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THE GENESIS:

REVIVING BIODIVERSITY ON A FORMER LEGACY WASTE SITE

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INTRODUCTION

Life finds a way" is a famous quote from the much-acclaimed Stephen Spielberg directed, first Jurassic Park movie. Although the film was a fiction depicting resurrection of an extinct species from the Jurassic era, the quote is very much relevant in the present Cenozoic era too. Unsustainable and rapid pace of development witnessed post globalization of economies, has led to serious degradation of land resulting in many tracts of land losing all pivotal elements necessary for sustaining life and going dead, quite literally. India is no exception to the trend and face many related issues that concerns life and ecosystems alike. One of many such fallen lands commonly sighted in urban landscapes are landfill sites, which are gaining such mammoth proportions now that they are making way into manifestos of political parties and larger political discourse. An urban eyesore, landfills are huge garbage dump yards which eventually renders soil contaminated and unfit for sustaining life. Many remediation strategies have been employed and research is still in progress to find innovative solution to this urbanization generated problem.

LANDFILL SITES & BIODIVERSITY

Landfill sites are environmentally damaging and cause biodiversity loss. They are also major sources of pollution, adversely affecting surface and ground water, air and soil of the area where they are located, thereby causing habitat degradation. It takes years for such sites to stabilize, even after closure, hence causing long-term damage. The site is created either by clearing vegetation or using an open expanse of land that is inhabited by smaller plants and dependent organisms. The site once cleared and used for waste dumping is rendered infertile and dead due to various kinds of pollutants making their way into it through leachate. It forms an ecosystem so harsh which is impossible to be created naturally on Earth. However, these landfill sites are inhabited by umpteen bacteria and fungi which constantly decompose the waste material, releasing Greenhouse gases that further contribute to climate change, leading to further habitat degradation and biodiversity loss, perhaps at a site much farther from the landfill! So, while landfill is a home to a plethora of micro-organisms, insects, small mammals and scavenging birds, it is causing widespread damage to biodiversity in ways which are undesirable and have far greater consequences.

THE ENDEAVOUR

Being a developing nation with scores of issues to cater to, it is not always feasible for Indian authorities to put in resources required for stabilization of a landfill site. Off late, there is a growing concern for devising decentralized and sustainable solutions for local problems. One such endeavour exemplifying such an approach is underway in the city of Ghaziabad situated in Delhi-NCR region. SAY EARTH NGO in collaboration with environmentally conscious corporates is poised to transform a former legacy landfill site into a sprawling urban forest, using Japanese technique of creating dense jungles, popularly known as Miyawaki. This choice of transformation of site into urban forest was based on the intent of providing a refuge to biodiversity of the region witnessing rapid habitat loss due to rampant construction activities apart from providing the city with green lungs. Additionally, once transformed, this biodiverse zone is intended to provide certain ecosystem services pivotal for maintenance of health and well-being of human populations inhabiting adjoining areas.

GEOGRAPHICAL SETTINGS

The site is situated in the satellite township of Indirapuram in Ghaziabad district, located nearby to the Delhi-Uttar Pradesh border. It lies within Indo-Gangetic biogeographic zone. The terrain is generally flat and is dominated by loam to sandy loam soils. The climate of the region is majorly semi-arid, categorized as BSh under Koppen climate classification system with an annual average temperature of 24.5°C and rainfall of 764mm. The latitude and longitude of the site are 28° 39' 04" N and 77°22'30" E respectively. Landfill site is located in residential area and is surrounded by a sewage treatment plant on the Southern end, habitation on the Eastern and Western ends & slums and abandoned buildings in the North. There were no recorded species of plants before intervention and limited faunal species sighted comprised of few birds like Egrets and Kites; mammals such as dogs and rodents like Greater bandicoot rats. No assessments were done for estimating lower microorganisms.

METHODOLOGY

The site was used since 1985 for dumping of municipal solid waste until 2020, when it was closed down by the authorities. The site had waste measuring more than 50,000 cubic metric tons. SAY EARTH NGO adopted the site in 2022, with an intent to transform it into urban forests. The land was cleared of garbage which was given to a company for producing "Refuse Derived Fuel". Land Survey and soil testing was done that concluded the soil was deficient in essential nutrients and incapable of sustaining plants. An initial layout was designed for the site and land was prepared by adding soil procured from numerous construction sites in and around Indirapuram. Organic supplements like compost, plant-based mulch etc. were added to restore fertility. High quality saplings of native plants were selected and planted in pre-dug pits on the site. Many of these species are known to have medicinal properties. The plantation was done in accordance with Miyawaki technique, which lays stress on multi-layered plantation with a greater number of plants growing in less space, requiring low maintenance. The site has been divided into batches and work is being done in one batch before moving to the next. For binding of soil, grasses have been planted between saplings. Also, network of pipeline has been laid to ensure timely availability of water to the plantation. A team of gardeners have been employed for taking care of the plants. Till date, around 10,000 saplings have been planted on the site, details of which are provided in later sections.

ASSESSMENT OF FLORAL DIVERSITY

Measuring biodiversity is an essential step in evaluation of conservation efforts. Analysis of botanical dataset/ planted saplings was conducted to assess the floral diversity present (excluding grasses/ runners used for binding of soil). Shannon's diversity index was employed as a quantitative measure to evaluate the species richness within the population. Denoted as (H), this index is calculated using the formula given below:

$$H = -\Sigma pi * \ln(pi)$$

- Where, Σ: means "sum"
- **ln:** Natural log
- **pi:** The proportion of the entire community made up of species "I"

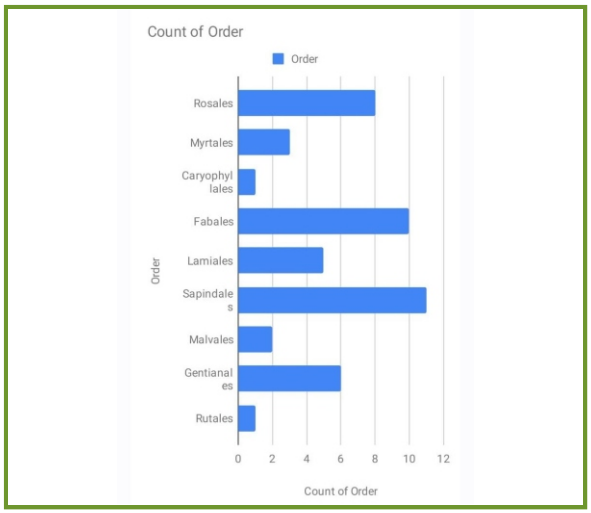
The evaluation comprised of the following steps:

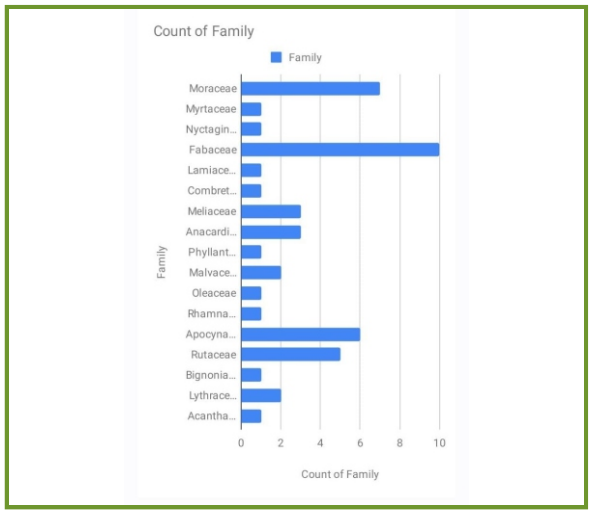
- **Data Collection:** A botanical dataset comprising information on different plant species was created.
- **Data Pre-processing:** The dataset was carefully examined, and any incomplete or erroneous entries were addressed to ensure the accuracy of the analysis.
- **Species Enumeration:** The number of individuals for each plant species was recorded.
- **Calculation of Proportions:** The proportion of each species was determined by dividing the number of individuals by the total number of individuals assessed across all species.
- **Calculation of Proportional Diversity:** The Shannon's diversity index was calculated by multiplying the proportion of each species by the logarithm (base 2) of its proportion and summing these values.
- **Biodiversity Index Calculation:** The biodiversity index was obtained by taking the negative of the sum of the proportional diversity values.

RESULT AND DISCUSSION

The analysis of the botanical dataset revealed a total of 45 plant species at the site. Each species was assessed based on its proportion, logarithmic value, and contribution to the overall diversity. The calculated biodiversity index was found to be approximately 13.287, indicating a relatively high level of biodiversity within the studied plant community of the landfill site. The highest number of plant species belonged to taxonomic order “Sapindales” and family “Fabacaea” .

The obtained biodiversity index reflects the richness of plant species within the dataset. A higher biodiversity index suggests a more diverse and balanced ecosystem. The dataset showcased a variety of plant families, orders, classes, phyla, and kingdoms, representing the complex interconnections and coexistence of different plant species. This diversity would attract a variety of dependent fauna, giving birth to a diverse ecosystem. The identification and conservation of plant species with low abundance, such as "Aak" (Calotropis gigantea), are crucial for maintaining a healthy ecosystem. These less prevalent species often play vital roles in ecological processes, and their loss can have far-reaching consequences on overall biodiversity.





CONCLUSION

This article provides a glimpse into assessment of species diversity present within the floral population at Indirapuram landfill site. The calculated biodiversity index of approximately 13.287 indicates a considerable level of biodiversity which is desirable when compared with the zero-plant life recorded at the commencement of the intervention. These results are based on a limited dataset of 10,000 saplings, planted few months ago. The site has large tract of land yet to be covered with plantation. Once the task gets completed, it would transform into a sprawling urban forest and would become a self-sustaining ecosystem having diverse species of flora and fauna.

The findings emphasize that with sustained efforts its very much possible to reintroduce life into former landfill sites and transform them into jungles. These metamorphosed sites act as a refuge for diverse forms of plant and animal species. Besides, they also behave as local climate mitigation units that abate heat island effect and regulates micro-climate, apart from generating oxygen and contributing to carbon sequestration. The findings also lay stress on importance of conservation efforts and sustainable management practices to protect and preserve the diverse plant species represented in the dataset. Further research and conservation initiatives would focus on understanding the ecological roles and threats faced by individual species to ensure their long-term survival and the sustainability of natural ecosystems.

ACKNOWLEDGEMENTS

The authors wish to thank everyone associated with this task of transformation of the landfill site to urban forests. The project is mammoth in scale and ground execution was not possible without continuous support of urban local bodies of Ghaziabad district, donors, volunteers and the team of SAY EARTH NGO led by Dr Harendra Tomar and Mr. Amit Bhati. We express our deep gratitude and acknowledge the efforts of everyone who believed in the concept and helped in transforming an idea into reality.

ANNEXURE 1:

List of floral species at the site

Common Name	Kingdom	Phylum	Class	Order	Family	Genus	Species	No.
Bargad	Plantae	Angiosperms	Magnoliopsida	Rosales	Moraceae	Ficus	Ficus benghalensis	7
Peepal	Plantae	Angiosperms	Magnoliopsida	Rosales	Moraceae	Ficus	Ficus religiosa	7
Jamun	Plantae	Angiosperms	Magnoliopsida	Myrtales	Myrtaceae	Syzygium	Syzygium cumini	15
Bougainvillea	Plantae	Angiosperms	Magnoliopsida	Caryophyllales	Nyctaginaceae	Bougainvillea	Bougainvillea glabra	136
Shisham	Plantae	Angiosperms	Magnoliopsida	Fabales	Fabaceae	Dalbergia	Dalbergia sissoo	15
Sagwan	Plantae	Angiosperms	Magnoliopsida	Lamiales	Verbenaceae	Tectona	Tectona grandis	15
Kathal	Plantae	Angiosperms	Magnoliopsida	Rosales	Moraceae	Artocarpus	Artocarpus heterophyllus	15
Amaltas, Bahava	Plantae	Angiosperms	Magnoliopsida	Fabales	Fabaceae	Cassia	Cassia fistula	15
Arjun	Plantae	Angiosperms	Magnoliopsida	Myrtales	Combretaceae	Terminalia	Terminalia arjuna	10
Bakain	Plantae	Angiosperms	Magnoliopsida	Sapindales	Meliaceae	Melia	Melia azedarach	15
Indian Coral Tree	Plantae	Angiosperms	Magnoliopsida	Fabales	Fabaceae	Erythrina	Erythrina variegata	15
Toon	Plantae	Angiosperms	Magnoliopsida	Sapindales	Meliaceae	Toona	Toona ciliata	15
Thor	Plantae	Angiosperms	Magnoliopsida	Euphorbiales	Euphorbiaceae	Euphorbia	Euphorbia royleana	30
Papdi	Plantae	Angiosperms	Magnoliopsida	Fabales	Fabaceae	Hopotelea		20
Mango (Desi)	Plantae	Angiosperms	Magnoliopsida	Sapindales	Anacardiaceae	Mangifera	Mangifera indica	15
Pilkhan	Plantae	Angiosperms	Magnoliopsida	Rosales	Moraceae	Ficus	Ficus virens	70
Aamla	Plantae	Angiosperms	Magnoliopsida	Oxalidales	Phyllanthaceae	Phyllanthus	Phyllanthus emblica	70
Kadamb	Plantae	Angiosperms	Magnoliopsida	Malvales	Salicaceae	Neolamarckia	Neolamarckia Pine	70
Harshingar	Plantae	Angiosperms	Magnoliopsida	Lamiales	Oleaceae	Nyctanthes	Nyctanthes arbortristis	70
Ber/Bor	Plantae	Angiosperms	Magnoliopsida	Rosales	Rhamnaceae	Ziziphus	Ziziphus mauritiana	70
Kejorina	Plantae	Angiosperms	Magnoliopsida					70
Sonjana	Plantae	Angiosperms	Magnoliopsida	Brassicales	Moringaceae	Moringa	Moringa oleifera	70
Imli	Plantae	Angiosperms	Magnoliopsida	Fabales	Fabaceae	Tamarindus	Tamarindus indica	70
Bel	Plantae	Angiosperms	Magnoliopsida	Rutales	Rutaceae	Aegle	Aegle marmelos	30
Jungle Jalebi	Plantae	Angiosperms	Magnoliopsida	Fabales	Fabaceae	Pithecellobium	Pithecellobium dulce	80
Amrod	Plantae	Angiosperms	Magnoliopsida	Myrtales	Myrtaceae	Psidium	Psidium guajava	80
Jakrenda	Plantae	Angiosperms	Magnoliopsida	Lamiales	Bignoniaceae	Jacaranda	Jacaranda Mimosifolia	50
Kachanar	Plantae	Angiosperms	Magnoliopsida	Fabales	Fabaceae	Bauhinia	Bauhinia variegata	90
Sita Ashok	Plantae	Angiosperms	Magnoliopsida	Fabales	Fabaceae	Saraca	Saraca asoca	50
Palash	Plantae	Angiosperms	Magnoliopsida	Fabales	Fabaceae	Butea	Butea monosperma	40
Champa	Plantae	Angiosperms	Magnoliopsida	Gentianales	Apocynaceae	Plumeria	Plumeria rubra	90
Maulsari	Plantae	Angiosperms	Magnoliopsida	Ericales	Thymelaeaceae	Mimushops	Mimushops elengi	80
Kanak Champa	Plantae	Angiosperms	Magnoliopsida	Malvales	Sterculiaceae	Pterospermum	Pterospermum acerifolium	90
Badhal	Plantae	Angiosperms	Magnoliopsida	Rosales	Moraceae	Artocarpus	Artocarpus lakoocha	40
Mehndi	Plantae	Angiosperms	Magnoliopsida	Myrtales	Lythraceae	Lawsonia	Lawsonia inermis	67
Aadu	Plantae	Angiosperms	Magnoliopsida	Rosales	Rosaceae	Prunus	Prunus persia	50

Common Name	Kingdom	Phylum	Class	Order	Family	Genus	Species	No.
Orange	Plantae	Angiosperms	Magnoliopsida	Sapindales	Rutaceae	Murraya	Murraya koenigii	134
Mausami	Plantae	Angiosperms	Magnoliopsida	Gentianales	Apocynaceae	Cascabela	Cascabela Thevetia	150
Kari Patta	Plantae	Angiosperms	Magnoliopsida	Malvales	Malvaceae	Hibiscus	Hybiscus Syriacus	130
Kaner	Plantae	Angiosperms	Magnoliopsida	Gentianales	Rutaceae	Murraya	Murriaya paniculata	150
Hibiscus	Plantae	Angiosperms	Magnoliopsida	Sapindales	Rutaceae	Citrus	Citrus limon	145
Kamini	Plantae	Angiosperms	Magnoliopsida	Myrtales	Lythraceae	Punica	Punica protopunica	150
Nimbu	Plantae	Angiosperms	Magnoliopsida	Gentianales	Apocynaceae	Calotropis	Calotropis gigantea	50
Anar	Plantae	Angiosperms	Magnoliopsida	Sapindales	Rutaceae	Citrus	Citrus X sinensis	50
Aak	Plantae	Angiosperms	Magnoliopsida	Sapindales	Rutaceae	Citrus	Citrus limetta	50

ANNEXURE 2:

TAXONOMIC CLASSIFICATION

OF SOME OF THE SPECIES PRESENT ON THE SITE

Xerolycosa Nemoralis

Kingdom	Animalia
Phylum	Arthropoda
Class	Arachnida
Order	Araneae
Family	Lycosidae
Genus	Xerolycosa
Species	nemoralis
Common Name	Woodland Wolf Spider
Role in the ecosystem	Plays a role in controlling insect populations and maintaining balance in forest ecosystems

Perillus Bioculatus

Kingdom	Animalia
Phylum	Arthropoda
Class	Insecta
Order	Hemiptera
Family	Pentatomidae
Genus	Perillus
Species	Perillus bioculatus
Common Name	Two-spotted Stink Bug
Role in the ecosystem	Helps with pest control and nutrient recycling in agricultural ecosystems

Zygogramma Bicolorata

Kingdom	Animalia
Phylum	Arthropoda
Class	Insecta
Order	Coleoptera
Family	Chrysomelidae
Genus	Zygogramma
Species	Zygogramma bicolorata
Common Name	Two-spotted Leaf Beetle
Role in the ecosystem	Zygogramma bicolorata: Helps control invasive weed populations by feeding on the leaves of plants likeZygogramma bicolorata: Helps control invasive weed populations by feeding on the leaves of plants like ragweed.

Polistes Baldern

Kingdom	Animalia
Phylum	Arthropoda
Class	Insecta
Order	Hymenoptera
Family	Vespidae
Genus	Polistes
Species	Polistes baldern
Common Name	Bald-faced Hornet
Role in the ecosystem	Polistes baldern: Contributes to insect population control and serves as a pollinator in the ecosystem.

Danaus Chrysippus

Kingdom	Animalia
Phylum	Arthropoda
Class	Insecta
Order	Lepidoptera
Family	Nymphalidae
Genus	Danaus
Species	Danaus chrysippus
Common Name	Plain Tiger
Role in the ecosystem	Pollinator, Plant Diversity

Hemipepsis

Kingdom	Animalia
Phylum	Arthropoda
Class	Insecta
order	Hymenoptera
Family	Pompilidae
Subfamily	Pepsinae
Genus	Hemipepsis
Common Name	wasp
Role in the ecosystem	Important for pollination, pest control, decomposition, and serving as a food source, contributing to ecosystem balance.

Verbena Bonariensis

Kingdom	Plantae
clade	Tracheophytes
clade	Angiosperms
clade	Eudicots
clade	Asterids
order	Lamiales
family	Verbenaceae
genus	Verbena
species	V. bonariensis
common name	Verbena bonariensis
role in ecosystem	pollination and supporting biodiversity in the ecosystem.

Celosia Argentea

Kingdom	Plantae
clade	Tracheophytes
clade	Angiosperms
clade	Eudicots
order	Caryophyllales
family	Amaranthaceae
genus	Celosia
species	argentea
common name	Cockscomb
role in ecosystem	provides habitat for beneficial insects, contributing to pollination and supporting biodiversity in the ecosystem.

Parthenium Hysterophorus

Kingdom	Plantae
clade	Tracheophytes
clade	Angiosperms
clade	Eudicots
clade	Asterids
order	Asterales
family	Asteraceae
genus	Parthenium
species	hysterophorus
common name	Congress Grass
role in ecosystem	Parthenium hysterophorus is an invasive species that outcompetes native plants

Ageratum Conyzoides

Kingdom	Plantae
Phylum	Magnoliophyta
Class	Magnoliopsida
order	Asterales
Family	Asteraceae
Genus	Ageratum
Common Name	Billy Goat Weed
Role in the eco system	Billy Goat Weed acts as a pioneer species in disturbed areas, quickly colonizing bare ground, and playing a role insoil stabilization and succession. It can be toxic to livestock when consumed in large quantities

Litsea Cubeba

Kingdom	Plantae
Phylum	Magnoliophyta
Class	Magnoliopsida
order	Laurales
Family	Lauraceae
Genus	Litsea
Common Name	May Chang
Role in the ecosystem	Litsea cubeba is valued for its aromatic properties and is commonly used in the production of essential oils. It may also provide habitat and food sources for various insects and other wildlife.

Ficus Religiosa

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Rosales
Family	Moraceae
Genus	Ficus
Common Name	Sacred Fig
Role in the ecosystem	Ficus religiosa serves as a valuable food source and habitat for various animals, including birds, bats, and insects. It also has cultural and religious significance in many regions .

Gaotharia Shallon

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Ericales
Family	Ericaceae
Genus	Gaotharia
Species	shallon
Common Name	Salal
Role in the ecosystem	Salal provides important habitat and food for various wildlife species, including birds and small mammals. It helps prevent soil erosion and contributes to the overall biodiversity and resilience of forest ecosystems

Dalbergia

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Fabales
Family	Fabaceae
Genus	Dalbergia
Species	Unidentified
Role in Environment	provides important habitat and food for various wildlife species, including birds and small mammals.

Hibiscus Moscheutos

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Malvales
Family	Malvaceae
Genus	Hibiscus
Species	moscheutos
common name	Rose Mallow
role in envionment	Rose Mallow serves as a nectar source for pollinators and provides habitat for various insects and birds, contributing to pollination and supporting biodiversity in wetland and riparian ecosystems.

Dendrocnide Meyeniana

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Rosales
Family	Urticaceae
Genus	Dendrocnide
Species	meyeniana
common name	Gympie-Gympie
role in envionment	Dendrocnide meyeniana plays a role in ecosystem as a food source for certain insects and provides shelter for small animals.

Mangifera Indica

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Sapindales
Family	Anacardiaceae
Genus	Mangifera
Species	Mangifera indica
common name	Mango
role in envionment	The Mango tree plays a significant role in the environment by providing habitat and food for animals, birds, insects, and mammals

Euphorbia Hirta

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Malpighiales
Family	Euphorbiaceae
Genus	Euphorbia
Species	hirta
common name	Asthma Plant
role in envionment	Euphorbia hirta providing food and shelter for insects and small animals. It also has medicinal properties and is used in traditional medicine for its potential therapeutic effects on

Atriplex Polycarpa

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Caryophyllales
Family	Amaranthaceae
Genus	Atriplex
Species	Atriplex polycarpa
common name	Allscale
role in envionment	Atriplex polycarpa (Allscale) plays a vital role in arid and semi-arid environments. It is considered a valuable plant for soil conservation and erosion control due to its deep roots

Hibiscus Rosa-Sinensis

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Malvales
Family	Malvaceae
Genus	Hibiscus
Species	Hibiscus rosa-sinensis
common name	Chinese Hibiscus
role in envionment	Hibiscus rosa-sinensis serves as an ornamental plant and provides habitat and food for various insects, birds, and butterflies. adding color to garden and attracting pollinators

Neriumoleander

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Gentianales
Family	Apocynaceae
Genus	Nerium
Species	Nerium oleander
common name	Oleander
role in envionment	It provides shelter and nesting sites for birds and habitat for insects. However, it's important to note that all parts of the oleander plant are highly toxic, which acts as a deterrent against herbivores.

Solanum Lycopersicum

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Solanales
Family	Solanaceae
Genus	Solanum
Species	Solanum lycopersicum
common name	Tomato
role in envionment	They are a source of food for various animals, including insects, birds, and mammals, contributing to the overall food chain

Cymbopogon Citratus

Kingdom	Plantae
Phylum	Tracheophyta
Class	Liliopsida
order	Poales
Family	Poaceae
Genus	Cymbopogon
Species	Cymbopogon citratus
common name	Lemon grass
role in envionment	It attracts beneficial insects such as bees and butterflies

Bearded Windgrass

Kingdom	Plantae
Phylum	Tracheophyta
Class	Liliopsida
order	Poales
Family	Poaceae
Genus	Chloris
Species	Chloris barbata
common name	Bearded Windgrass
role in envionment	species, it helps stabilize soil and prevent erosion. It also serves as a food source for various herbivores

Nerium

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Gentianales
Family	Apocynaceae
Genus	Nerium
Species	Unidentified
role in envionment	It provides shelter and nesting sites for birds and habitat for insects.

Hibiscus

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Malvales
Family	Malvaceae
Genus	Hibiscus
Species	Unidentified
common name	Hibiscus
role in envionment	hey provide habitat and food for pollinators such as bees, butterflies, and hummingbirds

Citrullus Lanatus

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Cucurbitales
Family	Cucurbitaceae
Genus	Citrullus
Species	Citrullus lanatus
common name	Watermelon
role in envionment	They provide a source of food and hydration for various animals

Asclepias

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
order	Gentianales
Family	Apocynaceae
Genus	Asclepias
Species	Unidentified
common name	Milkweed
role in envionment	play a crucial role in supporting pollinators, particularly monarch butterflies. They serve as the primary host plant for monarch caterpillars

Leptochola

Kingdom	Plantae
Phylum	Tracheophyta
Class	Liliopsida
order	Poales
Family	Poaceae
Genus	Leptochloa
Species	Unidentified
common name	Grass
role in envionment	They are typically found in wetlands, marshes, and areas with moist soils

Saxicola Caprata

Kingdom	Animalia
Phylum	Chordata
Class	Aves
order	Passeriformes
Family	Muscicapidae
Genus	Saxicola
Species	Saxicola caprata
common name	Pied Bush Chat
role in envionment	Insect control and like many other bird species, the Pied Bush Chat aids in seed dispersal.

Oenanthe Familiaris

Kingdom	Animalia
Phylum	Chordata
Class	Aves
order	Passeriformes
Family	Muscicapidae
Genus	Cercomela
Species	Cercomela fusca
common name	Brown Rock Chat
role in envionment	Insect control and like many other bird species, the Pied Bush Chat aids in seed dispersal.

Zenaida Asiatica

Kingdom	Animalia
Phylum	Chordata
Class	Aves
order	Columbiformes
Family	Columbidae
Genus	Zenaida
Species	Asiatica
common name	Dove
role in envionment	Insect control and like many other bird species, the Pied Bush Chat aids in seed dispersal.

Merops

Kingdom	Animalia
Phylum	Chordata
Class	Aves
order	Coraciiformes
Family	Meropidae
Genus	Merops
common name	Bee eater
role in envionment	Control insect population, aids in seed dispersal.

ANNEXURE 3:

GALLERY



























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