


Alien flora in Zimbabwe: an updated checklist

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Dates

Submitted: 27 May 2025
 Accepted: 3 December 2025
 Published: 25 March 2026

How to cite this article:

Maroyi, A., 2026, 'Alien flora in Zimbabwe: an updated checklist', *African Biodiversity & Conservation* 56(2), a4. <http://dx.doi.org/10.38201/abc.v56.2.a4>

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The naturalised flora diversity and richness in Zimbabwe has continued to increase over the past decades. Alien species inventories provide baseline data needed to understand naturalisation dynamics, historical invasion patterns and impacts. Therefore, an updated inventory of the alien flora of Zimbabwe, providing details about the taxa, life forms, their occurrence at regional level, geographical origins, types of habitats colonised and degree of naturalisation is presented. The checklist comprises 476 alien plant taxa, that is, 108 (23%) casuals, 278 (58%) naturalised and 90 (19%) invasive. The most represented families are Asteraceae (65 taxa), Poaceae (63), Fabaceae (58), Solanaceae (30) and Amaranthaceae (23). More than half (51.3%) of the alien plant taxa are primarily herbs, followed by trees (16%), grasses (13%), shrubs (11%) and climbers (8%). The central (77%) and eastern (67%) floristic regions of Zimbabwe have the largest proportion of alien flora in the country. The majority of these alien taxa are native to the Americas (49%), followed by Asia (30%) and Europe (19%); with 55% of the taxa introduced intentionally as ornamentals, while 22% were introduced accidentally. Most of the alien plant taxa have been recorded as ruderals (48%) and agricultural weeds (46%). Results of this study provide baseline data required to monitor and manage alien plant invasions in the country.

Keywords: alien species, floristic diversity, plant invasion, taxonomy, Zimbabwe.

Introduction

Anthropogenic activities involving the exchange of biota among the different geographical regions of the world are increasingly changing the biotic and abiotic components of the biosphere (Lewis & Maslin 2015; Omer et al. 2021a). Alien plant invasions is one of the main conservation threats to biodiversity worldwide (Van Kleunen et al. 2015; Pyšek et al. 2017; Seebens et al. 2018; Bordbar & Meerts 2022). Invasive alien plants (IAPs) cause substantial multiple direct and indirect impacts on natural habitats, ecosystem functioning and human well-being (Vilà et al. 2011; Holmes et al. 2020; Spampinato et al. 2022; Kalusová et al. 2024). Potgieter et al. (2021) defined IAPs as 'introduced plant species with individuals that have been dispersed, surviving and reproducing at multiple sites across a greater or lesser spectrum of habitats and extent of occurrence'. Many IAPs are known to decrease local plant species diversity, decrease ecosystem productivity, alter the rate of nutrient cycling, fire regimes, and hence impact upon ecosystem functioning, capacity to provide services, affecting human well-being and their socio-economic conditions through various mechanisms (Richardson & Van Wilgen 2004; Le Maitre et al. 2011; Downey & Richardson 2016; Rai & Singh 2020; Potgieter et al. 2021). Invasive alien plants have both costs and benefits on ecosystems and local human communities (Dickie et al. 2014; Zengeya et al. 2017; Vimercati et al. 2020; Kachena & Shackleton 2024). Seebens et al. (2018) showed that there is a need to have knowledge of prior invasion history of alien species, including details of their temporal distributional trends, origins and the drivers of the spread of the

species in order to improve interventions for managing biological invasions. Similarly, recent studies show that IAPs are now an important component of the wild florae of many regions of the world and invasive species are a real challenge for current and future environmental and habitat management strategies (Pyšek et al. 2020; Spampinato et al. 2022).

The first comprehensive checklist of alien plants in Zimbabwe was published about 20 years ago as part of the catalogue of the alien flora of the country (Maroyi 2006). This catalogue provided information on 1 449 alien taxa in the country based on data derived from herbarium records. Since the publication of this catalogue, substantial new information on invasive alien plants (IAPs) in Zimbabwe has been documented (e.g., Chantanga et al. 2008; Maroyi 2012, 2017, 2022; Sukhorukov et al. 2017; Maroyi et al. 2019; Jimu et al. 2020; Mujaju et al. 2021; Tarugara et al. 2022; Chikowore et al. 2023; Kachena & Shackleton 2024; Hyde et al. 2025), which created a need for a revision of the original checklist. The original checklist has been updated by reassessing the status of alien taxa due to changes in taxonomy and adding new information obtained from field studies done in the last two decades. Field studies aimed at recording alien species in Zimbabwe were carried out by the author from 2007 to 2023 in various floristic regions of the country. National lists of this nature are not static, but become outdated due to taxonomical changes, as well as changes in the distribution of the taxa over time, and therefore, should be improved as better technology, expertise and information become available (Matthys et al. 2025; Zengeya et al. 2025). Therefore, compiling alien flora inventories

is an essential required step to have knowledge about the species, and also monitor, assess and quantify the impacts of IAPs on landscapes, biodiversity, ecosystem functioning, economy and human well-being (Pyšek et al. 2004; Randall et al. 2008; Groom et al. 2015; Bordbar & Meerts 2022; Kachena & Shackleton 2024; Kalusová et al. 2024). Accurate and up-to-date checklists of IAPs are required by policy makers, government officials, conservation managers, invasion biologists and managers to effectively manage biological invasions (Groom et al. 2015; Kalusová et al. 2024). Checklists of alien taxa provide information on alien species present in a country, as well as their status (establishment, distribution and impacts). This information is fundamental for developing and implementing regulations that prioritise management actions and assessing both current and emerging biosecurity risks. It is therefore, within this context, that the current study was undertaken aimed at providing an updated checklist of the alien flora of Zimbabwe, providing details about the taxa, life forms, their occurrence at regional level, geographical origins, types of habitats colonised and degree of naturalisation.

Materials and methods

Study area

Zimbabwe is a landlocked country in southern Africa, lying between latitudes 15°S to 23°S and longitudes 25°E to 34°E (Figure 1). It is bordered by Zambia to the north, South Africa to the south, Mozambique to the east and northeast and Botswana to the west

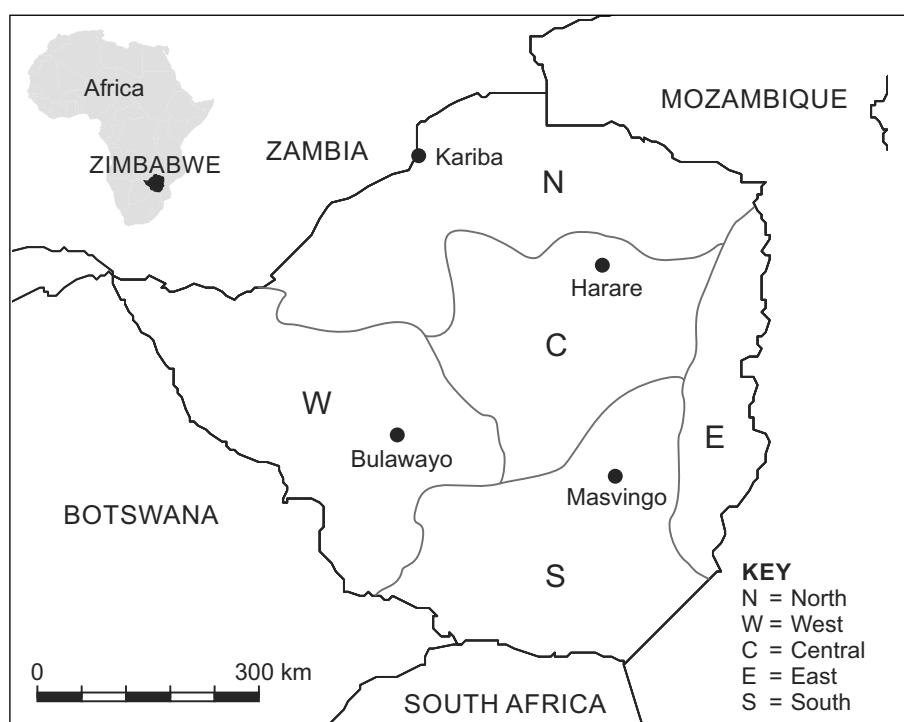


Figure 1. Map showing the study area. Zimbabwe is divided into five floristic regions: North (N), West (W), Central (C), East (E) and South (S), see Pope & Pope (1998) which provides detailed information about the floristic regions, their districts and GPS coordinates.

and southwest. Zimbabwe covers a total area of 390 757 km² (Underwood et al. 2024) with a population of 16 850 527 people, corresponding to an average density of 43.1 people/km² (Worldometer 2025). The topography in Zimbabwe varies from an altitude of about 250 m above sea level in the southern part of the country to about 2 600 m in the eastern part of the country (Mupfiga et al. 2022, 2025). The minimum temperatures usually occur around June to July, while maximum temperatures are usually experienced in October, with temperatures ranging from 6°C to 35°C (Mupangwa et al. 2023; Underwood et al. 2024). Annual rainfall in Zimbabwe varies from below 400 mm in the western and southern regions to above 1 500 mm in the eastern regions (Gwitira et al. 2014; Shekede et al. 2019; Mupfiga et al. 2022; Underwood et al. 2024). The native flora of Zimbabwe is estimated to be about 6 000 species of vascular plants (Mapaura & Timberlake 2004) recorded in diversified vegetation types such as forests, woodlands and grasslands (White 1983; Timberlake 1999).

Data sources and terminology

The checklist of alien flora of Zimbabwe (Wild 1955, Biegel 1977, 1980; Drummond 1975, 1984; Mullin 1996, 2000; Timberlake 1999; Chapano 2002; Glen 2002; Mapaura & Timberlake 2004; Maroyi 2006, 2012, 2015, 2017, 2022; Maroyi et al. 2019; Hyde et al. 2025) were used as the main sources of data for all the analyses. The alien flora of Zimbabwe was characterised in terms of number of taxa, taxonomic composition, life forms, occurrence at regional level, geographical origins, types of habitats colonised and degree of naturalisation. Herbarium labels and published literature were systematically screened for each taxon recorded. The distribution of alien species in Zimbabwe was based on herbarium occurrence records, personal observations made during field work, field collections preserved at the National Herbarium of Zimbabwe (SRGH), acronym according to Thiers (2021) and information obtained from the electronic version of the Flora of Zimbabwe (<https://www.zimbabweflora.co.zw>) (Hyde et al. 2025). The nomenclature of the taxa is based on the Plants of the World Online (POWO 2025), that of the families follows the Pteridophyte Phylogeny Group I (PPG I 2016) for lycophytes, ferns and fern allies, Christenhusz et al. (2011) for gymnosperms and the Phylogeny Group IV (APG IV 2016) for angiosperms. The geographic origin of the alien taxa included in the list was from temperate Europe, the Mediterranean (including the Mediterranean part of Europe, Mediterranean northern Africa, and the Middle East), Africa, America, Asia and Oceania. The distribution of taxa in Zimbabwe is classified into five floristic regions (North, West, Central, East and South) following Pope & Pope (1998) (see Figure 1). For each taxon, information about its life history (herb, climber,

grass, fern, gymnosperm, shrub or tree) was obtained from herbarium labels or literature sources (Wild 1955, Biegel 1977, 1980; Drummond 1975, 1984; Mullin 1996, 2000; Timberlake 1999; Chapano 2002; Glen 2002; Mapaura & Timberlake 2004; Maroyi 2006, 2012, 2015, 2017, 2022; Maroyi et al. 2019; Hyde et al. 2025). Habitat categorisation of taxa follows Hejda et al. (2015), that is, forests, grasslands, sandy, rocky, riparian, wetland, aquatic, ruderal and agricultural habitats. The alien taxa were classified according to the stage they reached along the introduction-naturalisation-invasion continuum (Blackburn et al. 2011), which distinguish casual (alien plants that may occasionally reproduce outside cultivation without forming self-replacing populations, their persistence depends on repeated introductions), naturalised (alien plants that sustain self-replacing populations and reproduce without direct human intervention from seed or vegetative parts capable of independent growth) and invasive (a subset of naturalised plants with the potential to spread over a large area in natural or man-made habitats, due to high reproductive efficiency and their long-distance dispersion ability from parent plants).

Results

Taxonomic diversity

The alien flora of Zimbabwe includes 476 taxa (species, subspecies, varieties and hybrids), belonging to 272 genera and 80 families (Supplementary material). The taxa recorded belong mainly to angiosperm eudicots (61 families, 384 taxa), followed by monocots (10 families, 77 taxa), ferns and fern allies (6 families, 9 taxa) and gymnosperms (2 families, 6 taxa). An analysis of the degree of naturalisation of the alien flora in Zimbabwe showed that 108 taxa (23%) are casuals, 278 (58%) are naturalised and 90 (19%) are invasive (Supplementary material). More than three quarters of the taxa (382 taxa, 80%) are members of 22 plant families: the Asteraceae, Poaceae, Fabaceae, Solanaceae, Amaranthaceae, Euphorbiaceae, Brassicaceae, Convolvulaceae, Verbenaceae, Myrtaceae, Malvaceae, Polygonaceae, Cactaceae, Caryophyllaceae, Passifloraceae, Lamiaceae, Apiaceae, Apocynaceae, Boraginaceae, Onagraceae, Plantaginaceae and Rosaceae families (Figure 2). The proportion of naturalised taxa is larger in all families, a trend demonstrated by the whole alien flora. Several genera are represented with at least five taxa each and these include *Euphorbia*, *Ipomoea* and *Solanum* with 11 taxa each, followed by *Acacia* (9 taxa), *Amaranthus* and *Senna* (8 taxa each), *Passiflora* and *Physalis* (7 taxa each), *Erigeron* (6 taxa), *Eucalyptus*, *Lolium*, *Oenothera*, *Rumex* and *Verbena* (5 taxa each) (Supplementary material).

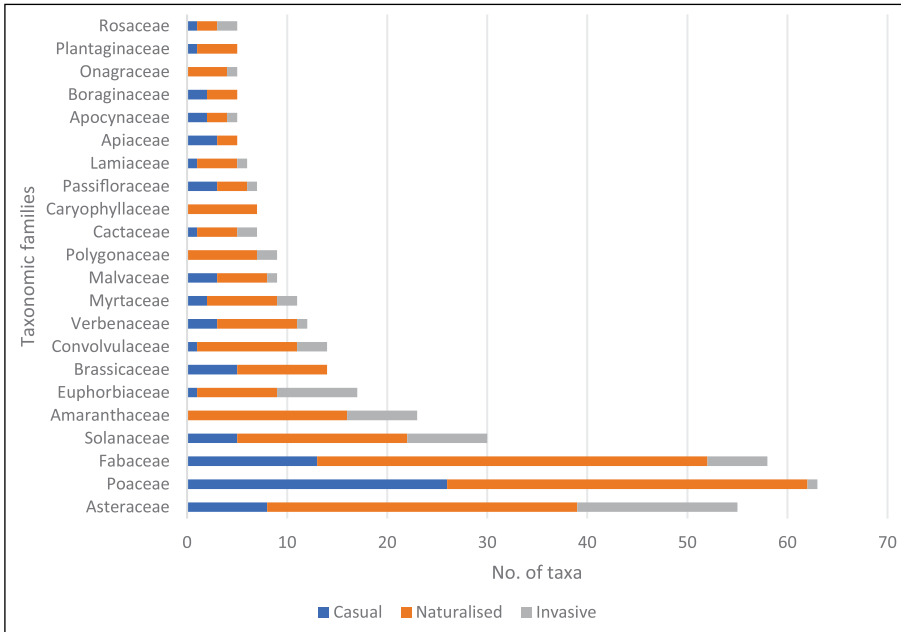


Figure 2. Plant families with five or more alien taxa. The alien taxa were classified according to the stage they reached along the introduction-naturalisation-invasion continuum, see Blackburn et al. (2011).

Life forms, geographical origins and introduction pathways

Almost half (244 taxa) of alien taxa in Zimbabwe are herbs, followed by trees (74 taxa) and grasses (63 taxa) (Figure 3). About half of the alien taxa (235 = 49%) are native to the Americas, with the Asian region contributing 141 taxa (30%) (Figure 4). The European and African regions contributed 19% and 17% respectively, while the Mediterranean region contributed 8% and Oceania 6% (Figure 4). Most alien species were introduced intentionally for ornamental purposes (55%), agriculture (19%) and forestry (3%). Unintentional introductions account for 22% and often mixed with seeds of other species (as contaminants) and/or hitchhikers on transport vectors (Supplementary material).

Distribution of alien taxa in Zimbabwe

The region with the highest number of alien taxa in Zimbabwe is Central (365; 77%), followed by Eastern (318; 67%), Western (191; 40%), Northern (183; 38%) and Southern (144; 30%) (Figure 5). There are 71 taxa that occur in all five floristic regions of Zimbabwe, making them the most widespread (Table 1), and all these taxa are either naturalised or invasive. Alien plants in Zimbabwe occupy a wide range of habitats in the country, and the majority of these taxa have been recorded as ruderals (48%) and agricultural weeds (46%) (Figure 6). Other habitats where alien taxa have been recorded in Zimbabwe include the following (in descending order of importance): riparian, forest, woodland, grassland, wetland, aquatic, rocky, forest margins, riverine,

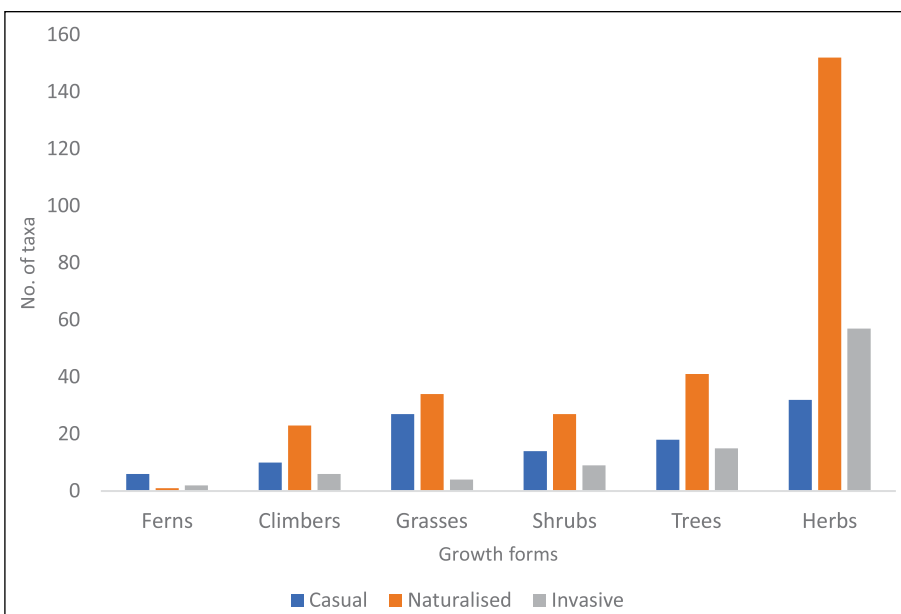


Figure 3. The growth forms of alien taxa recorded in Zimbabwe. The alien taxa were classified according to the stage they reached along the introduction-naturalisation-invasion continuum, see Blackburn et al. (2011).

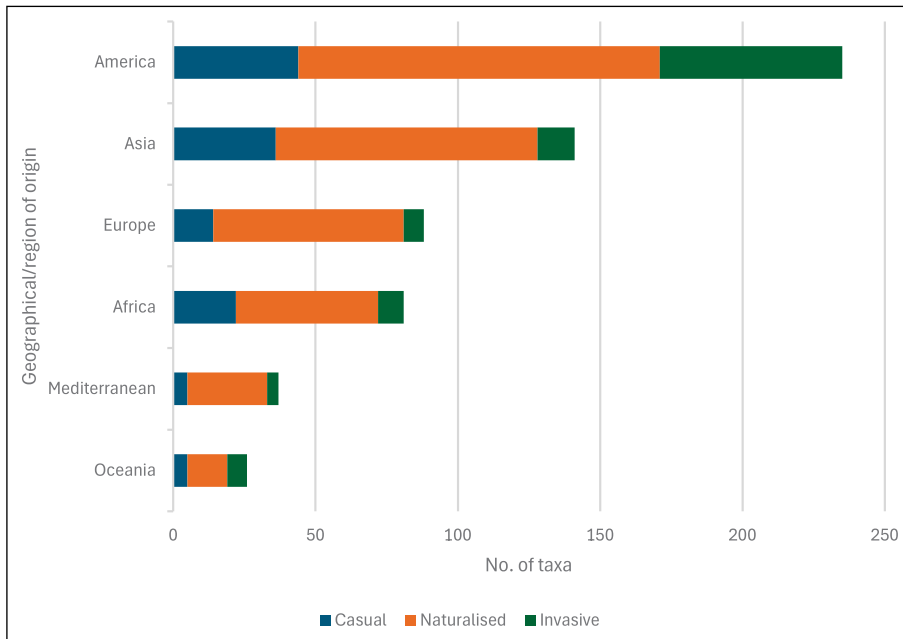


Figure 4. Geographical origin of alien flora of Zimbabwe. The alien taxa were classified according to the stage they reached along the introduction-naturalisation-invasion continuum, see Blackburn et al. (2011).

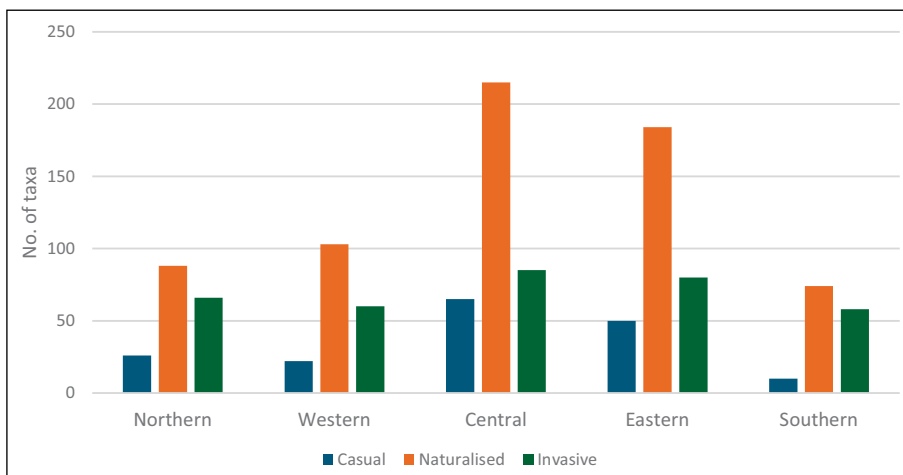


Figure 5. Distribution of alien taxa in Zimbabwe (after Pope & Pope [1998], that is, Northern, Western, Central, Eastern and Southern). The alien taxa were classified according to the stage they reached along the introduction-naturalisation-invasion continuum, see Blackburn et al. (2011).

Table 1. Taxa recorded in all five floristic regions of Zimbabwe. The Plants of the World Online (POWO 2025) serves as the taxonomic backbone of the listed taxa

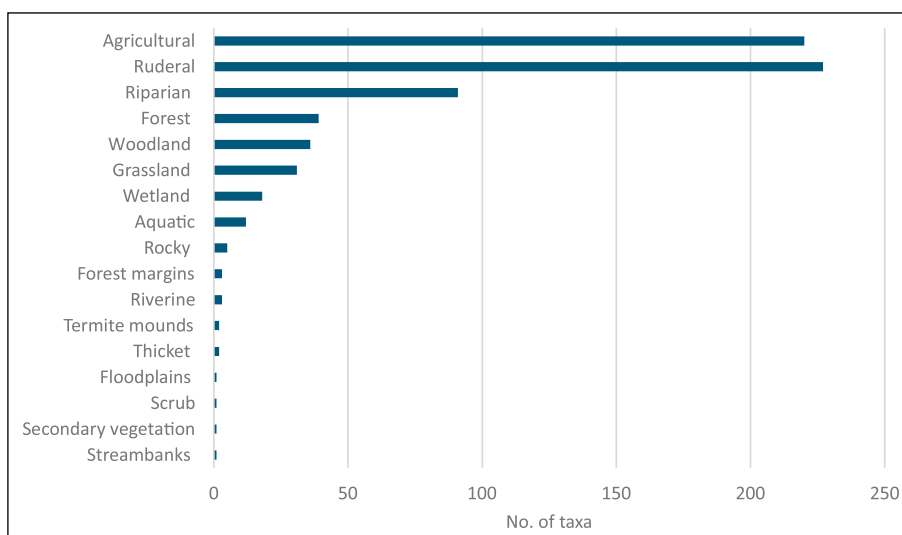
Taxon	Introduction pathway
<i>Acanthospermum hispidum</i> DC.	Unintentional
<i>Achyranthes aspera</i> L. var. <i>pubescens</i> (Moq.) C.C.Towns	Unintentional
<i>Achyranthes aspera</i> L. var. <i>sicula</i> L.	Unintentional
<i>Ageratum conyzoides</i> L.	Ornamental
<i>Alternanthera pungens</i> Kunth	Unintentional
<i>Alternanthera sessilis</i> (L.) DC.	Unintentional
<i>Amaranthus spinosus</i> L.	Food
<i>Argemone mexicana</i> L.	Unintentional
<i>Bidens pilosa</i> L.	Unintentional
<i>Boerhavia diffusa</i> L. var. <i>diffusa</i>	Unintentional
<i>Bromus catharticus</i> Vahl	Fodder

Table 1. Taxa recorded in all five floristic regions of Zimbabwe. The Plants of the World Online (POWO 2025) serves as the taxonomic backbone of the listed taxa (continued)

Taxon	Introduction pathway
<i>Calotropis procera</i> (Aiton) W.T.Aiton	Ornamental
<i>Canna indica</i> L.	Ornamental
<i>Crotalaria pallida</i> Aiton var. <i>pallida</i>	Green manure
<i>Cyclosporum leptophyllum</i> (Pers.) Sprague ex Britton & P.Wilson	Unintentional
<i>Cynodon nlemfuensis</i> Vanderyst	Fodder
<i>Datura stramonium</i> L.	Ornamental
<i>Dichondra micrantha</i> Urb.	Unintentional
<i>Duranta erecta</i> L.	Ornamental
<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	Unintentional
<i>Eclipta prostrata</i> (L.) L.	Unintentional
<i>Erigeron bonariensis</i> L.	Unintentional
<i>Erigeron canadensis</i> L.	Unintentional
<i>Erigeron sumatrensis</i> Retz.	Unintentional
<i>Euphorbia cyathophora</i> Murray	Ornamental
<i>Euphorbia heterophylla</i> L.	Unintentional
<i>Euphorbia hirta</i> L.	Unintentional
<i>Euphorbia leucocephala</i> Lotsy	Unintentional
<i>Euphorbia milii</i> Des Moul.	Unintentional
<i>Euphorbia prostrata</i> Aiton	Unintentional
<i>Euphorbia tirucalli</i> L.	Ornamental
<i>Flaveria bidentis</i> (L.) Kuntze	Unintentional
<i>Flaveria trinervia</i> (Spreng.) C.Mohr	Unintentional
<i>Galinsoga parviflora</i> Cav.	Unintentional
<i>Gnaphalium polycaulon</i> Pers.	Unintentional
<i>Gomphrena celosioides</i> Mart.	Unintentional
<i>Guilleminea densa</i> (Willd. ex Schult.) Moq.	Unintentional
<i>Ipomoea cairica</i> (L.) Sweet var. <i>cairica</i>	Ornamental
<i>Ipomoea carnea</i> Jacq. subsp. <i>fistulosa</i> (Mart. ex Choisy) D.F.Austin	Ornamental
<i>Jacaranda mimosifolia</i> D.Don	Ornamental
<i>Lantana camara</i> L.	Ornamental
<i>Macroptilium atropurpureum</i> (DC.) Urb.	Fodder
<i>Malvastrum coromandelianum</i> (L.) Garcke	Unintentional
<i>Mangifera indica</i> L.	Food
<i>Melia azedarach</i> L.	Ornamental
<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	Ornamental
<i>Nicandra physalodes</i> (L.) Gaertn.	Ornamental

Table 1. Taxa recorded in all five floristic regions of Zimbabwe. The Plants of the World Online (POWO 2025) serves as the taxonomic backbone of the listed taxa (continued)

Taxon	Introduction pathway
<i>Nicotiana glauca</i> Graham	Ornamental
<i>Oxalis corniculata</i> L.	Unintentional
<i>Persicaria lapathifolia</i> (L.) Delarbre	Unintentional
<i>Phalaris minor</i> Retz.	Unintentional
<i>Phyllanthus fraternus</i> G.L.Webster	Unintentional
<i>Physalis peruviana</i> L.	Food
<i>Pontederia crassipes</i> Mart.	Ornamental
<i>Portulaca oleracea</i> L.	Unintentional
<i>Pseudognaphalium luteoalbum</i> (L.) Hilliard & B.L.Burt	Unintentional
<i>Psidium guajava</i> L.	Food, ornamental
<i>Ricinus communis</i> L.	Oil and ornamental
<i>Schkuhria pinnata</i> (Lam.) Kuntze ex Thell.	Unintentional
<i>Senna didymobotrya</i> (Fresen.) H.S.Irwin & Barneby	Ornamental
<i>Senna obtusifolia</i> (L.) H.S.Irwin & Barneby	Ornamental
<i>Senna occidentalis</i> (L.) Link	Ornamental
<i>Sida cordifolia</i> L. subsp. <i>maculata</i> (Cav.) Marais	Fibre
<i>Solanum seaforthianum</i> Andrews	Ornamental
<i>Sonchus oleraceus</i> L.	Unintentional
<i>Sorghum bicolor</i> (L.) Moench	Food
<i>Sorghum halepense</i> (L.) Pers.	Food
<i>Tagetes minuta</i> L.	Unintentional
<i>Tithonia rotundifolia</i> (Mill.) S.F.Blake	Ornamental
<i>Tridax procumbens</i> L.	Unintentional
<i>Verbena bonariensis</i> L.	Ornamental

**Figure 6.** Habitats in which the alien plant taxa are found in Zimbabwe. Habitat categorisation of taxa follows Hejda et al. (2015).

termite mounds, thicket, floodplains, scrub, secondary vegetation and streambanks (Figure 6).

Discussion and recommendations

The naturalised flora of 476 taxa recorded in Zimbabwe is comparable in terms of species richness with 428 taxa recorded in Nigeria (Borokini et al. 2023) and 436 taxa recorded in the Democratic Republic of Congo (DRC) (Bordbar & Meerts 2022). The data reported by Wild (1955), Drummond (1984) and Maroyi (2006, 2012, 2017, 2022) highlight an increase of alien species in Zimbabwe. The records of alien plant taxa naturalised in Zimbabwe increased from about 30 in 1955 (Wild 1955) to 62 in 1984 (Drummond 1984) and about 328 to 401 taxa recognised by Maroyi (2006, 2012, 2017, 2022). There has been an improvement in recording of alien species and processes associated with the spread of these taxa in Zimbabwe, as research on IAPs in the country has progressively revealed various socio-ecological impacts of such species (Chatanga et al. 2008; Kundhlande et al. 2012; Sukhorukov et al. 2017; Jimu et al. 2020; Makoni 2020; Mujaju et al. 2021; Tarugara et al. 2022; Chakuya et al. 2023; Chikowore et al. 2023; Kachena & Shackleton 2024). These data on IAPs in Zimbabwe show a significant increase in the number of naturalised alien plant species in the country in recent years, highlighting the importance of plant invasions in the country, and similar patterns have been observed elsewhere, see Rai and Singh (2020).

The families with the most alien species in the Zimbabwean flora are Asteraceae, Poaceae, Fabaceae, Solanaceae and Amaranthaceae, which are also dominant in other African alien floras (Henderson 2007; Witt et al. 2018; Ansong et al. 2019; Meddour et al. 2020; Omer et al. 2021b; Bordbar & Meerts 2022; Borokini et al. 2023). Asteraceae, Poaceae, Fabaceae, Solanaceae and Amaranthaceae are also among the largest plant families in the world characterised by at least 2 000 species each (Christenhusz & Byng 2016; Roebler et al. 2024). The most represented genera in the Zimbabwean alien flora are (in descending order of importance): *Euphorbia*, *Ipomoea*, *Solanum*, *Acacia*, *Amaranthus*, *Senna*, *Passiflora*, *Physalis*, *Erigeron*, *Eucalyptus*, *Lolium*, *Oenothera*, *Rumex* and *Verbena*. Similarly, *Euphorbia*, *Ipomoea*, *Solanum*, *Acacia*, *Amaranthus*, *Senna* and *Eucalyptus* have also been cited as having the highest number of representatives among the naturalised plants in East Africa (Witt et al. 2018), Algeria (Meddour et al. 2020), Sudan and South Sudan (Omer et al. 2021b), the DRC (Bordbar & Meerts 2022) and Nigeria (Borokini et al. 2023). Herbaceous plants are the dominant growth forms (>51%) among the alien taxa in Zimbabwe, and such plant species are characterised by efficient dispersal ability, short

generation time and ability to form soil seed banks (Gioria & Pyšek 2016; Gioria et al. 2021).

The prevalence of herbaceous plants is to some extent correlated with the dominant plant families, that is, Asteraceae, Poaceae, Solanaceae and Amaranthaceae, which contain mainly herbaceous plants (Crawford 2015; Samuels 2015; Linder et al. 2017; Zhang & Elomaa 2024). Herbaceous alien plants are the predominant growth forms in disturbed habitats, such as ruderal areas, wastelands, abandoned agricultural fields, roadsides and cultivated areas (Meddour et al. 2020). Previous studies show that herbaceous alien plants often thrive in pioneer, ruderal and disturbed habitats due to their ability to grow rapidly, and their resilience to environmental stress (Omer et al. 2021b; Dubyna et al. 2022; Gazoulis et al. 2022; Sohrabi et al. 2023). Some of the IAPs recorded in all floristic regions of Zimbabwe are mainly growing in semi-natural, human-disturbed and agricultural habitats, and such taxa include *Achyranthes aspera* L. var. *pubescens* (Moq.) C.C.Towns, *A. aspera* L. var. *sicula* L., *Calotropis procera* (Aiton) W.T.Aiton, *Canna indica* L., *Crotalaria pallida* Aiton var. *pallida*, *Euphorbia hirta* L., *Lantana camara* L., *Macroptilium atropurpureum* (DC.) Urb., *Phalaris minor* Retz., *Portulaca oleracea* L., *Psidium guajava* L., *Ricinus communis* L., *Senna obtusifolia* (L.) H.S.Irwin & Barneby, *Sonchus oleraceus* L., *Sorghum bicolor* (L.) Moench and *S. halepense* (L.) Pers. Further investigations are required to identify the main drivers and disturbances that facilitate plant invasions in the country.

Most of the alien taxa in Zimbabwe are represented by plants that have escaped from gardens and agricultural fields, confirming deliberate introduction of ornamental, food, fodder and forestry plant taxa. For example, several species such as *Acacia longifolia* (Andrews) Willd., *A. mearnsii* De Wild., *A. melanoxylon* R.Br., *Callitris endlicheri* (Parl.) F.M.Bailey, *Corymbia citriodora* (Hook.) K.D.Hill & L.A.S.Johnson, *Cupressus torulosa* D.Don ex Lamb., *Eucalyptus camaldulensis* Dehnh., *E. globulus* Labill., *E. grandis* W.Hill ex Maiden, *E. robusta* Sm., *E. terebinthifolia* Sm., *Grevillea robusta* A.Cunn. ex R.Br., *Hesperocyparis lusitanica* (Mill.) Bartel, *Pinus elliotii* Engelm., *P. patula* Schiede ex Schltdl. & Cham., *P. roxburghii* Sarg., *Populus × canescens* (Ait.) Smith and *Toona ciliata* M.Roem. were introduced into the country for structural timber, furniture, poles and tanbark (Mullin 1996, 2000; Timberlake et al. 1999; Maroyi 2015). There is also a long history of transatlantic exchanges of agricultural crops (and unintentional contaminated seeds) between Africa and the Americas (Bordbar & Meerts 2022), and this phenomenon could be used to explain why the majority of alien taxa recorded in Zimbabwe are native to the Americas (49%). According to Maroyi (2006), small-scale plantings of IAPs in Zimbabwe are linked to the country's colonial history and the settlement of the colonists in the country in the 1890s and early 20th century. This is the period when botanical gardens flourished in the British

colonies, and ornamental plants and other associated uses such as hedges, shade plants and windbreaks were transported from one continent to another (Maroyi 2006, 2012). However, unintentional introduction of alien taxa in Zimbabwe spread randomly via contaminants, traffic, human transport, water courses or stowaways (38.4%) is slightly more important than the ornamental (38.1%) pathway (Maroyi 2012). The horticulture industry, particularly ornamental horticulture, is considered an important pathway for introducing and dispersing IAPs in Botswana, the DRC, Eswatini, Namibia, South Africa, Zambia and Zimbabwe (Seboko et al. 2024; Rodríguez-Cala et al. 2025). Well-known IAPs that are of horticultural importance such as *Jacaranda mimosifolia* D. Don, *Melia azedarach* L., *P. guajava* and *Senna didymobotrya* (Fresen.) H.S. Irwin & Barneby (Table 1) are dominant in Zimbabwe and South Africa (Seboko et al. 2024), partly because such species are known to have desirable characteristics such as easy propagation, production of beautiful flowers, rapid growth and establishment rate (Seboko et al. 2024). Results of this study showed that hotspots of IAPs in Zimbabwe are near major cities and surrounding areas in central and the eastern parts of the country, and these two floristic regions are thoroughly researched and better collected regions than the northern, southern and western regions of the country (Maroyi 2006).

Currently, the Zimbabwean checklists of alien taxa have not followed the global biodiversity data standards that are expected to be tidy and meeting FAIR data principles, that is, Findable, Accessible, Interoperable and Reuseable (Wilkinson et al. 2016). Therefore, there is a need to use and develop publicly available workflows

that will ensure that the integration of databases is reproducible and transparent (Seebens et al. 2020), and likely to increase trust in the data, research findings, interpretation and conclusions. If this approach is adopted, then the checklist will be updated and revised regularly as new information becomes available. The checklist generated from this study will be available in an Excel spreadsheet to provide easy access to the main end users. For the process to be fully transparent, the National Herbarium (SRGH) should be in a position to curate the checklist, tracking the alien taxa over time, informing management planning and regulatory bodies. This updated checklist could be used as a baseline for updating other online lists such as the Global Register of Introduced and Invasive Species for Zimbabwe (Maroyi et al. 2019). This updated checklist is a crucial starting point in trying to understand and initiate the management of biological invasions in Zimbabwe. The checklist provides baseline data on invasion status of alien taxa in the country. Such detailed information of the alien flora can provide national authorities in the country with essential information required to manage the taxa, identify regions in the country that are at risk of biological invasions, environmental and socio-economic impacts likely to be caused by the alien flora. The results of the current research are likely to increase awareness and knowledge of alien plant taxa in Zimbabwe and trigger further detailed studies focusing on management of invasive species, invasion ecology, environmental and socio-economic impacts likely to be caused by the alien flora. Further research should also focus on quantifying the environmental impacts caused by invasive species to natural ecosystems and habitats.

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Supplementary material

Available online: <http://dx.doi.org/10.38201/abc.v56.2.a4>.

Spreadsheet of alien taxa of Zimbabwe, listing taxon name, family name, growth form, distribution, native range, introduction pathway, degree of naturalisation and habitat.

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