Second Analysis of Forest Stands in Evergreen Community, Tamil Nadu, India.

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Abstract

India's tropical dry evergreen forests have been reduced in size due to farming and logging but have been preserved in certain areas such as groves of religious importance. The Evergreen community outside of the Auroville Township in Tamil Nadu India, is a reforestation project dedicated to the re-introduction of TDEF species but uses the non-native *Acacia auriculiformis* as means of income by using it as timber. In the fall of 2011 a study was conducted to create a description of transects in this forest and determine the relationship between the presence of *Acacia auriculiformis* and species richness and diversity. After that study was completed a cyclone significantly altered the canopy coverage of the transects studied. The purpose of my study was to describe species composition and canopy coverage of these forest transects one year after the cyclone. My results showed that the *Acacia auriculiformis* trees were still the dominant species in each transect. The first second and third transects lost 91.32%, 85.79% and 54.65% of their canopy coverage, respectively. Many young *Acacia auriculiformis* were found growing in transects 1 and 3. Continued monitoring of all transects will be necessary to learn more about the relationship between canopy coverage and native species recovery, and also how young non-native species compete with young TDEF species.

Introduction

Tropical Dry Evergreen Forest.

The tropical dry evergreen forests are found throughout India and Sri Lanka. In India they are located on the east coast and only extend inland about 60 km. The regions where TDEFs are able to grow are characterized by their short monsoon season. The eastern coasts of Andhra Pradesh and Tamil Nadu have a rainy season that begins in mid to late October and ends in December. These areas have an average annual rainfall of 1000-1500 mm per year. These Conditions make it possible for TDEFs to grow and thrive (Meher-Homji 2007). TDEFs are home to approximately 54 woody species and over 300 flowering plants. The trees of these forests are evergreen species and typically grow to heights between 9 and 12 meters (Venugopal et al., 2008).

Currently, dry tropical forests make up 46% of India’s forest cover (Ramanujam and Kadamban 2001). As a developing nation, India requires large amounts of timber which is used for construction, development and as a fuel source. Up to 95% of rural homes in India use wood burning stoves as their main heat source (Manhas, Negi et al. 2006). To meet rising the demand for food, forested areas are often converted to farmland. From 1984 to 1994 the state of Tamil Nadu had a net loss of 22,000 hectares of forested area (Manhas, Negi et al. 2006).

TDEF restoration

Forested areas in India are under the protection of various preservation areas such as wildlife sanctuaries, national parks, and reserve forests that restrict public use and resource collection. The TDEFs that have been best preserved lie within sacred groves. These sacred groves are areas where Hindus believe deities reside and because of this, such areas have been unaltered by human interference, even when these sacred groves lie close to heavily populated areas (Venugopal et al., 2008). As these areas will not be disturbed by humans, they are ideal for observing TDEF growth over long periods of time (Ramanujam and Kadamban 2001).

Evergreen Community

The evergreen community is located outside of the Auroville International Township located 10 km north of Pondicherry, Tamil Nadu. Auroville was founded in 1968 as community dedicated to Human unity and life-long learning. One of its secondary goals was to restore native plant species, such as those found in dry evergreen forests, to the area (Blanchflower 2005). Evergreen is a community that focuses primarily on the reintroduction of TDEF plant species. In order to fund its efforts, Evergreen uses *Acacia auriculiformis* as a source of timber sold for profit. Evergreen also owns several guest houses that are rented out to eco-tourists. (D. Storey, personal communication, Nov 2012).

Previous research and Study Purpose

In the fall of 2011 a study of three transects in the evergreen community was conducted to describe species diversity and richness. One of the goals of this study was to determine if there was a relationship between diameter at breast height and canopy coverage of *Acacia auriculiformis.* Species richness and diversity was also compared to canopy coverage in each transect. (Maier 2011) This study was meant to be the initial phase of examining the change forest composition over time. However, just after this study was completed, a cyclone hit the eastern coast of India. (The Times of India, 2011) This Cyclone hit the Evergreen community and drastically altered the canopy coverage of the transects. The purpose of this study was to assess the changes in canopy coverage and species composition of all three transects. The data collected will hopefully give some insight on how varying canopy coverage of a non-native species affects the growth and development of tropical dry evergreen forests.

Methods

I conducted this study in the Evergreen Community located outside of the village of Auroville in the state of Tamil Nadu, India during November 2012. Within Evergreen, I roped off the same three transect that had been plotted the previous year. Each transect measured 5 meters by 30 meters. Each transect was further divided into six smaller 2.5 meter by 5 meter rectangles (Maier 2011). In each transect I identified species and recorded the location of each woody plant over breast height (130 cm).

For each tree I recorded the circumference at breast height, and then calculated diameter for each tree with a circumference over 3 cm. To record height, I used a 3 meter pole with a tape measure attached. For trees that were taller than 3 meters I used a clinometer, and recorded the distance and angle. I then calculated the height of each tree.

I estimated canopy coverage by creating crown projection diagrams. I measured out from the base of the trees to the estimated edge of their canopy coverage and recorded the area onto graph paper (1cm = 1m). I later calculated area by creating a ratio between the weight of the graph paper to the area it represented. I cut out and weighed the crown projections and calculated the total canopy coverage for each transect.

I totaled the number of different species from each transect to determine species richness, and used the Shannon index to calculate diversity (Cain, Bowman et al. 2011). I compared the data I collected to the data collected in November 2011 (Maier 2011).

Results

Transect one had a total of 82 trees over 130 cm. Trees in the first transect had an average height of 2.55 m (Table 1). Transect one had a total estimated canopy coverage area of 299.91 m^2 in 2011 and 26.03 m^2 in 2012. (Figure 1). The most dominant species in the first transect was *Acacia auriculiformis* (hereon referred to as acacia) with 52 trees. The only other species with more than two trees in the transect were *Bridelia retusa* with 5 trees and *Ixora pavetta* and *Tarenna asiatica*, each with four trees (Table 2). From 2011 to 2012 the species richness was reduced from 18 to 17. The Shannon Index value for diversity was also reduced from 1.59 to 1.58

Transect 2 had a total of 53 trees over 130 cm. The average height of each tree in this transect was 2.51 m (Table 1). The dominant species for transect two was the acacia in both 2011 and 2012, however there were 25 acacia in 2011 and only 13 in 2012. The other two most abundant tree species were *Manilkara hexandra* and *Cassia siamea* each with four trees in the transect (Table 2). The second transect had a total estimated canopy area of 297.12 m^2 in 2011 and 42.22 m^2 in 2012 (Figure 2). Species richness was 25 for both 2011 and 2012. However, the species diversity value increased from 2.65 to 2.90.

Transect 3 had a total of 57 trees with an average height of 2.84 (Table 1). The most abundant species in the third transect was also the Acacia for both 2011 and 2012, however in 2011 there were only 12 acacia and in 2012 there were 25. The second most abundant species present was *Tarenna asiatica* with 6 trees (Table 2). The total estimated canopy coverage was reduced from 152.21 m^2 in 2011 to 69.16 m^2 in 2012 (Figure 3). The species richness was 12 in both 2011 and 2012 but the species diversity value decreased from 2.07 in 2011 to 1.71 in 2012.

Discussion

The effects of the cyclone from December 29 are apparent in each of the three transects. Transect one showed the biggest change in total estimated canopy coverage with a 91.32% reduction from 2011 to 2012. Transect 2 showed an 85.79%. The third transect showed the lease amount of reduction with a 54.56% decrease.

The large reduction in canopy coverage in the first transect may seem surprising as there was only one fewer acacia tree in 2012, however, 12 of the acacia found in the first transect had a height of less than 2 meters, and likely were not tall enough to be recorded in 2011. Because of this an estimated 12 acacia trees were removed after the cyclone. This is supported by examining the crown projection diagrams from both years. Most of the canopy reduction came from the removal of taller acacia. Many of the older acacia trees still standing after the storm had many branches removed, reducing their canopy coverage as well.

The immediate losses in the first transect seem to manifest in the reduced number of native TDEF trees present. 5 *Bridelia retusa* were lost in the past year along with multiple *Ixora pavetta* and *Tarenna asiatica.* The removal of older acacia has contributed greatly to large reduction in canopy coverage. This may be beneficial to the shorter TDEF species present in the first transect. Some TDEF trees were excluded from this study as they had not yet reached 130 cm in height, by next year they may have benefited from the additional sunlight and will be able to be counted towards the species richness diversity values.

Another possibility is that the 12 small acacia tree will grow to form new canopy coverage that could hinder the growth of more TDEF species.

The second transect was the only transect that had a greater diversity value in 2012 than in 2011. (2.65 in 2011 and 2.90 in 2010) However these numbers give a skewed view in regards to the recovery of TDEF species. This transect actually had 14 fewer TDEF trees in 2012 than it did in 2011. The lower species diversity value is a result of the fact that this transect also had a net loss of 12 acacia, lowering its proportion in relation to the native species.

Continued study of the second transect will be valuable as it is has been the transect with highest species richness and diversity in both 2011 and 2012. After the cyclone this is also the transect with the least canopy coverage. Monitoring continued growth of TDEF species will give insight to how younger trees react to more sunlight with less competition from the acacia.

The third transect underwent the least amount of change between 2011 and 2012. This transect lost two TDEF species in the past year, *Cassia fistula* and *Breynia retusa.* It did however gain one more TDEF species, *Pterocarpus indicus,* and one non TDEF species, *Acacia holeseicea.* This resulted in no net change in species richness.

15 of the acacia in the third transect were less than 2 meters in height. These acacia are very young and were most likely not recorded in 2011. As the number of number of TDEF trees did not change from 2011 to 2012, these acacia yearlings are a major contributing factor to the smaller species diversity value of this transect. Most of these young acacia were located in the B4 sub-transect. Because of the high concentration, these trees will be competing with each other for sunlight in the coming years, it is possible that some of them will die within the next year.

In the neighboring sub-transects, (A4, B3, and B5) there are 5 TDEF trees that could suffer from a lack of sunlight if they are in competition with the young patch of acacia in sub-transect B4.

The growth of all the transects will be determined by a number of factors over the coming years. Current projected climate change for India is expected to result in increased temperatures and rainfall across the country. These increases would increase the area of moister forests and could possibly be harmful to the development of tropical dry evergreen forests (Kaushik and Khalid 2011).

Rain fall shortages have also been a concern in the past year. The state of Tamil Nadu has experienced an 18% deficit in rainfall for the 2012 eleven monsoon season. (newspaper source) This could be particularly damaging to the many yearling trees currently growing in the evergreen community.

Previous studies have shown that tropical dry evergreen forests are capable of recovering from light logging and damage from grazing animals. The Kuzhanthaikuppam and Thirumanikkuzhi forests in Tamil Nadu showed 2.28% and 27.4% respective increases in above ground biomass from 1995 to 2005 (Mani and Parthasarathy 2009).

The Puthupet tropical dry evergreen forest located 13 km north of Auroville experienced similar changes during a ten year period(1992-2002) Not only did this forest experience a net increase in basal area and above ground bio mass, it also experienced a 21% increase in species richness (Venkateswaran and Parthasarathy 2005).

As the evergreen community is also located in Tamil Nadu, it experiences very similar climate and rainfall has the potential to show similar increase in biomass and species diversity. The main concern is whether or not the increase in biomass will occur in the native TDEF species or the non-native acacia. The future of the evergreen community forest will also differ from the other case studies due the key difference that the evergreen community forest will be subject to human interference over the next few years. To lessen the competition TDEF species experience for sunlight, larger acacia trees may be remove and also sold for income for the evergreen community. The evergreen community is also currently looking for opportunities to increase their income through eco-tourism. During my stay an additional guest house was being constructed within evergreen. Additional income from tourism would lessen the need to sell timber, and would allow the transects to be undisturbed over the next few years. This would be beneficial as it would allow data to be analyzed without taking human interference into account, and would be more comparable to the similar forest profile studies done in Tamil Nadu.

Ultimately the knowledge gained from data gathered in future years should be used to further understand the effects of non-native species competing for sunlight. These transects could then possibly be used as a model for TDEF restoration projects that use non-native timber as a source of funding.

I recommend that this study be continued in future years by other St. Olaf students participating in the Biology in South India program.

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Appendix

Table 1. Location, species. and quantitative data of trees.

Plot	Tree Number	Tree	CBH	DBH (cm)	Height (m)
1A1	1	*Acacia auriculiformis*	41	13.05	14.00
1A1	2	*Tricalysia sphaerocarpa*	3	0.95	1.95
1A1	3	*Acacia auriculiformis*	40	12.73	14.20
1B1	1	*Manilkandra hexandra*	5	1.59	1.75
1B1	3	*Acacia auriculiformis*	10	3.18	3.30
1B1	2	*Khaya senegalensis*	22	7.00	3.00
1A2	1	*Acacia auriculiformis*	49	15.60	14.20
1A2	2	*Acacia auriculiformis*	25	7.96	2.48
1A2	3	*Garcinia spicata*	2.4	0.76	1.77
1A2	4	*Acacia auriculiformis*	1	0.32	1.70
1A2	5	*Acacia auriculiformis*	23	7.32	7.24
1B2	1	*Acacia auriculiformis*	23	7.32	6.57
1B2	2	*Acacia auriculiformis*	0	0.00	1.75
1B2	3	*Walsura triofoliolata*	8	2.55	2.70
1B2	4	*Lemisanthes tetraphylla*	0	0.00	1.70
1A3	1	*Acacia auriculiformis*	15	4.77	2.27
1A3	2	*Ixora Pavetta*	3	0.95	1.82
1A3	3	*Acacia auriculiformis*	0	0.00	1.55
1A3	4	*Acacia auriculiformis*	0	0.00	1.57
1A3	5	*Acacia auriculiformis*	0	0.00	1.80
1A3	6	*Acacia auriculiformis*	0	0.00	1.34
1A3	7	*Acacia auriculiformis*	0	0.00	1.45
1A3	8	*Acacia auriculiformis*	0	0.00	2.05
1A3	9	*Acacia auriculiformis*	0	0.00	1.43
1A3	10	*Acacia auriculiformis*	0	0.00	1.39
1A3	11	*Acacia auriculiformis*	0	0.00	1.40
1A3	12	*Acacia auriculiformis*	0	0.00	1.40
1A3	13	*Acacia auriculiformis*	0	0.00	1.43
1B3	1	*Trarenna Asiatica*	4	1.27	3.00
1A4	1	*Acacia auriculiformis*	23	7.32	6.25
1A4	2	*Acacia auriculiformis*	0	0.00	1.62
1A4	3	*Acacia auriculiformis*	0	0.00	1.96
1A4	4	*Acacia auriculiformis*	0	0.00	1.42
1A4	5	*Acacia auriculiformis*	0	0.00	1.56
1A4	6	*Acacia auriculiformis*	0	0.00	1.62
1A4	7	*Acacia auriculiformis*	0	0.00	1.17
1A4	8	*Acacia auriculiformis*	0	0.00	1.31
1A4	9	*Acacia auriculiformis*	0	0.00	1.60
1A4	10	*Acacia auriculiformis*	0	0.00	1.32
1A4	11	*Acacia auriculiformis*	0	0.00	1.87
1B4	1	*Acacia auriculiformis*	26	8.28	6.04
1B4	2	*Careya arborea*	18	5.73	3.10
1B4	3	*Trichalysia sphaerocarpa*	7	2.23	2.80
1B4	4	*Ixora Pavetta*	3	0.95	1.70
1B4	5	*Atlantia monophylla*	10	3.18	2.70
1B4	6	*Acacia auriculiformis*	0	0.00	1.60
1A5	1	*Acacia auriculiformis*	0	0.00	2.05
1A5	2	*Trarenna Asiatica*	0	0.00	2.10
1A5	3	*Acacia auriculiformis*	0	0.00	1.40

Plot	Tree Number	Tree	CBH	DBH (cm)	Height (m)
1A5	4	*Acacia auriculiformis*	0	0.00	2.07
1A5	5	*Acacia auriculiformis*	0	0.00	1.90
1A5	6	*Acacia auriculiformis*	0	0.00	1.35
1A5	7	*Acacia auriculiformis*	0	0.00	2.40
1A5	8	*Acacia auriculiformis*	0	0.00	1.42
1A5	9	*Acacia auriculiformis*	0	0.00	1.85
1A5	10	*Acacia auriculiformis*	0	0.00	1.90
1A5	11	*Acacia auriculiformis*	0	0.00	1.90
1A5	12	*Acacia auriculiformis*	0	0.00	2.05
1A5	13	*Acacia auriculiformis*	0	0.00	2.05
1A5	14	*Acacia auriculiformis*	0	0.00	2.00
1A5	15	*Acacia auriculiformis*	0	0.00	1.45
1A5	16	*Acacia auriculiformis*	0	0.00	1.50
1A5	17	*Acacia auriculiformis*	0	0.00	1.53
1A5	18	*Acacia auriculiformis*	0	0.00	1.60
1A5	19	*Acacia auriculiformis*	0	0.00	1.72
1A5	20	*Prenna serritifolio*	4.2	1.34	3.10
1B5	1	*Walsura triofoliolata*	6	1.91	2.73
1B5	2	*Acacia auriculiformis*	0	0.00	1.40
1B5	3	*Acacia auriculiformis*	0	0.00	1.70
1B5	4	*Acacia auriculiformis*	0	0.00	2.00
1B5	5	*Acacia auriculiformis*	0	0.00	1.45
1B5	6	*Acacia auriculiformis*	0	0.00	2.10
1B5	7	*Acacia auriculiformis*	0	0.00	2.00
1B5	8	*Acacia auriculiformis*	0	0.00	1.80
1B5	9	*Acacia auriculiformis*	0	0.00	1.35
1B5	10	*Acacia auriculiformis*	0	0.00	1.45
1B5	11	*Acacia auriculiformis*	0	0.00	1.80
1B5	12	*Acacia auriculiformis*	0	0.00	1.75
1B5	13	*Acacia auriculiformis*	0	0.00	1.60
1B5	14	*Acacia auriculiformis*	0	0.00	1.65
1A6	1	*Acacia auriculiformis*	4	1.27	2.23
1A6	2	*Acacia auriculiformis*	3.5	1.11	2.05
2A1	1	*Memecylon Umbellatum*	4	1.27	2.15
2A1	2	*Acacia auriculiformis*	64	20.37	16.13
2A1	3	*Clausena dentata*	4	1.27	3.25
2A1	4	*Tricalysia sphaerocarpa*	12	3.82	2.90
2A1	5	*Murrayapaniculata*	5	1.59	2.30
2A1	6	*Walsura triofoliolata*	0	0.00	2.45
2A1	7	*Trarenna asiatica*	5	1.59	2.50*
2B1	1	*Manilkandra hexandra*	6	1.91	2.87
2B1	2	*Catunaregam spinosa*	0	0.00	1.50
2A2	1	*Sapindus emarginatus*	8	2.55	2.85
2A2	2	*Ixora pavetta*	4	1.27	1.80
2A2	3	*Diospyros ebenum*	11	3.50	2.95
2A2	4	*Walsura triofoliolata*	7	2.23	1.93
2A2	5	*Garcinia spicata*	0	0.00	1.40
2A2	6	*Drypetes sepiaria*	5	1.59	1.85
2A2	7	*Acacia auriculiformis*	4	1.27	2.00
2A2	8	*Acacia auriculiformis*	0	0.00	1.40
2A2	9	*Acacia auriculiformis*	0	0.00	1.85
2A2	10	*Acacia auriculiformis*	0	0.00	1.40

*This tree was wind damaged and was growing nearly horizontal to the ground.

Plot	Tree Number	Tree	CBH	DBH (cm)	Height (m)
2A2	11	*Acacia auriculiformis*	4	1.27	2.00
2A2	12	*Acacia auriculiformis*	6	1.91	2.20
2A2	13	*Acacia auriculiformis*	0	0.00	1.60
2B2	1	*Anacardium occidentale*	40	12.73	3.00
2B2	2	*Trarenna asiatica*		0.00	
2B2	3	*Acacia auriculiformis*	88	28.01	3.70
2B2	4	*Acacia auriculiformis*	11	3.50	3.40
2A3	1	*Manilkandra hexandra*	7	2.23	2.83
2A3	2	*Manilkandra hexandra*	5	1.59	1.85
2A3	3	*Manilkandra hexandra*	5	1.59	2.05
2A3	4	*Lemisanthes tetraphylla*	8	2.55	2.60
2A3	5	*Polyalthia suberosa*	4	1.27	1.80
2B3	1	*Anacardium occidentale*	8	2.55	2.40
2B3	2	*Bridelia retusa*	14	4.46	2.80
2B3	3	*Acacia auriculiformis*	0	0.00	1.95
2A4	1	*Diospyros ebenum*	9	2.86	2.93
2A4	2	*Cassia siamea*	0	0.00	1.70
2A4	3	*Cassia siamea*	0	0.00	1.70
2A4	4	*Cassia siamea*	0	0.00	1.85
2A4	5	*Bridelia retusa*	15	4.77	1.95
2A4	6	*Polyalthia suberosa*	4	1.27	1.75
2A4	7	*surugada angustifolia*	10	3.18	3.45
2B4	1	*Cassia siamea*	4	1.27	1.70
2A5	1	*Acacia auriculiformis*	42	13.37	6.11
2A5	2	*Pterocarpus marsupium*	6	1.91	2.00
2A5	3	*Pterospermum suberifolium*	11	3.50	3.44
2B5	1	*Drypetes sepiaria*	4	1.27	1.90
2B5	2	*Acacia auriculiformis*	3	0.95	2.10
2B5	3	*Unknown*	11	3.50	3.27
2A6	1	*Ixora pavetta*	7	2.23	2.10
2A6	2	*Todelia asiatica*		0.00	2.05
2A6	3	*Ixora pavetta*	0	0.00	1.70
2B6	1	*Lepisanthes tetraphylla*	6	1.91	4.41
3A1	1	*Acacia auriculiformis*	38	12.10	8.55
3A1	2	*Pterocarpus indicus*	12	3.82	3.54
3A1	3	*Dimorphocalyx glabellus*	0	0.00	1.37
3B1	1	*Acacia auriculiformis*	39	12.41	6.77
3B1	2	*Euphorbia tirucalli*	4	1.27	1.45
3B1	3	*Acacia auriculiformis*	0	0.00	1.50
3B1	4	*Todelia asiatica*	0	0.00	1.40
3B1	5	*Tarenna asiatica*	4	1.27	1.80
3B1	6	*Berrya cordifolia*	7	2.23	2.50
3A2	1	*Ixora pavetta*	4	1.27	1.75
3A2	2	*Lannea coromandelica*	0	0.00	1.40
3A2	3	*Millingtonia hortensis*	0	0.00	1.40
3B2	1	*Tarenna asiatica*	6	1.91	1.95
3B2	2	*Acacia auriculiformis*	0	0.00	1.35
3B2	3	*Acacia auriculiformis*	39	12.41	8.37
3B2	4	*Pterocarpus indicus*	10	3.18	3.20
3A3	1	*Bridelia retusa*	5	1.59	2.15
3A3	2	*Acacia auriculiformis*	43	13.69	7.07

Plot	Tree Number	Tree	CBH	DBH (cm)	Height (m)
3A3	3	*Dolichandiom atrovirens*	6	1.91	1.85
3A3	4	*Berrya cordifolia*	5	1.59	2.30
3A3	5	*Tarenna asiatica*	0	0.00	1.65
3B3	1	*Tarenna asiatica*	0	0.00	1.50
3B3	2	*Tarenna asiatica*	0	0.00	1.65
3B3	3	*Tarenna asiatica*	4	1.27	1.85
3B3	4	*Millingtonia hortensis*	8	2.55	3.10
3B3	5	*Acacia auriculiformis*	0	0.00	1.55
3B3	6	*Acacia auriculiformis*	49	15.60	11.82
3A4	1	*Acacia auriculiformis*	41	13.05	6.66
3A4	2	*Dalbergia latifolia*	7	2.23	2.30
3A4	3	*Dimorphocalyx glabellus*	0	0.00	1.65
3B4	1	*Pterocarpus marsupium*	16	5.09	3.53
3B4	2	*Acacia holesericea*	0	0.00	1.60
3B4	3	*Acacia holisericea*	0	0.00	1.35
3B4	4	*Acacia auriculiformis*	0	0.00	1.30
3B4	5	*Acacia auriculiformis*	0	0.00	1.75
3B4	6	*Acacia auriculiformis*	0	0.00	1.75
3B4	7	*Acacia auriculiformis*	0	0.00	1.75
3B4	8	*Acacia auriculiformis*	0	0.00	1.80
3B4	9	*Acacia auriculiformis*	0	0.00	1.40
3B4	10	*Acacia auriculiformis*	0	0.00	1.60
3B4	11	*Acacia auriculiformis*	0	0.00	1.70
3B4	12	*Acacia auriculiformis*	0	0.00	1.50
3B4	13	*Acacia auriculiformis*	0	0.00	1.80
3B4	14	*Acacia auriculiformis*	0	0.00	1.60
3B4	15	*Acacia auriculiformis*	37	11.78	4.78
3A5	1	*Pterocarpus santalinus*	0	0.00	3.44
3B5	1	*Acacia auriculiformis*	0	0.00	1.70
3B5	2	*Acacia auriculiformis*	0	0.00	1.30
3B5	3	*Murrayapaniculata*	0	0.00	1.85
3A6	1	*Lannea coromandelica*	6	1.91	1.70
3A6	2	*Pterocarpus indicus*	6	1.91	2.28
3A6	3	*Ziziphus Oenoplia*	4	1.27	2.05
3A6	4	*Acacia auriculiformis*	4	1.27	2.40
3A6	5	*Morinda corena*	4	1.27	1.70
3B6	1	*Acacia auriculiformis*	32	10.19	10.94
3B6	2	*Acacia auriculiformis*	25	7.96	5.81
3B6	3	*Millingtonia hortensis*	4	1.27	2.05

Table 2. Tree species by transect for 2011 and 2012

Species	Transect					
	1	1	2	2	3	3
	2011	2012	2011	2012	2011	2012
Arecales						
Arecaceae						
Phoenix pusilla	0	0	0	2	0	0
Fabales						
Fabaceae						
Acacia auriculiformis	53	52	25	13	12	25
Acacia holeseicea	0	0	0	0	0	2
Cassia fistula	0	0	0	0	3	0
Cassia siamea	0	0	2	4	0	0
Dalbergia latifolia	0	0	0	0	1	1
Pterocarpus indicus	0	0	0	0	0	3
Pterocarpus marsupium	0	0	1	1	2	1
Gentiales						
Rubiaceae						
Tricalysia sphaerocarpa	2	2	1	1	0	0
Ixora pavetta	4	2	3	3	1	1
Tarenna asiatica	4	2	8	2	5	6
Canthium coromandelicum	0	0	1	0	0	0
Ericales						
Ebenaceae						
Diospyros ebenum	1	1	2	2	0	0
Diospyros ferrea	1	0	0	0	0	0
Lecythindaceae						
Careya arborea	1	1	0	0	0	0
Sapotaceae						
Manilkara hexandra	1	1	3	4	0	0
Lamiales						
Bignoniaceae						
Millingtonia hortensis	0	0	0	0	3	3
Varbenaceae						
Premna serratifolia	1	1	0	1	0	0

Species	Transect					
	1	1	3	2	2	3
	2011	2012	2011	2012	2011	2012
Clusiaciae						
Garcinia spicata	1	1	1	1	0	0
Euphorbiaceae						
Breynia vitis-idaea	1	0	0	0	0	0
Breynia retusa	0	1	0	0	1	0
Bridelia retusa	5	0	4	2	1	1
Drypetes sepiaria	0	0	3	2	0	0
Suregada angustifolia	0	0	1	2	0	0
Magnoliales						
Annonaceae						
Polyalthia suberosa	0	0	2	2	0	0
Malvales						
Malvaceae						
Berrya cordifolia	0	0	0	0	2	2
Sterculiaceae						
Pterospermum suberifolium	0	0	1	1	0	0
Myrtales						
Melastomataceae						
Memecylon umbellatum	0	0	2	1	0	0
Rosales						
Rhamnaceae						
Ziziphus oenoplia	2	0	0	0	1	1
Sapindales						
Anacardiaceae						
Anacardium occidentale	0	0	3	2	0	0
Meliaceae						
Azadirachta indica	0	0	1	0	0	0
Khaya senegalensis	1	1	0	0	0	0
Walsura trifoliata	2	2	2	2	0	0
Rutaceae						
Atalantia monophylla	1	1	0	0	0	0
Catunaregam spinosa	0	0	4	1	0	0
Clausena dentata	0	0	1	1	0	0
Toddalia asiatica	0	0	0	1	0	0
Murraya paniculata	0	0	3	2	1	1
Sapindaceae						
Dodonaea viscosa	0	0	1	0	0	0
Lepisanthes tetraphylla	2	1	2	2	0	0
Sapindus emarginata	0	0	1	1	0	0

Species	Transect					
	1	1	3	2	2	3
	2011	2012	2011	2012	2011	2012
Boraginaceae						
Cordia monoica	0	0	1	0	0	0
Species Richness	17	14	25	25	12	12
Species Diversity	1.59	1.18	2.65	2.90	2.07	1.71

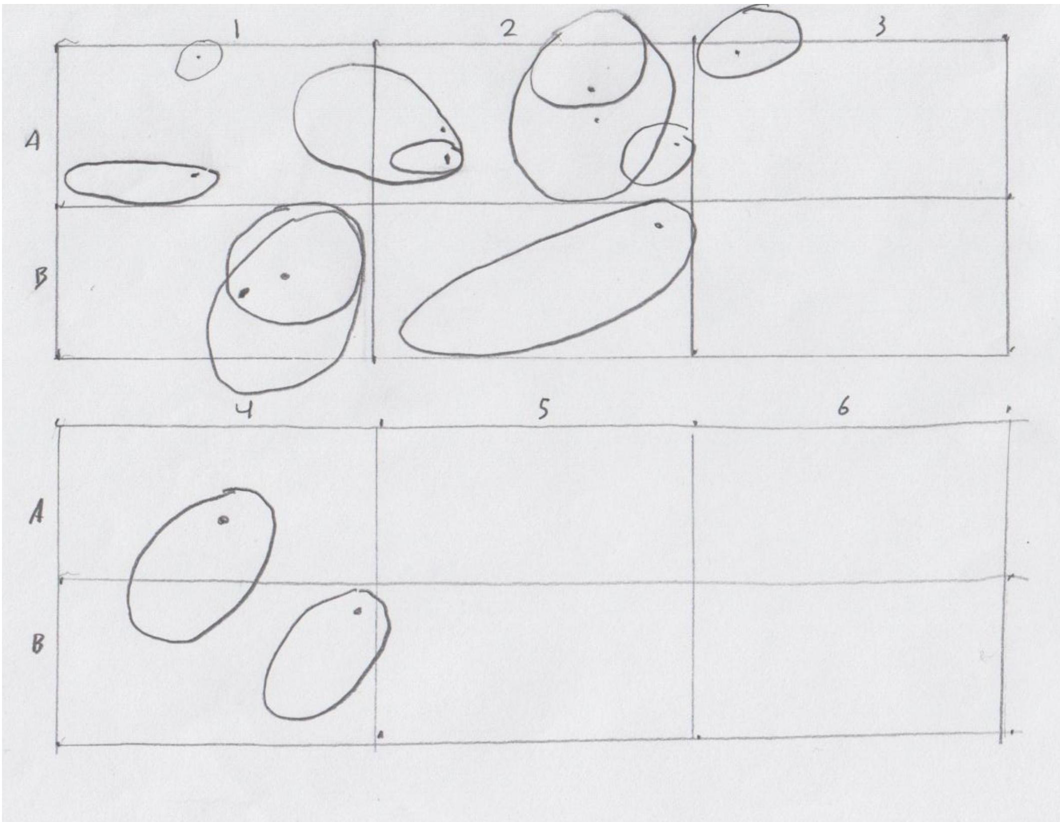

Figure 1. Crown projection diagram of transect 1

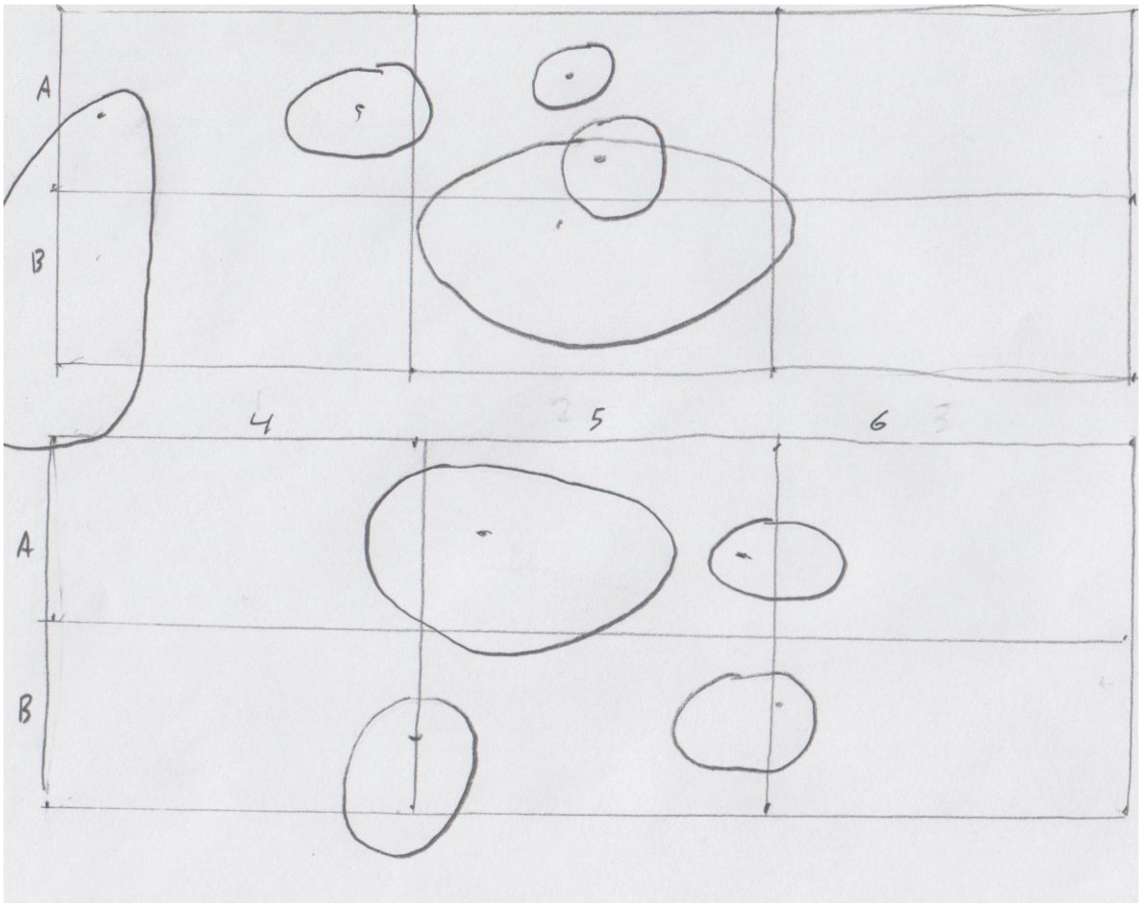

Figure 2. Crown projection diagram of transect 2

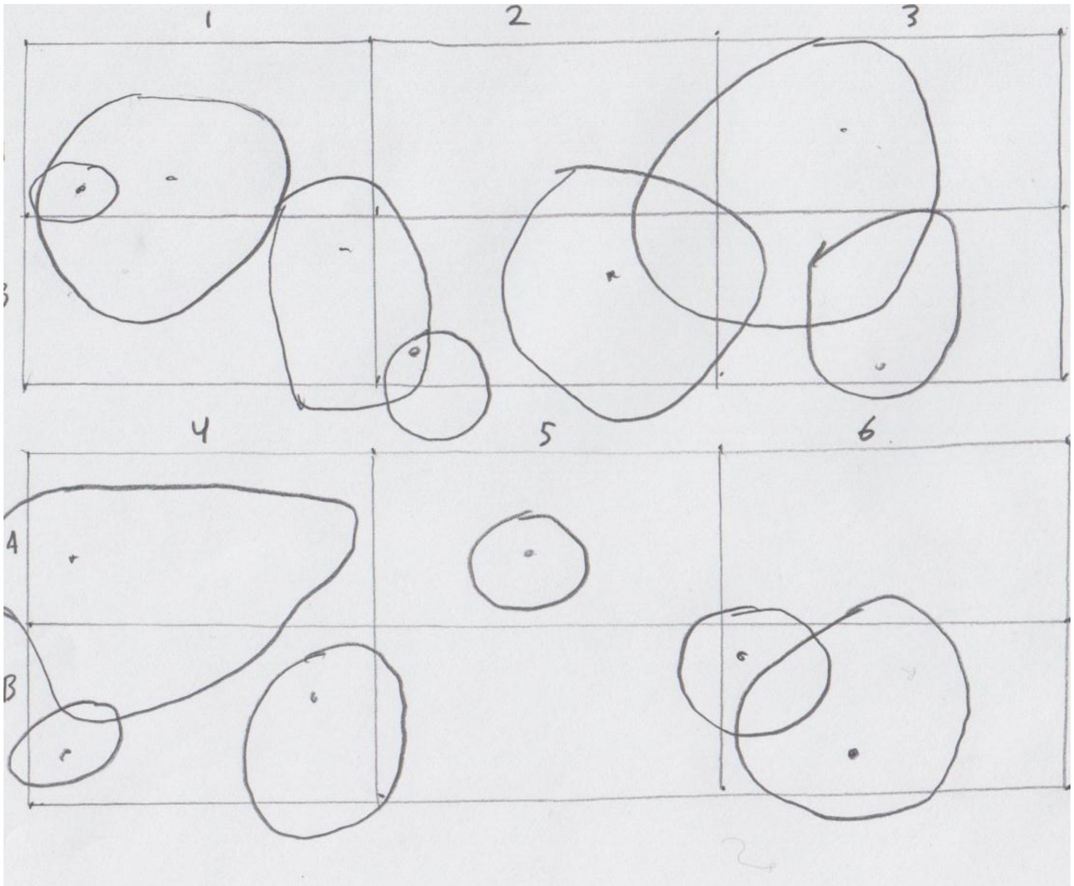

Figure 3. Crown projection diagram of transect 3

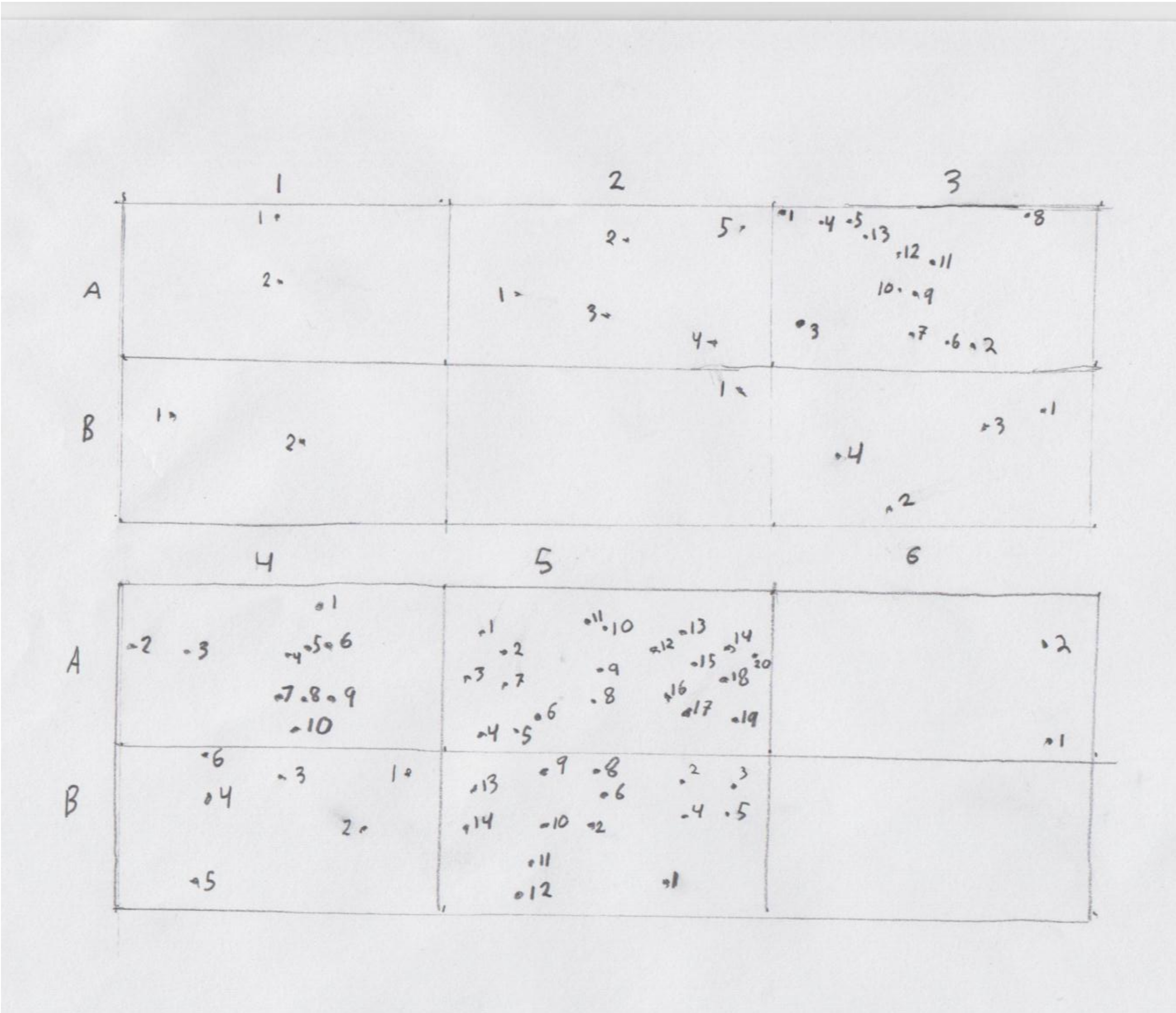

Figure 4. Tree locations for transect 1

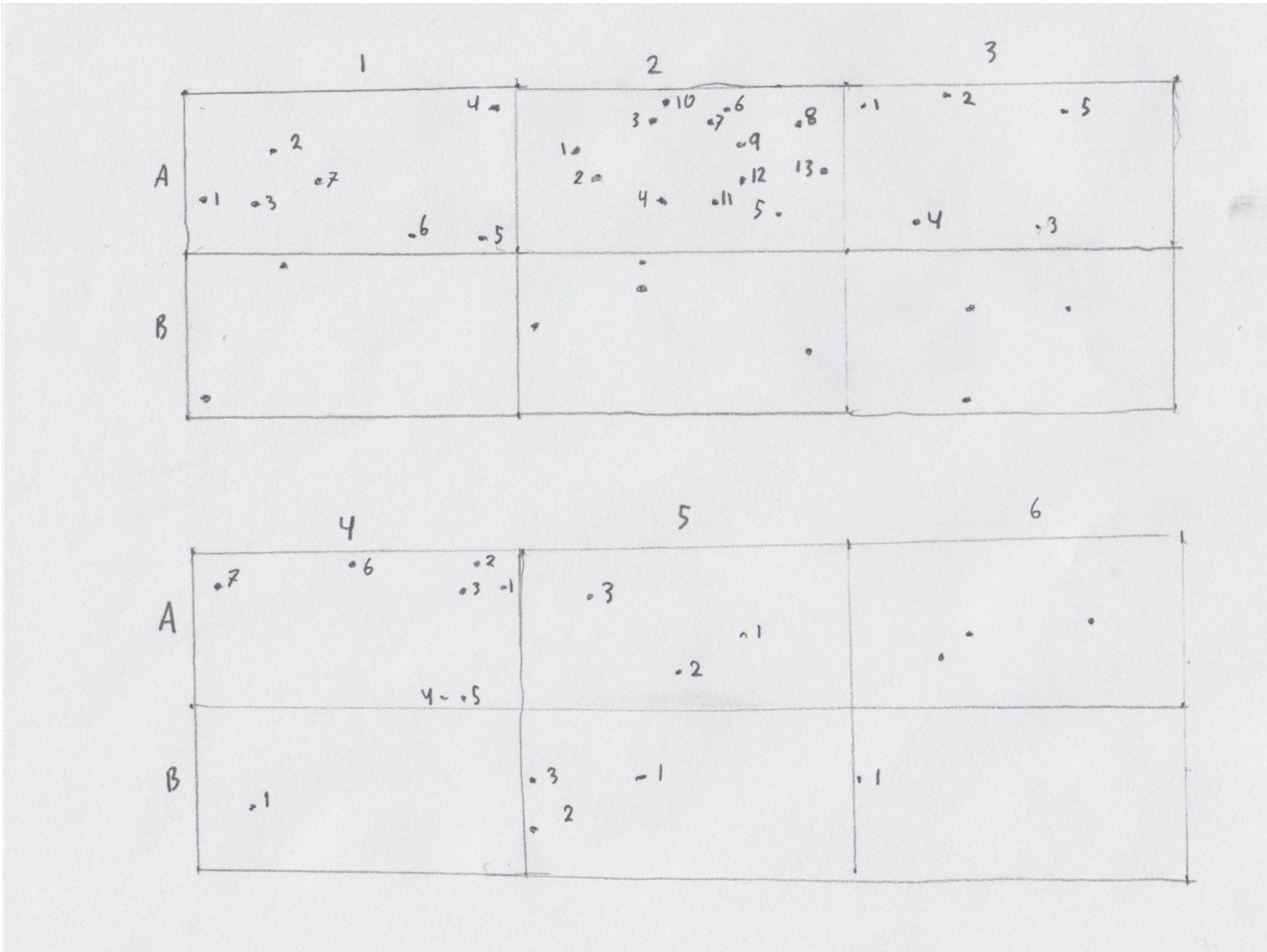

Figure 5. Tree locations for transect 2.

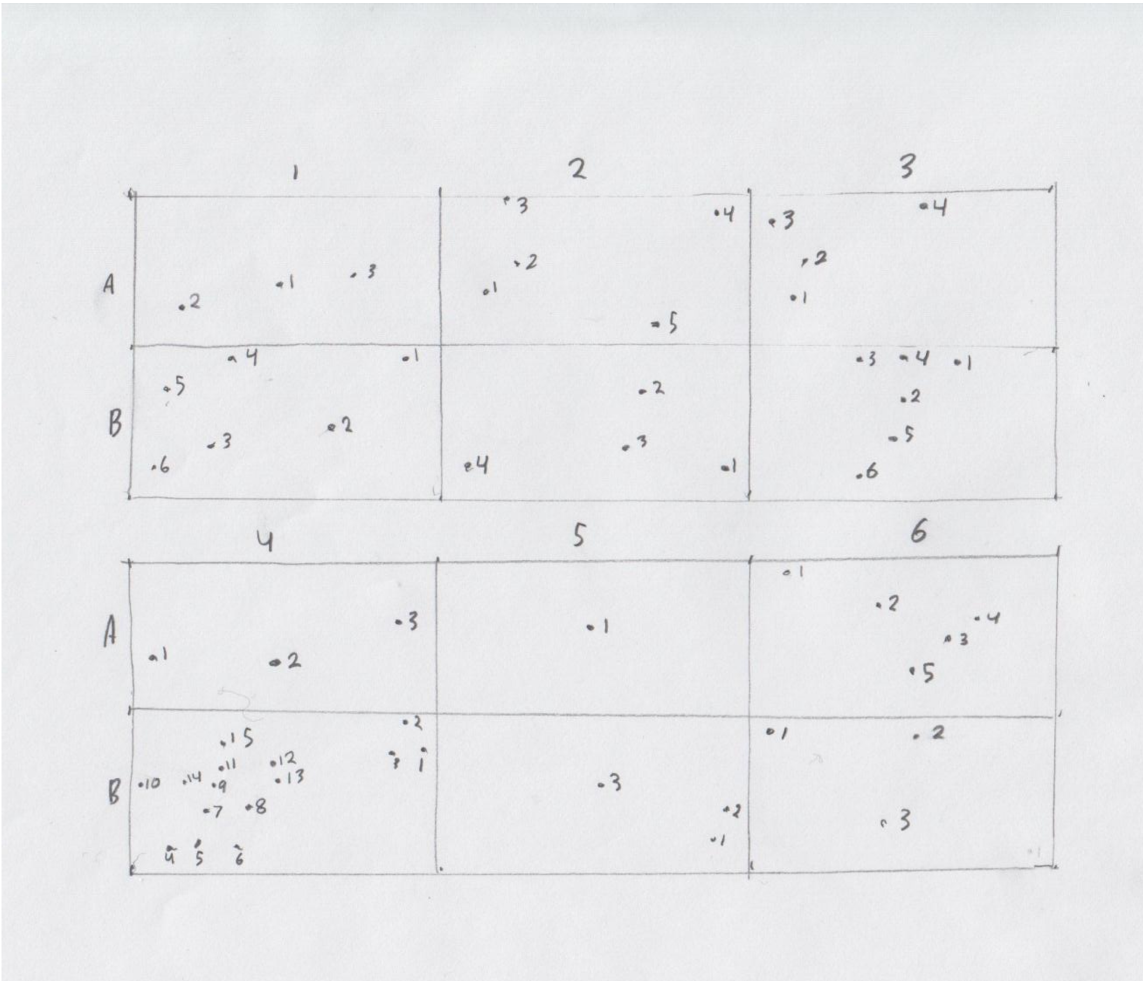

Figure 6. Tree locations for transect 3.

Personal Reflection

Auroville was one of the most interteresting and fun places I had the privelage of visiting during my semester India. When we arrived at Mitra, our hostel, Leah and I felt a little nervous about re-joining a community style living situation. However, our minds were put at ease when we met our respective roommates, who instantly included us in their circle of friends. After the first day we never had a shortage of invitations to any number of interesting activities.

Leah became very involved with the Frisbee team, while I took time to explore the countryside surrounding Auroville. I was able to take my first surfing lessons, attended an earth chant, and went to the weekly pizza nights at the youth center. I even stepped further out of my comfort zone than I had the entire semester when I agreed attended a class on free form interpretive dance.

Working in Evergreen was often times solitary, even meditative. Working in the forest for hours at a time by myself provided great introspective opportunities. Working with Dave was always fun, He was incredibly knowledgeable and was never hesitant to invite me to meals with his family on the weekends.

The best part about Auroville, however, was the amazing group of people I had the pleasure of meeting. I am always going to miss Satish's command random knowledge, Aditya's sense of humor, Jannis's hospitality and my roommate Suman's companionship. The people I met made my time truly worthwhile.