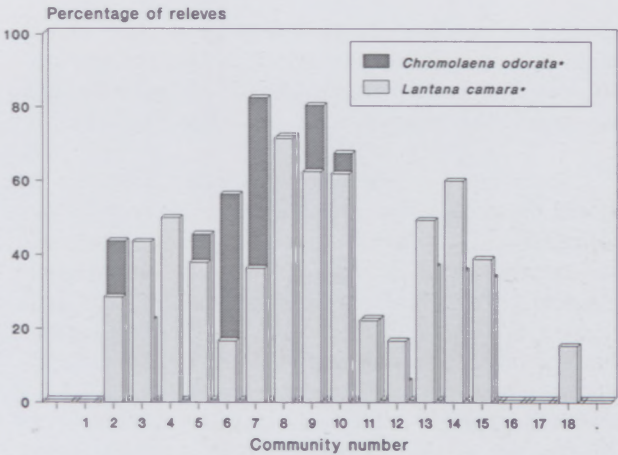


FIGURE 6.—Percentage of relevés in Communities 1–18 in which *Chromolaena odorata** and *Lantana camara** were recorded.

General

The majority of the relevés constituting this community occur in the frontal section of the secondary dunes (Tinley 1985) and are floristically equivalent to Tinley’s (1985) Scrub-Thicket Community, Cawood’s (1980) Dune Scrub and Ward’s (1980) Closed Dune Scrub. Acocks (1988) does not recognise this as a separate community and describes this formation as part of the Dune Forest unit.

According to the classification presented in this study, also included within this community are two relevés (205 and 219) comprised predominantly of dense stands of the two invasive species *Chromolaena odorata** and *Lantana camara**, situated well inland of the secondary dune area. Although these relevés are floristically different from those located within the dune area, they are similar in terms of cover, structure, density and species richness. For the purposes of community description, the frontal dune scrub/thicket community (Moll 1976; Tinley 1985) repre-



FIGURE 7.—Community 2: Transitional *Eugenia capensis*–*Maytenus procumbens* High Closed Shrubland. Note wind-clipped, compact, even canopy of closed frontal dune communities (in the middle and background) containing *Eugenia capensis*, *Maytenus procumbens* and *Rhus nebulosa*. Dune pioneer *Scaevola thunbergii* (of the Strand community) in foreground. Location: Virginia Beach.

sented by Community 2 (excluding the atypical relevés) could be more accurately described as *Eugenia capensis*–*Maytenus procumbens* High Closed Shrubland rather than as a transitional group as indicated in the Appendix.

Community 2 is related to Community 3 through the shared presence of the *Eugenia capensis* species group (Appendix .3), and to Communities 3 and 5 through the shared presence of the *Ficus burtt-davyi* species group (Appendix .9), this indicates a common indigenous shrub element throughout all three communities. Its association with the other vegetation complexes is limited to generalist species groups (both indigenous and alien) that are ubiquitous throughout the study area, and is the result of the presence of the two atypical relevés already noted. The strong floristic relationship between Communities 2, 3 & 5 is the first indication that the community spectrum should be treated as the fundamental unit for conservation. This implies that it is insufficient merely to preserve a single area of each community type without preserving ecological/physical continuity with viable examples of the associated types.

As with the mangroves, the species diversity in the frontal dune area is restricted by the severe environmental conditions to which the community is exposed (Ward 1980). The diversity of the frontal dune communities is, however, higher than in the mangroves (Figure 4). The presence of *Chromolaena odorata** and *Lantana camara** in this community (Figures 5 & 6) is due only to the inclusion of the two atypical relevés, although Cawood (1980) and Ward (1980) both note that *Lantana camara** is an important invasive species in areas of disturbance in the frontal dune community. In this community a D structure predominates (Figure 2B), and is the result of the 'salt-spray factor' which produces a clipped-hedge appearance (Ward 1980). The predominant structural stratum in this community therefore falls within the 0.5–5.0 m category. The existence of a cover value in the greater than 5 m category, is the result of relevés sampled further

inland, here 'as the scrub-thicket matures it provides increasing protection and humus, with patches of uneven canopy in lee sites and hollows' (Tinley 1985).

Community 3: *Mimusops caffra*–*Allophylus natalensis* Low/Short Thicket (Figure 8)

This low/short thicket community (Edwards 1983) is found between 5 and 142 m above sea level. It is represented by 23 relevés (Appendix) with 7–26 species per relevé, and has a D structure (Ito 1979; Figure 2C) with the greatest average cover of 68.9% in the 0.5–5.0 m height class.

Habitat

The soils are mainly of the Fernwood Form, Fernwood Series (8 relevés) and Hutton Form, Clansthal Series (13 relevés). However, the two relevés located within Stainbank Nature Reserve have soils of the Cartref Form, Cartref Series and Kroonstad Form, Mkambati Series. The terrain varies from flat to a slope of 45°. The aspect of the land in each of the relevés is also variable, with all points of an eight-point rose represented except northeast. The southeasterly aspect is the most common, and found in six out of the 23 relevés.

Floristics

This community is differentiated by the *Mimusops caffra*–*Allophylus natalensis* species group (Appendix .2). The species diversity averages 0.15 species per m² with an average of 14.1 species per relevé. A notable feature of this community is that 47.1% of the diagnostic species for this community are either seedlings or saplings.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:



FIGURE 8.—Community 3: *Mimusops caffra*–*Allophylus natalensis* Low/Short Thicket. Note the lack of large trees or forest patches. Predominant is a thicket of *Brachylaena discolor*, *Chrysanthemoides monilifera*, and *Strelitzia nicholai*, interspersed with representatives of *Allophylus natalensis* and *Mimusops caffra*. *Chromolaena odorata** and *Lantana camara** in foreground indicate previous disturbance. Location: southeastern Bluff slopes.

<i>Lantana camara</i> * (shrub)	43.5%	10.6%
<i>Chromolaena odorata</i> * (shrub)	21.7%	4.9%

Conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community are:

<i>Brachylaena discolor</i> (shrub/tree)	39.1%	29.7%
<i>Mimusops caffra</i> (tree)	21.7%	7.8%
<i>Ficus burtt-davyi</i> (shrub)	21.7%	6.3%
<i>Bequaertiodendron natalense</i> (tree)	21.7%	6.2%

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Isoglossa woodii</i> (forb/undershrub)	47.8%	24.9%
<i>Cyperus albostrigatus</i> (sedge)	21.7%	0.5%

Climbers

Climbers occurring in more than 20% of the relevés representing the community are:

<i>Rhoicissus rhomboidea</i> (shrub)	34.8%	30.5%
<i>Cynanchum obtusifolium</i> (climber)	30.4%	13.0%
<i>Cyphostemma hypoleucum</i> (forb)	26.1%	4.4%
<i>Flagellaria guineensis</i> (climber)	21.7%	13.1%
<i>Dalbergia obovata</i> (tree)	21.7%	2.2%
<i>Monanthotaxis caffra</i> (shrub)	21.7%	0.5%

Saplings and seedlings

The only sapling occurring in more than 20% of the relevés representing the community is:

<i>Deinbollia oblongifolia</i> sapling (tree)	39.1%	0.04%
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General

This community can be equated with Acocks's (1988) and Moll's (1976) Dune Forest, Tinley's (1985) Thicket/Forest Community and Ward's (1980) *Mimusops caffra* Woodland. Within the study area no significant patches of forest remain due to previous logging of the larger trees for building poles and fuelwood (Ward 1980; Director Parks, Beaches and Recreation Department 1989). To a large extent the community is dominated by heliophytic thicket elements such as *Mimusops* and *Brachylaena* with a significant creeper component (Moll 1976; Tinley 1985). The dense tangle of creepers, climbers, scandents and woody lianas which entwine the canopy is one of the most striking features of this community. These creepers are most abundant on the margins of thicket/forest, in openings where the canopy is light and especially in secondary habitats.

Moll (1976) (also Ward 1980) notes that 'much of the high density of these lianas can be attributed to recent disturbance, particularly where *Flagellaria* is present.' The predominance of *Brachylaena discolor* over large areas of this community can also be attributed to previous damage and disturbance (Moll 1976). Based on his observations at Isipingo during the period 1949–1960, Ward (1980) concluded that *Allophylus natalensis* and *Brachylaena discolor*, both characteristic species in this community, are not tolerant of deep shade, and unless there is disturbance, do not occur in the Dune Forest proper. The fact that

47.1% of the diagnostic species for this community are either seedlings or saplings indicates that regeneration is a significant aspect of this community's dynamics, and could also be related to prior disturbance.

Communities 2 and 3 are clearly related through the common presence of the *Eugenia capensis* species group (Appendix .3) and the *Ficus burtt-davyi* species group (Appendix .9). The latter also shows floristic associations with Community 5. The association between Communities 2 & 3 indicated by the *Eugenia capensis* species group (Appendix .3), is dependent on the fact that these two groups form the dune component of the Coastal Forest Complex. Together they represent a gradation from the high closed shrubland of the foredunes through to the low/short thicket of the backdunes.

The affinities of the *Ficus burtt-davyi* species group (Appendix .9) indicate that the dune components of the complex are not floristically isolated from the inland components of the Coastal Forest Complex, represented here by Community 5. This strong floristic association is confirmed by the fact that relevés in Seaton Park, Burman Bush and Stainbank Nature Reserve, traditionally regarded as areas of coastal forest as opposed to dune forest (Moll 1976; Cawood 1980) occur in Community 3; whereas of the 18 relevés located on the Bluff Ridge's seaward facing slopes (typically regarded as dune forest), 12 are grouped within the dune component (Community 3) and six within the coastal component (Community 5). This confirms the existence of a vegetation continuum in the Coastal Forest Complex, as opposed to the existence of totally distinct and separate community types, and has obvious implications for conservation planning. The coastal forest samples included within Community 3 form a distinct floristic subgroup (Appendix) not dominated by *Mimusops caffra* and *Allophylus natalensis* which are regarded as indicator species for Dune Forest (Acocks 1988); this subgroup serves to indicate the unambiguous links between these two groups and reinforces the need for a landscape approach to conservation (Forman & Godron 1986).

This floristic association between Communities 3 & 5 is the result of the distribution of differential species which are widespread within the coastal areas of the urban landscape e.g. *Deinbollia oblongifolia* (Appendix .8) and *Ficus burtt-davyi* (Appendix .9) and a variety of scandent forms such as *Rhoicissus rhomboidea* (Appendix .8) and *Flagellaria guineensis* (Appendix .8). This compares with the diagnostic species which distinguish communities, and have a more limited distribution e.g. *Mimusops caffra* (Appendix .2) and *Protorhus longifolia* (Appendix .6). Both diagnostic and differential species are critical to the identity and continued viability of the communities and must be catered for in conservation programs. This implies the need for large core areas to protect localised diagnostic species populations, with provision for continuity between these cores to allow free dispersal of the differential species groups which provide the broader-level ecological continuity across the urban landscape. This is totally compatible with the recommendations of Reticular Biogeography (Roberts 1990), used in the design of the municipal Durban open space system.

In Community 3 there is a marked increase in species diversity in comparison to Community 2. This is probably due to the more favourable and sheltered environmental conditions which prevail further inland (Figure 4). The average cover and percentage occurrence of *Lantana camara** is greater than *Chromolaena odorata**, although compared to the levels of these two species in other wooded communities, the absolute values are comparatively low (Figures 5 & 6). In this community too, the effect of salt-spray also affects physiognomy. This accords with the D structure evident for this community (Figure 2C) where there is a strong representation in the 0.5–5.0 m layer, but a greater percentage cover in the >5 m category than evident in Community 2.

Community 4: *Manilkara discolor*–*Tricalysia lanceolata* Short Thicket (Figure 9)

This short thicket community (Edwards 1983) is found at altitudes between 70 and 133 m above sea level. It is represented by relevés 167, 297, 299 and 309 with 13–20 species per relevé. This community has an rL structure (Ito 1979; Figure 2D) with the greatest average cover of 71.0% in the upper height classes of greater than 5 meters.

Habitat

The soils are of the Cartref Form, Cartref Series (3 out of 4 relevés) and Kroonstad Form, Mkambati Series. The terrain slopes from 1.4° to 39.8° in a generally easterly direction (only one of the four relevés has a westerly aspect).

Floristics

This community is differentiated by the *Manilkara discolor* species group (Appendix .4). The species diversity per unit area averages 0.16 species per m² for the community with an average of 18.3 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Lantana camara</i> * (shrub)	50.0%	45.5%
<i>Chromolaena odorata</i> * (shrub)	0.0%	0.0%

Conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community are:

<i>Monanthotaxis caffra</i> (shrub)	75.0%	9.3%
<i>Canthium inerme</i> (tree)	50.0%	6.5%
<i>Tricalysia lanceolata</i> (shrub/tree)	50.0%	6.5%
<i>Protorhus longifolia</i> (tree)	25.0%	22.8%
<i>Baphia racemosa</i> (tree)	25.0%	6.5%
<i>Bambusa</i> sp.* (grass)	25.0%	19.0%
(non-diagnostic)		

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Cyperus albostriatus</i> (sedge)	50.0%	0.3%
<i>Panicum laticomum</i> (grass)	25.0%	19.0%
<i>Isoglossa woodii</i> (forb/undershrub)	25.0%	12.8%

<i>Panicum maximum</i> (grass)	25.0%	8.5%
<i>Dicliptera heterostegia</i> (forb)	25.0%	0.03%
<i>Vernonia angulifolia</i> (forb)	25.0%	0.03%
<i>Phaulopsis imbricata</i> (forb)	50.0%	19.3%
(non-diagnostic species)		

Climbers

Climbers occurring in more than 20% of the relevés representing the community are:

<i>Dalbergia obovata</i> (tree)	75.0%	75.0%
<i>Uvaria caffra</i> (shrub)	75.0%	1.8%
<i>Dioscorea cotinifolia</i> (climber)	50.0%	50.0%
<i>Dalbergia armata</i> (tree)	50.0%	25.0%
<i>Protaspargus falcatus</i> (climber)	50.0%	0.03%
<i>Entada spicata</i> (shrub)	25.0%	25.0%

Saplings and seedlings

Saplings and seedlings occurring in more than 20% of the relevés representing the community are:

<i>Cussonia spicata</i> sapling (tree)	75.0%	2.8%
<i>Manilkara discolor</i> sapling (tree)	75.0%	0.3%
<i>Drypetes arguta</i> sapling (tree)	50.0%	0.03%
<i>Tricalysia lanceolata</i> sapling (shrub /tree)	50.0%	0.03%
<i>Euclea natalensis</i> sapling (tree)	50.0%	0.03%
<i>Melia azedarach</i> * seedlings (tree)	25.0%	1.5%
<i>Dalbergia obovata</i> sapling (tree)	25.0%	0.3%
<i>Albizia adianthifolia</i> sapling (tree)	25.0%	0.03%
<i>Strelitzia nicolai</i> sapling (tree)	25.0%	0.03%
<i>Dalbergia armata</i> seedlings (tree)	25.0%	0.3%
(non-diagnostic)		

General

Within the complex of coastal forest communities, Community 4 emerges as a distinct unit, which, because of its specific floristic relationships and characteristics can be separated from the community spectrum created by Communities 2, 3 & 5. Community 4 is related to Community 3 through the common presence of the *Tricalysia lanceolata* species group (Appendix .5), and to Community 5 via the common presence of the *Psychotria capensis* species group (Appendix .7), and to both 3 and 5 through the shared presence of the *Rhoicissus rhomboidea* species group (Appendix .8). This latter group indicates floristic similarity at the subcanopy level between these three communities. The floristic relationships shared by Communities 3 & 4 and by Community 4 & 5 suggest the presence of a distinct dune and coastal element in Community 4. The association with Community 5 is the more significant of the two, and is reinforced by the fact that the affiliation between Community 3 and 4 in the *Tricalysia lanceolata* species group (Appendix .5) is a result of the floristic similarities shown between the subgroup of coastal forest relevés incorporated into Community 3, and the relevés constituting Community 4.

This pattern reveals strong, but selective, floristic associations between Community 4 and the remainder of the communities constituting the Coastal Forest Complex. It shares distinct floristic ties with both Communities 3 & 5, but shows no similar association with Community 2 as indicated by its absence from the *Ficus burtt-davyi* species group (Appendix .9). This is noticeably different from Communities 3 & 5 which show clear floristic links with Community 2, and indicates that the indigenous shrub component shared by Communities 2, 3 & 5 is not present



FIGURE 9.—Community 4: *Manilkara discolor*–*Tricalysia lanceolata* Short Thicket. Canopy composed of *Albizia adianthifolia*, *Canthium inerme*, *Combretum kraussii*, *Manilkara discolor*, *Protorhus longifolia* and *Strelitzia nicolai*. Location: Silverglen Nature Reserve.

in Community 4. The only association between Community 2 & 4 occurs at the most generalised floristic level through the *Chaetacanthus burchellii* species group (Appendix .45). This group contains only generalistic and opportunistic species, (both alien and indigenous) and even here there would have been no association if it had not been for the two anomalous relevés included in Community 2. Although these patterns could in part be an artifact of undersampling (Community 4 is identified by only four sample sites), the relationship between the dune and coastal forest communities is certainly far more complex and inter-related than previously documented (Moll 1976; Cawood 1980; Ward 1980).

The close floristic associations between Communities 2, 3, 4 & 5 re-emphasise the need for any urban open space system to conserve a landscape continuum rather than single examples of each community type. This approach, however, is a complex one. Variations within the continuum, such as that provided by Community 4, complicate conservation planning because of the biased importance of some floristic links, e.g. the coastal association (Community 5) is more critical to Community 4 than the dune communities (Communities 2 & 3). Yet because dune species are essential to the continued identity and viability of Community 5, ultimately it is not possible to preserve Community 4 without preserving viable communities of Community 2, 3 & 5, even though the floristic associations between Community 4 and Communities 2 & 3 are relatively limited.

Community 4 also shows specific floristic associations outside of the Coastal Forest Complex with the Valley Bushveld Complex through the *Canthium inerme* (sapling) species group (Appendix .12). This is less exclusive than the relationships with Communities 3 & 5. This association reinforces the link between Communities 4 & 5, while de-emphasising the dune connection even further, as Communities 6 & 7 of the Valley Bushveld Complex have no

floristic links with Community 2. They are, however, clearly floristically associated with Communities 3 & 5, e.g. through the *Calpurnia aurea* species group (Appendix .16). The exact implications of these community relationships are as yet unclear, but field observations of Community 4 indicate that the result is a mix of species typical of coastal forest and valley bushveld, with the coastal forest element predominant.

This observation is supported by the fact that the areas occupied by Community 4, i.e. Silverglen and Welbedacht, have traditionally been regarded as a botanical transition zone (Cawood 1980; Moll 1976). The existence of such transition areas reinforces the need to ensure ecological continuity between community complexes in order to ensure long-term viability. Any conservation system must therefore make provision not only for the linking of community types, but also for the linking of community complexes, in order to accommodate the natural complexity of floristic associations.

There is only a slight increase in diversity between Communities 3 and 4 (Figure 4). The average cover and percentage occurrence of *Lantana camara** is again greater than *Chromolaena odorata** (Figures 5 & 6). This latter observation may, however, also be a result of the fact that this community was undersampled, as may be the fact that the average cover shown by *Lantana camara** is the highest percentage obtained for any community. The presence of *Lantana camara** does, however, indicate extensive disturbance as a factor in this community.

Other important features of this community are the well-developed herb layer, a large sapling and seedling component and the frequency of creepers and climbers. Both the presence of saplings in significant numbers and the proliferation of creepers and climbers such as *Dalbergia* provide an indication of past disturbance in this area and subsequent regeneration. In comparison to Com-

munity 3, the rL structure of this community (Figure 2D) indicates that the highest cover values occur within the >5 m category. Nevertheless, the cover values in the 0.5–5.0 m class are significant and can be attributed to the high sapling count and presence of *Lantana camara**, and previous removal of large trees.

Community 5: *Protorhus longifolia* (sapling)–*Psychotria capensis* Short Thicket (Figure 10)

This short thicket community (Edwards 1983) is found at altitudes of 5–124 m. It is represented by 29 relevés (Appendix) with 6–36 species per relevé. This community has an rL structure (Ito 1979; Figure 2E) with the greatest average cover 75.9% in the >5 m height class.

Habitat

The majority of the soils underlying this community are of the Hutton Form, Clansthal Series (21 relevés). The Cartref Form, Cartref Series occurs in two relevés and each of the following soil types are represented in a single relevé: Dundee Form, Dundee Series; Fernwood Form, Fernwood Series; Katspruit Form, Katspruit Series; Longlands Form, Waldene Series; Mispah Form, Mispah Series and Swartland Form, Swartland Series. The slope of the terrain varies from flat to a 51.3° slope. Aspect is variable and all eight points of an eight-point rose are represented. West and north are the two most common directions, occurring in 6 and 5 relevés respectively.

Floristics

This community is distinguished by the *Canthium obovatum* (sapling) species group (Appendix .6). The species diversity per unit area averages 0.16 species per m² for the 29 relevés with an average of 18.1 species per relevé. A significant feature of this community is that 68.4% of the diagnostic species occur as seedlings or saplings.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Chromolaena odorata</i> * (shrub)	44.8%	17.3%
<i>Lantana camara</i> * (shrub)	37.9%	18.9%

Conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés are:

<i>Psychotria capensis</i> (shrub/tree)	55.2%	5.0%
<i>Albizia adianthifolia</i> (tree)	31.0%	17.1%

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Isoglossa woodii</i> (forb/undershrub)	48.3%	30.6%
<i>Cyperus albostratus</i> (sedge)	34.5%	0.1%
<i>Aneilema aequinoctiale</i> (forb)	20.7%	6.2%

Climbers

Climbers occurring in more than 20% of the relevés representing the community are:

<i>Entada spicata</i> (shrub)	31.0%	21.9%
<i>Dalbergia obovata</i> (tree)	31.0%	15.6%
<i>Flagellaria guineensis</i> (climber)	27.6%	24.4%
<i>Smilax kraussiana</i> (shrub)	27.6%	17.3%
<i>Rhoicissus rhomboidea</i> (shrub)	20.7%	10.4%
<i>Cyphostemma hypoleucum</i> (forb)	24.1%	3.5%
<i>Jasminum multipartitum</i> (shrub)	20.7%	3.5%
<i>Monanthes affra</i> (shrub)	34.5%	3.9%

Saplings and seedlings

The only sapling occurring in more than 20% of the relevés representing the community is:

<i>Deinbollia oblongifolia</i> sapling (tree)	20.7%	0.6%
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FIGURE 10.—Community 5: *Protorhus longifolia* (sapling)–*Psychotria capensis* Short Thicket. Canopy composed of *Canthium obovatum*, *Chaetacme aristata*, *Protorhus longifolia* and *Strychnos madagascariensis*. Location: Burman Bush.



FIGURE 11.—Community 6: *Rhus pentheri*–*Cussonia spicata* Low Thicket. Canopy composed of *Commiphora harveyi*, *Cussonia spicata*, *Dombeya tiliacea* and *Euphorbia triangularis*. Location: Effingham Quarries.

General

The most significant feature of this community is the high proportion of juvenile individuals of particular indigenous tree species which define it. The large sapling presence would seem to indicate past disturbance (and subsequent regeneration) as an important factor in the areas where this community type occurs. This is supported by the presence of *Albizia adianthifolia*, a known forest precursor common at forest margins and in open forest (Ward 1980; Coates Palgrave 1983), in approximately a third of the sampled sites. A large climber presence/component is also indicative of past disturbance (Moll 1976; Cawood 1980; Tinley 1985). The inclusion of relevés located in areas such as Virginia Bush within this community, which by 1931/1932 had already been totally cleared for agricultural purposes, may well account for the high number of saplings in the diagnostic group for this community, and suggests that the majority of the areas presently occupied by Community 5 consist of regenerating examples of this community, rather than less disturbed sites.

Using Acocks's (1988) species lists as a guide, this community is diagnosed by those species he identified as being characteristic of Typical Coast-belt Forest e.g. *Celtis africana*, *Chaetacme aristata*, *Ekebergia capensis* and *Protorhus longifolia*. There is also a strong floristic correlation between Moll (1976) and Ward's (1980) description of Coast Forest and the species composition of Community 5, both at the canopy and subcanopy layer.

A strong floristic link between Community 5 and the dune communities is indicated by the *Rhoicissus rhomboidea* and *Ficus burtt-davyi* species groups (Appendix .8 & .9) which are common to Communities 3, 4 & 5 and 2, 3 & 5 respectively. The *Rhoicissus rhomboidea* species complex describes the indigenous understorey species common to both the dune and coastal forest communities, while the *Ficus burtt-davyi* species group describes

a common indigenous shrub component present throughout the dune/coastal forest complex. As with Community 3, *Isoglossa woodii* is an important component of the field layer.

This strong association between the two community types implies that they cannot be treated as separate conservation entities, and must be planned and managed together. The presence of relevé 104 within Community 5, situated as it is in the back dune area, provides further confirmation of this inter-relatedness, indicating that restrictive lines drawn on vegetation maps are distinctly misleading for conservation purposes. Conservationists should be addressing the minimum critical areas of vegetation complexes rather than single community types. The *Psychotria capensis* species group (Appendix .7) alternatively describes a strong and exclusive association between Community 4 & 5, not shared by the dune vegetation (Communities 2 & 3). This is discussed in Community 4.

In Community 5, although both invasive species have approximately the same average cover (Figure 5), *Chromolaena odorata** occurs more frequently (Figure 6). The species diversity is on a par with that in Community 4 (Figure 4), and Community 5 also has a rL structure (Figure 2E), due to the presence of a clear tree canopy in most of the sampled areas. The high cover in the 0.5–5.0 m category could again in part be attributed to invasion by *Chromolaena odorata** and *Lantana camara**, and the presence of saplings.

VALLEY BUSHVELD COMPLEX

Community 6: *Rhus pentheri*–*Cussonia spicata* Low Thicket (Figure 11)

This low thicket community (Edwards 1983) is found at altitudes of 20–148 m and is associated with the larger river valleys in the area. It is represented by 18 relevés (Appendix) with 8–33 species per relevé. This community

has a D structure (Ito 1979; Fig. 2F) with the greatest average cover of 77.1% in the 0.5–5.0 m height class.

Habitat

The soils underlying this community are diverse and include the Cartref Form, Cartref Series; Glenrosa Form, Williamson Series; Katspruit Form, Katspruit Series; Kroonstad Form, Avoca Series; Milkwood Form, Milkwood Series; Shortlands Form, Shortlands Series and Swartland Form, Swartland Series. Of these the Glenrosa Williamson soils (5 relevés) and Katspruit Katspruit soils (4 relevés) are the most common. The terrain slopes from 4.8° to 39.8° in a variety of directions. All points of an eight-point compass rose are represented except east; south is the most common direction and occurs in 5 relevés.

Floristics

This community is distinguished by the *Rhus pentheri* species group (Appendix .10). The species diversity per unit area is 0.19 species per m² for the eighteen relevés with an average of 20.9 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Chromolaena odorata</i> * (shrub)	55.6%	26.9%
<i>Lantana camara</i> * (shrub)	16.7%	6.2%

Conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community are:

<i>Anastrebe integerrima</i> (tree)	33.3%	8.7%
<i>Rhus pentheri</i> (tree)	33.3%	5.9%
<i>Dombeya tiliacea</i> (tree)	22.2%	5.7%
<i>Hibiscus calyphyllus</i> (shrub)	38.9%	1.4%

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Cyperus albostrigatus</i> (sedge)	27.8%	3.0%
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Climbers

Climbers occurring in more than 20% of the relevés representing the community are:

<i>Uvaria caffra</i> (shrub)	44.5%	8.6%
<i>Jasminum multipartitum</i> (shrub)	38.9%	6.0%
<i>Dioscorea cotinifolia</i> (climber)	38.9%	5.6%
<i>Monanthes caffra</i> (shrub)	38.9%	0.7%
<i>Rhoicissus tomentosa</i> (shrub)	38.9%	33.3%
<i>Rhoicissus digitata</i> (shrub)	27.8%	27.8%
<i>Entada spicata</i> (shrub)	27.8%	13.0%
<i>Dalbergia obovata</i> (tree)	22.2%	26.4%
<i>Scutia myrtina</i> (shrub)	22.2%	5.6%
<i>Passiflora suberosa</i> * (climber)	22.2%	0.006%

Saplings and seedlings

Saplings and seedlings occurring in more than 20% of the relevés representing the community are:

<i>Cussonia spicata</i> sapling (tree)	38.9%	0.06%
<i>Hippobromus pauciflorus</i> sapling(tree)	33.3%	1.9%
<i>Baphia racemosa</i> sapling (tree)	22.2%	0.06%
<i>Clausena anisata</i> sapling (shrub)	22.2%	0.006%

General

The relevés constituting Community 6 are located along the valley lines associated with river courses. This is similar to the distribution noted by Acocks (1988) for his Northern Variation of the Valley Bushveld, and that noted by Moll (1976) for Dry Valley Scrub and Bushland Mosaic. Floristically Community 6 corresponds well with Acocks's (1988) Veld Type 23a—the Northern Variation of the Valley Bushveld. Note the presence of species such as *Acacia robusta*, *Cussonia spicata*, *Euphorbia triangularis* and *Rhus pentheri*. It also shows varying degrees of floristic similarity with Moll's (1976) Dry valley Scrub and Bushland Mosaic (greater) and *Acacia sieberiana* Savanna (lesser).

The relationship between this valley bushveld community and the dune and coastal components of the Coastal Forest Complex, i.e. Communities 3, 4 & 5, is indicated by the common presence of the *Chaetacme aristata* species group (Appendix .11) common to Communities 5 and 6; the *Canthium inerme* sapling species group (Appendix .12) common to Communities 4, 5 & 6; and finally the *Uvaria caffra* species group (Appendix .13) shared by Communities 3, 4, 5 & 6. These species groups indicate a floristic similarity largely in the subcanopy layers between the two vegetation complexes e.g. *Brachylaena discolor* (Appendix .13) and *Rhoicissus tomentosa* (Appendix .13).

Thus, although the tree species defining the Valley Bushveld Complex are, to a large extent, distinct from those defining the various components of the Coastal Forest complex, there is still a common subcanopy element linking the two groups. This is important, as it indicates the need to establish continuous closed canopy links between the complexes. Because of the large distances separating most of the important conservation sites for Communities 3, 4, 5 & 6 within the city, corridors or stepping-stone areas capable of supporting viable wooded communities will therefore be necessary to ensure the adequate conservation and dissemination of these species, particularly where the species concerned are poor dispersers.

Although there is a large creeper representation in this community, indigenous saplings and seedlings are not as prominent a component of the community either in abundance or diagnostic importance as in Communities 4 or 5; only 30.8% of diagnostic species occur as saplings or seedlings. That disturbance is a critical feature in this community, however, cannot be doubted and is evident in the fact that this community has a higher average cover and percentage occurrence of *Chromolaena odorata** than any of the preceding woody communities. It nevertheless also has lower levels of *Lantana camara** (Figures 5 & 6).

Community 6 shows a marked increase in species diversity over that recorded for Community 5 (Figure 4). This is the highest species diversity shown by any of the wooded communities in the study. The D-structure of

Community 6 (Figure 2F) could be attributed to disturbance and invasion by *Lantana camara** and *Chromolaena odorata**, sapling establishment, previous tree felling and the drier conditions which prevail in areas occupied by Community 6.

Community 7: *Dovyalis rhamnoides*–*Hippobromus pauciflorus* Low Thicket (Figure 12)

This low thicket community (Edwards 1983) is found at altitudes of between 30 and 140 m. It is represented by 11 relevés (Appendix) with 9–31 species per relevé. This community has a D structure (Ito 1979; Figure 2G) with the greatest average cover of 73.7% in the 0.5–5.0 m height class.

Habitat

The soils of this community are widely varied and include the Cartref Form, Cartref Series; Glenrosa Form, Williamson Series; Hutton Form, Clansthal Series; Katspruit Form, Katspruit Series; Kroonstad Form, Avoca Series; Longlands Form, Waldene Series; Rensburg Form, Phoenix Series and Swartland Form, Swartland Series. The Glenrosa Williamson soils are the most common and are represented in 3 out of 11 relevés. The terrain slopes from 6.5° to 32° in a generally southerly direction (7 out of 11 relevés).

Floristics

The community is distinguished by the *Cissampelos torulosa* species group (Appendix .14). The species diversity per unit area is 0.19 species per m² for the 11 relevés, with an average of 21.4 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Chromolaena odorata</i> * (shrub)	81.8%	44.3%
<i>Lantana camara</i> * (shrub)	36.4%	25.4%
Conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community are:		

<i>Hippobromus pauciflorus</i> (tree)	27.3%	9.3%
<i>Melia azedarach</i> * (tree)	27.3%	7.7%

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Cyperus albostrigatus</i> (sedge)	45.5%	2.9%
<i>Scadoxus puniceus</i> (forb)	36.4%	1.0%
<i>Setaria megaphylla</i> (grass)	36.4%	0.6%
<i>Panicum maximum</i> (grass)	27.3%	6.9%

Climbers

Climbers occurring in more than 20% of the relevés representing the community are:

<i>Protaspargus virgatus</i> (climber)	81.8%	0.2%
<i>Monanthotaxis caffra</i> (shrub)	36.4%	1.0%
<i>Cissampelos torulosa</i> (shrub)	27.3%	9.1%

Saplings and seedlings

Saplings and seedlings occurring in more than 20% of the relevés representing the community are:

<i>Euclea natalensis</i> sapling (tree)	45.5%	0.6%
<i>Hippobromus pauciflorus</i> sapling (tree)	36.4%	3.1%
<i>Clausena anisata</i> sapling (shrub)	36.4%	0.7%
<i>Dovyalis rhamnoides</i> sapling (shrub)	27.3%	1.6%
<i>Trimeria grandifolia</i> sapling (tree)	27.3%	0.1%
<i>Dalbergia obovata</i> seedlings (tree)	27.3%	0.2%



FIGURE 12.—Community 7: *Dovyalis rhamnoides*–*Hippobromus pauciflorus* Low Thicket. Canopy composed of *Hippobromus pauciflorus*, *Kraussia floribunda*, *Scolopia zeyheri* and *Trimeria grandifolia*. Location: Hulett's Bush.

General

In terms of species composition, Community 7 can be related to Acocks's (1988) Northern Variation of the Valley Bushveld (note the presence of species such as *Calpurnia aurea*, *Coddia rudis*, *Hippobromus pauciflorus* and *Zanthoxylum capense*) and to Moll's (1976) Dry valley Scrub and Bushland Mosaic (greater extent) and *Aca-cia sieberiana* Savanna (lesser extent). Community 7 is related to Community 6 through the common presence of the *Coddia rudis* species group (Appendix .15).

As with Community 6, Community 7 shows associations with the Coastal Forest Complex, in this instance through the shared presence of the *Calpurnia aurea* species group (Appendix .16) which Community 7 shares in common with Communities 3, 4, 5 & 6. The *Dovyalis rhamnoides* sapling (Appendix .17) and *Cyphostemma hypoleucum* (Appendix .18) species group are composed predominantly of indigenous saplings and provide a broad floristic association between Communities 5, 6, 7 & 8 and 3, 4, 5, 6, 7 & 8. This indicates a common level of regeneration occurring in both the Valley Bushveld and Coastal Forest Complexes, and strengthens the need for integrated conservation of all community types.

Community 7 shows a greater degree of disturbance than Community 6. This is evident in the higher values for average cover and percentage occurrence of *Chromolaena odorata** and *Lantana camara** (Figures 5 & 6), as well as the greater predominance of seedlings and saplings of various species and the widespread occurrence of the invasive *Melia azedarach** which is characteristic of early seral stages (Ward 1980). The proportional representation by climbers in this community is, however, greatly reduced. The frequency of occurrence and average cover of *Chromolaena odorata** is the highest for any of the wooded communities contained in the Coastal Forest and Valley Bushveld Complexes (Figures 5 & 6). The percentage occurrence of *Chromolaena odorata** within this community is even higher than for Community 9 which represents the badly invaded shrubland areas of Durban.

Because of the floristic similarities and the greater signs of disturbance, it could be that Community 7 is merely a more disturbed form of Community 6 (i.e. a preceding seral stage) but, without further study of the dynamics and inter-relationships of these two vegetation types, it is not yet possible to investigate this proposal more fully. It is just as likely that the broad differences in the diagnostic species of both groups indicate local variations of the valley bushveld form. This is highly probable, if one considers that Moll (1976) identified three variations in the woody communities occupying the areas equivalent to those occupied by Communities 6 and 7 in this study.

Species diversity for Community 7 is on a par with that for Community 6 and represents the highest species diversity values recorded for any of the wooded communities within the classification table (Figure 4). As with Community 6 the D structure (Figure 2G) of this community can be attributed to disturbance, shrub invasion, felling, a significant sapling layer and possibly to drier



FIGURE 13.—Community 8: Transitional. Represents an encroaching woody element into grassland communities. *Trimeria grandifolia* sapling in the middleground. The Grassland community is dominated by ruderal and secondary species such as *Eragrostis curvula*, *Digitaria* sp., *Senecio polyanthemoides* and *Sorghum bicolor*. Dense clumps of *Chromolaena odorata** and *Lantana camara** to the left indicate past disturbance. Location: Effingham Quarries.

conditions which produce a shorter canopy layer (Moll 1976).

SHRUBLAND COMPLEX

Community 8: Transitional (Figure 13)

This tall closed shrubland/low/short thicket community mosaic (Edwards 1983) is found at altitudes of 5–237 m. It is represented by seven relevés (Appendix) with 10–35 species per relevé. This community has a D structure (Ito 1979; Figure 2H) with the greatest average cover of 67.3% in the 0.5–5.0 m height class, which also contains a significant grass component.

Habitat

The soils underlying this community are varied and include the Cartref Form, Cartref Series; Fernwood Form, Fernwood Series; Hutton Form, Clansthal Series; Katspruit Form, Katspruit Series; Milkwood Form, Milkwood Series and Mispah Form, Mispah Series. None are obviously predominant. The terrain slopes from virtually flat to 51.3°, the aspect being variable and including all four points of a four-point rose, with east being the most common (3 out of 7 relevés).

Floristics

This community is differentiated by the absence of character species. The species diversity per unit area averages 0.18 species per m² for the community with an average of 19.9 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Chromolaena odorata</i> * (shrub)	71.4%	35.0%
<i>Lantana camara</i> * (shrub)	71.4%	19.6%

There are no woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community.

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Hibiscus surattensis</i> (forb)	28.6%	14.3%
<i>Eragrostis curvula</i> (grass)	28.6%	5.7%
<i>Sorghum bicolor</i> (grass)	28.6%	0.9%
<i>Senecio polyanthemoides</i> (forb)	28.6%	0.1%
<i>Digitaria</i> sp. (grass)	28.6%	0.1%
<i>Cyperus albostrigatus</i> (sedge)	28.6%	0.01%

Climbers

Climbers occurring in more than 20% of the relevés representing the community are:

<i>Protaspargus virgatus</i> (climber)	42.9%	0.03%
<i>Cyphostemma hypoleucum</i> (forb)	28.6%	28.6%
<i>Dalbergia armata</i> (tree)	28.6%	14.3%
<i>Dalbergia obovata</i> (tree)	28.6%	25.1%

Saplings and seedlings

Saplings and seedlings occurring in more than 20% of the relevés representing the community are:

<i>Dalbergia obovata</i> sapling (tree)	28.6%	1.6%
<i>Heteropyxis natalensis</i> sapling (tree) (non-diagnostic species)	28.6%	0.9%

General

Except for Communities 9, 12 & 17 the remainder of the floristic units represented in the Appendix cannot be equated with any of the communities described by Acocks (1988), Moll (1976), Cawood (1980) or Ward (1980). This means that prior to this study, 44% of the communities which occur in the municipal area had not been described.

Community 8 marks a transition zone from the valley bushveld communities represented by Communities 6 & 7 to the disturbed shrubland and grassland communities of the urban area. The physiognomy and floristic make-up of Community 8 indicate that it represents an encroaching woody element into the disturbed shrublands and grasslands of the Appendix represented by Communities 9 and 10. This observation is supported by the high percentage of saplings present in the *Dovyalis rhamnoides* sapling (Appendix .17) and *Cyphostemma hypoleucum* (Appendix

.18) species groups, and in other species groups with representatives in this community e.g. the *Hippobromus pauciflorus* (sapling) species group (Appendix .20). All of the species concerned are indigenous, which indicates the potential for the re-establishment of natural communities in these areas. This process of regeneration could be encouraged through active management, and where necessary and appropriate such areas could be used to form links with, or to enlarge core conservation areas of the more 'pristine' communities. Another prominent species group in this community is the *Senecio polyanthemoides* species group (Appendix .39). This group is characterised by the presence of ruderal and generalist species, some of which are alien invasives. This supports the concept of an encroachment dynamic in this transition zone.

That disturbance is a prominent feature of this transition zone is evident in the high average cover and percentage occurrence of both *Chromolaena odorata** and *Lantana camara** in this community (Figures 5 & 6). Community 8 shows an equal percentage occurrence for *Chromolaena odorata** and *Lantana camara**, resulting from a decrease in *Chromolaena odorata** and an increase in *Lantana camara** as compared with Community 7 levels (Figure 6). There is a slight decrease in diversity relative to Community 7 (Figure 4), probably due to increased levels of disturbance and invasion by alien shrub species which tend to form large homogeneous stands. The D structure (Figure 2H) can also be attributed to the significant alien shrub component and an increased representation of grass species in this community.

Community 9: *Acacia gerrardii*-*Rhus chirindensis* Tall Closed Shrubland/Low/Short Thicket Mosaic (Figure 14)

This tall closed shrubland/low/short thicket community mosaic (Edwards 1983) is found at altitudes of 10–285 m. It is represented by 64 relevés (Appendix) with 2–33 species per relevé. This community has a D structure (Ito 1979; Figure 2I) with the greatest average cover of 79.8% in the 0.5–5.0 m height class. Grass is a significant component of both the 0–0.5 m and 0.5–5.0 m height class, a factor which distinguishes it from previous communities.

Habitat

The soils underlying this community are diverse and include the Cartref Form, Cartref Series; Dundee Form, Dundee Series; Fernwood Form, Fernwood Series; Glenrosa Form, Williamson Series; Hutton Form, Clansthal Series; Katspruit Form, Katspruit Series; Kroonstad Form, Mkambati Series; Longlands Form, Waldene Series; Milkwood Form, Milkwood Series; Mispah Form, Mispah Series; Rensburg Form, Phoenix Series and Swartland Form, Swartland Series. The three most common soils are the Mispah Mispah soils (in 12 relevés), Glenrosa Williamson soils (in 9 relevés) and Cartref Cartref soils (in 8 relevés). The terrain occupied by this community varies from flat at some sites to an inclination of 39.8° at others, with all eight points of an eight-point compass rose represented. Northern and southern aspects are most common, and are found in 12 and 15 relevés respectively.



FIGURE 14.—Community 9: *Acacia gerrardii*–*Rhus chirindensis* Tall Closed Shrubland// Low/Short Thicket Mosaic. Community 9 is composed predominantly of dense stands of *Chromolaena odorata** and *Lantana camara**, in this instance interspersed with specimens of *Mangifera indica**. Location: Welbedacht.

Floristics

This community is distinguished by the *Maytenus senegalensis* sapling species group (Appendix .19). The species diversity per unit area averages 0.12 species per m² for the community, with an average of 13.5 species per relevé; 47.1% of the species diagnostic for this community type occur as saplings or seedlings.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Chromolaena odorata</i> * (shrub)	79.7%	58.1%
<i>Lantana camara</i> * (shrub)	62.5%	19.2%

The only conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community is:

<i>Melia azedarach</i> * (tree)	34.4%	9.3%
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Herbs

There are no herb species occurring in more than 20% of the relevés representing the community.

Climbers

Climbers occurring in more than 20% of the relevés representing the community are:

<i>Protasparagus virgatus</i> (climber)	31.3%	0.06%
<i>Dalbergia obovata</i> (tree)	20.3%	7.7%

General

This community can be equated floristically with the ‘heavily disturbed’ areas described by Cawood (1980),

and is characterised by the presence of alien invasive species. Community 9 as identified within this study is dominated by three invasive species: *Chromolaena odorata**, *Lantana camara** and *Melia azedarach**, all of which indicate high levels of disturbance, and early seral communities (Ward 1980). Concurrent with dominance by alien species is the low cover and occurrence values for the indigenous herbs, saplings, seedlings and climbers which characterise this community (Sukopp & Werner 1983). This indicates a generally unfavourable environment created by the invasive species, forming stands so dense that they shade out and out-compete most indigenous species. Potential for regeneration of the indigenous cover is, however, indicated by the fact that 47.1% of the species diagnostic for this community type are saplings or seedlings of indigenous species.

The relationship of this community to the Valley Bushveld Complex and associated shrub community (6, 7 & 8) is shown through the common presence of the *Hippobromus pauciflorus* sapling species group (Appendix .20). Community 9 is also associated with the Coastal Forest Complex through the *Protasparagus virgatus* species group (Appendix .21) common to Communities 5, 6, 7, 8 & 9; and the *Isoglossa woodii* species group (Appendix .22) shared by Communities 3, 4, 5, 6, 7, 8 & 9. These broad floristic associations indicate the widely occurring nature of this invasive shrubland, elements of which can be found in areas previously occupied by all the wooded communities described, except the mangrove communities. This widespread occurrence can be linked to the broad patterns of disturbance that have characterised the urban landscape and facilitated the spread of opportunistic species such as *Chromolaena odorata** and *Lantana camara**.

It should be noted that the majority of the saplings which characterise this group would according to Acocks (1988) be typical of the Northern Variation of the Valley

Bushveld e.g. *Acacia nilotica*, *Buddleja saligna*, *Combretum molle*, *Dalbergia obovata*, *Hippobromus pauciflorus*, *Maytenus heterophylla* and *Spirostachys africana*. However, the presence of species such as *Apodytes dimidiata*, *Rhus chirindensis*, *Trema orientalis* and *Vitellariopsis marginata* also suggests a strong coastal forest element. These patterns are also reflected in the occurrence of shrubs and climbers. This is important because, by using the sapling component of these shrublands as an index, it should be possible to assess the nature of the community that existed in these areas prior to disturbance. Such an assessment is critical to the future use of disturbed areas as extensions to existing core areas and as dispersal corridors within the open space system. Not only will it provide direction for replanting schemes, but it will serve to indicate the potential effectiveness of various areas as links between different community and complex types. The presence of grass species such as *Panicum maximum* and *Eragrostis curvula* as a marked component of the 0–0.5 m and 0.5–5.0 m height class indicates that this community not only represents wooded areas which have been disturbed, but probably also represents grassland areas which have since become invaded and dominated by these shrub species.

Community 9 shows a marked drop in species diversity in comparison to Community 8 (Figure 4). This is an important characteristic of the shrubland complex, i.e. as the intensity of invasion by species such *Chromolaena odorata** and *Lantana camara** increases, so the overall species diversity within communities decreases. *Chromolaena odorata** predominates in this community and shows an increase in both cover and percentage occurrence relative to levels in Community 10 (Figures 5 & 6). In fact, this community has the highest average cover for *Chromolaena odorata** of all the communities sampled. The cover for *Lantana camara**, however, remains the same as that found in Community 10 and its actual percentage occurrence decreases. The D structure (Figure 2I)

is due to the predominance of shrub and grass components in this community.

Community 10: Transitional (Figure 15)

This low/short closed grassland/tall closed shrubland/low/short thicket community mosaic (Edwards 1983) is found at altitudes of 5–230 m. It is represented by 21 relevés (Appendix) with 4–21 species per relevé. This community has a D structure (Ito 1979; Figure 2J) with the greatest average cover of 75.2% in the 0.5–5.0 m height class. This class contains a large shrub component.

Habitat

The soils underlying this community are diverse and include the Cartref Form, Cartref Series; Dundee Form, Dundee Series; Fernwood Form, Fernwood Series; Glenrosa Form, Williamson Series; Hutton Form, Clansthal Series; Katspruit Form, Katspruit Series; Kroonstad Form, Mkambati Series; Longlands Form, Waldene Series; Milkwood Form, Milkwood Series; Mispah Form, Mispah Series; Rensburg Form, Phoenix Series and Swartland Form, Swartland Series. The most common are the Glenrosa Williamson soils (4 relevés), Hutton Clansthal soils (3 relevés) and Mispah Mispah soils (3 relevés). The terrain occupied by this community varies from flat at some sites to an inclination of 22.6° at others, with all eight points of an eight-point compass rose represented except for southeast and southwest. North and east are the most common aspect, each occurring in 5 relevés.

Floristics

This community is characterised by the absence of character species, but is best represented floristically by the *Mangifera indica** species group (Appendix .23). The



FIGURE 15.—Community 10: Transitional. The presence of *Mangifera indica** (remnant of an old mango plantation) is a sign of past human disturbance, as is the presence of species such as *Chromolaena odorata**, *Lantana camara** and *Tagetes minuta**. Predominant grass species is *Panicum maximum*. Location: Newlands West, along Umgeni River.



FIGURE 16.—Community 11. *Bothriochloa insculpta*–*Hyparrhenia hirta* Short Closed Grassland. Species recorded: *Bothriochloa insculpta*, *Panicum maximum*, *Rhynchelytrum repens* and *Sporobolus africanus*. Location: Phoenix.

species diversity per unit area is 0.09 species per m² for the community with an average of 10.0 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Chromolaena odorata</i> * (shrub)	66.7%	33.0%
<i>Lantana camara</i> * (shrub)	61.9%	27.2%

There are no conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community.

Herbs

There is only a single herb species occurring in more than 20% of the relevés representing the community, this is:

<i>Panicum maximum</i> (grass)	33.3%	16.7%
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Saplings and seedlings

The only sapling occurring in more than 20% of the relevés representing the community is:

<i>Psidium guajava</i> * sapling (tree)	23.8%	0.01%
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General

As with the other two communities in this complex, Community 10 is dominated by the two shrub species *Chromolaena odorata** and *Lantana camara**. This community is related to the coastal forest and valley bushveld and disturbed shrubland communities (3, 4, 5, 6, 7, 8 & 9) through the common presence of the *Mangifera indica** species group (Appendix .24). This widespread association across the table again re-emphasises the ubiquitous

nature and effects of disturbance throughout the urban landscape. Two species within species group 24, *Mangifera indica** and *Syzygium cumini**, would seem to indicate past cultivation (Indian market gardening) and residential development as a factor in disturbance. This may to a certain extent be confirmed by the presence of *Psidium guajava** seedlings within this community.

Like Community 9, Community 10 is essentially a shrubland/thicket community, but with a more prominent grassland component, suggesting that it acts as a transition between the shrublands dominated by *Chromolaena odorata** and *Lantana camara** and the disturbed grassland communities that follow on the table. Of the three communities in the shrubland complex it has the lowest species diversity (Figure 4), and is only higher on the diversity index than the mangrove and foredune communities, where exposure and harsh environmental conditions are responsible for limiting species diversity. Community 10 also sees a marked fall in the average cover and percentage occurrence of *Chromolaena odorata**, and a rise in the average cover of *Lantana camara** although its percentage occurrence is the same as in Community 9 (Figures 5 & 6). The low species diversity of this community can be associated with the extensive presence of both *Chromolaena odorata** and *Lantana camara**. As with the other disturbed communities, the D structure is due to the strong shrub component and increasingly high levels of grass with the community.

The low species diversity of this community combined with the overall predominance of ruderal, invasive and alien species, provides little indication of the indigenous regeneration noted in Communities 8 and 9. In Community 10 all trace of the previous vegetation layer has been removed and altered. Any restoration of these areas will therefore have to rely on informed guesswork, using a knowledge of the location of the area and the surrounding community types.

GRASSLAND COMPLEX

General

Community 11: *Bothriochloa insculpta*–*Hyparrhenia hirta* Short Closed Grassland (Figure 16)

This short/closed grassland community (Edwards 1983) is found at altitudes of 26–117 m. It is represented by 9 relevés (Appendix) with 6–19 species per relevé. This community has a D structure (Ito 1979; Figure 2K) with the greatest average cover of 74.2% in the 0.5–5.0 m height class. No vegetation above 5 m occurs in this community type.

Habitat

The soils underlying this community are of three types, the Glenrosa Form, Williamson Series; Milkwood Form, Milkwood Series and Mispah Form, Mispah Series. All are equally common. The terrain occupied by this community varies in inclination from 3.8°–26.6° in the following directions: northeast, southeast, south, northwest and north. East is the most common aspect occurring in 3 out of the 9 relevés.

Floristics

This community is distinguished by the *Bothriochloa insculpta* species group (Appendix .24). The species diversity per unit area is 0.11 species per m² for the nine relevés, with an average of 12.6 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Chromolaena odorata</i> * (shrub)	22.2%	18.6%
<i>Lantana camara</i> * (shrub)	22.2%	3.8%

There are no conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community.

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Bothriochloa insculpta</i> (grass)	77.8%	27.9%
<i>Teramnus labialis</i> (forb)	66.7%	0.1%
<i>Hyparrhenia hirta</i> (grass)	33.3%	16.9%
<i>Panicum maximum</i> (grass)	33.3%	16.9%
<i>Eragrostis curvula</i> (grass)	33.3%	15.1%
<i>Sporobolus africanus</i> (grass)	22.2%	8.6%
<i>Sorghum bicolor</i> (grass)	22.2%	1.3%
<i>Physalis viscosa</i> * (forb)	22.2%	0.8%
<i>Sonchus wilmsii</i> (forb)	22.2%	0.8%
<i>Cynodon dactylon</i> (grass)	22.2%	0.7%
<i>Stachys natalensis</i> (forb)	22.2%	0.7%
<i>Rhynchelytrum repens</i> (grass)	22.2%	0.2%

Saplings and seedlings

The only sapling occurring in more than 20% of the relevés is:

<i>Psidium guajava</i> * sapling (tree)	33.3%	0.01%
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The lack of a significant floristic association between Community 11 and the preceding communities on the Appendix, indicates a distinct floristic break between the woody components of the shrubland, thicket and forest contained in Communities 1–10, and the distinct grassland forms which begin with Community 11. The predominance of the perennial *Bothriochloa insculpta* in Community 11 indicates that the areas where this grassland occurs have generally been subjected to conditions of ‘over-utilisation, trampling and bad management’ (Tainton *et al.* 1976). Tainton (1981a) regards *Bothriochloa insculpta* as an Increaser II species. This is one of four possible classes:

Decreaser species: those which dominate in veld which is in good condition and which decline in abundance when veld deteriorates in condition;

Increaser I species: those which are not abundant in veld which is in good condition, but which increase when the veld is under-utilised;

Increaser II species: those which are not abundant in veld of good condition, but which increase when veld is over-utilised;

Increaser III species: those which are not abundant in the veld which is in good condition, but which increase when the veld is selectively grazed.

Other species such as *Cynodon dactylon* (Increaser II), *Eragrostis curvula* (Increaser II), *Hyparrhenia hirta* (Increaser II), *Rhynchelytrum repens* (Increaser II) and *Sporobolus africanus* (Increaser II) are also good indicators of previous disturbance (particularly cultivation), over-utilisation or mismanagement (Tainton *et al.* 1976, 1981b; Ward 1980). Bayer (1955) goes so far as to describe grassland types for Natal as ‘subseral grasslands of old fields’. The presence of *Panicum maximum* in significant amounts in this community, a Decreaser species, however, suggests a possible improvement in veld condition.

This is supported by Tainton *et al.* (1976) assertion that when such deteriorated veld is rested, *Bothriochloa insculpta* may increase to the extent of dominance and assist in the restoration of a ‘productive cover of mixed composition’. The predominance of perennial species and species such as *Bothriochloa insculpta* in Community 11, thus indicate both good soil protection and the potential for the regeneration of a better quality and a more diverse community. These grassland sites should therefore be assigned a high conservation value. The presence of *Leucaena leucocephala** as a diagnostic species for this community and *Psidium guajava** saplings in 20% of the samples, however, indicates the potential for woody encroachment by invasive species which must be carefully monitored.

This community shows no affiliation with the coastal forest, valley bushveld or shrubland complexes except through the generalist species groups e.g. the *Tagetes minuta** species group (Appendix .35). Within the ecological/floristic gradient represented by the table, Community

11 is also clearly separated from the remainder of the grasslands in the municipal area, i.e. Communities 13 to 18, except at the most generalised levels where the association is largely due to a common level of disturbance rather than floristically meaningful interrelationships, e.g. the *Senecio polyanthemoides* species group (Appendix .39) and the *Chaetacanthus burchellii* species group (Appendix .45). The reason for this distinctiveness is difficult to ascertain, for as far as could be determined there has been no significant variation in the disturbance pattern experienced in areas occupied by Community 11 when compared with the other secondary grasslands in municipal Durban. It is therefore important that viable units of this grassland type are conserved and carefully monitored in order to clarify the causal factors underlying their floristic distinctness. Community 11 is associated with the wetlands/floodplains (Community 12) and disturbed grasslands (Community 13) through the *Mariscus sumatrensis* species group (Appendix .28). The species composition of this group, however, also suggests that this similarity is the result of a common element of disturbance, rather than the existence of a similar moisture regime.

Community 11 shows levels of *Chromolaena odorata** and *Lantana camara** well below those evident in Community 10. There is a marked decrease in both the average cover values and percentage occurrence for these species (Figure 5 & 6). This indicates an improved community condition as does the higher species diversity in this community (Figure 4). Community 11 does, however, have the highest *Chromolaena odorata** values of all the grasslands, but has the second lowest values of *Lantana camara**. Note that there is no representation in the >5 m category due to the predominant grass component which also accounts for the D structure of the community (Figure 2K).

Community 12: *Phragmites australis*–*Cyperus immensus* Short Closed Grassland//Tall/High Closed Shrubland//Tall Closed Reedbed Mosaic (Figure 17)

This short closed grassland//tall/high closed shrubland//tall closed reedbed community mosaic (Edwards 1983) occurs at altitudes of 5–55 m. It is represented by 18 relevés (Appendix), with 4–21 species per relevé. This community has a D structure (Ito 1979; Figure 2L) with the greatest average cover of 79.6% in the 0.5–5.0 m height class. Both the 0.5–5.0 m height class and the >5 m height class consists predominantly of reeds.

Habitat

The soils underlying this reedbed community are predominantly of the Dundee Form, Dundee Series; Katspruit Form, Katspruit Series and Rensburg Form, Phoenix Series. Several fill sites are also noted within this community type in areas such as the harbour and airport (i.e. areas of recent alluvial deposits). The Dundee Dundee soils are by far the most common occurring in 13 of the 18 relevés. The terrain occupied by this community varies from generally flat to an inclination of 32.0° in the following directions: northeast, east, southwest, west, northwest and north. East is the most common aspect occurring in 8 out of the 18 relevés.

Floristics

This community is distinguished by the *Phragmites australis* species group (Appendix .25). The species diversity per unit area is 0.11 species per m² for the 18 relevés, with an average of 11.8 species per relevé.



FIGURE 17.—Community 12: *Phragmites australis*–*Cyperus immensus* Short Closed Grassland//Tall/High Closed Shrubland//Tall Closed Reedbed Mosaic. Species along riverbank: *Cyperus immensus* and *Phragmites australis*. Presence of several alien invasive species in floodplain e.g. *Chromolaena odorata**, *Lantana camara** and *Schinus terebinthifolius**, and larger *Pennisetum* sp.* reeds in background. Location: Umhlanga River floodplain near the Northern Waste Water Treatment Works.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Chromolaena odorata</i> * (shrub)	5.6%	5.1%
<i>Lantana camara</i> * (shrub)	16.7%	0.06%

There are no conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community. The community is otherwise dominated by reed and sedge species:

<i>Phragmites australis</i> (reed)	61.1%	20.7%
<i>Phragmites</i> sp. (reed)	38.9%	22.9%
<i>Cyperus immensus</i> (sedge)	27.8%	5.6%

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Laportea peduncularis</i> (forb)	33.3%	10.0%
<i>Ageratum conyzoides</i> * (forb)	33.3%	2.2%
<i>Senecio polyanthemoides</i> (forb)	33.3%	0.7%
<i>Panicum maximum</i> (grass)	27.8%	11.2%
<i>Commelina erecta</i> (forb)	27.8%	0.1%

Climbers

Climbers present in more than 20% of relevés are:

<i>Ipomoea cairica</i> (forb)	27.8%	22.3%
<i>Cardiospermum grandiflorum</i> * (climber)	22.2%	22.2%

General

This floristic grouping describes the wetland communities in the Durban area. The majority of the sites represented by this community are floodplain sites, as most other wetland areas in municipal Durban have been drained and filled. The floristic composition of the diagnostic species group i.e. the *Phragmites australis* species group (Appendix .25), clearly illustrates the dominance of reeds within this community. The general floristic composition of Community 12 accords well with that provided by Ward (1980) for 'reedswamp communities'.

Community 12, like Community 11, represents a unique floristic unit. The majority of the floristic similarities demonstrated by Community 12 indicate similarities in disturbance regimes rather than fundamental ecological similarities. Community 12 is related to Community 13 through the shared presence of the *Verbena bonariensis** species group (Appendix .27). It is also related to the grasslands of Community 11 and Community 13 through the shared presence of the *Mariscus sumatrensis* species group (Appendix .28). The species composition of these differential groups indicates the nature of these floristic associations, as the majority of the species are ruderal and/or invasive species.

Community 12 is also related to the disturbed shrublands of Community 9 & 10, as well as Community 13 through the shared presence of the *Cynodon dactylon* species group (Appendix .29). Fifty per cent of the species within the *Cynodon dactylon* species group (Appendix .29) are alien and characteristic of badly disturbed areas,

e.g. the garden escapees *Ageratum conyzoides** and *Canna generalis**. This again indicates that these floristic similarities are largely due to common disturbance regimes rather than any fundamental ecological similarities between the community types. Many of the alien species in these shared species groups favour the moister conditions offered in the floodplain regions e.g. *Ageratum conyzoides**, *Canna generalis**, *Paspalum urvillei**, *Pennisetum purpureum** and *Senna didymobotrya**.

General connections are also indicated between Community 12 and Communities 5, 7, 9, 10 & 13 through the shared presence of the *Melia azedarach** species group (Appendix .30). Again the floristic relationship is a superficial one, indicating the shared presence of several generalist (and for the most part, alien) species which are widespread throughout the disturbed areas of the urban landscape and which proliferate under the disturbed conditions found in many of the floodplain and wetland areas. This is clearly indicative of a situation where *bona fide* floristic links may well have been obscured by the overriding effects of disturbance.

Both the average cover and percentage occurrence of *Chromolaena odorata** and *Lantana camara** in Community 12 are lower than those for Community 11 (Figures 5 & 6), with both species achieving only minimal representation within this community, despite the fact that many of these areas have been extensively disturbed in the past. This could be due to the damper conditions experienced in these areas. Diversity is on a par with Community 11 (Figure 4) and the D structure of the community (Figure 2L) is due to the predominance of reeds and grasses.

Community 13: *Senecio madagascariensis*–*Panicum maximum* Tall Closed Shrubland//Short Closed Grassland Mosaic (Figure 18)

This closed tall closed shrubland//short closed grassland community mosaic (Edwards 1983) is found at altitudes of 1–287 m. It is represented by 69 relevés (Appendix) with 2–44 species per relevé. This community has a D structure (Ito 1979; Figure 2M) with the greatest average cover in the 0.5–5.0 m height class of 72.4% which contains a high proportion of grass. The 0–0.5 m height class also contains significant levels of grass.

Habitat

The soils underlying this community are diverse and include the Arcadia Form, Rydalvale Series; Cartref Form, Cartref Series; Dundee Form, Dundee Series; Fernwood Form, Fernwood Series; Glenrosa Form, Williamson Series; Hutton Form, Clanstad Series; Katspruit Form, Katspruit Series; Kroonstad Form, Mkambati Series; Longlands Form, Waldene Series; Milkwood Form, Milkwood Series; Mispah Form, Mispah Series; Rensburg Form, Phoenix Series and several areas of landfill. The four most common are the Mispah Mispah soils (12 relevés), the Cartref Cartref soils (11 relevés), fill sites (10 relevés) and Dundee Dundee soils (9 relevés). The terrain occupied by this community varies from flat at some sites to an inclination of 39.8° at others, with all eight points of an eight-point compass rose represented. The most



FIGURE 18.—Community 13: *Senecio madagascariensis*–*Panicum maximum* Tall Closed Shrubland//Short Closed Grassland Mosaic. Most ubiquitous community, ranges from grassland through to a variety of shrub-invaded types. Species recorded: *Eragrostis curvula*, *Flaveria bidentis**, *Leucaena leucocephala**, *Panicum maximum*, *Rhynchelytrum repens* and *Senecio chrysocoma*. Location: Bay-head grassland.

common directions are east (20 relevés), north (14 relevés) south (11 relevés) and west (10 relevés).

Floristics

This community is defined by the *Senecio madagascariensis* species group (Appendix .26). The species diversity per unit area averages 0.15 species per m² for the 69 relevés, with an average of 17.0 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Lantana camara</i> * (shrub)	49.3%	14.9%
<i>Chromolaena odorata</i> * (shrub)	36.2%	9.6%

There are no conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community.

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Panicum maximum</i> (grass)	52.2%	20.5%
<i>Eragrostis curvula</i> (grass)	49.3%	14.2%
<i>Sida rhombifolia</i> (forb)	43.5%	1.5%
<i>Senecio polyanthemoides</i> (forb)	37.7%	3.4%
<i>Cynodon dactylon</i> (grass)	33.3%	17.5%
<i>Rhynchelytrum repens</i> (grass)	33.3%	5.0%
<i>Physalis viscosa</i> * (forb)	31.9%	1.5%
<i>Commelina erecta</i> (forb)	29.0%	0.8%
<i>Tagetes minuta</i> * (forb)	24.6%	1.8%
<i>Sporobolus africanus</i> (grass)	23.2%	6.3%
<i>Sorghum bicolor</i> (grass)	23.2%	4.6%
<i>Bidens pilosa</i> * (forb)	23.2%	1.8%
<i>Conyza floribunda</i> * (forb)	20.3%	1.0%

Climbers

The only climber present in more than 20% of relevés is:

<i>Hewittia sublobata</i> (forb)	24.6%	2.9%
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General

This community represents disturbed grassland areas, and is the most widespread community in the municipal area. The disturbed nature of the this community is clearly indicated by the fact that 44% of the diagnostic species in the *Senecio madagascariensis* species group (Appendix .26) are alien species. The grass species which dominate Community 13 are widely distributed species and are particularly common in disturbed areas (Tainton *et al.* 1976). The increased levels of cover and occurrence of perennial species such as *Cynodon dactylon* (Increaser II) and *Eragrostis curvula* (Increaser II) relative to Community 11 also indicate the poorer comparative quality of the sward, as these are usually predominant in highly disturbed areas. The widespread nature and relatively high average cover of the annual *Rhynchelytrum repens* (Increaser II), may also pose erosion problems because of inadequate soil protection (Tainton *et al.* 1976).

Community 13 is related to the wetlands i.e. Community 12 through the shared presence of the *Verbena bonariensis** species group (Appendix .27). These two communities in turn are related to Community 11 through the shared presence of the *Mariscus sumatrensis* species group (Appendix .28). Its broad relationship with Communities 9, 10 & 12 is indicated through the shared presence of the *Cynodon dactylon* species group (Appendix .29). Floristic associations with the dune communities (Community 3), coast forest (Community 5), valley bushveld (Community 7), disturbed shrublands (Communities 8, 9 & 10) and wetlands (Community 12) is indicated through the common presence of the *Melia*

*azedarach** species group (Appendix .30) and the *Setaria megaphylla* species group (Appendix .31). These species groups indicate the presence of widespread generalists (both alien and indigenous) such as *Ipomoea* sp. and *Cardiospermum grandiflorum**, which occur in all these communities as a result of disturbance throughout the urban landscape. The result is a blurring of floristic boundaries and, any 'true' distinctness which once might have existed, is now largely obscured.

Although Community 13 is clearly a product of disturbance, the average cover and percentage occurrence of *Chromolaena odorata** and *Lantana camara** are significantly lower than those found in communities such as 8, 9 & 10 (but higher than those found in Communities 11 & 12, Figures 5 & 6). *Lantana camara** has the highest average cover values and is the most widespread of the two species. It is probable that Community 13 thus represents areas where disturbed grasslands have been invaded by these two species (Ward 1980; Liggitt 1983). It is likely that without intervention the invasive shrub species already well represented in this community will continue to encroach further, eventually making Communities 9 & 13 indistinguishable.

Woody encroachment is also suggested by the presence of species such as *Dichrostachys cinerea*, *Dichrostachys cinerea* sapling, *Morus* sp.*, *Pseudarthria hookeri* sapling and *Rhus chirindensis* sapling, within the *Cynodon dactylon* species group (Appendix .29). Species such as *Dichrostachys cinerea* are well known invaders of open grassland (Ward 1980), and confirm the idea of an element of woody encroachment into the grassland areas found in Communities 9, 10, 11, 12 & 13. This is further supported by the presence of *Clerodendrum glabrum* sapling, *Melia azedarach** and *Melia azedarach** seedlings in the *Melia azedarach** species group (Appendix .30). *Melia azedarach** particularly is an important element in the early seral stages of woodland and forest communities in the Durban area (Ward 1980). The species diversity of

Community 13 is far higher than that for Community 12 (Figure 4) and can be attributed to the large number of alien species found within this community. The D structure (Figure 2M) is due to the predominance of shrub, grass and forb species.

Community 14: *Phyllanthus burchellii*–*Digitaria eriantha* Short Closed Grassland//Tall Sparse/Closed Shrubland Mosaic (Figures 19 & 20)

This short closed grassland//tall sparse/closed shrubland community mosaic (Edwards 1983) is found at altitudes of 35–170 m. It is represented by twenty relevés (Appendix) with 7–45 species per relevé. It has a D structure (Ito 1979; Figure 2N) with the greatest average cover of 86.0% in the 0.5–5.0 m height class. This group is made up predominantly of grasses. No vegetation cover in this community is above 5 m in height.

Habitat

The soils underlying this community are of the Cartref Form, Cartref Series; Glenrosa Form, Williamson Series; Hutton Form, Clansthal Series; Kroonstad Form, Avoca Series; Kroonstad Form, Mkambati Series; Mispah Form, Mispah Series; Rensburg Form, Phoenix Series and Swartland Form, Swartland Series. The most common are the Hutton Clansthal soils (5 relevés) and the Kroonstad Mkambati soils (4 relevés). The terrain occupied by this community varies from flat at some sites to an inclination of 22.6° at others. All eight points of an eight-point compass rose are represented, except northwest. An easterly direction is most common (6 relevés).

Floristics

This community is distinguished by the *Phyllanthus burchellii* species group (Appendix .32). The species diversity per unit area averages 0.21 species per m² for the community, with an average of 23.5 species per relevé.



FIGURE 19.—Community 14: *Phyllanthus burchellii*–*Digitaria eriantha* Short Closed Grassland//Tall Sparse/Closed Shrubland Mosaic. Wide variation in diversity of herb layer evident in these grasslands. Species-rich Treasure Beach Grasslands—*Acalypha petiolaris*, *Digitaria eriantha*, *Eugenia albanensis*, *Glycine wightii*, *Helichrysum decorum*, *Helichrysum kraussii*, *Helichrysum panduratum*, *Phyllanthus burchellii*, *Rumex sagittatus*, *Salacia kraussii* and *Thesium goetzeanum*. *Strelitzia nicholai* in background.



FIGURE 20.—Community 14: *Phyllanthus burchellii*–*Digitaria eriantha* Short Closed Grassland//Tall Sparse/Closed Shrubland Mosaic. Wide variation in diversity of herb layer evident in these grasslands. Depauperate grasslands of old Phoenix caneland—*Bidens pilosa**, *Digitaria eriantha*, *Panicum maximum*, *Rhynchelytrum repens*, *Sesbania sesban* and *Tagetes minuta**. *Saccharum officinarum** in background indicates past cultivation of site.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Lantana camara</i> * (shrub)	60.0%	9.8%
<i>Chromolaena odorata</i> * (shrub)	35.0%	10.5%

There are no conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community.

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Nidorella auriculata</i> (forb)	70.0%	2.9%
<i>Tagetes minuta</i> * (forb)	55.0%	2.2%
<i>Crotalaria lanceolata</i> (forb)	55.0%	0.5%
<i>Phyllanthus burchellii</i> (forb)	50.0%	1.2%
<i>Panicum maximum</i> (grass)	40.0%	24.8%
<i>Cassia mimosoides</i> (forb)	40.0%	8.0%
<i>Rhynchelytrum repens</i> (grass)	35.0%	6.1%
<i>Digitaria eriantha</i> (grass)	30.0%	16.6%
<i>Aristida junciformis</i> (grass)	30.0%	10.3%
<i>Eragrostis curvula</i> (grass)	30.0%	8.5%
<i>Helichrysum decorum</i> (forb)	30.0%	2.0%
<i>Bidens pilosa</i> * (forb)	30.0%	1.9%
<i>Hyparrhenia hirta</i> (grass)	30.0%	1.4%
<i>Senecio chrysocoma</i> (forb)	30.0%	0.7%
<i>Senecio polyanthemoides</i> (forb)	30.0%	0.07%
<i>Oxalis</i> sp.* (forb)	30.0%	0.05%
<i>Helichrysum longifolium</i> (forb)	25.0%	3.2%
<i>Eriosema parviflorum</i> (forb)	25.0%	3.0%
<i>Tephrosia macropoda</i> (forb)	25.0%	2.3%
<i>Helichrysum panduratum</i> (forb/shrub)	25.0%	0.4%
<i>Zornia capensis</i> (forb)	25.0%	0.3%
<i>Senecio</i> sp. (forb)	25.0%	0.07%
<i>Laggera alata</i> (forb)	25.0%	0.005%
<i>Sorghum bicolor</i> (grass)	20.0%	7.6%
<i>Sida rhombifolia</i> (forb)	20.0%	3.8%
<i>Sporobolus africanus</i> (grass)	20.0%	2.2%
<i>Cymbopogon validus</i> (grass)	20.0%	1.2%
<i>Centella asiatica</i> (forb)	20.0%	0.9%
<i>Asystasia gangetica</i> (forb)	20.0%	0.7%
<i>Commelina erecta</i> (forb)	20.0%	0.6%

<i>Desmodium incanum</i> (forb)	20.0%	0.1%
<i>Richardia brasiliensis</i> * (forb)	20.0%	0.06%
<i>Cheilanthes viridis</i> (fern)	20.0%	0.05%

Climbers

The only climber present in more than 20% of relevés is:

<i>Hewittia sublobata</i> (forb)	25.0%	10.0%
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Saplings and seedlings

Saplings and seedlings occurring in more than 20% of the relevés representing the community are:

<i>Melia azedarach</i> * sapling (tree)	25.0%	0.6%
<i>Albizia adianthifolia</i> sapling (tree)	20.0%	4.6%
<i>Tagetes minuta</i> * seedlings (forb)	20.0%	0.4%

General

Other than the recently burned grasslands represented by Community 16, where the herb diversity would be expected to be high, Community 14 has the highest forb diversity of all the grasslands identified in this study. It also has the second highest overall species diversity of all the communities surveyed. As is the case with Community 13, the diagnostic species group for this community, the *Phyllanthus burchellii* species group (Appendix .32), is dominated by forb species indicating that it is on the basis of the forb component rather than the grass sward that grasslands are distinguished. The better quality of the Community 14 grasslands, as compared to those included within Community 13, is highlighted by the fact that only 18.8% of the diagnostic species for Community 14 are alien, as compared to the 44.4% of Community 13.

As with Communities 11 & 13, *Panicum maximum* (Decreaser) and *Eragrostis curvula* (Increase II) form a major component of the sward in Community 14. *Eragrostis curvula* in particular is indicative of disturbance

and badly managed areas. The occurrence and cover of *Rhynchelytrum repens* (Increaser II) is virtually identical to that found in Community 13 and could represent an erosion hazard in badly managed or impacted areas. *Aristida junciformis* (Increaser III), *Cymbopogon validus* (Increaser I) and *Digitaria eriantha* (Decreaser) appear for the first time as major grassland constituents. *Digitaria eriantha* is one of the most visible components of this grassland type, and together with the high cover values for *Panicum maximum*, another Decreaser species, indicates an improving sward quality. The presence of a wide range of grass types, i.e. Decreasers, Increaser I, Increaser II and Increaser III suggests that areas included within this community show a range of disturbance regimes ranging from under- to over-utilisation.

The presence of the pioneer species *Aristida junciformis* has important management implications because of the difficulty in eradicating it from the sward, and its tendency to dominate under conditions of disturbance. The presence of *Hyparrhenia hirta* also suggests a history of past disturbance, as this species usually predominates on 'old-land sites' (Tainton *et al.* 1976). The presence of *Saccharum officinarum** in the diagnostic species for Community 14 confirms that cultivation was an important source of disturbance. This observation is supported by the widespread occurrence of Community 14 in the old caneland areas of Phoenix.

This community shows an increase in the forb and grass component and a decrease in the shrub component when compared with Community 13. However, woody encroachment is an ever-present threat as indicated by the presence of *Lantana camara** seedlings in the *Conyza floribunda** species group (Appendix .33), which is shared by Communities 12, 13 & 14. This is further confirmed by the presence of *Chrysanthemoides monilifera* and *Melia azedarach** sapling in the *Tagetes minuta** species

group (Appendix .35), which is shared by Communities 3 and 5–13. *Albizia adianthifolia* saplings are also present within a fifth of the relevés defining Community 14. *Albizia adianthifolia* is noted by Ward (1980) as 'an invader of grassland, often dominant in woodland seral to forest'.

It is important to realise that while the overall herb diversity of this community is high, there is a gradient of diversity within the community itself. This ranges from the relatively depauperate old canefields of the Phoenix area, to the species-rich grasslands at Treasure Beach. This difference is probably best related to the timescale of disturbance and the level of active management that has been operative in these areas.

Community 14 shows strong floristic links with Community 13 and Community 12 (wetlands/floodplains) through the shared presence of the *Conyza floribunda** species group (Appendix .33). The species composition of this group indicates the presence of damp conditions in all of these communities through the shared presence of species such as *Andropogon eucomus*, *Cyperus distans*, *Cyperus sphaerospermus*, *Imperata cylindrica* and *Pycnus polystachyos*, which are characteristic of badly drained areas. It is related to Communities 10, 11 & 13 through the shared presence of the *Cassia mimosoides* species group (Appendix .34), which does not occur in the wetland areas and is more characteristic of open grassland areas. A broad association between Community 14 and the remainder of the communities so far described (except for Communities 1, 2 & 4) is demonstrated by the shared presence of the *Tagetes minuta** species group (Appendix .35). The fact that the species in this group are predominantly indigenous indicates a common floristic link extending throughout the herb layer of the urban landscape. Most of these species are generalists, and are common in disturbed areas, but this commonality does



FIGURE 21.—Community 15: *Sutera kraussiana*–*Aristida junciformis* Low/Short Closed Grassland. Note sward dominated by *Aristida junciformis*. Other species recorded: *Cassia mimosoides*, *Crotalaria lanceolata*, *Desmodium incanum*, *Helichrysum* sp., *Indigofera hiliaris*, *Rhynchelytrum repens*, *Sporobolus africanus* and *Teramnus labialis*. Location: Welbedacht.

reinforce the concept of landscape- as opposed to community-based conservation.

The average cover for *Lantana camara** in Community 14 is lower than the equivalent levels found in Community 13, but demonstrates a higher percentage occurrence. The reverse situation exists for *Chromolaena odorata** (Figures 5 & 6). Community 14 has the highest percentage occurrence of *Lantana camara** of all the grasslands, suggesting that this shrub may pose a potentially severe encroachment problem in this community. Because of the extensive herb complement within this community, Community 14 has the highest species diversity of any community (other than the recently burned grasslands of Community 16, Figure 4). The lack of cover in the >5 m height class and the D structure of the community (Figure 2N) is due to the predominance of forb and grass species in this community.

Community 15: *Sutera kraussiana*–*Aristida junciformis* Low/Short Closed Grassland (Figure 21)

This low/short closed grassland community (Edwards 1983) is found at altitudes of 5–332 m. It is represented by 18 relevés (Appendix) with 7–34 species per relevé. This community has a D structure (Ito 1979; Figure 2O) with the greatest average cover of 52.7% in the 0.5–5.0 m height class. This is a more open grassland community than Community 14.

Habitat

The soils underlying this community include the Cartref Form, Cartref Series; Fernwood Form, Fernwood Series; Glenrosa Form, Williamson Series; Hutton Form, Clansthal Series; Katspruit Form, Katspruit Series; Kroonstad Form, Avoca Series; Longlands Form, Waldene Series; Milkwood Form, Milkwood Series and Mispah Form, Mispah Series. The Mispah Mispah soils are the most common occurring in 7 out of 18 relevés. The terrain occupied by this community varies from flat at some sites to an inclination of 26.6° at others, in an east, southeast, south, west, and northwest direction. Of these, east and south are the most common occurring in 5 relevés each.

Floristics

This community is distinguished by the *Oxalis latifolia** species group (Appendix .36). The species diversity averages 0.13 species per m² for the community with an average of 14.8 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Lantana camara</i> * (shrub)	38.9%	5.3%
<i>Chromolaena odorata</i> * (shrub)	3.3%	14.9%

There are no conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community.

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Nidorella auriculata</i> (forb)	66.7%	3.6%
<i>Eragrostis curvula</i> (grass)	50.0%	19.4%
<i>Hyparrhenia hirta</i> (grass)	33.3%	12.5%
<i>Teramnus labialis</i> (forb)	33.3%	0.4%
<i>Aristida junciformis</i> (grass)	27.8%	13.7%
<i>Senecio variabilis</i> (forb)	27.8%	7.5%
<i>Vernonia capensis</i> (forb)	27.8%	4.2%
<i>Centella asiatica</i> (forb)	27.8%	0.02%
<i>Sporobolus africanus</i> (grass)	22.2%	7.3%
<i>Senecio polyanthemoides</i> (forb)	22.2%	1.3%
<i>Hypoxis moperi</i> (geophyte)	22.2%	1.3%
<i>Digitaria</i> sp. (grass)	22.2%	1.0%
<i>Sonchus wilmsii</i> (forb)	22.2%	0.06%

General

Community 15 demonstrates a limited association with Community 14 through the common presence of the *Lo-belvia erinus* species group (Appendix .37). A more significant association with the two grassland Communities 13 & 14, is indicated by the common presence of the *Digitaria eriantha* species group (Appendix .38). This suggests the existence of a range of indigenous grasses and forbs common to these three major grassland types in the urban area, and reinforces the need for ecological continuity between communities. A broad association with all of the previously discussed communities except the mangroves (Community 1) is indicated by the common presence of the *Senecio polyanthemoides* species group (Appendix .39).

This group is dominated by generalists, opportunists, invasive and pioneer species and serves to re-emphasise the fact that disturbance throughout the municipal landscape has blurred the original floristic boundaries by providing conditions ideally suited to the proliferation of these r-selected species. The problem of woody encroachment into the grassland areas is again highlighted through the presence of *Albizia adianthifolia*, *Chromolaena odorata** and *Psidium guajava** in the *Senecio polyanthemoides* species group (Appendix .39).

An important characteristic of Community 15 is the marked drop in species diversity as compared to Community 14 (Figure 4). This is the result of a decrease in the diversity of the forb layer. This is also accompanied by a decrease in the diversity of the grass sward and an increase in the cover of grass species such as *Aristida junciformis* (Increaser III), *Eragrostis curvula* (Increaser II) and *Hyparrhenia hirta* (Increaser II) (all relative to Community 14). These species (particularly the predominance of *Aristida junciformis* in many areas) suggest previous mismanagement and disturbance through overgrazing and poor agricultural practices (Tainton 1981b). Of all the grassland communities sampled, Community 15 has the highest cover values for *Aristida junciformis*, and the second highest cover values for *Eragrostis curvula* and *Sporobolus africanus*.

Further confirmation of disturbance is provided by the significant presence of the two invasive shrub species *Chromolaena odorata** and *Lantana camara**. Relative to Community 14 the average cover of *Chromolaena*



FIGURE 22.—Community 16: *Hypoxis gerrardii*-*Alloteropsis semialata* Low Closed Grassland. Species recorded include: *Berkheya speciosa*, *Cyperus obtusiflorus*, *Helichrysum* sp. and *Hypoxis* sp. Location: Silverglen Nature Reserve.

*odorata** increases and that of *Lantana camara** decreases (Figure 5) The percentage occurrence of both species decreases (Figure 6). The D structure of this community (Figure 20) is due to the predominance of grass species.

Community 16: *Hypoxis gerrardii*-*Alloteropsis semialata* Low Closed Grassland (Figure 22)

This low closed grassland community (Edwards 1983) is found at altitudes of 128–157 m. It is represented by two relevés (Appendix) with 19–39 species per relevé. This community has a L structure (Ito 1979; Figure 2P) with the greatest average cover of 76.0% in the 0–0.5 m height class. There is no representation in the upper height classes of 0.5–5.0 m and greater than 5 m.

Habitat

The soils are of the Cartref Form, Cartref Series, and are derived from Natal Group Sandstone. The terrain slopes from 10.9° to 15.5° in a southerly direction.

Floristics

This community is distinguished by the *Alepidea* sp. species group (Appendix .40). The species diversity per unit area is 0.26 species per m² for the two relevés, with an average of 29.0 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Lantana camara</i> * (shrub)	0.0%	0.0%
<i>Chromolaena odorata</i> * (shrub)	0.0%	0.0%

There are no conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community.

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

Diagnostic

<i>Alloteropsis semialata</i> (grass)	100.0%	34.0%
<i>Becium obovatum</i> (forb)	100.0%	20.0%
<i>Gerbera ambigua</i> (forb)	100.0%	18.5%
<i>Berkheya speciosa</i> (forb)	100.0%	8.5%
<i>Tristachya leucothrix</i> (grass)	100.0%	6.0%
<i>Aster bakeranus</i> (forb)	100.0%	6.0%
<i>Euphorbia natalensis</i> (forb)	100.0%	3.1%
<i>Alepidea</i> sp. (forb)	100.0%	3.1%
<i>Hypoxis gerrardii</i> (geophyte)	100.0%	3.0%
<i>Hypoxis acuminata</i> (geophyte)	100.0%	0.05%
<i>Rhynchelytrum repens</i> (grass)	50.0%	17.0%
<i>Aristida junciformis</i> (grass)	50.0%	5.5%
<i>Helichrysum cephaloideum</i> (forb)	50.0%	3.0%
<i>Scabiosa columbaria</i> (forb)	50.0%	3.0%
<i>Setaria sphacelata</i> (grass)	50.0%	3.0%
<i>Nidorella auriculata</i> (forb)	50.0%	0.5%
<i>Vernonia capensis</i> (forb)	50.0%	0.5%
<i>Cyperus obtusiflorus</i> (sedge)	50.0%	0.5%
<i>Thunbergia atriplicifolia</i> (forb)	50.0%	0.05%
<i>Tephrosia macropoda</i> (forb)	50.0%	0.05%

Non-diagnostic

<i>Digitaria setifolia</i> (grass)	50.0%	25.5%
<i>Senecio glaberrimus</i> (forb)	100.0%	18.5%
<i>Eulalia villosa</i> (grass)	50.0%	3.0%
<i>Pentanisia prunelloides</i> (forb)	50.0%	3.0%
<i>Urelytrum agropyroides</i> (grass)	50.0%	3.0%
<i>Helichrysum miconiifolium</i> (forb)	50.0%	3.0%
<i>Helichrysum griseum</i> (forb)	50.0%	0.5%
<i>Euryops</i> sp. (shrub)	50.0%	0.5%
<i>Cyanotis speciosa</i> (forb)	50.0%	0.05%
<i>Clutia cordata</i> (shrub)	50.0%	0.05%
<i>Andropogon appendiculatus</i> (grass)	50.0%	0.05%
<i>Sporobolus mauritanus</i> (grass)	50.0%	0.05%
<i>Vernonia hirsuta</i> (forb)	50.0%	0.05%
<i>Watsonia densiflora</i> (geophyte)	50.0%	0.05%

General

The number of herb species in this community is very high compared to the levels exhibited by the other grassland communities identified in the study. This is linked to the fact that this community is defined by only two relevés and represents newly burned grassland areas. The occurrence of geophytes such as *Hypoxis gerrardii* within the diagnostic species is evidence of this latter fact. It is proposed that Community 16 represents the burned form of Community 17. This is suggested by the strong floristic similarity between these two communities indicated by the *Helichrysum cephaloideum* species group (Appendix .42), and the fact that Community 17 predominates in Silverglen Nature Reserve, the area in which the two relevés defining this community were sampled.

Community 16 is related to grassland Communities 13, 14, 15 & 17 through the shared presence of the *Helichrysum cephaloideum* species group (Appendix .42). The presence of *Themeda triandra* in this group would seem to indicate that this floristic similarity may be the result of these communities representing various levels of disturbance (and recovery?) of the original *Themeda triandra* sward which predominated prior to the advent of agriculture and urbanisation (Moll 1976). The association between Community 13 and Communities 14–17 at this level is slight, probably indicating a far greater level and/or frequency of disturbance in Community 13.

Of all the communities, 16 has the highest overall species diversity (due to the presence of an extensive forb component) (Figure 4), which points to the importance of fire as a management tool in maintaining the quality of grassland areas (Figures 5 & 6). The lack of woody species, especially *Chromolaena odorata** and *Lantana camara**, also indicates the value of fire in maintaining grassland areas and reducing the threat of woody encroachment.

In terms of sward composition the occurrence and comparatively high cover of *Rhynchelytrum repens* (Increaser II) could represent an erosion hazard in badly managed or impacted areas. The presence of the pioneer species *Aristida junciformis* (Increaser III) also has important management implications because of the difficulty in eradicating it from the sward and its tendency to dominate under conditions of disturbance. The presence of species such as *Alloteropsis semialata* (Increaser I), *Eulalia villosa* (Increaser I) and *Tristachya leucothrix* identified by Tainton & Mentis (1984) as a post-fire climax species are significant, as they indicate that these grasslands have been under-utilised, resulting in accumulation of dry material and the grassland becoming moribund. The L structure of this community (Figure 2P) can be attributed to the recent burn in these areas.

Community 17: *Helichrysum aureum*–*Themeda triandra* Short Closed Grassland (Figure 23)

This short closed grassland community (Edwards 1983) is found at altitudes of 83–133 m. It is represented by seven relevés (Appendix) with 7–31 species per relevé. This community has a D structure (Ito 1979; Figure 2Q) with the greatest average cover of 75.0% in the 0.5–5.0 m height class. This is composed predominantly of grass.

Habitat

The soils are mainly of the Cartref Form, Cartref Series (4 out of 7 relevés). Also present are soils of the Hutton Form, Clanshal Series; Milkwood Form, Milkwood Series and Mispah Form, Mispah Series. The terrain occupied by this community slopes from 7.5°–32.0°, in an northeastern, southeastern, southern and northern direction. Of these north is the most common aspect occurring in 4 out of 7 relevés.



FIGURE 23.—Community 17: *Helichrysum aureum*–*Themeda triandra* Short Closed Grassland. Species recorded: *Digitaria* sp., *Helichrysum auriceps*, *Setaria sphacelata* and *Themeda triandra*. Location: Stainbank Nature Reserve.



FIGURE 24.—Community 18: *Dianthus zeyheri*–*Eragrostis curvula* Short/Low Closed Grassland. Species recorded: *Cymbopogon excavatus*, *Desmodium incanum*, *Eragrostis curvula*, *Hyparrhenia hirta*, *Rhynchelytrum repens*, *Scabiosa columbaria*, *Setaria sphacelata*, *Sporobolus africanus* and *Xysmalobium undulatum*. Location: Newlands.

Floristics

This community is distinguished by the *Helichrysum aureum* species group (Appendix .41). The species diversity per unit area is 0.16 species per m² for the community, with an average of 17.9 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Lantana camara</i> * (shrub)	0.0%	0.0%
<i>Chromolaena odorata</i> * (shrub)	0.0%	0.0%

There are no conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community.

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

<i>Teramnus labialis</i> (forb)	57.1%	0.3%
<i>Aristida junciformis</i> (grass)	42.9%	1.0%
<i>Aeschynomene micrantha</i> (forb)	42.9%	0.01%
<i>Chaetacanthus burchellii</i> (shrublet)	42.9%	0.01%
<i>Themeda triandra</i> (grass)	28.6%	23.9%
<i>Tephrosia macropoda</i> (forb)	28.6%	15.9%
<i>Setaria sphacelata</i> (grass)	28.6%	8.9%
<i>Monocymbium ceresiiforme</i> (grass)	28.6%	3.7%
<i>Panicum maximum</i> (grass)	28.6%	2.4%
<i>Cyperus obtusiflorus</i> (sedge)	28.6%	1.7%
<i>Selago woodii</i> (shrublet)	28.6%	1.7%
<i>Cymbopogon validus</i> (grass)	28.6%	1.6%
<i>Desmodium incanum</i> (forb)	28.6%	0.9%
<i>Helichrysum aureum</i> (forb)	28.6%	0.2%
<i>Xysmalobium undulatum</i> (forb)	28.6%	0.2%
<i>Gerbera piloselloides</i> (forb)	28.6%	0.1%
<i>Tephrosia kraussiana</i> (forb)	28.6%	0.1%
<i>Helichrysum cephaloideum</i> (forb)	28.6%	0.03%
<i>Eragrostis capensis</i> (grass)	28.6%	0.01%

General

This community is related to the other grassland Communities 13, 14, 15 & 16 through the common presence of the *Helichrysum cephaloideum* species group (Appendix .42). This is the same floristic association shown by Community 16, and supports the suggestion that these communities represent the burned and unburned version of the same or very similar communities. *Chromolaena odorata** and *Lantana camara** are also totally lacking from this grassland community (Figures 5 & 6), a reflection of the comparatively undisturbed nature of this community and the effect of active management (burning and clearing of alien invasives) in areas such as Silverglen Nature Reserve and Stainbank Nature Reserve where this community occurs.

The presence of *Themeda triandra* (Decreaser) within the differential species of this community indicates that it still bears some association with the primary grassland types i.e. the fire maintained *Themeda triandra* grassland proposed by Moll (1976). The species composition of Community 17 is virtually identical to that described as the ‘Secondary *Aristida junciformis* understorey’ of Moll’s (1976) *Acacia sieberiana* Wooded Grassland.

The widespread presence of *Aristida junciformis* (Increaser III) in the sward is cause for concern and should be addressed as part of any management plan for this community. The presence of *Themeda triandra* (Decreaser), however, indicates the potential of the area to be returned to a high quality grassland. This is supported by the presence of another Decreaser species *Monocymbium ceresiiforme*. The idea that these grasslands may have been moribund for extended periods of time as indicated by the species composition of Community 16 is here also suggested by the presence of species such as *Helichrysum aureum*, which is diagnostic for this community. *Helichrysum aureum* is a fire-sensitive species which is a common weed in unburned or moribund fire-climax grasslands

(Tainton 1981c). The presence of Increaser I species such as *Cymbopogon validus* tends to confirm this.

As with Community 16, the relatively minor occurrence of species characteristic of the broad generalist *Chaetacanthus burchellii* species group (Appendix .45), indicates a less disturbed form of grassland than represented by Communities 14 & 15. The occurrence of *Aristida junciformis* in the sward, however, prescribes the need for management policies aimed at reducing the *Aristida* component and improving the *Themeda*.

In Community 17 there is a substantial decrease in species diversity to levels just higher than those recorded for the most heavily impacted grasslands (Communities 13 & 15) (Figure 4). The decrease in species diversity from the levels attained by Community 16, indicates that as the grass sward of this community type becomes moribund, so the forb diversity decreases. Thus, fire will obviously be an important management tool in maintaining the diversity of the herb populations in these grassland communities. The D structure of this community (Figure 2Q) is due to the predominance of grass and forb species.

Community 18: *Dianthus zeyheri*-*Eragrostis curvula*
Short/Low Closed Grassland (Figure 24)

This short/low closed grassland community (Edwards 1983) is found at altitudes of 5–152 m. It is represented by 13 relevés (Appendix) with 2–43 species per relevé. This community (Edwards 1983) has a D structure (Ito 1979; Figure 2R) with the greatest average cover of 56.5% in the 0.5–5.0 m height class. No vegetation above 5 m occurs in this community type.

Habitat

The soils are mainly of the Mispah Form, Mispah Series (7 out of 13 relevés). Others underlying this community type include the Cartref Form, Cartref Series; Dundee Form, Dundee Series; Glenrosa Form, Williamson Series and Milkwood Form, Milkwood Series. The terrain occupied by this community varies from flat at some sites to an inclination of 39.8° at others, in a general easterly direction (8 relevés). Southeastern, southern and northern aspects are also noted.

Floristics

This community is distinguished by the *Dianthus zeyheri* species group (Appendix .43). The species diversity per unit area averages 0.17 species per m² for the 13 relevés, with an average of 19.0 species per relevé.

Trees and shrubs

Percentage occurrence and average cover of *Chromolaena odorata** and *Lantana camara** are:

<i>Lantana camara</i> * (shrub)	15.4%	7.1%
<i>Chromolaena odorata</i> * (shrub)	0.0%	0.0%

There are no conspicuous woody species with more than 5% mean cover and occurring in more than 20% of the relevés representing the community.

Herbs

Herb species occurring in more than 20% of the relevés representing the community are:

Diagnostic

<i>Eragrostis curvula</i> (grass)	76.9%	27.9%
<i>Chaetacanthus burchellii</i> (shrublet)	69.2%	1.0%
<i>Desmodium incanum</i> (forb)	61.5%	1.0%
<i>Stachys natalensis</i> (forb)	53.9%	2.3%
<i>Ruellia cordata</i> (undershrub)	46.2%	0.6%
<i>Teramnus labialis</i> (forb)	46.2%	7.9%
<i>Hyparrhenia hirta</i> (grass)	38.5%	25.8%
<i>Cymbopogon</i> sp. (grass)	38.5%	7.7%
<i>Gerbera ambigua</i> (forb)	38.5%	2.0%
<i>Hypoxis rooperi</i> (geophyte)	38.5%	0.6%
<i>Commelina africana</i> (forb)	38.5%	0.02%
<i>Setaria sphacelata</i> (grass)	30.8%	4.4%
<i>Indigofera hiliaris</i> (forb)	30.8%	2.0%
<i>Scabiosa columbaria</i> (forb)	30.8%	1.8%
<i>Aspilia natalensis</i> (forb)	30.8%	1.0%
<i>Vernonia capensis</i> (forb)	30.8%	0.5%
<i>Crabbea hirsuta</i> (shrublet)	30.8%	0.5%
<i>Cassia plumosa</i> (forb)	30.8%	0.02%
<i>Sonchus wilmsii</i> (forb)	30.8%	0.02%
<i>Gerbera piloselloides</i> (forb)	30.8%	0.008%
<i>Panicum maximum</i> (grass)	23.1%	12.2%
<i>Rhynchelytrum repens</i> (grass)	23.1%	2.6%
<i>Dianthus zeyheri</i> (forb)	23.1%	1.3%
<i>Thesium pallidum</i> (forb)	23.1%	0.9%
<i>Aeschynomene micrantha</i> (forb)	23.1%	0.09%
<i>Sida rhombifolia</i> (forb)	23.1%	0.09%
<i>Acalypha peduncularis</i> (forb)	23.1%	0.08%
<i>Xysmalobium undulatum</i> (forb)	23.1%	0.008%

Non-diagnostic

<i>Abrus precatorius</i> (undershrub)	23.1%	0.008%
<i>Senecio glaberrimus</i> (forb)	23.1%	0.6%

General

This community is related to grassland Communities 14, 15, 16 & 17 through the common presence of the *Hypoxis acuminata* species group (Appendix .44). It is, however, distinct from these communities in that it shows no floristic association with Community 13, except at the grossest floristic level through the *Chaetacanthus burchellii* species group (Appendix .45). Communities 14–17 show distinct floristic links with the more disturbed Community 13 through groups such as the *Helichrysum cephaloideum* species group (Appendix .42). This species group does not include Community 18.

The predominant grass species in Community 18 are *Cymbopogon* sp. (Increaser I), *Eragrostis curvula* (Increaser II), *Hyparrhenia hirta* (Increaser II) and *Panicum maximum* (Decreaser). *Eragrostis curvula* is characteristic of ‘disturbed areas’ and ‘badly managed veld’ (Tainton *et al.* 1976). Similarly, the presence of *Hyparrhenia hirta* is probably due to the fact that Newlands (where the most extensive areas of this community occur) was previously used for the cultivation of sugarcane. *Hyparrhenia hirta* tends to ‘become dominant on old-land sites’ (Tainton *et al.* 1976). This grassland has a well-developed forb component, not found in badly impacted grasslands such as Community 15.

Woody encroachment into the grassland communities is clearly evident through the presence of *Acacia nilotica*,

Albizia adianthifolia sapling, *Chromolaena odorata** seedlings, *Lantana camara** and *Psidium guajava** sapling in the *Chaetacanthus burchellii* species group (Appendix .45), all of which occur in Community 18. It is probable that reduced fire frequency has played a role in facilitating this encroachment (Moll 1976).

As mentioned previously, Community 18 grasslands are largely restricted to the Newlands area of municipal Durban. This is one of the most obvious areas where the current classification is incompatible with Moll's (1976) assertion that the dominant grasslands in Durban are Secondary *Aristida junciformis* grasslands. Community 18 grasslands differ substantially on floristic grounds from Moll's (1976) secondary grasslands. The most noticeable difference is the absence of *Aristida junciformis*, which Moll (1976) regards as the 'dominant understorey grass', and the occurrence of *Panicum maximum* as a significant component of the sward.

Although the two invasive shrub species *Chromolaena odorata** and *Lantana camara** are present in Communities 13, 14 & 15, their significance decreases in Communities 16–18. This suggests that one is possibly dealing with a mosaic of disturbance and recovery patterns within the grassland community spectrum. Although clearly related to Communities 14–17 it is possible that Community 18 represents a transition to another grassland type not sampled during this survey, and which forms part of the community continuum that extends outside the municipal boundaries. Further research is needed to clarify the relationship of Community 18 to the other grassland communities in the urban area.

This grassland community has a higher species diversity than the Community 17 grasslands (Figure 4) and shows signs of prior disturbance through the presence of *Lantana camara**, although *Chromolaena odorata** is absent (Figure 5). *Lantana camara** has a greater percentage occurrence throughout all the grassland communities than *Chromolaena odorata** (Figure 6), suggesting that it may be a preliminary invader of these communities (Ward 1980). The control of this species should therefore be treated as a priority before it becomes a serious problem in the remaining grassland areas. Community 18, as with the remainder of the grassland communities, has a D structure (Figure 2R) due to the predominance of grass and forb species.

DISCUSSION AND CONCLUSIONS

The classification of vegetation in the municipal Durban area demonstrated the existence of 18 identifiable floristic communities, eight of which had not been previously described. Research into the long-term dynamics of all 18 communities will form part of Durban's ongoing open space planning and management initiative.

In comparison to previous vegetation surveys which have included the Durban municipal area or the majority thereof, i.e. Acocks (1988), Cawood (1980) and Moll (1976), this study presents a marked refinement in community description and identification. This has obvious advantages from a urban planning point of view, if the aim is the establishment of an ecologically viable open space system. According to Acocks's (1988) community descrip-

tions, four main vegetation types could be identified within the municipal area: Typical Coast-belt Forest, Dune Forest, Mangrove Forest and Northern Variation of the Valley Bushveld. However, the associated mapping contribution by Acocks's (1988), at a scale of 1:1 500 000, prevented representation of this detail, and the whole city is merely located within a belt of Coastal Forest and Thornveld.

Moll (1976) in his *The Three Rivers region: a vegetation study* also identified four community types within the municipal area: Coast Forest and Palm Veld, Dry Valley Scrub and Woodland Mosaic, *Acacia sieberiana* Savanna and Mangrove Swamp, with an associated mapping contribution of 1:250 000. Although Moll (1976) shows a more detailed rationalisation of the community distribution, there are some discrepancies between the communities represented on the 1:250 000 map and the communities which actually existed on the ground. By tracing the municipal boundary on to Moll's (1976) vegetation map it is possible to ascertain that according to the map, Phoenix is occupied by Coast Forest and Palm Veld. This may well represent the natural potential for the area, but at present the area is occupied by grasslands (e.g. Community 14) which have developed following the clearing of extensive canelands which existed even when Moll mapped Phoenix. This draws attention to the critical fact that both Acocks and Moll tended to map the natural communities which would have occurred at particular sites, or their nearest equivalents, rather than ground truthing these areas.

Of the three studies, Cawood (1980) presents the most detailed analysis of community types within the municipal area. He identified seven distinct groupings: Coast Forest/Scrub and Woodland Mosaic, Dune Forest, Mangrove Swamp, Bush Clump and Grassland Mosaic, Timber Plantation, Heavily Disturbed and Intergradation of Coast Forest/Scrub and Woodland Mosaic and Bush Clump and Grassland Mosaic. The mapping contribution of this study was presented at a scale of 1:50 000, and of the three represents the most detailed and accurate description of plant community distribution and location in the Durban area. But not all of municipal Durban is included within Cawood's Greater Durban boundaries, as the section north of the Umgeni River is omitted. Its usefulness to planners in municipal Durban is further reduced by the fact that many of the smaller open areas were not mapped or surveyed.

Moll (1976) recognised the limitations of these three studies when he wrote, 'plant studies can play an important role in planning for future development. However, at the scale at which the present survey was conducted, only broad guidelines can be given for the region; the planning of specific local areas requires more detailed plant ecological studies.' The aim of the present study was therefore to address this shortfall and to present a more detailed community analysis and associated mapping contribution (1:6 000) for municipal Durban; one that is sufficiently accurate in terms of floristic detail and actual community distribution to provide an effective planning and management tool. It also highlighted the need for a more encompassing and holistic view of urban conservation. Extensive floristic links in the Durban area indicate the need for a

landscape- (rather than a species- or even community-) based approach to open space design (Forman & Godron 1986). This in turn implies that the ecological viability of any open space system proposed for the City can only be ensured through the mitigation of landscape fragmentation, e.g. through the provision of dispersal corridors and the implementation of management techniques favouring naturalisation and the recreation of natural habitat settings. These guidelines have been employed in the design of the municipal Durban open space system described by Roberts (1990).

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APPENDIX

Synoptic table showing the general species characteristics of each of the 52 communities distinguished in the study area. Complete phytosociological tables for both the diagnostic species and the non-diagnostic species are available from the author or Dr R.H. Westfall, Agricultural Research Council, Rooedeplaas Grassland Institute, Private Bag X05, Lynn East 0039, Pretoria.

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table)

										1 1 1 1 1 1 1 1 1								
Community number										1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8								
1. <i>Avicennia marina</i> - <i>Bruguiera gymnorrhiza</i> mangrove short forest																		
<i>Avicennia marina</i> (T) **						5												
<i>Bruguiera gymnorrhiza</i> (T)						5												
<i>Rhizophora mucronata</i> (T)						3												
<i>Avicennia marina</i> seedlings (T)						2												
<i>Bruguiera gymnorrhiza</i> seedlings (T)						2												
<i>Rhizophora mucronata</i> seedlings (T)						2												
2. <i>Mimusops caffra</i> - <i>Allophylus natalensis</i> low/short thicket																		
<i>Mimusops caffra</i> (T)	+		2				+				+							
<i>Allophylus natalensis</i> (T)	+		2								+							
<i>Cynanchum obtusifolium</i> (CL)			2															
<i>Mimusops caffra</i> sapling (T)	+		2				+											
<i>Cordia caffra</i> sapling (T)			1				+											
<i>Croton sylvaticus</i> (T)	+		+								+							
<i>Deinbollia oblongifolia</i> seedlings (T)	+		+				+											
<i>Drypetes natalensis</i> (T)	+		+				+											
<i>Ficus lutea</i> (T)			1						+									
<i>Carissa bispinosa</i> sapling (S)			1															
<i>Cordia caffra</i> seedling (T)			1															
<i>Cyphostemma flaviflorum</i> (F/C)			1															
<i>Pavetta revoluta</i> sapling (S)			1															
<i>Tricalysia sonderiana</i> (S/T)			1															
<i>Bequaertiodendron natalense</i> (T)							5											
<i>Rawsonia lucida</i> sapling (T)							3											
<i>Teclea natalensis</i> sapling (T)							2											
3. Differential species for communities 2 & 3																		
<i>Eugenia capensis</i> (S)	3		+				+				+							
<i>Abutilon sonneratianum</i> (F)	+		1								+							
<i>Barleria obtusa</i> (SL)	+		1										+					
4. <i>Manilkara discolor</i> - <i>Tricalysia lanceolata</i> short thicket																		
<i>Manilkara discolor</i> sapling (T)						4												
<i>Manilkara discolor</i> (T)						4												
5. Differential species for communities 3 & 4																		
<i>Tricalysia lanceolata</i> (S/T)	2		3		+		+											
<i>Drypetes arguta</i> sapling (T)	+		3		+													
<i>Vernonia angulifolia</i> (F)	1		+						+									

* Alien and naturalised species
** (C) - Sedge; (F) - Forb; (CL) - Climber; (G) - Grass;
(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte
(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;
(/c) - Climbing form

APPENDIX — Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	1	1	1	1	1	1	1
6. <i>Protorhus longifolia</i> (sapling) - <i>Psychotria capensis</i> short thicket																		
<i>Canthium obovatum</i> sapling (T)						1				+								
<i>Protorhus longifolia</i> sapling (T)						1												
<i>Xylothea kraussiana</i> sapling (S)						1												
<i>Capparis brassii</i> (CL)						1												
<i>Capparis sepiaria</i> (CL)						1	+											
<i>Chaetacme aristata</i> sapling (T)						1					+							
<i>Cola natalensis</i> sapling (T)			+			1												
<i>Ekebergia capensis</i> sapling (T)						1												
<i>Entada spicata</i> seedlings (S/C)			+			1												
<i>Maytenus peduncularis</i> sapling (F)						1			+									
<i>Mimusops obovata</i> sapling (T)			+			1												
<i>Mimusops obovata</i> (T)						1												
<i>Celtis africana</i> sapling (T)						1												
<i>Cyphostemma hypoleucum</i> seedlings (F/C)						1												
<i>Hibiscus tiliaceus</i> (T)						1												
<i>Momordica</i> sp. seedlings (F/C)						1												
<i>Teclea gerrardii</i> (T)						1												
<i>Vepris lanceolata</i> sapling (T/S)						1												
<i>Vepris lanceolata</i> (T/S)						1												
7. Differential species for communities 4 & 5																		
<i>Psychotria capensis</i> (S/T)			+			3	3			+								
<i>Canthium inerme</i> (T)			+			3	1											
<i>Canthium obovatum</i> (T)						+	1		+	+								
<i>Protorhus longifolia</i> (T)						+	1			+								
<i>Tricalysia lanceolata</i> sapling (S/T)			+			3	1											
<i>Cussonia</i> sp. (T)						+	1		+									
8. Differential species for communities 3, 4 & 5																		
<i>Rhoicissus rhomboidea</i> (S/C)			+			2	+	+	1		+		+					
<i>Deinbollia oblongifolia</i> sapling (T)						3	+		1		+		+					
<i>Flagellaria guineensis</i> (CL)						1	2		2	+			+					
<i>Deinbollia oblongifolia</i> (T)						1	+		2	+								
<i>Carissa bispinosa</i> (S)						1	2	+	1				+					
<i>Tinospora caffra</i> (CL)			+			2			1									
<i>Cordia caffra</i> (T)						2			1									
<i>Drimiopsis maculata</i> (GEO)						1	+		1			+			+			
<i>Psychotria capensis</i> sapling (S/T)						1	+	+	1									
<i>Pyrenacantha scandens</i> (CL)						1			1		+							
<i>Strelitzia nicolai</i> (T)						1	+		1		+	+			+			
<i>Drypetes arguta</i> (T)							3		1	+								
<i>Digitaria diversinervis</i> (G)			+	+					1				+					
<i>Drypetes natalensis</i> sapling (T)						1	+		1									
<i>Panicum laticomum</i> (G)						1		+	+		+	+						
<i>Protasparagus falcatus</i> (CL)							+	3	+		+	+						
<i>Bequaertiodendron natalense</i> sapling (T)							3		1									
<i>Momordica involucreta</i> (F/C)						1			+						+			
<i>Secamone alpinii</i> (CL)						1			+		+							
<i>Strychnos madagascariensis</i> (T)							+		1	+								
<i>Celosia trigyna</i> (F)						1			+			+						
<i>Maerua racemulosa</i> (S)							+		1	+								
<i>Xylothea kraussiana</i> (S)							2		1									

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (CL) - Climber; (G) - Grass;
 (R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte
 (S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;
 (/c) - Climbing form

APPENDIX — Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1 1 1 1 1 1 1 1 1																	
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
9. Differential species for communities 2, 3 & 5																		
<i>Ficus burtt-davyi</i> (S)		2	2		1													
<i>Rhus nebulosa</i> (S)		2	+		1			+						+				
<i>Canthium</i> sp. sapling (T)		+	+		1				+									
<i>Maytenus procumbens</i> (S)		3			1													
10. <i>Rhus pentheri</i> - <i>Cussonia spicata</i> low thicket																		
<i>Rhus pentheri</i> (T)						+	2		+							+		
<i>Cussonia spicata</i> (T)							2	+										
<i>Dombeya tiliacea</i> (T)							2	+										
<i>Acacia robusta</i> (T)							1									+		
<i>Protasparagus densiflorus</i> (CL)						+	1											
<i>Abutilon</i> sp. (F)							1	+										
<i>Acalypha glabrata</i> sapling (T)							1	+										
<i>Acalypha sonderiana</i> sapling (T)						+	1											
<i>Capparis fascicularis</i> (CL)						+	1											
<i>Combretum kraussii</i> (T)				+			1											
<i>Commiphora harveyi</i> (T)						+	1											
<i>Euphorbia triangularis</i> sapling (T)							1											
<i>Ficus natalensis</i> (T)			+				1											
<i>Haemanthus albiflos</i> (F)						+	1											
<i>Maytenus mossambicensis</i> (T)							1											
<i>Maytenus undata</i> sapling (T)							1	+										
<i>Putterlickia verrucosa</i> sapling (S/T)							1											
<i>Rhus rehmanniana</i> (T)							1		+									
<i>Sansevieria</i> sp. (X)			+				1											
<i>Acridocarpus natalitius</i> (S)							1											
<i>Ehretia rigida</i> (S)							1											
<i>Euphorbia triangularis</i> (T)							1											
<i>Osyridicarpus schimperianus</i> (SU)							1											
<i>Rhus gueinzii</i> sapling (S)							1											
<i>Rhus</i> sp. sapling (T)							1											
<i>Tecomaria capensis</i> sapling (S)							1											
11. Differential species for communities 5 & 6																		
<i>Chaetacme aristata</i> (T)			+				1	1	+									
<i>Oplismenus hirtellus</i> (G)							1	1	+		+			+				
<i>Jasminum streptopus</i> (S/C)			+				1	1			+							
<i>Acalypha glabrata</i> (T)							1	1			+							
<i>Dracaena hookeriana</i> (S)			+				+	1										
<i>Maerua racemulosa</i> sapling (S)							+	1			+							
<i>Pellaea viridis</i> (P)							+	1			+							
<i>Sideroxylon inerme</i> (T)							1	+	+									
12. Differential species for communities 4, 5 & 6																		
<i>Canthium inerme</i> sapling (T)		+					+	1	1	+		+		+				
<i>Cussonia spicata</i> sapling (T)							4	2			+							

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (CL) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX —Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
13. Differential species for communities 3, 4, 5 & 6																		
<i>Uvaria caffra</i> (S/C)				3	4	1	3	+	+	+								+
<i>Brachylaena discolor</i> (S/T)	+	3				1	2	+	+									
<i>Rhoicissus tomentosa</i> (S/C)		1				1	2	+	+	+								
<i>Rothmannia globosa</i> sapling (T)			2	+	1	1		+			+							+
<i>Rothmannia globosa</i> (T)			3	+	1	1					+							
<i>Sansevieria hyacinthoides</i> (X)		1				1	1				+							
<i>Pupalia atropurpurea</i> (F)		2				1												
<i>Senecio tamoides</i> (F/C)		+			1	+	+		+									
<i>Cestrum laevigatum</i> sapling (T/S) *		+			1	+	+											
<i>Clausena anisata</i> (S)				+			1	+										
<i>Rhoicissus digitata</i> (S/C)	2	+				+	2	+	+									
14. <i>Dovyalis rhamnoides</i> - <i>Hippobromus pauciflorus</i> low thicket																		
<i>Cissampelos torulosa</i> (S/C)							2		+									
<i>Coddia rudis</i> sapling (S)				+		+	+		+									
<i>Dovyalis rhamnoides</i> (S)						+	2											
<i>Kraussia floribunda</i> sapling (T)							1		+									
<i>Kraussia floribunda</i> (T)							2											
<i>Scolopia zeyheri</i> (T)							2											
<i>Trimeria grandifolia</i> seedlings (T)							1		+									
<i>Zanthoxylum capense</i> seedlings (T)							1		+									
<i>Canthium ciliatum</i> (S)							1											
<i>Diospyros whyteana</i> sapling (S)							1											
<i>Maytenus undata</i> (T)							1											
<i>Schoenoxiphium lehmannii</i> (F)							1											
15. Differential species for communities 6 & 7																		
<i>Coddia rudis</i> (S)		+				2	1											
<i>Hippobromus pauciflorus</i> (T)						1	2		+									
<i>Acokanthera oblongifolia</i> sapling (T)						+	1	1	+									
<i>Trimeria grandifolia</i> (T)							1	1	+									
<i>Zanthoxylum capense</i> (T)							+	1		+								
16. Differential species for communities 3, 4, 5, 6 & 7																		
<i>Calpurnia aurea</i> (S)						1	2	1										
<i>Dicliptera heterostegia</i> (F)						+	1	1	1									
<i>Celtis africana</i> (T)							1	+	+		+							+
<i>Scutia myrtina</i> (S/C)		1	+			1	2	1	+									
<i>Euclea natalensis</i> (T)		1		+	+	1	2											
<i>Grewia caffra</i> (S)		1				+	+		+									
17. Differential species for communities 5, 6, 7 & 8																		
<i>Dovyalis rhamnoides</i> sapling (S)							+	2	2									
<i>Trimeria grandifolia</i> sapling (T)								2	+									+
<i>Clausena anisata</i> sapling (S)							1	2	2	2		+						
<i>Canthium ciliatum</i> sapling (S)							+		+	+								+

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;
 (R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte
 (S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;
 (/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

										1 1 1 1 1 1 1 1 1 1																					
Community number										1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8				
18. Differential species for communities 3, 4, 5, 6, 7 & 8																															
Cyphostemma hypoleucum (F/C)										2		2		1		1		2		+	+		+								
Euclea natalensis sapling (T)										1		3		1		1		3		2											
Strelitzia nicolai sapling (T)												+		+		1				+		+				+		+			
19. Acacia gerrardii-Rhus chirindensis tall closed shrubland//low/short thicket mosaic																															
Maytenus senegalensis sapling (T)																						1				+		+			
Pereskia aculeata (CL) *																						1									
Acacia gerrardii (T)																						1									
Acacia nilotica sapling (T)																						1		+							
Amaranthus viridis (F) *																						1				+					
Microglossa mespilifolia (S/C)																						+		1							
Polygala natalensis (F)																						1									
Rhus chirindensis seedlings (T)																				+		1									
Achyroopsis leptostachya (SU)																						1									
Buddleja saligna sapling (T)																						1									
Crassula sp. (F)																						1									
Dombeya rotundifolia sapling (T)																						1									
Eucalyptus grandis (T) *																						1									
Eustachys paspaloides (G)																						1									
Spirostachys africana sapling (T)																						1									
Vitellariopsis marginata sapling (T)																						1									
Combretum molle sapling (T)																				+		+		1				+		+	
20. Differential species for communities 6, 7, 8 & 9																															
Hippobromus pauciflorus sapling (T)										2		2				1												+			
Putterlickia verrucosa (S/T)										2		2				1												+			
Rhoicissus tridentata (S/C)														+		1		1		+		1		+				+			
Anastrabe integerrima (T)																2		+		1											
Dalbergia obovata sapling (T/C)														+		1				2		1		+				+			
Baphia racemosa (T)												+		+		1				+		1									
Panicum sp. (G)																1				+		1		+		+		+			
Passiflora suberosa (CL) *														+		2		+		1				+							
Buddleja saligna (T)																2		1		1											
Combretum molle (T)												+				1		+		2		1									
Rhus pentheri sapling (T)																1		+		+		1									
Rhus rehmanniana sapling (T)																1				1						+					
Dombeya rotundifolia (T)																+				1								+			
Spirostachys africana (T)																1				1											
Tecomaria capensis (S)																+		+		1		+									
Rhus chirindensis (T)												+				1		2		1		+									
Maytenus heterophylla sapling (T)												+		+		+		+		1											
Apodytes dimidiata (T)												+				+		1													
Clerodendrum glabrum (T)												+				+		1													
Bridelia micrantha sapling (T)												+				+		1													
Hibiscus fuscus (F)												+				+		1													

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (CL) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX — Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	1	1	1	1	1	1	1
21. Differential species for communities 5, 6, 7, 8 & 9																		
<i>Protasparagus virgatus</i> (CL)				+	1	1	5	3	2					+	+			
<i>Jasminum multipartitum</i> (S/C)					1	2	+	+	1									
<i>Hibiscus calyphyllus</i> (S)					1	2		+	1		+							
<i>Apodytes dimidiata</i> sapling (T)		+		+	1	1			1					+	+			
<i>Scadoxus puniceus</i> (F)					1	1	2		1	+								
<i>Bridelia micrantha</i> (T)					1	+	+		1					+				
<i>Dalbergia obovata</i> seedlings (T/C)			+		1		2		1					+			+	
<i>Trema orientalis</i> (T)		+			1				1					+	+			
<i>Calpurnia aurea</i> sapling (S)					1	+			1									
<i>Maytenus heterophylla</i> (T)					1		+	+	1									
<i>Sapium integerrimum</i> (T)			+		1				1									
<i>Apodytes dimidiata</i> seedlings (T)					+		1		+	+								
<i>Dalechampia capensis</i> (SU/C)					1				1									
<i>Pavetta lanceolata</i> sapling (T/S)					+				1	+				+				
<i>Trema orientalis</i> sapling (T)					+				1					+				
<i>Montanoa hibiscifolia</i> (S) *					+				1	+								
22. Differential species for communities 3, 4, 5, 6, 7, 8 & 9																		
<i>Isoglossa woodii</i> (F/SU)					3	3	+	3	1		+	1						
<i>Monanthotaxis caffra</i> (S/C)					+	4	4	2	2	2	+	1						
<i>Dalbergia armata</i> (T/C)					1	+	3	1	1	2	2	1	+			+	+	
<i>Entada spicata</i> (S/C)					1		+	2	2			1				+		
<i>Aneilema aequinoctiale</i> (F)		+	1			1			+		1	+						
<i>Baphia racemosa</i> sapling (T)						2	+	1	2			1						
<i>Grewia occidentalis</i> (S)		+	1				+	1			+	1						
<i>Tragia durbanensis</i> (F)			+				+			+	1				+			+
<i>Acacia kraussiana</i> (S/C)					1				+			1						
<i>Dioscorea cotinifolia</i> (CL)						+	3	1	2	+		1						
23. Differential species for communities 3, 4, 5, 6, 7, 8, 9 & 10																		
<i>Mangifera indica</i> (T) *					+			1		+	+	1	1			+	+	
<i>Diospyros lycioides</i> sapling (S)							+	+	1		+	1	+			+	+	1
<i>Syzgium cumini</i> (T) *							1		+			+				+		
<i>Pavonia burchellii</i> (F)												1	1					
<i>Dalbergia obovata</i> (T/C)		+	1	2	4	2	2	1	2	1	1	+			+	+		
<i>Erythrina lysistemon</i> (T)					1			+		+	1	1			+	+		
24. <i>Bothriochloa insculpta</i> - <i>Hyparrhenia hirta</i> short closed grassland																		
<i>Bothriochloa insculpta</i> (G)																4		
<i>Leucaena leucocephala</i> (S) *																2	+	
25. <i>Phragmites australis</i> - <i>Cyperus immensus</i> short closed grassland//tall/high closed shrubland//tall closed reedbed mosaic																		
<i>Phragmites australis</i> (R)																	4	
<i>Phragmites</i> sp. (R)																	2	
<i>Rumex rhodesius</i> (F)																	1	
<i>Amaranthus spinosus</i> (F) *																	1	
<i>Polygonum hydropiper</i> (F/S) *																	1	
<i>Polygonum senegalense</i> (F/S)																	1	

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (CL) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
26. <i>Senecio madagascariensis</i> - <i>Panicum maximum</i> tall closed grassland//short closed grassland mosaic																		
<i>Senecio madagascariensis</i> (F)								+	+	+	1			+				
<i>Ambrosia maritima</i> (F) *											1	1						
<i>Eleusine indica</i> (G)								+			+	1						
<i>Ambrosia artemisiifolia</i> (F) *												1	+					
<i>Asclepias physocarpa</i> (F)									+			1						
<i>Conyza chilensis</i> (F) *												1		+				
<i>Cyperus esculentus</i> (C)							+					1	+					
<i>Nidorella linifolia</i> (F)												1						
<i>Aster squamatus</i> (F) *												+	1	+				
<i>Malvastrum coromandelianum</i> (F) *													1					
<i>Solanum nigrum</i> (F) *												1	1					
<i>Sonchus oleraceus</i> (F) *													1		+			
<i>Crocosmia aurea</i> (F)													1	+				
<i>Hypochoeris glabra</i> (F) *										+		1						
<i>Paspalum notatum</i> (G) *												1					+	
<i>Chamaesyce hypericifolia</i> (F) *												1						
<i>Cissampelos mucronata</i> (S/C)												1						
<i>Corchorus trilocularis</i> (F) *												1						
<i>Eragrostis ciliaris</i> (G)												1						
<i>Hibiscus</i> sp. (F)								+				1						
<i>Hibiscus trionum</i> (F)												1	+					
<i>Jacquemontia tamnifolia</i> (F/C)								+				1						
<i>Lagenaria macrarena</i> (F/C)												+	+	+				
<i>Lycopersicon</i> sp. (F) *												+	1					
<i>Nemesia caerulea</i> (F)												+	1					
<i>Paspalum scrobiculatum</i> (G)						+							1					
<i>Stenotaphrum secundatum</i> (G)													1					
<i>Tridax procumbens</i> (F) *													1	+				
<i>Acalypha ecklonii</i> (F)													1					
<i>Amaranthus dubius</i> (F) *													1					
<i>Chrysanthemoides monilifera</i> seedlings (S)												+	+					
<i>Coreopsis lanceolata</i> (F) *													1					
<i>Cyperus natalensis</i> (C)													1					
<i>Melilotus indica</i> (F) *													1					
<i>Pelargonium alchemilloides</i> (F)													1					
<i>Rubus pinnatus</i> (S/C)													1					
27. Differential species for communities 12 & 13																		
<i>Verbena bonariensis</i> (F) *									+		1	1					+	
<i>Lepidium bonariense</i> (F) *											1	1						
<i>Laportea peduncularis</i> (F)											2	1						
<i>Achyranthes aspera</i> (F) *							+				1	1		+				
28. Differential species for communities 11, 12 & 13																		
<i>Mariscus sumatrensis</i> (C)									+	1	+	1		+			+	
<i>Hibiscus cannabinus</i> (S)											2	1						
<i>Sesbania sesban</i> (S)										1	2	1	+	+			+	
<i>Cyperus immensus</i> (C)						+				+	+	2	1					
<i>Indigofera spicata</i> (F)											2	+	1					
<i>Sporobolus pyramidalis</i> (G)										+	+	1	+				+	
<i>Indigofera trita</i> (F)									+	1		1						
<i>Pennisetum purpureum</i> (R) *					+				+			1	1					
<i>Senna didymobotrya</i> (S) *									+			1	+					

* Alien and naturalised species

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(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
29. Differential species for communities 9, 10, 12 & 13																		
<i>Cynodon dactylon</i> (G)								+	1	+	2	1	2	+	+			
<i>Ageratum conyzoides</i> (F) *					+	+			1			2	1	+				
<i>Oxalis corniculata</i> (F) *									1	+		1						+
<i>Ipomoea congesta</i> (F/C) *								+	1	+		1			+			
<i>Paspalum urvillei</i> (G) *									1			1						
<i>Dichrostachys cinerea</i> sapling (S)								+	1	+		1			+		+	
<i>Tithonia diversifolia</i> (F) *								+	1			1						
<i>Canna generalis</i> (F) *									1			1	1					
<i>Rhus chirindensis</i> sapling (T)					+				1	+		1						
<i>Chloris gayana</i> (G)									1	+		+	1					
<i>Dichrostachys cinerea</i> (S)			+						1			+	+					
<i>Nidorella</i> sp. (F)									1	+		+	1					
<i>Macrotyloma axillare</i> (F/C)									+			+	1		+			
<i>Morus</i> sp. (T) *								+	1			1						
<i>Pseudarthria hookeri</i> sapling (SU)									+	+			1		+			
<i>Conyza canadensis</i> (F) *									+				1	+				
<i>Tephrosia polystachya</i> (S)									+	1			1					
<i>Syzygium cordatum</i> (T)									+				1					
30. Differential species for communities 5, 7, 9, 10, 12 & 13																		
<i>Melia azedarach</i> (T) *		+							1	+	2		2	1		1	+	+
<i>Melia azedarach</i> seedlings (T) *					+				1	+		1	1		+	+		
<i>Cardiospermum grandiflorum</i> (CL) *			+						1			1	+		2	+		+
<i>Convolvulus farinosus</i> (F)									+						1	+	+	
<i>Clerodendrum glabrum</i> sapling (T)									1	+	+				1			
31. Differential species for communities 3, 5, 7, 8, 9, 10 & 13																		
<i>Setaria megaphylla</i> (G)		+	+	+	+	1	+	2	+	1	1			1			+	
<i>Solanum auriculatum</i> (S) *						1		+	+		1	1		+	1			
<i>Ipomoea</i> sp. (F/C)		+	1			1	+		+	+				+	1			+
<i>Passiflora foetida</i> (CL) *						1					+			+	+			
32. <i>Phyllanthus burchellii</i> - <i>Digitaria eriantha</i> short closed grassland//tall sparse/closed shrubland mosaic																		
<i>Phyllanthus burchellii</i> (F)														+	3			
<i>Alectra sessiliflora</i> (F)															2			
<i>Anthospermum herbaceum</i> (SU)															1		+	
<i>Eugenia albanensis</i> (T)															1		+	
<i>Hyparrhenia dichroa</i> (G)														+	1			
<i>Leucas lavandulifolia</i> (F)														+	1			
<i>Rumex sagittatus</i> (F)														+	1			
<i>Saccharum officinarum</i> (G) *														+	1			
<i>Senecio polyanthemoides</i> seedlings (F)								+							1			
<i>Wedelia trilobata</i> (F) *										+					1			
<i>Achyroopsis avicularis</i> (SU)															1			
<i>Ceratotheca triloba</i> (F/C)															1			
<i>Desmodium dregeanum</i> (F)															1			
<i>Indigofera arrecta</i> (S)														+	+			
<i>Ricinus communis</i> seedlings (S) *															1			
<i>Salacia kraussii</i> (SL)															1			

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (CL) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

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(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
33. Differential species for communities 12, 13 & 14																		
<i>Conyza floribunda</i> (F) *																		
<i>Imperata cylindrica</i> (G)																		
<i>Lantana camara</i> seedlings (S) *									+									
<i>Eriosema parviflorum</i> (F)										+								
<i>Triumfetta rhomboidea</i> (F)									+									
<i>Digitaria natalensis</i> (G)																		
<i>Lactuca indica</i> (F) *										+								
<i>Richardia brasiliensis</i> (F) *									+									
<i>Zornia capensis</i> (F/C)										+								
<i>Cyperus distans</i> (C)						+	+		+									
<i>Helichrysum longifolium</i> (F)																		
<i>Chamaesyce hirta</i> (F)									+									
<i>Pycnus polystachyos</i> (C)									+									
<i>Andropogon eucomus</i> (G)																		
<i>Gomphrena celosioides</i> (F) *										+								
<i>Hyparrhenia filipendula</i> (G)																		
<i>Sesbania punicea</i> (S) *										+								
<i>Tagetes minuta</i> seedlings (F) *																		
<i>Cyperus sphaerospermus</i> (C)																		
<i>Conyza</i> sp. (F) *									+									
34. Differential species for communities 10, 11, 13 & 14																		
<i>Cassia mimosoides</i> (F)																		
<i>Triumfetta</i> sp. (F)						+			+									
<i>Polygala hottentotta</i> (F)								+										
<i>Sonchus</i> sp. (F)								+										
35. Differential species for communities 3, 5, 6, 7, 8, 9, 10, 11, 12, 13 & 14																		
<i>Tagetes minuta</i> (F) *								+		1	+	+	1	2	3			
<i>Hewittia sublobata</i> (F/C)		+		+	+	+	+	+	1	+	+	1	2	2		+		
<i>Crotalaria lanceolata</i> (F)									1		+		1	3		+		
<i>Melia azedarach</i> sapling (T) *		+							1	1		+	1	2			1	
<i>Vigna vexillata</i> (F)						+	+	+		+			1	1	+		+	1
<i>Berkheya</i> sp. (F)								+	1	1			1	1	+		+	+
<i>Helichrysum panduratum</i> (F/S)									1				1	2				
<i>Helichrysum cymosum</i> (F)						+			1	+			1	1				
<i>Helichrysum kraussii</i> (F)									1				1	1	+			
<i>Laggera alata</i> (F)						+			1				1	2				
<i>Desmodium setigerum</i> (F)									1	+			1	1	+			
<i>Hibiscus surattensis</i> (S)						+		2	+	1		+	1	1				
<i>Acalypha petiolaris</i> (F)						+		+					+	1	+			
<i>Glycine wightii</i> (F/C)						+		1	+	1	1		+	1	1			
<i>Acacia</i> sp. sapling (T)							+	+					+	1			+	
<i>Oxalis</i> sp. (F) *						1	+	+	+	1	+	+	1	1	2			1
<i>Brachiaria chusqueoides</i> (G)						1		+									+	
<i>Commelina erecta</i> (F)	1			1	1		+	1	1		2	2	1	+		+	+	
<i>Asystasia gangetica</i> (F)	1			1	+	+		1	1		1	1	1	+		+	+	
<i>Chrysanthemoides monilifera</i> (S)	1			+	1	+	+	1	1	+		1	1			+	+	
<i>Cheilanthes viridis</i> (P)	+	+		+	1	+	+	1				1	1					
<i>Smilax kraussiana</i> (S/C)	1			2		+	+	1	1			1	1					
<i>Brachylaena discolor</i> sapling (S/T)	1	+	+	1	1			+					1					
<i>Erythrina lysistemon</i> sapling (T)	1			1		+		+				+	1	+				

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;

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(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
36. <i>Sutera kraussiana</i> - <i>Aristida junciformis</i> low/short closed grassland																		
<i>Oxalis latifolia</i> (F) *																1		
<i>Sutera kraussiana</i> (F)																1		
<i>Indigofera</i> sp. (F)																1	+	
37. Differential species for communities 14 & 15																		
<i>Lobelia erinus</i> (F)									+							1	1	+
<i>Rhynchosia caribaea</i> (F)						+										1	1	
38. Differential species for communities 12, 13, 14 & 15																		
<i>Digitaria eriantha</i> (G)								+						1	2	1		+
<i>Helichrysum</i> sp. (F)								+					+		1	1		+
<i>Leonotis ocymifolia</i> (S)														1	+	1		+
<i>Cymbopogon excavatus</i> (G)								+					+	+		1		
<i>Physalis viscosa</i> (F) *								+	2	+	2	1	1					1
39. Differential species for communities 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 & 15																		
<i>Senecio polyanthemoides</i> (F)									+	2	1	1		2	2	2	2	
<i>Sorghum bicolor</i> (G)										2	1	+	2	1	2	1	1	
<i>Digitaria</i> sp. (G)										2	1	+			1	2		+
<i>Berkheya bipinnatifida</i> (S)					+		1	1	3	2	1	+		1	1			+
<i>Psidium guajava</i> (T) *						+	1	+	+	1	1	+		+	1			
<i>Commelina</i> sp. (F)					+		1	1	+	+	1	1		1	1	+	1	+
<i>Cyperus albostriatus</i> (C)							+	1	2	3	2	2	3	2	1	+	+	+
<i>Chromolaena odorata</i> (S) *							3	2		3	3	5	4	4	4	2	+	2
<i>Albizia adianthifolia</i> (T)							2	1		2	+		1	+		+	1	
40. <i>Hypoxis gerrardii</i> - <i>Alloteropsis semialata</i> low closed grassland																		
<i>Alepidea</i> sp. (F)																5		+
<i>Hypoxis gerrardii</i> (GEO)									+							5		
<i>Alloteropsis semialata</i> (G)																5		
<i>Becium obovatum</i> (F)																5		
<i>Euphorbia natalensis</i> (F)																5		
<i>Tristachya leucothrix</i> (G)																5		
<i>Aster bakeranus</i> (F)									+							5		+
<i>Berkheya speciosa</i> (F)																1	5	
41. <i>Helichrysum aureum</i> - <i>Themeda triandra</i> short closed grassland																		
<i>Helichrysum aureum</i> (F)																	2	
<i>Monocymbium cerasiiforme</i> (G)																	2	
<i>Tephrosia kraussiana</i> (F)																	2	

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	1	1	1	1	1	1	1
42. Differential species for communities 13, 14, 15, 16 & 17																		
<i>Helichrysum cephaloideum</i> (F)																	1	2
<i>Cassia</i> sp. (F)																	+	+
<i>Cyperus obtusiflorus</i> (C)																	+	+
<i>Selago woodii</i> (SL)																	+	+
<i>Eragrostis capensis</i> (G)																	+	+
<i>Themeda triandra</i> (G)									+								+	+
<i>Eriosema salignum</i> (F)																	+	+
<i>Aristida junciformis</i> (G)									1	1							1	2
43. <i>Dianthus zeyheri</i> - <i>Eragrostis curvula</i> low/short closed grassland																		
<i>Dianthus zeyheri</i> (F)																	2	
<i>Thesium pallidum</i> (F)																	2	
<i>Crabbea hirsuta</i> (SL)																	2	
44. Differential species for communities 14, 15, 16, 17 & 18																		
<i>Hypoxis acuminata</i> (GEO)									+	+							1	5
<i>Thunbergia atriplicifolia</i> (F)									+								+	+
<i>Aeschynomene micrantha</i> (F)																	+	1
45. Differential species for communities 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 & 18																		
<i>Chaetacanthus burchellii</i> (SL)																		3
<i>Gerbera ambigua</i> (F)																	+	1
<i>Scabiosa columbaria</i> (F)																	+	1
<i>Aspilia natalensis</i> (F)									+								+	+
<i>Cymbopogon</i> sp. (G)										+							+	+
<i>Indigofera hiliaris</i> (F)																	1	+
<i>Eriosema cordatum</i> (F)																	+	1
<i>Tephrosia macropoda</i> (F)																	2	1
<i>Setaria sphacelata</i> (G)									+								1	1
<i>Vernonia capensis</i> (F)										+							1	2
<i>Hypoxis rooperi</i> (GEO)									+	+							1	2
<i>Commelina africana</i> (F)																	1	+
<i>Cassia plumosa</i> (F)																	1	+
<i>Gerbera piloselloides</i> (F)																	+	+
<i>Sonchus wilmsii</i> (F)																	+	+
<i>Sida rhombifolia</i> (F)																	+	+
<i>Stachys natalensis</i> (F)																	1	1
<i>Cymbopogon validus</i> (G)									+								1	1
<i>Ruellia cordata</i> (SU)										+							+	+
<i>Acacia nilotica</i> (T)									+								1	+
<i>Acalypha peduncularis</i> (F)										1							1	+
<i>Hibiscus pusillus</i> (F)										1							+	1
<i>Rhynchelytrum repens</i> (G)									+								2	2
<i>Nidorella auriculata</i> (F)										+							1	4
<i>Sporobolus africanus</i> (G)										+							2	1
<i>Bidens pilosa</i> (F) *										1							2	1
<i>Albizia adianthifolia</i> sapling (T)									+								1	1
<i>Chromolaena odorata</i> seedlings (S) *										+							1	1

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
45. Differential species for communities 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 & 18 (continued)																		
<i>Helichrysum decorum</i> (F)									1	1		+	1	2	1	+		
<i>Helichrysum nudifolium</i> (F)									+	1	1		1	1	1			1
<i>Ipomoea cairica</i> (F/C)								+	1	1		2	1	+	1			
<i>Senecio variabilis</i> (F)									+	1		+	1	1	2		+	+
<i>Ricinus communis</i> (S) *									1	+		2	1	+	1			
<i>Senecio</i> sp. (F)									1				1	2	1		+	
<i>Hyparrhenia</i> sp. (G)									1	+	+		+	+	1	+	+	
<i>Desmodium gangeticum</i> (F)						+			+	1			+	1				1
<i>Lantana rugosa</i> (F/S)									1		2			1				+
<i>Senecio chrysocoma</i> (F)							+	+	1	1		1	1	2	1		+	2
<i>Desmodium incanum</i> (F)						+		1	+	1	1	+		1	1	1		2
<i>Centella asiatica</i> (F)						+	1	+	+	1	1		1	1	2		+	1
<i>Teramnus labialis</i> (F)							+		1	1	4		1	1	2		3	3
<i>Hyparrhenia hirta</i> (G)							+		1	1	2		1	2	2		+	2
<i>Xysmalobium undulatum</i> (F)									1	+	+		+	+	+		2	2
<i>Psidium guajava</i> sapling (T) *							+	1		1	2	2		1	1	1		1
<i>Eragrostis curvula</i> (G)							1		2	1	1	2		3	2	3		4
<i>Panicum maximum</i> (G)	+	1		+	1	+	2	+	1	2	2	2	3	2	+		2	2
<i>Lantana camara</i> (S) *	2	3		3	2	1	2	4	4	4	2	1	3	3	2		2	1
46. Trees																		
<i>Abrus precatorius</i>									+				+	1	+			2
<i>Dalbergia armata</i> seedling (C) **									+	+			+					
<i>Schinus terebinthifolius</i> sapling *									1		1							
<i>Vangueria infausta</i> sapling												+	+	+			+	+
<i>Albizia adianthifolia</i> seedlings															+			
<i>Allophylus melanocarpus</i>																		
<i>Antidesma venosum</i>																		
<i>Dalbergia armata</i> sapling (C)																		
<i>Grewia occidentalis</i> sapling																		
<i>Maytenus nemorosa</i>																		
<i>Schinus terebinthifolius</i> *																		
<i>Tephrosia polystachya</i> seedlings																		
<i>Chrysanthemoides monilifera</i> sapling																		
<i>Heteropyxis natalensis</i>																		
<i>Hippobromus pauciflorus</i> seedlings																		
<i>Leucaena leucocephala</i> sapling *																		
<i>Maytenus senegalensis</i>																		
<i>Morus</i> sp. sapling *																		
<i>Sapium integerrimum</i> sapling																		
<i>Strychnos madagascariensis</i> sapling																		
<i>Acacia ataxacantha</i> (C)																		
<i>Acacia gerrardii</i> sapling																		
<i>Acacia</i> sp. seedling																		
<i>Acalypha glabrata</i> seedlings																		
<i>Allophylus melanocarpus</i> sapling																		
<i>Allophylus natalensis</i> sapling																		
<i>Anastrabe integerrima</i> sapling																		
<i>Baphia racemosa</i> seedlings																		

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
46. Trees (continued)																		
<i>Berkheya bipinnatifida</i> seedlings								+									+	
<i>Berkheya</i> sp. seedlings								+	+									
<i>Berkheya umbellata</i>					+												+	
<i>Bridelia micrantha</i> seedlings							+	+										
<i>Cassia coluteoides</i> sapling *					+				+									
<i>Cassia</i> sp. seedlings *									+						+			
<i>Clausena anisata</i> seedlings					+		+											
<i>Coddia rudis</i> seedling								1										
<i>Cussonia nicholsonii</i>							+	+										
<i>Diospyros lycioides</i> seedlings							+	+										
<i>Diospyros lycioides</i>							+	+										
<i>Diospyros villosa</i>							+		+									
<i>Dombeya tilicea</i> sapling							+	+										
<i>Entada spicata</i> sapling (C)			+			+												
<i>Erythrococca berberidea</i>							+	+										
<i>Erythrina</i> sp. sapling								+	+									
<i>Ficus natalensis</i> sapling					+				+									
<i>Furcraea foetida</i> *							+		+									
<i>Gnidia macropetala</i>								+							+			
<i>Hibiscus pedunculatus</i>							+	+										
<i>Hibiscus platycalyx</i>							+		+									
<i>Heteropyxis natalensis</i> sapling								2										
<i>Litsea sebifera</i> seedlings *									+	+								
<i>Naerua cafra</i> sapling								+	+									
<i>Mangifera indica</i> sapling *						+			+									
<i>Nuxia floribunda</i>									+				+					
<i>Ochna natalitia</i> sapling					+		+											
<i>Ozoroa paniculosa</i>						+			+									
<i>Peddiea africana</i> sapling			+		+													
<i>Phoenix reclinata</i> sapling			+						+									
<i>Pseudarthria hookeri</i> seedlings									+								+	
<i>Rhus nebulosa</i> sapling									+								+	
<i>Ruellia patula</i>														+		+		
<i>Sapium ellipticum</i>					+	+												
<i>Sesbania bispinosa</i> *									+				+					
<i>Syzygium cuminii</i> sapling *									+			+						
<i>Tarenna pavettoides</i> sapling					+				+									
<i>Turraea floribunda</i>					+				+									
<i>Turraea obtusifolia</i>				+	+													
<i>Vangueria infausta</i>																	+	+
<i>Vitellariopsis marginata</i>					+				+									
<i>Vitex trifolia</i> *									+				+					
<i>Zanthoxylum capense</i> sapling					+				+									
<i>Abrus precatorius</i> seedlings							+											
<i>Acacia karroo</i> sapling									+									
<i>Acacia karroo</i> seedlings																	+	
<i>Acacia karroo</i>									+									
<i>Acacia robusta</i> sapling																+		
<i>Acacia sieberiana</i>									+									
<i>Acalypha sonderiana</i>						+												
<i>Acokanthera oblongifolia</i> seedlings					+													
<i>Acokanthera oblongifolia</i>							+											

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;
 (R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte
 (S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;
 (/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1 1 1 1 1 1 1 1 1																	
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
46. Trees (continued)																		
<i>Acridocarpus natalitius</i> sapling						+												
<i>Albizia lebbeck</i> sapling *							+											
<i>Allophylus natalensis</i> seedlings			+															
<i>Anastrebe integerrima</i> seedlings								+										
<i>Ardisia crenulata</i> *						+												
<i>Arthrocnemum perenne</i>	+																	
<i>Asclepias fruticosa</i>														+				
<i>Azima tetracantha</i>									+									
<i>Berkheya rhapontica</i>																	+	
<i>Berkheya umbellata</i> seedlings													+					
<i>Brachylaena discolor</i> seedlings								+										
<i>Brachylaena uniflora</i>									+									
<i>Bruguiera gymnorhiza</i> sapling	+																	
<i>Burchellia bubalina</i>							+											
<i>Calpurnia aurea</i> seedlings						+												
<i>Canthium gueinzii</i>						+												
<i>Canthium pauciflorum</i> sapling									+									
<i>Carissa macrocarpa</i>														+				
<i>Cassia bicapsularis</i> *															+			
<i>Cassia floribunda</i> sapling *									+									
<i>Cassipourea gerrardii</i>							+											
<i>Cassia hirsuta</i> *														+				
<i>Cassia occidentalis</i> sapling *															+			
<i>Cassia occidentalis</i> *													+					
<i>Casuarina equisetifolia</i> *									+									
<i>Catunaregam spinosa</i>									+									
<i>Cestrum laevigatum</i> *							+											
<i>Cestrum</i> sp. sapling *										+								
<i>Chrysophyllum viridifolium</i>						+												
<i>Clerodendrum glabrum</i> seedlings									+									
<i>Clerodendrum myricoides</i> sapling														+				
<i>Clusia cordata</i>																	+	
<i>Clusia disceptata</i>																		+
<i>Clusia pulchella</i> sapling									+									
<i>Cola natalensis</i>							+											
<i>Combretum bracteosum</i>					+													
<i>Combretum kraussii</i> sapling							+											
<i>Combretum molle</i> seedlings									+									
<i>Combretum</i> sp. seedlings																	+	
<i>Commiphora harveyi</i> sapling						+												
<i>Commiphora</i> sp.						+												
<i>Croton bonplandianus</i> *														+				
<i>Cryptolepis oblongifolia</i>							+											
<i>Cryptocarya woodii</i>			+															
<i>Cussonia sphaerocephala</i> sapling						+												
<i>Cussonia sphaerocephala</i>									+									
<i>Dalechampia volubilis</i> (C)						+												
<i>Delonix regia</i> sapling *														+				
<i>Diospyros natalensis</i> sapling						+												
<i>Diospyros natalensis</i>			+															
<i>Diospyros</i> sp. sapling														+				
<i>Dracaena hookeriana</i> seedlings			+															

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1 1 1 1 1 1 1 1 1																	
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
46. Trees (continued)																		
<i>Drypetes natalensis</i> seedlings						+												
<i>Dyschoriste depressa</i>																	+	
<i>Ekebergia capensis</i>						+												
<i>Erythrococca berberidea</i> sapling							+											
<i>Erythrococca natalensis</i>						+												
<i>Erythroxylum pictum</i>							+											
<i>Erythrina</i> sp.										+								
<i>Eucalyptus</i> sp. sapling *										+								
<i>Euclea crispa</i> sapling									+									
<i>Euclea divinorum</i> sapling													+					
<i>Euclea natalensis</i> seedlings									+									
<i>Euclea schimperi</i> sapling							+											
<i>Euclea</i> sp. seedlings								+										
<i>Eugenia</i> sp. sapling								+										
<i>Eugenia</i> sp.																	+	
<i>Eugenia uniflora</i> sapling *									+									
<i>Eugenia uniflora</i> seedlings *										+								
<i>Euphorbia geniculata</i>																	+	
<i>Euphorbia heterophylla</i> *																	+	
<i>Euphorbia ingens</i>								+										
<i>Euphorbia pulcherrima</i> *										+								
<i>Euphorbia tirucalli</i>									+									
<i>Euryops</i> sp.																		+
<i>Ficus craterostoma</i>									+									
<i>Ficus sur</i> sapling																	+	
<i>Ficus sur</i>										+								
<i>Foeniculum vulgare</i> *																	+	
<i>Hibiscus calyphyllus</i> seedlings																	+	
<i>Hyperacanthus amoenus</i>								+										
<i>Gnidia anthyllodes</i>																		+
<i>Gnidia kraussiana</i>																	+	
<i>Gnidia phaeotricha</i>																	+	
<i>Helinus integrifolius</i>																		+
<i>Isoglossa ciliata</i>																	+	
<i>Isoglossa</i> sp.											+							
<i>Isoglossa woodii</i> seedlings							+											
<i>Lagynias lasiantha</i> sapling							+											
<i>Lagynias</i> sp. sapling																		
<i>Lantana camara</i> sapling *										+								
<i>Leonotis leonurus</i>																		+
<i>Leonotis</i> sp.											+							
<i>Litsea sebifera</i> sapling *																	+	
<i>Litsea sebifera</i> *																	+	
<i>Maerua cafra</i>																	+	
<i>Maerua nervosa</i>							+											
<i>Maytenus mossambicensis</i> sapling							+											
<i>Maytenus nemorosa</i> sapling								+										
<i>Maytenus nemorosa</i> seedlings																		
<i>Maytenus peduncularis</i> seedlings																		
<i>Maytenus peduncularis</i>																		
<i>Maytenus</i> sp. seedlings																		
<i>Millettia grandis</i> sapling																		
<i>Millettia grandis</i>																		

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1																	
Community number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
46. Trees (continued)																		
<i>Monanthotaxis caffra</i> seedlings (C)						+												
<i>Mitriostigma axillare</i>		+																
<i>Ochna natalitia</i>								+										
<i>Ochna</i> sp.						+												
<i>Olea woodiana</i>						+												
<i>Oricia bachmannii</i> sapling			+															
<i>Oxyanthus pyriformis</i>						+												
<i>Pachystigma latifolium</i>																		+
<i>Pavetta inandensis</i> sapling						+												
<i>Pavetta lanceolata</i>								+										
<i>Pavetta revoluta</i>		+																
<i>Pavetta</i> sp. sapling						+												
<i>Peddiea africana</i>		+																
<i>Phoenix reclinata</i>															+			
<i>Pittosporum viridiflorum</i> sapling										+								
<i>Pittosporum viridiflorum</i> seedlings								+										
<i>Podocarpus</i> sp. sapling				+														
<i>Psychotria capensis</i> seedlings						+												
<i>Psydrax locuples</i> sapling					+													
<i>Psydrax locuples</i>					+													
<i>Ptaeroxylon obliquum</i> sapling							+											
<i>Raphiolepis indica</i> sapling *									+									
<i>Rawsonia lucida</i>				+														
<i>Rhus gueinzii</i>						+												
<i>Rhus natalensis</i> sapling																	+	
<i>Rhus natalensis</i>		+																
<i>Rhus pyroides</i>										+								
<i>Rosa</i> sp. *										+								
<i>Rubus x proteus</i> (C)										+								
<i>Ruttya ovata</i>										+								
<i>Salacia gerrardii</i>				+														
<i>Schinus terebinthifolius</i> seedlings *										+								
<i>Schrebera alata</i> sapling					+													
<i>Sclerocarya caffra</i> sapling										+								
<i>Sclerocarya caffra</i>										+								
<i>Sesbania</i> sp. *																		+
<i>Sesbania bispinosa</i> seedlings *																		+
<i>Sideroxylon inerme</i> sapling									+									
<i>Solanum auriculatum</i> sapling *																		+
<i>Strychnos decussata</i>								+										
<i>Strychnos henningsii</i> sapling						+												
<i>Strychnos spinosa</i> sapling																		+
<i>Strychnos usambarensis</i> sapling		+																
<i>Strychnos usambarensis</i>		+																
<i>Syzygium cordatum</i> sapling									+									
<i>Syzygium jambos</i> sapling *										+								
<i>Syzygium</i> sp. sapling						+												
<i>Tabernaemontana ventricosa</i> sapling						+												
<i>Tabernaemontana ventricosa</i>						+												
<i>Teclea gerrardii</i> sapling						+												
<i>Tephrosia polystachya</i> sapling																	+	
<i>Tephrosia</i> sp.										+								
<i>Tricalysia sonderiana</i> sapling		+																

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
46. Trees (continued)																		
<i>Trichilia dregeana</i>																		
<i>Trichilia</i> sp. sapling																		
<i>Trimeria</i> sp. sapling																		
<i>Uvaria caffra</i> sapling (C)																		
<i>Vangueria randii</i>																		
<i>Vepris</i> sp. seedlings																		
<i>Xylothea kraussiana</i> seedlings (S)																		
<i>Ziziphus mucronata</i> sapling																		
47. Grasses																		
<i>Panicum deustum</i>																		
<i>Bambusa</i> sp. *																		
<i>Echinochloa pyramidalis</i>																		
<i>Sacciolepis curvata</i>																		
<i>Trachypogon spicatus</i>																		
<i>Andropogon appendiculatus</i>																		
<i>Apochaete hispida</i>																		
<i>Aristida bipartita</i>																		
<i>Aristida</i> sp.																		
<i>Axonopus affinis</i> *																		
<i>Bothriochloa bladhii</i>																		
<i>Brachiaria brizantha</i>																		
<i>Bromus unioloides</i> *																		
<i>Cenchrus brownii</i> *																		
<i>Dichanthium aristatum</i>																		
<i>Digitaria ciliaris</i>																		
<i>Digitaria diagonalis</i>																		
<i>Digitaria sanguinalis</i> *																		
<i>Digitaria setifolia</i>																		
<i>Diheteropogon amplexans</i>																		
<i>Ehrharta erecta</i>																		
<i>Eragrostis inamoena</i>																		
<i>Eragrostis lappula</i>																		
<i>Eragrostis plana</i>																		
<i>Eragrostis racemosa</i>																		
<i>Eriochloa meyeriana</i>																		
<i>Eulalia villosa</i>																		
<i>Leersia hexandra</i>																		
<i>Paspalum dilatatum</i> *																		
<i>Sporobolus mauritianus</i>																		
<i>Sporobolus</i> sp.																		
<i>Urelytrum agropyroides</i>																		

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	1	1	1	1	1	1	1
48. Sedges																		
<i>Kyllinga</i> sp.						+											+	
<i>Cyperus fenzelianus</i>																+		
<i>Cyperus</i> sp.																+		
<i>Bulbostylis boeckeleriana</i>																+		
<i>Bulbostylis contexta</i>																+		
<i>Fimbristylis complanata</i>																		+
<i>Fimbristylis dichotoma</i>								+										
<i>Fimbristylis ferruginea</i>															+			
<i>Fimbristylis obtusifolia</i>															+			
<i>Kyllinga elatior</i>								+										
<i>Mariscus dregeanus</i>																+		
<i>Mariscus dubius</i>																+		
<i>Mariscus macrocarpus</i>																+		
<i>Mariscus</i> sp.																+		
<i>Pycnus nitidus</i>																		+
<i>Pycnus rehmannianus</i>									+									
49. Reeds																		
<i>Typha latifolia</i>																+	+	+
50. Ferns																		
<i>Nephrolepis exaltata</i> *																+	+	
<i>Thelypteris guienziana</i>																	+	
<i>Asplenium splendens</i>																		
<i>Cheilanthes concolor</i>																		
<i>Cheilanthes viridis</i> seedlings																		
<i>Mohria caffrorum</i>																	+	
51. Forbs and geophytes																		
<i>Senecio glaberrimus</i>																+	+	5
<i>Helichrysum griseum</i>																+	+	1
<i>Phaulopsis imbricata</i>																		
<i>Rhynchosia</i> sp.																+	+	
<i>Rhynchosia pentheri</i>																+	+	1
<i>Argyrolobium rupestre</i>																+	+	
<i>Juncus kraussii</i>																+	+	
<i>Lagenaria sphaerica</i> (C)																+	+	
<i>Ledebouria floribunda</i>																		1
<i>Striga bilabiata</i>																+	+	
<i>Aloe maculata</i>																		
<i>Cyanotis speciosa</i>																	+	+
<i>Eriospermum natalense</i>																	+	+
<i>Gladiolus</i> sp.																+	+	
<i>Ipomoea alba</i> (C) *																+	+	
<i>Justicia flava</i>																+	+	
<i>Rhynchosia minima</i>																+	+	
<i>Sida dregei</i>																	+	+
<i>Triumfetta pilosa</i>																	+	+
<i>Alsysicarpus rugosus</i>																	+	+

* Alien and naturalised species

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(R) - Reed; (GEO) - Geophyte; (P) - Ferns; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	1	1	1	1	1	1	1	1
51. Forbs and geophytes (continued)																			
<i>Blepharis integrifolia</i>																			1
<i>Ciclospermum leptophyllum</i> *									+				+						
<i>Desmodium adscendens</i>												+		+					
<i>Dicliptera</i> sp.		+						+											
<i>Dicoma speciosa</i>									+									+	
<i>Didymodoxa caffra</i>			+				+												
<i>Dietes</i> sp.							+						+						
<i>Drimiopsis maxima</i>							+												+
<i>Eriosema psoraleoides</i>												+				+			
<i>Hypochoeris brasiliensis</i> *													+			+			
<i>Hypoxis filiformis</i>													+			+			
<i>Ipomoea plebeia</i> (C)													+	+					
<i>Ledebouria</i> sp.								+										+	
<i>Mikania cordata</i>													+			+			
<i>Momordica balsamina</i> (C)		+		+															
<i>Pelargonium</i> sp.									+	+									
<i>Pentanisia prunelloides</i>																	+	+	
<i>Phyllanthus</i> sp.													+	+					
<i>Rhinacanthus gracilis</i>					+		+												
<i>Senecio erubescens</i>													+			+			
<i>Sigesbeckia orientalis</i> *													+			+			
<i>Stylochiton natalensis</i>								+		+									
<i>Tephrosia linearis</i>													+	+					
<i>Thesium goetzeanum</i>														+				+	
<i>Thunbergia dregeana</i>							+	+											
<i>Vernonia hirsuta</i>														+			+		
<i>Achyrocline stenoptera</i>																+			
<i>Ageratum conyzoides</i> seedlings *													+						
<i>Aizoon canariense</i>														+					
<i>Aloe arborescens</i>		+																	
<i>Aloe saponaria</i>																			+
<i>Aloe</i> sp.																		+	
<i>Anomatheca laxa</i>													+						
<i>Anthericum galpinii</i>																+			
<i>Aspidoglossum woodii</i>																			+
<i>Australina acuminata</i>										+									
<i>Ceropegia distincta</i>																			+
<i>Chamaesyce inaequilatera</i>													+						
<i>Chenopodium album</i> *													+						
<i>Chenopodium</i> sp. *													+						
<i>Chlorophytum krookianum</i>													+						
<i>Cineraria deltoidea</i>									+										
<i>Cineraria</i> sp.		+																	
<i>Coccinia palmata</i> (C)										+									
<i>Coleotrype natalensis</i>						+													
<i>Colocasia antiquorum</i> *																	+		
<i>Conyza bonariensis</i> *														+					
<i>Conyza ulmifolia</i>																+			
<i>Crassula sarmentosa</i>										+									
<i>Crotalaria grantiana</i>																+			
<i>Crotalaria virgulata</i>																+			
<i>Ctenomeria capensis</i> (C)									+										

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form

APPENDIX—Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	1	1	1	1	1	1	1
51. Forbs and geophytes (continued)																		
<i>Cucumis hirsutus</i> (C)																		+
<i>Desmodium tortuosum</i>																+		
<i>Dicliptera heterostegia</i> seedlings					+													
<i>Dietes iridioides</i>						+												
<i>Eichhornia crassipes</i> *															+			
<i>Emex australis</i> *										+								
<i>Eriosema kraussianum</i>																+		
<i>Eriosema</i> sp.																+		
<i>Eulophia speciosa</i>								+										
<i>Evolvulus alsinoides</i>															+			
<i>Felicia erigeroides</i>															+			
<i>Flaveria bidentis</i> *															+			
<i>Galactia tenuiflora</i>																		+
<i>Galopina tomentosa</i>															+			
<i>Geranium schlechteri</i>														+				
<i>Gerbera ambigua</i> seedlings															+			
<i>Gladiolus crassifolius</i>																	+	
<i>Gloriosa superba</i>		+																
<i>Haemanthus</i> sp.					+													
<i>Helianthus</i> sp. *															+			
<i>Helichrysum acutatum</i>															+			
<i>Helichrysum ascendens</i>								+										
<i>Helichrysum miconiifolium</i>																	+	
<i>Helichrysum oxyphyllum</i>															+			
<i>Heliotropium amplexicaule</i> *															+			
<i>Hermannia</i> sp.															+			
<i>Hibiscus aethiopicus</i>															+			
<i>Hypericum aethiopicum</i>															+			
<i>Hypochoeris radicata</i> *															+			
<i>Hypoestes forskalii</i>								+										
<i>Hypoxis hemerocallidea</i>															+			
<i>Hypoxis</i> sp.															+			
<i>Indigofera eriocarpa</i>																	+	
<i>Indigofera grata</i>															+			
<i>Indigofera oxytropis</i>																	+	
<i>Indigofera velutina</i>															+			
<i>Ipomoea ficifolia</i> (C)					+													
<i>Ipomoea obscura</i> (C)														+				
<i>Ipomoea wightii</i> (C)										+								
<i>Justicia campylostemon</i> seedlings		+																
<i>Justicia campylostemon</i>		+																
<i>Justicia petiolaris</i>						+												
<i>Kniphofia laxiflora</i>																	+	
<i>Kohautia virgata</i>															+			
<i>Lactuca capensis</i>															+			
<i>Lactuca serriola</i> *															+			
<i>Laportea grossa</i>		+																
<i>Lepidium</i> sp. *															+			
<i>Lepidium virginicum</i> *															+			
<i>Lobelia coronopifolia</i>																	+	
<i>Lobelia</i> sp.																+		
<i>Lotus discolor</i>										+								
<i>Ludwigia octovalvis</i>															+			

* Alien and naturalised species

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APPENDIX —Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1 1 1 1 1 1 1 1 1																	
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
51. Forbs and geophytes (continued)																		
<i>Macrotyloma maranguense</i>														+				
<i>Melanthera scandens</i>														+				
<i>Melhania didyma</i>																+		
<i>Merremia tridentata</i>														+				
<i>Mirabilis jalapa</i> *									+									
<i>Nicandra physalodes</i> *														+				
<i>Nidorella auriculata</i> seedlings														+				
<i>Nidorella</i> sp. seedlings														+				
<i>Nothoscordum inodorum</i> *									+									
<i>Oenothera parodiana</i> *														+				
<i>Orthosiphon suffrutescens</i>																		+
<i>Pentarrhinum insipidum</i> (C)			+															
<i>Peponium mackenii</i> (C)													+					
<i>Peucedanum capense</i>														+				
<i>Phyllanthus heterophyllus</i>																		+
<i>Physalis angulata</i> *														+				
<i>Physalis viscosa</i> seedlings *															+			
<i>Polygonum salicifolium</i>														+				
<i>Raphionacme flanaganii</i> (C)								+										
<i>Raphionacme galpinii</i> (C)														+				
<i>Rhynchosia nervosa</i>														+				
<i>Rubia cordifolia</i>		+																
<i>Rumex crispus</i> *														+				
<i>Rumex</i> sp. *									+									
<i>Sarcostemma viminale</i> (C)								+										
<i>Schistostephium rotundifolium</i>														+				
<i>Schizoglossum cordifolium</i>																+		
<i>Schkuhria pinnata</i> *															+			
<i>Sebaea sedoides</i>																		+
<i>Senecio chrysocoma</i> seedlings										+								
<i>Senecio coronatus</i>																		+
<i>Senecio deltoideus</i>							+											
<i>Senecio oxyodontus</i>														+				
<i>Senecio</i> sp. seedlings														+				
<i>Sida cordifolia</i>														+				
<i>Sida rhombifolia</i> seedlings														+				
<i>Solanum incanum</i>														+				
<i>Sonchus dregeanus</i>										+								
<i>Sonchus</i> sp. seedlings														+				
<i>Spermacoce natalensis</i>																		+
<i>Stachytarpheta indica</i> *										+								
<i>Streptocarpus prolixus</i>							+											
<i>Striga asiatica</i>														+				
<i>Talinum cafferum</i>									+									
<i>Tephrosia capensis</i>																		+
<i>Tephrosia longipes</i>														+				
<i>Tetragonia tetragonoides</i>													+					
<i>Thesium natalense</i>															+			
<i>Thesium</i> sp.										+								
<i>Thunbergia alata</i>										+								
<i>Tithonia diversifolia</i> sapling *														+				
<i>Tithonia diversifolia</i> seedlings *														+				

* Alien and naturalised species
** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;
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APPENDIX — Phytosociological classification of the vegetation of municipal Durban (synoptic table) (continued)

Community number	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8
51. Forbs and geophytes (continued)											1	1	1	1	1	1	1	1
<i>Tolpis capensis</i>																+		
<i>Trachyandra asperata</i>																		+
<i>Tradescantia virginiana</i> *		+																
<i>Tragia okanyua</i>								+										
<i>Tragia</i> sp.										+								
<i>Tropaeolum majus</i> *											+							
<i>Urospermum picroides</i> *												+						
<i>Verbena tenuisecta</i> *													+					
<i>Vernonia</i> sp.																	+	
<i>Vigna unguiculata</i>													+					
<i>Wahlenbergia dinteri</i>													+					
<i>Waltheria indica</i>													+					
<i>Watsonia densiflora</i>																+		
<i>Withania somnifera</i> *													+					
52. Creepers																		
<i>Cynanchum schistoglossum</i>								+		+						1		
<i>Secamone filiformis</i>								+	+	+								
<i>Adenia gummifera</i>									+	+								
<i>Ceratiosicyos laevis</i>																1		
<i>Pereskia aculeata</i> sapling *						+				+								
<i>Capparis brassii</i> seedlings						+												
<i>Capparis</i> sp.										+								
<i>Cardiospermum grandiflorum</i> seedlings *					+													
<i>Clematis brachiata</i>										+								
<i>Dioscorea crinita</i>					+													
<i>Flagellaria guineensis</i> seedlings						+												
<i>Gerrardanthus tomentosus</i>					+													
<i>Myrsiphyllum asparagoides</i>							+		+									
<i>Protasparagus natalensis</i>										+								
<i>Protasparagus plumosus</i>						+												
<i>Protasparagus setaceus</i>											+							
<i>Protasparagus virgatus</i> seedlings					+													
<i>Secamone gerrardii</i>						+												
<i>Secamone parvifolia</i>							+											

* Alien and naturalised species

** (C) - Sedge; (F) - Forb; (Cl) - Climber; (G) - Grass;

(R) - Reed; (GEO) - Geophyte; (P) - Fern; (X) - Xerophyte

(S) - Shrub; (SU) - Undershrub; (SL) - Shrublet; (T) - Tree;

(/c) - Climbing form