

Reforestation Monitoring Study

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Reforestation Monitoring: The Study

This is an ongoing study of the Cloudbridge reforestation effort. Each year, starting in 2003, we monitor a substantial sample of the trees that have been planted, to assess their growth and health. We are seeking volunteer researchers to continue with this project.

Reforestation Monitoring: Methodology

The purpose of the data collected on planted tree sites is to give an evaluation of each site and to start compiling a database on the conditions preferred by different tree species. Information concerning slope, competition, coverage, soil quality and drainage was collected along with the tree species (if known) and tree condition. At the same time sites were numbered and labeled so that specific sites could be revisited in the future.

The labels: Metal tags were affixed to the stake corresponding to tree site. The tree number, species and date planted were engraved into the tag. At the beginning another number corresponding to the number of the specific species planted (similar to the number of tree but only the number of trees of that species) was also included but later dropped as deemed unnecessary. The labels now read tree number, species, date. For example: [134 CY 02] would indicate tree number 134 is a Cypress planted in 2002. If species or date are not know than that space is left blank. Metal tags are first etched with a ball point pen and then retraced with a black permanent marker. This creates a much longer lasting label than just permanent marker. Between tree 200 and 300 we ran out of metal tags and started using orange flagging tape. This flagging tape is always tied below that corresponding to the date as not to get the two confused. It is important that these tags soon be replaced with metal tags so that a more secure marker be in place.

Tree number: Sites (with or without trees) that are deemed good for planting (for example, if is a site is located under another tree it is not good for planting and should be excluded) are given a tree number. If there is no tree or if the tree is dead this should be noted in the additional section so that one may be planted there later. In the tree number column it is also important to note the tree species and date it was planted.



The following are the measurements we take for each tree:

Tree height:	The height in meters beginning at the base to the top of the crown with measuring stick or Abney See separate Abney Guide. Picture of Abney Level below (Stephan used Blume-Leiss device)
DBH (Diameter at Breast Height)	The stem diameter at the height of 1.3 m in cm with measuring tape or caliper (cross measuring)
Crown Diameter:	The crown radius in 4 cardinal directions in meters with measuring stick or measuring tape (survey from trees higher than 1.5 m -> determination of the crown coverage (crown projection))
Ground Coverage:	Estimation of the ground cover within a radius of 1 m around the planting point - Scale from 0 to 5: <ul style="list-style-type: none"> • 0 (no ground cover) • 1 (20 % covered) • 2 (40 % covered) • 3 (60 % covered) • 4 (80 % covered) • 5 (completely covered) The type of the coverage is also noted (gr - grass, fb - forbs, fr - fern ect.)
Competition:	Estimation of the competition situation, especially LIGHT: <ul style="list-style-type: none"> • 0 (no effect on the tree) to • 5 (completely covered - overshadowed / highest amount of shade degree) • Steps like Ground Coverage Type of competition: <ul style="list-style-type: none"> • tree(species)(tr), fern (fr), grass (gr)
Soil quality/Drainage:	estimation on a scale from 1 - 5 - this should not change from year to year 1 (puddles no drainage) 5 (steep slope good drainage)
Type of soil:	R - rock; S- sand; C - clay; D - dark rich soil
Health:	estimation of the vitality on a scale from 0 to 5: <ul style="list-style-type: none"> • 0 - dead • 1 - very bad developed trees, decaying (only isolated foliage / needle foliage, badly damage, etc.) • 2 - bad developed trees (depending on the species - (needle) foliage below average and/or height below average and/or (lightly) damaged) • 3 - trees of average development (depending on the species) • 4 - well developed trees (depending on the species - (needle) foliage above average and/or height above average, only few damages) • 5 - very well developed trees (only picked out specimen of a tree species with strong, stable growth and height/crown projection above average, only few little damages)

The following are some of the trees in the reforestation plantation:

Tree Code	Common Name	Scientific Name
AA	Jaul, Alder	<i>Alnus acuminata</i>
CT	Cedro dulce, Sweet cedar	<i>Cedrela tonduzii</i>
CDS	Dama	<i>Citharexylum donnell-smithii</i>
CL	Cypress, Cipress	<i>Cupressus lusitanica</i>
DA	Guachipelin	<i>Diphysa americana</i>
EJ	Manzana de rosa, Rose Apple	<i>Eugenia jambos</i>
IN	Guayaba de montana, wild avocado	<i>Inga sp.</i> (mainly <i>Inga sierrae</i>)
PF	Zapote, Nispero	<i>Pouteria fossicola</i> (manilkara zapo- ta - change to last methodology)
PC	Aguacatillo, wild avocado	<i>Persea caerulea</i>
QC	Roble blanco, white oak	<i>Quercus copeyensis</i>
QCC	Roble negro, black oak	<i>Quercus costaricensis</i>
QS	Encino blanco, Roble, oak	<i>Quercus seemanii</i>
QGT	Roble blanco, white oak	<i>Quercus gulielmi-treleasii</i>
QO	Encino blanco, Roble, oak	<i>Quercus oocarpa</i> (insignis, rapura- huensis)
SP	Yos	<i>Sapium pachystachys</i>
SC	Llama del bosque, Flame of the Forest	<i>Spathodea campanulata</i>
TS	Vainilla, Candelillo	<i>Tecoma stans</i>
UM	Tirrá, Mexican elm	<i>Ulmus mexicana</i>
Laur	aguacatillo, aguacaton	Lauraceae (including following species: <i>Cinnamomum</i> spp. (not seen but possible); <i>Nectandra</i> spp.; <i>Ocotea</i> spp.; <i>Persea</i> spp.; <i>Beilschmiedia</i> spp.)

Tree monitoring site: Amanzimtoti Measures in metres
 Date: Height measured directly, or with Abney Level
 Name: DBH=diameter at 1.3m

No.	Species code	Height (meters)	DBH (m)	crown diameter: (meters)				Cov.	Comp.	Soil	Health	Planted	Comments	Abney tree height data			
				north	west	south	east							Dist. (m)	Angle up (Φt degrees)	Angle down (Φb degrees)	estimated height (hest meters)
0	Example	5.2	1.5	2	2	2	2	1 fb	4 tr	2D		5		5	45	-2	6
A1	nispero	0.0										2002					
A2	nispero	0.0										2002					
A3	in	0.0										2002					
A4	nispero	0.0										2002					
A5	in	0.0										2002					
A6	nispero	0.0										2002					
A7	nispero	0.0										2002					
A8	nispero	0.0										2002					
A9	pf	0.0										2002					
A10	nispero	0.0										2002					
A11	in	0.0										2002					
A12	nispero	0.0										2004					
A13	pf	0.0										2002					
A14	cds	0.0										2002					
A15	qc	0.0										2002					
A16	in	0.0										2002					
A17	pf	0.0										2002					
A18	um	0.0										2002					
A19	pc	0.0										2002					
A20	aa	0.0										2002					
A21	sp	0.0										2002					
A22	cl	0.0										2002					
A23	ej	0.0										2004					
A24	aa	0.0										2002					
A25	guarea kunth	0.0										2002					
A26	sc	0.0										2004					
A27	cds	0.0										2002					
A28	aa	0.0										2002					
A29	ts	0.0										2002					
A30	ts	0.0										2002					
A31	inga? - mirto	0.0										2003					
A32	cds	0.0										2002					
A33	ts	0.0										2002					
A34	ej	0.0										2004					
A35	qc.spp. - q.pi	0.0										2002					
A36	qc	0.0										2002					
A37	cds	0.0										2002					
A38	pf	0.0										2002					
A39	pc	0.0										2002					
A40	um	0.0										2002					
A41	qc.spp.	0.0										2002					

Tree monitoring site: Amanzimtoti Measures in metres
 Date: Height measured directly, or with Abney Level
 Name: DBH=diameter at 1.3m

Abney tree height data estimated
 Dist. Angle up Angle down height
 (m) (ϕt degrees) (ϕb degrees) (hest meters)

No.	Species code	Height (meters)	DBH (m)	crown diameter: (meters)				Cov.	Comp.	Soil	Health	Planted	Comments	Dist. (m)	Angle up (ϕt degrees)	Angle down (ϕb degrees)	height (hest meters)
				north	west	south	east										
A42		0.0															
A43	sp	0.0										2002					
A44		0.0															
A45	qc	0.0										2002					
A46	in	0.0										2003					
A47	aa	0.0										2002					
A48	ct	0.0										2002					
A49	pc	0.0										2002					
A50	cds	0.0										2002					
A51	pc	0.0										2002					
A52	aa	0.0										2002					
A53	ct	0.0										2002					
A54	sp	0.0										2002					
A55	sp	0.0										2002					
A56	sc	0.0										2004					
A57	qc	0.0										2002					
A57X	ej	0.0										2004					
A58	pf	0.0										2002					
A59	sp	0.0										2002					
A59X	in	0.0										2002					
A60	x	0.0										2002					
A60X	qc	0.0										2002					
A61	in	0.0										2002					
A62	in	0.0										2003					
A63	not found	0.0															
A64	qc	0.0										2002					
A65	not found	0.0															
A66	x	0.0										2002					
A67	qc	0.0										2002					
A68	dead	0.0															
A69	pc?	0.0										2004					
A70	perhaps dead	0.0															
A71	dead	0.0															
A72	not found	0.0															
A73	not found	0.0															
A74	aa	0.0										2002					
A75	qc	0.0										2002					
A76	aa	0.0										2002					
A77	not found	0.0															
A78	sp	0.0										2002					
A79	cds	0.0										2002					
A80	um	0.0										2002					

Tree monitoring site: Amanzimtoti Measures in metres
 Date: Height measured directly, or with Abney Level
 Name: DBH=diameter at 1.3m

Abney tree height data estimated
 Dist. Angle up Angle down height
 (m) (ϕt degrees) (ϕb degrees) (hest meters)

No.	Species code	Height (meters)	DBH (m)	crown diameter: (meters)				Cov.	Comp.	Soil	Health	Planted	Comments	Dist. (m)	Angle up (ϕt degrees)	Angle down (ϕb degrees)	height (hest meters)
				north	west	south	east										
A81	x	0.0										2002					
A82	dead	0.0															
A83	dead	0.0															
A84	q.spp.	0.0										2002					
A85	aa	0.0										2002					
A86	sp	0.0										2002					
A87	sp	0.0										2002					
A88	lauraceae - ir	0.0										2002					
A89	aa	0.0										2002					
A90	sp	0.0										2002					
A91	ct	0.0										2002					
A92	ct	0.0										2002					
A93	dead ?	0.0															
A94	sp	0.0										2002					
A95	aa	0.0										2002					
A96	not found	0.0															
A97	cds	0.0										2002					
A98	cds	0.0										2002					
A99	aa	0.0										2002					
A100	ct	0.0										2002					
A101	sp	0.0										2002					
A102	um	0.0										2002					
A103	in	0.0										2002					
A104	sp	0.0										2002					
A105	qc	0.0										2002					