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Inventory Of Native Plant Species For Urban Landscaping: An Alternative To Exotics.

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ABSTRACT

Native plants serve as excellent alternatives to invasive species and promote a healthier environment. It is not safe for native and indigenous flora to have too many exotic species present, given their naturalization and invasiveness, particularly for The area surrounding Pune is close to the "Western Ghats," a worldwide recognized hotspot for biodiversity. The list of indigenous plants finds species that are appropriate for conservation, restoration, land management, and horticulture initiatives. The important aim of this study is preparation of list of native plant and use for landscaping an up-to-date account of native plants of Pune urban area. Native plant species were documented and photographed during 2012 to 2018. The compiled list includes 127 trees with the information on each native plant species like botanical name, local name, and family. The dominant plant families include Moraceae, Fabaceae, Rubiaceae, Combretaceae, Mimosaceae, Anacardiaceae, Caesalpiniae, Euphorbiaceae, and Sapotaceae. They can also provide ecological, historical and cultural value when incorporated into residential landscapes, a fact that has led to the emerging field of ecological landscaping.

Keywords: Native plant, Landscape ecology, Pune urban area, exotic species

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INTRODUCTION

Native plants possess certain qualities that make them exceptionally adapted to local conditions, providing a practical and ecologically valuable alternative for landscaping, conservation and restoration projects, and as livestock forage. They can also provide ecological, historical and cultural value when incorporated into residential landscapes, a fact that has led to the emerging field of ecological landscaping. While it is important to increase awareness of the benefits of native plants among members of the horticulture industry, home gardeners, lawmakers and developers; the educational efforts should extend to all members of the general public to create a favourable public perception and thus increase the overall demand for native plants [8]. Inappropriate plantation practices has significantly affected the original vegetation composition in Vetal hill, Pune [5].

Native plant with economic and cultural significance may decline in number rapidly. This could also create opportunities for exotic plants to spread in the areas. Such changes may affect tribes in many areas, as traditional gathering areas have experienced a decline in productivity due to anthropogenic influences of the past century and the proliferation of invasive plant species [1]. The areas occupied by the exotic weeds once vacated, the natural vegetation may return to the site and all other association problem in the ecosystem might solve [2], [3].

Landscape ecology is the field dedicated to examining and enhancing the connections between urban development and ecological processes within the environment and specific ecosystems. This examination takes place across various landscape scales, spatial development patterns, and levels of research and policy organization [9], [10]. Landscapes are defined as geographically heterogeneous areas consisting of diverse and interacting patches or ecosystems, which can include relatively natural terrestrial and aquatic systems such as forests, grasslands, and lakes, as well as human-influenced environments like agricultural and urban areas [9], [7].

There are many studies from different places around the world where it has been proved that the introduction of exotics led to decline in native species richness, diversity and abundance. The introduction of exotic is always accompanied by the possibility of that species to become invasive and once established on the new terrain it is always very difficult to eradicate them and restore the native species.

Native plants are the foundation for the local ecosystem, providing habitat and food for wildlife in a fragmented landscape [6]. Most remaining native plant communities in suburban and rural areas are highly fragmented, causing a loss of ecological function [11]. Typically, moving from countryside to city regions results in a reduction of native species diversity and numbers, while the presence of invasive species tends to rise [6], [11].

Most developed landscapes consist of a highly simplified community of a few species of exotic ornamental plants that provide little to no benefit for animals [6]. Native plantings in suburban and rural areas can serve as habitat corridors or habitat islands, increasing the structural and species diversity of human-dominated landscapes. When planted in the context of a natural plant community, native plants can mimic the structure and function of the local ecosystem, accomplishing both large scale restoration and the creation of backyard habitat pockets. They provide cover from predators and harsh weather, nesting sites and places for organisms to raise their young. Insects often survive the winter in the leaf litter left by deciduous shrubs and trees [6].

Pune has very rich biodiversity. A comparative study conducted by RANWA [4] to assess the biodiversity of major cities like Delhi, Bangalore, Mumbai and Pune also proves the superiorly of the diversity of the city in terms and numbers of species of plants, birds butterflies *etc*. Common road side avenues include *Tamarindus indica*, *Peltophorum petrocarpum*, *Ficus benghalensis, Ficus religiosa*, *Delonix regia*, *Bombax ceiba*, *Pongamia pinnata*, *Cassia siamea*, *Cassia renigera, Cassia javanica, Gliricidia sepium*, *etc*.

This all indicates that we have many native plant species which should be given preference in the plantation programmes. This would definitely increase the status of biodiversity and provide good habitat for a faunal composition. However, the exotic plant species like *Peltophorum pterocarpum*, *Broussonetia papyrifera, Leucaena, Gliricidia, Cassia siamea, etc*. has got performance in plantation programmes. Out of

these some are becoming invasive. This is leading to a loss of the native vegetation composition in the city.

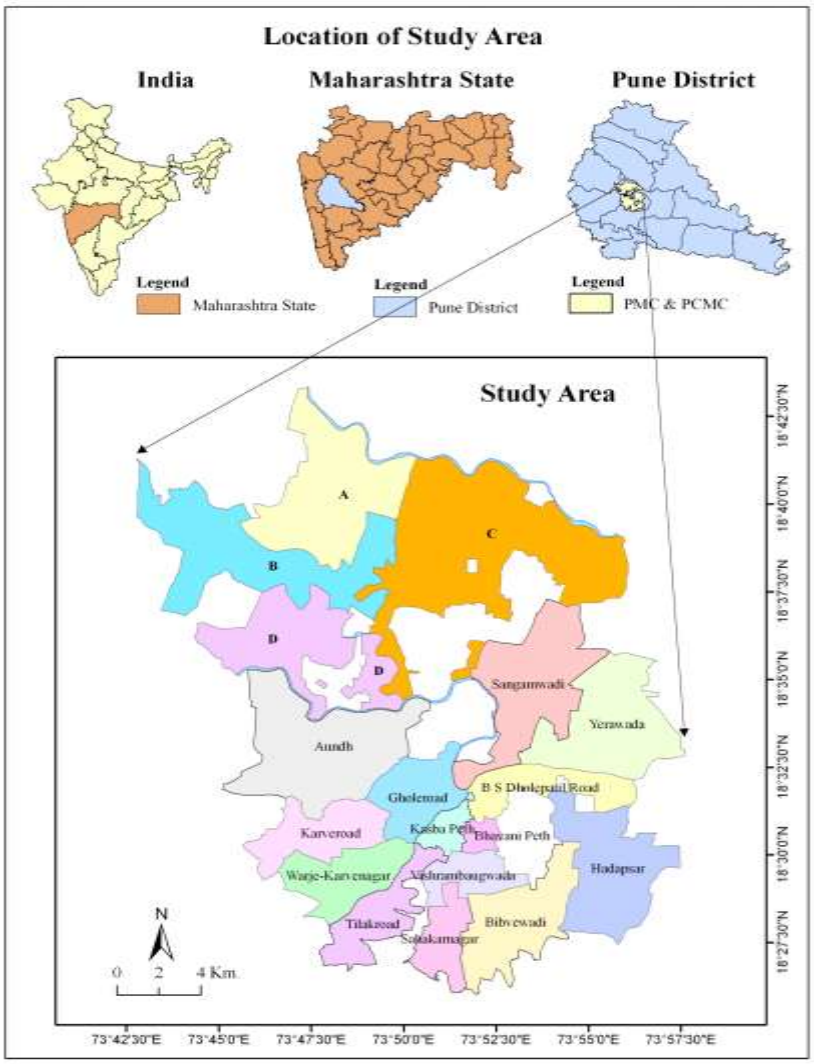
Depending on feasibility, several other suitable measures may be employed to facilitate rapid growth of native species. In the area experiencing disturbances like deforestation, road building site, and waters and water bodies devoid of native vegetation may be given special attention to ensure regrowth of native species. Special drives to facilitate regrowth of native species may help the restoration. Designing with native plants offers significant benefits due to their adaptation to local conditions. It is essential to choose plants whose growth requirements align with the specific conditions of the planting area.

Study Area

As shown in Figure 1, the study region includes the jurisdictions of the Pimpri-Chinchwad Municipal Corporation (PCMC) and the Pune Municipal Corporation (PMC). These two municipal corporations are most ideal urban landscapes, which surrounds the natural landscapes showing the urban-natural interface. It lies between 18° 27' N to 18° 45' N and 73° 45' E to 73°58' E latitude and situated at an altitude of 530 m to 560 m and above MSL. The PCMC covers an area of 172 sq km, while the PMC occupies 146 sq km.

Geologically the entire tract is covered by basaltic flows commonly known as Deccan Trap of Cretaceous Eocene age and laterites of still younger age form conspicuous rock units.

Figure 1: Study area



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MATERIAL AND METHODS

Primary Data Collection

Primary data generation was done by the frequent field visit during the years 2012-2018 to the region under investigation, and eastern fringes of Western Ghats. Native plant species were documented from various locations. To help select native vegetation species, a list of suitable native plants for landscaping has been compiled. There exists a wide variety of native floral species, which can be used for landscaping, and the list attached (Table 2) suggests a few of them. Landscape architects and designers should consider using native species beyond those listed below after consulting with taxonomy experts.

Secondary Data Collection

When creating the list of native plant species, we referred to older literature for reference. The literature referred includes research paper, popular articles, notes published in journal and book, and various libraries. Discussion with experts from the field of Botany was done for secondary data collection. Secondary data on plant species distribution in the past was gathered and used to compare with present plant species and distribution. The information gathered by botanist in the past was used to assess general pattern of plant species diversity and to show how these patterns have changed over time.

RESULT AND DISCUSSION

The compiled list of native plant species (Table 2) illustrates the range of plant species that can be used for plantation at various localities. It represents 127 trees. The compiled list includes the information on each native plant species like botanical name, local name, family. Moraceae, Fabaaceae, Rubiaceae, Combrataceae, Mimosaceae, Anacardiaceae, Caesalpiniaceae, Euphorbiaceae and Sapotaceae are the dominant families (Table 2).

The compilation of indigenous plants highlights species that are appropriate for gardening, land stewardship, conservation efforts, and restoration initiatives. The list provides a selection of plant choices adapted to growing conditions, focusing on those native species currently available in the nursery. Using native plants in design produces distinctive natural landscapes that represent a particular geographical character, such as marshes, meadows, and forests.

Table 1: Dominant families

Family	No. of species
Moraceae	9
Fabaaceae	8
Rubiaceae	8
Combrataceae	7
Mimosaceae	7
Anacardiaceae	5
Caesalpiniaceae	5
Euphorbiaceae	5
Sapotaceae	5

Table 2: list of native plant species

Sr. no.	Botanical Name	Local Name	Family
1	*Acacia catechu* (L. f.) Willd	Khair	Mimosaceae
2	*Acacia nilotica* (L.) Willd. ex Del	Babhal	Mimosaceae
3	*Acacia leucophoea* (Roxb) Willd	Hivar	Mimosaceae

4	*Aegle marmelos* (L) Corre.	Bel	Rutaceae
5	*Ailanthus exelsa* Roxb.	Maharukh	Simaroubaceae
6	*Alangium salvifolium* (L.f.) Wangerin	Ankol	Alangianceae
7	*Albizia chinensis* (Osb.)Merr	Phalara	Mimosaceae
8	*Albizia lebbeck* (L.) Bth.	Siras	Mimosaceae
9	*Albizia procera* (Roxb.) Bth	Kinkal	Mimosaceae
10	*Alstonia scholaris* (L.) R. Br.	Satvin	Apocynaceae
11	*Anogeissus acuminata* (Roxb ex DC.) Guill. & Perr.	Dhankra	Combretaceae
12	*Anogeissus latifolia* (Roxb ex DC.) Wall. Ex Guill. & Perr.	Dhawada	Combretaceae
13	*Artocarpus heterophyllus* Lam.	Phanas	Moraceae
14	*Azadirachta indica* A. Juss	Neem	Meliaceae
15	*Bauhinia faveolata* Dalz.	Kanchan	Caesalpiniaceae
16	*Bauhinia purpurea L.*	Rakta Kanchan	Caesaliniaceae
17	*Bauhinia recemosa* Lam.	Apta	Caesalpiniaceae
18	*Bombax ceiba* L	Kate - sawar	Bombacaceae
19	*Bombax insigne* L	Saver	Bombacaceae
20	*Borassus flabelliber* L	Tad	Arecaceae
21	*Boswellia serrata* Roxb. ex Colebr.	Salai	Burseraceae
22	*Bridelia retusa* (L.) Spreng	Asana	Euphorbiaceae
23	*Buchanania cochinchinesis* (Lour) Almeida	Char	Anacardiaceae
24	*Butea monosperma* var. *lutea*	Pivla Palas	Fabaceae
25	*Butea monosperma* var. *monosperma* L.	Palas	Fabaceae
26	*Calophyllum inophyllum* L	Undi	Clusiaceae
27	*Capparis grandis* L.f.	Pachunda	Capparaceae
28	*Careya arborea* Roxb.	Kambhi	Lecythidaceae
29	*Caryota urens* L.	Bherali mad	Arecaceae
30	*Cassine glauca* (Rottb) O. Ktze	Butyakalas	Calastraceae
31	*Casssia fistula* L	Bava	Caesalpiniaceae
32	*Cochlospermum religiosum* (L.) Alst.	Ganeri	Cochlospermaceae
33	*Cordia dichotoma* Forst f	Bhokar	Boraginaceae
34	*Crateva magna* (Lour.) DC.	Varun	Capparaceae
35	*Dalbergia latifolia* Roxb.	Shisam	Fabaceae
36	*Dalbergia sissoo* Roxb	Shisam	Fabaceae
37	*Dillenia indica* L.	Mota-Karmal	Dilleniaceae
38	*Dillenia pentagyna* Roxb	Karmal	Dilleniaceae
39	*Diospyros melanoxylon* Roxb	Temru	Ebenaceae
40	*Diospyros peregrina* (Gaertn.) Guerke	Tembhurni	Ebenaceae
41	*Dolichandrone falcata* (Wall.ex DC.) Seem.	Medsingi	Bignoniaceae
42	*Drypetes roxburghii* (Wall.) Hurusawa	Putranjiva	Euphorbiaceae
43	*Ehretia aspera* Roxb.	Ajan	Ehratiaceae
44	*Ehretia laevis* Roxb.	Ajan	Ehratiaceae
45	*Elaeocarpus sphaericus* (Gaertn.) K. Schum.	Rudraksha	Elaeocarpaceae

46	*Embelia bassal* Burm	Wawding	Myrsinaceae
47	*Emblica officinalis*Gaerttn.	Awala	Euphorbiaceae
48	*Erythrina variegata* L.	Pangara	Fabaaceae
49	*Ficus amplissima* J.E.Sm.	Pimpri	Moraceae
50	*Ficus arnottiana* (Miq.) Miq.	Kadakpayar	Moraceae
51	*Ficus benghalensis* L.	Wad	Moraceae
52	*Ficus exasperata* Vahl, Enum.	Kharvati	Moraceae
53	*Ficus hispida* L.f.	Kalaumbar	Moraceae
54	*Ficus microcarpa* L.f.	Nandruk	Moraceae
55	*Ficus racemosa* L.	Umber	Moraceae
56	*Ficus religiosa* L.	Pimpal	Moraceae
57	*Firmina colorata* (Roxb.) R.Br.	Kaushil	Sterculiaceae
58	*Flacourtia latifolia* (Hook.f. & Thoms.) T.Cooke	Tambat	Flacourtiaceae
59	*Garcinia indica* (Du Petit-Thou.) Choisy	Kokam	Clusiaceae
60	*Gardenia resinifera* Roth	Dikemali	Rubiaceae
61	*Garuga pinnata* Roxb.	Kakkad	Burseraceae
62	*Gmelina arborea* Roxb	Shivan	Verbenaceae
63	*Grewia tiliifolia* Vahl.	Dhaman	Tiliaceae
64	*Haldina cordifolia* (Roxb.) Ridsd.	Hedu	Rubiaceae
65	*Heterophragma quadriloculare* (Roxb.) K.Schum.	Varas	Bignoniaceae
66	*Holarrhena pubescens* (Buch - Ham) Wall. ex G. Don	Kuda	Apocynaceae
67	*Holoptelea integrifolia* (Roxb.) Planch.	Wavli	Ulmaceae
68	*Hyphaene dichotoma* (White) Furtado	Ravan tad	Arecaceae
69	*Ixora brachiata* Roxb.	Lokhandi	Rubiaceae
70	*Kydia calycina* Roxb	Warung	Malvaceae
71	*Lagerstroemia microcarpa* Wight	Nana-bondara	Lythraceae
72	*Lagerstroemia reginae* Roxb.	Tamas	Lythraceae
73	*Lannea coromandelica* (Houtt.) Merr.	Moya	Anacardiaceae
74	*Limonia acidissima* L.	Kavath	Rutaceae
75	*Macaranga peltata* (Roxb.) Muell.-Arg.	Chandiva	Euphorbiaceae
76	*Madhuca latifolia* var. *latifolia* (Koen) Mac Bride	Mohva	Sapotaceae
77	*Madhuca latifolia* var. *longifolia* (Roxb.) Chev	Moha	Sapotaceae
78	*Mallotus philippensis* (Lam) Muell	Kumkum	Euphorbiaceae
79	*Mammea surgia* (Buch.-Ham. ex Roxb) Kosterm.	Surungi	Clusiaceae
80	*Mangifera india* L.	Amba	Anacardiaceae
81	*Manilkara hexandra* (Roxb.) Dub.	Khirni	Sapotaceae
82	*Melia azedarach* L.	Bakan neeb	Meliaceae
83	*Melia dubia* Cav Diss.	Nimbara	Meliaceae
84	*Memecylon umbellatum* Burm. F	Anjani	Melastamaceae
85	*Meyna laxiflora* Robyns	Helu	Rubiaceae
86	*Michelia champaca* L.	Sonchafa	Magnoliaceae
87	*Mimusops elengi* L.	Bakul	Sapotaceae

88	*Mitragyna parvifolia* (Roxb.) Korth.	Kadam	Rubiaceae
89	*Morinda pubescens* J.E. Sm.	Bartondi	Rubiaceae
90	*Neolamarckia cadamba* (Roxb.) Bosser	Kadamb	Rubiaceae
91	*Nothapodytes nimmoniana* (J. Grah.) Mabberley	Amrut	Icacinaceae
92	*Nyctanthes arbor- tristis* L.	Parijatak	Oleaceae
93	*Olea dioica* Roxb.	Parjambul	Oleaceae
94	*Oroxylum indicum* (L.) Vent.	Tetu	Bigoniaceae
95	*Ougeinia oojeinensis* (Roxb.) Hochr.	Kalapalas	Fabaceae
96	*Pandanus odoratissimus* L.f.	Kewada	Pandanceae
97	*Phoenix sylvestris* (L.) Roxb.	Shindi	Arecaceae
98	*Pongamia pinnata* (L) Pierre	Karanj	Fabaceae
99	*Pterocarpus marsupium* Roxb.	Rakta-chandan	Fabaceae
100	*Salix tetrasperma Roxb.*	Walunj	Salicaceae
101	*Santalum album* L.	Chandan	Santalaceae
102	*Sapindus laurifolius* Vahl	Ritha	Sapindaceae
103	*Schleichera oleosa* (Lour.) Oken	Kusum	Sapindaceae
104	*Semecarpus anacardium* L.f.	Bibba	Anacardiaceae
105	*Soyamida febrifuga* (Roxb) A juss	Rohan	Meliaceae
106	*Spondias pinnata* (L.f.) Kurz	Ambada	Anacardiaceae
107	*Sterculia urens* Roxb.	Kandol	Sterculiaceae
108	*Stereospermum colais* (Buch.-Ham. Ex Dillw.) Mabb.	Paral	Bignoniaceae
109	*Strychnos nux-vomica* L.	Kajra	Loganiaceae
110	*Symplocos racemosa* Roxb	Lenda	Symplocaceae
111	*Syzygium cumini* (L.) Skeels	Jambhul	Myrtaceae
112	*Tamarindus indica* L.	Chinch	Caesalpiniaceae
113	*Tamilnadia uliginosa* (Retz.) Tirveng	Pandhra	Rubiaceae
114	*Terminalia bellirica* (Gaetn.) Roxb.	Beheda	Combrataceae
115	*Terminalia chebula* Retz.	Hirda	Combrataceae
116	*Terminalia cuneata* Roth.	Arjun	Combrataceae
117	*Terminalia paniculata* L.	Kinjal	Combrataceae
118	*Terminalia tomentosa* L.	Ain	Combrataceae
119	*Thespesia populnea* (L.) Soland. ex. Corr.	ParasBhendi	Malvaceae
120	*Trema orientalis* (L.) Bl.	Gol	Ulmaceae
121	*Vitex negundo* Linn.	Nirgudi	Verbenaceae
122	*Woodfordia fruticosa* Kurz	Dhyati	Lythraceae
123	*Wrightia arborea* (Dennst.) Mabb.	Tambda kuda	Apocynaceae
124	*Wrightia tinctoria* R. Br.	Kala Kuda	Apocynaceae
125	*Xantolis tomentosa* (Roxb) Raf.	Numbal	Sapotaceae
126	*Xylia xylocarpa* L.	Yorul	Mimosaceae
127	*Ziziphus mauritiana* Lam.	Bor.	Rhamnaceae

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Plate-I: Native plant species suggested as an alternative to exotics.

Plate-II: Native plant species suggested as an alternative to exotics.

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