

UHURU Data Set Visualization

Charles

2023-02-23

The Working directory inside this Rmarkdown r chunk is the following:

```
getwd()
```

```
## [1] "C:/Users/charl/Sp2023_DataScience/documents"
```

Note: remember that working directories in a project and in an R chunk are not always the same

1. Describing the working data set

UHURU data set

2. Reading the data set

we are reading the dataset into tsv (tab separated values).

```
read.csv(file = "../data-raw/ACACIA_DREPANOLOBIUM_SURVEY.txt", sep = "\t")
```

##	SURVEY	YEAR	SITE	BLOCK	TREATMENT	PLOT	ID	HEIGHT	AXIS1	AXIS2	CIRC
## 1	1	2012	SOUTH	1	TOTAL	S1TOTAL	581	2.25	2.75	2.15	20.0
## 2	1	2012	SOUTH	1	TOTAL	S1TOTAL	582	2.65	4.10	3.90	28.0
## 3	1	2012	SOUTH	1	TOTAL	S1TOTAL	3111	1.5	1.70	0.85	17.0
## 4	1	2012	SOUTH	1	TOTAL	S1TOTAL	3112	2.01	1.80	1.60	12.0
## 5	1	2012	SOUTH	1	TOTAL	S1TOTAL	3113	1.75	1.84	1.42	13.0
## 6	1	2012	SOUTH	1	TOTAL	S1TOTAL	3114	1.65	1.62	0.85	15.0
## 7	1	2012	SOUTH	1	TOTAL	S1TOTAL	3115	1.2	1.95	0.90	9.0
## 8	1	2012	SOUTH	1	TOTAL	S1TOTAL	3199	1.45	2.00	1.75	12.2
## 9	1	2012	SOUTH	1	MESO	S1MESO	941	1.87	2.15	1.82	13.0
## 10	1	2012	SOUTH	1	MESO	S1MESO	942	2.38	5.55	4.82	35.0
## 11	1	2012	SOUTH	1	MESO	S1MESO	943	2.58	4.90	4.24	24.0
## 12	1	2012	SOUTH	1	MESO	S1MESO	944	2.65	3.75	3.10	27.0
## 13	1	2012	SOUTH	1	MESO	S1MESO	946	2.35	2.34	2.05	20.0
## 14	1	2012	SOUTH	1	MESO	S1MESO	947	1.88	2.10	1.85	28.0
## 15	1	2012	SOUTH	1	MESO	S1MESO	3116	2.32	3.05	2.63	30.0
## 16	1	2012	SOUTH	1	MESO	S1MESO	3117	2.39	2.21	2.10	13.0
## 17	1	2012	SOUTH	1	MESO	S1MESO	3118	2.2	1.80	1.50	10.0
## 18	1	2012	SOUTH	1	MESO	S1MESO	3119	1.05	0.90	0.55	8.0
## 19	1	2012	SOUTH	1	MESO	S1MESO	3120	2	1.25	1.20	10.0
## 20	1	2012	SOUTH	1	MESO	S1MESO	3131	1.28	1.14	1.00	10.0

## 21	1	2012	SOUTH	2	OPEN	S2OPEN	341	dead	NA	NA	NA
## 22	1	2012	SOUTH	2	TOTAL	S2TOTAL	3178	1.4	2.50	2.15	18.0
## 23	1	2012	SOUTH	2	TOTAL	S2TOTAL	101	1.9	3.31	2.65	15.0
## 24	1	2012	SOUTH	2	TOTAL	S2TOTAL	102	1.75	2.70	2.55	16.0
## 25	1	2012	SOUTH	2	TOTAL	S2TOTAL	103	1.8	2.75	2.30	16.0
## 26	1	2012	SOUTH	2	TOTAL	S2TOTAL	104	2.7	4.05	4.00	35.2
## 27	1	2012	SOUTH	2	TOTAL	S2TOTAL	105	2.02	2.85	1.49	17.0
## 28	1	2012	SOUTH	2	TOTAL	S2TOTAL	108	1.9	3.10	2.85	19.0
## 29	1	2012	SOUTH	2	TOTAL	S2TOTAL	109	1.85	2.45	1.90	19.0
## 30	1	2012	SOUTH	2	TOTAL	S2TOTAL	110	1.65	1.90	1.54	17.0
## 31	1	2012	SOUTH	2	TOTAL	S2TOTAL	111	1.4	2.35	1.45	14.0
## 32	1	2012	SOUTH	2	TOTAL	S2TOTAL	113	2.5	3.25	2.30	22.0
## 33	1	2012	SOUTH	2	TOTAL	S2TOTAL	115	2.05	5.40	4.50	33.0
## 34	1	2012	SOUTH	2	TOTAL	S2TOTAL	116	2.26	3.50	3.10	33.0
## 35	1	2012	SOUTH	2	TOTAL	S2TOTAL	117	2.13	2.40	2.30	20.0
## 36	1	2012	SOUTH	2	TOTAL	S2TOTAL	118	1.8	3.15	2.55	22.0
## 37	1	2012	SOUTH	2	TOTAL	S2TOTAL	1211	1.85	2.00	2.27	20.0
## 38	1	2012	SOUTH	2	TOTAL	S2TOTAL	1212	1.5	2.15	1.80	15.0
## 39	1	2012	SOUTH	2	TOTAL	S2TOTAL	1213	1.87	2.34	2.05	13.0
## 40	1	2012	SOUTH	2	TOTAL	S2TOTAL	1214	1.58	1.28	0.75	11.0
## 41	1	2012	SOUTH	2	TOTAL	S2TOTAL	1215	2.05	2.10	1.75	17.0
## 42	1	2012	SOUTH	2	TOTAL	S2TOTAL	1216	1.75	2.45	3.28	16.0
## 43	1	2012	SOUTH	2	TOTAL	S2TOTAL	1217	1.49	1.50	1.45	13.0
## 44	1	2012	SOUTH	2	TOTAL	S2TOTAL	1218	1.28	2.00	0.90	10.0
## 45	1	2012	SOUTH	2	TOTAL	S2TOTAL	1219	1.49	2.35	1.65	13.0
## 46	1	2012	SOUTH	2	TOTAL	S2TOTAL	1220	1.07	1.20	0.95	11.0
## 47	1	2012	SOUTH	2	TOTAL	S2TOTAL	1231	1.48	1.25	1.20	9.0
## 48	1	2012	SOUTH	2	TOTAL	S2TOTAL	1232	1.25	1.25	0.90	10.0
## 49	1	2012	SOUTH	2	TOTAL	S2TOTAL	1233	1.41	1.41	1.40	14.0
## 50	1	2012	SOUTH	2	TOTAL	S2TOTAL	1234	1.6	1.60	1.30	13.0
## 51	1	2012	SOUTH	2	TOTAL	S2TOTAL	1235	1.2	1.20	1.30	14.0
## 52	1	2012	SOUTH	2	TOTAL	S2TOTAL	1236	1.49	1.49	1.20	8.0
## 53	1	2012	SOUTH	2	TOTAL	S2TOTAL	1237	1.5	1.50	1.50	14.0
## 54	1	2012	SOUTH	2	TOTAL	S2TOTAL	1238	1.65	1.65	2.00	20.0
## 55	1	2012	SOUTH	2	TOTAL	S2TOTAL	1239	1.13	1.13	1.20	10.0
## 56	1	2012	SOUTH	2	TOTAL	S2TOTAL	1240	1.25	1.25	0.90	10.0
## 57	1	2012	SOUTH	2	TOTAL	S2TOTAL	1251	1.1	1.20	1.10	10.0
## 58	1	2012	SOUTH	2	TOTAL	S2TOTAL	1252	2.2	2.70	2.40	25.0
## 59	1	2012	SOUTH	2	TOTAL	S2TOTAL	1253	1.45	1.65	1.25	10.0
## 60	1	2012	SOUTH	2	TOTAL	S2TOTAL	1254	1.6	2.45	2.10	13.0
## 61	1	2012	SOUTH	2	TOTAL	S2TOTAL	1255	1.55	2.40	1.80	13.0
## 62	1	2012	SOUTH	2	TOTAL	S2TOTAL	1256	1.5	2.40	2.15	13.0
## 63	1	2012	SOUTH	2	TOTAL	S2TOTAL	1257	1.03	1.20	1.00	10.0
## 64	1	2012	SOUTH	2	TOTAL	S2TOTAL	1258	2.14	1.90	1.70	13.0
## 65	1	2012	SOUTH	2	TOTAL	S2TOTAL	1259	1.2	1.90	1.65	12.0
## 66	1	2012	SOUTH	2	TOTAL	S2TOTAL	1260	1.05	1.10	1.00	9.0
## 67	1	2012	SOUTH	2	TOTAL	S2TOTAL	2131	1.8	2.60	2.40	15.0
## 68	1	2012	SOUTH	2	TOTAL	S2TOTAL	2132	1.2	1.00	0.95	7.0
## 69	1	2012	SOUTH	2	TOTAL	S2TOTAL	2133	1.75	1.40	1.10	10.0
## 70	1	2012	SOUTH	2	TOTAL	S2TOTAL	2134	1.45	3.10	1.80	10.0
## 71	1	2012	SOUTH	2	TOTAL	S2TOTAL	2135	1.17	1.20	1.10	5.0
## 72	1	2012	SOUTH	2	TOTAL	S2TOTAL	2136	2.15	3.10	2.58	22.0
## 73	1	2012	SOUTH	2	TOTAL	S2TOTAL	2137	1.7	1.70	1.40	12.0
## 74	1	2012	SOUTH	2	TOTAL	S2TOTAL	3132	1.98	2.85	2.70	12.0

## 75	1	2012	SOUTH	2	TOTAL	S2TOTAL	3133	1.26	1.95	1.75	17.0
## 76	1	2012	SOUTH	2	TOTAL	S2TOTAL	3134	1.11	1.95	1.50	10.0
## 77	1	2012	SOUTH	2	TOTAL	S2TOTAL	3135	1.14	1.32	1.05	10.0
## 78	1	2012	SOUTH	2	TOTAL	S2TOTAL	3136	1.26	1.60	1.40	10.0
## 79	1	2012	SOUTH	2	TOTAL	S2TOTAL	3137	1.3	1.40	0.80	10.0
## 80	1	2012	SOUTH	2	TOTAL	S2TOTAL	3138	1.29	1.44	1.35	13.0
## 81	1	2012	SOUTH	2	TOTAL	S2TOTAL	3139	1.31	1.35	1.15	7.0
## 82	1	2012	SOUTH	2	TOTAL	S2TOTAL	3140	1.15	1.70	1.28	10.0
## 83	1	2012	SOUTH	2	TOTAL	S2TOTAL	3151	1.87	3.40	1.85	15.0
## 84	1	2012	SOUTH	2	TOTAL	S2TOTAL	3152	1.47	2.10	1.61	8.0
## 85	1	2012	SOUTH	2	TOTAL	S2TOTAL	3153	1.05	1.79	1.50	10.0
## 86	1	2012	SOUTH	2	TOTAL	S2TOTAL	3154	2.1	4.90	3.75	25.0
## 87	1	2012	SOUTH	2	TOTAL	S2TOTAL	3155	1.99	1.80	1.35	13.0
## 88	1	2012	SOUTH	2	TOTAL	S2TOTAL	3156	1.42	1.90	1.80	14.0
## 89	1	2012	SOUTH	2	TOTAL	S2TOTAL	3157	1.5	2.11	1.75	12.0
## 90	1	2012	SOUTH	2	TOTAL	S2TOTAL	3158	1.06	1.05	0.85	4.0
## 91	1	2012	SOUTH	2	TOTAL	S2TOTAL	3159	1.49	1.50	1.15	13.0
## 92	1	2012	SOUTH	2	TOTAL	S2TOTAL	3160	1.8	1.60	1.50	14.0
## 93	1	2012	SOUTH	2	TOTAL	S2TOTAL	3171	1.93	1.74	1.20	14.0
## 94	1	2012	SOUTH	2	TOTAL	S2TOTAL	3172	1.2	1.60	1.30	10.0
## 95	1	2012	SOUTH	2	TOTAL	S2TOTAL	3173	1.65	1.25	1.10	11.0
## 96	1	2012	SOUTH	2	TOTAL	S2TOTAL	3174	1.52	1.49	1.10	12.0
## 97	1	2012	SOUTH	2	TOTAL	S2TOTAL	3175	1.43	2.05	1.54	13.0
## 98	1	2012	SOUTH	2	TOTAL	S2TOTAL	3176	1.25	1.40	1.25	13.0
## 99	1	2012	SOUTH	2	TOTAL	S2TOTAL	3177	1.88	2.65	2.64	20.0
## 100	1	2012	SOUTH	2	TOTAL	S2TOTAL	3179	1.03	1.40	0.60	13.0
## 101	1	2012	SOUTH	2	TOTAL	S2TOTAL	3180	1.1	1.30	1.20	10.0
## 102	1	2012	SOUTH	2	TOTAL	S2TOTAL	3191	1.4	1.05	1.00	10.0
## 103	1	2012	SOUTH	2	TOTAL	S2TOTAL	3192	1.05	1.55	0.90	10.0
## 104	1	2012	SOUTH	2	TOTAL	S2TOTAL	3193	1.18	1.20	1.00	7.0
## 105	1	2012	SOUTH	2	TOTAL	S2TOTAL	3194	1.4	1.30	1.85	13.0
## 106	1	2012	SOUTH	2	TOTAL	S2TOTAL	3195	1.37	2.67	2.19	19.0
## 107	1	2012	SOUTH	2	TOTAL	S2TOTAL	3196	1.32	2.15	1.55	11.0
## 108	1	2012	SOUTH	2	MEGA	S2MEGA	182	1.55	2.20	1.20	20.0
## 109	1	2012	SOUTH	2	MEGA	S2MEGA	183	1.3	1.80	0.90	8.0
## 110	1	2012	SOUTH	2	MEGA	S2MEGA	184	1.24	1.20	1.20	25.0
## 111	1	2012	SOUTH	2	MEGA	S2MEGA	185	1.5	2.10	1.75	16.0
## 112	1	2012	SOUTH	2	MEGA	S2MEGA	186	1.65	2.50	2.20	15.0
## 113	1	2012	SOUTH	2	MEGA	S2MEGA	187	2.17	2.00	1.20	15.0
## 114	1	2012	SOUTH	2	MEGA	S2MEGA	188	1.28	1.60	1.50	10.0
## 115	1	2012	SOUTH	2	MEGA	S2MEGA	189	1.07	1.50	1.50	10.0
## 116	1	2012	SOUTH	2	MEGA	S2MEGA	190	0.67	1.00	0.80	8.0
## 117	1	2012	SOUTH	2	MEGA	S2MEGA	191	0.68	0.70	0.60	4.0
## 118	1	2012	SOUTH	2	MEGA	S2MEGA	192	1.87	1.60	1.40	9.0
## 119	1	2012	SOUTH	2	MEGA	S2MEGA	193	1.35	1.90	1.50	14.0
## 120	1	2012	SOUTH	2	MEGA	S2MEGA	194	1.75	2.10	2.10	15.0
## 121	1	2012	SOUTH	2	MESO	S2MESO	462	1.75	3.30	2.50	23.0
## 122	1	2012	SOUTH	2	MESO	S2MESO	463	1.64	2.30	2.00	14.0
## 123	1	2012	SOUTH	2	MESO	S2MESO	2138	1.42	0.90	0.80	10.0
## 124	1	2012	SOUTH	3	OPEN	S3OPEN	1301	dead	NA	NA	NA
## 125	1	2012	SOUTH	3	OPEN	S3OPEN	1302	0.9	1.30	1.10	11.0
## 126	1	2012	SOUTH	3	TOTAL	S3TOTAL	1061	dead	NA	NA	NA
## 127	1	2012	SOUTH	3	TOTAL	S3TOTAL	1062	1.8	2.60	2.60	15.0
## 128	1	2012	SOUTH	3	TOTAL	S3TOTAL	1063	2.47	3.10	2.20	18.0

## 129	1	2012	SOUTH	3	TOTAL	S3TOTAL	1064	2.15	1.60	1.10	17.0
## 130	1	2012	SOUTH	3	TOTAL	S3TOTAL	1066	1.7	2.50	2.15	15.0
## 131	1	2012	SOUTH	3	TOTAL	S3TOTAL	1066	1.9	1.80	1.50	20.0
## 132	1	2012	SOUTH	3	TOTAL	S3TOTAL	1067	1.95	2.10	1.90	13.0
## 133	1	2012	SOUTH	3	TOTAL	S3TOTAL	1068	1.8	1.70	1.40	13.0
## 134	1	2012	SOUTH	3	TOTAL	S3TOTAL	1069	1.4	2.00	1.60	14.0
## 135	1	2012	SOUTH	3	TOTAL	S3TOTAL	1070	1	1.30	1.20	7.0
## 136	1	2012	SOUTH	3	TOTAL	S3TOTAL	2139	1.75	1.20	1.10	13.0
## 137	1	2012	SOUTH	3	TOTAL	S3TOTAL	2140	1.28	1.50	0.95	4.0
## 138	1	2012	SOUTH	3	TOTAL	S3TOTAL	2151	1	1.40	1.20	4.0
## 139	1	2012	SOUTH	3	TOTAL	S3TOTAL	2152	1.45	1.50	1.30	10.0
## 140	1	2012	SOUTH	3	TOTAL	S3TOTAL	2153	1	1.00	0.75	8.0
## 141	1	2012	SOUTH	3	TOTAL	S3TOTAL	2154	1.03	1.00	0.90	6.0
## 142	1	2012	SOUTH	3	TOTAL	S3TOTAL	2155	1.51	2.00	1.80	12.0
## 143	1	2012	SOUTH	3	TOTAL	S3TOTAL	2156	1.17	1.10	0.90	10.0
## 144	1	2012	SOUTH	3	TOTAL	S3TOTAL	2157	1.33	1.90	1.85	14.0
## 145	1	2012	SOUTH	3	TOTAL	S3TOTAL	2158	1.3	1.10	0.85	8.0
## 146	1	2012	SOUTH	3	TOTAL	S3TOTAL	2159	1.13	1.10	0.90	10.0
## 147	1	2012	SOUTH	3	TOTAL	S3TOTAL	2160	1.58	1.40	1.40	13.0
## 148	1	2012	SOUTH	3	TOTAL	S3TOTAL	2171	1.06	1.40	1.00	5.0
## 149	1	2012	SOUTH	3	TOTAL	S3TOTAL	2172	1.05	1.40	0.95	7.0
## 150	1	2012	SOUTH	3	TOTAL	S3TOTAL	2173	1.45	1.60	1.10	6.0
## 151	1	2012	SOUTH	3	TOTAL	S3TOTAL	2174	1.15	1.10	0.90	5.0
## 152	1	2012	SOUTH	3	TOTAL	S3TOTAL	2175	1.42	1.45	1.30	13.0
## 153	1	2012	SOUTH	3	TOTAL	S3TOTAL	2176	1.02	1.20	1.00	8.0
## 154	1	2012	SOUTH	3	TOTAL	S3TOTAL	2177	1.4	1.20	1.00	9.0
## 155	1	2012	SOUTH	3	TOTAL	S3TOTAL	2178	1.45	2.10	2.05	15.0
## 156	1	2012	SOUTH	3	MESO	S3MESO	1421	1.95	2.20	1.60	13.0
## 157	1	2012	SOUTH	3	MESO	S3MESO	1422	dead	NA	NA	NA
##	FLOWERS	BUDS	FRUITS	ANT							
## 1	0	0	10	CS							
## 2	0	0	150	TP							
## 3	2	1	50	TP							
## 4	0	0	75	CS							
## 5	0	0	20	CS							
## 6	0	0	0	E							
## 7	0	0	0	CS							
## 8	0	0	25	CS							
## 9	0	0	0	TP							
## 10	0	0	50	TP							
## 11	0	0	5	CS							
## 12	0	0	60	TP							
## 13	0	0	60	TP							
## 14	2	0	60	CS							
## 15	2	0	0	CS							
## 16	0	0	0	TP							
## 17	0	0	0	TP							
## 18	0	0	0	CS							
## 19	0	0	0	CM							
## 20	0	0	0	TP							
## 21	NA	NA	NA								
## 22	0	0	5	CS							
## 23	0	0	45	CS							
## 24	40	50	35	CS							

## 25	8	2	65	CS
## 26	0	0	20	TP
## 27	0	0	70	CS
## 28	0	0	125	CM
## 29	0	0	200	CM
## 30	0	0	10	CS
## 31	0	0	0	CS
## 32	0	0	35	TP
## 33	0	0	300	CM
## 34	2	2	100	CS
## 35	0	0	30	CM
## 36	0	0	50	TP
## 37	0	0	10	CM
## 38	0	0	25	CS
## 39	0	0	15	TP
## 40	0	0	0	TP
## 41	0	0	15	TP
## 42	0	0	0	TP
## 43	0	0	40	TP
## 44	0	0	0	TP
## 45	0	0	15	CM
## 46	0	0	0	CM
## 47	0	0	0	TP
## 48	0	0	0	TP
## 49	0	0	1	TP
## 50	0	0	20	TP
## 51	0	0	0	TP
## 52	0	0	0	TP
## 53	0	0	20	TP
## 54	0	0	0	TP
## 55	0	0	0	CN
## 56	0	0	0	CN
## 57	0	0	0	TP
## 58	0	0	5	TP
## 59	0	0	0	TP
## 60	0	0	25	TP
## 61	0	0	25	TP
## 62	0	0	20	TP
## 63	0	0	0	TP
## 64	0	0	10	CS
## 65	1	0	25	CS
## 66	0	0	0	TP
## 67	0	0	10	TP
## 68	0	0	0	TP
## 69	0	0	0	TP
## 70	0	0	0	TP
## 71	0	0	0	TP
## 72	0	0	0	CS
## 73	0	0	0	CS
## 74	0	0	25	AB_TP
## 75	0	0	0	TP
## 76	0	0	0	TP
## 77	0	0	0	TP
## 78	0	0	0	CS

## 79	0	0	0	CS
## 80	0	0	0	CS
## 81	0	0	0	CS
## 82	0	0	5	CS
## 83	6	0	0	CS
## 84	0	0	0	CS
## 85	0	0	1	CS
## 86	0	0	25	CS
## 87	0	0	0	CS
## 88	0	0	0	CS
## 89	0	0	10	CS
## 90	0	0	0	CS
## 91	0	0	35	CS
## 92	0	0	0	CS
## 93	0	0	0	CS
## 94	0	0	0	CS
## 95	0	0	0	CS
## 96	0	0	20	CS
## 97	0	0	0	CS
## 98	0	0	0	CM
## 99	0	0	100	CM
## 100	0	0	0	CS
## 101	0	0	0	CS
## 102	0	0	0	CS
## 103	0	0	0	CM
## 104	0	0	0	TP
## 105	0	0	30	CS
## 106	0	0	50	TP
## 107	0	0	10	CS
## 108	0	0	0	CS
## 109	0	0	15	CS
## 110	0	0	10	CS
## 111	5	0	200	CS
## 112	0	0	80	CS
## 113	0	0	150	TP
## 114	0	0	40	TP
## 115	0	0	60	TP
## 116	0	0	0	CS
## 117	0	0	0	TP
## 118	0	0	40	CS
## 119	0	0	20	CS
## 120	0	0	75	TP
## 121	0	0	20	CM
## 122	0	0	0	TP
## 123	0	0	0	E
## 124	NA	NA	NA	
## 125	0	0	0	TP
## 126	NA	NA	NA	
## 127	0	0	50	TP
## 128	0	0	0	TP
## 129	0	0	0	TP
## 130	0	0	2	TP
## 131	0	0	25	TP
## 132	0	0	0	TP

```
## 133      0      0      0      TP
## 134      0      0      0      TP
## 135      0      0      0      TP
## 136      0      0      0      TP
## 137      0      0      0      TP
## 138      0      0      0      TP
## 139      0      0      0      TP
## 140      0      0      0      TP
## 141      0      0      0      TP
## 142      0      0      0      TP
## 143      0      0      0      TP
## 144      0      0      0      TP
## 145      0      0      0      TP
## 146      0      0      0      TP
## 147      0      0      0      TP
## 148      0      0      8      TP
## 149      0      0      0      TP
## 150      0      0      0      TP
## 151      0      0      0      TP
## 152      0      0      0      TP
## 153      0      0      0      TP
## 154      0      0      0      TP
## 155      0      0     20      TP
## 156      0      0      2      CS
## 157     NA     NA     NA
```

Assign the data to a variable so we can work with it

```
acacia <- read.csv(file = "../data-raw/ACACIA_DREPANOLOBIUM_SURVEY.txt", sep = "\t")
```

```
head(acacia)
```

```
##  SURVEY YEAR  SITE BLOCK TREATMENT  PLOT  ID HEIGHT AXIS1 AXIS2 CIRC
## 1      1 2012 SOUTH      1      TOTAL S1TOTAL 581   2.25 2.75 2.15 20
## 2      1 2012 SOUTH      1      TOTAL S1TOTAL 582   2.65 4.10 3.90 28
## 3      1 2012 SOUTH      1      TOTAL S1TOTAL 3111   1.5 1.70 0.85 17
## 4      1 2012 SOUTH      1      TOTAL S1TOTAL 3112   2.01 1.80 1.60 12
## 5      1 2012 SOUTH      1      TOTAL S1TOTAL 3113   1.75 1.84 1.42 13
## 6      1 2012 SOUTH      1      TOTAL S1TOTAL 3114   1.65 1.62 0.85 15
##  FLOWERS BUDS FRUITS ANT
## 1      0      0      10 CS
## 2      0      0     150 TP
## 3      2      1      50 TP
## 4      0      0      75 CS
## 5      0      0      20 CS
## 6      0      0      0  E
```

```
str(acacia)
```

```
## 'data.frame':   157 obs. of  15 variables:
## $ SURVEY      : int   1 1 1 1 1 1 1 1 1 1 ...
## $ YEAR        : int  2012 2012 2012 2012 2012 2012 2012 2012 2012 2012 ...
```

```
## $ SITE      : chr  "SOUTH" "SOUTH" "SOUTH" "SOUTH" ...
## $ BLOCK     : int   1 1 1 1 1 1 1 1 1 1 ...
## $ TREATMENT: chr  "TOTAL" "TOTAL" "TOTAL" "TOTAL" ...
## $ PLOT      : chr  "S1TOTAL" "S1TOTAL" "S1TOTAL" "S1TOTAL" ...
## $ ID       : int  581 582 3111 3112 3113 3114 3115 3199 941 942 ...
## $ HEIGHT   : chr  "2.25" "2.65" "1.5" "2.01" ...
## $ AXIS1    : num   2.75 4.1 1.7 1.8 1.84 1.62 1.95 2 2.15 5.55 ...
## $ AXIS2    : num   2.15 3.9 0.85 1.6 1.42 0.85 0.9 1.75 1.82 4.82 ...
## $ CIRC     : num   20 28 17 12 13 15 9 12.2 13 35 ...
## $ FLOWERS  : int   0 0 2 0 0 0 0 0 0 0 ...
## $ BUDS     : int   0 0 1 0 0 0 0 0 0 0 ...
## $ FRUITS   : int   10 150 50 75 20 0 0 25 0 50 ...
## $ ANT      : chr  "CS" "TP" "TP" "CS" ...
```

```
numbers <- 1:10
numbers
```

```
## [1] 1 2 3 4 5 6 7 8 9 10
```

```
numbers[3:6]
```

```
## [1] 3 4 5 6
```

```
acacia
```

##		SURVEY	YEAR	SITE	BLOCK	TREATMENT	PLOT	ID	HEIGHT	AXIS1	AXIS2	CIRC
## 1		1	2012	SOUTH	1	TOTAL	S1TOTAL	581	2.25	2.75	2.15	20.0
## 2		1	2012	SOUTH	1	TOTAL	S1TOTAL	582	2.65	4.10	3.90	28.0
## 3		1	2012	SOUTH	1	TOTAL	S1TOTAL	3111	1.5	1.70	0.85	17.0
## 4		1	2012	SOUTH	1	TOTAL	S1TOTAL	3112	2.01	1.80	1.60	12.0
## 5		1	2012	SOUTH	1	TOTAL	S1TOTAL	3113	1.75	1.84	1.42	13.0
## 6		1	2012	SOUTH	1	TOTAL	S1TOTAL	3114	1.65	1.62	0.85	15.0
## 7		1	2012	SOUTH	1	TOTAL	S1TOTAL	3115	1.2	1.95	0.90	9.0
## 8		1	2012	SOUTH	1	TOTAL	S1TOTAL	3199	1.45	2.00	1.75	12.2
## 9		1	2012	SOUTH	1	MESO	S1MESO	941	1.87	2.15	1.82	13.0
## 10		1	2012	SOUTH	1	MESO	S1MESO	942	2.38	5.55	4.82	35.0
## 11		1	2012	SOUTH	1	MESO	S1MESO	943	2.58	4.90	4.24	24.0
## 12		1	2012	SOUTH	1	MESO	S1MESO	944	2.65	3.75	3.10	27.0
## 13		1	2012	SOUTH	1	MESO	S1MESO	946	2.35	2.34	2.05	20.0
## 14		1	2012	SOUTH	1	MESO	S1MESO	947	1.88	2.10	1.85	28.0
## 15		1	2012	SOUTH	1	MESO	S1MESO	3116	2.32	3.05	2.63	30.0
## 16		1	2012	SOUTH	1	MESO	S1MESO	3117	2.39	2.21	2.10	13.0
## 17		1	2012	SOUTH	1	MESO	S1MESO	3118	2.2	1.80	1.50	10.0
## 18		1	2012	SOUTH	1	MESO	S1MESO	3119	1.05	0.90	0.55	8.0
## 19		1	2012	SOUTH	1	MESO	S1MESO	3120	2	1.25	1.20	10.0
## 20		1	2012	SOUTH	1	MESO	S1MESO	3131	1.28	1.14	1.00	10.0
## 21		1	2012	SOUTH	2	OPEN	S2OPEN	341	dead	NA	NA	NA
## 22		1	2012	SOUTH	2	TOTAL	S2TOTAL	3178	1.4	2.50	2.15	18.0
## 23		1	2012	SOUTH	2	TOTAL	S2TOTAL	101	1.9	3.31	2.65	15.0
## 24		1	2012	SOUTH	2	TOTAL	S2TOTAL	102	1.75	2.70	2.55	16.0
## 25		1	2012	SOUTH	2	TOTAL	S2TOTAL	103	1.8	2.75	2.30	16.0
## 26		1	2012	SOUTH	2	TOTAL	S2TOTAL	104	2.7	4.05	4.00	35.2

## 27	1	2012	SOUTH	2	TOTAL S2TOTAL	105	2.02	2.85	1.49	17.0
## 28	1	2012	SOUTH	2	TOTAL S2TOTAL	108	1.9	3.10	2.85	19.0
## 29	1	2012	SOUTH	2	TOTAL S2TOTAL	109	1.85	2.45	1.90	19.0
## 30	1	2012	SOUTH	2	TOTAL S2TOTAL	110	1.65	1.90	1.54	17.0
## 31	1	2012	SOUTH	2	TOTAL S2TOTAL	111	1.4	2.35	1.45	14.0
## 32	1	2012	SOUTH	2	TOTAL S2TOTAL	113	2.5	3.25	2.30	22.0
## 33	1	2012	SOUTH	2	TOTAL S2TOTAL	115	2.05	5.40	4.50	33.0
## 34	1	2012	SOUTH	2	TOTAL S2TOTAL	116	2.26	3.50	3.10	33.0
## 35	1	2012	SOUTH	2	TOTAL S2TOTAL	117	2.13	2.40	2.30	20.0
## 36	1	2012	SOUTH	2	TOTAL S2TOTAL	118	1.8	3.15	2.55	22.0
## 37	1	2012	SOUTH	2	TOTAL S2TOTAL	1211	1.85	2.00	2.27	20.0
## 38	1	2012	SOUTH	2	TOTAL S2TOTAL	1212	1.5	2.15	1.80	15.0
## 39	1	2012	SOUTH	2	TOTAL S2TOTAL	1213	1.87	2.34	2.05	13.0
## 40	1	2012	SOUTH	2	TOTAL S2TOTAL	1214	1.58	1.28	0.75	11.0
## 41	1	2012	SOUTH	2	TOTAL S2TOTAL	1215	2.05	2.10	1.75	17.0
## 42	1	2012	SOUTH	2	TOTAL S2TOTAL	1216	1.75	2.45	3.28	16.0
## 43	1	2012	SOUTH	2	TOTAL S2TOTAL	1217	1.49	1.50	1.45	13.0
## 44	1	2012	SOUTH	2	TOTAL S2TOTAL	1218	1.28	2.00	0.90	10.0
## 45	1	2012	SOUTH	2	TOTAL S2TOTAL	1219	1.49	2.35	1.65	13.0
## 46	1	2012	SOUTH	2	TOTAL S2TOTAL	1220	1.07	1.20	0.95	11.0
## 47	1	2012	SOUTH	2	TOTAL S2TOTAL	1231	1.48	1.25	1.20	9.0
## 48	1	2012	SOUTH	2	TOTAL S2TOTAL	1232	1.25	1.25	0.90	10.0
## 49	1	2012	SOUTH	2	TOTAL S2TOTAL	1233	1.41	1.41	1.40	14.0
## 50	1	2012	SOUTH	2	TOTAL S2TOTAL	1234	1.6	1.60	1.30	13.0
## 51	1	2012	SOUTH	2	TOTAL S2TOTAL	1235	1.2	1.20	1.30	14.0
## 52	1	2012	SOUTH	2	TOTAL S2TOTAL	1236	1.49	1.49	1.20	8.0
## 53	1	2012	SOUTH	2	TOTAL S2TOTAL	1237	1.5	1.50	1.50	14.0
## 54	1	2012	SOUTH	2	TOTAL S2TOTAL	1238	1.65	1.65	2.00	20.0
## 55	1	2012	SOUTH	2	TOTAL S2TOTAL	1239	1.13	1.13	1.20	10.0
## 56	1	2012	SOUTH	2	TOTAL S2TOTAL	1240	1.25	1.25	0.90	10.0
## 57	1	2012	SOUTH	2	TOTAL S2TOTAL	1251	1.1	1.20	1.10	10.0
## 58	1	2012	SOUTH	2	TOTAL S2TOTAL	1252	2.2	2.70	2.40	25.0
## 59	1	2012	SOUTH	2	TOTAL S2TOTAL	1253	1.45	1.65	1.25	10.0
## 60	1	2012	SOUTH	2	TOTAL S2TOTAL	1254	1.6	2.45	2.10	13.0
## 61	1	2012	SOUTH	2	TOTAL S2TOTAL	1255	1.55	2.40	1.80	13.0
## 62	1	2012	SOUTH	2	TOTAL S2TOTAL	1256	1.5	2.40	2.15	13.0
## 63	1	2012	SOUTH	2	TOTAL S2TOTAL	1257	1.03	1.20	1.00	10.0
## 64	1	2012	SOUTH	2	TOTAL S2TOTAL	1258	2.14	1.90	1.70	13.0
## 65	1	2012	SOUTH	2	TOTAL S2TOTAL	1259	1.2	1.90	1.65	12.0
## 66	1	2012	SOUTH	2	TOTAL S2TOTAL	1260	1.05	1.10	1.00	9.0
## 67	1	2012	SOUTH	2	TOTAL S2TOTAL	2131	1.8	2.60	2.40	15.0
## 68	1	2012	SOUTH	2	TOTAL S2TOTAL	2132	1.2	1.00	0.95	7.0
## 69	1	2012	SOUTH	2	TOTAL S2TOTAL	2133	1.75	1.40	1.10	10.0
## 70	1	2012	SOUTH	2	TOTAL S2TOTAL	2134	1.45	3.10	1.80	10.0
## 71	1	2012	SOUTH	2	TOTAL S2TOTAL	2135	1.17	1.20	1.10	5.0
## 72	1	2012	SOUTH	2	TOTAL S2TOTAL	2136	2.15	3.10	2.58	22.0
## 73	1	2012	SOUTH	2	TOTAL S2TOTAL	2137	1.7	1.70	1.40	12.0
## 74	1	2012	SOUTH	2	TOTAL S2TOTAL	3132	1.98	2.85	2.70	12.0
## 75	1	2012	SOUTH	2	TOTAL S2TOTAL	3133	1.26	1.95	1.75	17.0
## 76	1	2012	SOUTH	2	TOTAL S2TOTAL	3134	1.11	1.95	1.50	10.0
## 77	1	2012	SOUTH	2	TOTAL S2TOTAL	3135	1.14	1.32	1.05	10.0
## 78	1	2012	SOUTH	2	TOTAL S2TOTAL	3136	1.26	1.60	1.40	10.0
## 79	1	2012	SOUTH	2	TOTAL S2TOTAL	3137	1.3	1.40	0.80	10.0
## 80	1	2012	SOUTH	2	TOTAL S2TOTAL	3138	1.29	1.44	1.35	13.0

## 81	1	2012	SOUTH	2	TOTAL S2TOTAL	3139	1.31	1.35	1.15	7.0
## 82	1	2012	SOUTH	2	TOTAL S2TOTAL	3140	1.15	1.70	1.28	10.0
## 83	1	2012	SOUTH	2	TOTAL S2TOTAL	3151	1.87	3.40	1.85	15.0
## 84	1	2012	SOUTH	2	TOTAL S2TOTAL	3152	1.47	2.10	1.61	8.0
## 85	1	2012	SOUTH	2	TOTAL S2TOTAL	3153	1.05	1.79	1.50	10.0
## 86	1	2012	SOUTH	2	TOTAL S2TOTAL	3154	2.1	4.90	3.75	25.0
## 87	1	2012	SOUTH	2	TOTAL S2TOTAL	3155	1.99	1.80	1.35	13.0
## 88	1	2012	SOUTH	2	TOTAL S2TOTAL	3156	1.42	1.90	1.80	14.0
## 89	1	2012	SOUTH	2	TOTAL S2TOTAL	3157	1.5	2.11	1.75	12.0
## 90	1	2012	SOUTH	2	TOTAL S2TOTAL	3158	1.06	1.05	0.85	4.0
## 91	1	2012	SOUTH	2	TOTAL S2TOTAL	3159	1.49	1.50	1.15	13.0
## 92	1	2012	SOUTH	2	TOTAL S2TOTAL	3160	1.8	1.60	1.50	14.0
## 93	1	2012	SOUTH	2	TOTAL S2TOTAL	3171	1.93	1.74	1.20	14.0
## 94	1	2012	SOUTH	2	TOTAL S2TOTAL	3172	1.2	1.60	1.30	10.0
## 95	1	2012	SOUTH	2	TOTAL S2TOTAL	3173	1.65	1.25	1.10	11.0
## 96	1	2012	SOUTH	2	TOTAL S2TOTAL	3174	1.52	1.49	1.10	12.0
## 97	1	2012	SOUTH	2	TOTAL S2TOTAL	3175	1.43	2.05	1.54	13.0
## 98	1	2012	SOUTH	2	TOTAL S2TOTAL	3176	1.25	1.40	1.25	13.0
## 99	1	2012	SOUTH	2	TOTAL S2TOTAL	3177	1.88	2.65	2.64	20.0
## 100	1	2012	SOUTH	2	TOTAL S2TOTAL	3179	1.03	1.40	0.60	13.0
## 101	1	2012	SOUTH	2	TOTAL S2TOTAL	3180	1.1	1.30	1.20	10.0
## 102	1	2012	SOUTH	2	TOTAL S2TOTAL	3191	1.4	1.05	1.00	10.0
## 103	1	2012	SOUTH	2	TOTAL S2TOTAL	3192	1.05	1.55	0.90	10.0
## 104	1	2012	SOUTH	2	TOTAL S2TOTAL	3193	1.18	1.20	1.00	7.0
## 105	1	2012	SOUTH	2	TOTAL S2TOTAL	3194	1.4	1.30	1.85	13.0
## 106	1	2012	SOUTH	2	TOTAL S2TOTAL	3195	1.37	2.67	2.19	19.0
## 107	1	2012	SOUTH	2	TOTAL S2TOTAL	3196	1.32	2.15	1.55	11.0
## 108	1	2012	SOUTH	2	MEGA S2MEGA	182	1.55	2.20	1.20	20.0
## 109	1	2012	SOUTH	2	MEGA S2MEGA	183	1.3	1.80	0.90	8.0
## 110	1	2012	SOUTH	2	MEGA S2MEGA	184	1.24	1.20	1.20	25.0
## 111	1	2012	SOUTH	2	MEGA S2MEGA	185	1.5	2.10	1.75	16.0
## 112	1	2012	SOUTH	2	MEGA S2MEGA	186	1.65	2.50	2.20	15.0
## 113	1	2012	SOUTH	2	MEGA S2MEGA	187	2.17	2.00	1.20	15.0
## 114	1	2012	SOUTH	2	MEGA S2MEGA	188	1.28	1.60	1.50	10.0
## 115	1	2012	SOUTH	2	MEGA S2MEGA	189	1.07	1.50	1.50	10.0
## 116	1	2012	SOUTH	2	MEGA S2MEGA	190	0.67	1.00	0.80	8.0
## 117	1	2012	SOUTH	2	MEGA S2MEGA	191	0.68	0.70	0.60	4.0
## 118	1	2012	SOUTH	2	MEGA S2MEGA	192	1.87	1.60	1.40	9.0
## 119	1	2012	SOUTH	2	MEGA S2MEGA	193	1.35	1.90	1.50	14.0
## 120	1	2012	SOUTH	2	MEGA S2MEGA	194	1.75	2.10	2.10	15.0
## 121	1	2012	SOUTH	2	MESO S2MESO	462	1.75	3.30	2.50	23.0
## 122	1	2012	SOUTH	2	MESO S2MESO	463	1.64	2.30	2.00	14.0
## 123	1	2012	SOUTH	2	MESO S2MESO	2138	1.42	0.90	0.80	10.0
## 124	1	2012	SOUTH	3	OPEN S3OPEN	1301	dead	NA	NA	NA
## 125	1	2012	SOUTH	3	OPEN S3OPEN	1302	0.9	1.30	1.10	11.0
## 126	1	2012	SOUTH	3	TOTAL S3TOTAL	1061	dead	NA	NA	NA
## 127	1	2012	SOUTH	3	TOTAL S3TOTAL	1062	1.8	2.60	2.60	15.0
## 128	1	2012	SOUTH	3	TOTAL S3TOTAL	1063	2.47	3.10	2.20	18.0
## 129	1	2012	SOUTH	3	TOTAL S3TOTAL	1064	2.15	1.60	1.10	17.0
## 130	1	2012	SOUTH	3	TOTAL S3TOTAL	1066	1.7	2.50	2.15	15.0
## 131	1	2012	SOUTH	3	TOTAL S3TOTAL	1066	1.9	1.80	1.50	20.0
## 132	1	2012	SOUTH	3	TOTAL S3TOTAL	1067	1.95	2.10	1.90	13.0
## 133	1	2012	SOUTH	3	TOTAL S3TOTAL	1068	1.8	1.70	1.40	13.0
## 134	1	2012	SOUTH	3	TOTAL S3TOTAL	1069	1.4	2.00	1.60	14.0

## 135	1 2012 SOUTH	3	TOTAL S3TOTAL 1070	1	1.30	1.20	7.0
## 136	1 2012 SOUTH	3	TOTAL S3TOTAL 2139	1.75	1.20	1.10	13.0
## 137	1 2012 SOUTH	3	TOTAL S3TOTAL 2140	1.28	1.50	0.95	4.0
## 138	1 2012 SOUTH	3	TOTAL S3TOTAL 2151	1	1.40	1.20	4.0
## 139	1 2012 SOUTH	3	TOTAL S3TOTAL 2152	1.45	1.50	1.30	10.0
## 140	1 2012 SOUTH	3	TOTAL S3TOTAL 2153	1	1.00	0.75	8.0
## 141	1 2012 SOUTH	3	TOTAL S3TOTAL 2154	1.03	1.00	0.90	6.0
## 142	1 2012 SOUTH	3	TOTAL S3TOTAL 2155	1.51	2.00	1.80	12.0
## 143	1 2012 SOUTH	3	TOTAL S3TOTAL 2156	1.17	1.10	0.90	10.0
## 144	1 2012 SOUTH	3	TOTAL S3TOTAL 2157	1.33	1.90	1.85	14.0
## 145	1 2012 SOUTH	3	TOTAL S3TOTAL 2158	1.3	1.10	0.85	8.0
## 146	1 2012 SOUTH	3	TOTAL S3TOTAL 2159	1.13	1.10	0.90	10.0
## 147	1 2012 SOUTH	3	TOTAL S3TOTAL 2160	1.58	1.40	1.40	13.0
## 148	1 2012 SOUTH	3	TOTAL S3TOTAL 2171	1.06	1.40	1.00	5.0
## 149	1 2012 SOUTH	3	TOTAL S3TOTAL 2172	1.05	1.40	0.95	7.0
## 150	1 2012 SOUTH	3	TOTAL S3TOTAL 2173	1.45	1.60	1.10	6.0
## 151	1 2012 SOUTH	3	TOTAL S3TOTAL 2174	1.15	1.10	0.90	5.0
## 152	1 2012 SOUTH	3	TOTAL S3TOTAL 2175	1.42	1.45	1.30	13.0
## 153	1 2012 SOUTH	3	TOTAL S3TOTAL 2176	1.02	1.20	1.00	8.0
## 154	1 2012 SOUTH	3	TOTAL S3TOTAL 2177	1.4	1.20	1.00	9.0
## 155	1 2012 SOUTH	3	TOTAL S3TOTAL 2178	1.45	2.10	2.05	15.0
## 156	1 2012 SOUTH	3	MESO S3MESO 1421	1.95	2.20	1.60	13.0
## 157	1 2012 SOUTH	3	MESO S3MESO 1422	dead	NA	NA	NA
##	FLOWERS	BUDS	FRUITS	ANT			
## 1	0	0	10	CS			
## 2	0	0	150	TP			
## 3	2	1	50	TP			
## 4	0	0	75	CS			
## 5	0	0	20	CS			
## 6	0	0	0	E			
## 7	0	0	0	CS			
## 8	0	0	25	CS			
## 9	0	0	0	TP			
## 10	0	0	50	TP			
## 11	0	0	5	CS			
## 12	0	0	60	TP			
## 13	0	0	60	TP			
## 14	2	0	60	CS			
## 15	2	0	0	CS			
## 16	0	0	0	TP			
## 17	0	0	0	TP			
## 18	0	0	0	CS			
## 19	0	0	0	CM			
## 20	0	0	0	TP			
## 21	NA	NA	NA				
## 22	0	0	5	CS			
## 23	0	0	45	CS			
## 24	40	50	35	CS			
## 25	8	2	65	CS			
## 26	0	0	20	TP			
## 27	0	0	70	CS			
## 28	0	0	125	CM			
## 29	0	0	200	CM			
## 30	0	0	10	CS			

## 31	0	0	0	CS
## 32	0	0	35	TP
## 33	0	0	300	CM
## 34	2	2	100	CS
## 35	0	0	30	CM
## 36	0	0	50	TP
## 37	0	0	10	CM
## 38	0	0	25	CS
## 39	0	0	15	TP
## 40	0	0	0	TP
## 41	0	0	15	TP
## 42	0	0	0	TP
## 43	0	0	40	TP
## 44	0	0	0	TP
## 45	0	0	15	CM
## 46	0	0	0	CM
## 47	0	0	0	TP
## 48	0	0	0	TP
## 49	0	0	1	TP
## 50	0	0	20	TP
## 51	0	0	0	TP
## 52	0	0	0	TP
## 53	0	0	20	TP
## 54	0	0	0	TP
## 55	0	0	0	CN
## 56	0	0	0	CN
## 57	0	0	0	TP
## 58	0	0	5	TP
## 59	0	0	0	TP
## 60	0	0	25	TP
## 61	0	0	25	TP
## 62	0	0	20	TP
## 63	0	0	0	TP
## 64	0	0	10	CS
## 65	1	0	25	CS
## 66	0	0	0	TP
## 67	0	0	10	TP
## 68	0	0	0	TP
## 69	0	0	0	TP
## 70	0	0	0	TP
## 71	0	0	0	TP
## 72	0	0	0	CS
## 73	0	0	0	CS
## 74	0	0	25	AB_TP
## 75	0	0	0	TP
## 76	0	0	0	TP
## 77	0	0	0	TP
## 78	0	0	0	CS
## 79	0	0	0	CS
## 80	0	0	0	CS
## 81	0	0	0	CS
## 82	0	0	5	CS
## 83	6	0	0	CS
## 84	0	0	0	CS

## 85	0	0	1	CS
## 86	0	0	25	CS
## 87	0	0	0	CS
## 88	0	0	0	CS
## 89	0	0	10	CS
## 90	0	0	0	CS
## 91	0	0	35	CS
## 92	0	0	0	CS
## 93	0	0	0	CS
## 94	0	0	0	CS
## 95	0	0	0	CS
## 96	0	0	20	CS
## 97	0	0	0	CS
## 98	0	0	0	CM
## 99	0	0	100	CM
## 100	0	0	0	CS
## 101	0	0	0	CS
## 102	0	0	0	CS
## 103	0	0	0	CM
## 104	0	0	0	TP
## 105	0	0	30	CS
## 106	0	0	50	TP
## 107	0	0	10	CS
## 108	0	0	0	CS
## 109	0	0	15	CS
## 110	0	0	10	CS
## 111	5	0	200	CS
## 112	0	0	80	CS
## 113	0	0	150	TP
## 114	0	0	40	TP
## 115	0	0	60	TP
## 116	0	0	0	CS
## 117	0	0	0	TP
## 118	0	0	40	CS
## 119	0	0	20	CS
## 120	0	0	75	TP
## 121	0	0	20	CM
## 122	0	0	0	TP
## 123	0	0	0	E
## 124	NA	NA	NA	
## 125	0	0	0	TP
## 126	NA	NA	NA	
## 127	0	0	50	TP
## 128	0	0	0	TP
## 129	0	0	0	TP
## 130	0	0	2	TP
## 131	0	0	25	TP
## 132	0	0	0	TP
## 133	0	0	0	TP
## 134	0	0	0	TP
## 135	0	0	0	TP
## 136	0	0	0	TP
## 137	0	0	0	TP
## 138	0	0	0	TP

```
## 139      0      0      0      TP
## 140      0      0      0      TP
## 141      0      0      0      TP
## 142      0      0      0      TP
## 143      0      0      0      TP
## 144      0      0      0      TP
## 145      0      0      0      TP
## 146      0      0      0      TP
## 147      0      0      0      TP
## 148      0      0      8      TP
## 149      0      0      0      TP
## 150      0      0      0      TP
## 151      0      0      0      TP
## 152      0      0      0      TP
## 153      0      0      0      TP
## 154      0      0      0      TP
## 155      0      0     20      TP
## 156      0      0      2      CS
## 157      NA     NA     NA
```

Accessing elements of a data frame

It is similar to what we do for vectors, but there are two dimensions to a data frame

```
acacia[8]
```

```
##      HEIGHT
## 1      2.25
## 2      2.65
## 3      1.5
## 4      2.01
## 5      1.75
## 6      1.65
## 7      1.2
## 8      1.45
## 9      1.87
## 10     2.38
## 11     2.58
## 12     2.65
## 13     2.35
## 14     1.88
## 15     2.32
## 16     2.39
## 17     2.2
## 18     1.05
## 19      2
## 20     1.28
## 21    dead
## 22     1.4
## 23     1.9
## 24     1.75
## 25     1.8
## 26     2.7
## 27     2.02
```

## 28	1.9
## 29	1.85
## 30	1.65
## 31	1.4
## 32	2.5
## 33	2.05
## 34	2.26
## 35	2.13
## 36	1.8
## 37	1.85
## 38	1.5
## 39	1.87
## 40	1.58
## 41	2.05
## 42	1.75
## 43	1.49
## 44	1.28
## 45	1.49
## 46	1.07
## 47	1.48
## 48	1.25
## 49	1.41
## 50	1.6
## 51	1.2
## 52	1.49
## 53	1.5
## 54	1.65
## 55	1.13
## 56	1.25
## 57	1.1
## 58	2.2
## 59	1.45
## 60	1.6
## 61	1.55
## 62	1.5
## 63	1.03
## 64	2.14
## 65	1.2
## 66	1.05
## 67	1.8
## 68	1.2
## 69	1.75
## 70	1.45
## 71	1.17
## 72	2.15
## 73	1.7
## 74	1.98
## 75	1.26
## 76	1.11
## 77	1.14
## 78	1.26
## 79	1.3
## 80	1.29
## 81	1.31

## 82	1.15
## 83	1.87
## 84	1.47
## 85	1.05
## 86	2.1
## 87	1.99
## 88	1.42
## 89	1.5
## 90	1.06
## 91	1.49
## 92	1.8
## 93	1.93
## 94	1.2
## 95	1.65
## 96	1.52
## 97	1.43
## 98	1.25
## 99	1.88
## 100	1.03
## 101	1.1
## 102	1.4
## 103	1.05
## 104	1.18
## 105	1.4
## 106	1.37
## 107	1.32
## 108	1.55
## 109	1.3
## 110	1.24
## 111	1.5
## 112	1.65
## 113	2.17
## 114	1.28
## 115	1.07
## 116	0.67
## 117	0.68
## 118	1.87
## 119	1.35
## 120	1.75
## 121	1.75
## 122	1.64
## 123	1.42
## 124	dead
## 125	0.9
## 126	dead
## 127	1.8
## 128	2.47
## 129	2.15
## 130	1.7
## 131	1.9
## 132	1.95
## 133	1.8
## 134	1.4
## 135	1


```
## 136 1.75
## 137 1.28
## 138 1
## 139 1.45
## 140 1
## 141 1.03
## 142 1.51
## 143 1.17
## 144 1.33
## 145 1.3
## 146 1.13
## 147 1.58
## 148 1.06
## 149 1.05
## 150 1.45
## 151 1.15
## 152 1.42
## 153 1.02
## 154 1.4
## 155 1.45
## 156 1.95
## 157 dead
```

```
acacia$SURVEY
```

```
## [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [38] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [75] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [112] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [149] 1 1 1 1 1 1 1 1 1 1
```

```
acacia[, "SURVEY"]
```

```
## [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [38] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [75] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [112] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [149] 1 1 1 1 1 1 1 1 1 1
```

```
acacia$HEIGHT
```

```
## [1] "2.25" "2.65" "1.5" "2.01" "1.75" "1.65" "1.2" "1.45" "1.87" "2.38"
## [11] "2.58" "2.65" "2.35" "1.88" "2.32" "2.39" "2.2" "1.05" "2" "1.28"
## [21] "dead" "1.4" "1.9" "1.75" "1.8" "2.7" "2.02" "1.9" "1.85" "1.65"
## [31] "1.4" "2.5" "2.05" "2.26" "2.13" "1.8" "1.85" "1.5" "1.87" "1.58"
## [41] "2.05" "1.75" "1.49" "1.28" "1.49" "1.07" "1.48" "1.25" "1.41" "1.6"
## [51] "1.2" "1.49" "1.5" "1.65" "1.13" "1.25" "1.1" "2.2" "1.45" "1.6"
## [61] "1.55" "1.5" "1.03" "2.14" "1.2" "1.05" "1.8" "1.2" "1.75" "1.45"
## [71] "1.17" "2.15" "1.7" "1.98" "1.26" "1.11" "1.14" "1.26" "1.3" "1.29"
## [81] "1.31" "1.15" "1.87" "1.47" "1.05" "2.1" "1.99" "1.42" "1.5" "1.06"
## [91] "1.49" "1.8" "1.93" "1.2" "1.65" "1.52" "1.43" "1.25" "1.88" "1.03"
## [101] "1.1" "1.4" "1.05" "1.18" "1.4" "1.37" "1.32" "1.55" "1.3" "1.24"
```

```
## [111] "1.5" "1.65" "2.17" "1.28" "1.07" "0.67" "0.68" "1.87" "1.35" "1.75"
## [121] "1.75" "1.64" "1.42" "dead" "0.9" "dead" "1.8" "2.47" "2.15" "1.7"
## [131] "1.9" "1.95" "1.8" "1.4" "1" "1.75" "1.28" "1" "1.45" "1"
## [141] "1.03" "1.51" "1.17" "1.33" "1.3" "1.13" "1.58" "1.06" "1.05" "1.45"
## [151] "1.15" "1.42" "1.02" "1.4" "1.45" "1.95" "dead"
```

```
as.numeric(acacia$HEIGHT)
```

```
## Warning: NAs introduced by coercion
```

```
## [1] 2.25 2.65 1.50 2.01 1.75 1.65 1.20 1.45 1.87 2.38 2.58 2.65 2.35 1.88 2.32
## [16] 2.39 2.20 1.05 2.00 1.28 NA 1.40 1.90 1.75 1.80 2.70 2.02 1.90 1.85 1.65
## [31] 1.40 2.50 2.05 2.26 2.13 1.80 1.85 1.50 1.87 1.58 2.05 1.75 1.49 1.28 1.49
## [46] 1.07 1.48 1.25 1.41 1.60 1.20 1.49 1.50 1.65 1.13 1.25 1.10 2.20 1.45 1.60
## [61] 1.55 1.50 1.03 2.14 1.20 1.05 1.80 1.20 1.75 1.45 1.17 2.15 1.70 1.98 1.26
## [76] 1.11 1.14 1.26 1.30 1.29 1.31 1.15 1.87 1.47 1.05 2.10 1.99 1.42 1.50 1.06
## [91] 1.49 1.80 1.93 1.20 1.65 1.52 1.43 1.25 1.88 1.03 1.10 1.40 1.05 1.18 1.40
## [106] 1.37 1.32 1.55 1.30 1.24 1.50 1.65 2.17 1.28 1.07 0.67 0.68 1.87 1.35 1.75
## [121] 1.75 1.64 1.42 NA 0.90 NA 1.80 2.47 2.15 1.70 1.90 1.95 1.80 1.40 1.00
## [136] 1.75 1.28 1.00 1.45 1.00 1.03 1.51 1.17 1.33 1.30 1.13 1.58 1.06 1.05 1.45
## [151] 1.15 1.42 1.02 1.40 1.45 1.95 NA
```

Replacing numbers in a data frame

```
numbers
```

```
## [1] 1 2 3 4 5 6 7 8 9 10
```

We identified that the HEIGHT should be numeric

```
acacia$HEIGHT <- as.numeric(acacia$HEIGHT)
```

```
## Warning: NAs introduced by coercion
```

```
acacia$HEIGHT
```

```
## [1] 2.25 2.65 1.50 2.01 1.75 1.65 1.20 1.45 1.87 2.38 2.58 2.65 2.35 1.88 2.32
## [16] 2.39 2.20 1.05 2.00 1.28 NA 1.40 1.90 1.75 1.80 2.70 2.02 1.90 1.85 1.65
## [31] 1.40 2.50 2.05 2.26 2.13 1.80 1.85 1.50 1.87 1.58 2.05 1.75 1.49 1.28 1.49
## [46] 1.07 1.48 1.25 1.41 1.60 1.20 1.49 1.50 1.65 1.13 1.25 1.10 2.20 1.45 1.60
## [61] 1.55 1.50 1.03 2.14 1.20 1.05 1.80 1.20 1.75 1.45 1.17 2.15 1.70 1.98 1.26
## [76] 1.11 1.14 1.26 1.30 1.29 1.31 1.15 1.87 1.47 1.05 2.10 1.99 1.42 1.50 1.06
## [91] 1.49 1.80 1.93 1.20 1.65 1.52 1.43 1.25 1.88 1.03 1.10 1.40 1.05 1.18 1.40
## [106] 1.37 1.32 1.55 1.30 1.24 1.50 1.65 2.17 1.28 1.07 0.67 0.68 1.87 1.35 1.75
## [121] 1.75 1.64 1.42 NA 0.90 NA 1.80 2.47 2.15 1.70 1.90 1.95 1.80 1.40 1.00
## [136] 1.75 1.28 1.00 1.45 1.00 1.03 1.51 1.17 1.33 1.30 1.13 1.58 1.06 1.05 1.45
## [151] 1.15 1.42 1.02 1.40 1.45 1.95 NA
```

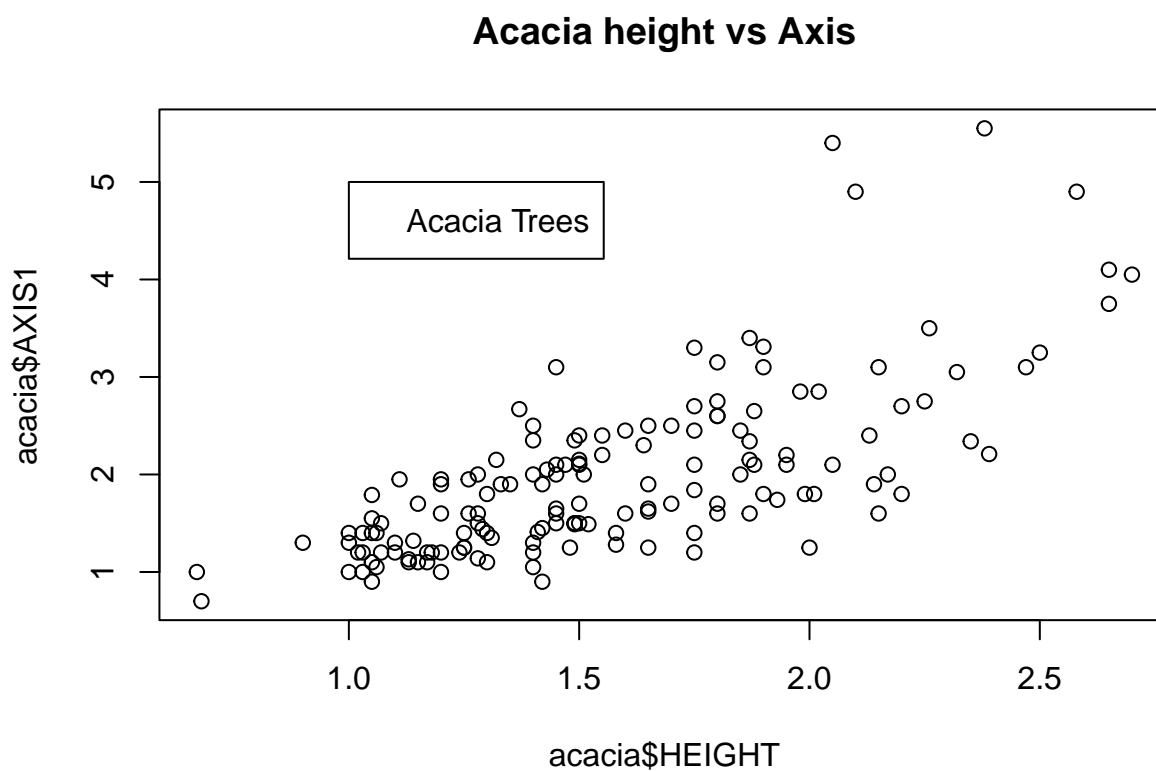
```
acacia <- read.csv(file = "../data-raw/ACACIA_DREPANOLOBIUM_SURVEY.txt",
                  sep = "\t",
                  na.strings = "dead")
is.numeric(acacia$HEIGHT)
```

```
## [1] TRUE
```

```
head(acacia)
```

```
##  SURVEY YEAR  SITE BLOCK TREATMENT  PLOT  ID HEIGHT AXIS1 AXIS2 CIRC
## 1      1 2012 SOUTH      1      TOTAL S1TOTAL 581  2.25 2.75 2.15 20
## 2      1 2012 SOUTH      1      TOTAL S1TOTAL 582  2.65 4.10 3.90 28
## 3      1 2012 SOUTH      1      TOTAL S1TOTAL 3111 1.50 1.70 0.85 17
## 4      1 2012 SOUTH      1      TOTAL S1TOTAL 3112 2.01 1.80 1.60 12
## 5      1 2012 SOUTH      1      TOTAL S1TOTAL 3113 1.75 1.84 1.42 13
## 6      1 2012 SOUTH      1      TOTAL S1TOTAL 3114 1.65 1.62 0.85 15
##  FLOWERS BUDS FRUITS ANT
## 1      0  0    10  CS
## 2      0  0   150  TP
## 3      2  1    50  TP
## 4      0  0    75  CS
## 5      0  0    20  CS
## 6      0  0     0  E
```

```
plot(x = acacia$HEIGHT, y = acacia$AXIS1, main = "Acacia height vs Axis")
legend(x = 1, y = 5, legend = "Acacia Trees")
```

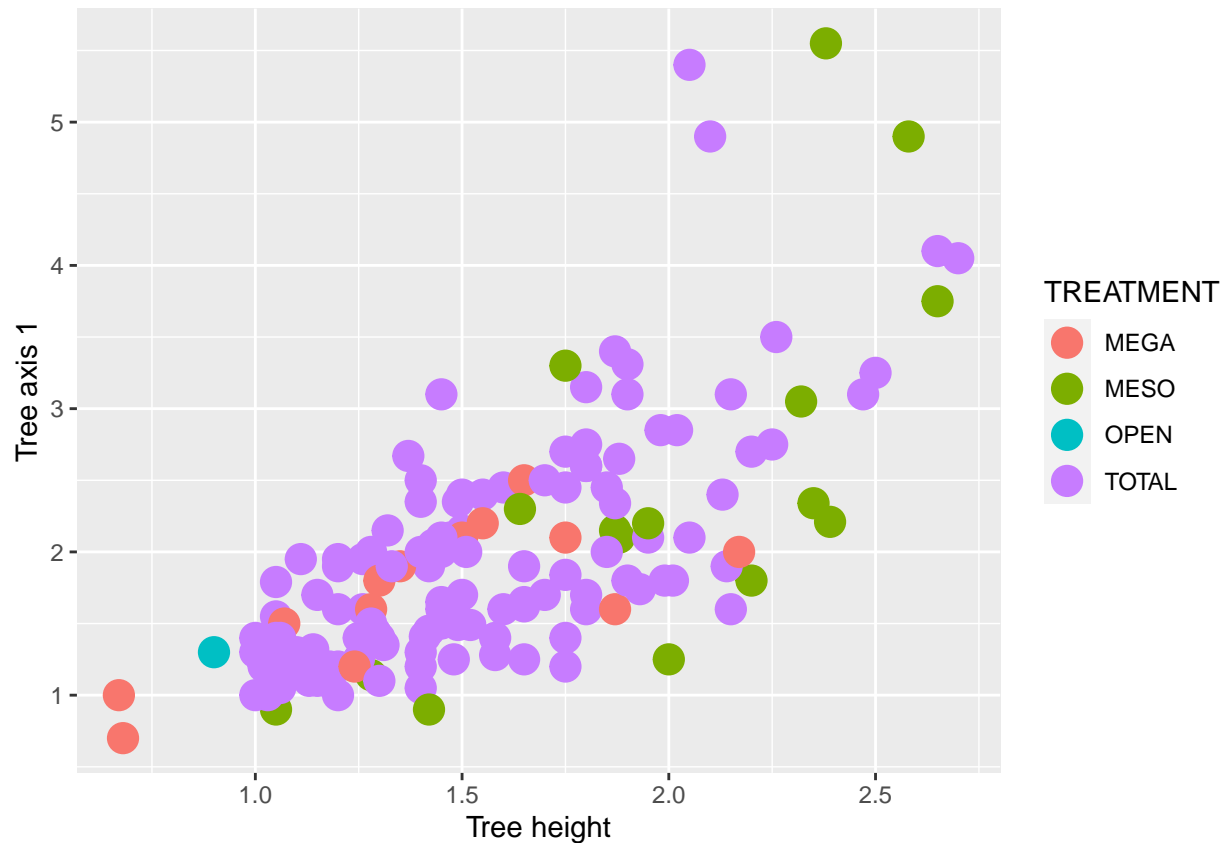


With GGplot, we create layers

```
library(ggplot2)

ggplot(data = acacia, mapping = aes(x = HEIGHT, y = AXIS1, color = TREATMENT)) +
  geom_point(size = 5) +
  labs(x = "Tree height", y = "Tree axis 1")
```

```
## Warning: Removed 4 rows containing missing values ('geom_point()').
```



THE DEAL WITH THIS EXPERIMENT:

How does excluding certain classes of animals change tree height in an area?

MEASURED VARIABLES:

Variables measured include plot number, height, rainfall, circumference, flowers, buds, fruit, and ants.

WHAT HAPPENED TO THE OPEN PLOTS?:

Open plots tended to have low tree heights, maybe because of all the grazing that happened

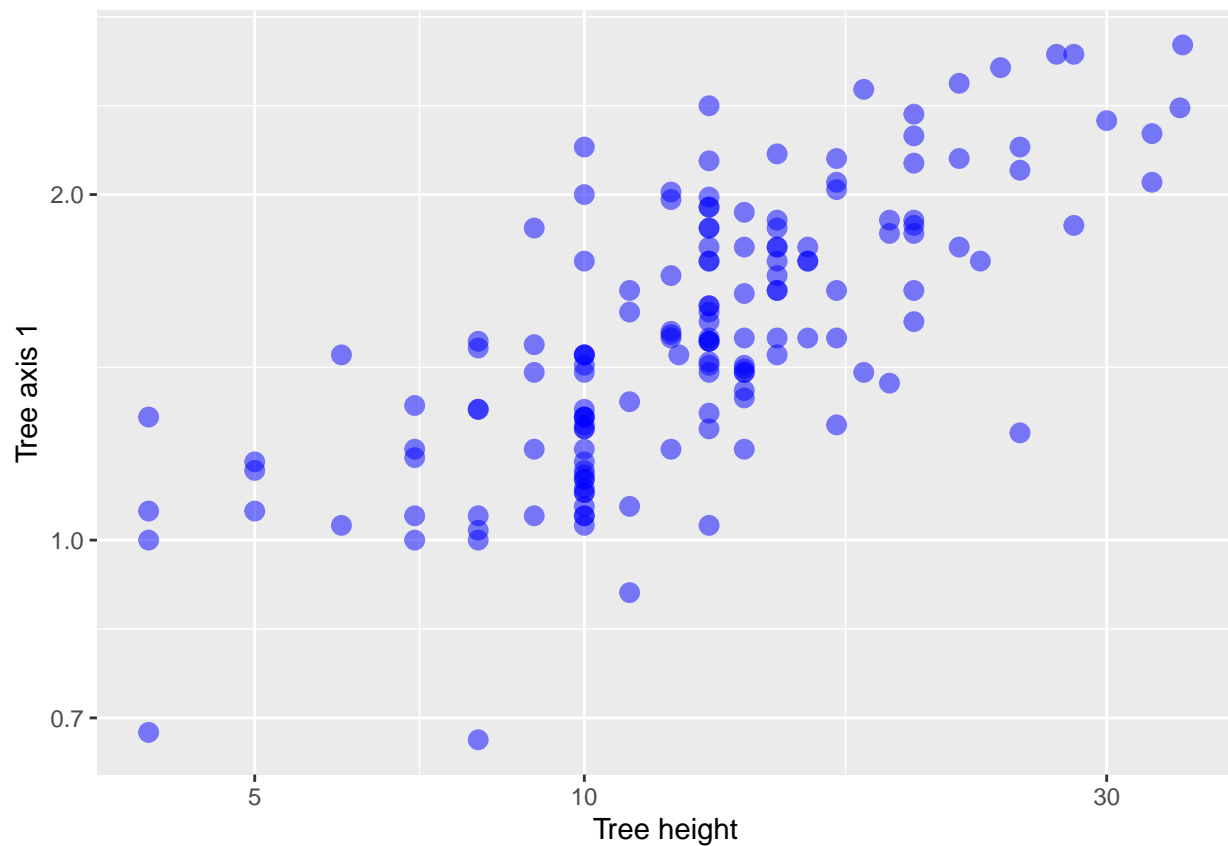
DAY TWO

Axis scale transforms

```
library(ggplot2)

ggplot(data = acacia, mapping = aes(x = CIRC, y = HEIGHT)) +
  geom_point(size = 3, color = "blue", alpha = 0.5) +
  scale_y_log10() +
  scale_x_log10() +
  labs(x = "Tree height", y = "Tree axis 1")
```

```
## Warning: Removed 4 rows containing missing values ('geom_point()').
```



Fitting linear models

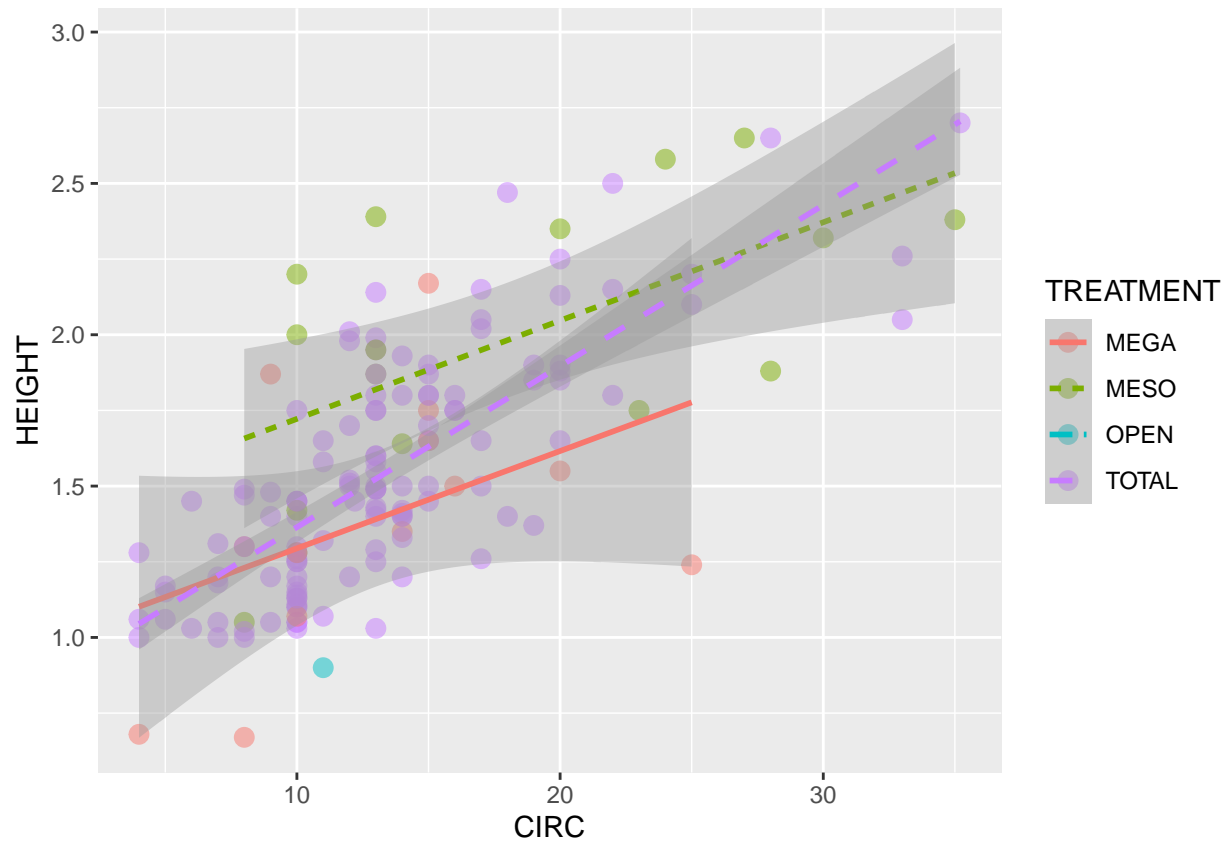
```
library(ggplot2)

ggplot(data = acacia, mapping = aes(x = CIRC, y = HEIGHT, color = TREATMENT, linetype = TREATMENT)) +
  geom_point(size = 3, alpha = 0.5) +
  geom_smooth(method = "glm")
```

```
## 'geom_smooth()' using formula = 'y ~ x'
```

```
## Warning: Removed 4 rows containing non-finite values ('stat_smooth()').
```

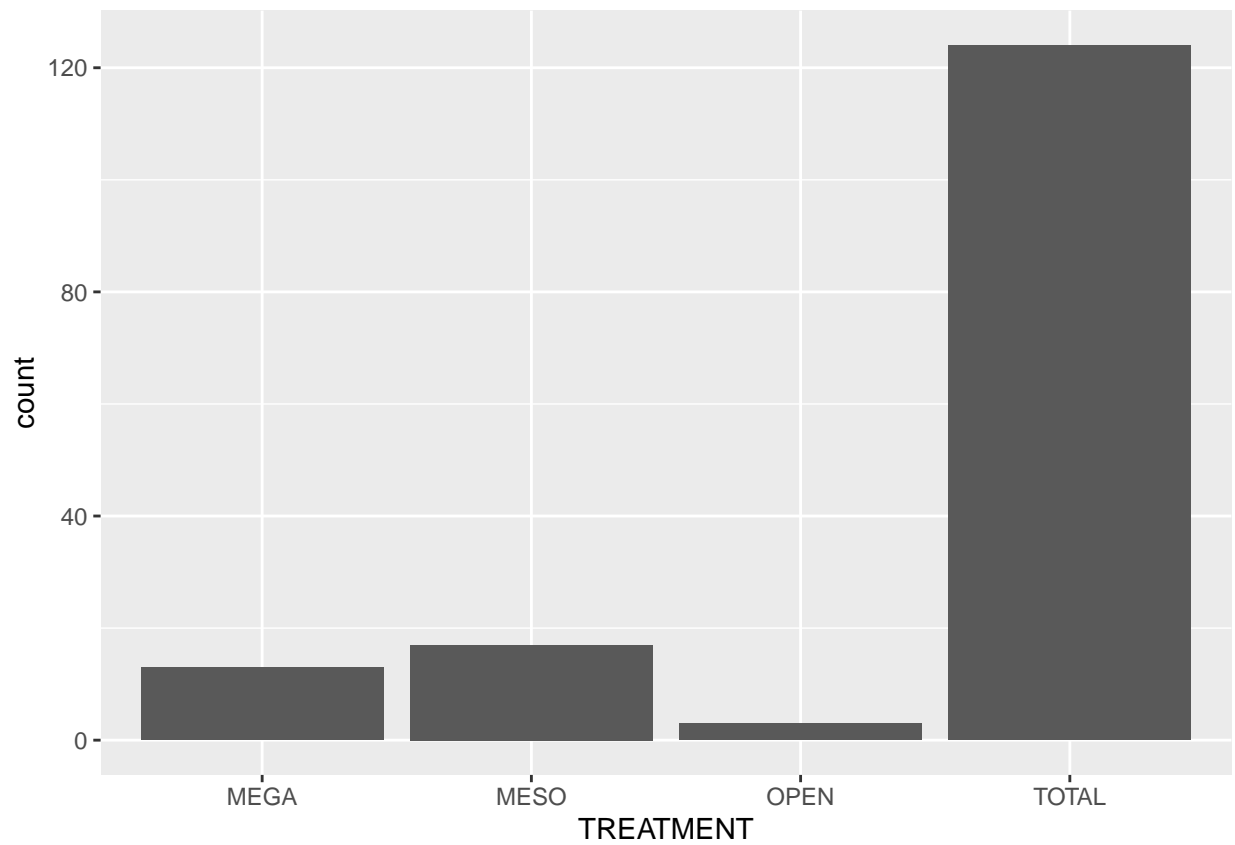
```
## Warning: Removed 4 rows containing missing values ('geom_point()').
```



Histograms and Bar Plots

```
library(ggplot2)

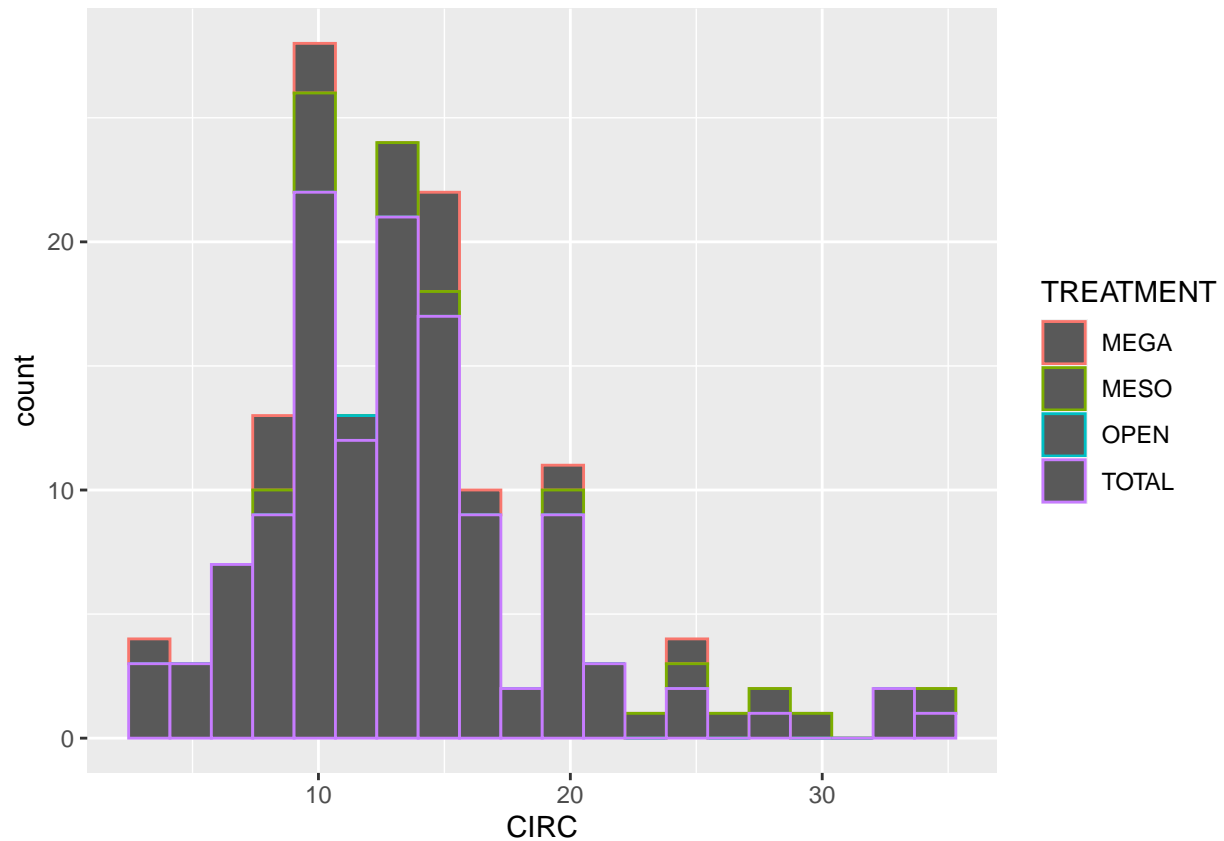
ggplot(data = acacia, mapping = aes(x = TREATMENT)) +
  geom_bar()
```



```
library(ggplot2)

ggplot(data = acacia, mapping = aes(x = CIRC, color = TREATMENT)) +
  geom_histogram(bins = 20)

## Warning: Removed 4 rows containing non-finite values ('stat_bin()').
```

Layering multiple data

```
library(ggplot2)

ggplot() +
  geom_point(data = acacia,
            mapping = aes(x = CIRC, y = HEIGHT,
                          color = TREATMENT)) +
  geom_smooth(data = acacia,
            mapping = aes(x = CIRC, y = HEIGHT)) +
  geom_histogram(data = acacia,
            mapping = aes(x = CIRC, color = TREATMENT),
            alpha = 0.1)
```

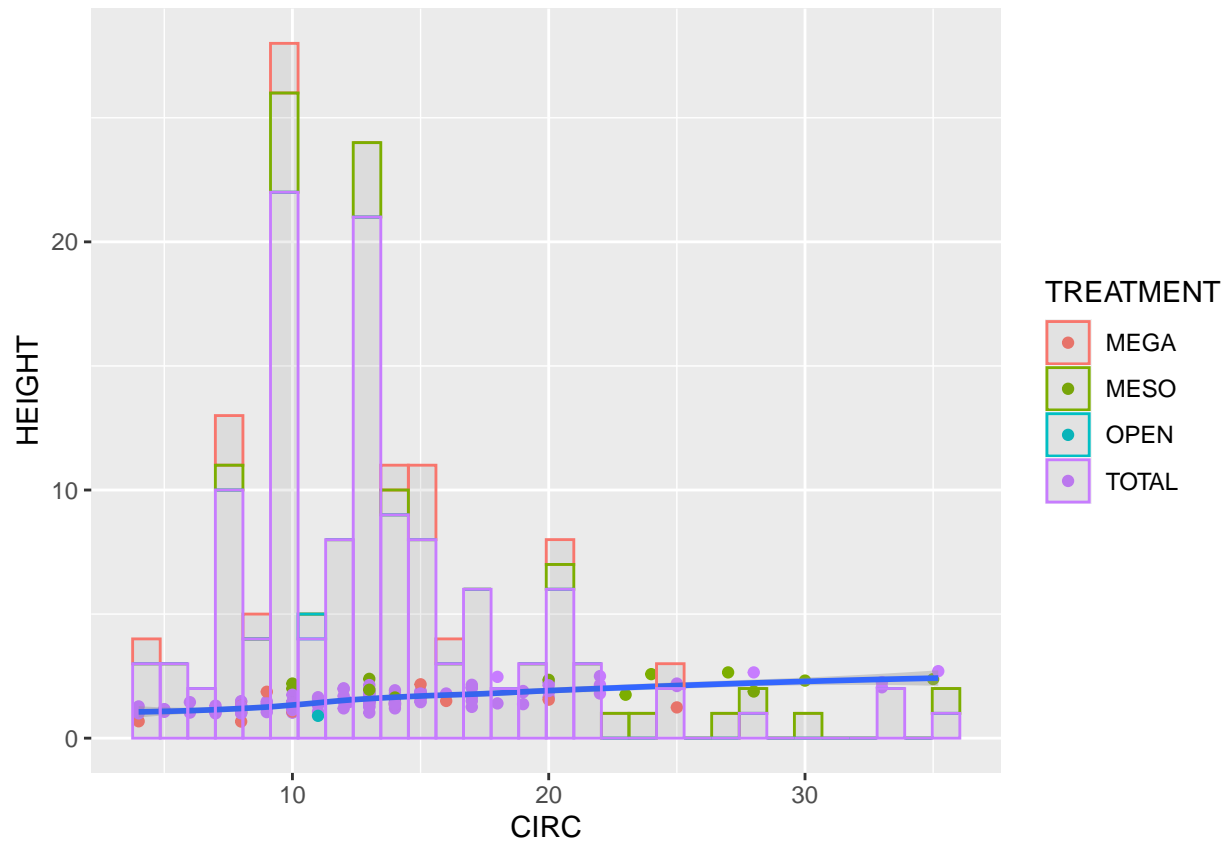
```
## 'geom_smooth()' using method = 'loess' and formula = 'y ~ x'
```

```
## Warning: Removed 4 rows containing non-finite values ('stat_smooth()').
```

```
## 'stat_bin()' using 'bins = 30'. Pick better value with 'binwidth'.
```

```
## Warning: Removed 4 rows containing non-finite values ('stat_bin()').
```

```
## Warning: Removed 4 rows containing missing values ('geom_point()').
```



Layering multiple data

```
library(ggplot2)

ggplot() +
  geom_point(data = acacia,
            mapping = aes(x = CIRC, y = HEIGHT,
                          color = TREATMENT)) +
  geom_smooth(data = acacia,
            mapping = aes(x = CIRC, y = HEIGHT)) +
  geom_histogram(data = acacia,
            mapping = aes(x = CIRC, color = TREATMENT),
            alpha = 0.1)
```

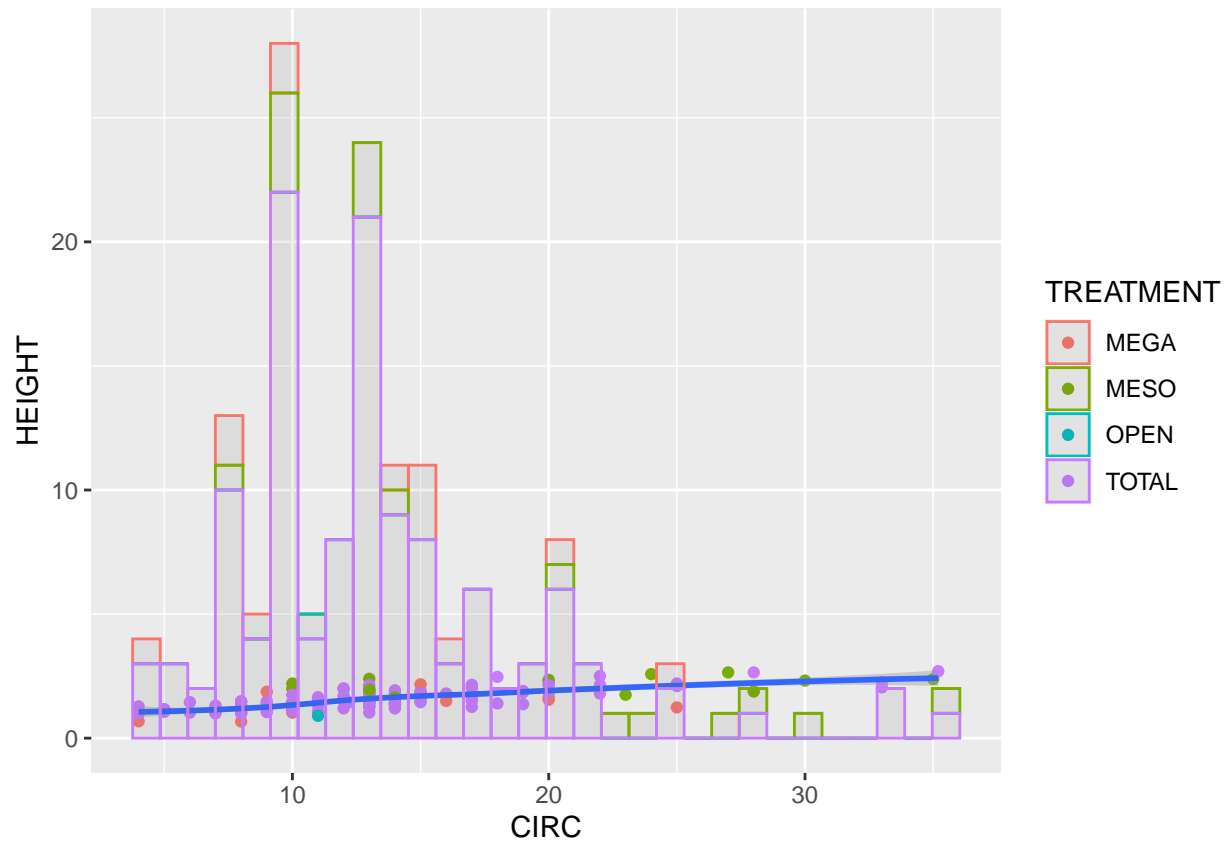
```
## 'geom_smooth()' using method = 'loess' and formula = 'y ~ x'
```

```
## Warning: Removed 4 rows containing non-finite values ('stat_smooth()').
```

```
## 'stat_bin()' using 'bins = 30'. Pick better value with 'binwidth'.
```

```
## Warning: Removed 4 rows containing non-finite values ('stat_bin()').
```

```
## Warning: Removed 4 rows containing missing values ('geom_point()').
```



```
library(ggplot2)

ggsave("acacia_by_treatment.jpg")

## Saving 6.5 x 4.5 in image
## 'geom_smooth()' using method = 'loess' and formula = 'y ~ x'

## Warning: Removed 4 rows containing non-finite values ('stat_smooth()').

## 'stat_bin()' using 'bins = 30'. Pick better value with 'binwidth'.

## Warning: Removed 4 rows containing non-finite values ('stat_bin()').

## Warning: Removed 4 rows containing missing values ('geom_point()').
```