

Metadata abstract for the Fergusson Long-term Vegetation Monitoring project

Prepared by: Ashish N. Nerlekar (ashishnerlekar3@gmail.com)

Investigators: Ashish N. Nerlekar, Snehangshu Das, Akshay A. Onkar, Mayur Bhagwat, Pranav C. Mhaisalkar, Vinayak Chavan, Minakshi C. Mahajan.

Start and end Dates:

2018 enumeration: 18th May 2018 (Botanical Garden), 17th June 2018 (Central garden), 21-23 June 2018 (Long-term transects)

2019 enumeration: To be updated.

Objectives: To understand changes in the structural and functional composition (specifically, ecosystem-based traits) of woody vegetation in the campus over time.

Key words: Fergusson College, Pune, Long-term, city, trees, ecology

Locations: The table below gives locations of all the 50 permanent transects along with locations of the two gardens.

Transect code	Start GPS	End GPS	Transect code	Start GPS	End GPS
T1	18.52030397; 73.83771499	18.52037304; 73.83778699	T26	18.52276197; 73.83967401	18.52262702; 73.83969798
T2	18.52044596; 73.83783703	18.52046801; 73.83776796	T27	18.52287998; 73.83988699	18.52286297; 73.83993602
T3	18.52035997; 73.83787299	18.52028503; 73.83789201	T28	18.52260103; 73.84034104	18.52247204; 73.84032201
T4	18.52113797; 73.83824699	18.52123001; 73.83825202	T29	18.52274302; 73.840435	18.52271201; 73.84048596
T5	18.52150401; 73.83825503	18.52149102; 73.838177	T30	18.52320403; 73.83981398	18.52322901; 73.83973201
T6	18.52153502; 73.83808102	18.521574; 73.83807398	T31	18.524336; 73.83919699	18.52438697; 73.83922004
T7	18.521632; 73.83834003	18.52166402; 73.83835101	T32	18.52503497; 73.839041	18.52500102; 73.83912499
T8	18.521804; 73.83845201	18.52182596; 73.83836702	T33	18.52508702; 73.83878804	18.52514503; 73.83879298
T9	18.52201003; 73.83849802	18.52192403; 73.83847497	T34	18.52584299; 73.839112	18.52580904; 73.83928601
T10	18.52225704; 73.838508	18.52227003; 73.83842904	T35	18.52538701; 73.83971198	18.52546899; 73.83970301
T11	18.52245896; 73.838365	18.52254999; 73.83838001	T36	18.52603904; 73.83962799	18.52615203; 73.83966001
T12	18.52235; 73.83850104	18.52244304; 73.83849702	T37	18.52623702; 73.83986704	18.52623099; 73.83994801
T13	18.52262903; 73.83855603	18.52257597; 73.83849903	T38	18.52635697; 73.83995304	18.52644003; 73.84000098
T14	18.52195102; 73.83890304	18.52193702; 73.83894101	T39	18.52684798; 73.839904	18.52681202; 73.83996896

T15	18.52178204; 73.83903799	18.52179402; 73.83912197	T40	18.52463197; 73.84091503	18.52461697; 73.84098896
T16	18.52130603; 73.838867	18.521229; 73.83880304	T41	18.52366998; 73.83710001	18.52374902; 73.83724904
T17	18.52192302; 73.839069	18.52189704; 73.83905198	T42	18.52319397; 73.83667496	18.523271; 73.83666096
T18	18.52254001; 73.83902499	18.52257597; 73.83887496	T43	18.52325097; 73.83620004	18.52333001; 73.836179
T19	18.52296104; 73.83853398	18.522869; 73.83855301	T44	18.52288996; 73.83529002	18.522926; 73.83524702
T20	18.52321501; 73.83827699	18.52318198; 73.83838001	T45	18.52351801; 73.83536302	18.52358297; 73.835286
T21	18.52307998; 73.83873699	18.52314804; 73.83884504	T46	18.52378598; 73.83513998	18.52376201; 73.83505499
T22	18.52295098; 73.83916204	18.52293103; 73.839256	T47	18.52415403; 73.83472198	18.52422897; 73.83465702
T23	18.523227; 73.83930503	18.52330503; 73.83930403	T48	18.52404599; 73.83388203	18.52401297; 73.83385504
T24	18.52330696; 73.83929003	18.52345599; 73.83917201	T49	18.52458897; 73.83407397	18.52460104; 73.83398999
T25	18.52352103; 73.83931903	18.52366604; 73.83932901	T50	18.52385002; 73.835344	18.52392999; 73.83536403
Fergusson College Botanical Garden:		18.523275; 73.840630			
Fergusson College Central Garden:		18.523251; 73.839009			

Methods:

1. For Long-term transects:

We established and monitored 50 vegetation transects, each of 10m x 2m in the Fergusson College campus, Pune. All trees in the transects have been marked with yellow oil paint (one stem per individual marked). The botanical identity of all woody species with a diameter greater than 1cm at 1.3 m height above ground was recorded, along with their girth and height. All plant groups including Palms, Cycads, woody Pteridophytes, Bamboos and Lianas were included along with non-woody groups (eg. *Dracaena* spp., *Musa* spp.). A 10 m long nylon rope was stretched from the first tree in the specified direction to ascertain the transect boundaries and a width of 1m was considered on both the sides. For the botanical identification, Ingalhalikar and Barve (2010) and Nerlekar et al. (2016) were primarily followed. The girth was measured using a Freeman's measuring tape (details in equipment used) and a digital Vernier calliper (for some individual smaller than 10cm diameter, details in equipment used) to the nearest millimetre. For the tape, it should be noted that the steel end denotes zero. Height was visually estimated for the 2018 enumeration, and by using Rangefinders (details in equipment used) from the 2019-20 enumeration onward. For multi-stemmed trees, all girths were recorded separately in the data sheet. Dead trees (standing) were also included in the enumeration. A photograph of the transect was clicked using a

DSLR camera (details in equipment used) in the wide angle mode, standing behind the starting tree, so as to include first tree, 10m nylon rope with all trees in between preferably visible.

2. For Garden census:

We undertook a census for the two gardens (The Botanical garden and the Central garden of the Fergusson College, Pune). All woody plant species including Palms, Cycads, woody Pteridophytes, Bamboos and Lianas were included, but non-woody groups (eg. *Dracaena* spp. and non-woody vines (eg. *Vallaris solanacea*, *Vitis quadrangularis*) along with *Bougainvillea* spp. were excluded. All woody plants greater than 1cm diameter (at 1.3m height above ground) were identified, their girth and height measured. The methods for enumeration are similar to those for the Long-term transects. Some plants were re-visited to confirm their botanical identity.

File and sheet descriptions:

Sheet 1) 'Long term transects': Includes data for the 50 Long-term transects established and monitored. 'Date' is in the DD-MM-YYYY format. 'Team' has names of investigators present for the sampling. 'Transect name', which is usually based on an area, a peculiar tree, or an object is given so that new investigators can easily locate transects without a GPS unit. 'Transect number' ranges from 1 to 50 and denotes the respective transect codes. The 'Species' column provides scientific names of all species encountered including dead and unidentified ones. The columns 'GBH 1 (cm)' to 'GBH 12 (cm)' provide measurements in centimetre for single or multi-stemmed trees. 'Height' column provides an approximate height in meters. Note that this is a coarse visual estimate. 'Remarks' has any useful information and also presence of saplings that are less than 1.3m height. 'Transect landmarks' have remarks that list peculiar objects in or near transects so as to easily locate it.

Sheet 2) 'FCBG census': Includes data for the census of the Fergusson College Botanical Garden (FCBG). All fields mentioned in Sheet 1 that appear here again, have the same description. For trees with stems more than 12 (eg. Bamboos, *Adhatoda vasica*), stems with same GBH have been pooled and written for the sake of convenience. Note that for calculating total basal area, using this pooled girth is erroneous and basal area must be calculated for each stem separately. The data sheet hard copies can be referred for obtaining information on number of stems of each GBH class. 'Tag number' refers to the maroon tags that were attached to trees during the survey of Dr. M. C. Mahajan during 2006-07.

Sheet 3) 'Central garden census': Includes data for the census of the Fergusson College Central Garden. All fields mentioned in Sheet 1 and 2 that appear here again, have the same description. The 'Section' column refers to the four sections of the garden that are created due to pavements. These four sections have been given names based on prominent trees or buildings so that a section-wise comparison is possible if necessary at a later stage.

References:

1. Ingalhalikar, S. and S. Barve (2010). *Trees of Pune -Including Palms, Conifers, Cycads & Bamboos*. Corolla Publications, Pune, 249pp.
2. Nerlekar, A. N., Lapalikar, S. A., Onkar, A. A., Laware, S. L., and Mahajan, M. C. (2016). Flora of Fergusson College campus, Pune, India: monitoring changes over half a century. *Journal of Threatened Taxa*, 8(2), 8452-8487.

Equipment used:

1. Freeman's measuring tape: 15 meter tape- <https://www.amazon.in/Freemans-FT15-Fiberglass-Line-Measuring/dp/B010M5HKR8>
2. Digital Vernier calliper: with a 150 mm maximum measurement possible
<https://www.amazon.in/YUZUKI-Digital-Caliper-150mm-inch/dp/B012VRZ694?tag=googinhydr18418-21&tag=googinkenshoo-21&ascsubtag=fbe0dd64-dff9-475b-8576-bba26a8c7bf8>
3. Rangefinders: To be used for the 2019 sampling.
4. DSLR camera: we used Canon EOS 550D with the wide angle (18-55mm) lens
(<https://www.amazon.com/Canon-European-Digital-3-0-Inch-18-55mm/dp/B0037KM2IS>)