

Strategies For Restoration and Long-Term Protection and Management of Flowering Plant Species Belonging to Purandar Tehsil Dist. Pune, M.S., India

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Abstract— Ecological restoration is a practical aspect of ecology and it is essential for the re-gaining the degraded, damaged and deteriorated ecosystems. The foremost step in strategizing the plan for the restoration and management of the project is the meticulous and thoughtful selection of workable plan. The selection of the native plant materials that are ecologically appropriate and genetically diverse is a vital element of any restoration project. The revival of native species in the tehsil will offer habitat for the establishment of wild plant species, which have disappeared. The better living conditions are required for the wild life. This can be achieved through habitat improvement which includes availability of food, fodder, water, space etc. The continuous Contour trenching is a soil and water retaining technique that can be easily applied in semi arid and semi critical regions to allow water, and soil conservation, and to promote the vegetation of an area.

During the field surveys 1352 plant species were documented. Among the 1352 species, 706 were native species (52.21%) while 646 were exotic (47.78%). The Purandar tehsil is very close to Pune city, and now covered under PMRDA. Due to this it is facing overall developmental challenges. It has resulted in habitat loss for many species.

Key words — Anthropogenic, Broadcasting Encroachment, Management, Restoration, Sustainability.

I. INTRODUCTION

The Purandar tehsil is categorized as Semi-Critical, as per Ground Water Resources Estimation carried out by CGWB and GSDA as on March 2013 (India Water Portal, 2013). It is the semi-arid zone. The tehsil experiences hot summer and general dryness throughout the year except monsoon season. The monsoon lasts from June to the end of September, with moderate rainfall. The typical summer months are from February to May, with temperatures ranging from 30 to 40 °C. The warmest months are April and May. The Annual rainfall for the last ten

years ranges from 550 mm to 1124.6 mm. (India Water Portal, 2018). The average annual rainfall in the year 2014 was 371.3mm., in 2015 it was 388.8mm., in 2016 it was 270.2mm., in 2018 it was 358.1mm. (Data Source: IMD Pune).

During the dry months, in the early hours of the morning humidity may rise to 60–70%, but during the noon and afternoon hours it comes down to about 30%. Forest shelters very little area in the western part on the slopes of the hills, while most of the hilly terrain is barren wasteland. The vegetation represents dry-deciduous along with scrub vegetation at few places. It is varied at higher peaks of the mountains illustrating the rare, endemic and threatened plant species.

Ecological restoration is a practical aspect of ecology and it is essential for the re-gaining the degraded, damaged and deteriorated ecosystems. It is essential for health, reliability and the most important is the sustainability of the environment. The ecosystem restoration actions should be based on the assessment of the given area. A semi-arid as well as semi-critical tehsil like Purandar shares its borders with villages, agriculture and mountainous regions, due to which entire region always remains under continuous human disturbance that brings about the deterioration of the ecosystems.

The foremost step in strategizing the plan for the restoration and management of the project is the meticulous and thoughtful selection of workable plan. It is based on the status and features influencing an area. After repeated visits during 2014 to 2020 in the tehsil, it was observed that some major concerns should be taken into the consideration for the successful restoration and management of threatened and endangered plant species.

I. The following are some of the concerns for depletion of the vegetation in the tehsil.

- The Mukhymatri Gram Sadak Yojana (Chief Minister Village Road Development Scheme), road widening has resulted into loss of agricultural land (From Village Dive to Morgaon).
- The road present from the village Pur to the middle/Parking belt of the Purandar fort has been widened, which has caused decline in the plant species.
- The narrow road between the village Kodit and Narayanpur has also been widened.
- Some part of the road present in the ghat section of Pangare has been reconstructed (straightened), resulting into loss of species diversity.
- The habitat destruction due to various residential developmental projects established at Ketkawale and at upper part of Chivhe ghat are not sustainable.
- The industries located in the Jejuri MIDC zone are causing air pollution.
- The domestic grazing animals, sheeps in particular, destroying the grass lands which ultimately results in erosion of the soil Fig.1
- The monotonous plantation of exotic plant species disturb the native plant species and obviously the fauna.
- The entire tehsil suffer from fires and infestation by invasive species.
- The eradication of invasive species is not an easy task. NGO's are working upon it.
- Pollution in the form of plastic water bottles and wine bottles at the Dive ghat top portion as well as at some other places is not affordable.
- In various ghat sections and on the slopes of few hills of Chevhwadi, Nishnai ghat, Askarwadi etc. plantation of *Eucalyptus lanceolatus*, *Gliricidia sepium*, *Leucaena leucacephala* was observed and acclimatization and proliferation of *Lantana camara* is very fast.

II. Management And Restoration

To improve the status of vulnerable and threatened plant species reasonable time span is required. Following practices are advised for operative management and restoration for the semi arid zone like Purandar tehsil.

1. To target more objectives in single practice is to replace the exotic plants with the native species. e.g. the exotic plants like *Gliricidia sp.*, *Eucalyptus sp.*, *Delonix sp.*, can be replaced by native species like *Azadirchata indica*, *Tamarindus indica*, *Mangifera indica* etc.
2. The selection of the native plant materials that are ecologically appropriate and genetically diverse is a vital element of any restoration project. The long distance dispersal of seeds, spores is central to species expansion following ecological disturbance (Johnson *et.al.*, 2010).
3. The seed broadcasting method should be applied just after first and second rain. In such a case proper care is required. Seeds should be viable, should be put up in small clay pots along with moist soil and compost.
4. The continuous contour trenches (CCT) serve the saplings properly. CCT should be practiced in summer season.
5. In the recent years, water Cup / water Olympiad (Pani Foundation) and Rotary Club Pune has done excellent work in different villages of Maharashtra, such activities should be implemented.
6. The revival of native species in the tehsil will offer habitat for the establishment of wild plant species, which have disappeared.
7. This is a high time to cultivate the indigenous plants like *Ficus sp.*, *Polyalthia sp.*, etc. which require various agencies like birds, insects for their dispersal, pollination and propagation.
8. Ecologically adapted native species are essential for reviving healthy, sustainable ecosystems.
9. Any random destruction of grassland, digging unwanted trenches, etc. should be avoided. Removal of stray dogs and unchecked conversion of grassland habitat to agricultural and industrial land should be disallowed, Sumant., Lonkar, *et al.*, (2009).
10. NGO's need to take lead in organising the awareness programs to minimise the anthropogenic activities and achieve the sustainable development Fig.2, 3 and 4

III. For The Restoration And Conservation, Vanak *Et.AL.*, (2014) Suggested The Following Measures

- Eliminate some exotic tree species like *Leucaena leucacephala*, *Gliricidia sepium*, *G. maculata*, *Eucalyptus sp.* etc
- The manual root stock removal should be practiced instead of using heavy machinery.
- The deep contour trenches may disturb the normal water flows and hamper the movement of animals, so it must be avoided.
- The good grass cover will help for the soil conservation measures and will prevent the runoff Fig.5
- The removal of invasive species such as *Parthenium hysterophorus*, *Lantana camara*, *Alternanthera sp.*, *Cosmos sulphurius*, *Cassia tora* etc. should be preferred.

In order to improve the entire ecosystem regeneration, steps to be taken up are as below:

1. Increase the number of farm ponds (Shet-tali).
2. The state government should promote the establishment of additional nurseries by giving subsidies and land near by water canals.
3. The state government should expand some of the schemes like 'Pan -Lot Skhetra Vikas Yojana', Rojgar Hami Yojana, which were consistently in practice many years before.
4. Some other methods of irrigation should be practiced like drip and sprinkler irrigation system, preparation of sunken seed beds, ridges and furrow method of beds for agriculture crops.
5. Increasing the efforts for harvesting of rain water.
6. Increase the number of nurseries for the cultivation of native plant species Table 1
7. Need to put bunds on rivulets, canals etc to restore the rain water at every village area.
8. Reduce or stop the encroachment.
9. Plants like *Agave sp.*, *Euphorbia sp.*, *Cacti* are already planted as hedges around some forests, such plant species should be planted around other patches of forests to

restrict the entry of stray dogs and other unwanted entities.

10. The main fruit trees grown in the tehsil are custard apple, pomegranate, figs etc. For the packings of fruits in boxes, farmers use the leaves and soft branches of different plants. For eg. *Azadirachta . indica*. Grass species should be grown in large number, so that they can be used for the packing purpose.
11. The ground orchids, *Habenaria longicorniculata* and *H. grandifloriformis* were found in the farms of village Askarwadi and Kodit respectively. The concern farmers are unaware about the importance of these threatened plant species. For the conservation of these species, Government of Maharashtra should provide incentive to the concerned farmers.
12. Local people are unaware about the importance of threatened plant species. They usually take out the underground part of *Ceropegia hirsuta* for consumption. Organisation of Awareness campaign's in village schools are essential to deal with all the issues.
13. The threatened plant species should be grown by Plant tissue culture method for further plantation in the Purandar tehsil.
14. The local organizations like Purandar pratisthan, Ela Foundation etc are playing significant role in plantation drives of native plant species. These organizations should be encouraged by government of Maharashtra.

These are some of the measures can focus mostly on restoration and management of flowering species.



Fig.1: Biotic disturbances in the Study area, Pangare ghat section



Fig.2: Anthropogenic activities at Ketkawale, Purandar Tehsil



Fig.4: View of Ketkawale and adjoining region showing developmental activities



Fig.3: Anthropogenic activities at Ketkawale, Purandar Tehsil



Fig.5: Grass cutting for fodder is a common practice in the tehsil

Table 1. List of Native Plant species Suggested for Plantation in the Tehsil:

Botanical name	Family	Common name	Habit
<i>Abutilon indicum</i> (L.) Sweet.	Malvaceae	Mudra	Herb
<i>Acacia leucophloea</i> (Roxb.) Willd.	Mimosaceae	Hivar	Tree
<i>Acacia nilotica</i> spp. <i>cuprissiformis</i> (J.L.Steward) Ali & Faruqi.	Mimosaceae	Ramkathi	Tree
<i>Acacia torta</i> Craib.	Mimosaceae	Chilar	Shrub
<i>Acalypaha indica</i> L.	Euphorbiaceae	Khokli	Herb
<i>Adenoon indicum</i> Dalz.	Asteraceae	Mothasunki	Herb
<i>Aegle marmelos</i> (L.) Correa.	Rutaceae	Bel	Tree
<i>Aerides maculosum</i> Lindl.	Orchidaceae	Orchid	Herb
<i>Ailanthus excelsa</i> Roxb.	Simaroubaceae	Maharukh	Tree
<i>Anisochilus carnosus</i> (Linn.) Wall.	Lamiaceae	Kapurli/ Charonava	Herb
<i>Anisochilus verticillatus</i> Hook. f.	Lamiaceae	Akash-tulas	Herb
<i>Anisomeles indica</i> (L.) O. Ktze.	Lamiaceae	Gopali	Shrub
<i>Anisomeles malabarica</i> R.Br.	Lamiaceae	Gojibha	Shrub
<i>Anotis calycina</i> Hook.f.	Rubiaceae		Herb
<i>Anotis foetida</i> (Dalz.)Benth et.Hook.	Rubiaceae		Herb
<i>Anotis lancifolia</i> (Dalz.) Hook.f.	Rubiaceae		Herb

<i>Anotis montholoni</i> Hook.f.	Rubiaceae		Herb
<i>Argyreia cuneata</i> Ker-Gawl.	Convolvulaceae	Mahalungi	Climber
<i>Argyreia sericea</i> Dalz. & Gibs.	Convolvulaceae	Gavel	Climber
<i>Arisaema neglectum</i> Schott.	Araceae	Sardacha jad	Herb
<i>Arthraxon santapau</i> Bor. in Kew.	Poaceae		Herb
<i>Arundinella pumila</i> Steud.	Poaceae		Herb
<i>Azadirachta indica</i> A. Juss.	Meliaceae	Kadi-limb/Neem	Tree
<i>Barleria gibsoni</i> Dalz.	Acanthaceae	Gura	Herb
<i>Barleria prionitis</i> Linn.	Acanthaceae	Kholeta/Kate-koranti	Shrub
<i>Cadaba fruticosa</i> (L.) Druce.	Capparaceae	Kalitaka/Kalaskal	Shrub
<i>Canavalia gladiata</i> (Jacq.) DC.	Fabaceae	Abai/Abeyvel	Climber
<i>Canna indica</i> L.	Cannaceae	Dev-kel/Kardal	Herb
<i>Capparis aphylla</i> Roth.	Capparaceae	Nepti	Shrub
<i>Capparis divaricata</i> Lam.	Capparaceae	Pachunda	Shrub
<i>Caralluma adscendens</i> Roxb. R.Br.	Asclepiadaceae	Makadsingi	Herb
<i>Celastrus paniculata</i> Willd.	Celastraceae	Kangli/Kiri	Climber
<i>Chionachne koenigii</i> Thw.	Poaceae	Varival/Kasadi	Herb
<i>Clerodendrum multiflorum</i> (Burm.f.) O.Ktze.	Verbenaceae	Iran/Bahuri	Shrub
<i>Coleus forskohlii</i> (Poir.) Briq.	Lamiaceae	Gormar/Mainmul	Herb
<i>Coleus spec.</i>	Lamiaceae	Pathachur	Herb
<i>Convolvulus rottlerianus</i> Choisy.	Convolvulaceae		Herb
<i>Corallocarpus conocarpus</i> (Dalz. & Gibs.) Hook.f.	Cucurbitaceae		Climber
<i>Corallocarpus epigaeus</i> (Rottle & willd.) Hook. F.	Cucurbitaceae		Climber
<i>Corchorus depressus</i> L.	Tiliaceae	Mudhiri/Bahuphali	Herb
<i>Crotalaria clarkei</i> Gamble.	Fabaceae	Rattlepods	Herb
<i>Cryptolepis buchanani</i> Roem. Et. Scult.	Asclepiadaceae	Setakarli/Karnata	Climber
<i>Curculigo orchiodes</i> Gaertn.	Hypoxidaceae	Kali-musali/Kajuri	Herb
<i>Curcuma pseudomontana</i> Graham.	Zingiberaceae	Ran-halad/Sindrbar	Herb
<i>Curcuma spec.</i>	Zingiberaceae	Haladi	Herb
<i>Cyathocline purpurea</i> (Don.)	Asteraceae	Gangotra	Herb
<i>Cyathocline purpurea</i> var. <i>alba</i> Santapau.	Asteraceae	Pandhra gangotra	Herb
<i>Cylista scariosa</i> Roxb.	Fabaceae	Ranghevada	Climber
<i>Cynotis cristata</i> (Linn.) Schult. F.	Commelinaceae	Nabhali	Herb
<i>Cynotis tuberosa</i> (Roxb.) Schult.	Commelinaceae	Abhali	Herb
<i>Dalbergia latifolia</i> Roxb.	Fabaceae	Pendgul/ Yekvel	Tree
<i>Dendrobium barbatulum</i> Lindl.	Orchidaceae	Gulabi-dande-amri	Herb
<i>Dendrobium mabelae</i> Gammie.	Orchidaceae	Pivli-dande-amri	Herb
<i>Dendrobium microbulbon</i> Rich.	Orchidaceae	Jambhli-dande-amri	Herb
<i>Desmodium oojinense</i> (Roxb.) H. Ohashi	Fabaceae	Sandan	Tree
<i>Desmodium rotundifolium</i> Baker.	Fabaceae	Ticktrefoil	Herb
<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	Mimosaceae	Velatur/Sigamkati	Shrub
<i>Dicliptera zeylanica</i> Nees.	Acanthaceae		Herb
<i>Dicoelospermum ritchiei</i> Clarke.	Cucurbitaceae	Gogara	Climber

<i>Dolichos bracteatus</i> Baker.	Fabaceae	Bhendri/Thapti-seng	Climber
<i>Drimia indica</i> (Roxb.) Jessop	Liliaceae	Jangali kanda	Herb
<i>Echinops echinatus</i> Roxb.	Asteraceae	Utanti/Kate-chendu	Herb
<i>Ehretia aspera</i> Roxb.	Boraginaceae	Lokhande	Tree
<i>Eranthemum roseum</i> (Vahl.) R. Br.	Acanthaceae	Dasmuli	Herb
<i>Eriocaulon nepalense</i> Presc.	Eriocaulaceae	Gend	Herb
<i>Eulophia ochreatea</i> Lindl.	Orchidaceae		Herb
<i>Euphorbia microphylla</i> Lam.	Euphorbiaceae	Chil dudhi	Herb
<i>Exacum lawii</i> Clarke.	Gentianaceae	Lahan-chirayat	Herb
<i>Exacum pumilum</i> Griseb.	Gentianaceae	Jambhli-chirayat	Herb
<i>Ficus benghalensis</i> Linn.	Moraceae	Wad/Banyan	Tree
<i>Ficus elastica</i> Roxb.ex Horn.	Moraceae	Indian rubber plant	Tree
<i>Ficus religiosa</i> Linn.	Moraceae	Pimpal/Pipal	Tree
<i>Frerea indica</i> Dalz.	Asclepiadaceae	Shindal-makudi	Herb
<i>Gardenia resinifera</i> Roth.	Rubiaceae	Dikemali/ Dikamali	Shrub
<i>Girardinia zeylanica</i> Dence.	Urticaceae	Motha -khajoti/Agya	Herb
<i>Gnaphalium indicum</i> Linn.	Asteraceae		Herb
<i>Grewia tiliifolia</i> Vahl.	Tiliaceae	Phalsa / Khatkhati/Dhaman	Tree
<i>Grewia villosa</i> Willd.	Tiliaceae	Kharmati	Shrub
<i>Hackelochloa granularis</i> (L.) O.Ktze.	Poaceae	Kangri/Dalura ghas	Herb
<i>Hemigraphis latebrosa</i> Nees. Var. <i>heyneana</i> Bremek.	Acanthaceae	Morpankhi	Herb
<i>Heracleum concanense</i> Dalz.	Apiaceae		Herb
<i>Heterophragma quadriloculare</i> (Roxb.) Schum.	Bignoniaceae	Varas	Tree
<i>Iphigenia indica</i> (L.) A. Gray	Liliaceae	Bhuichakra/Markalai	Herb
<i>Iphigenia pallida</i> Baker.	Liliaceae	Bhui-chkra	Herb
<i>Ipomea eriocarpa</i> R.Br. Prodr.	Convolvulaceae	Ranbhari/Ranbhori	Climber
<i>Ischaemum indicum</i> (Houtt.) Merr.	Poaceae	Bherda/Putena	Herb
<i>Iseilema laxum</i> Hack.	Poaceae	Mus/Mashi/Tambit	Herb
<i>Jasminum malabaricum</i> Wt.	Oleaceae	Kasur	Climber
<i>Jasminum multiflorum</i> (Burm. f.) Andr.	Oleaceae	Ran-mogra	Shrub
<i>Justicia betonica</i> Linn.	Acanthaceae	Gulabi-adulsa	Shrub
<i>Justicia micrantha</i> Heyne.	Acanthaceae		Herb
<i>Justicia pectinata</i> (L.) Nees in Dc.	Acanthaceae		Herb
<i>Justicia simplex</i> D.Don.	Acanthaceae	Lavender scallops	Herb
<i>Kydia calycina</i> Roxb.	Malvaceae	Warang/Bhoti/Varas	Tree
<i>Lepidagathis cuspidata</i> (Wall.) Nees.	Acanthaceae	Kate-adulsa	Shrub
<i>Lepidagathis mitis</i> Dalz.	Acanthaceae	Kate-adulsa/Kumbhi	Herb
<i>Leucas biflora</i> R.Br.	Lamiaceae	Jodiburumbi	Herb
<i>Leucas lavandulaefolia</i> Nees.	Lamiaceae		Herb
<i>Leucas longifolia</i> Benth.	Lamiaceae	Dudhani	Herb
<i>Leucas montana</i> Spreng.	Lamiaceae		Shrub
<i>Limnophila indica</i> (Linn.) Druce.	Scrophulariaceae	Turti	Herb
<i>Limonia acidissima</i> L.	Rutaceae	Kavath	Tree

<i>Lindernia crustacea</i> (Linn.) F. Mueller.	Scrophulariaceae		Herb
<i>Lophopogon tridentatus</i> Roxb. Hook.	Poaceae		Herb
<i>Madhuca longifolia</i> (Koen.) Mac Bride	Sapotaceae	Moha	Tree
<i>Mangifera indica</i> Linn.	Anacardiaceae	Amba	Tree
<i>Marsdenia volubilis</i> Cooke.	Asclepiadaceae	Ambri/Hirandodi	Shrub
<i>Melanocenchris jacquemontii</i> Jaub. & Spach.	Poaceae	Ghula gavat	Herb
<i>Melia azedarach</i> L.	Meliaceae	Bakan nimb	Tree
<i>Meyna laxiflora</i> Robyns.	Rubiaceae	Helu/Alu	Herb
<i>Mimosa hamata</i> Willd.	Mimosaceae	Gulabi-babul/ Arati	Shrub
<i>Murdannia semiteres</i> Santapau.	Commelinaceae		Herb
<i>Nepeta hindustana</i> Haines. <i>Var. woodrowii</i> (Cooke.)	Lamiaceae	Nepta	Herb
<i>Ocimum sanctum</i> Linn.	Lamiaceae	Kalitulas	Herb
<i>Oldenlandia spec.</i>	Rubiaceae		Herb
<i>Panicum psilopodium</i> Trin.	Poaceae	Saga	Herb
<i>Pavetta indica</i> var. <i>tomentosa</i> Hook. f.	Rubiaceae		Shrub
<i>Pennisetum typhoides</i> (Burm.) Stapf. & Hubb.	Poaceae	Bajara	Herb
<i>Pentanema indica</i> (L.) Ling.	Asteraceae	Sonkadi	Herb
<i>Petrea volubilis</i> Linn.	Verbenaceae	Bhibhiryacha vel	Climber
<i>Phaselous dalzellii</i> Cooke.	Fabaceae	Moong	Climber
<i>Phaseolus aconitifolus</i> Jacq.	Fabaceae	Moth/Matki	Herb
<i>Phaseolus radiatus</i> Linn.	Fabaceae	Sona mug	Climber
<i>Phyllanthus amarus</i> Schum & Thonn.	Euphorbiaceae	Bhuiavali	Herb
<i>Pimpinella heyneana</i> (Wall. Ex DC.) Kurz.	Apiaceae		Herb
<i>Plectranthus prostrates</i>	Lamiaceae		Herb
<i>Pogostemon parviflorus</i> Benth.	Lamiaceae	Pangli	Herb
<i>Polygala erioptera</i> DC.	Polygalaceae		Herb
<i>Polygonum glabra</i> Willd.	Polygonaceae	Sheral	Herb
<i>Potamogeton indicus</i> Roxb.	Potamogetonaceae		Herb
<i>Pouzolzia indica</i> (Wall) Wedd.	Urticaceae		Herb
<i>Pseudodichanthium serrafalcoides</i> Bor.	Poaceae		Herb
<i>Putranjiva roxburghii</i> Wall.	Putranjivaceae	Putranjiv	Tree
<i>Quisqualis indica</i> Linn.	Combretaceae	Madhu-malti	Climber
<i>Reinwardtia trigyna</i> (Roxb.) Planch.	Linaceae	Piwali- abai	Shrub
<i>Rhinacanthus nasuta</i> (Linn.) Kurz.	Acanthaceae	Gajkarni/Nagmalli	Herb
<i>Rhus mysorensis</i> G.Don.	Anacardiaceae	Amboni	Shrub
<i>Rivea hypocrateriformis</i> (Desr.) Choisy.	Convolvulaceae	Phangyel	Climber
<i>Rotheca serrata</i> (L.) Stean & Mabb.	Acanthaceae	Bharangi	Shrub
<i>Rubia cordifolia</i> Linn.	Rubiaceae	Manjistha/Iltta	Climber
<i>Rungia pectinata</i> (Linn.) Nees.	Acanthaceae		Herb
<i>Rungia repens</i> (Linn.) Nees.	Acanthaceae	Ghati-pittapapada	Herb
<i>Santalum album</i> L.	Santalaceae	Chandan	Tree
<i>Sapindus laurifolius</i> Vahl.	Sapindaceae	Ritha	Tree
<i>Scilla hyacinthina</i> (Roth.) Mc. Bride.	Liliaceae	Khaj-kanda	Herb
<i>Semecarpus anacardium</i> L.f.	Anacardiaceae	Bibba /Bhilava	Tree

<i>Senecio bombayensis</i> Balakr.	Asteraceae	Sonki	Herb
<i>Senecio edworthii</i> Hook.f.	Asteraceae	Hiwali-sonki	Herb
<i>Senecio gibsoni</i> Hook.f.	Asteraceae		Herb
<i>Senecio gramhami</i> Hook.f.	Asteraceae		Herb
<i>Smithia bigemina</i> Dalz.	Fabaceae	Lahan-kawla/Berki	Herb
<i>Smithia blanda</i> var. <i>racemosa</i> Baker.	Fabaceae		Herb
<i>Smithia hirsuta</i> Dalz.	Fabaceae	Kawla	Herb
<i>Solanum virginianum</i> L.	Solanaceae	Bhui ringni/Kateringni	Climber
<i>Solanum xanthocarpum</i> Schrad & Wendl.	Solanaceae		Herb
<i>Sopubia delphinifolia</i> G. Don. Var. <i>parviflora</i> Benth.	Scrophulariaceae	Dudhali	Herb
<i>Sopubia trifida</i> Buch. Ham.	Scrophulariaceae		Herb
<i>Sorghum glabrescens</i> (Steud.) Schwienf.	Poaceae	Jawar	Herb
<i>Sphaeranthus indicus</i> Linn.	Asteraceae	Gorakhmun/ Mundi	Herb
<i>Sterculia urens</i> (Roxb.)	Sterculiaceae	Bhutya	Tree
<i>Sutera dissecta</i> Walp.	Scrophulariaceae	Bhul	Herb
<i>Talinum cuneifolium</i> Willd.	Portulacaceae	Fame/Flame-flower	Shrub
<i>Taxillus cuneatus</i> (Roth.) Danser.	Loranthaceae	Hirvebandgul	Shrub
<i>Terminalia arjuna</i> (Roxb.) ex DC.) Wight & Arn.	Combretaceae	Arjun sadada	Tree
<i>Terminalia paniculata</i> (Roth.)	Combretaceae	Kindal	Tree
<i>Thelepaepale ixiocephala</i> (Benth.)	Acanthaceae	Patri	Shrub
<i>Themeda quadrivalvis</i> (Linn.) O. Kuntze.	Poaceae	Bhati/Fulora	Herb
<i>Themeda triandra</i> Forssk.	Poaceae	Bunden/Batani	Herb
<i>Thunbergia coccinea</i> Wall.	Acanthaceae		Climber
<i>Tragia plukanetti</i> L.	Euphorbiaceae	Khaj-kolti	Herb
<i>Tricholepis amplexicaulis</i> Clarke.	Asteraceae	Dahan	Herb
<i>Tricholepis glaabberima</i> DC.	Asteraceae		Herb
<i>Tricholepis radicans</i> (Roxb.) DC.	Asteraceae	Dhann	Herb
<i>Tripogon jacquemontii</i> Stapf.	Poaceae		Herb
<i>Tylophora indica</i> (Burm. f.) Merr.	Asclepiadaceae	Potmari	Shrub
<i>Vernonia anthelmintica</i> (Linn.) Willd.	Asteraceae	Kale-jire/Kadu-karala	Herb
<i>Vernonia indica</i> Wall. Ex. C.B.Cl.	Asteraceae		Shrub
<i>Vigna khandalensis</i> (Sant.) R & W.	Fabaceae	Badmung	Herb
<i>Vioca indica</i> (Willd) DC.	Asteraceae	Sonkadi	Herb
<i>Vioca indica</i> L.	Asteraceae	Sonkadi	Herb
<i>Viscum angulatum</i> Heyne.	Loranthaceae	Jalunder	Shrub
<i>Woodfordia fruticosa</i> (Linn.) Kurz.	Lythraceae	Dhayti/Dhauri	Shrub
<i>Xyris indica</i> L.	Xyridaceae	Dadumari	Herb
<i>Zingiber diwakarianum</i> R. Kr. Singh.	Zingiberaceae		Herb

IV. Habitat Improvement Measures:

Plant and animal species also need favourable climatic conditions for their survival. The better living conditions are required for the wild life. This can be achieved through habitat improvement which

includes availability of food, fodder, water, space etc.

The continuous Contour trenching is a soil and water retaining technique that can be easily applied in semi arid and semi critical regions to allow water,

and soil conservation, and to promote the vegetation of an area.

V. The after benefits are as follows:

The rain water is retained in the trenches and slowly percolates in the soil. As the trenches are narrow in breadth, water does not evaporate quickly. The water balance is boosted. Saplings do not suffer due to availability of water and soil does not lost by rain water and air stream erosion. All the above factors contribute in enhancing the humidity created by micro climates in the region.

VI. Scientific skills and Techniques: The trenches are to be dug along the contour lines. Water flowing down the hill is arrested by the trenches. Based on the slope of the hill, the parallel trenches should be closer or a little bit away from one another. The trenches are shallow due to human limitations. The trenches created with machinery are deeper, but again on hill slopes, machinery has certain limitations. The dimensions of the trenches should relate to the local ecosystem and soil conditions. The trenches should be large enough to keep all the rain water; no water should flow over the downhill border. The upper side of the trench should be sheltered against erosion, by planting cacti, grasses, hedges etc.

The area divided in watersheds should be treated separately starting from the head to stream. Such a work should be carried out in summer before Monsoon. The seed broadcasting in 'V' shape furrow on nala bunds gives stability to the soil and to augment the fodder availability (Abhang, 2010). Depending upon the surrounding climatic conditions plant species should be grown on the trenches. In semi critical zone, different *Acacia* spp., should be grown while in semi arid zone, non-scrubby, native species should be grown. The endangered species need to be systematically explored in other similar habitats and conservation should be done (Bhagat, 2017).

Farm Ponds: Are small water bodies formed either by the construction of a small dams across a waterway like rivulet by excavating or dug out. The farm ponds store excess runoff during rainy season, Stored water can be used for supplemental irrigation to crops, It is useful as drinking water for domestic animals, during drought situation. Farm ponds conserve soil and moisture.

II. RESULTS

During the field surveys 1352 plant species were documented. Out of these, 1103 were dicotyledonous species distributed in 593 genera and 115 families. The total number of monocotyledonous species were 249 covering 152 genera and 23 families.

The habit-form distribution shows 771 herbs, 241 shrubs, 208 trees and 132 climbers. Among the 1352 species, 706 were native species (52.21%) while 646 were exotic (47.78%).

The Purandar tehsil is very close to Pune city, and now covered under PMRDA. Due to this it is facing overall

III. CONCLUSION:

In order to improve the entire ecosystem regeneration, steps to be taken up are as below:

Increasing the efforts for harvesting of rain water. Need to put bunds on rivulets, canals etc to restore the rain water. Reduce or stop the encroachment. Increase the number of nurseries for the cultivation of native plant species. To target more objectives in single practice is to replace the exotic plants with the native species. The selection of the native plant materials that are ecologically appropriate and genetically diverse is a vital element. The seed broadcasting method should be applied just after first and second rain. The revival of native species in the tehsil will offer habitat for the establishment of wild plant species, which have disappeared. The threatened plant species should be grown by plant tissue culture method for further plantation in the Purandar tehsil. These measures can focus mostly on restoration and management of uncommon plant species.

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