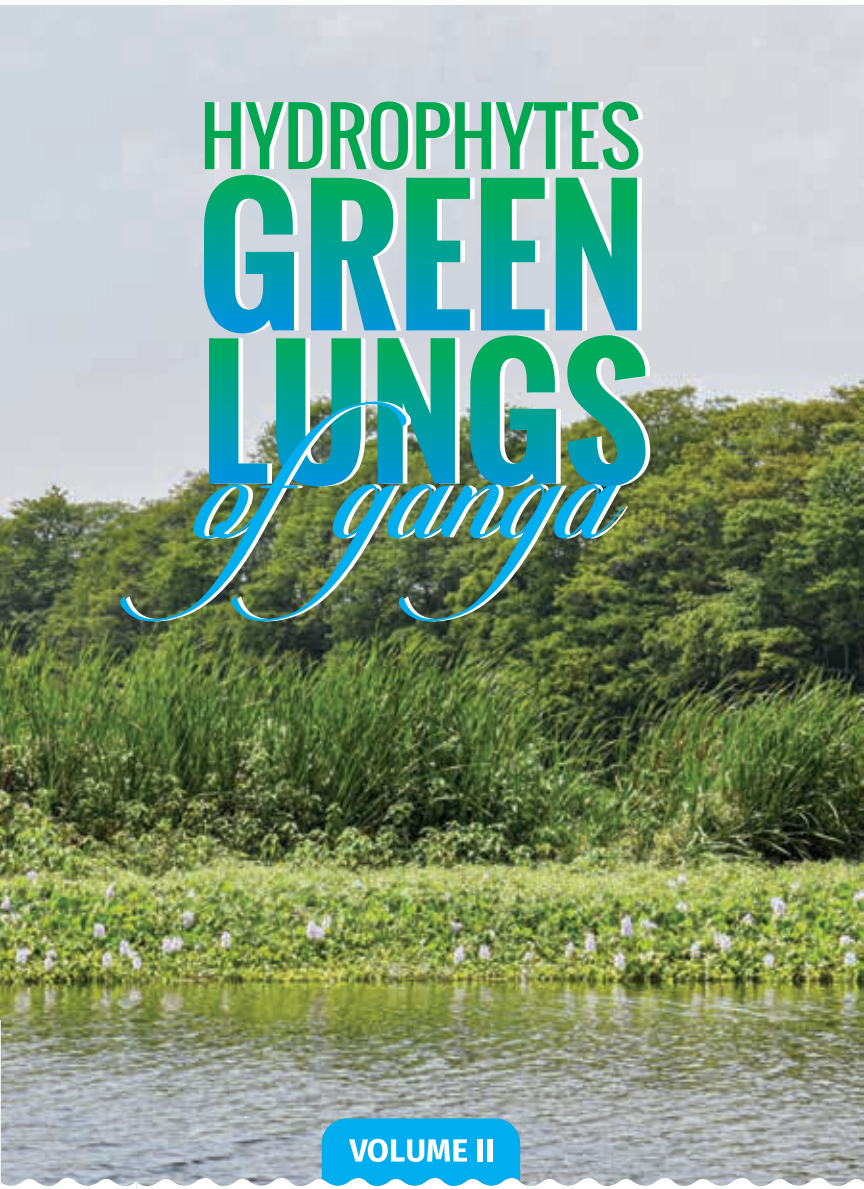
VIBRANT GANGA

नमामि गंगे

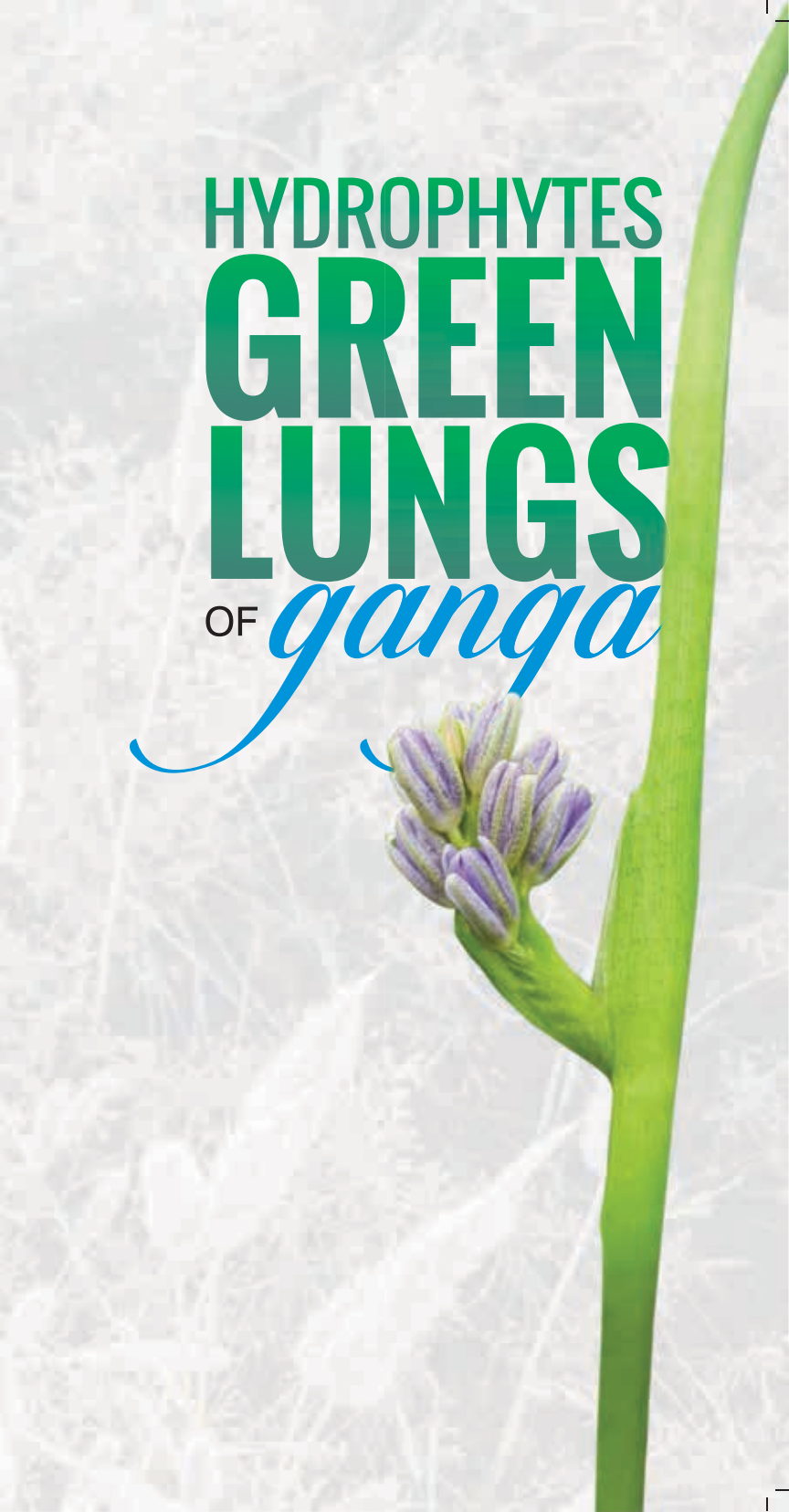
HYDROPHYTES GREEN LUNGS of ganga



VOLUME II

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

HYDROPHYTES
GREEN LUNGS
OF *ganga*



तत्र त्रिपथगां दिव्यां शीततोयामशैवलाम् ।
ददर्श राघवो गङ्गा रम्यामृषिनिषेविताम् ॥२.५०.१२॥

1: There, the river which flows along Three Paths, the river which is Divine, the river which carries cool and clear waters without weeds or moss, ...

2: Raghava (Sri Rama) saw that river Ganga, which is pleasing to the eyes and which is frequented and honoured by the Sages.

PLANNING AND MANAGEMENT FOR AQUATIC SPECIES CONSERVATION AND MAINTENANCE OF ECOSYSTEM SERVICES IN THE GANGA RIVER BASIN FOR A CLEAN GANGA

Hydrophytes green lungs of Ganga, Volume II
2024

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PREFACE

The Ganga River stands as an emblem of reverence and sustenance, intertwining with the cultural and spiritual fabric of India. Its story, steeped in mythology and history, mirrors the journey of Indian civilization, embodying traditions and values that have endured through millennia. The Ganga is not merely a river; it is a lifeline, providing both physical nourishment and spiritual solace to millions who dwell along its banks.

Floral assemblages along the riparian land of the river are excellent indicators of both upland and aquatic plant communities, which helps to assess the health of the river in a particular area. Any changes in the dynamics of the riparian habitat can have a knock-on effect on aquatic and river dependent faunal diversity viz. resident and migratory birds, amphibians, fishes, invertebrates, aquatic mammals, and effect the river infrastructure, flood cycle, agriculture, and local communities along the river basins.

In this volume, as well, we delve into the rich tapestry of flora that adorns the banks and waters of the Ganga. From ancient scriptures to modern scientific studies, the diversity of aquatic plants along this sacred river has captured the imagination of scholars and devotees alike. These hydrophytic wonders, thriving in water-dominated environments, play a pivotal role in the ecological health of the Ganga. Thus, it is important to shed light on their presence, ecological role and management strategies for the overall health of our river systems.

contents

AQUATIC PLANTS

A PLANT THAT GROWS IN OR ALONG WATER AND IS EITHER EMERGENT, SUBMERGENT, OR FLOATING

Rotala serpyllifolia (Roth) Bremek.

Vernacular name:	Not known
Common name:	Creeping dwarf rotala, Slender Rotala
Family:	Lythraceae
Genus:	*Rotala*
Species:	*serpyllifolia*
Distribution:	Native to Bangladesh, India, West Himalaya, also reported in parts of Southeast Asia and has been introduced in some regions outside its native range.
Habit:	Aquatic creeping herb
Habitat:	It grows submerged in rivers, streams, and lakes but is also found in areas where standing water recedes. The plant often thrives in shallow, slow-moving water bodies and is adaptable to a variety of water conditions.

Native/Exotic: Native

Phenology: Late winters up-to mid summers.

Flowers: Pink flowers are borne in dense stalked spikes at the end of branches, up to 3.5 cm long. Each flower is small, with a tubular calyx and petals that may attract small pollinators.

Fruit: Small capsule, ovoid or ellipsoid, dehisces to release seeds. The seeds are tiny and can be dispersed by water currents.

Ecological role: Grows submerged in water systems providing shade and shelter for aquatic life. Can infest drainage canals.

Local usage: Popular plant for aquariums and ponds due to its attractive foliage and flowers. It is used in aquascaping for its aesthetic appeal and valued for their role in traditional water gardens.

Bioindicator: Undisturbed habitats

Control measures: Do not release from aquariums or use in outdoor settings where it may escape into natural areas. Dewatering events (drawdowns) often will not result in complete control. Harvested plants should be removed from the site and not simply left to decompose on the bank.

IUCN status: Least concern

Limnophila indica (L.) Druce

Vernacular name:	Brahmi, Ambuli
Common name:	Indian Marshweed
Family:	Plantaginaceae
Genus:	*Limnophila*
Species:	*indica*
Distribution:	Widespread in tropical and subtropical regions of Asia and Africa, also found in parts of Australia and the Pacific Islands.
Habit:	Aquatic or semi-aquatic herb
Habitat:	Wetlands, rice paddies, ditches, and marshes. It thrives in moist, nutrient-rich environments and can tolerate both fully submerged and partially submerged conditions.

Native/Exotic: Native

Phenology: Flowers during the monsoon season.

Flowers: Small white or pale purple flowers, arise singly in the axils of aerial leaves.

Fruit: Small, ovoid or oblong capsules that contain numerous tiny seeds. The fruit dehisces to release seeds, which are dispersed by water.

Ecological Role: Provides habitat for aquatic organisms, helps in water filtration by absorbing excess nutrients, and stabilizes sediment in wetlands.

Local use: Used in traditional medicine for its anti-inflammatory properties. It is also used in Ayurvedic and traditional Chinese medicine to treat various ailments, including skin diseases, fever, and digestive issues.

Bioindicator: Indicator of wetland health and water quality.

Control Measures: Regular monitoring and manual removal are necessary to keep its population in check, especially in managed water bodies like rice paddies and irrigation channels.

IUCN category: Least Concern

Najas marina L.

Vernacular name:	Mota Jawasa
Common name:	Spiny Naiad, Marine Naiad
Family:	Hydrocharitaceae
Genus:	*Najas*
Species:	*marina*
Distribution:	Found in Europe, Asia, Africa, and the Americas. It is especially common in temperate and tropical regions.
Habit:	Submerged aquatic herb
Habitat:	Lakes, ponds, and slow-moving rivers. It prefers clear, nutrient-rich waters and can tolerate a range of pH levels and salinities.

Native/Exotic: Native

Phenology: Flowers in late spring to early autumn.

Flowers: Tiny, inconspicuous flowers that are often hidden within the leaf axils. The flowers are typically unisexual, with male and female flowers on the same or different plants.

Fruit: A small, ellipsoid drupe. The fruit is hard and contains a single seed, which can be dispersed by water currents and waterfowl.

Ecological Role: Provides habitat and food for aquatic animals, helps stabilize sediments.

Local use: Sometimes used in aquariums for its aesthetic value and as a natural water filter. It is also used in some regions for traditional medicine and as fodder for livestock.

Bioindicator: Indicator of water quality and aquatic ecosystem health.

Control Measures: Can be managed through manual removal, mechanical harvesting, and water management practices. These methods should be done carefully to avoid fragmentation, which can lead to regrowth from plant fragments.

IUCN category: Least Concern

Nechamandra alternifolia (Roxb. ex Wight) Thwaites

Vernacular name:	Jalneem
Common name:	Indian Oxygen-Weed
Family:	Hydrocharitaceae
Genus:	*Nechamandra*
Species:	*alternifolia*
Distribution:	Found in tropical regions of Asia, including India, Sri Lanka, Bangladesh, and Southeast Asia.
Habit:	Submerged aquatic herb
Habitat:	Slow-moving rivers, ponds, and lakes.

Native/Exotic: Native

Phenology: Flowers during the monsoon season.

Flowers: Small, white flowers. The flowers are borne on long peduncles that rise above the water surface, facilitating pollination.

Fruit: Small, ovoid to ellipsoid berry, containing one seed. The fruit is buoyant, aiding in seed dispersal by water currents.

Ecological Role: Provides habitat for aquatic organisms, contributes to oxygenating water.

Local use: Limited documented use, sometimes used in aquariums.

Bioindicator: Indicator of water quality.

Control Measures: Hand-pulling or using rakes to remove the plants, ensuring all fragments are collected to prevent regrowth.

IUCN category: Least Concern

Sagittaria guayanensis subsp. *lappula* (D. Don) Bogin

Vernacular name:	Ban Shakarkand
Common name:	Guyana Arrowhead
Family:	Alismataceae
Genus:	*Sagittaria*
Species:	*guayanensis*
Distribution:	Found in tropical and subtropical regions of the America, Africa, and Asia.
Habit:	Perennial aquatic herb
Habitat:	Typically found in shallow freshwater bodies, marshes, and wetland areas with slow-moving or still water. It prefers nutrient-rich substrates.

Native/Exotic: Native

Phenology: February to May

Flowers: White flowers with three petals.

Fruit: Bears clusters of small, flattened, beaked achenes that ripen and disperse seeds by water currents.

Ecological Role: Provides habitat for aquatic organisms, contributes to wetland biodiversity.

Local use: Occasionally utilized in traditional medicine for its purported medicinal properties, including wound healing and digestive aid. It is also cultivated as an ornamental plant in water gardens.

Bioindicator: Sensitive to changes in water quality. Its presence often signifies nutrient-rich conditions.

Control Measures: Effective control involves manual removal of entire plants, including roots and rhizomes, to prevent regrowth. For larger infestations, altering water levels through draining or fluctuation can expose and weaken the plants.

IUCN category: Least Concern

Rotala rotundifolia
(Buch.-Ham. ex Roxb.) Koehne

Vernacular name:	Ishing Kundo, Loubuk leiri, Sim Jhaar, Thanchama-hlo
Common name:	Roundleaf toothcup, Dwarf rotala
Family:	Lythraceae
Genus:	*Rotala*
Species:	*rotundifolia*
Distribution:	South and South East Asia and also in Japan.
Habit:	Perennial herb, capable of growing both submerged and emergent in freshwater environments.
Habitat:	Found in diverse habitats such as marshes, stream sides, paddy fields, and mountainous regions.

Native/Exotic: Native

Phenology: September to March

Flowers: Pink flowers in dense racemes and nearly stalkless.

Fruit: Produces dry capsules that split open to disperse seeds, aiding in its spread.

Ecological Role: Grows as a weed in rice paddies and wet soils, infests drainage canals.

Local use: Utilized in folk medicine and traditional Chinese medicine for various therapeutic purposes. Also, popular as an ornamental plant in the international aquarium trade and increasingly used in water gardens.

Bioindicator: Eutrophic waters, indicating nutrient-rich conditions.

Control Measures

Preventive Measures: Avoid releasing from aquariums or using in outdoor settings where it could escape into natural areas.

Cultural/Physical: Rooting and establishment above the waterline can make dewatering events ineffective for complete control.

Mechanical: Spreads by fragmentation, harvested plants should be removed from the site and not simply left to decompose on the bank.

IUCN category: Least Concern

Sagittaria montevidensis Cham. & Schltdl.

Vernacular name:	Not known
Common name:	Giant Arrowhead, Aztec Arrowhead, Ruby-Eyed Arrowhead
Family:	Alismataceae
Genus:	*Saggittaria*
Species:	*montevidensis*
Distribution:	Considered native to South America, possibly Brazil.
Habit:	Robust, stemless, rhizomatous, aquatic plant.
Habitat:	Thrives in shallow, transient water bodies, occasionally extending into tidal mud flats. It exhibits a preference for the edges of ponds, where water levels fluctuate, often in areas characterized by temporary water presence.

Native/Exotic: Exotic

Phenology: June to September

Flowers: The thick pedicels end in 3 green sepals and an equal number of cream to white coloured petals with burgundy coloured spots at their bases.

Fruits: Produces winged achenes that are oblanceolate in outline, aiding in seed dispersal.

Ecological Role: Considered highly invasive, capable of choking waterways, clogging irrigation systems, and displacing native aquatic flora and fauna. It is particularly problematic in flooded rice fields, reducing productivity and impacting agriculture and recreational activities.

Local use: Cultivated as an ornamental plant in ponds and aquariums due to its attractive appearance.

Bioindicator: Known to accumulate heavy metals, serving as a bioindicator of environmental contamination.

Control Measures: Small or newly establishing populations may be removed by digging out all parts of the plant, including rhizomes and any tubers. Crop rotation plus no tillage was the most useful combination of treatments that reduced Sagittaria species densities in infested rice fields.

IUCN category: Least Concern

AMPHIBIOUS/MOIST

THESE PLANTS ARE ADAPTED TO BOTH AQUATIC AND TERRESTRIAL MODES OF LIFE, PREFER SATURATED SOILS.

Eriocaulon quinquangulare L.

Vernacular name:	Phurki
Common name:	Five-Angled Pipewort
Family:	Eriocaulaceae
Genus:	*Eriocaulon*
Species:	*quinquangulare*
Distribution:	The native range is Indian Subcontinent to Indo-China.
Habit:	It is an erect or ascending annual herbaceous plant.
Habitat:	Typically thrives in moist environments, especially in lowland plains and wetland areas.

Native/Exotic: Native

Phenology: October to March.

Flowers: Inflorescences form dense clusters in leaf axils, often with prominent bracts, bearing bisexual flowers.

Fruits: Linear-oblong to linear-ovoid capsules, 1 to 2 cm long, containing numerous seeds.

Ecological Role: Provides habitat and shelter for aquatic organisms, contributes to nutrient cycling within freshwater ecosystems, and its root systems aid in stabilizing sediments along shorelines and riverbanks.

Local Use: Specific local uses are not extensively documented in this context.

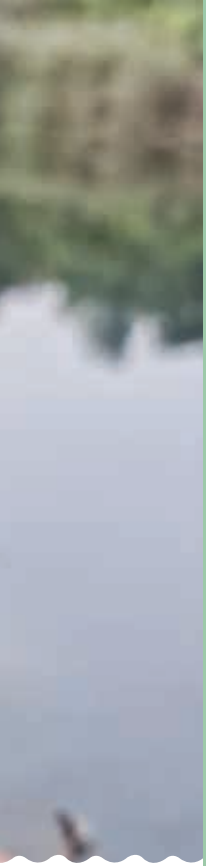
Bioindicator: Potentially indicative of heavy metal presence in aquatic environments.

Control Measures: Control measures may include targeted removal of regrowth or new seedlings, thorough cleaning of machinery to prevent spread, and careful excavation to ensure complete removal of root and rhizome fragments.

IUCN Category: Not Known

Hygrophila ringens
(L.) R.Br. ex Spreng.

Vernacular name:	Nir-schulli, itkata, sadu gobbi, dhakta kolsunda
Common name:	Erect Hygrophila
Family:	Acanthaceae
Genus:	*Hygrophila*
Species:	*ringens*
Distribution:	Has a wide area of distribution: from India and Sri Lanka to South-East Asia.
Habit:	Erect or ascending annual herb
Habitat:	Moist localities in plains



Native/Exotic: Native

Phenology: October to March

Flowers: Inflorescences form dense clusters in leaf axils, prominently bracteate, with bisexual flowers.

Fruits: Linear-oblong to linear-ovoid capsules, 1-2 cm long, containing numerous seeds.

Ecological Role: Provides habitat and shelter for aquatic organism, play a role in nutrient cycling within freshwater ecosystems, extensive root systems help stabilize sediments and reduce erosion along shorelines and riverbanks.

Local use: Used as an ornamental or aquarium plant, in folk medicine (digestive disorders), young shoots and leaves are consumed as leafy vegetables.

Bioindicator: Heavy metals

Control Measures: Generally found growing on edges of paddy fields in agricultural areas. Not known for its weedy effects, if population has to be removed then hand plucking is mostly preferred.

IUCN category: Not known

Oxystelma esculentum (L.f.) Sm.

Vernacular name:	Dudhiya lata
Common name:	Rosy milkweed wine, Sodom's apple
Family:	Apocynaceae
Genus:	*Oxystelma*
Species:	*esculentum*
Distribution:	Species is native from Egypt, Tanzania to South China and North Australia including, India, Nepal, Pakistan, Bangladesh, Myanmar etc.
Habit:	Perennial creeping or climbing herb. Plant secrets milky latex when injured.
Habitat:	Prefers wet clay and loamy soil, back waters of dam, or area which were under water and in wetlands. Can survive under submerged condition for some period.

Native/Exotic: Native

Phenology: July to February

Flowers: Bell shaped flowers are of pink colour and born on raceme like cyme inflorescence.

Fruit: A pair of follicles, seeds are flat and tufted with crown of hairs at the apex.

Ecological role: Many butterflies use this plant as their larval host plant. Flowering in large numbers attract many insects. Tiger betel and some other insects are seen always sitting on the plant.

Local use: Plant is preferred as an ornamental plant and also planted in butterfly gardens. Phyto-medical- useful in cancer, hepatitis, kidney disorder, stress- related problems etc.

Bioindicator: Undisturbed habitat

Control measure: Plant is a minor weed of agriculture land near waterbodies, which can be easily removed by ploughing and removing the plant matter from the field, along with some times herbicidal use is also preferred

IUCN category: Least Concern

Colocasia esculenta (L.) Schott

Vernacular name:	Arbi
Common name:	Taro
Family:	Araceae
Genus:	*Colocasia*
Species:	*esculenta*
Distribution:	Native India, South China up to Sumatera.
Habit:	Perennial geophytic stemless herb having underground tuber, leaves have a long petiolate and peltate leaves.
Habitat:	Prefers to grow in marsh wetlands and seasonal pools.

Native/Exotic: Native

Phenology: Blooms generally in monsoon and pre-winter seasons.

Flowers: Inflorescence is covered with a large off-white to yellow bract. Flowers are arranged on a long stalk where male flowers are on top, neuters in the middle and female flowers at the bottom.

Fruit: A trilocular berry with seeds which is covered with greenish bract when young.

Ecological role: Known to grow in wetland conditions with underground stem modification which help to accumulate sediments and protect soil from been wash off.

Local use: Very famous plant known by different names in all over the country, cultivated on large scale for its tubers and leaves, used in many curries and dishes of which some are only made in specific region.

Bioindicator: Environment pollution, Heavy metals.

Control measure: Can escape from cultivation and multiply by its tubers, can be effectively scrapped by removing tubers from ground by ploughing of land. Use of herbicides is not preferable due to underground modification of stem.

IUCN category: Least Concern

Hydrocotyle sibthorpioides Lam.

Vernacular name:	Lawn marshpennywort
Common name:	Water pennywort
Family:	Araliaceae
Genus:	*Hydrocotyle*
Species:	*sibthorpoides*
Distribution:	Tropical Asia, Africa, China, and Japan; introduced into America, Australia and India.
Habit:	A diffuse prostrate herb.
Habitat:	Found generally in open or damp areas, moist soils/ grasslands.

Native/Exotic: Native

Phenology: April to May

Flowers: The flowers are a faint yellow with a hint of purple, densely packed.

Fruits: The fruits are elliptical to round with thin ridges and no oil tubes. They are flat and break in half when the plant reaches maturity. Once broken open, there is one seed on each side.

Ecological Role: Forms dense mats of vegetation in wetland habitats, providing shelter, breeding grounds, and foraging areas for various aquatic and semi-aquatic organisms such as insects, small fish, and amphibians.

Local use: Young leaves and shoots are cooked as vegetable specially with small fishes etc., also used to prepare chutney. Leaves are used in healing wounds of man and animals.

Bioindicator: Acidic and poor draining soils

Control Measures: For small infestations or in sensitive areas where herbicides cannot be used, manual removal is effective. This involves physically pulling up the plants, ensuring to remove as much of the roots and rhizomes as possible to prevent regrowth.

IUCN category: Least Concern

Cryptocoryne ciliata
(Roxb.) Schott

Vernacular name:	Not known
Common name:	Fringed Water trumpet
Family:	Araceae
Genus:	*Cryptocoryne*
Species:	*ciliata*
Distribution:	Eastern India, Bangladesh, Vietnam, Thailand, Peninsular Malaysia, Singapore, Indonesia, Brunei, and Papua New Guinea.
Habit:	Perennial aquatic herb.
Habitat:	It grows semi-submerged or fully exposed in wet, muddy areas, shorelines (mangrove Forest, mudflat).

Native/Exotic: Native

Phenology: July to August

Flowers: The plant features a distinctive tubular structure known as the spathe, which is a modified leaf enveloping the flowering shoot called the spadix. This spathe forms a tubular shape with a pointed opening at the top adorned with purplish-red hairs. The outer margin of the opening exhibits a purplish-red hue, while the inner margin appears greenish-yellow. The remainder of the tube is pale-green with intricate purple veins and lines. The base of the spathe, known as the 'kettle', swells to enclose the spadix-a club-shaped flowering shoot housing both male and female flowers. At the base of the spadix, four to eight female flowers emerge, followed by a sterile section, and numerous male flowers at the apical end. Notably, the flowers lack distinct petals.

Fruits: Black, round, fleshy, 2.5-3 cm long, and break open into 6-8 parts when ripe to release tiny seedlings. Its seeds are smooth and whitish.

Ecological Role: Reduce river water current action promoting sedimentation and serves as a good soil binder, shelter and breeding places for fishes and other aquatic animals.

Local use: Ornamental plant, used in glass aquaria.

Bioindicator: Alkaline conditions

Control Measures: Uproot the plants by hand, ensuring that all parts of the plant, including roots and rhizomes, are removed. For larger areas, mechanical harvesters can be used to cut and collect the plants.

IUCN category: Least Concern

Crinum defixum Ker Gawl.

Vernacular name:	Jalkuworee, Pani nohoru, Sukhdarshan, Gavarikand, Kaadu eerulli, Manjivaru.
Common name:	River Crinum Lily, Poison bulb, Spider lily, Trumpet flower, and Swamp lily, Juncus-like clubrush
Family:	Amaryllidaceae
Genus:	*Crinum*
Species:	*defixum*
Distribution:	It grows naturally in Asia, from India and Sri Lanka through much of mainland Southeast Asia to south China
Habit:	Stout aquatic bulbous herb.
Habitat:	Found in swampy river banks.

Native/Exotic: Native

Phenology: March to May

Flowers: White flowers, borne in umbels which usually 6-15 flowered.

Fruits: Fruit is a capsule, ellipsoid, about 2.5 cm long, 1-2 seeded.

Ecological Role: The genus is being studied for its potential in grassland restoration strategies.

Local use: This herb is mostly used in Ayurveda for painful swellings, unexplained fevers, poisoning, and skin disorders.

Bioindicator: Heavy Metal Contamination

Control Measures: Manually digging up the plants, including their bulbs, can be effective, especially for small infestations. For larger infestations, mechanical equipment like excavators can be used to dig out the plants and their bulbs.

IUCN category: Least Concern

Acorus calamus L.

Vernacular name:	Vacha, Bach, Ugragandha, Jalmansi
Common name:	Sweet Flag, Calamus
Family:	Acoraceae
Genus:	*Acorus*
Species:	*calamus*
Distribution:	Widely distributed in North America, Europe, and Asia.
Habit:	Semi-aquatic perennial herb.
Habitat:	Thrives in moist, marshy areas, wetlands, riverbanks, and swamps.

Native/Exotic: Native

Phenology: April to July

Flowers: Small, inconspicuous greenish-yellow flowers arranged in a spadix.

Fruits: Berry-like, oblong fruits containing a few oblong seeds.

Ecological Role: Provides habitat for various wetland species and plays a role in stabilizing wetland ecosystems.

Local use: Rhizome used in traditional medicine and also to protect clothing from insect attack. The roots are made into a paste with milk and given to children to improve digestion.

Bioindicator: Sensitive to pollution and changes in hydrology.

Control Measures: Not typically invasive, but can be managed by physical removal or controlling water levels to prevent excessive spread in managed wetlands.

IUCN category: Least Concern

Alternanthera paronychioides A.St.-Hil.

Vernacular name:	Not known
Common name:	Smooth Chaff Flower
Family:	Amaranthaceae
Genus:	*Alternanthera*
Species:	*paronychioides*
Distribution:	Native to: Argentina, Brazil, Bolivia, Colombia, Costa Rica, Cuba, Mexico etc.
	Introduced to: Andaman Islands, India, Pakistan, Philippines, Thailand, Vietnam, Nepal.
Habit:	Annual or biannual prostrate spreading herbs with spatulate leaves and stems covered with sparse hairs.

Habitat: Generally seen growing in wet sandy bed and in and along the agriculture fields.

Native/Exotic: Introduced

Phenology: Extends throughout most of the year

Flowers: Papery white flowers densely packed in leaf axile with 5 tepals, 5 stamens and 3 staminodes & a bifid stigma.

Fruit: Fruit is a single seeded utricle.

Ecological role: The Genus is known for their allelopathic effect to compete with native vegetation. The plant is considered as noxious weeds in many parts of India.

Local use: Plant is used is known to treat gout, hyperuricemia, rheumatic arthritis, nephritis etc. as folk medicine.

Bioindicator: Heavy metals

Control measures: Is considered as noxious weeds in many parts of India, it is removed manually or by ploughing the fields. The dried plant material should be burned to avoid further spread.

IUCN category: Not Known

Amaranthus spinosus L.

Vernacular name:	Kanta chaulai
Common name:	Spiny amaranth
Family:	Amaranthaceae
Genus:	*Amaranthus*
Species:	*spinosus*
Distribution:	Native range extends from Mexico to Tropical America but introduced in India, Sri Lanka, Philippines, Swaziland, Sweden, Taiwan, Tanzania etc.
Habit:	Erect branched annual or biannual spinescent herb up to 160 cm tall.
Habitat:	Generally, grows in and around agricultural lands inside the river bed and wastelands.

Native/Exotic: Exotic

Phenology: June to October

Flowers: Unisexual flowers are green born on terminal spikes, perianth five inconspicuous, stamens five & style recurved.

Fruits: A single seeded capsule, dehiscing when mature, seed is black & shiny.

Ecological role: It is a fast-growing weed which can easily acquire new fertile lands and has resistance to weedicides to some extent. The plant's ability to grow in poor soils makes it useful for soil stabilization in degraded lands.

Local use: The young leaves and tender shoots are consumed as a leafy vegetable (rich in nutrients such as vitamins A and C, iron, and calcium). The seeds are harvested and used as a grain substitute. Decoctions made from the roots or leaves are used to alleviate diarrhea and menstrual cramps. Can be used as forage for livestock in some areas.

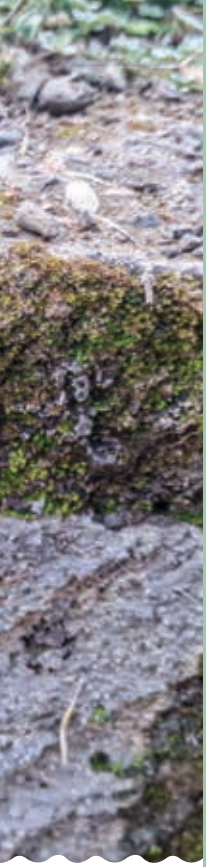
Bioindicator: This plant's presence can indicate rich, fertile soils with high nutrient levels, particularly nitrogen and phosphorus.

Control measure: Clearance of weed before seed set is most preferable, but mechanical uprooting is suggested. Chemical pesticides used for broadleaf weeds are also effective.

IUCN category: Least Concern

Androsace umbellata (Lour.) Merr.

Vernacular name:	Not known
Common name:	Umbelled rock jasmine
Family:	Primulaceae
Genus:	*Androsace*
Species:	*umbellata*
Distribution:	Plant is found along N. Pakistan to Russia & far east up to New Guinea.
Habit:	Annual or biennial small herb with basal rosette leaves which grows in the grassy patches on wet soil.
Habitat:	Predominantly grows in temperate biomes of Himalayas on wet surfaces along with many other ephemeral species in rocky river beds, grasslands and river banks.



Native/Exotic: Native

Phenology: February to April

Flowers: Born on a Stalk which arises few centimetres above the ground and are arranged in umbel inflorescence. White coloured flowers are bisexual and radial.

Fruit: Multiple minute seeds are enclosed in a capsule which opens from its apex to release seeds, calyx is persistent.

Ecological role: It is also used to stabilize soil and reduce erosion.

Local use: The plant is believed to help with respiratory ailments, such as coughs and colds. It is sometimes used as a febrifuge, a remedy to reduce fever. The plant's leaves or extracts are applied topically to wounds or sores to promote healing and prevent infections.

Bioindicator: In alpine regions, where it typically grows, its presence and population dynamics can provide insights into climate change impacts, air pollution levels, and habitat alterations.

Control measure: Plant grows not more than 8-10 cm in hight and can only found in undisturbed places hence not seen as a weed in agricultural lands.

IUCN category: Not Evaluated

Campanula dimorphantha Schweinf.

Vernacular name:	Not known
Common name:	Two-Form Bellflower
Family:	Campanulaceae
Genus:	*Campanula*
Species:	*dimorphantha*
Distribution:	India, Nepal, Afghanistan, Bangladesh, China, Pakistan.
Habit:	Annual erect herb covered by hairy trichomes with alternate lanceolate leaves & generally found growing on levee bank regions of rivers.
Habitat:	Its natural habitat primarily includes rocky slopes, cliffs, and alpine meadows at high elevations.

Native/Exotic: Native

Phenology: April to July

Flowers: Flowers are born on the tip of branches and are of two forms i.e. one complete flower and other without petals and stamens. Pinkish whitish flowers are campanulate in shape and are pollinated by various insects.

Fruits: Fruit is a capsule covered with persistent calyx covered with hairs, seeds are small and many about 2-3mm long.

Ecological role: Plant is found in specific wetland habitat where soil is damp and wet, been an annual plant produces flowers early hence visited by various insects.

Local use: Is primarily valued for its ornamental qualities. These flowers can range in colour from blue to violet, adding aesthetic appeal to gardens and floral arrangements.

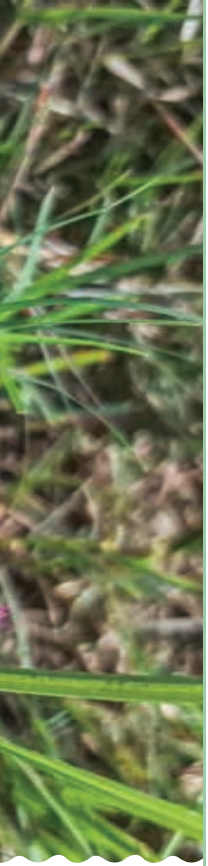
Bioindicator: Not known

Control measures: Plant is not often found in agricultural fields and grows sparsely on the river bank, hence do not have any weedy effects.

IUCN category: Not Known

Centaurium pulchellum (Sw.) Hayek ex Hand.-Mazz., Stadlm., Janch. & Faltis

Vernacular name:	Barik chirayata
Common name:	Pink Centaury
Family:	Gentiniaceae
Genus:	*Centaurium*
Species:	*pulchellum*
Distribution:	Native range extents from Europe, Mediterranean to Sahara including countries like India, Afghanistan, Austria, Iraq, Pakistan, Saudi Arabia, China, etc.
Habit:	Annual erect herb.
Habitat:	Found growing in the edges of flowing water in river and in between the short grassland within the riparian zone.



Native/Exotic: Native

Phenology: June to September

Flowers: Stalked flowers are born on dichotomous cyme having 5 petals of pink colour and starlike shape.

Fruit: A capsule about 1.5 cm long with numerous minute seeds.

Ecological role: The flowers are attractive to a variety of pollinators; by providing nectar and pollen, it supports these pollinators, contributing to ecosystem health and biodiversity.

Local use: Plant is used to restore stomach acid, helps in absorption of caLeast Concernium, iron & B12 & also improve protein metabolism.

Bioindicator: Not known.

Control measure: Manual removal should be done before the plant flowers and sets seed to prevent further spread.

IUCN category: Least Concern

Cleome viscosa L.

Vernacular name:	Bagra
Common name:	Yellow spider flower
Family:	Cleomaceae
Genus:	*Cleome*
Species:	*viscosa*
Distribution:	India, Bangladesh, Afghanistan, Sri Lanka, Sudan, Thailand, Vietnam, Myanmar, Pakistan.
Habit:	Erect, annual herb up 90-110 cm tall with palmately compound leaves.
Habitat:	Grows near drying wetlands, river banks and Wastelands.

Native/Exotic: Native

Phenology: April to October

Flowers: Bright yellow flowers are born solitary in the axile of leaves, with long petiole, Calyx and corolla 4; unsymmetrical with numerous stamens.

Fruit: The fruit is long slender up to 10 cm tall; Silicula.

Ecological role: This is an ephemeral species and is one of the ruderal species known to occupy arable lands, the glandular trichomes and bright colour of flowers attract many insects for pollination. Seed germination rate is high in this species. It is also a drought tolerant species.

Local use: Leaves of this plant are known to be eaten as vegetable times of food scarcity, Seeds are used traditionally for their anthelmintic, antimicrobial properties, they are called as wild mustard.

Bioindicator: Heavy metals

Control measure: Hand weeding is effective whereas use of herbicides also beneficial.

IUCN category: Not Known

Cyathocline purpurea (Buch. -Ham. ex D.Don) Kuntze

Vernacular name:	Gangotra
Common name:	Purple bane
Family:	Asteraceae
Genus:	*Cyathocline*
Species:	*purpurea*
Distribution:	India, Bangladesh, China, Myanmar, Pakistan, Thailand, Vietnam i.e. Indo-Malayan realm.
Habit:	Annual erect aromatic herbs up to 40 cm covered with soft hairs.
Habitat:	Grows on wet sandy and loamy river soil and on the river banks.

Native/Exotic: Native

Phenology: April to June

Flowers: Purple heads are born in cyme on the tip of branches.

Fruit: Fruits are achenes, without papus.

Ecological role: The plant is adapted to pollination, the aromatic oil in plant helps in attraction of insects. Plant is capable of long-distance dispersal of seeds.

Local use: plant is used as herbal medicine for tuberculosis, Malaria, Rheumatism & inflammation.

Bioindicator: Not known.

Control measure: Sometimes consider as a weed but no known weedy effects, but if needed hand plucking is useful.

IUCN category: Least Concern

Dentella repens
(L.) J.R. Forst. & G.Forst.

Vernacular name:	Sheem, jata
Common name:	Creeping Dentella
Family:	Rubiaceae
Genus:	*Dentella*
Species:	*repens*
Distribution:	Native range of plant extents from Tropical Asia to West Pacific including India.
Habit:	Annual creeping branched herb with small elliptic to oblong leaves arranged oppositely often rooting at nodes.
Habitat:	Generally seen growing on damp and wet places in the river bed along with some mosses and algae, also seen growing in agricultural beds on the sand.

Native/Exotic: Native

Phenology: April to June

Flowers: Sessile flowers are born at the fork of branches; white coloured petals are villous near the throat and 3 lobed at the apex

Fruit: Globose capsule is about 3-5 mm with many tiny seeds and covered with transparent hairs.

Ecological role: Plant when grow in suitable conditions forms green mats on ground, producing beautiful tiny white flowers are often visited by pollinators.

Local use: Plant is use traditionally as a poultice to treat wounds and skin problems along with it also used to treat dysentery in infants, for blood pressure and to purify blood.

Bioindicator: Can reflect soil pH conditions (prefers neutral to slightly acidic soils).

Control measure: It is a tiny ground cover weed, and grows very fast on waste lands, proper ploughing and removing the plant can help prevent overgrowth.

IUCN category: Least Concern

Euphorbia dracunculoides Lam.

Vernacular name:	Bumburi, Ban-bui-jayanti
Common name:	Dragon Spurge
Family:	Euphorbiaceae
Genus:	*Euphorbia*
Species:	*dracunculoides*
Distribution:	The native range of this species extents from North Africa to south central China including Afghanistan, Bangladesh, India, Nepal, Madagascar etc.
Habit:	Erect branched annual herb up to 120 cm tall, with linear lanceolate leaves arranged in opposite manner.
Habitat:	Grows on the edges of river bank where soil is wet, also seen growing the river bed agricultural area as a weed.

Native/Exotic: Native

Phenology: April to June

Flowers: Inconspicuous terminal few-rayed cyathium born at the tip of branch from where two new branches start growing; Flower is of greenish yellow colour having a tricarpellary gynoecium and special cup shaped nectar gland.

Fruit: A three chambered capsule with few seeds, seeds have caruncle.

Ecological role: It can help stabilize the soil, preventing erosion and providing ground cover in areas where other vegetation is sparse or absent.

Local use: This species is use by local practitioners for the treatment of rheumatism, snakebite & for its purgative effects. Also contains Antioxidant and anti-inflammatory properties.

Bioindicator: It thrives in nutrient-poor soils and can tolerate dry conditions, which can provide clues about soil fertility and water availability.

Control measure: Manual uprooting of plants and dispose the material away from field before fruiting. Use of herbicides is suggested during the vegetative stage of plant.

IUCN category: Not Known

Euphorbia helioscopia L.

Vernacular name:	Dudhya
Common name:	Sun spurge
Family:	Euphorbiaceae
Genus:	*Euphorbia*
Species:	*helioscopia*
Distribution:	This species is native to Africa, Temp. Eurasia up to Indian Subcontinent.
Habit:	50-60 cm erect annual herb with branching at the tip, leaves ovate.
Habitat:	Prefers sandy & loamy river soil, agricultural lands and disturbed grounds.

Native/Exotic: Native

Phenology: April to June

Flowers: Are born in umbel at the tip of branch, with basal leaf like bract; flowers are yellow green in colour, special type of nectar glands are present in the cyathia.

Fruit: A trilocular glabrous capsule with multiple seeds inside it.

Ecological role: Like many pioneer species, helps stabilize the soil with its root system, important in habitats prone to erosion or soil degradation. Provide nectar and pollen, attracting a variety of pollinators

Local use: Plant when injured oozes out milky latex which is highly poisonous and has active components which make this plant a potential weed for the field of medical sciences. Plant contains many secondary metabolites, Polyphenols, Tannins, Jatrophen and many more which are useful to treat many diseases.

Bioindicator: Indicate recent soil disturbances or human activities in an area (colonizes open, disturbed habitats).

Control measure: Being poisonous this plant is not preferred by animals and can grow very fast in farms, manual uprooting and removing plant material form cultivation area before seed forms is best way to control this plant.

IUCN category: Not Known

Glinus oppositifolius
(L.) Aug. DC.

Vernacular name:	Grishma-sundaraka
Common name:	Jima
Family:	Molluginaceae
Genus:	*Glinus*
Species:	*oppositifolius*
Distribution:	India, Nepal, Bangladesh, Madagascar, Philippines, Queensland, Thailand, Vietnam, Myanmar.
Habit:	Low-growing herbaceous plant.
Habitat:	Prostate, spreading annual herb without hairy trichomes, Leaves are arranged in pseudo whorls 6-7 in single whorl, each whorl is arranged in opposite to other hence name oppositifolius.

Native/Exotic: Native

Phenology: Throughout the year

Flowers: Flowers are born in leaf axils and composed of 5 perianth which are sepal like outside and petal like inside, pale white in colour, Stamens 3 with 3 bifid staminodes and 3 carpels.

Fruit: Fruits are capsules with numerous minute seeds.

Ecological role: Jima is a fast-growing ground cover herb with can easily see growing in vast sandy river beds in Ganga and its tributaries, flowers are regularly visited by files and bees, also the ground cover habit provides shelter to many insects.

Local use: Fresh plucked leaves are used against dizziness and appetite, plant is also known for the treatment of abdominal pain, jaundice, Joint pain, intestinal parasites, malaria, wounds and skin disorder. Plant is also use as a vegetable used in curries.

Bioindicator: It prefers moist soils and can indicate areas where soil moisture is fluctuating.

Control measures: Fast growing nature of plant can overcome the agricultural land with short time period, to which manual uprooting and ploughing of fields is best solution.

IUCN category: Least Concern

Gnomophalium pulvinatum (Delile) Greuter

Vernacular name:	Not known
Common name:	Cudweed
Family:	Asteraceae
Genus:	*Gnomophalium*
Species:	*pulvinatum*
Distribution:	Native range of plant extents from Egypt- Arabian Peninsula up to Tibet including India Nepal, Pakistan.
Habit:	Annual prostate spreading herb with woolly tomentose branches, arising from the base, leaves are sessile and spatulate.
Habitat:	Sparsely grows in dry sand in the vast river bed, or around the shallow pools and wetlands.

Native/Exotic: Native

Phenology: July to August

Flowers: Heads are clustered toward the terminal end of branched densely tomentose with white hairs, Bract greenish, florets small yellow in colour, Both type of florets present.

Fruit: Achenes oblong, covered with minute white woolly hairs.

Ecological role: Acts as a pioneer species, colonizing disturbed or open areas with poor soils.

Local use: Paste is prepared by using whole plant to treat skin problems & bone fractures.

Bioindicator: Not known

Control measure: Can act as weed if allow to grow on wet fallow lands, ploughing and mowing of land along with removing the plant matter is suggested.

IUCN category: Data deficient

Grangea minima
(L.) Dum.Cours.

Vernacular name:	Nakchhikni
Common name:	Spreading Sneeze Weed
Family:	Asteraceae
Genus:	*Grangea*
Species:	*minima*
Distribution:	India, China, Japan, Korea, Vietnam.
Habit:	Spreading sneeze weed is a watery prostate annual herb with slender week stem with sessile wedge-shaped leaves.
Habitat:	Plant is found growing in wet sandy and loamy soil.

Native/Exotic: Native

Phenology: August to September

Flowers: Flowers are yellow minute, bisexual having both types of florets, female flowers are arranged in outer rows and bisexual flowers in the middle rows.

Fruits: Achenes are tiny around 1.5 mm long, angular having brown hairs where pappus are absent.

Ecological role: Like many members of the Asteraceae family, *Grangea minima* can fix nitrogen in the soil, which enriches the nutrient content and supports the growth of other plants.

Local use: It is believed to have anti-inflammatory, antipyretic, and wound healing effects. In some regions, the young leaves are used as a vegetable in soups or as a flavouring agent.

Bioindicator: Often colonizes degraded habitats. Its presence can indicate soil disturbance and habitat degradation. The species is tolerant of saline soils

Control measures: Can me control by manual uprooting and organic weedicides.

IUCN category: Not Known

Grona triflora (L.) fH. Ohashi & K.Ohashi

Vernacular name:	Haspandi, Kudaliya
Common name:	Creeping tick trefoil
Family:	Fabaceae
Genus:	*Grona*
Species:	*triflora*
Distribution:	This species is distributed pantropically from Africa to Asia & East Asian countries.
Habit:	Perennial Creeping herb or subshrub with trifoliate leaves forming a green mat on ground.
Habitat:	Highly adaptive species which can grow well in variety of habitat including very dry arid areas to wetland like habitats.

Native/Exotic: Native

Phenology: May to June

Flowers: Born on a short raceme, are papilionaceous with 2 wings, 2 keel and 1 standard petal with purple-red-violet colour sheds which are open during day time specially in morning and evening to attract visitors.

Fruit: Characteristic fruit is a lomentum with 3-5 joints and have sticky hairs for dispersal.

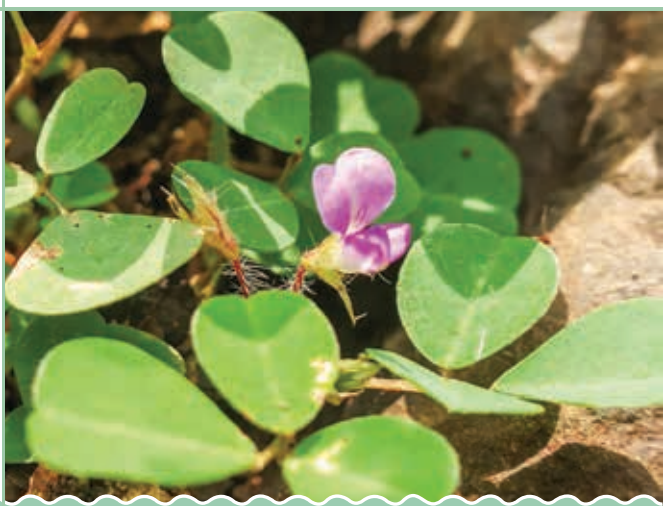
Ecological role: Fast growing nature of plant covers soil surface hence works as an excellent for soil erosion, roots have symbiotic association with rhizobia which helps to nourish soil by fixing nitrogen in soil. Plant produces many flowers at a time hence constantly visited by insects and act as larval host plant for butterflies.

Local use: Used for grazing, improve soil fertility and have medicinal properties like laxative, cure bone fracture, used for fever and cures skin diseases.

Bioindicator: Not known

Control measure: Proper mowing and drying of land and removing all remaining plant matter along with use of weedicides.

IUCN category: Not Known



Heliotropium indicum L.

Vernacular name:	Hathajori
Common name:	Indian heliotrope
Family:	Boraginaceae
Genus:	*Heliotropium*
Species:	*indicum*
Distribution:	Native to: Argentina, Bolivia, Brazil, Paraguay and Peru, Introduced to India.
Habit:	Annual or biannual, with woody base and branched above.
Habitat:	Grows around the drying wetlands, on wet sandy banks, in and around wet and damp places.

Native/Exotic: Introduced

Phenology: July to January

Flowers: Whitish to pale violet colour with yellow throat, born on a long slender coiled structure called as scorpioid cymes.

Fruit: The ovoid indehiscent fruit is composed of two nutlets.

Ecological role: The plant is preferred by tiger-crow butterflies specially by male butterflies and moths, as plant is rich in alkaloids, hence planted in butterfly gardens.

Local use: Leaf juice is used for the treatment of stings and boils of scorpions and insect bites. Whole plant is used to treat inflammation, tumours and to ease rheumatic pain, paste is applied externally. Seeds are also known to treat cholera and malaria.

Bioindicator: Air pollution.

Control measure: Is a widespread weed of field and pastures with can effectively controlled by ploughing and manual uprooting but proper disposal of plant is necessary to avoid further infestation.

IUCN category: Least Concern

Jamesbrittenia dissecta
(Delile) Kuntze

Vernacular name:	Not known
Common name:	Dissected-Leaf Sutera
Family:	Scrophulariaceae
Genus:	*Jamesbrittenia*
Species:	*dissecta*
Distribution:	India, Bangladesh, Egypt, Sudan.
Habit:	An annual erect herb with alternate spirally arranged highly lobed leaves, whole plant except petals is covered with glandular trichomes.
Habitat:	Typically found in rocky habitats, especially on sandstone slopes and outcrops. It prefers well-drained soils and thrives in full sun to partial shade.

Native/Exotic: Native

Phenology: January to February

Flowers: Are born in leaf axils singly or in pairs and generally crowded on growing tip of plant, are tubular, slightly zygomorphic, whitish in colour. The calyx is fused in to a cuplike structure covered with glandular trichomes.

Fruit: Fruit is a bivalved capsule with persistent sticky calyx, seeds are minute and numerous.

Ecological role: Is able to grow in drying wetland and riverine habitat, the presence of glandular trichomes all over body part is for attraction and protection of plant form the visitors.

Local use: In traditional medicine, used to treat ailments such as coughs, colds, chest complaints, and respiratory infections. The leaves and roots are brewed into teas or decoctions for these purposes. Possesses antimicrobial properties, making it useful in treating infections.

Bioindicator: Not known.

Control measures: Can be seen growing in fallow lands, which can be controlled by ploughing the land.

IUCN category: Near Threatened

Launaea procumbens (Roxb.) Ramayya & Rajagopal

Vernacular name:	Jangi gobi
Common name:	Creeping Launaea
Family:	Asteraceae
Genus:	*Launaea*
Species:	*procumbens*
Distribution:	India, Myanmar, Nepal, Oman, Pakistan, Saudi Arabia, Egypt.
Habit:	Perennial or annual prostrate herb.
Habitat:	Grows on sandy and loamy river beds, also occupies drying wetlands.

Native/Exotic: Native

Phenology: October to December

Flowers: Yellow flowers born of a long slender branch singly or in small racemes, flower is bisexual having both type of florets i.e., ray and disk florets.

Fruits: Simple dry achenes known as cypsela which contains papus calyx, for areal dispersal.

Ecological role: Plant grows in disturbed habitats, in dry sandy beds producing many flowers which are frequently visited by bees, flies, and bugs for the pollen. Plant can also survive with very little supply of water and nutrients and preferred for grazing by herbivores.

Local use: Leaves are used for preparation of curry as a wild edible, also use traditionally for the treatment of skin disease, dysentery, kidney stone, painful urination, boils etc.

Bioindicator: Not known

Control measures: Manual uprooting is effective, except this organic weedicide are also useful, ploughing of agricultural lands is also can be effective as well.

IUCN category: Not Known

Lindenbergia indica (L.) Vatke

Vernacular name:	Patthar-chatti
Common name:	Indian Lindenbergia
Family:	Orobanchaceae
Genus:	*Lindenbergia*
Species:	*indica*
Distribution:	India, Iran, Kenya, Nepal, Oman, Pakistan, Saudi Arabia, Bangladesh.
Habit:	An erect annual or biannual branched herb.
Habitat:	Generally found growing in wet and damp river banks, rock crevices.

Native/Exotic: Native

Phenology: September to December

Flowers: Flowers are born singly in the axile of leaves, having yellow coloured zygomorphic corolla, often with brown spots on them, the calyx is fused to from a cuplike structure.

Fruit: Fruit is a capsule, covered by calyx cup with acute tips, capsule not longer than calyx lobes, ovary hairy (glandular hairs). Seeds minute & numerous.

Ecological role: Contributes to local biodiversity by providing habitat and food for insects and other small animals.

Local use: The plant extract is used for treatment of bronchitis and skin disorder, tooth ache, sore throat etc.

Bioindicator: The presence, can indicate low fertility or specific moisture regimes, making it a useful plant for ecological monitoring.

Control measures:

Hand Weeding: Effective in small areas, especially in early growth stages before the plant sets seeds.

Tillage: Deep plowing can bury the seeds and reduce the plant's ability to germinate

IUCN category: Least Concern

Bonnaya antipoda (L.) Druce

Vernacular name:	Pipali phool
Common name:	Sparrow Lindernia
Family:	Linderniaceae
Genus:	*Bonnaya*
Species:	*antipoda*
Distribution:	Native to Tropical and Subtropical Asia up to Northwest Pacific including India, Nepal, Pakistan, Bangladesh, Myanmar and Japan.
Habit:	Perennial erect or prostate branched herb with ovate to lanceolate leaves having toothed margins. Growth and habit can vary according to season.
Habitat:	Grows primarily in wet soil conditions around stream sides, shallow ditches and wetlands.

Native/Exotic: Native

Phenology: November to February

Flowers: Bilipped flowers are born in the leaf axil having a long pedicel, petals are of purple-violet-white colour. Fertile stamens 2, staminodes 2 protruding out from corolla lips, yellow in colour.

Fruit: Cylindrical capsule longer than the length of leaf or equal to it, seeds brown numerous.

Ecological role: Bright yellow colour of staminode attracts the pollinator, supporting insect populations which are crucial for ecosystem health.

Local use: Root along with some astringent is used to treat diarrhoea. Plant is a part of a drug made to treat vertigo.

Bioindicator: Not known

Control measure: This species is consider as weed of minor importance which grows when land remains fallow without cultivation, which can easily remove by hand pulling, ploughing and use of selective herbicides.

IUCN category: Least Concern

Mecardonia procumbens (Mill.) Small

Vernacular name:	Makardana
Common name:	Baby jump up
Family:	Plantaginaceae
Genus:	*Mecardonia*
Species:	*procumbens*
Distribution:	Native of Tropical and Subtropical America and naturalized in other parts of world including India, Nepal, Bangladesh
Habit:	Prostate annual or biennial herb with spreading branches, leaves ovate to elliptic with toothed margin.
Habitat:	Prefers wet and damp places to grow in the river bed, as a weed in farms and along the roadsides.

Native/Exotic: Naturalized

Phenology: April to October

Flowers: Born in the axil of leaves with pedicel longer than the leaf, yellow-coloured petals are zygomorphic with green calyx.

Fruit: Capsule covered with green calyx, seeds many and minute.

Ecological role: Fast growing groundcover habit helps to reduce soil erosion and helps in water absorption by soil. Fresh yellow flowers attract many insects.

Local use: Whole plant is boiled and applied on wounds for rapid healing, plant is sometimes grown for ornamental purpose.

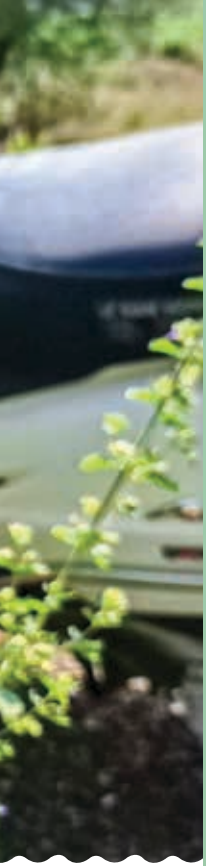
Bioindicator: Eutrophication and pollution.

Control measure: Can be controlled manually, mechanically or herbicidally depending on situation.

IUCN category: Least Concern

Mesosphaerum suaveolens (L.) Kuntze

Vernacular name:	Vilayti tulsi
Common name:	American Mint
Family:	Lamiaceae
Genus:	*Mesosphaerum*
Species:	*suaveolens*
Distribution:	Native to Mexico and Tropical America but widely introduced in countries like India, Bangladesh, Nepal, Myanmar, Pakistan, Western Australia, Zimbabwe
Habit:	Annual or biennial woody herb grows up to 1.5-2 meter tall, strongly aromatic, with ovate to obovate with serrate margins, hairs present of plant body.



Habitat: **Can possibly grow in any type of habitat including wetlands, road sides, railway tracks, on old buildings, Dry or evergreen forests etc.**

Native/Exotic: Exotic

Phenology: August to December

Flowers: Flowers are born in cyme of 1-5 flowers arranged in racemes; calyx is tubular and corolla is bi-lipped bluish in colour, stamens 4.

Fruit: Nutlets covered by persistent calyx are brown in colour.

Ecological role: Plant is known for its negative allelopathic effects on native vegetation, and have ability to completely replace the local flora of particular area. Flowers are set at very early stage and are pollinated by variety of insects hence seed production rate is very high. Grasslands and wetland ecosystems have been destroyed by this species.

Local use: Refreshing drinks are made from the seeds. Also known to be useful for treatment of diarrhoea.

Bioindicator: Disturbed Habitat, Negative allelopathy and poor soil.

Control measure: Manual uprooting can help in dispersal of seeds in such cases burning of plants is preferred and then ploughing of land and leave it for some time so that the remaining seeds or plants will grow again and then used of herbicides should be preferred.

IUCN category: Not Known

Micromeria biflora
(Buch. -Ham. ex D.Don) Benth.

Vernacular name:	Van ajwain
Common name:	Lemon Savory
Family:	Lamiaceae
Genus:	*Micromeria*
Species:	*biflora*
Distribution:	Native range of this plant is from Afghanistan, South central China up to North Myanmar.
Habit:	Annual suberect to prostate slender hairy branched herb with alternately arranged ovate to elliptic leaves having glands on them.

Habitat: Prefers growing among the shrubs around main flowing channel or can also found growing in sandy and pebbly habitat alone. Along with that, grows very well on wet hill slopes of Himalayan and Shivalik ranges.

Native/Exotic: Native

Phenology: August to December

Flowers: Inflorescence Verticillaster of 1-2 flowers or some times more, with whitish pink zygomorphic flower and hairy tubular calyx having pointed edges.

Fruit: Covered with persistent calyx, nutlets are oblong and glabrous.

Ecological role: Produces flowers that are rich in nectar, attracting a variety of pollinators, including bees, butterflies, and other insects. By providing food resources to these pollinators, the plant supports local pollinator populations, essential for the reproduction of many other plant species.

Local use: Tea is prepared from flowers and leaves, also dried and used as flavouring agent in soups. Plant is crushed and smell the aroma to treat nose bleeds, also used to treat wounds. Root past is pressed between jaws to treat tooth ache.

Bioindicator: Undisturbed habitat.

Control measure: Not reported as weed but if causing weedy effects, manual removal is best preferred.

IUCN category: Not Known

Oenothera laciniata Hill

Vernacular name:	Not known
Common name:	Cutleaf Evening Primrose
Family:	Orobanchaceae
Genus:	*Oenothera*
Species:	*laciniata*
Distribution:	South America and Europe
	Native to: New Mexico, New York, Pennsylvania, Oklahoma, Texas etc.
	Introduced to: Austria, Belgium, California, Costa Rica, India, Ireland, Italy, Japan, Korea etc.
Habit:	Annual or biannual erect to procumbent herb with simple lobed.

Habitat: Plant is found growing among the grasslands in and around the river bank.

Native/Exotic: Introduced

Phenology: April to October

Flowers: Flowers are born in leaf axils, yellow-coloured flowers consist of 5 petals and cylindrical ovary with 5 stamens, ovary is sessile but other parts of flowers are lifted 3-5 cm high by a stalklike structure.

Fruit: Sessile fruits are capsule upto 5-6 cm with many small seeds.

Ecological role: The plant is introduced in India and provide a food source for many insects and bird.

Local use: The seeds of plant is sometimes used for extraction of oil as a raw material for production of pharmaceuticals drugs.

Bioindicator: Not known.

Control measures: Manual uprooting, ploughing and use of organic weedicides.

IUCN category: Not Known

Oligochaeta ramosa
(Roxb.) Wagenitz

Vernacular name:	Nakchhikni
Common name:	Spreading Sneeze Weed
Family:	Asteraceae
Genus:	*Oligochaeta*
Species:	*ramosa*
Distribution:	India, Pakistan and Afghanistan
Habit:	Erect annual herb spreading by dichotomous branching, Leaves are alternate lobed with spiny margins.
Habitat:	The plant is found growing in wet river bed and around the wetland areas.

Native/Exotic: Native

Phenology: June to September

Flowers: The heads are born solitary at the tip of branches, flowers are purple-pinkish in colour, involucre of bracts is green with spinescent structures on it. Flowers are bisexual.

Fruits: Acenes are 5-6mm long, smooth and angular with silvery papus on it.

Ecological role: The flowers are regularly visited by vast range of insects for pollen and nector, hence cross pollination is promoted. Plant is not preferred by herbivores for grazing.

Local use: Whole plant is use as laxative, anti-pyretic, antiemetic, antimicrobial, purgative, astringent, antidote and resolvent. Also used as tonic for cold and cough.

Bioindicator: Not known

Control measures: Plant grows in wet waste lands and in agricultural lands which can be controlled by manual uprooting and ploughing of fields.

IUCN category: Not Known

Polygonum capitatum Buch. -Ham. ex D.Don

Vernacular name:	Jhaar
Common name:	Pink-head knotweed
Family:	Polygonaceae
Genus:	*Polygonum*
Species:	*capitatum*
Distribution:	This species is native to Indian subcontinent and East Asian countries including China South-Central, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Tibet, Vietnam.
Habit:	Perennial herbaceous plant with creeping stems rooting at nodal regions with ovate elliptic leaves having V-shaped dark purple colour blotch on them, orchea present.

Habitat: Generally found growing on the hill slopes along the river, sometimes seen growing on rocks.

Native/Exotic: Native

Phenology: May to December

Flowers: Flowers are born in terminal head, having 5 pink tepals, 8 stamens and 3 styles.

Fruit: Achenes are enclosed in persistent perianth, ovoid and trigonous.

Ecological role: Plant is found in temperate biome of the Himalayas where it grows on rocky slopes where it holds soil hence prevents soil erosion. Flowers are visited by many flies.

Local use: Traditionally whole plant is used to treat urinary tract infection, dysentery, eye disease, also helpful in reducing body heat. Plant is also used for ornamental purposes.

Bioindicator: Undisturbed habitat.

Control measure: Plant can be found only in Himalayan landscapes, where sometime it can act as weed on hill slope farming lands which can be hand removed easily.

IUCN category: Not Known

Polygonum plebeium R.Br.

Vernacular name:	Machechi, sarpdarshi
Common name:	Common knotweed
Family:	Polygonaceae
Genus:	*Polygonum*
Species:	*plebeium*
Distribution:	This species is native to old world, from Zimbabwe to Philippines including India, Nepal, Bangladesh, Pakistan, Tibet, Vietnam etc.
Habit:	Prostate branched spreading herb, alternately arranged leaves are ovate to oblanceolate with hairy orchea. Internodal distance can vary according to resource availability and season.

Habitat: **Generally found growing in disturbed habitats which are frequently flooded or around shallow pools, river banks and around the wetland region.**

Native/Exotic: Native

Phenology: June to November

Flowers: Pink flowers Born in the axil of leaf in clusters of 1-5 flowers; stamens 5, style tricarpellary.

Fruit: Three-sided achene or a nutlet often associated with enlarged perianth.

Ecological role: Highly adaptive species which can survive in extreme conditions, forms pioneer plant communities. Flowers when bloom are visited by small insects for pollen.

Local use: Plant is sometimes used as vegetable, also used as blood purifier, to treat liver disorder, dysentery, diarrhea and ring worms.

Bioindicator: Low-lying lands & Pollution indicator

Control measure: Plant can act as a serious weed when allow to grow and can completely cover the soil surface, hence ploughing and mowing of land along with removing the plant matter is suggested, selective weedicides can be effective.

IUCN category: Least Concern

Portulaca oleracea L.

Vernacular name:	Nonia
Common name:	Common purslane
Family:	Portulacaceae
Genus:	*Portulaca*
Species:	*oleracea*
Distribution:	Native to middle East, Afghanistan, North Africa introduce to India, Sri Lanka, China, Tibet, Central America, Colombia
Habit:	Annual or perennial semi succulent herb.
Habitat:	Grows in sandy banks, waste lands, Agricultural fields, and along the roadsides.

Native/Exotic: Introduced

Phenology: April to October

Flowers: Flowers are born at the tip of branches, in pair or more, with two sepals and five yellow petals; flowers are bisexual.

Fruit: A unique type of capsule, dehiscing through lid. Seeds are numerous and tiny.

Ecological role: Is known for its ability to grow in poor, compacted soils. Its extensive root system helps to break up hard soils, improving soil structure and increasing aeration. The plant produces small, bright yellow flowers that attract various pollinators, including bees and other insects. These pollinators play a crucial role in the reproduction of many plants in the ecosystem, thereby supporting biodiversity.

Local use: Young plant, leaves and stems are eaten raw in salads and even cooked as leafy vegetable, rich in nutrients and minerals, also grown as a wild edible.

Bioindicator: Heavy metals, Alkaline soil.

Control measure: Consider as a noxious weed in india, manual uprooting and mulching on soil can help to some extent but use of herbicides is preferred, pre-emergent and post emergent herbicides can be used.

IUCN category: Least Concern

Potentilla supina L.

Vernacular name:	Not known
Common name:	Spreading Cinquefoil and downy cinquefoil
Family:	Rosaceae
Genus:	*Potentilla*
Species:	*supina*
Distribution:	The plant is native to temperate and subtropical northern hemisphere, some parts of North & South Africa and Asia including, China, India, Nepal, Pakistan, Thailand, Tibet, Vietnam etc.
Habit:	Annual or biennial prostate to suberect spreading herb with alternately arranged leaves; pinnate or trifoliate, dissected, hairs present of the leaf margin and petiole.

Habitat: **Prefers wet sandy habitats, around the main water channel, ditches, pools and wetlands.**

Native/Exotic: Native

Phenology: June to September

Flowers: Born in the axile of leaves, are having long pedicel densely hairy, sepals and petals 5 arranged alternate to each other, petals are two times smaller than sepals and yellow in colour, stamens and carpels numerous arranged on a swollen thalamus.

Fruit: Seeds grows with in cylindrical seed pod with a corky appendage.

Ecological role: This species is a prominent part of amphibious vegetation growing in the river Ganga and its tributaries. Caterpillar of order Lepidoptera feed on this as larval host plant and many visits flower on regular basis.

Local use: The species is known to treat inflammation and gastrointestinal disorders. Roots are known to help in tooth ache, leaves are used as vegetable as emergency food.

Bioindicator: Not known.

Control measure: It grows sparsely among the riverain vegetation and in riverbed agricultural beds which can easily hand plucked/pulled.

IUCN category: Least Concern

Pupalia lappacea (L.) Juss.

Vernacular name:	Chirchitta
Common name:	Forest Burr, creeping cock's comb
Family:	Amaranthaceae
Genus:	*Pupalia*
Species:	*lappacea*
Distribution:	India, Bangladesh, Sri Lanka, Afghanistan, Sudan, Pakistan, Ethiopia, Jawa, Kenya, Central African Repu, Madagascar etc.
Habit:	Perennial branched erect or decumbent spreading herb.
Habitat:	Grows in drying wetlands and in and around the river banks, generally seen growing in between ziziphus bushes.

Native/Exotic: Native

Phenology: August to November

Flowers: Inflorescence is long slender racemes called as spike; sessile Flowers are arranged in clusters of 2-3. Tepals 5, woolly at the base, anthers 5. Old flowers are covered with clusters of hooked bristles.

Fruit: Single seeded achenes covered with clusters of hooked bristles.

Ecological role: Bushy habit and tangling with other shrubs create hideout for birds and small mammals.

Local use: The seeds are balled to filter milk. Flowers are used as an ingredient for rat poison. Young leaves are used as vegetable.

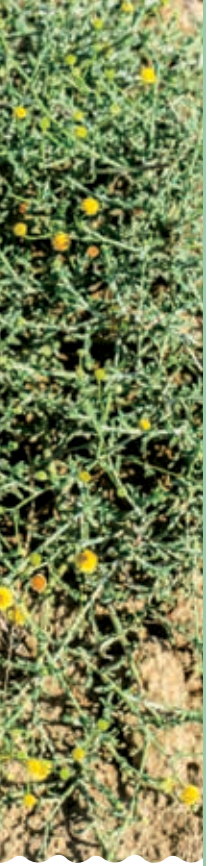
Bioindicator: Not Known (grows in fertile soils)

Control measure: Mechanical uprooting along with spreading of weedicides, the collected plant should burn to control further spread.

IUCN category: Least Concern.

Pulicaria undulata
(L.) C.A. Mey.

Vernacular name:	Soneli, Dhola lizru.
Common name:	Desert Golden Daisy.
Family:	Asteraceae
Genus:	*Pulicaria*
Species:	*undulata*
Distribution:	India, Pakistan, Iran, Iraq, Afghanistan, Sudan, Yemen.
Habit:	Annual decumbent or erect herb up to 50 cm.
Habitat:	Grows in lose sandy river bed, can be found in dry and wet conditions.



Native/Exotic: Native

Phenology: August to April.

Flowers: Beautiful yellow heads grow solitary on the tip of branch, both ray and disk florets are present

Fruits: Fruit is single seeded, dry with papus called as cypsela

Ecological role: Produces many flowers during the summers, hence attracts many insects like flies, bees, bugs, butterflies etc.

Local use: Plant is used in treatment of back pain, menstrual cramps, dysentery, headache and also know for anti-inflammatory, antioxidant and antibacterial properties. The plant is slightly aromatic and is sometimes sold in local markets, along with that used in making traditional perfumes and preparing tea.

Bioindicator: Not known

Control measures: Can be controlled by manual uprooting as required, but generally grows on boundaries of farms in the river bed and in exposed sandy beds hence do not cause any weedy effect.

IUCN category: Not known

Rumex dentatus L.

Vernacular name:	Jangli palak, Ambavati
Common name:	Toothed Dock
Family:	Polygonaceae
Genus:	*Rumex*
Species:	*dentatus*
Distribution:	This species is native to Indochina region including Afghanistan, India, Bangladesh, Nepal up to Yemen.
Habit:	Annual 30-70 cm tall herb with basal broad ovate leaves and fewer stem leaves.
Habitat:	Amphibious herb grows in shallow water and wet places along the river stretch but can also grow in dry conditions.

Native/Exotic: Native

Phenology: February to May

Flowers: Born on clusters on the nodal region of stem, flowers are green, stalked and with six tepals, the inner tepals are with spiny edges.

Fruit: Simple dry achene up to 3-3.5 mm long.

Ecological role: This species is known to have allelopathic activity and can be seen growing in monotonous patches, also grows as a ruderal species in disturbed landscapes. Dense growth provides hideout for small insects and mammals.

Local use: Tender aerial parts of the plants are used as vegetable. Leaf root & stem are used to treat pneumonia, cough, stomach-ache, smallpox and abscesses.

Bioindicator: Heavy metals, pollution.

Control measure: It is well known weed for its weed resistance, hence removing plant with help of sickle or ploughing the land along with removing all the plant material is preferred.

IUCN category: Least Concern

Salvia plebeia R.Br.

Vernacular name:	Kamrkash
Common name:	Sage Weed, Indian sage
Family:	Lamiaceae
Genus:	*Salvia*
Species:	*plebeia*
Distribution:	Native range of this plant is from Iran, South Russia, Vietnam, North Sumatera up to East Victoria including India, Nepal, Pakistan, China, Bangladesh Etc.
Habit:	Annual, Erect Branched woody herbaceous aromatic plant with opposite ovate-lanceolate leaves
Habitat:	Prefers to grow along the stream sides, river bank edges, wet places and in agricultural fields.

Native/Exotic: Native

Phenology: October to December

Flowers: Inflorescence is verticillaster of 5-8 flowers arranged in terminal racemes, flowers are tiny white in colour, zygomorphic & bilipped.

Fruit: Enclosed in persistent calyx nutlets are obovoid.

Ecological role: Plant produces flowers in large numbers which are pollinated by bees and flies. Allelopathic effects are known from this species.

Local use: Plant is traditionally used for the treatment of common cold, diarrhea and hepatitis. Also known for benefit like enhance brain function, improve memory and delay age associated cognitive decline.

Bioindicator: Eutrophication

Control measure: Can become a weed in river bed agriculture, where it can be easily uprooted by hands, herbicides can also be helpful over large areas.

IUCN category: Not Known

Scoparia dulcis L.

Vernacular name:	Mithi patti
Common name:	Sweet-broom
Family:	Plantaginaceae
Genus:	*Scoparia*
Species:	*dulcis*
Distribution:	**Native to:** Alabama, Bahamas, Brazil, Colombia, Mexico, Florida. **Introduced to:** Andaman Islands, Sri Lanka, Thailand, Saudi Arabia, India.
Habit:	Annual or perennial branched sub-shrub, with opposite decussate leaves growing up to 1.5 m tall.

Habitat: Generally found growing near the flowing streams in wet sand, also on river banks and clayey soil.

Native/Exotic: Introduced

Phenology: June to November

Flowers: Flowers are born in leaf axiles and contains 4 sepals and 4 petals; white flowers are densely hairy at base of ovary with 4 stamens protruding outside.

Fruit: The ovary is superior and forms a globose capsule with many tiny seeds, calyx is persistent during the development of capsule.

Ecological role: It is considered as weed in many parts of India, which generally grows in farms and waste lands.

Local use: It is used traditionally for the treatment of diabetes, hypertension and kidney stones. The fresh or dried plants are said to kill fleas, lice and intestinal worms

Bioindicator: Not known.

Control measures: On small scale manual uprooting can help and on large scale infestation herbicides like 2,4-D can be used.

IUCN category: Not known

Spergula arvensis L.

Vernacular name:	Jhyaau Jhaar
Common name:	Corn Spurry
Family:	Caryophyllaceae
Genus:	*Spergula*
Species:	*arvensis*
Distribution:	Native range of plant extents from Europe to Central and south Africa including India & Nepal.
Habit:	Annual branched, erect or diffuse herbs up to 20 cm with long linear leaves arranged in whorls at nodes.
Habitat:	Generally found growing in wet and damp places on river banks.

Habitat: **Generally found growing in wet and damp places on river banks.**

Native/Exotic: Native

Phenology: October to March

Flowers: White coloured flowers are complete, having five petals and five sepals which are alternate to each other, ten stamens and styles three which are free from base.

Fruit: Ovoid glabrous capsules with tiny black shining seeds.

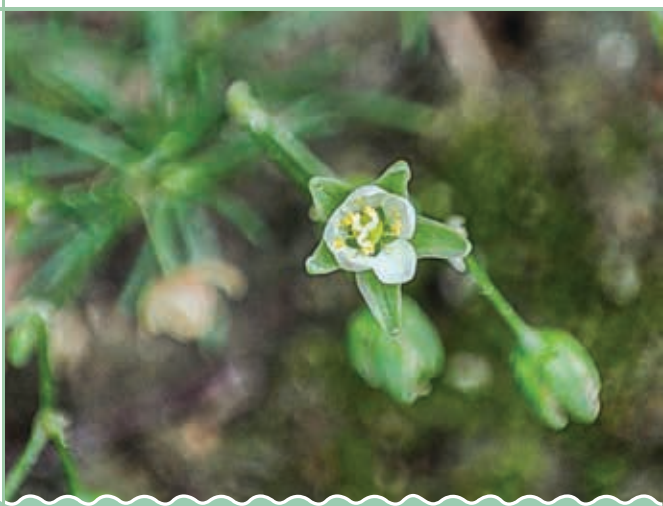
Ecological role: It is readily eaten by life stocks and also act as alternative host for many viruses.

Local use: Can be used as forage for livestock, particularly in areas where other forage options might be limited. It has been used to treat digestive issues, particularly as a mild laxative, and to address skin conditions such as rashes and inflammations.

Bioindicator: Not known

Control measure: Primary control method includes winnowing of crop seeds before sowing, hand pulling and grazing is also preferable to control plant in farms. Adding lime to soil can also help.

IUCN category: Not Known



Tribulus terrestris L.

Vernacular name:	Gokharu
Common name:	Puncture Vine
Family:	Zygophyllaceae
Genus:	*Tribulus*
Species:	*terrestris*
Distribution:	Native to old world; India, Bangladesh, Nepal, Sri Lanka, Pakistan & in African countries.
Habit:	Prostate, spreading branched annual herbs.
Habitat:	Grows in wet sandy beds of river Ganges and its tributaries, also grows on banks of agricultural fields, along the railway tracks & roadsides.

Native/Exotic: Native

Phenology: April to September

Flowers: Yellow flowers are born in leaf axils on a short pedicel, petals 5, stamens 10, style variable; long or short, ovary bristly.

Fruit: A schizocarp, splitting into 4-5 woody cocci, each cocci with two spines.

Ecological role: It is a very common plant having fruits with spines meant for dispersal by animals, flowers are frequently visited by bees, and the style is variable which helps in cross pollination.

Local use: The seeds are collected and sold in market, plant is known for properties like helps to expel kidney stones, as a diuretic and tonic, to improve sexual function, heart problem etc.

Bioindicator: Not known

Control measure: This species can act as a noxious weed if allow to grow in fallow lands, fruits have spines hard enough to puncher tiers of vehicles and very painful if step on them. Mechanical uprooting & ploughing of land is helpful along with burning of plant material to avoid further invasion.

IUCN category: Least Concern

Vicoa indica (L.) DC.

Vernacular name:	Bichhloo
Common name:	Sonkadi
Family:	Asteraceae
Genus:	*Vicoa*
Species:	*indica*
Distribution:	India, Myanmar, Nepal, Pakistan, Senegal, Sri Lanka, Thailand, Vietnam, Central Africa.
Habit:	1-2 feet tall annual herb, much branched in upper region but supported by a single unbranched stem.
Habitat:	Generally grows in grasslands of the riverbed and outside the forested areas.

Native/Exotic: Native

Phenology: June to September

Flowers: Yellow heads that's grows at the tip of every branch, flower contains both ray and disk florets.

Fruits: Dry indehiscent achene called as cypsela having a crown of hairs for dispersal by the wind.

Phenology: Almost throughout the year.

Ecological role: Plant is pollinated by various types of insects and the availability of flowers in dry seasons ensure the food supply for them, sometimes plant is preferred for grazing by herbivores. The plant can grow in extreme climatic conditions and also found growing in disturbed habitats.

Local use: Roots are uses for kidney troubles and leaves for stomach problems, supervised dose of plant possessed antifertility activity in females and used by tribal peoples.

Bioindicator: Not known

Control measures: Manual uprooting is effective except this organic weedicide are also useful, ploughing of agricultural lands is also helpful.

IUCN category: Not Known

SEDGES AND RUSHES

'SEDGES HAVE EDGES, RUSHES ARE ROUND, GRASSES HAVE KNEES THAT BEND TO THE GROUND'

THE 'KNEES' OF GRASSES ARE JOINT-LIKE NODES FOUND ALONG ROUND, HOLLOW STEMS. THE STEMS OF SEDGES AND RUSHES ARE SOLID; IN CROSS-SECTION THE STEMS OF RUSHES ARE ROUND, WHILE THOSE OF SEDGES ARE TRIANGULAR AND SO HAVE EDGES.

Bolboschoenus maritimus
(L.) Palla

Vernacular name:	Not known
Common name:	Cosmopolitan bulrush
Family:	Cyperaceae
Genus:	*Bolboschenus*
Species:	*maritimus*
Distribution:	This species is cosmopolitan in distribution, native to temperate to subtropical areas including India, Pakistan, Afghanistan, Bangladesh, Myanmar etc.
Habit:	Perennial clum forming rhizomatous sedge which spreads through underground rhizomes.
Habitat:	Grows in shallow pools, ditches and around the wetlands, also seen growing the drying river bed.

Native/Exotic: Native

Phenology: June to September

Flowers: Arranged in topped capitulum on leaf having 2-3 involucral of bract. Glumes are orange-brown, stamens ± 2, equal to the length of style.

Fruit: Nutlets are dark brown, obovoid and biconvex.

Ecological role: Plant forms clums which are a preferred hideout for insects, seeds are eaten by waterfowl and stems used as nesting material, In Ganga and its tributary, when riverbeds are drying, this species is among the first who colonise the vast wet sand and clay sandy beds. This species is can be effectively use for reconstruction of wetlands.

Local use: Rhizomes are known to be used as astringent and diuretic. Sometime used for habitat creation for wetland species.

Bioindicator: Healthy and undisturbed habitat.

Control measure: Species is considered as a weed in rice farms which can removed by hand plucking and rotary weeding followed by removal of rhizomes from the cultivation area.

IUCN category: Least Concern

Bulbostylis barbata
(Rottb.) C.B.Clarke

Vernacular name:	Masa
Common name:	Bearded Watergrass
Family:	Cyperaceae
Genus:	*Bulbostylis*
Species:	*barbata*
Distribution:	Native range of this species extents from tropical and subtropical Old World including India, Bangladesh, Southeast China, Philippines, Thailand & Western Australia.
Habit:	Annual, tufted clumed sedge with fibrous roots and without any stem modification up to 12cm in hight.
Habitat:	Grows in sandy riverbed of Ganga and its tributary around the shallow pools and streams side.

Native/Exotic: Native

Phenology: June to September

Flowers: Inflorescence is terminal capitulum having involucre of bracts, Spikelets ovoid, glumes brown to yellow green, Stamen ± 1, stigma 3.

Fruit: Nutlet brown, three sided obovoid.

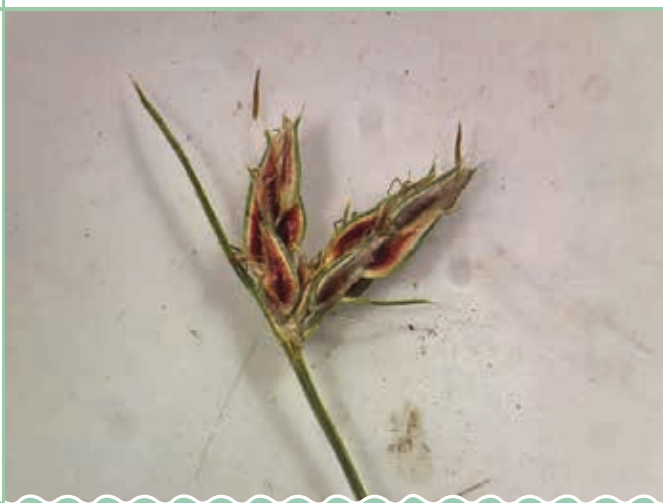
Ecological role: Plant have ability to survive in dry sand and produce flowers and seeds, which can remain viable for longer times till habitat becomes suitable for pioneer communities.

Local use: Plant has been recorded for having antibacterial activity. Decoction of whole plant is given for the treatment of dysentery.

Bioindicator: Healthy and undisturbed habitat.

Control measure: can act as a weed in seasonally flood agricultural lands, where seed germination occurs during the month of June after plowing, hence weedicides are suggested but manual uprooting and removal of plants before flowering is also preferred.

IUCN category: Least Concern



Cyperus compressus L.

Vernacular name:	Jhusuna
Common name:	Poorland Flat Sedge
Family:	Cyperaceae
Genus:	*Cyperus*
Species:	*compressus*
Distribution:	Plant is native to tropical and subtropical regions of world including India, Bangladesh, Pakistan, South China etc.
Habit:	Annual unbranched herb up to 40cm tall.
Habitat:	Prefers to grow in wet and damp soil, stream sides, wetlands and shallow pools.

Native/Exotic: Native

Phenology: June and September

Flowers: Inflorescence is simple anthela with broad spike. Glumes straw coloured, Stamens 3, style 3.

Fruit: Nutlet dark brown, obovoid.

Ecological role: Plant has a fibrous root system that helps bind the soil, reducing erosion, especially in areas prone to water runoff or wind erosion.

Local use: Plant is consumed as green fodder by domestic animals thus collected from wild or grazed.

Bioindicator: Eutrophic waterbody, poor land.

Control measure: Hand plucking is best practice to control this plant as weed or mowing and ploughing are also effective.

IUCN category: Least Concern

Cyperus cyperoides (L.) Kuntze

Vernacular name:	Kode jhar
Common name:	Common Flat Sedge
Family:	Cyperaceae
Genus:	*Cyperus*
Species:	*cyperoides*
Distribution:	Plant is native to Asia & Africa including Bangladesh, Cambodia, Pakistan, Philippines, India, Thailand, Nepal etc.
Habit:	Perennial rhizomatous sedge. Tufted tall up to 70 cm.
Habitat:	Prefers to grow in open grasslands and sunny areas, around ditches and shallow pools.

Native/Exotic: Native

Phenology: June to September

Flowers: Inflorescence is a compound anthela with involucre of bract longer than the inflorescence. Spikes cylindric with yellow green glumes, 3 anthers and 3 stigmas.

Fruit: A three sided nutlet of straw coloured.

Ecological role: Rhizomes hold the soil tight and also help in waster penetration into the ground.

Local use: Plant is collected from wild for its rhizomes, as a source of food and leaf as medicine and other use.

Bioindicator: Healthy and undisturbed habitat.

Control measure: If the plant is growing in agricultural land, best way of control is to properly mow and plough the land and remove the rhizomes from soil.

IUCN category: Least Concern

Cyperus difformis L.

Vernacular name:	Dila
Common name:	One-arm sedge, Variable Flat sedge
Family:	Cyperaceae
Genus:	*Cyperus*
Species:	*difformis*
Distribution:	This species is probably native to old world including India, Afghanistan, Pakistan, Bangladesh, Sri Lanka, Turkey, Myanmar.
Habit:	Annual fast-growing sedge of wetlands with long liner leaves and soft stem, grows up to 30-50 cm long.
Habitat:	Prefers shallow waters, streams side, ditches and seasonal pools.

Native/Exotic: Native

Phenology: June to September

Flowers: The spikelets are arranged in a dense capitulum, spikelet compressed, ovoid. Glumes dark purple, stamens 1 or 2, style very short.

Fruit: Nutlets, ellipsoid, yellowish as long as glume.

Ecological role: Fibrous root system that helps bind the soil. By stabilizing the soil, it prevents the loss of topsoil and maintains soil health.

Local use: Plant has antibacterial activity, antioxidant properties and also a good herbal fodder for the dairy animals.

Bioindicator: Eutrophic water bodies, mineral rich water.

Control measure: Hand and mechanical weeding during pre-emergence of plant in field is suggested.

IUCN category: Least Concern

Cyperus iria L.

Vernacular name:	Moth
Common name:	Rice Flat Sedge
Family:	Cyperaceae
Genus:	*Cyperus*
Species:	*iria*
Distribution:	Species is native to Subtropical and Tropical Old world including Central Asia.
Habit:	Annual or sometimes perennial sedge which do not have any stem modification, leaves are basal liner and few in number.
Habitat:	Grows as marginal species around the edge of wetlands and river, also grows in shallow pools formed during rainy season.

Native/Exotic: Native

Phenology: June and September

Flowers: Inflorescence is a compound or simple anthela where spikelets are arranged in lax, Glumes yellow ovate, bracts always larger than the inflorescence.

Fruit: Nutlet dark brown as long as glume, obovoid.

Ecological role: Species is also an important landscape modifying seasonal species as it single plant can produce 5000 or more seeds during monsoon season and can survive even after the land is dry.

Local use: Plant is used as a medicinal tonic, astringent and also useful in treatment of rheumatism, menstrual problems etc.

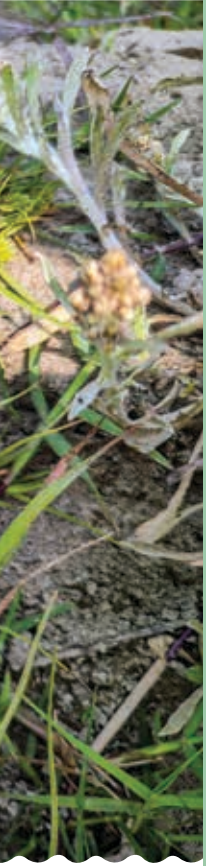
Bioindicator: Eutrophic water bodies, mineral rich water.

Control measure: Considered as one of the major weed in rice field, seedlings emerge as soon as rice is transplanted. Hand weeding at early stage to avoid flowering, also rotary weeding in field is effective.

IUCN category: Least Concern

Cyperus michelianus subsp. *pygmaeus* (Rottb.) Asch. & Graebn.

Vernacular name:	Not known
Common name:	Pygmy Sedge
Family:	Cyperaceae
Genus:	*Cyperus*
Species:	*michelianus subsp. pygmaeus*
Distribution:	Native to Old world countries including India, Pakistan, Thailand, Tibet, Sri Lanka, Saudi Arabia, South Australia etc.
Habit:	Annual tufted sedge with tri-angular stem and leaves as long as the stem.



Habitat: Grows around the stream sides, around the shallow pools and ditches, extensively grows in agricultural lands as a weed. Prefers wet sandy and loamy substrate.

Native/Exotic: Native

Phenology: June to September

Flowers: Inflorescence capitate, pyramidal, spikelets are arranged densely and are stalkless. Glumes yellowish, stamens ± 1and a style is long.

Fruit: Nut lets narrow oblong with 3 sides and hyaline cells are white.

Ecological role: This species branches spreading which forms green mat on soil, thus help in water retention and protects soil from been wash off.

Local use: During rainy season this species is extensively used and harvested from wild as green fodder for domestic animals.

Bioindicator: Fertile soil.

Control measure: It grows a major seasonal weed in riverbed agriculture and can be easily controlled by removing plant with the help of sickle. Plants uprooted should be removed from the fields.

IUCN category: Least Concern

Fimbristylis ovata
(Burm.f.) J. Kern

Vernacular name:	Bhulna
Common name:	One-Spike Fimbry
Family:	Cyperaceae
Genus:	*Fimbristylis*
Species:	*ovata*
Distribution:	Plant is native to Tropics and Subtropics of world including India, Bahamas, Bangladesh, Madagascar, Sri Lanka, Ghana, Yemen, Zambia etc.
Habit:	Perennial sedge up to 35-40cm tall, with slender long leaves.
Habitat:	Prefers to grow on moist hillsides, Grassland, Streamside.

Native/Exotic: Native

Phenology: December to March

Flowers: Inflorescence is terminal spikelet, with distichous yellowish glumes. Stigma and style three.

Fruit: Nutlets obovoid, verruculose.

Ecological role: Has a dense, fibrous root system that binds soil particles together, helping to stabilize the soil and prevent erosion. This is especially important in areas prone to flooding or heavy rainfall, where the plant helps maintain the integrity of riverbanks and wetlands by reducing soil loss.

Local use: Plant is sometimes grazed by domestic animals.

Bioindicator: Heavy metal

Control measure: Mowing and ploughing of farms can be very effective to control this plant.

IUCN category: Least Concern

Juncus bufonius L.

Vernacular name:	Not known
Common name:	Toad Rush
Family:	Juncaceae
Genus:	*Juncus*
Species:	*bufonius*
Distribution:	This species has cosmopolitan distribution over tropical to subtropical and temperate regions of world including India, Pakistan, Nepal, Bangladesh, Sri Lanka, Myanmar etc.
Habit:	Annal tufted rush with many slender branches having long linear leaves and flowers at the tip.
Habitat:	Prefers wet sandy substrate and places which were flooded previously

Native/Exotic: Native

Phenology: June to September

Flowers: Inflorescence is terminal lax of 4-5 flowers, Flowers bisexual with 6 tepals which are sepaloid outside and petaloid inside with six stamens and trifid stigma; style absent. Bract membranous.

Fruit: A trilocular capsule with multiple minute seeds.

Ecological role: Its presence (fibrous root system) in disturbed soils, such as those found in agricultural fields or along water bodies, helps to stabilize the soil and prevent it from being washed away during heavy rains or flooding.

Local use: Plant is collected from wild as green fodder for domestic animals.

Bioindicator: Undisturbed habitat.

Control measure: If growing as weed in agricultural lands can easily remove with help of sickle. Ploughing can also be effective.

IUCN category: Least Concern

Juncus prismatocarpus R.Br.

Vernacular name:	Not known
Common name:	Branching rush, prism-fruited rush
Family:	Juncaceae
Genus:	*Juncus*
Species:	*prismatocarpus*
Distribution:	Native to Indian peninsula and East Asian countries including Myanmar, New Zealand, Thailand, Vietnam etc.
Habit:	Annual or perennial tufted erect branched herb; terete stem.
Habitat:	Grows on riverbed islands, stream sides, around the wetlands and shallow pools, prefers sandy substrate.

Native/Exotic: Native

Phenology: Around the year

Flowers: Terminal globose heads with 4-8 flowers, involucral leaf like bract shorter than the inflorescence. Flowers bisexual, perianth 6, stamens 3 with a long style stigma bifid.

Fruit: Capsule with one locule and small yellow seeds.

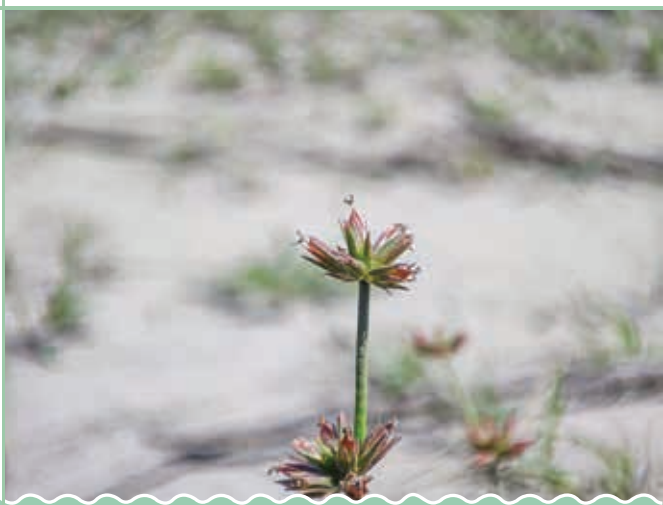
Ecological role: Has a fibrous root system that helps bind soil particles together, reducing erosion in wet, muddy environments.

Local use: Traditionally known to be used for bone diseases.

Bioindicator: Undisturbed habitat.

Control measure: Can grow as an unwanted plant in seasonally flooded agricultural land where this species can easily be managed by mowing and ploughing of land or either by hand plucking and removing the plant material from land.

IUCN category: Least Concern



GRASSES

PLANTS THAT BELONG TO THE FAMILY POACEAE (ALSO KNOWN AS GRAMINEAE) ARE KNOWN AS GRASSES. GRASSES ARE

CHARACTERIZED BY THEIR NARROW LEAVES WITH PARALLEL VEINS, HOLLOW STEMS, AND SIMPLE, OFTEN INCONSPICUOUS FLOWERS.

Chloris barbata Sw.

Vernacular name:	konda-pullu, gondvel, tan, Chevvarakupul, Kotai-p-pul, Uppu gaddi
Common name:	Swollen Finger Grass, airport grass, feather finger grass, fingergrass, pea-cock plumegrass, plush grass, purpletop chloris, swollen fingergrass, swollen windmill grass
Family:	Poaceae
Genus:	*Chloris*
Species:	*barbata*
Distribution:	Native to tropical America; introduced in tropics of South and South-East Asia as aggressive weeds. Widespread in the tropics and sub-tropics.
Habit:	A tufted, erect, annual or short-lived perennial grass.

Habitat: **Degraded forests, wasteland and riversides.**

Native/Exotic: Exotic

Phenology: August to December

Flowers: Purple, wedge-shaped and fleshy.

Fruit: Caryopsis

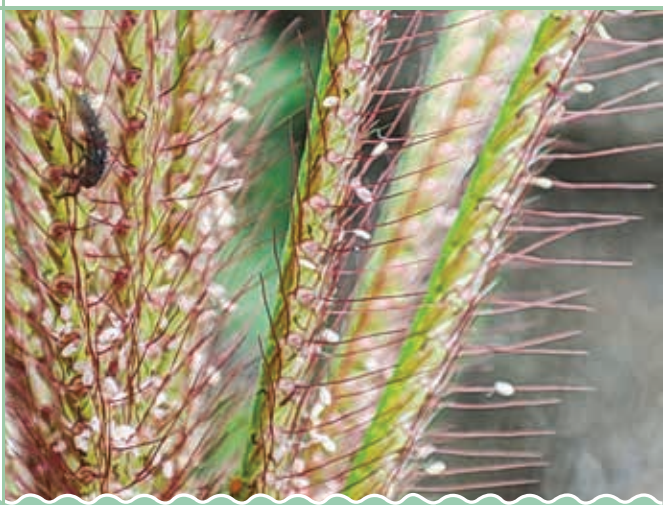
Ecological Role: Ruderal species, is considered an invasive weed species and is host to a number of serious agricultural pest species. It is used as revegetation, fodder, and forage grass.

Local use: Anti-diabetic, analgesic, antibacterial, anti-hyperlipidaemic. Used to treat rheumatism in traditional medicine. The leaf paste is used externally for skin disorders leaves juice used in fever, diarrhoea and diabetes.

Bioindicator: Heavy metals

Control Measures: Hand-pulling can prove to be effective.

IUCN category: Not known



Cynodon dactylon (L.) Pers.

Vernacular name:	Dhoob, dubo
Common name:	Bermuda grass, Couch grass
Family:	Poaceae
Genus:	*Cynodon*
Species:	*dactylon*
Distribution:	Grass found worldwide. It is native to Europe, Africa, Australia and much of Asia.
Habit:	Long-lived (perennial) grass
Habitat:	Prefers moist and warm climates with high light. Common in upland rice, moist but not flooded soils, particularly in areas regularly disturbed. This species is adapted to a wide range of soils with a

preference for the sandy, muddy and well drained soils.

Native/Exotic: Native

Phenology: March to September

Flowers: Usually, 3-6 racemes or consists of several (usually 4-5) slender, purplish spikes up to 10 cm or 60 mm long, arising in a star-like arrangement from the end of stem. Along the underside of the spikes the numerous, sessile spikelets are arranged in two rows. Each spikelet contains a single floret 2.5 mm long and there are not bristles.

Fruit: Caryopsis

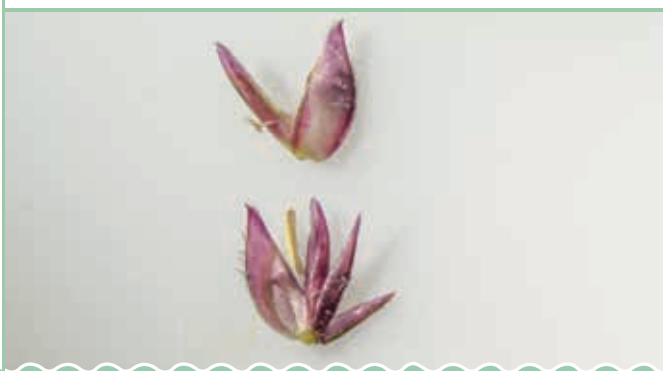
Ecological Role: Can be an invasive and competitive weed. The extensive stolon and rhizome system provide a means of rapid expansion.

Local use: As a remedy for indigestion and it is using as pasture grass. Also plays an important role in conservation, because it prevents soil erosion.

Bioindicator: Sodic soil (is the presence of a high proportion of sodium ions relative to other cations).

Control Measures: The plants with creeping stolons on the soil surface can be controlled by frequent shallow cultivation and removing the weed to prevent re-rooting. Rhizomatous ones are more difficult to control. Several dry-season cultivations can be effective if the rhizomes are brought to the surface, where they are killed by desiccation. This usually requires tractor-drawn implements, especially where deep rhizomes are present.

IUCN category: Not know



Dactyloctenium aegyptium (L.) Willd.

Vernacular name:	Makra, Pungphai
Common name:	Crowfoot Grass, beach wiregrass, coast button grass, comb fringe grass, Duck grass, Durban crowfoot, Egyptian fingergrass, Egyptian grass, finger comb grass, four-finger grass
Family:	Poaceae
Genus:	*Dactyloctenium*
Species:	*aegyptium*
Distribution:	Crowfoot Grass is native to Africa, but naturalized world-wide.
Habit:	Spreading annual herb
Habitat:	It is a very common weed of open spaces and wasteland.

Native/Exotic: Exotic

Phenology: Throughout the year

Flowers: Flowers arise in 1-7 spikes, 1-6.2 cm long, 3-7 mm wide, at the tip of stems.

Fruit: Caryopsis

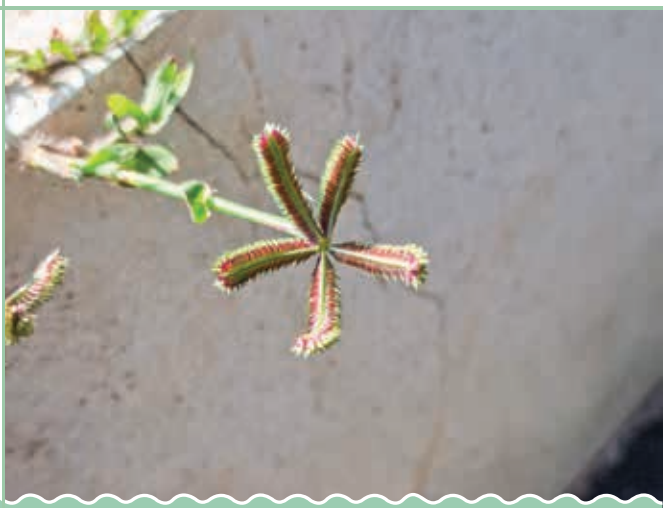
Ecological Role: It is one of the most drought-resistant grasses as it can quickly grow and seed during the wet season. It is considered a weed in major parts of the country.

Local use: In Manipur, juice of fresh plants is prescribed in fevers. Decoction of the plant is given in small pox. Mainly used as a fodder.

Bioindicator: High metal concentrations

Control Measures: Intercropping (pea/soyabean) with leafy crops is used extensively to suppress weed growth.

IUCN category: Least Concern



Desmostachya bipinnata
(L.) Stapf

Vernacular name:	Kush, Darbha, Daabh
Common name:	Kusha Grass
Family:	Poaceae
Genus:	*Desmostachya*
Species:	*bipinnata*
Distribution:	Grass is native to India, Bangladesh, Nepal, Pakistan and North eastern countries.
Habit:	Perennial rhizomatous stout grass, up to 2m tall and leaves are about 70 cm long.
Habitat:	Grows in area where water table is near surface i.e., on the river banks, flood plains of river and around the wetlands.

Native/Exotic: Native

Phenology: May to November

Flowers: Inflorescence is long raceme about 50-70 cm tall, spikelets are elliptic-oblong, glumes ovate, lemmas are straw-coloured.

Fruit: A caryopsis (Nut).

Ecological role: This is very hard and stout grass species which can grow well in arid regions also useful as soil binder. Creates microhabitat for many small species of reptiles, mammals and insects. Can survive in saline conditions.

Local use: Plant is long known for its cultural significance and also use to prepare mats for sitting purpose during pooja and medication. Traditionally plant is use to treat dysentery.

Bioindicator: Arid regions, Saline conditions

Control measure: Hand pulling might not be possible to control this grass effectively if growing as weed in agricultural lands, best way is to do mowing and ploughing along with removal of rhizomes.

IUCN category: Least Concern

Dichanthium annulatum (Forssk.) Stapf

Vernacular name:	Diaz bluestem, Hindi grass, marvel grass, Angleton Grass
Common name:	Sheda Grass, bluestem
Family:	Poaceea
Genus:	*Dicanthium*
Species:	*annulatum*
Distribution:	Pantropical. Native to northern Africa, Middle East to India and Indonesia.
Habit:	A perennial densely tufted grass
Habitat:	Waste lands, unused grounds

Native/Exotic: Native

Phenology: November to March

Flowers: Racemes sub-digitately fascicled, pinkish or nearly white.

Fruit: Caryopsis

Ecological Role: Grows in hedges and on roadsides stabilizing soil and preventing erosion, especially in arid and semi-arid regions. It supports biodiversity by providing habitat and forage for livestock and wildlife. Additionally, its resilience to drought makes it valuable for restoring degraded lands.

Local use: It is widely used as a high-quality pasture grass for grazing and hay production, contributing to sustainable livestock farming in rural areas.

Bioindicator: Not known

Control measures: In farming regions, this species can be controlled by manual weeding with angady.

IUCN category: Not known

Imperata cylindrica
(L.) Raeusch.

Vernacular name:	Uloo, Dhab, Khans
Common name:	Cogon grass, Cotton grass, etc.
Family:	Poaceae
Genus:	*Imperata*
Species:	*cylindrica*
Distribution:	Perennial rhizomatous grass native to tropical and subtropical Asia to Medit. to Africa and Afghanistan.
Habit:	Grass
Habitat:	Found in a wide range of habitats including grassland, cultivated annual crops, plantations, abandoned farm land, road and railway embankments, reclaimed mined areas, pine and hardwood forests, recreational areas and deforested areas

Native/Exotic: Native

Phenology: March to July

Flowers: The inflorescence is a cylindrical fusiform panicle, loose and silky. It is silvery-white in colour, dotted with orange stamens and brown stigmas.

Fruit: Caryopsis

Ecological Role: Cogon grass is ranked as the seventh worst weed globally due to its aggressive spread and flammability. As a pyrophyte, it thrives in disturbed areas and promotes frequent wildfires. Its dense growth and substantial biomass create a significant fuel load, allowing wildfires to burn more rapidly, intensely, and at higher temperatures.

Local use: It is used for thatching the roofs of traditional homes. Other uses include paper-making, thatching and weaving into mats and bags and as ornamental plants. Young inflorescences and shoots may be eaten cooked, and the roots contain starch and sugars and are used in traditional medicine.

Bioindicator: Degraded soils

Control Measures: Control is typically by the use of herbicides and controlled fire treatments. The legume vine Mucuna pruriens is used in the countries of Benin and Vietnam as a biological control for *Imperata cylindrica*.

IUCN category: Least Concern

Paspalum distichum L.

Vernacular name:	Janai ghans
Common name:	Water finger-grass
Family:	Poaceae
Genus:	*Paspalum*
Species:	*distichum*
Distribution:	Native to new world, introduced in India, China, Pakistan, Bangladesh.
Habit:	Perennial, suberect to prostrate, spreading grass with rooting at nodes. Leaves linear, lance shaped.
Habitat:	Grows prominently in shallow water pools, and on margins of wetlands.

Native/Exotic: Introduced

Phenology: Throughout the year

Flowers: Inflorescence raceme of two spikelets, flower ovate, lower glume absent or scale like, upper glume papery, stamens 3, stigma feathery pink in colour.

Fruit: A caryopsis.

Ecological role: Fast growing grass, nodes where ever touches ground starts rooting, help to cover and bind the soil. Able to grow in saline condition. Plant is eaten by many water-birds and is alternative host for many parasitic fungi.

Local use: Plant is preferred by livestock as green fodder.

Bioindicator: Saline conditions.

Control measure: Plant is tolerant to many pre and post emergent herbicides, best way to control this introduced grass is grazing by livestock in the farms. Hand weeding, deep plowing can be effective machinal control.

IUCN category: Least Concern

Source: efloraindia.com

Perotis indica (L.) Kuntze

Vernacular name:	Kuras
Common name:	Indian Comet grass
Family:	Poaceae
Genus:	*Perotis*
Species:	*indica*
Distribution:	India, Nepal, Sri Lanka, Myanmar, Malaya, Southeast Asia
Habit:	Annual, tall, slender, erect or suberect grass
Habitat:	Wastelands

Native/Exotic: Native

Phenology: Throughout the year

Flowers: Spike long, compact, violet-purple. Spikelets subterete, narrowly linear, scabrous.

Fruit: Caryopsis

Ecological Role: Plays a role in soil stabilization and erosion control, particularly in sandy or disturbed areas.

Local use: Locally, it is used as fodder for livestock, especially in dry regions where other forage options are limited, and is sometimes utilized in traditional medicine for treating minor ailments.

Bioindicator: Contaminated soils

Control measures: Satisfactory control can be obtained by combining timely cultivation, crop rotation and herbicide applications.

IUCN category: Not known

Polypogon monspeliensis (L.) Desf.

Vernacular name:	Malhar
Common name:	Annual beard-grass, Annual rabbit's-foot grass
Family:	Poaceae
Genus:	*Polypogon*
Species:	*monspeliensis*
Distribution:	Native to Europe and Asia. Widespread cosmopolitan weed.
Habit:	Annual grass
Habitat:	Rabbits foot grass prefers moist to wet conditions, including meadows, streams, ponds, lakes, ditches, seasonally wet locations, and disturbed sites.

Native/Exotic: Exotic

Penology: April to August

Flowers: Flower-head is a soft, cigar-shaped, dense panicle from 2-15 cm long and 1-3.5 cm wide, pale yellow-green with a silvery tinge to yellowish-brown with maturity.

Fruit: Caryopsis

Ecological Role: Can be found today throughout the world as an introduced species and sometimes a noxious weed. Forms dense stands that outcompete native plants and limit their reproduction. The litter of rabbits foot grass is allelopathic.

Local use: An infusion of the plant ashes has been used in the treatment of heart palpitations.

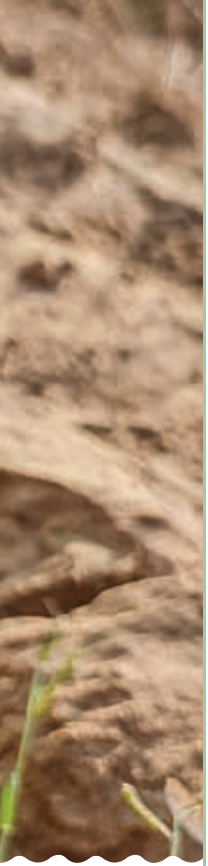
Bioindicator: Polluted and saline soils

Control Measures: Prescribed burning, tillage, and hand pulling are effective control methods as long as they are applied before inflorescences mature. Research showed rabbitsfoot grass did not tolerate high salt applications

IUCN category: Least Concern

Urochloa reptans (L.) Stapf

Vernacular name:	Para ghaans
Common name:	Creeping Signal Grass
Family:	Poaceae
Genus:	*Urochloa*
Species:	*reptans*
Distribution:	Arabian Peninsula, tropical Asia to Australia
Habit:	Annual or perennial Grass
Habitat:	It prefers rather moist to rather dry soils of fields, along road-sides, up to 1200 m altitude and upland rice fields. In waste places, wastelands and bunds of paddy fields.



Native/Exotic: Native

Flowers: The inflorescence of 2 to 8 cm long consist of 4 to 13 racemes more or less spread and grouped on a short axis. The acute oval spikelets of 2 to 2.2 mm long, are of violet to purple in colour, shortly pedicellate, and usually have some long bristles.

Fruits: Oval, grain-like seeds.

Phenology: July to November

Ecological Role: The species grows forming clumps of slender, creeping culms up to 50 cm tall that are capable of displacing other plants and grasses. It is considered an important weed in agricultural lands and pastures, but it can also invade disturbed sites, degraded forests, coastal areas, river and creek beds, and riparian forests.

Local use: It is a good fodder grass. The plant is harvested from the wild for local use as a medicine, and probably also as a food on occasions.

Bioindicator: Not known

Control Measures: Small infestations can be removed manually or with mulch machinery.

IUCN category: Least Concern

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