UHURU data set visualization

Davinder Singh

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A tip for working with Rmarkdown

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

```
getwd()
```

[1] "/Users/davindersingh/Downloads/datasceince2023/documents"

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

1. Describing the working data set

UHURU data set The UHURU(ungulate herbivory under rainfall uncertainty) aim to characterize the effects of successively removing the largest size classes of herbivores from the system as well as evaluate how the direction and magnitude of these effects are shaped by variation in precipation regimes ## 2. Reading the data set We are reading a data set in TSV format. This is a "tab separted values" file. To read it into R we use the function read.csv() with the sep = argument set to "\t" which represents a tab in computer language.

```
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
                                      TOTAL S1TOTAL
## 2
             1 2012 SOUTH
                               1
                                                      582
                                                             2.65
                                                                   4.10
                                                                         3.90 28.0
## 3
             1 2012 SOUTH
                                      TOTAL S1TOTAL 3111
                                                             1.5
                                                                   1.70
                                                                          0.85 17.0
                               1
## 4
             1 2012 SOUTH
                               1
                                      TOTAL S1TOTAL 3112
                                                             2.01
                                                                   1.80
                                                                         1.60 12.0
             1 2012 SOUTH
                                      TOTAL S1TOTAL 3113
                                                             1.75
## 5
                               1
                                                                   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
             1 2012 SOUTH
                                      TOTAL S1TOTAL 3199
                                                             1.45
                                                                   2.00
                                                                         1.75 12.2
## 8
                               1
             1 2012 SOUTH
## 9
                               1
                                       MES<sub>0</sub>
                                             S1MESO
                                                      941
                                                             1.87
                                                                   2.15
                                                                         1.82 13.0
             1 2012 SOUTH
                               1
                                             S1MESO
                                                      942
                                                             2.38
                                                                   5.55
                                                                         4.82 35.0
## 10
                                       MESO
## 11
             1 2012 SOUTH
                               1
                                       MESO
                                             S1MESO
                                                      943
                                                             2.58
                                                                   4.90
                                                                         4.24 24.0
             1 2012 SOUTH
## 12
                               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
             1 2012 SOUTH
## 15
                               1
                                       MESO
                                             S1MESO 3116
                                                             2.32
                                                                   3.05
                                                                         2.63 30.0
## 16
             1 2012 SOUTH
                                       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
##				SOUTH	1	MESO	S1MESO		1.05	0.90	0.55 8.0
##				SOUTH	1	MESO	S1MESO		2	1.25	1.20 10.0
##				SOUTH	1	MESO	S1MESO		1.28	1.14	1.00 10.0
##				SOUTH	2	OPEN	S20PEN	341	dead	NA	NA NA
##				SOUTH	2		S2TOTAL		1.4	2.50	2.15 18.0
##				SOUTH	2		S2TOTAL	101	1.9	3.31	2.65 15.0
##				SOUTH	2		S2TOTAL	102	1.75	2.70	2.55 16.0
##				SOUTH	2		S2TOTAL	103	1.8	2.75	2.30 16.0
##				SOUTH	2		S2TOTAL	104	2.7	4.05	4.00 35.2
##				SOUTH	2	_	S2TOTAL	105	2.02	2.85	1.49 17.0
##	28			SOUTH	2		S2TOTAL	108	1.9	3.10	2.85 19.0
##				SOUTH	2		S2TOTAL	109	1.85	2.45	1.90 19.0
##				SOUTH	2		S2TOTAL	110	1.65	1.90	1.54 17.0
##				SOUTH	2		S2TOTAL	111	1.4	2.35	1.45 14.0
##				SOUTH	2		S2TOTAL	113	2.5	3.25	2.30 22.0
##				SOUTH	2		S2TOTAL	115	2.05	5.40	4.50 33.0
##				SOUTH	2		S2TOTAL	116	2.26	3.50	3.10 33.0
##				SOUTH	2		S2TOTAL	117	2.13	2.40	2.30 20.0
##				SOUTH	2		S2TOTAL	118	1.8	3.15	2.55 22.0
##				SOUTH	2		S2TOTAL		1.85	2.00	2.27 20.0
##				SOUTH	2		S2TOTAL		1.5	2.15	1.80 15.0
##				SOUTH	2		S2TOTAL		1.87	2.34	2.05 13.0
##				SOUTH	2		S2TOTAL		1.58	1.28	0.75 11.0
##				SOUTH	2		S2TOTAL		2.05	2.10	1.75 17.0
##				SOUTH	2		S2TOTAL		1.75	2.45	3.28 16.0
##				SOUTH	2		S2TOTAL		1.49	1.50	1.45 13.0
##				SOUTH	2		S2TOTAL		1.28	2.00	0.90 10.0
##	45			SOUTH	2		S2TOTAL		1.49	2.35	1.65 13.0
##				SOUTH	2		S2TOTAL		1.07	1.20	0.95 11.0
##				SOUTH	2		S2TOTAL		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	
##	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	S2T0TAL	1259	1.2	1.90	1.65 12.0
##	66	1	2012	SOUTH	2	TOTAL	S2T0TAL	1260	1.05	1.10	1.00 9.0
##	67	1	2012	SOUTH	2	TOTAL	S2T0TAL	2131	1.8	2.60	2.40 15.0
##	68	1	2012	SOUTH	2	TOTAL	S2T0TAL	2132	1.2	1.00	0.95 7.0
##	69	1	2012	SOUTH	2	TOTAL	S2T0TAL	2133	1.75	1.40	1.10 10.0
##	70	1	2012	SOUTH	2	TOTAL	S2T0TAL	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
##				SOUTH	2	_	S2TOTAL		2.15	3.10	2.58 22.0
##				SOUTH	2		S2TOTAL		1.7	1.70	1.40 12.0
##				SOUTH	2		S2TOTAL		1.98	2.85	2.70 12.0
##				SOUTH	2		S2TOTAL		1.26	1.95	1.75 17.0
##				SOUTH	2		S2TOTAL		1.11	1.95	1.50 10.0
##				SOUTH	2		S2TOTAL		1.14	1.32	1.05 10.0
##				SOUTH	2		S2TOTAL		1.26	1.60	1.40 10.0
##				SOUTH	2		S2TOTAL		1.3	1.40	0.80 10.0
##				SOUTH	2		S2TOTAL		1.29	1.44	1.35 13.0
##				SOUTH	2		S2TOTAL		1.31	1.35	1.15 7.0
##				SOUTH	2		S2TOTAL		1.15	1.70	1.28 10.0
##				SOUTH	2		S2TOTAL		1.87	3.40	1.85 15.0
##				SOUTH	2		S2TOTAL		1.47	2.10	1.61 8.0
##				SOUTH	2		S2TOTAL		1.05	1.79	1.50 10.0
##				SOUTH	2		S2TOTAL		2.1	4.90	3.75 25.0
##				SOUTH	2		S2TOTAL		1.99	1.80	1.35 13.0
##				SOUTH	2		S2TOTAL		1.42	1.90	1.80 14.0
##				SOUTH	2		S2TOTAL		1.42	2.11	1.75 12.0
##				SOUTH	2		S2TOTAL				0.85 4.0
##				SOUTH	2		S2TOTAL		1.06	1.05 1.50	1.15 13.0
##				SOUTH	2		S2TOTAL		1.49		1.15 13.0
##							S2TOTAL		1.8	1.60	
				SOUTH SOUTH	2		S2TOTAL		1.93	1.74	1.20 14.0 1.30 10.0
##		_		SOUTH	2		S2TOTAL		1.2	1.60	
##				SOUTH	2		S2TOTAL		1.65	1.25	1.10 11.0
##					2				1.52	1.49	1.10 12.0
##				SOUTH	2		S2TOTAL		1.43	2.05	1.54 13.0
##				SOUTH	2		S2TOTAL		1.25	1.40	1.25 13.0
##				SOUTH	2		S2TOTAL		1.88	2.65	2.64 20.0
	100			SOUTH	2		S2TOTAL		1.03	1.40	0.60 13.0
	101			SOUTH	2		S2TOTAL		1.1	1.30	1.20 10.0
	102			SOUTH	2		S2TOTAL		1.4	1.05	1.00 10.0
	103			SOUTH	2		S2TOTAL		1.05	1.55	0.90 10.0
	104			SOUTH	2	_	S2TOTAL		1.18	1.20	1.00 7.0
	105			SOUTH	2		S2TOTAL		1.4	1.30	1.85 13.0
	106			SOUTH	2	_	S2TOTAL		1.37	2.67	2.19 19.0
	107	_		SOUTH	2		S2TOTAL		1.32	2.15	1.55 11.0
	108			SOUTH	2	MEGA	S2MEGA	182	1.55	2.20	1.20 20.0
	109			SOUTH	2	MEGA	S2MEGA		1.3	1.80	0.90 8.0
	110			SOUTH	2	MEGA			1.24	1.20	1.20 25.0
	111			SOUTH	2	MEGA	S2MEGA		1.5	2.10	1.75 16.0
	112			SOUTH	2	MEGA	S2MEGA		1.65	2.50	2.20 15.0
	113			SOUTH	2	MEGA	S2MEGA		2.17	2.00	1.20 15.0
	114			SOUTH	2	MEGA	S2MEGA		1.28	1.60	1.50 10.0
	115			SOUTH	2	MEGA	S2MEGA		1.07	1.50	1.50 10.0
	116			SOUTH	2	MEGA	S2MEGA		0.67	1.00	0.80 8.0
	117			SOUTH	2	MEGA	S2MEGA		0.68	0.70	0.60 4.0
	118			SOUTH	2	MEGA	S2MEGA		1.87	1.60	1.40 9.0
	119			SOUTH	2	MEGA	S2MEGA		1.35	1.90	1.50 14.0
	120			SOUTH	2	MEGA	S2MEGA		1.75	2.10	2.10 15.0
	121			SOUTH	2	MESO	S2MESO		1.75	3.30	2.50 23.0
	122			SOUTH	2	MESO	S2MES0	463	1.64	2.30	2.00 14.0
	123			SOUTH	2	MESO	S2MESO		1.42	0.90	0.80 10.0
##	124	1	2012	SOUTH	3	OPEN	S30PEN	1301	dead	NA	NA NA

```
1 2012 SOUTH
## 125
                                     OPEN S30PEN 1302
                                                          0.9 1.30 1.10 11.0
## 126
            1 2012 SOUTH
                             3
                                    TOTAL S3TOTAL 1061
                                                          dead
                                                                  NA
                                                                        NΑ
                                                                             NΑ
## 127
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 1062
                                                          1.8 2.60
                                                                      2.60 15.0
## 128
            1 2012 SOUTH
                                    TOTAL S3TOTAL 1063
                                                          2.47 3.10
                                                                      2.20 18.0
                             3
## 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
            1 2012 SOUTH
                                    TOTAL S3TOTAL 1067
                                                          1.95 2.10 1.90 13.0
## 132
                              3
## 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
                                    TOTAL S3TOTAL 2139
## 136
            1 2012 SOUTH
                              3
                                                          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
                                                                      1.20 4.0
                                                          1 1.40
## 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
                                                               1.10 0.90 10.0
## 143
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2156
                                                          1.17
## 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
            1 2012 SOUTH
                                    TOTAL S3TOTAL 2160
## 147
                                                          1.58 1.40
                                                                      1.40 13.0
                              3
## 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
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2175
## 152
                                                          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
                                     MESO S3MESO 1422
## 157
            1 2012 SOUTH
                              3
                                                          dead
                                                                  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
                               F.
## 7
                         0
             0
                  0
                               CS
## 8
             0
                  0
                         25
                               CS
## 9
             0
                  0
                         0
                               TP
## 10
                         50
             0
                  0
                               TP
## 11
             0
                  0
                         5
                               CS
## 12
                  0
                         60
                               TP
             0
## 13
             0
                  0
                         60
                               TP
## 14
             2
                         60
                  0
                               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 32	0	0	0	CS
##		0	0	35	TP
##	33	0	0	300	CM CS
##	34	2	2	100	
## ##	35 36	0	0 0	30 50	CM TP
##	37	0	0	10	CM
##	38	0	0	25	CM
##	39	0	0	25 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	Ö	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
## 101	0	0	0	CS
## 102	0	0	0	CM
## 103	0	0	0	TP
## 104	0	0	30	CS
## 105	0	0	50	TP
## 100	0	0	10	CS
## 107	0	0	0	CS
## 100	0	0	15	CS
## 109 ## 110	0	0	10	CS
## 110	5	0	200	CS
## 111 ## 112	0	0	80	CS
## 112 ## 113	0	0	150	TP
## 113 ## 114	0	0	40	TP
## 114	0	0	60	
## 115 ## 116	0	0	0	TP CS
## 117 ## 118	0	0 0	0 40	TP CS
	0	0	20	CS
## 119 ## 120	0	0	20 75	TP
## 121 ## 122	0	0	20	CM
## 122 ## 123	0	0	0	TP
## 123	0	0	0	E
## 124	NA	NA	NA	mr.
## 125	O N. A	0	0	TP
## 126	NA	NA	NA	mr.
## 127	0	0	50	TP
## 128	0	0	0	TP

```
TP
## 129
              0
                    0
                           0
## 130
              0
                    0
                           2
                                 TP
## 131
                    0
                           25
                                 TP
## 132
                    0
                           0
                                 ΤP
              0
## 133
              0
                    0
                           0
                                 TP
## 134
              0
                    0
                           0
                                 TP
## 135
              0
                    0
                           0
                                 TP
                           0
## 136
              0
                    0
                                 TP
## 137
              0
                   0
                           0
                                 TP
## 138
              0
                    0
                           0
                                 TP
## 139
              0
                    0
                           0
                                 TP
                           0
                                 TP
## 140
              0
                    0
                    0
                           0
                                 TP
## 141
              0
## 142
              0
                    0
                           0
                                 ΤP
## 143
              0
                    0
                           0
                                 TP
## 144
              0
                    0
                           0
                                 TP
## 145
              0
                   0
                           0
                                 TP
## 146
                    0
                           0
                                 TP
## 147
              0
                   0
                           0
                                 TP
## 148
              0
                    0
                           8
                                 TP
## 149
              0
                    0
                           0
                                 TP
## 150
                    0
                           0
                                 TP
## 151
              0
                   0
                           0
                                 TP
## 152
              0
                   0
                           0
                                 TP
## 153
                   0
                           0
                                 TP
              0
## 154
              0
                    0
                           0
                                 TP
## 155
              0
                    0
                          20
                                 ΤP
## 156
              0
                    0
                           2
                                 CS
## 157
             NA
                  NA
                          NA
```

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

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

3. Acessing elements of a data.frame

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
          1 2012 SOUTH
## 2
                                 TOTAL S1TOTAL 582
                                                      2.65 4.10 3.90
                                                                          28
                           1
          1 2012 SOUTH
## 3
                           1
                                 TOTAL S1TOTAL 3111
                                                       1.5 1.70 0.85
                                                                          17
## 4
          1 2012 SOUTH
                                 TOTAL S1TOTAL 3112
                                                      2.01 1.80 1.60
                                                                          12
## 5
          1 2012 SOUTH
                                 TOTAL S1TOTAL 3113
                                                      1.75 1.84 1.42
                                                                          13
                           1
## 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
                          TP
                     150
## 3
           2
                1
                      50
                          TP
## 4
                      75 CS
           0
                0
## 5
           0
                0
                      20 CS
## 6
           0
                0
                       0
                           Ε
```

str(acacia)

```
## 'data.frame': 157 obs. of 15 variables:
   $ SURVEY : int 1 1 1 1 1 1 1 1 1 1 ...
                  $ YEAR
             : int
            : chr "SOUTH" "SOUTH" "SOUTH" ...
## $ SITE
## $ BLOCK : int 1 1 1 1 1 1 1 1 1 ...
## $ TREATMENT: chr "TOTAL" "TOTAL" "TOTAL" "TOTAL" ...
            : chr "S1TOTAL" "S1TOTAL" "S1TOTAL" "S1TOTAL" ...
##
   $ PLOT
            : int 581 582 3111 3112 3113 3114 3115 3199 941 942 ...
## $ ID
## $ HEIGHT : chr "2.25" "2.65" "1.5" "2.01" ...
            : num 2.75 4.1 1.7 1.8 1.84 1.62 1.95 2 2.15 5.55 ...
## $ AXIS1
          : num 2.15 3.9 0.85 1.6 1.42 0.85 0.9 1.75 1.82 4.82 ...
## $ AXIS2
           : num 20 28 17 12 13 15 9 12.2 13 35 ...
## $ CIRC
## $ FLOWERS : int 0 0 2 0 0 0 0 0 0 ...
## $ BUDS
            : int 001000000...
## $ FRUITS
           : int 10 150 50 75 20 0 0 25 0 50 ...
            : chr "CS" "TP" "TP" "CS" ...
## $ ANT
```

It is similar to what we do for vectors, but we have two dimensions

acacia[,6]

```
[1] "S1TOTAL" "S1TOTAL" "S1TOTAL" "S1TOTAL" "S1TOTAL" "S1TOTAL"
##
    [8] "S1TOTAL" "S1MESO" "S1MESO" "S1MESO" "S1MESO" "S1MESO" "S1MESO"
##
   [15] "S1MESO" "S1MESO" "S1MESO" "S1MESO" "S1MESO" "S1MESO" "S2OPEN"
##
   [22] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
   [29] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
##
   [36] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
##
   [43] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
##
   [50] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
##
   [57] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
##
   [64] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
##
   [71] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
   [78] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
##
   [85] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
   [92] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
  [99] "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL" "S2TOTAL"
## [106] "S2TOTAL" "S2TOTAL" "S2MEGA"
                                   "S2MEGA" "S2MEGA" "S2MEGA" "S2MEGA"
## [113] "S2MEGA" "S2MEGA" "S2MEGA"
                                   "S2MEGA" "S2MEGA" "S2MEGA" "S2MEGA"
## [120] "S2MEGA" "S2MESO" "S2MESO" "S3OPEN" "S3OPEN" "S3TOTAL"
## [127] "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL"
## [134] "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL"
## [141] "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL"
## [148] "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL" "S3TOTAL"
## [155] "S3TOTAL" "S3MESO" "S3MESO"
```

str(acacia)

```
$ SITE
              : chr "SOUTH" "SOUTH" "SOUTH" ...
   $ BLOCK
##
             : int 1 1 1 1 1 1 1 1 1 ...
  $ TREATMENT: chr
                    "TOTAL" "TOTAL" "TOTAL" "TOTAL" ...
              : chr "S1TOTAL" "S1TOTAL" "S1TOTAL" ...
  $ PLOT
##
   $ TD
              : int 581 582 3111 3112 3113 3114 3115 3199 941 942 ...
  $ HEIGHT : chr "2.25" "2.65" "1.5" "2.01" ...
##
             : num 2.75 4.1 1.7 1.8 1.84 1.62 1.95 2 2.15 5.55 ...
  $ AXIS1
              : num 2.15 3.9 0.85 1.6 1.42 0.85 0.9 1.75 1.82 4.82 ...
##
   $ AXIS2
##
   $ CIRC
              : num 20 28 17 12 13 15 9 12.2 13 35 ...
## $ FLOWERS : int 0 0 2 0 0 0 0 0 0 ...
  $ BUDS
              : int 001000000...
              : int 10 150 50 75 20 0 0 25 0 50 ...
##
   $ FRUITS
                   "CS" "TP" "TP" "CS" ...
   $ ANT
              : chr
```

All are the following ways to accessing a column or variable in data

```
acacia$SURVEY
## [149] 1 1 1 1 1 1 1 1 1
acacia[, 1]
## [149] 1 1 1 1 1 1 1 1 1
acacia[, "SURVEY"]
## [149] 1 1 1 1 1 1 1 1 1
```

Replacing elements in a data frame

4. quality control

```
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
                                TOTAL S1TOTAL 582
                                                     2.65 4.10 3.90
                                                                        28
                          1
```

```
## 3
          1 2012 SOUTH
                                  TOTAL S1TOTAL 3111
                                                        1.5 1.70 0.85
                                                                           17
                           1
                                  TOTAL S1TOTAL 3112
## 4
          1 2012 SOUTH
                                                                           12
                                                       2.01 1.80 1.60
                            1
          1 2012 SOUTH
                            1
                                  TOTAL S1TOTAL 3113
                                                       1.75 1.84 1.42
                                                                           13
          1 2012 SOUTH
                                  TOTAL S1TOTAL 3114
## 6
                                                        1.65 1.62 0.85
                                                                           15
                            1
    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
                           Ε
```

str(acacia)

```
## 'data.frame':
                 157 obs. of 15 variables:
   $ SURVEY
            : int 1 1 1 1 1 1 1 1 1 1 ...
   $ YEAR
             : int
                   : chr
                   "SOUTH" "SOUTH" "SOUTH" ...
##
   $ SITE
   $ BLOCK
             : int
                  1 1 1 1 1 1 1 1 1 1 ...
   $ TREATMENT: chr
                   "TOTAL" "TOTAL" "TOTAL" ...
##
   $ PLOT
            : chr
                   "S1TOTAL" "S1TOTAL" "S1TOTAL" "S1TOTAL" ...
             : int 581 582 3111 3112 3113 3114 3115 3199 941 942 ...
##
   $ ID
   $ 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 ...
             : num 2.15 3.9 0.85 1.6 1.42 0.85 0.9 1.75 1.82 4.82 ...
##
   $ AXIS2
             : num 20 28 17 12 13 15 9 12.2 13 35 ...
##
   $ CIRC
   $ FLOWERS : int 0 0 2 0 0 0 0 0 0 0 ...
             : int 0010000000...
   $ BUDS
   $ FRUITS
             : int 10 150 50 75 20 0 0 25 0 50 ...
             : chr "CS" "TP" "TP" "CS" ...
   $ ANT
```

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
            1 2012 SOUTH
                                  TOTAL S1TOTAL 3112
                                                       2.01 1.80 1.60 12.0
## 4
                            1
## 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
                                  TOTAL S1TOTAL 3115
                                                        1.2 1.95 0.90 9.0
                            1
            1 2012 SOUTH
                                                       1.45 2.00 1.75 12.2
## 8
                            1
                                  TOTAL S1TOTAL 3199
                                                       1.87 2.15 1.82 13.0
## 9
            1 2012 SOUTH
                                   MESO S1MESO 941
                            1
## 10
            1 2012 SOUTH
                            1
                                   MESO
                                         S1MESO
                                                 942
                                                       2.38 5.55
                                                                  4.82 35.0
            1 2012 SOUTH
                                   MESO
                                         S1MESO
                                                       2.58 4.90 4.24 24.0
## 11
                            1
                                                 943
## 12
            1 2012 SOUTH
                                   MESO
                                         S1MESO
                                                 944
                                                       2.65
                                                            3.75
                                                                   3.10 27.0
                            1
                                                       2.35 2.34 2.05 20.0
## 13
            1 2012 SOUTH
                                   MESO
                                         S1MESO 946
                            1
            1 2012 SOUTH
                                   MESO
                                         S1MESO 947
                                                       1.88 2.10 1.85 28.0
## 14
                            1
            1 2012 SOUTH
## 15
                            1
                                   MESO 
                                         S1MESO 3116
                                                       2.32 3.05 2.63 30.0
            1 2012 SOUTH
                                   MESO
                                         S1MESO 3117
                                                       2.39 2.21
                                                                   2.10 13.0
## 16
                            1
## 17
            1 2012 SOUTH
                            1
                                   MESO.
                                         S1MESO 3118
                                                        2.2 1.80 1.50 10.0
           1 2012 SOUTH
## 18
                            1
                                   MESO.
                                         S1MESO 3119
                                                       1.05 0.90 0.55 8.0
           1 2012 SOUTH
                                                          2 1.25 1.20 10.0
## 19
                                   MESO
                                         S1MESO 3120
                            1
```

##	20	1	2012	SOUTH	1	MESO	S1MESO	3131	1.28	1.14	1.00	10.0
##	21	1	2012	SOUTH	2	OPEN	S20PEN	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	S2T0TAL	109	1.85	2.45	1.90	19.0
##	30	1	2012	SOUTH	2	TOTAL	S2T0TAL	110	1.65	1.90	1.54	17.0
##	31	1	2012	SOUTH	2	TOTAL	S2T0TAL	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			SOUTH	2		S2TOTAL		1.85	2.00	2.27	
##				SOUTH	2		S2TOTAL		1.5	2.15		15.0
##				SOUTH	2	_	S2T0TAL		1.87	2.34	2.05	
	40			SOUTH	2		S2TOTAL		1.58	1.28	0.75	
	41			SOUTH	2		S2T0TAL		2.05	2.10		17.0
	42			SOUTH	2		S2T0TAL		1.75	2.45	3.28	
	43			SOUTH	2		S2TOTAL		1.49	1.50		13.0
	44			SOUTH	2		S2TOTAL		1.28	2.00	0.90	
	45			SOUTH	2		S2TOTAL		1.49	2.35		13.0
##				SOUTH	2		S2TOTAL		1.07	1.20	0.95	
	47			SOUTH	2		S2TOTAL		1.48	1.25	1.20	9.0
##				SOUTH	2		S2TOTAL		1.25	1.25	0.90	
	49 50			SOUTH	2 2		S2TOTAL S2TOTAL		1.41 1.6	1.41 1.60		14.0 13.0
	51			SOUTH	2		S2TOTAL		1.0	1.20		14.0
	52			SOUTH	2		S2TOTAL		1.49	1.49	1.20	8.0
	53			SOUTH	2		S2TOTAL		1.43	1.50		14.0
	54			SOUTH	2		S2TOTAL		1.65	1.65	2.00	
	55			SOUTH	2		S2TOTAL		1.13	1.13		10.0
	56			SOUTH	2		S2TOTAL		1.25	1.25	0.90	
##				SOUTH	2		S2TOTAL		1.1	1.20		10.0
	58			SOUTH	2		S2TOTAL			2.70	2.40	
	59			SOUTH	2		S2T0TAL			1.65		10.0
	60			SOUTH	2		S2T0TAL		1.6	2.45		13.0
##	61			SOUTH	2		S2TOTAL		1.55	2.40	1.80	13.0
##	62			SOUTH	2		S2TOTAL		1.5	2.40		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	S2T0TAL	2133	1.75	1.40	1.10	10.0
	70			SOUTH	2		S2T0TAL			3.10		10.0
	71			SOUTH	2		S2T0TAL			1.20		5.0
	72			SOUTH	2		S2T0TAL			3.10	2.58	
##	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
##				SOUTH	2	_	S2TOTAL		1.26	1.95		17.0
##	76			SOUTH	2		S2TOTAL		1.11	1.95		10.0
##				SOUTH	2		S2TOTAL		1.14	1.32	1.05	
##				SOUTH	2		S2TOTAL		1.26	1.60	1.40	
##				SOUTH	2		S2TOTAL		1.3	1.40	0.80	
##				SOUTH	2		S2TOTAL		1.29	1.44	1.35	
##				SOUTH	2		S2TOTAL		1.31	1.35	1.15	7.0
##				SOUTH	2		S2TOTAL		1.15	1.70	1.28	
##				SOUTH	2		S2TOTAL		1.87	3.40	1.85	
##				SOUTH	2		S2TOTAL		1.47	2.10	1.61	8.0
##				SOUTH	2		S2TOTAL			1.79	1.50	
##				SOUTH	2		S2TOTAL		1.05 2.1	4.90	3.75	
				SOUTH			S2TOTAL					
##					2				1.99	1.80	1.35	
##				SOUTH	2		S2TOTAL		1.42	1.90	1.80	
##				SOUTH	2		S2TOTAL		1.5	2.11	1.75	
##				SOUTH	2		S2TOTAL		1.06	1.05	0.85	4.0
##				SOUTH	2		S2TOTAL		1.49	1.50	1.15	
##				SOUTH	2	_	S2TOTAL		1.8	1.60	1.50	
##				SOUTH	2	_	S2T0TAL		1.93	1.74	1.20	
##				SOUTH	2		S2TOTAL		1.2	1.60	1.30	
##	95	1	2012	SOUTH	2		S2TOTAL		1.65	1.25	1.10	
##	96	1	2012	SOUTH	2		S2T0TAL		1.52	1.49	1.10	12.0
##	97	1	2012	SOUTH	2		S2TOTAL		1.43	2.05	1.54	13.0
##	98	1	2012	SOUTH	2		S2TOTAL		1.25	1.40	1.25	13.0
##	99	1	2012	SOUTH	2	TOTAL	S2T0TAL	3177	1.88	2.65	2.64	20.0
##	100	1	2012	SOUTH	2	TOTAL	S2T0TAL	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			SOUTH	2	MEGA	S2MEGA	186	1.65	2.50	2.20	
	113			SOUTH	2	MEGA	S2MEGA		2.17	2.00	1.20	
	114			SOUTH	2	MEGA	S2MEGA	188	1.28	1.60	1.50	
	115			SOUTH	2	MEGA	S2MEGA	189	1.07	1.50	1.50	
	116			SOUTH	2	MEGA	S2MEGA	190	0.67	1.00	0.80	8.0
	117			SOUTH	2	MEGA	S2MEGA	191	0.68	0.70	0.60	4.0
	118			SOUTH	2	MEGA	S2MEGA	192	1.87	1.60	1.40	9.0
	119			SOUTH	2	MEGA	S2MEGA	193	1.35	1.90	1.50	
	120			SOUTH	2	MEGA	S2MEGA		1.75	2.10	2.10	
	121			SOUTH	2	MESO	S2MESO		1.75	3.30	2.50	
	121			SOUTH	2	MESO	S2MESO	463	1.64	2.30	2.00	
	123			SOUTH	2	MESO	S2MESO S2MESO		1.42	0.90	0.80	
	123			SOUTH	3							
					3	OPEN	S30PEN		dead 0 0	NA 1 30	NA 1 10	NA 11 O
	125			SOUTH		OPEN	S30PEN		0.9	1.30	1.10	
	126			SOUTH	3		SSTOTAL		dead	NA	NA	NA 15.0
##	127	Τ	2012	SOUTH	3	IUIAL	S3TOTAL	1002	1.8	2.60	2.60	15.0

```
1 2012 SOUTH
## 128
                              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
                                    TOTAL S3TOTAL 1066
                              3
                                                            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
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 1069
                                                            1.4 2.00
                                                                       1.60 14.0
## 134
            1 2012 SOUTH
                                    TOTAL S3TOTAL 1070
                                                                       1.20 7.0
## 135
                              3
                                                              1
                                                                1.30
## 136
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2139
                                                           1.75
                                                                 1.20
                                                                       1.10 13.0
            1 2012 SOUTH
                              3
                                                           1.28
                                                                       0.95 4.0
## 137
                                    TOTAL S3TOTAL 2140
                                                                1.50
## 138
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2151
                                                              1 1.40
                                                                       1.20 4.0
## 139
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2152
                                                                 1.50
                                                                       1.30 10.0
                                                           1.45
## 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
                                                                       0.90 6.0
                                                                1.00
## 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
                                    TOTAL S3TOTAL 2159
                                                                       0.90 10.0
                              3
                                                           1.13 1.10
## 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
            1 2012 SOUTH
## 150
                                    TOTAL S3TOTAL 2173
                                                           1.45 1.60
                                                                       1.10
                                                                              6.0
                              3
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2174
                                                           1.15
                                                                 1.10
                                                                       0.90
## 151
                                                                              5.0
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2175
                                                                       1.30 13.0
## 152
                                                           1.42 1.45
## 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
            1 2012 SOUTH
                              3
                                     TOTAL S3TOTAL 2178
## 155
                                                           1.45
                                                                 2.10
                                                                       2.05 15.0
## 156
            1 2012 SOUTH
                              3
                                     MESO
                                           S3MESO 1421
                                                           1.95
                                                                2.20
                                                                       1.60 13.0
                                                           dead
## 157
            1 2012 SOUTH
                              3
                                     MESO
                                            S3MESO 1422
                                                                   NA
                                                                          NA
                                                                               NA
       FLOWERS BUDS FRUITS
##
                              ANT
## 1
             0
                  0
                         10
                               CS
## 2
             0
                   0
                        150
                               TP
## 3
                         50
                               TP
             2
                   1
## 4
             0
                  0
                         75
                               CS
## 5
             0
                  0
                         20
                               CS
## 6
             0
                  0
                          0
                                Ε
## 7
             0
                  0
                          0
                               CS
## 8
             0
                  0
                         25
                               CS
## 9
             0
                  0
                          0
                               TP
## 10
                         50
             0
                  0
                               TP
## 11
             0
                  0
                          5
                               CS
## 12
             0
                  0
                         60
                               TP
## 13
             0
                  0
                         60
                               TP
## 14
             2
                  0
                         60
                               CS
## 15
             2
                          0
                               CS
                  0
## 16
             0
                  0
                          0
                               TP
                               TP
## 17
             0
                  0
                          0
## 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 CN
##	55	0	0	0	
##	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	Ε
## 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
                                TP
## 133
                   0
                                TР
              0
                           0
## 134
                   0
                           0
                                TP
## 135
                                TP
                   0
                           0
              0
## 136
              0
                   0
                           0
                                TP
## 137
                           0
                                TP
              0
                   0
## 138
                                TP
                   0
## 139
                                TP
              0
                   0
                           0
## 140
              0
                   0
                           0
                                TP
## 141
                           0
                                TP
              0
                   0
## 142
              0
                   0
                           0
                                TP
                                TP
## 143
                   0
                           0
              0
                                TP
## 144
              0
                   0
                           0
## 145
                                ΤP
              0
                   0
                           0
## 146
              0
                   0
                           0
                                TP
## 147
              0
                   0
                           0
                                TP
## 148
                   0
                                TP
              Ω
                           8
## 149
                   0
                           0
                                TP
## 150
                           0
                                TP
              0
                   0
## 151
              0
                   0
                           0
                                TP
## 152
              0
                   0
                           0
                                TP
## 153
                   0
                           0
                                TP
## 154
                           0
                                TP
              0
                   0
## 155
                          20
                                TP
                   0
## 156
                           2
                                CS
              0
                   0
## 157
            NA
                  NA
                          NA
```

class(acacia\$HEIGHT)

[1] "character"

is.numeric(acacia\$HEIGHT)

[1] FALSE

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"
                                         "1.75" "1.28" "1"
## [131] "1.9" "1.95" "1.8" "1.4" "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
```

We identified that HEIGHT should be numeric and is instead character:

```
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
```

Coercion in R computer language ,eams tjat a va;ie was forced to be a type, in this case, the word "DEAD" cannot be transformed to a number, so it is assigned the NA value

```
SURVEY YEAR SITE BLOCK TREATMENT
                                           PLOT
                                                  ID HEIGHT AXIS1 AXIS2 CIRC
##
                                  TOTAL S1TOTAL
## 1
            1 2012 SOUTH
                            1
                                                 581
                                                        2.25
                                                             2.75
                                                                   2.15 20.0
## 2
            1 2012 SOUTH
                                  TOTAL S1TOTAL 582
                            1
                                                       2.65
                                                             4.10 3.90 28.0
## 3
           1 2012 SOUTH
                            1
                                  TOTAL S1TOTAL 3111
                                                       1.50 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
                                  TOTAL S1TOTAL 3113
                            1
                                                       1.75 1.84
                                                                   1.42 13.0
                                  TOTAL S1TOTAL 3114
## 6
           1 2012 SOUTH
                                                       1.65 1.62 0.85 15.0
```

##	7	1	2012	SOUTH	1	TOTAL	S1TOTAL	3115	1.20	1.95	0.90 9.0
##				SOUTH	1		S1TOTAL		1.45	2.00	1.75 12.2
##	9			SOUTH	1	MESO	S1MESO	941	1.87	2.15	1.82 13.0
##				SOUTH	1	MESO	S1MESO	942	2.38	5.55	4.82 35.0
	11			SOUTH	1	MESO	S1MESO	943	2.58	4.90	4.24 24.0
	12			SOUTH	1	MESO	S1MESO	944	2.65	3.75	3.10 27.0
	13			SOUTH	1	MESO	S1MESO	946	2.35	2.34	2.05 20.0
	14			SOUTH	1	MESO	S1MESO	947	1.88	2.10	1.85 28.0
	15			SOUTH	1	MESO	S1MESO		2.32	3.05	2.63 30.0
##	16			SOUTH	1	MESO	S1MESO		2.39	2.21	2.10 13.0
##	17			SOUTH	1	MESO	S1MESO	3118	2.20	1.80	1.50 10.0
##	18			SOUTH	1	MESO	S1MESO		1.05	0.90	0.55 8.0
##	19			SOUTH	1	MESO	S1MESO		2.00	1.25	1.20 10.0
##	20			SOUTH	1	MESO	S1MESO		1.28	1.14	1.00 10.0
	21			SOUTH	2	OPEN	S20PEN	341	NA	NA	NA NA
##				SOUTH	2		S2TOTAL		1.40	2.50	2.15 18.0
##				SOUTH	2		S2TOTAL	101	1.90	3.31	2.65 15.0
##				SOUTH	2		S2TOTAL	102	1.75	2.70	2.55 16.0
##	25			SOUTH	2	_	S2TOTAL	103	1.80	2.75	2.30 16.0
##	26			SOUTH	2		S2TOTAL	104	2.70	4.05	4.00 35.2
##				SOUTH	2		S2TOTAL	105	2.02	2.85	1.49 17.0
##	28	1	2012	SOUTH	2		S2TOTAL	108	1.90	3.10	2.85 19.0
##	29			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	1.40	2.35	1.45 14.0
##	32			SOUTH	2	TOTAL	S2TOTAL	113	2.50	3.25	2.30 22.0
##	33			SOUTH	2		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	1.80	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	1.50	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	1.60	1.60	1.30 13.0
##	51	1	2012	SOUTH	2	TOTAL	S2TOTAL	1235	1.20	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	1.50	1.50	1.50 14.0
##	54			SOUTH	2		S2T0TAL		1.65	1.65	2.00 20.0
##	55			SOUTH	2		S2T0TAL		1.13	1.13	1.20 10.0
##	56			SOUTH	2	TOTAL	S2T0TAL	1240	1.25	1.25	0.90 10.0
##	57	1	2012	SOUTH	2	TOTAL	S2T0TAL	1251	1.10	1.20	1.10 10.0
##	58	1	2012	SOUTH	2	TOTAL	S2T0TAL	1252		2.70	2.40 25.0
##	59			SOUTH	2		S2T0TAL			1.65	1.25 10.0
##	60	1	2012	SOUTH	2	TOTAL	S2T0TAL	1254	1.60	2.45	2.10 13.0

##	61	1	2012	SOUTH	2	TOTAL.	S2T0TAL	1255	1.55	2.40	1.80 13.0
##				SOUTH	2		S2TOTAL		1.50	2.40	2.15 13.0
##				SOUTH	2		S2TOTAL		1.03	1.20	1.00 10.0
##				SOUTH	2		S2TOTAL		2.14	1.90	1.70 13.0
##				SOUTH	2		S2TOTAL		1.20	1.90	1.65 12.0
##				SOUTH	2		S2TOTAL		1.05	1.10	1.00 9.0
##				SOUTH	2		S2TOTAL		1.80	2.60	2.40 15.0
##				SOUTH	2		S2TOTAL		1.20	1.00	0.95 7.0
##				SOUTH	2		S2TOTAL		1.75	1.40	1.10 10.0
##				SOUTH	2		S2TOTAL		1.45	3.10	1.80 10.0
##				SOUTH	2		S2TOTAL		1.17	1.20	1.10 5.0
##				SOUTH	2	_	S2TOTAL		2.15	3.10	2.58 22.0
##				SOUTH	2		S2TOTAL		1.70	1.70	1.40 12.0
##				SOUTH	2		S2TOTAL		1.98	2.85	2.70 12.0
##				SOUTH	2		S2TOTAL		1.26	1.95	1.75 17.0
##				SOUTH	2		S2TOTAL		1.11	1.95	1.50 10.0
##				SOUTH	2		S2TOTAL		1.11	1.32	1.05 10.0
##				SOUTH	2		S2TOTAL		1.14	1.60	1.40 10.0
##				SOUTH	2		S2TOTAL		1.30	1.40	0.80 10.0
##				SOUTH			S2TOTAL				
##				SOUTH	2 2		S2TOTAL		1.29	1.44	1.35 13.0 1.15 7.0
##				SOUTH	2		S2TOTAL		1.31	1.35 1.70	1.15 7.0 1.28 10.0
									1.15		
##				SOUTH	2		S2TOTAL		1.87	3.40	1.85 15.0 1.61 8.0
##				SOUTH	2		S2TOTAL		1.47	2.10	
##				SOUTH	2		S2TOTAL		1.05	1.79	1.50 10.0
##				SOUTH	2		S2TOTAL		2.10	4.90	3.75 25.0
##				SOUTH	2		S2TOTAL		1.99	1.80	1.35 13.0
##				SOUTH	2		S2TOTAL		1.42	1.90	1.80 14.0
##				SOUTH	2		S2TOTAL		1.50	2.11	1.75 12.0
##				SOUTH	2		S2TOTAL		1.06	1.05	0.85 4.0
##				SOUTH	2		S2TOTAL		1.49	1.50	1.15 13.0
##				SOUTH	2		S2TOTAL		1.80	1.60	1.50 14.0
##				SOUTH	2	_	S2TOTAL		1.93	1.74	1.20 14.0
##				SOUTH	2		S2TOTAL		1.20	1.60	1.30 10.0
##				SOUTH	2		S2TOTAL		1.65	1.25	1.10 11.0
	96			SOUTH	2		S2TOTAL		1.52	1.49	1.10 12.0
##				SOUTH	2		S2TOTAL		1.43	2.05	1.54 13.0
##				SOUTH	2		S2TOTAL		1.25	1.40	1.25 13.0
##				SOUTH	2		S2TOTAL		1.88	2.65	2.64 20.0
	100			SOUTH	2		S2TOTAL		1.03	1.40	0.60 13.0
	101			SOUTH	2		S2TOTAL		1.10	1.30	1.20 10.0
	102			SOUTH	2		S2TOTAL		1.40	1.05	1.00 10.0
	103			SOUTH	2		S2TOTAL		1.05	1.55	0.90 10.0
	104			SOUTH	2		S2TOTAL		1.18	1.20	1.00 7.0
	105			SOUTH	2		S2TOTAL		1.40	1.30	1.85 13.0
	106			SOUTH	2		S2T0TAL		1.37	2.67	2.19 19.0
	107			SOUTH	2		S2TOTAL		1.32	2.15	1.55 11.0
	108			SOUTH	2	MEGA			1.55	2.20	1.20 20.0
	109			SOUTH	2	MEGA			1.30	1.80	0.90 8.0
	110			SOUTH	2	MEGA	S2MEGA		1.24	1.20	1.20 25.0
	111			SOUTH	2	MEGA	S2MEGA		1.50	2.10	1.75 16.0
	112			SOUTH	2	MEGA	S2MEGA		1.65	2.50	2.20 15.0
	113			SOUTH	2	MEGA	S2MEGA		2.17	2.00	1.20 15.0
##	114	1	2012	SOUTH	2	MEGA	S2MEGA	188	1.28	1.60	1.50 10.0

```
1 2012 SOUTH
## 115
                              2
                                     MEGA
                                            S2MEGA
                                                    189
                                                           1.07 1.50 1.50 10.0
## 116
            1 2012 SOUTH
                              2
                                     MEGA
                                            S2MEGA
                                                    190
                                                                1.00
                                                                       0.80 8.0
                                                          0.67
            1 2012 SOUTH
                                                                0.70
                                                                       0.60
## 117
                              2
                                     MEGA
                                            S2MEGA
                                                    191
                                                           0.68
                                                                             4.0
            1 2012 SOUTH
## 118
                              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
            1 2012 SOUTH
                              2
                                     MESO.
                                            S2MES0
## 121
                                                    462
                                                           1.75
                                                                3.30
                                                                       2.50 23.0
            1 2012 SOUTH
                              2
## 122
                                     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
                                           S30PEN 1301
                                                            NA
                                                                   NA
                                                                         NA
                                                                              NA
## 125
            1 2012 SOUTH
                              3
                                     OPEN S30PEN 1302
                                                           0.90
                                                                1.30
                                                                       1.10 11.0
## 126
            1 2012 SOUTH
                                    TOTAL S3TOTAL 1061
                                                                   NA
                              3
                                                            NA
                                                                         NA
                                                                              NA
## 127
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 1062
                                                          1.80
                                                                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
                                                           1.70
                                                                2.50
                                                                       2.15 15.0
## 131
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 1066
                                                           1.90
                                                                1.80
                                                                       1.50 20.0
## 132
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 1067
                                                           1.95
                                                                2.10
                                                                       1.90 13.0
                                                                1.70
## 133
            1 2012 SOUTH
                                    TOTAL S3TOTAL 1068
                                                                       1.40 13.0
                              3
                                                           1.80
## 134
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 1069
                                                           1.40
                                                                2.00
                                                                       1.60 14.0
            1 2012 SOUTH
                                                          1.00
## 135
                              3
                                    TOTAL S3TOTAL 1070
                                                                1.30
                                                                       1.20 7.0
## 136
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2139
                                                          1.75
                                                                1.20
                                                                       1.10 13.0
            1 2012 SOUTH
## 137
                                    TOTAL S3TOTAL 2140
                                                           1.28 1.50
                                                                       0.95 4.0
                              3
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2151
                                                          1.00
                                                                1.40
                                                                       1.20 4.0
## 138
                              3
                                    TOTAL S3TOTAL 2152
                                                           1.45 1.50
                                                                       1.30 10.0
## 139
            1 2012 SOUTH
## 140
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2153
                                                           1.00 1.00
                                                                       0.75 8.0
## 141
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2154
                                                           1.03
                                                                1.00
                                                                       0.90 6.0
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2155
## 142
                                                          1.51
                                                                2.00
                                                                       1.80 12.0
## 143
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2156
                                                                1.10
                                                                       0.90 10.0
                                                          1.17
## 144
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2157
                                                           1.33 1.90
                                                                       1.85 14.0
## 145
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2158
                                                           1.30
                                                                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
                                    TOTAL S3TOTAL 2171
                                                                       1.00
                              3
                                                           1.06
                                                                1.40
                                                                             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
                                                           1.40
                                                                1.20
                                                                       1.00 9.0
            1 2012 SOUTH
                              3
                                    TOTAL S3TOTAL 2178
## 155
                                                           1.45
                                                                2.10
                                                                       2.05 15.0
            1 2012 SOUTH
                              3
                                     MESO S3MESO 1421
                                                           1.95 2.20
                                                                       1.60 13.0
## 156
## 157
            1 2012 SOUTH
                              3
                                     MESO S3MESO 1422
                                                            NA
                                                                   NA
                                                                         NA
                                                                              NA
##
       FLOWERS BUDS FRUITS
                              ANT
## 1
             0
                  0
                         10
                               CS
## 2
             0
                  0
                        150
                               TP
## 3
             2
                  1
                         50
                               TP
## 4
                         75
             0
                  0
                               CS
## 5
             0
                  0
                         20
                               CS
## 6
             0
                   0
                          0
                                Ε
## 7
                  0
                          0
                               CS
             0
## 8
             0
                  0
                         25
                               CS
## 9
             0
                  0
                          0
                               TP
## 10
             0
                  0
                         50
                               TP
```

	.1	0	0	5	CS
	.2	0	0	60	TP
	.3	0	0	60	TP
	.4	2	0	60	CS
	.5	2	0	0	CS
	.6	0	0	0	TP
	.7	0	0	0	TP
	.8 .9	0	0	0	CS CM
	.9 20	0	0	0	TP
	21	NA	NA	NA	11
	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	Ö	200	CM
	30	0	0	10	CS
	31	0	0	0	CS
## 3	32	0	0	35	TP
## 3	33	0	0	300	CM
## 3	34	2	2	100	CS
## 3	35	0	0	30	CM
## 3	36	0	0	50	TP
## 3	37	0	0	10	CM
## 3	38	0	0	25	CS
## 3	39	0	0	15	TP
## 4	-0	0	0	0	TP
## 4	1	0	0	15	TP
## 4	2	0	0	0	TP
## 4	13	0	0	40	TP
## 4	4	0	0	0	TP
## 4	<u>.</u> 5	0	0	15	CM
## 4	-6	0	0	0	CM
	-7	0	0	0	TP
	18	0	0	0	TP
	<u> 1</u> 9	0	0	1	TP
	50	0	0	20	TP
	51	0	0	0	TP
	52	0	0	0	TP
	3	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 . o	0	0	5	TP
	59	0	0	0	TP
	30 31	0	0	25	TP
	51 :2	0	0	25	TP
	32	0	0	20	TP
	33 24	0	0	0	TP
## 6	34	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		AB_TP
## 75 ## 76	0	0	0	TP
## 76 ## 77	0 0	0	0 0	TP
## 77 ## 78	0	0	0	TP CS
## 79	0	0	0	CS
## 79	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 ## 103	0	0	0	CS
## 103 ## 104	0 0	0 0	0 0	CM TP
## 104	0	0	30	CS
## 105	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
                                ΤP
              0
                   0
                          75
## 121
                          20
              0
                   0
                                CM
## 122
              0
                   0
                           0
                                ΤP
## 123
              0
                   0
                           0
                                 Ε
## 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
                           2
                                ΤP
              0
## 131
              0
                   0
                          25
                                TP
## 132
              0
                   0
                           0
                                TP
## 133
              0
                   0
                           0
                                TP
## 134
              0
                   0
                           0
                                ΤP
## 135
              0
                   0
                           0
                                TP
## 136
                   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
                                ΤP
                           0
                                TP
## 147
              0
                   0
## 148
              0
                   0
                           8
                                TP
## 149
              0
                   0
                           0
                                TP
## 150
              0
                   0
                           0
                                TP
## 151
              0
                   0
                           0
                                TP
                           0
                                TP
## 152
              0
                   0
## 153
                           0
                                TP
              0
                   0
## 154
                           0
                                TP
              0
                   0
## 155
              0
                   0
                          20
                                TP
## 156
              0
                   0
                           2
                                CS
## 157
             NA
                  NA
                          NA
```

is.numeric(acacia\$HEIGHT)

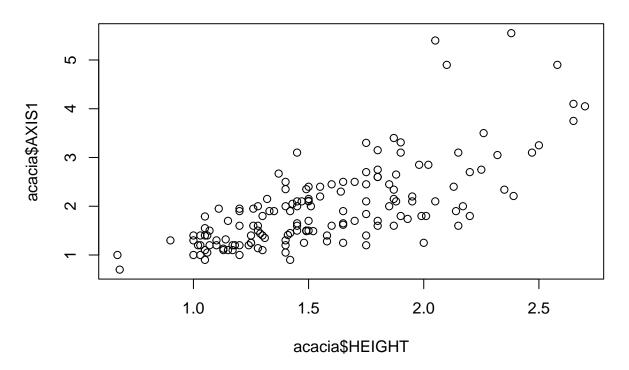
[1] TRUE

5. Plotting data with ggplot2

Regular way to plot in R

```
plot(x = acacia$HEIGHT, y = acacia$AXIS1, main = "Acacia height vs axis1")
```

Acacia height vs axis1



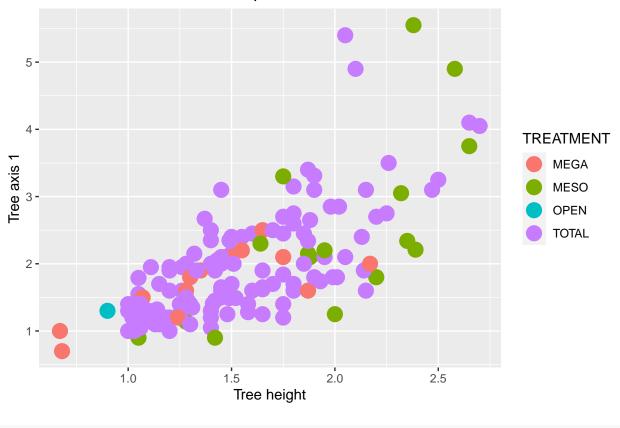
With ggplot, we create layers

```
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", title = "Acacia trees size relationships")
```

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

Acacia trees size relationships



colors()

##	[1]	"white"	"aliceblue"	"antiquewhite"
##	[4]	"antiquewhite1"	"antiquewhite2"	"antiquewhite3"
##	[7]	"antiquewhite4"	"aquamarine"	"aquamarine1"
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##	[22]	"bisque3"	"bisque4"	"black"
##	[25]	"blanchedalmond"	"blue"	"blue1"
##	[28]	"blue2"	"blue3"	"blue4"
##	[31]	"blueviolet"	"brown"	"brown1"
##	[34]	"brown2"	"brown3"	"brown4"
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##	[43]	"cadetblue1"	"cadetblue2"	"cadetblue3"
##	[46]	"cadetblue4"	"chartreuse"	"chartreuse1"
##	[49]	"chartreuse2"	"chartreuse3"	"chartreuse4"
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                                                             "lemonchiffon2"
```

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                                  "lightcoral"
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                                                           "lightcyan3"
##
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                                                           "lightgoldenrod1"
## [412] "lightgoldenrod2"
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## [427] "lightsalmon3"
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## [448] "limegreen"
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                                                           "magenta3"
## [454] "magenta4"
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## [457] "maroon2"
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## [463] "mediumorchid1"
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## [466] "mediumorchid4"
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                                                           "mediumpurple4"
## [472] "mediumseagreen"
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                                                           "mediumspringgreen"
## [475]
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                                  "mediumvioletred"
                                                           "midnightblue"
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## [481] "mistyrose2"
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                                                           "mistyrose4"
## [484] "moccasin"
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```

```
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##
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## [655] "yellow3"
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```

experimental treatment and goal

The goal experimental treatment is to find which treatment is the best and growing the largest trees.

different variables that were measured

the different variables that were measured were mega, meso, open, and the total.

what is the influnce of experimental treatment?

The influence of the experimental treatment is the meso treatment

what happened to the acacias in the open plot?

The open treatment didn't show much growth comprared to other treatment groups as meso, and mega had trees of larger height