Methods in evolutionary ecology WS25/26

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About

This script covers the computational and bioinformatics parts of the module "Methods in Evolutionary Ecology". We will introduce you to `R` and `BASH`, two of the most widely used scripting languages, and make you familiar with navigating in a UNIX environment. These skills are important for any biologist, irrespective of the field you may want to specialise in in the future. Building upon your new knowledge, we will learn how to reconstruct phylogenies from sequencing data, how to work with genomic data, and how to characterise microbiomes. At the end of three weeks computational work, you will tackle a small computational group project, putting your new skills into practise.

The script is designed to cover the entire course content. While we will go you through all of the material together in detail during the course, the script should also enable you to work through the content on your own, e.g., to recap after the course has finished and as a reference and starting point for future computational endeavours.

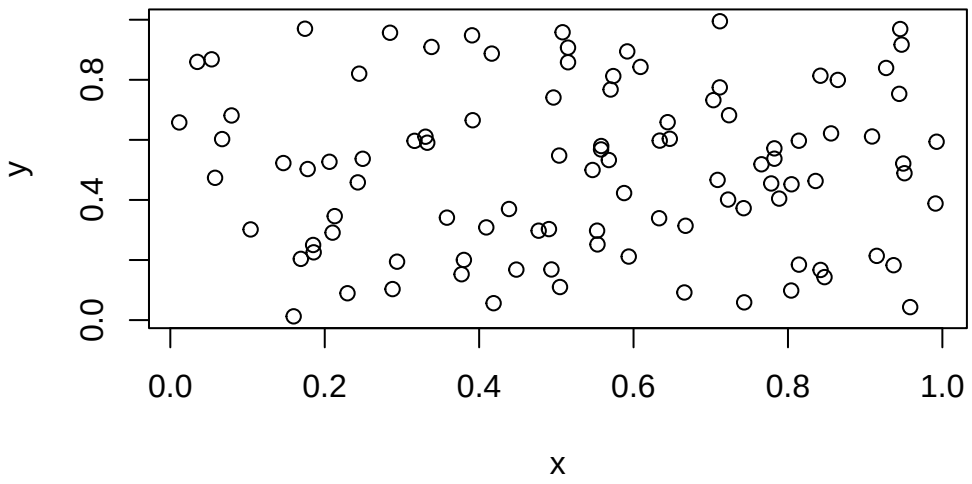
Quarto

The text is formatted using Quarto, which comes with a number of benefits. It allows us to provide explanations as structured and nicely formatted regular text, and to include code blocks for all computational steps. When compiling Quarto documents, all of the code is run, which means that you not only see the code, but also the outputs it creates.

Here is an example:

This little block of `R` code generates 100 random coordinates and plots them. The code is shown below, together with the output the code has produced (in this case, a plot).

```
x <- runif(100)
y <- runif(100)
plot(x, y)
```



The code can conveniently be copied from the block into your own scripts.

Quarto supports many formats, we here provide the script as a webpage and a printable pdf. Writing Quarto documents is very simple and can be done using RStudio as an editor. The entire script is available for you on github – feel free to download it and modify it with your own comments, notes, and code. We will provide a short introduction to github and Quarto in the course.

How to find your way around

Simply use the navigation on the left to quickly access the different topics, or flip through the individual pages using the buttons at the bottom of the page. You may wish to download the pdf version of the script (click the pdf icon in the top left) which is ideal for printing. The script is organized by topics, rather than course days, because we will adapt the tempo according to your needs.

> Please note: The script will very likely only be complete at the end of the course. We will still be modifying and correcting it throughtout the three weeks you are with us. So make sure to check out the final version at the end of the course.

Part I

R

1 First steps

R is a statistical programming environment that has become a standard tool in the data and life sciences and many other fields. You may have used R already to run some statistics in a course you took in your studies, and this will be a likely use case for your remaining degree. However, R is much more: it can be used to analyse massive the datasets of the "omics"- age, build webpages, blogs, and interactive apps, and even for art!

Before taking full advantage of what the various R packages have to offer, we need to become familiar with its basic structure and commands. It pays off to invest a little effort in practicing the basics, because all R packages use the same syntax – a solid familiarity with base R thus allows you to explore the entire R universe independently.

1.1 Operators and functions

R can be used just like an arithmetic calculator. You are familiar with all of the basic syntax already, if you know how to use a calculator!

Some examples:

```
3 + 4
```

```
[1] 7
```

```
3 - 4
```

```
[1] -1
```

```
3 * 4
```

```
[1] 12
```

```
3 / 4
```

```
[1] 0.75
```

```
3 ^ 4  # power of
```

```
[1] 81
```

As with a regular calculator, there is operator precedence: power > multiplicative operations > additive operations:

```
(1 + 2) * 3
```

```
[1] 9
```

```
2^3 * 3
```

```
[1] 24
```

```
2^(3 * 3)
```

```
[1] 512
```

Square roots, exponentials, and logarithms also work just as with a calculator:

```
sqrt(9)
```

```
[1] 3
```

```
exp(3)
```

```
[1] 20.08554
```

```r
log(3)
```

```
[1] 1.098612
```

```r
log(exp(3)) # natural logarithm
```

```
[1] 3
```

```r
log10(100)  # logarithm to base 10
```

```
[1] 2
```

In order to "save" a value for use later on, you have to assign it to a variable! `<-` is the assignment operator you need to use for this (handy shortcut in RStudio is `ALT` + `-`).

```r
x <- 3 + 4
```

Calling the variable will then print the result to the R console, and can be used in other calculations.

```r
x
```

```
[1] 7
```

```r
x + 10
```

```
[1] 17
```

You can call your variables whatever you want, but be careful: `R` will overwrite any variable if you tell it to, without a warning! You should also avoid giving your variables names that are already assigned to functions.

```r
my_favourite_variable <- 100
my_favourite_variable <- 50
my_favourite_variable
```

```
[1] 50
```

All variables (among other things) are visible in the environment panel in RStudio (default: top right part of the screen).

> "=" can also be used to assign variables but is discouraged, because the direction of the assignment is not immediately obvious. It is best practise to always start with the variable, followed by the assignment operator

1.2 Data types

You need to be familiar with at least three important data types in `R`: `logical`, `numeric`, and `character`. Data being stored in a different data type than required is one of the most frequent error messages you will encounter as an `R` beginner.

`logical` simply means true or false. `R` also understands the abbreviations T and F. To determine which types you data is in, you can use `mode` or `class`.

```
var1 <- TRUE
mode(var1)
```

```
[1] "logical"
```

`numeric` means numbers

```
var2 <- 10
class(10)
```

```
[1] "numeric"
```

A character is any form of text, a so called "string". It must always be surrounded by quotation marks!

```
var3 <- "A so called string"
mode(var3)
```

```
[1] "character"
```

If in doubt, R will often convert or read in data as characters. Watch out for some common errors!

```
var4 <- "5"
var4
```

```
[1] "5"
```

```
is.numeric(var4)
```

```
[1] FALSE
```

```
var5 <- "TRUE"
var5
```

```
[1] "TRUE"
```

```
is.logical(var5)
```

```
[1] FALSE
```

You can convert between types easily!

```
var6 <- as.numeric(var4)
var6
```

```
[1] 5
```

```
class(var6)
```

```
[1] "numeric"
```

1.3 Exercises

a) Sum the values of 1 to 5

b) Create a variable v1 and assign it a character value

c) Copy variable v1 to v2

d) Compare the value of v1 against v2

> **Tip**
>
> Compare values and variables using the following operators
>
> | | |
> |---|---|
> | `<` | less than |
> | `<=` | less than or equal to |
> | `>` | greater than |
> | `>=` | greater than or equal to |
> | `==` | equals |
> | `!=` | not equal |
>
> Please note, `=` and `==` do very different things! Don't mix them up.

2 Data structures

So far we've only looked at simple variables consisting of a single value or character. Typically, your data will be more complex. In `R`, there are three structures relevant for the data you will be working with.

2.1 Vectors

A **vector** is a number of elements of the same data type (`logical`, `numeric`, `character`). It can be generated by concatenating the elements using the function `c`.

```
vec1 <- c(T, F, T, F)
vec1
```

```
[1]  TRUE FALSE  TRUE FALSE
```

```
mode(vec1)
```

```
[1] "logical"
```

```
vec2 <- c(1, 2, 3, 4, 5)
vec2
```

```
[1] 1 2 3 4 5
```

```
mode(vec2)
```

```
[1] "numeric"
```

```
vec3 <- c("Spring", "Summer", "Autumn", "Winter")
vec3
```

```
[1] "Spring" "Summer" "Autumn" "Winter"
```

```
mode(vec3)
```

```
[1] "character"
```

Other ways to generate vectors are **rep** and **seq**. **rep** is used to repeat any number of elements any number of times.

```
rep(5, 10)
```

```
 [1] 5 5 5 5 5 5 5 5 5 5
```

```
rep(vec3, 5)
```

```
 [1] "Spring" "Summer" "Autumn" "Winter" "Spring" "Summer" "Autumn" "Winter"
 [9] "Spring" "Summer" "Autumn" "Winter" "Spring" "Summer" "Autumn" "Winter"
[17] "Spring" "Summer" "Autumn" "Winter"
```

seq can be used to create numerical sequences.

```
seq(from = 0, to = 100, by = 5)
```

```
 [1]   0   5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
[20]  95 100
```

The command above is easy to read and understand for humans, which is good. R will also understand if you specify it as

```
seq(0, 100, 5)
```

```
 [1]   0   5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90
[20]  95 100
```

As a shortcut for a common sequences, you can use

```r
1:10
```

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

As mentioned above,, vectors can only combine elements of a single data type. Combining multiple different data types may result in some unwanted behaviour.

```r
vec_mix1 <- c(5, TRUE, 65)
mode(vec_mix1)
```

```
[1] "numeric"
```

```r
vec_mix2 <- c("blue", TRUE, "red")
mode(vec_mix2)
```

```
[1] "character"
```

In many cases you may wish to access a single element of a vector. You can do so using square brackets.

```r
z <- c("order", "family", "genus", "species")
z[2]
```

```
[1] "family"
```

Similarly, you can access any combination of elements from the vector.

```r
z[1:2]
```

```
[1] "order"  "family"
```

```r
i <- c(1, 3)
z[i]
```

```
[1] "order" "genus"
```

```
z[c(1, 1, 1, 4)]
```

```
[1] "order"   "order"   "order"   "species"
```

```
z[-1]
```

```
[1] "family"  "genus"   "species"
```

The square brackets are also used if you need to change elements of the vector. Changes are made using the assignment operator which you already know.

```
x <- 1:5
x
```

```
[1] 1 2 3 4 5
```

```
x[c(1, 4)] <- 10
x
```

```
[1] 10  2  3 10  5
```

Which elements of a vector have certain characteristics? This is important for filtering/selecting in your dataset. You can combine different queries using logical operators.

```
x >= 5
```

```
[1]  TRUE FALSE FALSE  TRUE  TRUE
```

```
x[x >= 5]
```

```
[1] 10 10  5
```

```
which(x >= 5)
```

```
[1] 1 4 5
```

```
z
```

```
[1] "order"   "family"  "genus"   "species"
```

```
which(z == "genus")
```

```
[1] 3
```

```
z[z== "genus"]
```

```
[1] "genus"
```

```
z[z != "genus"]
```

```
[1] "order"   "family"  "species"
```

```
which(z== "genus" | z == "order")
```

```
[1] 1 3
```

Logical operators in R

|	OR
&	AND
!	NOT

Conveniently, the elements of a vector can be named and accessed using the names. Let's first create a vector...

```
dmel <- c("Hexapoda", "Diptera", "Drosophilidae", "Drosophila", "Drosophila
 ↪  melanogaster")
dmel
```

```
[1] "Hexapoda"                "Diptera"
[3] "Drosophilidae"           "Drosophila"
[5] "Drosophila melanogaster"
```

… and then add names for each element

```
names(dmel) <- c("Class", "Order", "Family", "Genus", "Species")
dmel
```

```
                Class                 Order                Family
          "Hexapoda"              "Diptera"       "Drosophilidae"
                Genus               Species
       "Drosophila" "Drosophila melanogaster"
```

```
str(dmel)
```

```
 Named chr [1:5] "Hexapoda" "Diptera" "Drosophilidae" "Drosophila" ...
 - attr(*, "names")= chr [1:5] "Class" "Order" "Family" "Genus" ...
```

Now we can use the names to access the values

```
dmel[c("Class", "Species")]
```

```
                Class               Species
          "Hexapoda" "Drosophila melanogaster"
```

```
dmel[names(dmel) == "Order"]
```

```
    Order
"Diptera"
```

2.1.1 Exercises

a) Create a vector consecutively numbering all days of the year 2026. Assign the correct weekday names for all elements of the vector.

b) Use the vector to determine how many days in 2026 are weekend days.

> **Tip**
>
> If you struggle to assign the correct names, have a look at the help for `rep`.

2.2 Matrices

A **matrix** in `R` can be thought of as a two-dimensional vector. All elements must be of the same data type. There are various ways to create a matrix. For example, one can use the `matrix` function like this.

```
mat1 <- matrix(data = 1:12, nrow = 3, ncol = 4, byrow=T)
mat1
```

```
     [,1] [,2] [,3] [,4]
[1,]    1    2    3    4
[2,]    5    6    7    8
[3,]    9   10   11   12
```

Alternatively, a vector can be transformed into a matrix

```
mat2 <- 1:12
dim(mat2) <- c(3, 4)
mat2
```

```
     [,1] [,2] [,3] [,4]
[1,]    1    4    7   10
[2,]    2    5    8   11
[3,]    3    6    9   12
```

Often you will want to combine multiple vectors into a matrix

```
dmel <- c("Hexapoda", "Diptera", "Drosophilidae", "Drosophila", "Drosophila
 ↪  melanogaster")
dhyd <- c("Hexapoda", "Diptera", "Drosophilidae", "Drosophila", "Drosophila
 ↪  hydei")
mat3 <- cbind(dmel, dhyd)
mat3
```

```
     dmel                      dhyd
[1,] "Hexapoda"                "Hexapoda"
[2,] "Diptera"                 "Diptera"
[3,] "Drosophilidae"           "Drosophilidae"
[4,] "Drosophila"              "Drosophila"
[5,] "Drosophila melanogaster" "Drosophila hydei"
```

```
mat4 <- rbind(dmel, dhyd)
mat4
```

```
     [,1]       [,2]      [,3]            [,4]
dmel "Hexapoda" "Diptera" "Drosophilidae" "Drosophila"
dhyd "Hexapoda" "Diptera" "Drosophilidae" "Drosophila"
     [,5]
dmel "Drosophila melanogaster"
dhyd "Drosophila hydei"
```

Just like vectors, matrix elements can have names

```
mat3
```

```
     dmel                      dhyd
[1,] "Hexapoda"                "Hexapoda"
[2,] "Diptera"                 "Diptera"
[3,] "Drosophilidae"           "Drosophilidae"
[4,] "Drosophila"              "Drosophila"
[5,] "Drosophila melanogaster" "Drosophila hydei"
```

```
colnames(mat3)
```

```
[1] "dmel" "dhyd"
```

```
rownames(mat3) <- c("Class", "Order", "Family", "Genus", "Species")
mat3
```

```
        dmel                      dhyd
Class   "Hexapoda"                "Hexapoda"
Order   "Diptera"                 "Diptera"
Family  "Drosophilidae"           "Drosophilidae"
Genus   "Drosophila"              "Drosophila"
Species "Drosophila melanogaster" "Drosophila hydei"
```

And just like with vectors, we can use square brackets to access and replace values. Because there are 2 dimensions, we need to provide 2 values (one for rows, one for columns, separated by `,`).

```
mat3
```

```
        dmel                        dhyd
Class   "Hexapoda"                  "Hexapoda"
Order   "Diptera"                   "Diptera"
Family  "Drosophilidae"             "Drosophilidae"
Genus   "Drosophila"                "Drosophila"
Species "Drosophila melanogaster" "Drosophila hydei"
```

```
mat3[1:3, 2]
```

```
          Class           Order          Family
     "Hexapoda"       "Diptera" "Drosophilidae"
```

```
mat3[1:3, ]
```

```
       dmel             dhyd
Class  "Hexapoda"      "Hexapoda"
Order  "Diptera"       "Diptera"
Family "Drosophilidae" "Drosophilidae"
```

```
mat3[c("Class", "Species"), ]
```

```
        dmel                        dhyd
Class   "Hexapoda"                  "Hexapoda"
Species "Drosophila melanogaster" "Drosophila hydei"
```

2.2.1 Exercise

a) create a matrix using with 20 rows & 5 columns, using 100 randomly generated numbers between 0 and 1000.

b) replace all values in the 3rd column of this matrix that are larger than 500 with `NA`.

> Tip
>
> use the function `runif` to create random values

2.3 Data frames

Data frames are the R equivalent of spread sheets. Like matrices, they are two-dimensional, however they may combine different data types. Most biological data sets you will encounter will be data frames.

Lets create a data frame

```
# create some data
species <- rep(c("beech","ash","elm","maple", "sycamore"),40)
species
```

```
  [1] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
  [7] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
 [13] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
 [19] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
 [25] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
 [31] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
 [37] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
 [43] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
 [49] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
 [55] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
 [61] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
 [67] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
 [73] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
 [79] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
 [85] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
 [91] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
 [97] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
[103] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
[109] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
[115] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
[121] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
[127] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
[133] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
[139] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
[145] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
[151] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
[157] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
[163] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
[169] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
[175] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
```

```
[181] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
[187] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
[193] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
[199] "maple"    "sycamore"
```

```
dbh <- runif(200, 5, 40)
dbh
```

```
  [1] 28.694692 22.403996 14.147917  8.530434 25.308911 19.417004 13.060531
  [8] 31.361943 31.070398 18.291651  9.940469 28.378370 35.878597 19.800579
 [15] 32.835185 28.775105 13.053317 19.698519 12.746081 16.981698 11.973512
 [22]  8.994859  8.727263 17.032190 33.945616 12.956451 32.901660 21.421461
 [29] 36.512168 28.899470 14.214760 22.736426 30.496303 27.839006 30.593111
 [36] 16.964465 25.177703 25.470504 37.522001 19.348926  8.508885  8.170181
 [43] 36.807920 39.584843  9.231431 25.910919 12.829381  5.724437 37.715553
 [50] 12.963041 36.562406 18.765656 34.897690 31.704208 38.591117  9.172318
 [57] 15.857278 12.061524 35.347561 27.380781 31.732204  9.545307 24.296558
 [64] 13.516808 15.530982 23.438800 16.936490 28.248875 37.714223 35.329811
 [71]  9.564596 31.397379 12.940176 19.529461 19.952301 29.938109 13.448629
 [78] 15.794199 14.585325 24.470019 35.888142  8.451499  8.194720 34.335354
 [85] 32.627144 27.271675 32.016845 17.531627 35.686469 36.903325  6.302611
 [92] 23.283390 17.048445 14.361020  6.396036 16.293280 36.492027 10.152519
 [99] 13.019257 14.836469 39.899912  9.162455 16.088645  8.204386 10.874838
[106] 32.718767  7.881157 30.857808 37.820784 16.530527 13.316257 10.515189
[113] 11.864947 34.533093 35.308276 31.818441 28.989119 30.481108 26.081997
[120] 37.054823  6.990241 24.856074 34.316670 10.101455  9.265572 23.928632
[127] 13.470367 16.904735 34.551873 22.239169 33.282751 26.948892  6.669262
[134] 24.769547 19.510209 21.282397 18.523555  6.628899 11.679243 31.717602
[141]  6.563938 13.438979 21.762672 31.668298 30.315645 16.157708 31.541211
[148]  5.185728 19.006955 15.042067 34.342712 29.614640 34.234716 35.443358
[155] 20.882660 36.457258 13.072970 29.807476 38.691823 24.330061 10.939816
[162] 17.701231 33.805668 36.364936 13.392329 13.488280 17.778627 38.180410
[169] 26.236709 19.192572 13.610383 37.249855 30.889654 35.961966 31.808316
[176] 16.274786 29.765368 37.604077 35.404129 26.625355 31.066135 24.321227
[183] 10.221176 39.855117 29.621267 23.968909 21.411667 20.736653  6.228965
[190] 31.076279  8.473592  6.011148 26.406205  8.417777 24.025716 28.211135
[197] 36.614439  8.667756 24.309187  6.729448
```

```
age <- as.integer(runif(200, 20, 120))
age
```

```
  [1] 115 109  92  65  51  34 108  85  87 118  61  53  64 103  43  67  29 115
 [19]  98  48  74  54  51 109  25 109  61  38  20  78  44  43  26  79  81  45
 [37]  56 101  47  35  57  76  60  51  68  97  69  90  94  95  86  61 102  71
 [55]  79  31  36 101 114  21 118  49  37  34  53  66 111  41  93  25  82 116
 [73]  78  50 104  93  38  87  78 106  24  71  82 104  57  58  57  80  55  92
 [91]  48  25 108 100  51  95  41  73  93  54 102  37  69 102  79  86 103  27
[109]  40  33  32  98  26  62  27  97 109  62  88  20  79 115  34 107 109  76
[127] 112  20  21  86 112  53 105  39  79  32  78  40  99  38 107  22 115  51
[145]  99 101  83  67  82  25  97  78  84  63  79  57  67  21  76  62  61  29
[163]  76  25  78 115  61  33  89 114  44  89  86  97  92  22 114 107  43  89
[181]  29 107  49  36  99  50  52  25  91  56  78  36  42  73  63  51 117  55
[199]  35 107
```

```
df1 <- data.frame(species, dbh, age)
df1
```

```
     species       dbh age
1      beech 28.694692 115
2        ash 22.403996 109
3        elm 14.147917  92
4      maple  8.530434  65
5   sycamore 25.308911  51
6      beech 19.417004  34
7        ash 13.060531 108
8        elm 31.361943  85
9      maple 31.070398  87
10  sycamore 18.291651 118
11     beech  9.940469  61
12       ash 28.378370  53
13       elm 35.878597  64
14     maple 19.800579 103
15  sycamore 32.835185  43
16     beech 28.775105  67
17       ash 13.053317  29
18       elm 19.698519 115
19     maple 12.746081  98
20  sycamore 16.981698  48
21     beech 11.973512  74
22       ash  8.994859  54
23       elm  8.727263  51
24     maple 17.032190 109
25  sycamore 33.945616  25
```

```
26     beech 12.956451 109
27       ash 32.901660  61
28       elm 21.421461  38
29     maple 36.512168  20
30  sycamore 28.899470  78
31     beech 14.214760  44
32       ash 22.736426  43
33       elm 30.496303  26
34     maple 27.839006  79
35  sycamore 30.593111  81
36     beech 16.964465  45
37       ash 25.177703  56
38       elm 25.470504 101
39     maple 37.522001  47
40  sycamore 19.348926  35
41     beech  8.508885  57
42       ash  8.170181  76
43       elm 36.807920  60
44     maple 39.584843  51
45  sycamore  9.231431  68
46     beech 25.910919  97
47       ash 12.829381  69
48       elm  5.724437  90
49     maple 37.715553  94
50  sycamore 12.963041  95
51     beech 36.562406  86
52       ash 18.765656  61
53       elm 34.897690 102
54     maple 31.704208  71
55  sycamore 38.591117  79
56     beech  9.172318  31
57       ash 15.857278  36
58       elm 12.061524 101
59     maple 35.347561 114
60  sycamore 27.380781  21
61     beech 31.732204 118
62       ash  9.545307  49
63       elm 24.296558  37
64     maple 13.516808  34
65  sycamore 15.530982  53
66     beech 23.438800  66
67       ash 16.936490 111
68       elm 28.248875  41
```

```
69     maple 37.714223  93
70  sycamore 35.329811  25
71     beech  9.564596  82
72       ash 31.397379 116
73       elm 12.940176  78
74     maple 19.529461  50
75  sycamore 19.952301 104
76     beech 29.938109  93
77       ash 13.448629  38
78       elm 15.794199  87
79     maple 14.585325  78
80  sycamore 24.470019 106
81     beech 35.888142  24
82       ash  8.451499  71
83       elm  8.194720  82
84     maple 34.335354 104
85  sycamore 32.627144  57
86     beech 27.271675  58
87       ash 32.016845  57
88       elm 17.531627  80
89     maple 35.686469  55
90  sycamore 36.903325  92
91     beech  6.302611  48
92       ash 23.283390  25
93       elm 17.048445 108
94     maple 14.361020 100
95  sycamore  6.396036  51
96     beech 16.293280  95
97       ash 36.492027  41
98       elm 10.152519  73
99     maple 13.019257  93
100 sycamore 14.836469  54
101    beech 39.899912 102
102      ash  9.162455  37
103      elm 16.088645  69
104    maple  8.204386 102
105 sycamore 10.874838  79
106    beech 32.718767  86
107      ash  7.881157 103
108      elm 30.857808  27
109    maple 37.820784  40
110 sycamore 16.530527  33
111    beech 13.316257  32
```

```
112      ash 10.515189  98
113      elm 11.864947  26
114    maple 34.533093  62
115 sycamore 35.308276  27
116    beech 31.818441  97
117      ash 28.989119 109
118      elm 30.481108  62
119    maple 26.081997  88
120 sycamore 37.054823  20
121    beech  6.990241  79
122      ash 24.856074 115
123      elm 34.316670  34
124    maple 10.101455 107
125 sycamore  9.265572 109
126    beech 23.928632  76
127      ash 13.470367 112
128      elm 16.904735  20
129    maple 34.551873  21
130 sycamore 22.239169  86
131    beech 33.282751 112
132      ash 26.948892  53
133      elm  6.669262 105
134    maple 24.769547  39
135 sycamore 19.510209  79
136    beech 21.282397  32
137      ash 18.523555  78
138      elm  6.628899  40
139    maple 11.679243  99
140 sycamore 31.717602  38
141    beech  6.563938 107
142      ash 13.438979  22
143      elm 21.762672 115
144    maple 31.668298  51
145 sycamore 30.315645  99
146    beech 16.157708 101
147      ash 31.541211  83
148      elm  5.185728  67
149    maple 19.006955  82
150 sycamore 15.042067  25
151    beech 34.342712  97
152      ash 29.614640  78
153      elm 34.234716  84
154    maple 35.443358  63
```

```
155 sycamore 20.882660  79
156    beech 36.457258  57
157      ash 13.072970  67
158      elm 29.807476  21
159    maple 38.691823  76
160 sycamore 24.330061  62
161    beech 10.939816  61
162      ash 17.701231  29
163      elm 33.805668  76
164    maple 36.364936  25
165 sycamore 13.392329  78
166    beech 13.488280 115
167      ash 17.778627  61
168      elm 38.180410  33
169    maple 26.236709  89
170 sycamore 19.192572 114
171    beech 13.610383  44
172      ash 37.249855  89
173      elm 30.889654  86
174    maple 35.961966  97
175 sycamore 31.808316  92
176    beech 16.274786  22
177      ash 29.765368 114
178      elm 37.604077 107
179    maple 35.404129  43
180 sycamore 26.625355  89
181    beech 31.066135  29
182      ash 24.321227 107
183      elm 10.221176  49
184    maple 39.855117  36
185 sycamore 29.621267  99
186    beech 23.968909  50
187      ash 21.411667  52
188      elm 20.736653  25
189    maple  6.228965  91
190 sycamore 31.076279  56
191    beech  8.473592  78
192      ash  6.011148  36
193      elm 26.406205  42
194    maple  8.417777  73
195 sycamore 24.025716  63
196    beech 28.211135  51
197      ash 36.614439 117
```

```
198      elm  8.667756  55
199    maple 24.309187  35
200 sycamore  6.729448 107
```

To access values, we can use the same approaches as for matrices:

```
df1[1:12, 1:2]
```

```
    species       dbh
1     beech 28.694692
2       ash 22.403996
3       elm 14.147917
4     maple  8.530434
5  sycamore 25.308911
6     beech 19.417004
7       ash 13.060531
8       elm 31.361943
9     maple 31.070398
10 sycamore 18.291651
11    beech  9.940469
12      ash 28.378370
```

but can also access and filter the columns directly using their names like this:

```
df1$species
```

```
  [1] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
  [7] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
 [13] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
 [19] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
 [25] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
 [31] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
 [37] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
 [43] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
 [49] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
 [55] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
 [61] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
 [67] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
 [73] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
 [79] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
```

```
 [85] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
 [91] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
 [97] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
[103] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
[109] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
[115] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
[121] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
[127] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
[133] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
[139] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
[145] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
[151] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
[157] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
[163] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
[169] "maple"    "sycamore" "beech"    "ash"      "elm"      "maple"
[175] "sycamore" "beech"    "ash"      "elm"      "maple"    "sycamore"
[181] "beech"    "ash"      "elm"      "maple"    "sycamore" "beech"
[187] "ash"      "elm"      "maple"    "sycamore" "beech"    "ash"
[193] "elm"      "maple"    "sycamore" "beech"    "ash"      "elm"
[199] "maple"    "sycamore"
```

```
df1[df1$dbh > 15, ]
```

```
     species      dbh age
1      beech 28.69469 115
2        ash 22.40400 109
5   sycamore 25.30891  51
6      beech 19.41700  34
8        elm 31.36194  85
9      maple 31.07040  87
10  sycamore 18.29165 118
12       ash 28.37837  53
13       elm 35.87860  64
14     maple 19.80058 103
15  sycamore 32.83519  43
16     beech 28.77511  67
18       elm 19.69852 115
20  sycamore 16.98170  48
24     maple 17.03219 109
25  sycamore 33.94562  25
27       ash 32.90166  61
28       elm 21.42146  38
```

```
29     maple 36.51217  20
30  sycamore 28.89947  78
32       ash 22.73643  43
33       elm 30.49630  26
34     maple 27.83901  79
35  sycamore 30.59311  81
36     beech 16.96446  45
37       ash 25.17770  56
38       elm 25.47050 101
39     maple 37.52200  47
40  sycamore 19.34893  35
43       elm 36.80792  60
44     maple 39.58484  51
46     beech 25.91092  97
49     maple 37.71555  94
51     beech 36.56241  86
52       ash 18.76566  61
53       elm 34.89769 102
54     maple 31.70421  71
55  sycamore 38.59112  79
57       ash 15.85728  36
59     maple 35.34756 114
60  sycamore 27.38078  21
61     beech 31.73220 118
63       elm 24.29656  37
65  sycamore 15.53098  53
66     beech 23.43880  66
67       ash 16.93649 111
68       elm 28.24887  41
69     maple 37.71422  93
70  sycamore 35.32981  25
72       ash 31.39738 116
74     maple 19.52946  50
75  sycamore 19.95230 104
76     beech 29.93811  93
78       elm 15.79420  87
80  sycamore 24.47002 106
81     beech 35.88814  24
84     maple 34.33535 104
85  sycamore 32.62714  57
86     beech 27.27168  58
87       ash 32.01684  57
88       elm 17.53163  80
```

```
89     maple 35.68647  55
90  sycamore 36.90332  92
92       ash 23.28339  25
93       elm 17.04845 108
96     beech 16.29328  95
97       ash 36.49203  41
101    beech 39.89991 102
103      elm 16.08864  69
106    beech 32.71877  86
108      elm 30.85781  27
109    maple 37.82078  40
110 sycamore 16.53053  33
114    maple 34.53309  62
115 sycamore 35.30828  27
116    beech 31.81844  97
117      ash 28.98912 109
118      elm 30.48111  62
119    maple 26.08200  88
120 sycamore 37.05482  20
122      ash 24.85607 115
123      elm 34.31667  34
126    beech 23.92863  76
128      elm 16.90474  20
129    maple 34.55187  21
130 sycamore 22.23917  86
131    beech 33.28275 112
132      ash 26.94889  53
134    maple 24.76955  39
135 sycamore 19.51021  79
136    beech 21.28240  32
137      ash 18.52355  78
140 sycamore 31.71760  38
143      elm 21.76267 115
144    maple 31.66830  51
145 sycamore 30.31564  99
146    beech 16.15771 101
147      ash 31.54121  83
149    maple 19.00695  82
150 sycamore 15.04207  25
151    beech 34.34271  97
152      ash 29.61464  78
153      elm 34.23472  84
154    maple 35.44336  63
```

```
155 sycamore 20.88266  79
156    beech 36.45726  57
158      elm 29.80748  21
159    maple 38.69182  76
160 sycamore 24.33006  62
162      ash 17.70123  29
163      elm 33.80567  76
164    maple 36.36494  25
167      ash 17.77863  61
168      elm 38.18041  33
169    maple 26.23671  89
170 sycamore 19.19257 114
172      ash 37.24985  89
173      elm 30.88965  86
174    maple 35.96197  97
175 sycamore 31.80832  92
176    beech 16.27479  22
177      ash 29.76537 114
178      elm 37.60408 107
179    maple 35.40413  43
180 sycamore 26.62535  89
181    beech 31.06614  29
182      ash 24.32123 107
184    maple 39.85512  36
185 sycamore 29.62127  99
186    beech 23.96891  50
187      ash 21.41167  52
188      elm 20.73665  25
190 sycamore 31.07628  56
193      elm 26.40621  42
195 sycamore 24.02572  63
196    beech 28.21113  51
197      ash 36.61444 117
199    maple 24.30919  35
```

2.3.1 Exercise

a) Using `df1`, select only entries corresponding to ash and maple with an age over 50 and a diameter less than 30.

b) Add a new column to the dataframe called "year". Generate data for this column so that there are 10 different years and the same number of entries for each tree species per year.

Tip

Use the function `rep` for this exercise

3 Data, packages, and some more functions

3.1 Setting up your working environment

Usually when working in R, you want to look at your own data, and not generate it from random distributions. To read in a data file, we first need to tell R where the working directory is located.

```
setwd("/home/of22haqi/Documents/TEACHING/MEE-WS25-26/")
```

The path will look different on your machine of course.

Now that R knows where to find it, we are ready to read in a data file.

```
# The table contains headers, and the fields are separated by commas
be <-  read.table("data/butterfly_ecology.csv", header = TRUE, sep = ",")

# Let's have a glimpse at the data
head(be)
```

```
            species      family range.size conservation.europe conservation.eu OWS_egg
1    Aglais_ichnusa Nymphalidae         NA                  NA              NA       0
2         Aglais_io Nymphalidae       1136                   5               5       0
3    Aglais_urticae Nymphalidae       1271                   5               5       0
4   Agriades_aquilo  Lycaenidae         21                   5               5       0
5 Agriades_dardanus  Lycaenidae          2                   4               4      NA
6  Agriades_glandon  Lycaenidae         45                   5               5       0
  OWS_larvae OWS_pupae OWS_adult GEN_Average GEN_Min GEN_Max GEN_Range
1          0         0         1        2.00     2.0       2       0.0
2          0         0         1        2.00     1.0       3       2.0
3          0         0         1        2.00     1.0       3       2.0
4          1         0         0        0.75     0.5       1       0.5
5         NA        NA        NA        1.00     1.0       1       0.0
6          1         0         0        1.00     1.0       1       0.0
  WSP_Female_average WSP_Female_range   HSI LEV_buried LEV_ground_layer
```

```
1               47.0               10 0.577         NA               NA
2               53.5               17 0.236          0                0
3               48.0               10 0.707          0                0
4               23.0                2 0.289          0                0
5               25.0                6 0.577         NA               NA
6               23.0                2 0.354          0                0
  LEV_field_layer LEV_shrub_layer LEV_canopy_layer ELT_single ELT_small_batch
1              NA              NA               NA         NA              NA
2               1               0                0          0               0
3               1               0                0          0               0
4               1               0                0         NA              NA
5              NA              NA               NA         NA              NA
6               1               0                0         NA              NA
  ELT_large_batch ALT_Min ALT_Range FM_Average FM_Range AFB_herb.flower
1              NA     700      1800        8.0        0               1
2               1       0      2500        7.5        3               1
3               1       0      3000        7.5        3               1
4              NA       0       900        3.0        0              NA
5              NA     800      3400        4.0        0              NA
6              NA    1600      1100        2.0        0               1
  AFB_grass AFB_shrub_flower AFB_honeydew AFB_sap AFB_animal AFB_mineral
1         0                0            0       0          0           0
2         0                1            0       0          1           1
3         0                1            0       0          1           1
4        NA               NA           NA      NA         NA          NA
5        NA               NA           NA      NA         NA          NA
6         0                0            0       0          0           0
```

> Use a text editor outside of Rstudio to look at the data file as well. Why do you think this is a good format to store data in? WHat is the advantage to e.g., an Excel file? What does using a text file format mean for your data entry requirements?

In order to save your entire working environment, so you don't have to re-run potentially time intensive pieces of your code, just save it and load it back into your work space the next time you use `R`.

```
save.image("myenv.Rdata")
```

You can also use the panel "Environment" in RStudio to save and load your data.

All of the functions we used today are so "base `R`" functions, which means they come preinstalled with `R`. Lots of the functionality of `R` is in external packages which need to be installed manually. The majority of relevant packages are found on CRAN (The Comprehensive R Archive Network),

and there is a special archive for packages relevant to the life sciences (Bioconductor). In order to install packages from CRAN, simply run

```
install.packages("tidyverse", dependencies = TRUE)
```

Here, `tidyverse` is the package we want to install we ask to also install any packages that `tidyverse` may require to function. You can find a list of all packages currently installed in the packages tab in the panel on the bottom left in RStudio. It is good practise to keep the packages, as well as your `R` installation up to date.

3.2 Functions

We have already used plenty of functions. Most of them require at least an object an which to perform the function on, and may also have some options. For example, consider the following function:

```
mean(be$range.size, na.rm = TRUE)
```

```
[1] 261.4116
```

`mean` is the function, `be$range.size` is the object (1 vector from the dataframe we just read into `R`) and `na.rm = TRUE` is the option to remove `NAs` from the vector before calculating the mean.

In some cases, you may want to do things to your data that cannot be addressed by a single function. In this case, you may have to perform a number of different operations on the dataset. If you are likely to use the same set of operations in the future, it may be advisable to use your own functions.

A very simple example. Let's assume the mean function didn't exist and we would need to write our own.

```
mean2 <- function(x){
  x <- na.omit(x)
  sum(x) / length(x)
}

mean2(be$range.size)
```

```
[1] 261.4116
```

We define `mean2` as a function that requires an object (here called `x` as an input). Looking into the function, we can see that it first removes the NAs from the object and next calculates the sum of x divided by the number of elements of x (this is how the mean is defined). Testing it, we can see that it gives the same result as the native mean function.

3.3 Loops

In many cases, we need to apply a function t a number of elements. In this case, loops come in handy. In the simple examples below, the structure of a for loop is illustrated.

```
for(i in 1:10) # how often is the loop repeated
{
   print(i)    # what is to be done each iteration
}
```

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

```
j<-0
for(i in 1:5)
{
   j<-i+j
   print(j)
}
```

```
[1] 1
[1] 3
[1] 6
[1] 10
[1] 15
```

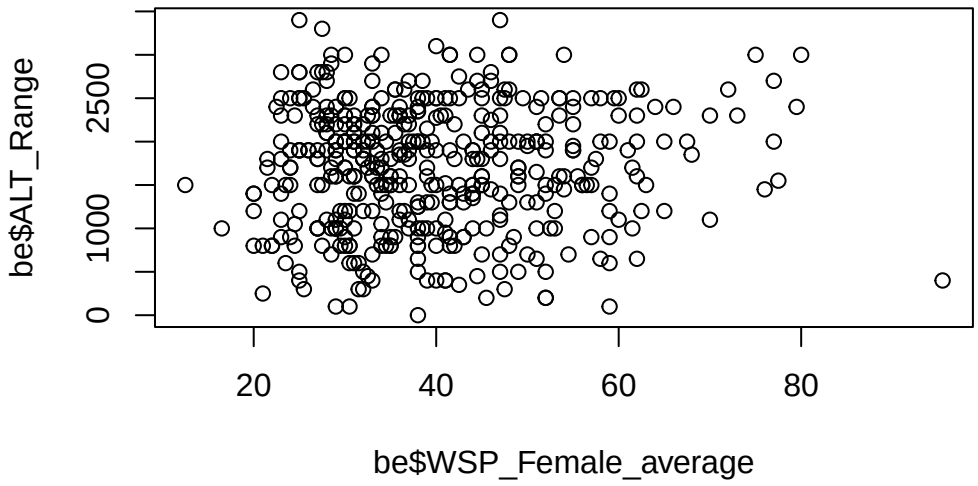
Observe and try to explain what happens in each iteration to the variables used in these examples.

3.4 Plots

For many use cases `ggplot2` is the best approach of plotting, and we will get to know this package later. However, for very simple and quick plots, base `R` plotting functions are sufficient and superior to othe options because of simplicity and speed.

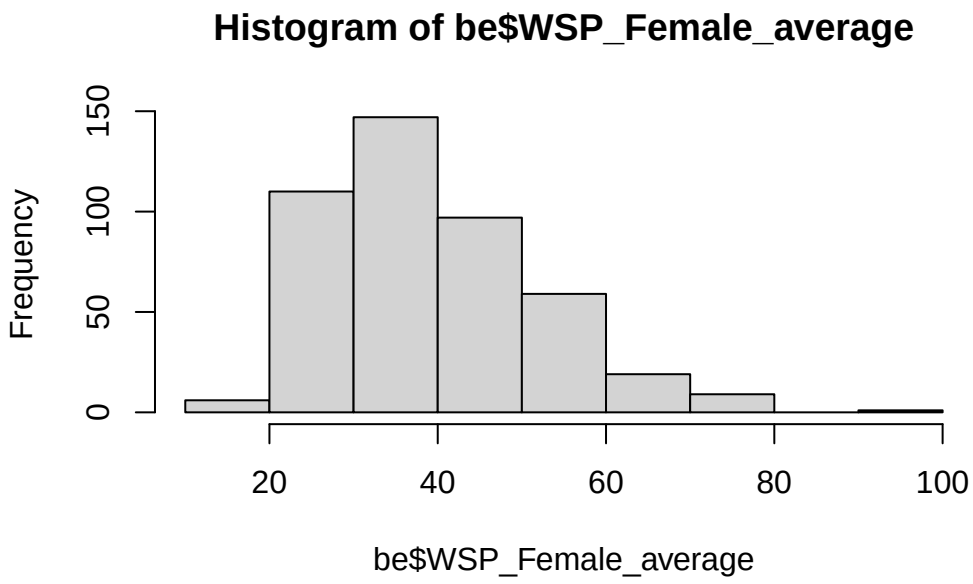
Scatter plots can be created by just naming the variables to be plotted against each other.

```
plot(be$WSP_Female_average, be$ALT_Range)
```



Histograms showing frequency distributions are also very easily generated

```
hist(be$WSP_Female_average)
```



3.5 Exercises

a) Using a loop, plot histograms for the columns “WSP_Female_average”, “Alt_Range”, “Alt_min”, and “range.size”.

b) Write a function that creates these plots with only the dataframe as argument.

4 Tidyverse

4.1 What is the `tidyverse`?

- A collection of R packages for data science
- All packages share a "philosophy" about design and data structure
- All packages are highly compatible and functions complement each other

We will only be looking at a couple of functions from a 2 packages (`dplyr` & `ggplot2`). All functions are about **data manipulation and visualisation** and are especially well suited for exploring very large data sets.

You can install all tidyverse packages by running

```
install.packages("tidyverse", dependencies = TRUE)
```

```
The following package(s) will be installed:
- tidyverse [2.0.0]
These packages will be installed into "~/work/MEE-WS25-26/MEE-WS25-26/renv/library/R-
4.2/x86_64-pc-linux-gnu".

# Installing packages --------------------------------------------------------
- Installing tidyverse ...                      OK [linked from cache]
Successfully installed 1 package in 5.6 milliseconds.
```

Let's refresh what we learned earlier this week:

1. What different types of data structures are used in R?
2. Which of these do you think is most likely to be used in the `tidyverse`?

(Remember, you can just add the answers into this document for future reference!)

4.2 Our data set for today

We will be looking at a data set of ecological traits of european butterflies. Download the table and read it into R.

```
# The table contains headers, and the fields are separated by commas
be <-  read.table("data/butterfly_ecology.csv", header = TRUE, sep = ",")

# Let's have a glimpse at the data
head(be)
```

```
            species      family range.size conserv.europe conserv.eu OWS_egg
1    Aglais_ichnusa Nymphalidae         NA              NA         NA       0
2         Aglais_io Nymphalidae       1136               5          5       0
3    Aglais_urticae Nymphalidae       1271               5          5       0
4   Agriades_aquilo  Lycaenidae         21               5          5       0
5 Agriades_dardanus  Lycaenidae          2               4          4      NA
6  Agriades_glandon  Lycaenidae         45               5          5       0
  OWS_larvae OWS_pupae OWS_adult GEN_Average GEN_Min GEN_Max GEN_Range
1          0         0         1        2.00     2.0       2       0.0
2          0         0         1        2.00     1.0       3       2.0
3          0         0         1        2.00     1.0       3       2.0
4          1         0         0        0.75     0.5       1       0.5
5         NA        NA        NA        1.00     1.0       1       0.0
6          1         0         0        1.00     1.0       1       0.0
  WSP_Female_average WSP_Female_range   HSI LEV_buried LEV_ground_layer
1               47.0               10 0.577         NA               NA
2               53.5               17 0.236          0                0
3               48.0               10 0.707          0                0
4               23.0                2 0.289          0                0
5               25.0                6 0.577         NA               NA
6               23.0                2 0.354          0                0
  LEV_field_layer LEV_shrub_layer LEV_canopy_layer ELT_single ELT_small_batch
1              NA              NA               NA         NA              NA
2               1               0                0          0               0
3               1               0                0          0               0
4               1               0                0         NA              NA
5              NA              NA               NA         NA              NA
6               1               0                0         NA              NA
  ELT_large_batch ALT_Min ALT_Range FM_Average FM_Range AFB_herb.flower
1              NA     700      1800        8.0        0               1
2               1       0      2500        7.5        3               1
```

```
3              1       0      3000        7.5        3              1
4             NA       0       900        3.0        0             NA
5             NA     800      3400        4.0        0             NA
6             NA    1600      1100        2.0        0              1
  AFB_grass AFB_shrub_flower AFB_honeydew AFB_sap AFB_animal AFB_mineral
1         0                0            0       0          0           0
2         0                1            0       0          1           1
3         0                1            0       0          1           1
4        NA               NA           NA      NA         NA          NA
5        NA               NA           NA      NA         NA          NA
6         0                0            0       0          0           0
```

Each of the rows contains data for 1 European species, and the columns contain the following information:

Trait abbreviation	Meaning	States	Notes
OWS	Overwintering stage	egg, larvae, pupae, adult	
GEN	Generations	average, min, max, range	
WSP	Wingspan	average, range	Measured in mm
HSI	Hostplant index	N/A	Measured from 0-1
LEV	Larval environment	buried, ground layer, field layer, shrub layer, canopy layer	
ELT	Egg laying type	single, small batch, large batch	
ALT	Altitude	min, range	
FM	Flight months	average, range	
AFB	Adult feeding behaviour	herb flower, grass, shrub flower, honeydew, sap, animal, mineral	

Now that we are familiar with the dataset, lets look at some `tidyverse` functions.

4.3 `filter()` for filtering data frames

As the name suggests, this is used to filter data frames, with a simple and efficient syntax:

```r
# first, we have to load the tidyverse packages
library(tidyverse, quietly = TRUE)

# the command always takes a dataframe as first argument, and a filtering
 ↪  criterion as second argument
# Here, we only look butterflies that overwinter as eggs
filter(be, OWS_egg == 1)
```

	species	family	range.size	conserv.europe	conserv.eu
1	Argynnis_paphia	Nymphalidae	1024	5	5
2	Aricia_cramera	Lycaenidae	138	5	5
3	Azanus_ubaldus	Lycaenidae	NA	NA	NA
4	Boloria_titania	Nymphalidae	141	4	5
5	Brenthis_daphne	Nymphalidae	323	5	5
6	Brenthis_hecate	Nymphalidae	190	5	5
7	Brenthis_ino	Nymphalidae	699	5	5
8	Catopsilia_florella	Pieridae	NA	NA	NA
9	Colias_palaeno	Pieridae	417	5	5
10	Cyclyrius_webbianus	Lycaenidae	NA	5	5
11	Danaus_chrysippus	Nymphalidae	38	NA	NA
12	Erebia_eriphyle	Nymphalidae	34	5	5
13	Erebia_euryale	Nymphalidae	203	5	5
14	Erebia_ligea	Nymphalidae	564	5	5
15	Erebia_manto	Nymphalidae	89	5	5
16	Fabriciana_adippe	Nymphalidae	888	5	5
17	Fabriciana_elisa	Nymphalidae	8	5	5
18	Fabriciana_niobe	Nymphalidae	646	5	4
19	Favonius_quercus	Lycaenidae	777	5	5
20	Gegenes_nostrodamus	Hesperiidae	65	5	5
21	Gonepteryx_cleobule	Pieridae	NA	3	3
22	Hesperia_comma	Hesperiidae	807	5	5
23	Issoria_lathonia	Nymphalidae	976	5	5
24	Laeosopis_roboris	Lycaenidae	82	5	5
25	Lampides_boeticus	Lycaenidae	361	5	5
26	Lycaena_hippothoe	Lycaenidae	689	5	4
27	Lysandra_albicans	Lycaenidae	40	5	5
28	Lysandra_coridon	Lycaenidae	575	4	4
29	Lysandra_hispana	Lycaenidae	50	5	5
30	Muschampia_proto	Hesperiidae	88	5	5
31	Pararge_xiphia	Nymphalidae	NA	2	2
32	Pararge_xiphioides	Nymphalidae	NA	5	5
33	Parnassius_apollo	Papilionidae	354	4	4

34	Parnassius_mnemosyne	Papilionidae	371	4	5	
35	Parnassius_phoebus	Papilionidae	48	4	4	
36	Pieris_cheiranthi	Pieridae	NA	2	2	
37	Plebejus_argus	Lycaenidae	991	5	5	
38	Plebejus_argyrognomon	Lycaenidae	290	5	5	
39	Plebejus_idas	Lycaenidae	774	5	5	
40	Polyommatus_damon	Lycaenidae	163	4	4	
41	Polyommatus_daphnis	Lycaenidae	305	5	5	
42	Pyrgus_cirsii	Hesperiidae	94	3	3	
43	Satyrium_acaciae	Lycaenidae	349	5	5	
44	Satyrium_esculi	Lycaenidae	106	5	5	
45	Satyrium_ilicis	Lycaenidae	586	5	5	
46	Satyrium_ledereri	Lycaenidae	1	NA	NA	
47	Satyrium_pruni	Lycaenidae	408	5	5	
48	Satyrium_spini	Lycaenidae	483	5	5	
49	Satyrium_w-album	Lycaenidae	553	5	5	
50	Speyeria_aglaja	Nymphalidae	1132	5	5	
51	Thecla_betulae	Lycaenidae	628	5	5	
52	Thymelicus_lineola	Hesperiidae	926	5	5	
53	Vanessa_vulcania	Nymphalidae	NA	5	5	
54	Zizeeria_karsandra	Lycaenidae	NA	NA	NA	
55	Zizeeria_knysna	Lycaenidae	39	NA	NA	

	OWS_egg	OWS_larvae	OWS_pupae	OWS_adult	GEN_Average	GEN_Min	GEN_Max	GEN_Range
1	1	1	0	0	1.00	1.0	1.0	0.0
2	1	1	1	1	2.50	2.0	3.0	1.0
3	1	1	1	1	3.00	3.0	3.0	0.0
4	1	1	0	0	1.00	1.0	1.0	0.0
5	1	1	0	0	1.00	1.0	1.0	0.0
6	1	0	0	0	1.00	1.0	1.0	0.0
7	1	1	0	0	1.00	1.0	1.0	0.0
8	1	1	1	1	3.00	3.0	3.0	0.0
9	1	1	0	0	1.00	1.0	1.0	0.0
10	1	1	1	1	3.00	3.0	3.0	0.0
11	1	1	1	1	3.00	3.0	3.0	0.0
12	1	1	0	0	0.50	0.5	0.5	0.0
13	1	1	0	0	0.75	0.5	1.0	0.5
14	1	1	0	0	0.75	0.5	1.0	0.5
15	1	1	0	0	0.50	0.5	0.5	0.0
16	1	1	0	0	1.00	1.0	1.0	0.0
17	1	1	0	0	1.00	1.0	1.0	0.0
18	1	1	0	0	1.00	1.0	1.0	0.0
19	1	0	0	0	1.00	1.0	1.0	0.0
20	1	1	1	1	3.00	3.0	3.0	0.0

21	1	1	1	1	3.00	3.0	3.0	0.0
22	1	1	0	0	1.00	1.0	1.0	0.0
23	1	1	1	1	2.00	1.0	3.0	2.0
24	1	0	0	0	1.00	1.0	1.0	0.0
25	1	1	1	0	3.00	3.0	3.0	0.0
26	1	1	0	0	1.00	1.0	1.0	0.0
27	1	0	0	0	1.00	1.0	1.0	0.0
28	1	0	0	0	1.50	1.0	2.0	1.0
29	1	0	0	0	2.00	2.0	2.0	0.0
30	1	0	0	0	1.00	1.0	1.0	0.0
31	1	1	1	1	3.00	3.0	3.0	0.0
32	1	1	1	1	3.00	3.0	3.0	0.0
33	1	1	0	0	1.00	1.0	1.0	0.0
34	1	0	0	0	1.00	1.0	1.0	0.0
35	1	1	0	0	1.00	1.0	1.0	0.0
36	1	1	1	1	3.00	3.0	3.0	0.0
37	1	0	0	0	1.50	1.0	2.0	1.0
38	1	1	0	0	1.50	1.0	2.0	1.0
39	1	0	0	0	1.50	1.0	2.0	1.0
40	1	1	0	0	1.00	1.0	1.0	0.0
41	1	0	0	0	1.00	1.0	1.0	0.0
42	1	1	0	0	1.00	1.0	1.0	0.0
43	1	0	0	0	1.00	1.0	1.0	0.0
44	1	0	0	0	1.00	1.0	1.0	0.0
45	1	0	0	0	1.00	1.0	1.0	0.0
46	1	0	0	0	1.00	1.0	1.0	0.0
47	1	0	0	0	1.00	1.0	1.0	0.0
48	1	0	0	0	1.00	1.0	1.0	0.0
49	1	0	0	0	1.00	1.0	1.0	0.0
50	1	1	0	0	1.00	1.0	1.0	0.0
51	1	0	0	0	1.00	1.0	1.0	0.0
52	1	0	0	0	1.00	1.0	1.0	0.0
53	1	1	1	1	3.00	3.0	3.0	0.0
54	1	1	1	1	3.00	3.0	3.0	0.0
55	1	1	1	1	3.00	3.0	3.0	0.0

	WSP_Female_average	WSP_Female_range	HSI	LEV_buried	LEV_ground_layer
1	62.0	8	0.258	0	0
2	25.0	6	0.112	0	1
3	12.5	5	0.577	0	0
4	39.5	9	0.500	0	0
5	47.0	10	0.447	0	0
6	40.0	8	0.408	0	0
7	37.0	8	0.204	0	1

8	50.0	10	NA	0	0
9	47.0	10	0.707	0	1
10	27.5	5	0.289	0	0
11	70.0	20	0.354	0	0
12	34.0	4	0.500	0	0
13	44.0	4	0.096	0	0
14	41.0	10	0.183	0	1
15	39.0	10	0.316	0	0
16	53.5	9	0.500	0	0
17	49.0	6	1.000	0	0
18	49.5	9	0.408	0	1
19	32.0	6	0.408	0	0
20	32.0	4	0.289	0	0
21	61.5	13	0.577	0	0
22	31.0	6	0.333	0	1
23	42.5	5	0.408	0	1
24	27.0	6	0.707	0	1
25	33.0	6	0.058	0	0
26	30.5	7	0.289	0	1
27	39.0	6	1.000	0	0
28	33.0	6	1.000	0	1
29	34.0	4	1.000	0	0
30	34.5	9	0.577	0	1
31	45.5	3	0.102	0	1
32	37.5	1	0.102	0	1
33	80.0	30	0.204	0	1
34	58.0	12	0.354	0	1
35	65.0	30	0.158	0	1
36	62.5	5	0.289	0	1
37	22.5	9	0.069	0	1
38	31.0	6	0.224	0	0
39	24.5	5	0.041	0	0
40	32.0	4	0.447	0	1
41	35.0	6	0.129	0	1
42	27.0	2	0.408	0	1
43	30.0	4	1.000	0	1
44	32.0	4	0.707	0	0
45	34.0	4	0.112	0	0
46	29.0	4	0.577	0	0
47	31.5	9	0.134	0	0
48	30.0	4	0.167	0	0
49	30.0	4	0.065	0	0
50	51.5	9	0.500	0	1

51	35.0	10	0.129	0	0
52	25.5	7	0.067	0	0
53	57.0	6	0.289	0	0
54	22.0	4	0.289	NA	NA
55	22.0	4	0.105	NA	NA

	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer	ELT_single	ELT_small_batch
1	1	0	0	1	0
2	1	0	0	1	0
3	0	1	0	1	1
4	1	0	0	1	0
5	0	1	0	1	0
6	1	0	0	1	0
7	1	0	0	1	1
8	0	1	1	1	1
9	1	0	0	1	0
10	1	0	0	0	1
11	1	0	0	NA	NA
12	1	0	0	NA	NA
13	1	0	0	1	0
14	1	0	0	1	0
15	1	0	0	1	0
16	1	0	0	1	0
17	1	0	0	1	0
18	1	0	0	1	0
19	0	0	1	1	0
20	1	0	0	1	0
21	0	1	1	1	0
22	1	0	0	1	0
23	1	0	0	1	0
24	0	0	1	1	0
25	1	0	0	1	0
26	1	0	0	1	0
27	1	0	0	NA	NA
28	0	0	0	1	0
29	1	0	0	1	0
30	1	0	0	1	0
31	1	0	0	1	0
32	1	0	0	1	0
33	0	0	0	1	1
34	0	0	0	1	0
35	1	0	0	1	0
36	1	1	0	0	1
37	1	0	0	1	0

38	1	0	0	1	0
39	1	0	0	1	0
40	0	0	0	1	0
41	1	0	0	1	0
42	1	0	0	1	0
43	0	1	0	1	0
44	0	1	1	1	0
45	0	1	0	1	0
46	0	1	0	1	0
47	0	1	0	1	0
48	0	1	0	1	1
49	0	1	1	1	0
50	1	0	0	1	0
51	0	1	0	1	0
52	1	0	0	0	1
53	1	0	0	1	0
54	NA	NA	NA	NA	NA
55	NA	NA	NA	NA	NA

	ELT_large_batch	ALT_Min	ALT_Range	FM_Average	FM_Range	AFB_herb.flower
1	0	0	2300	4.0	2	1
2	0	0	2500	9.5	5	1
3	0	0	1500	NA	NA	0
4	0	100	2000	3.0	0	1
5	0	0	2300	3.5	1	1
6	0	25	2275	3.0	0	1
7	0	0	2000	2.5	1	1
8	0	0	2000	11.0	2	NA
9	0	0	2500	3.0	0	1
10	0	200	3300	NA	NA	1
11	NA	0	1100	10.5	3	1
12	NA	1200	1050	3.0	0	1
13	0	600	1900	3.0	2	1
14	0	0	2500	3.0	2	1
15	0	900	1600	3.0	0	1
16	0	0	2300	3.5	3	1
17	0	400	1600	3.0	0	1
18	0	0	2500	2.5	3	1
19	0	0	2000	5.0	2	0
20	0	0	1900	9.0	0	1
21	0	300	1700	4.0	4	1
22	0	0	2200	3.5	3	1
23	0	0	2750	7.0	6	1
24	0	100	1500	3.0	0	1

25	0	0	2700	9.0	0	1
26	0	0	2500	4.5	1	1
27	NA	500	1000	3.0	0	1
28	0	100	2400	3.0	0	1
29	0	100	900	7.0	0	1
30	0	0	2000	4.0	2	1
31	0	0	1000	12.0	0	0
32	0	0	2000	12.0	0	0
33	0	0	3000	4.5	1	1
34	0	0	2500	3.0	0	1
35	0	1600	1200	3.0	0	1
36	1	200	1200	12.0	0	1
37	0	0	2400	4.0	0	1
38	0	300	1400	4.0	0	1
39	0	100	2300	5.0	0	1
40	0	600	1800	2.0	0	1
41	0	200	1800	3.0	0	1
42	0	0	1000	3.0	2	1
43	0	0	2000	3.0	2	1
44	0	100	1200	4.0	0	1
45	0	0	1800	4.0	0	0
46	0	600	1900	3.5	3	1
47	0	100	600	3.0	0	1
48	0	0	2000	3.5	1	1
49	0	0	1700	3.0	0	1
50	0	0	2500	3.5	3	1
51	0	0	1600	4.5	1	1
52	1	0	2500	3.5	3	1
53	0	0	1500	12.0	0	1
54	NA	0	1500	NA	NA	NA
55	NA	0	800	9.0	0	1

	AFB_grass	AFB_shrub_flower	AFB_honeydew	AFB_sap	AFB_animal	AFB_mineral
1	0	1	1	0	0	1
2	0	0	0	0	0	1
3	0	1	0	0	0	0
4	0	0	0	0	0	0
5	0	1	0	0	0	0
6	0	0	0	0	0	0
7	0	1	0	0	0	0
8	NA	NA	NA	NA	NA	NA
9	0	1	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0

12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	1
15	0	0	0	0	0	0
16	0	1	0	0	0	1
17	0	0	0	0	0	0
18	0	0	0	0	0	0
19	0	0	1	0	1	1
20	0	0	0	0	0	1
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	1
24	0	0	0	0	0	0
25	0	0	0	0	0	0
26	0	0	0	0	0	0
27	0	0	0	0	0	1
28	0	0	0	0	1	1
29	0	0	0	0	0	1
30	0	0	0	0	0	1
31	0	1	1	1	0	0
32	0	1	1	1	0	0
33	0	0	0	0	0	0
34	0	0	0	0	0	0
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	1	1
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	1
41	0	0	0	0	0	1
42	0	0	0	0	0	1
43	0	1	0	0	0	0
44	0	0	0	0	0	0
45	0	1	0	0	0	0
46	0	0	0	0	0	0
47	0	1	1	0	0	0
48	0	1	1	0	0	0
49	0	0	1	0	0	0
50	0	0	0	0	1	1
51	0	0	1	0	0	0
52	0	0	0	0	0	1
53	0	0	0	0	0	0
54	NA	NA	NA	NA	NA	NA

```
55          0                 0             0       0           0            1
```

The filtering criterion can be specified using the methods you are already familiar with (e.g., `>`, `>=`, `!=`, `%in%`).

Notice that the variable names can be used directly here, so instead of using `be$OWS_egg`, `filter()` lets you use `OWS_egg` directly. All `tidyverse` functions work like that. Let's look at more complex filtering:

```
# combine 2 filters with boolean "AND" ...
filter(be, OWS_egg == 1 , ALT_Min > 500)
```

```
             species       family range.size conservation.europe conservation.eu OWS_egg
1    Erebia_eriphyle  Nymphalidae         34                   5              5       1
2     Erebia_euryale  Nymphalidae        203                   5              5       1
3       Erebia_manto  Nymphalidae         89                   5              5       1
4 Parnassius_phoebus Papilionidae         48                   4              4       1
5  Polyommatus_damon   Lycaenidae        163                   4              4       1
6  Satyrium_ledereri   Lycaenidae          1                  NA             NA       1
  OWS_larvae OWS_pupae OWS_adult GEN_Average GEN_Min GEN_Max GEN_Range
1          1         0         0        0.50     0.5     0.5       0.0
2          1         0         0        0.75     0.5     1.0       0.5
3          1         0         0        0.50     0.5     0.5       0.0
4          1         0         0        1.00     1.0     1.0       0.0
5          1         0         0        1.00     1.0     1.0       0.0
6          0         0         0        1.00     1.0     1.0       0.0
  WSP_Female_average WSP_Female_range   HSI LEV_buried LEV_ground_layer
1                 34                4 0.500          0                0
2                 44                4 0.096          0                0
3                 39               10 0.316          0                0
4                 65               30 0.158          0                1
5                 32                4 0.447          0                1
6                 29                4 0.577          0                0
  LEV_field_layer LEV_shrub_layer LEV_canopy_layer ELT_single ELT_small_batch
1               1               0                0         NA              NA
2               1               0                0          1               0
3               1               0                0          1               0
4               1               0                0          1               0
5               0               0                0          1               0
6               0               1                0          1               0
  ELT_large_batch ALT_Min ALT_Range FM_Average FM_Range AFB_herb.flower
1              NA    1200      1050        3.0        0               1
```

```
2              0     600      1900        3.0        2              1
3              0     900      1600        3.0        0              1
4              0    1600      1200        3.0        0              1
5              0     600      1800        2.0        0              1
6              0     600      1900        3.5        3              1
  AFB_grass AFB_shrub_flower AFB_honeydew AFB_sap AFB_animal AFB_mineral
1         0                0            0       0          0           0
2         0                0            0       0          0           0
3         0                0            0       0          0           0
4         0                0            0       0          0           0
5         0                0            0       0          0           1
6         0                0            0       0          0           0
```

```
# ... or boolean "OR"
filter(be, OWS_egg == 1 | AFB_honeydew == 1)
```

```
                species       family range.size conserv.europe conserv.eu
1          Apatura_ilia  Nymphalidae        528              5          5
2          Apatura_iris  Nymphalidae        571              5          5
3         Apatura_metis  Nymphalidae         47              5          5
4       Aporia_crataegi     Pieridae        894              5          5
5       Argynnis_paphia  Nymphalidae       1024              5          5
6        Aricia_cramera   Lycaenidae        138              5          5
7        Azanus_ubaldus   Lycaenidae         NA             NA         NA
8       Boloria_titania  Nymphalidae        141              4          5
9       Brenthis_daphne  Nymphalidae        323              5          5
10      Brenthis_hecate  Nymphalidae        190              5          5
11         Brenthis_ino  Nymphalidae        699              5          5
12      Callophrys_rubi   Lycaenidae       1192              5          5
13   Catopsilia_florella     Pieridae         NA             NA         NA
14   Celastrina_argiolus   Lycaenidae       1190              5          5
15 Coenonympha_oedippus  Nymphalidae         52              2          5
16       Colias_palaeno     Pieridae        417              5          5
17   Cyclyrius_webbianus   Lycaenidae         NA              5          5
18     Danaus_chrysippus  Nymphalidae         38             NA         NA
19       Erebia_eriphyle  Nymphalidae         34              5          5
20        Erebia_euryale  Nymphalidae        203              5          5
21          Erebia_ligea  Nymphalidae        564              5          5
22          Erebia_manto  Nymphalidae         89              5          5
23    Euphydryas_maturna  Nymphalidae        210              3          5
24     Fabriciana_adippe  Nymphalidae        888              5          5
25      Fabriciana_elisa  Nymphalidae          8              5          5
```

26	Fabriciana_niobe	Nymphalidae	646	5	4
27	Favonius_quercus	Lycaenidae	777	5	5
28	Gegenes_nostrodamus	Hesperiidae	65	5	5
29	Gonepteryx_cleobule	Pieridae	NA	3	3
30	Hesperia_comma	Hesperiidae	807	5	5
31	Hyponephele_lupina	Nymphalidae	143	5	5
32	Issoria_lathonia	Nymphalidae	976	5	5
33	Laeosopis_roboris	Lycaenidae	82	5	5
34	Lampides_boeticus	Lycaenidae	361	5	5
35	Leptidea_reali	Pieridae	NA	5	5
36	Limenitis_camilla	Nymphalidae	526	5	5
37	Limenitis_reducta	Nymphalidae	410	5	5
38	Lopinga_achine	Nymphalidae	275	3	3
39	Lycaena_dispar	Lycaenidae	383	5	5
40	Lycaena_hippothoe	Lycaenidae	689	5	4
41	Lysandra_albicans	Lycaenidae	40	5	5
42	Lysandra_coridon	Lycaenidae	575	4	4
43	Lysandra_hispana	Lycaenidae	50	5	5
44	Muschampia_proto	Hesperiidae	88	5	5
45	Nymphalis_antiopa	Nymphalidae	910	5	5
46	Pararge_xiphia	Nymphalidae	NA	2	2
47	Pararge_xiphioides	Nymphalidae	NA	5	5
48	Parnassius_apollo	Papilionidae	354	4	4
49	Parnassius_mnemosyne	Papilionidae	371	4	5
50	Parnassius_phoebus	Papilionidae	48	4	4
51	Pieris_cheiranthi	Pieridae	NA	2	2
52	Plebejus_argus	Lycaenidae	991	5	5
53	Plebejus_argyrognomon	Lycaenidae	290	5	5
54	Plebejus_idas	Lycaenidae	774	5	5
55	Polygonia_c-album	Nymphalidae	1098	5	5
56	Polyommatus_damon	Lycaenidae	163	4	4
57	Polyommatus_daphnis	Lycaenidae	305	5	5
58	Polyommatus_violetae	Lycaenidae	3	3	3
59	Pyrgus_cirsii	Hesperiidae	94	3	3
60	Satyrium_acaciae	Lycaenidae	349	5	5
61	Satyrium_esculi	Lycaenidae	106	5	5
62	Satyrium_ilicis	Lycaenidae	586	5	5
63	Satyrium_ledereri	Lycaenidae	1	NA	NA
64	Satyrium_pruni	Lycaenidae	408	5	5
65	Satyrium_spini	Lycaenidae	483	5	5
66	Satyrium_w-album	Lycaenidae	553	5	5
67	Speyeria_aglaja	Nymphalidae	1132	5	5
68	Thecla_betulae	Lycaenidae	628	5	5

69	Thymelicus_lineola	Hesperiidae	926	5	5			
70	Vanessa_atalanta	Nymphalidae	1343	5	5			
71	Vanessa_cardui	Nymphalidae	1373	5	5			
72	Vanessa_vulcania	Nymphalidae	NA	5	5			
73	Zizeeria_karsandra	Lycaenidae	NA	NA	NA			
74	Zizeeria_knysna	Lycaenidae	39	NA	NA			

	OWS_egg	OWS_larvae	OWS_pupae	OWS_adult	GEN_Average	GEN_Min	GEN_Max	GEN_Range
1	0	1	0	0	1.50	1.0	2.0	1.0
2	0	1	0	0	1.00	1.0	1.0	0.0
3	0	1	0	0	1.50	1.0	2.0	1.0
4	0	1	0	0	1.00	1.0	1.0	0.0
5	1	1	0	0	1.00	1.0	1.0	0.0
6	1	1	1	1	2.50	2.0	3.0	1.0
7	1	1	1	1	3.00	3.0	3.0	0.0
8	1	1	0	0	1.00	1.0	1.0	0.0
9	1	1	0	0	1.00	1.0	1.0	0.0
10	1	0	0	0	1.00	1.0	1.0	0.0
11	1	1	0	0	1.00	1.0	1.0	0.0
12	0	0	1	0	1.25	1.0	1.5	0.5
13	1	1	1	1	3.00	3.0	3.0	0.0
14	0	0	1	0	1.75	1.0	2.5	1.5
15	0	1	0	0	1.00	1.0	1.0	0.0
16	1	1	0	0	1.00	1.0	1.0	0.0
17	1	1	1	1	3.00	3.0	3.0	0.0
18	1	1	1	1	3.00	3.0	3.0	0.0
19	1	1	0	0	0.50	0.5	0.5	0.0
20	1	1	0	0	0.75	0.5	1.0	0.5
21	1	1	0	0	0.75	0.5	1.0	0.5
22	1	1	0	0	0.50	0.5	0.5	0.0
23	0	1	1	0	0.75	0.5	1.0	0.5
24	1	1	0	0	1.00	1.0	1.0	0.0
25	1	1	0	0	1.00	1.0	1.0	0.0
26	1	1	0	0	1.00	1.0	1.0	0.0
27	1	0	0	0	1.00	1.0	1.0	0.0
28	1	1	1	1	3.00	3.0	3.0	0.0
29	1	1	1	1	3.00	3.0	3.0	0.0
30	1	1	0	0	1.00	1.0	1.0	0.0
31	0	1	0	0	1.00	1.0	1.0	0.0
32	1	1	1	1	2.00	1.0	3.0	2.0
33	1	0	0	0	1.00	1.0	1.0	0.0
34	1	1	1	0	3.00	3.0	3.0	0.0
35	0	0	1	0	2.00	1.0	3.0	2.0
36	0	1	0	0	1.00	1.0	1.0	0.0

37	0	1	0	0	2.00	1.0	3.0	2.0
38	0	1	0	0	1.00	1.0	1.0	0.0
39	0	1	0	0	2.00	1.0	3.0	2.0
40	1	1	0	0	1.00	1.0	1.0	0.0
41	1	0	0	0	1.00	1.0	1.0	0.0
42	1	0	0	0	1.50	1.0	2.0	1.0
43	1	0	0	0	2.00	2.0	2.0	0.0
44	1	0	0	0	1.00	1.0	1.0	0.0
45	0	0	0	1	1.25	1.0	1.5	0.5
46	1	1	1	1	3.00	3.0	3.0	0.0
47	1	1	1	1	3.00	3.0	3.0	0.0
48	1	1	0	0	1.00	1.0	1.0	0.0
49	1	0	0	0	1.00	1.0	1.0	0.0
50	1	1	0	0	1.00	1.0	1.0	0.0
51	1	1	1	1	3.00	3.0	3.0	0.0
52	1	0	0	0	1.50	1.0	2.0	1.0
53	1	1	0	0	1.50	1.0	2.0	1.0
54	1	0	0	0	1.50	1.0	2.0	1.0
55	0	0	0	1	2.00	1.0	3.0	2.0
56	1	1	0	0	1.00	1.0	1.0	0.0
57	1	0	0	0	1.00	1.0	1.0	0.0
58	0	1	0	0	1.00	1.0	1.0	0.0
59	1	1	0	0	1.00	1.0	1.0	0.0
60	1	0	0	0	1.00	1.0	1.0	0.0
61	1	0	0	0	1.00	1.0	1.0	0.0
62	1	0	0	0	1.00	1.0	1.0	0.0
63	1	0	0	0	1.00	1.0	1.0	0.0
64	1	0	0	0	1.00	1.0	1.0	0.0
65	1	0	0	0	1.00	1.0	1.0	0.0
66	1	0	0	0	1.00	1.0	1.0	0.0
67	1	1	0	0	1.00	1.0	1.0	0.0
68	1	0	0	0	1.00	1.0	1.0	0.0
69	1	0	0	0	1.00	1.0	1.0	0.0
70	0	0	0	1	2.00	1.0	3.0	2.0
71	0	0	0	1	2.00	1.0	3.0	2.0
72	1	1	1	1	3.00	3.0	3.0	0.0
73	1	1	1	1	3.00	3.0	3.0	0.0
74	1	1	1	1	3.00	3.0	3.0	0.0

	WSP_Female_average	WSP_Female_range	HSI	LEV_buried	LEV_ground_layer
1	68.0	8	0.267	0	0
2	70.0	10	0.316	0	0
3	62.0	4	1.000	0	0
4	62.5	11	0.082	0	0

5	62.0	8	0.258	0	0
6	25.0	6	0.112	0	1
7	12.5	5	0.577	0	0
8	39.5	9	0.500	0	0
9	47.0	10	0.447	0	0
10	40.0	8	0.408	0	0
11	37.0	8	0.204	0	1
12	23.0	6	0.033	0	1
13	50.0	10	NA	0	0
14	27.0	10	0.020	0	0
15	38.0	8	0.258	0	0
16	47.0	10	0.707	0	1
17	27.5	5	0.289	0	0
18	70.0	20	0.354	0	0
19	34.0	4	0.500	0	0
20	44.0	4	0.096	0	0
21	41.0	10	0.183	0	1
22	39.0	10	0.316	0	0
23	41.5	9	0.046	0	0
24	53.5	9	0.500	0	0
25	49.0	6	1.000	0	0
26	49.5	9	0.408	0	1
27	32.0	6	0.408	0	0
28	32.0	4	0.289	0	0
29	61.5	13	0.577	0	0
30	31.0	6	0.333	0	1
31	45.0	6	0.169	0	1
32	42.5	5	0.408	0	1
33	27.0	6	0.707	0	1
34	33.0	6	0.058	0	0
35	38.0	10	1.000	0	0
36	56.0	8	0.289	0	0
37	50.0	8	0.577	0	0
38	44.0	8	0.086	0	1
39	37.0	8	0.408	0	1
40	30.5	7	0.289	0	1
41	39.0	6	1.000	0	0
42	33.0	6	1.000	0	1
43	34.0	4	1.000	0	0
44	34.5	9	0.577	0	1
45	67.5	17	0.192	0	0
46	45.5	3	0.102	0	1
47	37.5	1	0.102	0	1

48	80.0	30	0.204	0	1
49	58.0	12	0.354	0	1
50	65.0	30	0.158	0	1
51	62.5	5	0.289	0	1
52	22.5	9	0.069	0	1
53	31.0	6	0.224	0	0
54	24.5	5	0.041	0	0
55	46.0	12	0.050	0	0
56	32.0	4	0.447	0	1
57	35.0	6	0.129	0	1
58	31.0	6	1.000	0	0
59	27.0	2	0.408	0	1
60	30.0	4	1.000	0	1
61	32.0	4	0.707	0	0
62	34.0	4	0.112	0	0
63	29.0	4	0.577	0	0
64	31.5	9	0.134	0	0
65	30.0	4	0.167	0	0
66	30.0	4	0.065	0	0
67	51.5	9	0.500	0	1
68	35.0	10	0.129	0	0
69	25.5	7	0.067	0	0
70	59.5	13	0.316	0	0
71	54.0	16	0.083	0	0
72	57.0	6	0.289	0	0
73	22.0	4	0.289	NA	NA
74	22.0	4	0.105	NA	NA

	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer	ELT_single	ELT_small_batch
1	0	1	1	1	0
2	0	1	0	1	0
3	0	1	1	1	0
4	1	1	0	0	0
5	1	0	0	1	0
6	1	0	0	1	0
7	0	1	0	1	1
8	1	0	0	1	0
9	0	1	0	1	0
10	1	0	0	1	0
11	1	0	0	1	1
12	1	1	0	1	0
13	0	1	1	1	1
14	0	1	1	1	0
15	1	0	0	1	0

16	1	0	0	1	0
17	1	0	0	0	1
18	1	0	0	NA	NA
19	1	0	0	NA	NA
20	1	0	0	1	0
21	1	0	0	1	0
22	1	0	0	1	0
23	1	1	1	0	0
24	1	0	0	1	0
25	1	0	0	1	0
26	1	0	0	1	0
27	0	0	1	1	0
28	1	0	0	1	0
29	0	1	1	1	0
30	1	0	0	1	0
31	1	0	0	1	0
32	1	0	0	1	0
33	0	0	1	1	0
34	1	0	0	1	0
35	1	0	0	1	0
36	0	1	1	1	0
37	0	1	0	1	0
38	1	0	0	1	0
39	1	0	0	1	1
40	1	0	0	1	0
41	1	0	0	NA	NA
42	0	0	0	1	0
43	1	0	0	1	0
44	1	0	0	1	0
45	0	1	1	0	0
46	1	0	0	1	0
47	1	0	0	1	0
48	0	0	0	1	1
49	0	0	0	1	0
50	1	0	0	1	0
51	1	1	0	0	1
52	1	0	0	1	0
53	1	0	0	1	0
54	1	0	0	1	0
55	1	1	1	1	0
56	0	0	0	1	0
57	1	0	0	1	0
58	1	0	0	NA	NA

59	1	0	0	1	0
60	0	1	0	1	0
61	0	1	1	1	0
62	0	1	0	1	0
63	0	1	0	1	0
64	0	1	0	1	0
65	0	1	0	1	1
66	0	1	1	1	0
67	1	0	0	1	0
68	0	1	0	1	0
69	1	0	0	0	1
70	1	0	0	1	0
71	1	0	0	1	0
72	1	0	0	1	0
73	NA	NA	NA	NA	NA
74	NA	NA	NA	NA	NA

	ELT_large_batch	ALT_Min	ALT_Range	FM_Average	FM_Range	AFB_herb.flower
1	0	50	1850	4.5	3	1
2	0	0	2300	2.5	1	1
3	0	0	650	4.0	0	1
4	1	0	2600	3.5	1	1
5	0	0	2300	4.0	2	1
6	0	0	2500	9.5	5	1
7	0	0	1500	NA	NA	0
8	0	100	2000	3.0	0	1
9	0	0	2300	3.5	1	1
10	0	25	2275	3.0	0	1
11	0	0	2000	2.5	1	1
12	0	0	2300	6.0	2	1
13	0	0	2000	11.0	2	NA
14	0	0	1900	7.0	0	1
15	0	0	500	3.0	0	1
16	0	0	2500	3.0	0	1
17	0	200	3300	NA	NA	1
18	NA	0	1100	10.5	3	1
19	NA	1200	1050	3.0	0	1
20	0	600	1900	3.0	2	1
21	0	0	2500	3.0	2	1
22	0	900	1600	3.0	0	1
23	1	100	900	2.5	1	1
24	0	0	2300	3.5	3	1
25	0	400	1600	3.0	0	1
26	0	0	2500	2.5	3	1

27	0	0	2000	5.0	2	0
28	0	0	1900	9.0	0	1
29	0	300	1700	4.0	4	1
30	0	0	2200	3.5	3	1
31	0	0	2300	4.5	5	1
32	0	0	2750	7.0	6	1
33	0	100	1500	3.0	0	1
34	0	0	2700	9.0	0	1
35	0	0	2000	6.0	4	0
36	0	0	1500	3.0	2	1
37	0	0	1950	5.0	4	1
38	0	100	1400	2.5	1	1
39	0	0	1000	6.5	1	1
40	0	0	2500	4.5	1	1
41	NA	500	1000	3.0	0	1
42	0	100	2400	3.0	0	1
43	0	100	900	7.0	0	1
44	0	0	2000	4.0	2	1
45	1	0	2000	5.5	7	1
46	0	0	1000	12.0	0	0
47	0	0	2000	12.0	0	0
48	0	0	3000	4.5	1	1
49	0	0	2500	3.0	0	1
50	0	1600	1200	3.0	0	1
51	1	200	1200	12.0	0	1
52	0	0	2400	4.0	0	1
53	0	300	1400	4.0	0	1
54	0	100	2300	5.0	0	1
55	0	0	2700	6.5	7	1
56	0	600	1800	2.0	0	1
57	0	200	1800	3.0	0	1
58	NA	1200	600	2.0	0	1
59	0	0	1000	3.0	2	1
60	0	0	2000	3.0	2	1
61	0	100	1200	4.0	0	1
62	0	0	1800	4.0	0	0
63	0	600	1900	3.5	3	1
64	0	100	600	3.0	0	1
65	0	0	2000	3.5	1	1
66	0	0	1700	3.0	0	1
67	0	0	2500	3.5	3	1
68	0	0	1600	4.5	1	1
69	1	0	2500	3.5	3	1

70	0	0	2500	8.5	7	1
71	0	0	3000	8.0	8	1
72	0	0	1500	12.0	0	1
73	NA	0	1500	NA	NA	NA
74	NA	0	800	9.0	0	1

	AFB_grass	AFB_shrub_flower	AFB_honeydew	AFB_sap	AFB_animal	AFB_mineral
1	0	0	1	1	1	1
2	0	0	1	1	1	1
3	0	1	1	1	1	1
4	1	0	1	0	0	1
5	0	1	1	0	0	1
6	0	0	0	0	0	1
7	0	1	0	0	0	0
8	0	0	0	0	0	0
9	0	1	0	0	0	0
10	0	0	0	0	0	0
11	0	1	0	0	0	0
12	0	1	1	0	0	0
13	NA	NA	NA	NA	NA	NA
14	0	1	1	0	0	0
15	0	1	1	0	0	0
16	0	1	0	0	0	0
17	0	0	0	0	0	0
18	0	0	0	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	1
22	0	0	0	0	0	0
23	0	0	1	0	0	0
24	0	1	0	0	0	1
25	0	0	0	0	0	0
26	0	0	0	0	0	0
27	0	0	1	0	1	1
28	0	0	0	0	0	1
29	0	0	0	0	0	0
30	0	0	0	0	0	0
31	0	0	1	1	0	0
32	0	0	0	0	0	1
33	0	0	0	0	0	0
34	0	0	0	0	0	0
35	0	1	1	1	1	1
36	1	1	1	1	1	1
37	0	1	1	1	1	1

38	0	0	1	1	0	1
39	0	1	1	0	0	0
40	0	0	0	0	0	0
41	0	0	0	0	0	1
42	0	0	0	0	1	1
43	0	0	0	0	0	1
44	0	0	0	0	0	1
45	0	1	1	1	1	1
46	0	1	1	1	0	0
47	0	1	1	1	0	0
48	0	0	0	0	0	0
49	0	0	0	0	0	0
50	0	0	0	0	0	0
51	0	0	0	0	0	0
52	0	0	0	0	1	1
53	0	0	0	0	0	0
54	0	0	0	0	0	0
55	0	1	1	1	1	1
56	0	0	0	0	0	1
57	0	0	0	0	0	1
58	0	0	1	0	0	1
59	0	0	0	0	0	1
60	0	1	0	0	0	0
61	0	0	0	0	0	0
62	0	1	0	0	0	0
63	0	0	0	0	0	0
64	0	1	1	0	0	0
65	0	1	1	0	0	0
66	0	0	1	0	0	0
67	0	0	0	0	1	1
68	0	0	1	0	0	0
69	0	0	0	0	0	1
70	0	1	1	1	1	1
71	0	1	1	0	0	0
72	0	0	0	0	0	0
73	NA	NA	NA	NA	NA	NA
74	0	0	0	0	0	1

NOTE

`filter()` (and many other `tidyverse` functions) return a data frame. In the tidyverse, these are called `tibble()` and behave slightly different to regular data frames. For our purposes however, these differences are not important.

4.4 The pipe %>% for combining commands

The filtering using `filter()` is very useful, but you can see that the commands can become very long when you have many filters. Also, trying out many different filters to see what they do with the data can be cumbersome. This where `%>%` comes in really handy.

The "pipe" `%>%` (keyboard shortcut: `Ctrl+Shift+M`) simply passes the result of one function to the next function. For the next function, one does not have to specify the data frame. Let's see an example.

```
# this is how we filtered our data frame earlier
filter(be, OWS_egg == 1)
```

	species	family	range.size	conserv.europe	conserv.eu
1	Argynnis_paphia	Nymphalidae	1024	5	5
2	Aricia_cramera	Lycaenidae	138	5	5
3	Azanus_ubaldus	Lycaenidae	NA	NA	NA
4	Boloria_titania	Nymphalidae	141	4	5
5	Brenthis_daphne	Nymphalidae	323	5	5
6	Brenthis_hecate	Nymphalidae	190	5	5
7	Brenthis_ino	Nymphalidae	699	5	5
8	Catopsilia_florella	Pieridae	NA	NA	NA
9	Colias_palaeno	Pieridae	417	5	5
10	Cyclyrius_webbianus	Lycaenidae	NA	5	5
11	Danaus_chrysippus	Nymphalidae	38	NA	NA
12	Erebia_eriphyle	Nymphalidae	34	5	5
13	Erebia_euryale	Nymphalidae	203	5	5
14	Erebia_ligea	Nymphalidae	564	5	5
15	Erebia_manto	Nymphalidae	89	5	5
16	Fabriciana_adippe	Nymphalidae	888	5	5
17	Fabriciana_elisa	Nymphalidae	8	5	5
18	Fabriciana_niobe	Nymphalidae	646	5	4
19	Favonius_quercus	Lycaenidae	777	5	5
20	Gegenes_nostrodamus	Hesperiidae	65	5	5
21	Gonepteryx_cleobule	Pieridae	NA	3	3
22	Hesperia_comma	Hesperiidae	807	5	5
23	Issoria_lathonia	Nymphalidae	976	5	5
24	Laeosopis_roboris	Lycaenidae	82	5	5
25	Lampides_boeticus	Lycaenidae	361	5	5
26	Lycaena_hippothoe	Lycaenidae	689	5	4
27	Lysandra_albicans	Lycaenidae	40	5	5
28	Lysandra_coridon	Lycaenidae	575	4	4

29	Lysandra_hispana	Lycaenidae	50	5	5			
30	Muschampia_proto	Hesperiidae	88	5	5			
31	Pararge_xiphia	Nymphalidae	NA	2	2			
32	Pararge_xiphioides	Nymphalidae	NA	5	5			
33	Parnassius_apollo	Papilionidae	354	4	4			
34	Parnassius_mnemosyne	Papilionidae	371	4	5			
35	Parnassius_phoebus	Papilionidae	48	4	4			
36	Pieris_cheiranthi	Pieridae	NA	2	2			
37	Plebejus_argus	Lycaenidae	991	5	5			
38	Plebejus_argyrognomon	Lycaenidae	290	5	5			
39	Plebejus_idas	Lycaenidae	774	5	5			
40	Polyommatus_damon	Lycaenidae	163	4	4			
41	Polyommatus_daphnis	Lycaenidae	305	5	5			
42	Pyrgus_cirsii	Hesperiidae	94	3	3			
43	Satyrium_acaciae	Lycaenidae	349	5	5			
44	Satyrium_esculi	Lycaenidae	106	5	5			
45	Satyrium_ilicis	Lycaenidae	586	5	5			
46	Satyrium_ledereri	Lycaenidae	1	NA	NA			
47	Satyrium_pruni	Lycaenidae	408	5	5			
48	Satyrium_spini	Lycaenidae	483	5	5			
49	Satyrium_w-album	Lycaenidae	553	5	5			
50	Speyeria_aglaja	Nymphalidae	1132	5	5			
51	Thecla_betulae	Lycaenidae	628	5	5			
52	Thymelicus_lineola	Hesperiidae	926	5	5			
53	Vanessa_vulcania	Nymphalidae	NA	5	5			
54	Zizeeria_karsandra	Lycaenidae	NA	NA	NA			
55	Zizeeria_knysna	Lycaenidae	39	NA	NA			

	OWS_egg	OWS_larvae	OWS_pupae	OWS_adult	GEN_Average	GEN_Min	GEN_Max	GEN_Range
1	1	1	0	0	1.00	1.0	1.0	0.0
2	1	1	1	1	2.50	2.0	3.0	1.0
3	1	1	1	1	3.00	3.0	3.0	0.0
4	1	1	0	0	1.00	1.0	1.0	0.0
5	1	1	0	0	1.00	1.0	1.0	0.0
6	1	0	0	0	1.00	1.0	1.0	0.0
7	1	1	0	0	1.00	1.0	1.0	0.0
8	1	1	1	1	3.00	3.0	3.0	0.0
9	1	1	0	0	1.00	1.0	1.0	0.0
10	1	1	1	1	3.00	3.0	3.0	0.0
11	1	1	1	1	3.00	3.0	3.0	0.0
12	1	1	0	0	0.50	0.5	0.5	0.0
13	1	1	0	0	0.75	0.5	1.0	0.5
14	1	1	0	0	0.75	0.5	1.0	0.5
15	1	1	0	0	0.50	0.5	0.5	0.0

```
16       1          1          0          0       1.00     1.0     1.0       0.0
17       1          1          0          0       1.00     1.0     1.0       0.0
18       1          1          0          0       1.00     1.0     1.0       0.0
19       1          0          0          0       1.00     1.0     1.0       0.0
20       1          1          1          1       3.00     3.0     3.0       0.0
21       1          1          1          1       3.00     3.0     3.0       0.0
22       1          1          0          0       1.00     1.0     1.0       0.0
23       1          1          1          1       2.00     1.0     3.0       2.0
24       1          0          0          0       1.00     1.0     1.0       0.0
25       1          1          1          0       3.00     3.0     3.0       0.0
26       1          1          0          0       1.00     1.0     1.0       0.0
27       1          0          0          0       1.00     1.0     1.0       0.0
28       1          0          0          0       1.50     1.0     2.0       1.0
29       1          0          0          0       2.00     2.0     2.0       0.0
30       1          0          0          0       1.00     1.0     1.0       0.0
31       1          1          1          1       3.00     3.0     3.0       0.0
32       1          1          1          1       3.00     3.0     3.0       0.0
33       1          1          0          0       1.00     1.0     1.0       0.0
34       1          0          0          0       1.00     1.0     1.0       0.0
35       1          1          0          0       1.00     1.0     1.0       0.0
36       1          1          1          1       3.00     3.0     3.0       0.0
37       1          0          0          0       1.50     1.0     2.0       1.0
38       1          1          0          0       1.50     1.0     2.0       1.0
39       1          0          0          0       1.50     1.0     2.0       1.0
40       1          1          0          0       1.00     1.0     1.0       0.0
41       1          0          0          0       1.00     1.0     1.0       0.0
42       1          1          0          0       1.00     1.0     1.0       0.0
43       1          0          0          0       1.00     1.0     1.0       0.0
44       1          0          0          0       1.00     1.0     1.0       0.0
45       1          0          0          0       1.00     1.0     1.0       0.0
46       1          0          0          0       1.00     1.0     1.0       0.0
47       1          0          0          0       1.00     1.0     1.0       0.0
48       1          0          0          0       1.00     1.0     1.0       0.0
49       1          0          0          0       1.00     1.0     1.0       0.0
50       1          1          0          0       1.00     1.0     1.0       0.0
51       1          0          0          0       1.00     1.0     1.0       0.0
52       1          0          0          0       1.00     1.0     1.0       0.0
53       1          1          1          1       3.00     3.0     3.0       0.0
54       1          1          1          1       3.00     3.0     3.0       0.0
55       1          1          1          1       3.00     3.0     3.0       0.0
   WSP_Female_average WSP_Female_range   HSI LEV_buried LEV_ground_layer
1                62.0                8 0.258          0                0
2                25.0                6 0.112          0                1
```

3	12.5	5	0.577	0	0
4	39.5	9	0.500	0	0
5	47.0	10	0.447	0	0
6	40.0	8	0.408	0	0
7	37.0	8	0.204	0	1
8	50.0	10	NA	0	0
9	47.0	10	0.707	0	1
10	27.5	5	0.289	0	0
11	70.0	20	0.354	0	0
12	34.0	4	0.500	0	0
13	44.0	4	0.096	0	0
14	41.0	10	0.183	0	1
15	39.0	10	0.316	0	0
16	53.5	9	0.500	0	0
17	49.0	6	1.000	0	0
18	49.5	9	0.408	0	1
19	32.0	6	0.408	0	0
20	32.0	4	0.289	0	0
21	61.5	13	0.577	0	0
22	31.0	6	0.333	0	1
23	42.5	5	0.408	0	1
24	27.0	6	0.707	0	1
25	33.0	6	0.058	0	0
26	30.5	7	0.289	0	1
27	39.0	6	1.000	0	0
28	33.0	6	1.000	0	1
29	34.0	4	1.000	0	0
30	34.5	9	0.577	0	1
31	45.5	3	0.102	0	1
32	37.5	1	0.102	0	1
33	80.0	30	0.204	0	1
34	58.0	12	0.354	0	1
35	65.0	30	0.158	0	1
36	62.5	5	0.289	0	1
37	22.5	9	0.069	0	1
38	31.0	6	0.224	0	0
39	24.5	5	0.041	0	0
40	32.0	4	0.447	0	1
41	35.0	6	0.129	0	1
42	27.0	2	0.408	0	1
43	30.0	4	1.000	0	1
44	32.0	4	0.707	0	0
45	34.0	4	0.112	0	0

46	29.0	4	0.577	0	0
47	31.5	9	0.134	0	0
48	30.0	4	0.167	0	0
49	30.0	4	0.065	0	0
50	51.5	9	0.500	0	1
51	35.0	10	0.129	0	0
52	25.5	7	0.067	0	0
53	57.0	6	0.289	0	0
54	22.0	4	0.289	NA	NA
55	22.0	4	0.105	NA	NA

	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer	ELT_single	ELT_small_batch
1	1	0	0	1	0
2	1	0	0	1	0
3	0	1	0	1	1
4	1	0	0	1	0
5	0	1	0	1	0
6	1	0	0	1	0
7	1	0	0	1	1
8	0	1	1	1	1
9	1	0	0	1	0
10	1	0	0	0	1
11	1	0	0	NA	NA
12	1	0	0	NA	NA
13	1	0	0	1	0
14	1	0	0	1	0
15	1	0	0	1	0
16	1	0	0	1	0
17	1	0	0	1	0
18	1	0	0	1	0
19	0	0	1	1	0
20	1	0	0	1	0
21	0	1	1	1	0
22	1	0	0	1	0
23	1	0	0	1	0
24	0	0	1	1	0
25	1	0	0	1	0
26	1	0	0	1	0
27	1	0	0	NA	NA
28	0	0	0	1	0
29	1	0	0	1	0
30	1	0	0	1	0
31	1	0	0	1	0
32	1	0	0	1	0

33	0	0	0	1	1
34	0	0	0	1	0
35	1	0	0	1	0
36	1	1	0	0	1
37	1	0	0	1	0
38	1	0	0	1	0
39	1	0	0	1	0
40	0	0	0	1	0
41	1	0	0	1	0
42	1	0	0	1	0
43	0	1	0	1	0
44	0	1	1	1	0
45	0	1	0	1	0
46	0	1	0	1	0
47	0	1	0	1	0
48	0	1	0	1	1
49	0	1	1	1	0
50	1	0	0	1	0
51	0	1	0	1	0
52	1	0	0	0	1
53	1	0	0	1	0
54	NA	NA	NA	NA	NA
55	NA	NA	NA	NA	NA

	ELT_large_batch	ALT_Min	ALT_Range	FM_Average	FM_Range	AFB_herb.flower
1	0	0	2300	4.0	2	1
2	0	0	2500	9.5	5	1
3	0	0	1500	NA	NA	0
4	0	100	2000	3.0	0	1
5	0	0	2300	3.5	1	1
6	0	25	2275	3.0	0	1
7	0	0	2000	2.5	1	1
8	0	0	2000	11.0	2	NA
9	0	0	2500	3.0	0	1
10	0	200	3300	NA	NA	1
11	NA	0	1100	10.5	3	1
12	NA	1200	1050	3.0	0	1
13	0	600	1900	3.0	2	1
14	0	0	2500	3.0	2	1
15	0	900	1600	3.0	0	1
16	0	0	2300	3.5	3	1
17	0	400	1600	3.0	0	1
18	0	0	2500	2.5	3	1
19	0	0	2000	5.0	2	0

20	0	0	1900	9.0	0	1
21	0	300	1700	4.0	4	1
22	0	0	2200	3.5	3	1
23	0	0	2750	7.0	6	1
24	0	100	1500	3.0	0	1
25	0	0	2700	9.0	0	1
26	0	0	2500	4.5	1	1
27	NA	500	1000	3.0	0	1
28	0	100	2400	3.0	0	1
29	0	100	900	7.0	0	1
30	0	0	2000	4.0	2	1
31	0	0	1000	12.0	0	0
32	0	0	2000	12.0	0	0
33	0	0	3000	4.5	1	1
34	0	0	2500	3.0	0	1
35	0	1600	1200	3.0	0	1
36	1	200	1200	12.0	0	1
37	0	0	2400	4.0	0	1
38	0	300	1400	4.0	0	1
39	0	100	2300	5.0	0	1
40	0	600	1800	2.0	0	1
41	0	200	1800	3.0	0	1
42	0	0	1000	3.0	2	1
43	0	0	2000	3.0	2	1
44	0	100	1200	4.0	0	1
45	0	0	1800	4.0	0	0
46	0	600	1900	3.5	3	1
47	0	100	600	3.0	0	1
48	0	0	2000	3.5	1	1
49	0	0	1700	3.0	0	1
50	0	0	2500	3.5	3	1
51	0	0	1600	4.5	1	1
52	1	0	2500	3.5	3	1
53	0	0	1500	12.0	0	1
54	NA	0	1500	NA	NA	NA
55	NA	0	800	9.0	0	1

	AFB_grass	AFB_shrub_flower	AFB_honeydew	AFB_sap	AFB_animal	AFB_mineral
1	0	1	1	0	0	1
2	0	0	0	0	0	1
3	0	1	0	0	0	0
4	0	0	0	0	0	0
5	0	1	0	0	0	0
6	0	0	0	0	0	0

7	0	1	0	0	0	0
8	NA	NA	NA	NA	NA	NA
9	0	1	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	1
15	0	0	0	0	0	0
16	0	1	0	0	0	1
17	0	0	0	0	0	0
18	0	0	0	0	0	0
19	0	0	1	0	1	1
20	0	0	0	0	0	1
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	1
24	0	0	0	0	0	0
25	0	0	0	0	0	0
26	0	0	0	0	0	0
27	0	0	0	0	0	1
28	0	0	0	0	1	1
29	0	0	0	0	0	1
30	0	0	0	0	0	1
31	0	1	1	1	0	0
32	0	1	1	1	0	0
33	0	0	0	0	0	0
34	0	0	0	0	0	0
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	1	1
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	1
41	0	0	0	0	0	1
42	0	0	0	0	0	1
43	0	1	0	0	0	0
44	0	0	0	0	0	0
45	0	1	0	0	0	0
46	0	0	0	0	0	0
47	0	1	1	0	0	0
48	0	1	1	0	0	0
49	0	0	1	0	0	0

50	0	0	0	0	1	1
51	0	0	1	0	0	0
52	0	0	0	0	0	1
53	0	0	0	0	0	0
54	NA	NA	NA	NA	NA	NA
55	0	0	0	0	0	1

```
# same command, this time using the pipe
be %>%
  filter(OWS_egg == 1)
```

	species	family	range.size	conserv.europe	conserv.eu
1	Argynnis_paphia	Nymphalidae	1024	5	5
2	Aricia_cramera	Lycaenidae	138	5	5
3	Azanus_ubaldus	Lycaenidae	NA	NA	NA
4	Boloria_titania	Nymphalidae	141	4	5
5	Brenthis_daphne	Nymphalidae	323	5	5
6	Brenthis_hecate	Nymphalidae	190	5	5
7	Brenthis_ino	Nymphalidae	699	5	5
8	Catopsilia_florella	Pieridae	NA	NA	NA
9	Colias_palaeno	Pieridae	417	5	5
10	Cyclyrius_webbianus	Lycaenidae	NA	5	5
11	Danaus_chrysippus	Nymphalidae	38	NA	NA
12	Erebia_eriphyle	Nymphalidae	34	5	5
13	Erebia_euryale	Nymphalidae	203	5	5
14	Erebia_ligea	Nymphalidae	564	5	5
15	Erebia_manto	Nymphalidae	89	5	5
16	Fabriciana_adippe	Nymphalidae	888	5	5
17	Fabriciana_elisa	Nymphalidae	8	5	5
18	Fabriciana_niobe	Nymphalidae	646	5	4
19	Favonius_quercus	Lycaenidae	777	5	5
20	Gegenes_nostrodamus	Hesperiidae	65	5	5
21	Gonepteryx_cleobule	Pieridae	NA	3	3
22	Hesperia_comma	Hesperiidae	807	5	5
23	Issoria_lathonia	Nymphalidae	976	5	5
24	Laeosopis_roboris	Lycaenidae	82	5	5
25	Lampides_boeticus	Lycaenidae	361	5	5
26	Lycaena_hippothoe	Lycaenidae	689	5	4
27	Lysandra_albicans	Lycaenidae	40	5	5
28	Lysandra_coridon	Lycaenidae	575	4	4
29	Lysandra_hispana	Lycaenidae	50	5	5
30	Muschampia_proto	Hesperiidae	88	5	5

31	Pararge_xiphia	Nymphalidae	NA	2	2			
32	Pararge_xiphioides	Nymphalidae	NA	5	5			
33	Parnassius_apollo	Papilionidae	354	4	4			
34	Parnassius_mnemosyne	Papilionidae	371	4	5			
35	Parnassius_phoebus	Papilionidae	48	4	4			
36	Pieris_cheiranthi	Pieridae	NA	2	2			
37	Plebejus_argus	Lycaenidae	991	5	5			
38	Plebejus_argyrognomon	Lycaenidae	290	5	5			
39	Plebejus_idas	Lycaenidae	774	5	5			
40	Polyommatus_damon	Lycaenidae	163	4	4			
41	Polyommatus_daphnis	Lycaenidae	305	5	5			
42	Pyrgus_cirsii	Hesperiidae	94	3	3			
43	Satyrium_acaciae	Lycaenidae	349	5	5			
44	Satyrium_esculi	Lycaenidae	106	5	5			
45	Satyrium_ilicis	Lycaenidae	586	5	5			
46	Satyrium_ledereri	Lycaenidae	1	NA	NA			
47	Satyrium_pruni	Lycaenidae	408	5	5			
48	Satyrium_spini	Lycaenidae	483	5	5			
49	Satyrium_w-album	Lycaenidae	553	5	5			
50	Speyeria_aglaja	Nymphalidae	1132	5	5			
51	Thecla_betulae	Lycaenidae	628	5	5			
52	Thymelicus_lineola	Hesperiidae	926	5	5			
53	Vanessa_vulcania	Nymphalidae	NA	5	5			
54	Zizeeria_karsandra	Lycaenidae	NA	NA	NA			
55	Zizeeria_knysna	Lycaenidae	39	NA	NA			

	OWS_egg	OWS_larvae	OWS_pupae	OWS_adult	GEN_Average	GEN_Min	GEN_Max	GEN_Range
1	1	1	0	0	1.00	1.0	1.0	0.0
2	1	1	1	1	2.50	2.0	3.0	1.0
3	1	1	1	1	3.00	3.0	3.0	0.0
4	1	1	0	0	1.00	1.0	1.0	0.0
5	1	1	0	0	1.00	1.0	1.0	0.0
6	1	0	0	0	1.00	1.0	1.0	0.0
7	1	1	0	0	1.00	1.0	1.0	0.0
8	1	1	1	1	3.00	3.0	3.0	0.0
9	1	1	0	0	1.00	1.0	1.0	0.0
10	1	1	1	1	3.00	3.0	3.0	0.0
11	1	1	1	1	3.00	3.0	3.0	0.0
12	1	1	0	0	0.50	0.5	0.5	0.0
13	1	1	0	0	0.75	0.5	1.0	0.5
14	1	1	0	0	0.75	0.5	1.0	0.5
15	1	1	0	0	0.50	0.5	0.5	0.0
16	1	1	0	0	1.00	1.0	1.0	0.0
17	1	1	0	0	1.00	1.0	1.0	0.0

18	1	1	0	0	1.00	1.0	1.0	0.0
19	1	0	0	0	1.00	1.0	1.0	0.0
20	1	1	1	1	3.00	3.0	3.0	0.0
21	1	1	1	1	3.00	3.0	3.0	0.0
22	1	1	0	0	1.00	1.0	1.0	0.0
23	1	1	1	1	2.00	1.0	3.0	2.0
24	1	0	0	0	1.00	1.0	1.0	0.0
25	1	1	1	0	3.00	3.0	3.0	0.0
26	1	1	0	0	1.00	1.0	1.0	0.0
27	1	0	0	0	1.00	1.0	1.0	0.0
28	1	0	0	0	1.50	1.0	2.0	1.0
29	1	0	0	0	2.00	2.0	2.0	0.0
30	1	0	0	0	1.00	1.0	1.0	0.0
31	1	1	1	1	3.00	3.0	3.0	0.0
32	1	1	1	1	3.00	3.0	3.0	0.0
33	1	1	0	0	1.00	1.0	1.0	0.0
34	1	0	0	0	1.00	1.0	1.0	0.0
35	1	1	0	0	1.00	1.0	1.0	0.0
36	1	1	1	1	3.00	3.0	3.0	0.0
37	1	0	0	0	1.50	1.0	2.0	1.0
38	1	1	0	0	1.50	1.0	2.0	1.0
39	1	0	0	0	1.50	1.0	2.0	1.0
40	1	1	0	0	1.00	1.0	1.0	0.0
41	1	0	0	0	1.00	1.0	1.0	0.0
42	1	1	0	0	1.00	1.0	1.0	0.0
43	1	0	0	0	1.00	1.0	1.0	0.0
44	1	0	0	0	1.00	1.0	1.0	0.0
45	1	0	0	0	1.00	1.0	1.0	0.0
46	1	0	0	0	1.00	1.0	1.0	0.0
47	1	0	0	0	1.00	1.0	1.0	0.0
48	1	0	0	0	1.00	1.0	1.0	0.0
49	1	0	0	0	1.00	1.0	1.0	0.0
50	1	1	0	0	1.00	1.0	1.0	0.0
51	1	0	0	0	1.00	1.0	1.0	0.0
52	1	0	0	0	1.00	1.0	1.0	0.0
53	1	1	1	1	3.00	3.0	3.0	0.0
54	1	1	1	1	3.00	3.0	3.0	0.0
55	1	1	1	1	3.00	3.0	3.0	0.0

	WSP_Female_average	WSP_Female_range	HSI	LEV_buried	LEV_ground_layer
1	62.0	8	0.258	0	0
2	25.0	6	0.112	0	1
3	12.5	5	0.577	0	0
4	39.5	9	0.500	0	0

5	47.0	10	0.447	0	0
6	40.0	8	0.408	0	0
7	37.0	8	0.204	0	1
8	50.0	10	NA	0	0
9	47.0	10	0.707	0	1
10	27.5	5	0.289	0	0
11	70.0	20	0.354	0	0
12	34.0	4	0.500	0	0
13	44.0	4	0.096	0	0
14	41.0	10	0.183	0	1
15	39.0	10	0.316	0	0
16	53.5	9	0.500	0	0
17	49.0	6	1.000	0	0
18	49.5	9	0.408	0	1
19	32.0	6	0.408	0	0
20	32.0	4	0.289	0	0
21	61.5	13	0.577	0	0
22	31.0	6	0.333	0	1
23	42.5	5	0.408	0	1
24	27.0	6	0.707	0	1
25	33.0	6	0.058	0	0
26	30.5	7	0.289	0	1
27	39.0	6	1.000	0	0
28	33.0	6	1.000	0	1
29	34.0	4	1.000	0	0
30	34.5	9	0.577	0	1
31	45.5	3	0.102	0	1
32	37.5	1	0.102	0	1
33	80.0	30	0.204	0	1
34	58.0	12	0.354	0	1
35	65.0	30	0.158	0	1
36	62.5	5	0.289	0	1
37	22.5	9	0.069	0	1
38	31.0	6	0.224	0	0
39	24.5	5	0.041	0	0
40	32.0	4	0.447	0	1
41	35.0	6	0.129	0	1
42	27.0	2	0.408	0	1
43	30.0	4	1.000	0	1
44	32.0	4	0.707	0	0
45	34.0	4	0.112	0	0
46	29.0	4	0.577	0	0
47	31.5	9	0.134	0	0

48	30.0	4	0.167	0	0
49	30.0	4	0.065	0	0
50	51.5	9	0.500	0	1
51	35.0	10	0.129	0	0
52	25.5	7	0.067	0	0
53	57.0	6	0.289	0	0
54	22.0	4	0.289	NA	NA
55	22.0	4	0.105	NA	NA

	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer	ELT_single	ELT_small_batch
1	1	0	0	1	0
2	1	0	0	1	0
3	0	1	0	1	1
4	1	0	0	1	0
5	0	1	0	1	0
6	1	0	0	1	0
7	1	0	0	1	1
8	0	1	1	1	1
9	1	0	0	1	0
10	1	0	0	0	1
11	1	0	0	NA	NA
12	1	0	0	NA	NA
13	1	0	0	1	0
14	1	0	0	1	0
15	1	0	0	1	0
16	1	0	0	1	0
17	1	0	0	1	0
18	1	0	0	1	0
19	0	0	1	1	0
20	1	0	0	1	0
21	0	1	1	1	0
22	1	0	0	1	0
23	1	0	0	1	0
24	0	0	1	1	0
25	1	0	0	1	0
26	1	0	0	1	0
27	1	0	0	NA	NA
28	0	0	0	1	0
29	1	0	0	1	0
30	1	0	0	1	0
31	1	0	0	1	0
32	1	0	0	1	0
33	0	0	0	1	1
34	0	0	0	1	0

35	1	0	0	1	0
36	1	1	0	0	1
37	1	0	0	1	0
38	1	0	0	1	0
39	1	0	0	1	0
40	0	0	0	1	0
41	1	0	0	1	0
42	1	0	0	1	0
43	0	1	0	1	0
44	0	1	1	1	0
45	0	1	0	1	0
46	0	1	0	1	0
47	0	1	0	1	0
48	0	1	0	1	1
49	0	1	1	1	0
50	1	0	0	1	0
51	0	1	0	1	0
52	1	0	0	0	1
53	1	0	0	1	0
54	NA	NA	NA	NA	NA
55	NA	NA	NA	NA	NA

	ELT_large_batch	ALT_Min	ALT_Range	FM_Average	FM_Range	AFB_herb.flower
1	0	0	2300	4.0	2	1
2	0	0	2500	9.5	5	1
3	0	0	1500	NA	NA	0
4	0	100	2000	3.0	0	1
5	0	0	2300	3.5	1	1
6	0	25	2275	3.0	0	1
7	0	0	2000	2.5	1	1
8	0	0	2000	11.0	2	NA
9	0	0	2500	3.0	0	1
10	0	200	3300	NA	NA	1
11	NA	0	1100	10.5	3	1
12	NA	1200	1050	3.0	0	1
13	0	600	1900	3.0	2	1
14	0	0	2500	3.0	2	1
15	0	900	1600	3.0	0	1
16	0	0	2300	3.5	3	1
17	0	400	1600	3.0	0	1
18	0	0	2500	2.5	3	1
19	0	0	2000	5.0	2	0
20	0	0	1900	9.0	0	1
21	0	300	1700	4.0	4	1

22	0	0	2200	3.5	3	1
23	0	0	2750	7.0	6	1
24	0	100	1500	3.0	0	1
25	0	0	2700	9.0	0	1
26	0	0	2500	4.5	1	1
27	NA	500	1000	3.0	0	1
28	0	100	2400	3.0	0	1
29	0	100	900	7.0	0	1
30	0	0	2000	4.0	2	1
31	0	0	1000	12.0	0	0
32	0	0	2000	12.0	0	0
33	0	0	3000	4.5	1	1
34	0	0	2500	3.0	0	1
35	0	1600	1200	3.0	0	1
36	1	200	1200	12.0	0	1
37	0	0	2400	4.0	0	1
38	0	300	1400	4.0	0	1
39	0	100	2300	5.0	0	1
40	0	600	1800	2.0	0	1
41	0	200	1800	3.0	0	1
42	0	0	1000	3.0	2	1
43	0	0	2000	3.0	2	1
44	0	100	1200	4.0	0	1
45	0	0	1800	4.0	0	0
46	0	600	1900	3.5	3	1
47	0	100	600	3.0	0	1
48	0	0	2000	3.5	1	1
49	0	0	1700	3.0	0	1
50	0	0	2500	3.5	3	1
51	0	0	1600	4.5	1	1
52	1	0	2500	3.5	3	1
53	0	0	1500	12.0	0	1
54	NA	0	1500	NA	NA	NA
55	NA	0	800	9.0	0	1

	AFB_grass	AFB_shrub_flower	AFB_honeydew	AFB_sap	AFB_animal	AFB_mineral
1	0	1	1	0	0	1
2	0	0	0	0	0	1
3	0	1	0	0	0	0
4	0	0	0	0	0	0
5	0	1	0	0	0	0
6	0	0	0	0	0	0
7	0	1	0	0	0	0
8	NA	NA	NA	NA	NA	NA

9	0	1	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	1
15	0	0	0	0	0	0
16	0	1	0	0	0	1
17	0	0	0	0	0	0
18	0	0	0	0	0	0
19	0	0	1	0	1	1
20	0	0	0	0	0	1
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	1
24	0	0	0	0	0	0
25	0	0	0	0	0	0
26	0	0	0	0	0	0
27	0	0	0	0	0	1
28	0	0	0	0	1	1
29	0	0	0	0	0	1
30	0	0	0	0	0	1
31	0	1	1	1	0	0
32	0	1	1	1	0	0
33	0	0	0	0	0	0
34	0	0	0	0	0	0
35	0	0	0	0	0	0
36	0	0	0	0	0	0
37	0	0	0	0	1	1
38	0	0	0	0	0	0
39	0	0	0	0	0	0
40	0	0	0	0	0	1
41	0	0	0	0	0	1
42	0	0	0	0	0	1
43	0	1	0	0	0	0
44	0	0	0	0	0	0
45	0	1	0	0	0	0
46	0	0	0	0	0	0
47	0	1	1	0	0	0
48	0	1	1	0	0	0
49	0	0	1	0	0	0
50	0	0	0	0	1	1
51	0	0	1	0	0	0

```
52          0                0             0       0          0           1
53          0                0             0       0          0           0
54         NA               NA            NA      NA         NA          NA
55          0                0             0       0          0           1
```

Note how in the second command, the output of `be` (which is our data frame) gets passed on to the `filter()` command. There, you don't have to specify the name of the data frame again. The result of this can be piped further to other commands:

```
# Multiple filters are connected by pipes
be %>%
  filter(OWS_egg == 1) %>%
  filter(LEV_ground_layer == 1) %>%
  filter(AFB_honeydew == 1)
```

```
             species      family range.size conserv.europe conserv.eu OWS_egg
1     Pararge_xiphia Nymphalidae         NA              2          2       1
2 Pararge_xiphioides Nymphalidae         NA              5          5       1
  OWS_larvae OWS_pupae OWS_adult GEN_Average GEN_Min GEN_Max GEN_Range
1          1         1         1           3       3       3         0
2          1         1         1           3       3       3         0
  WSP_Female_average WSP_Female_range   HSI LEV_buried LEV_ground_layer
1               45.5                3 0.102          0                1
2               37.5                1 0.102          0                1
  LEV_field_layer LEV_shrub_layer LEV_canopy_layer ELT_single ELT_small_batch
1               1               0                0          1               0
2               1               0                0          1               0
  ELT_large_batch ALT_Min ALT_Range FM_Average FM_Range AFB_herb.flower
1               0       0      1000         12        0               0
2               0       0      2000         12        0               0
  AFB_grass AFB_shrub_flower AFB_honeydew AFB_sap AFB_animal AFB_mineral
1         0                1            1       1          0           0
2         0                1            1       1          0           0
```

```
# As always in R, assign the result to a new variable using "<-"
be_filtered <- be %>%
  filter(OWS_egg == 1) %>%
  filter(LEV_ground_layer == 1) %>%
  filter(AFB_honeydew == 1)
```

Note how easy this command is to read (you could write it in a single line, but it's much easier to follow with line breaks)! The usefulness of the pipe will become more obvious when

we combine multiple different commands. In all the following examples, I will always use the pipe.

4.5 Sort by column with `arrange()`

This doesn't change the dataframe itself, it simply orders the columns (similar to the sort function in Excel):

```
# sort by age (ascending) and weight (descending)
be %>%
  arrange(conserv.eu, -range.size)
```

	species	family	range.size	conserv.europe
1	Tomares_nogelii	Lycaenidae	2	3
2	Colias_myrmidone	Pieridae	94	2
3	Phengaris_arion	Lycaenidae	522	2
4	Leptidea_morsei	Pieridae	49	4
5	Boloria_improba	Nymphalidae	6	2
6	Turanana_taygetica	Lycaenidae	3	2
7	Agriades_zullichi	Lycaenidae	2	2
8	Polyommatus_humedasae	Lycaenidae	2	2
9	Gonepteryx_maderensis	Pieridae	NA	2
10	Pararge_xiphia	Nymphalidae	NA	2
11	Pieris_cheiranthi	Pieridae	NA	2
12	Nymphalis_polychloros	Nymphalidae	845	5
13	Lopinga_achine	Nymphalidae	275	3
14	Phengaris_teleius	Lycaenidae	252	3
15	Coenonympha_hero	Nymphalidae	173	3
16	Pyrgus_cirsii	Hesperiidae	94	3
17	Colias_chrysotheme	Pieridae	36	3
18	Boloria_polaris	Nymphalidae	18	3
19	Erebia_sudetica	Nymphalidae	13	3
20	Polyommatus_orphicus	Lycaenidae	9	3
21	Euchloe_bazae	Pieridae	5	3
22	Polyommatus_golgus	Lycaenidae	3	3
23	Polyommatus_violetae	Lycaenidae	3	3
24	Erebia_christi	Nymphalidae	1	3
25	Pseudochazara_orestes	Nymphalidae	1	3
26	Gonepteryx_cleobule	Pieridae	NA	3
27	Hipparchia_bacchus	Nymphalidae	NA	3

28	Hipparchia_tilosi	Nymphalidae	NA	3
29	Pseudochazara_amymone	Nymphalidae	NA	3
30	Lycaena_hippothoe	Lycaenidae	689	5
31	Fabriciana_niobe	Nymphalidae	646	5
32	Lysandra_coridon	Lycaenidae	575	4
33	Limenitis_populi	Nymphalidae	529	5
34	Lycaena_alciphron	Lycaenidae	519	5
35	Thymelicus_acteon	Hesperiidae	496	4
36	Melitaea_diamina	Nymphalidae	461	5
37	Hipparchia_statilinus	Nymphalidae	360	4
38	Parnassius_apollo	Papilionidae	354	4
39	Phengaris_alcon	Lycaenidae	354	5
40	Chazara_briseis	Nymphalidae	353	4
41	Polyommatus_dorylas	Lycaenidae	330	4
42	Pyrgus_serratulae	Hesperiidae	318	5
43	Hipparchia_fagi	Nymphalidae	309	4
44	Melitaea_trivia	Nymphalidae	260	5
45	Scolitantides_orion	Lycaenidae	260	5
46	Hipparchia_hermione	Nymphalidae	237	4
47	Pseudophilotes_vicrama	Lycaenidae	212	4
48	Phengaris_nausithous	Lycaenidae	188	4
49	Polyommatus_damon	Lycaenidae	163	4
50	Carcharodus_lavatherae	Hesperiidae	146	4
51	Nymphalis_xanthomelas	Nymphalidae	113	5
52	Iolana_iolas	Lycaenidae	102	4
53	Argynnis_laodice	Nymphalidae	100	5
54	Melitaea_britomartis	Nymphalidae	99	4
55	Polyommatus_eros	Lycaenidae	88	4
56	Colias_phicomone	Pieridae	83	4
57	Zerynthia_cerisy	Papilionidae	61	4
58	Polyommatus_ripartii	Lycaenidae	59	5
59	Oeneis_norna	Nymphalidae	54	4
60	Parnassius_phoebus	Papilionidae	48	4
61	Euphydryas_desfontainii	Nymphalidae	41	4
62	Pseudophilotes_panoptes	Lycaenidae	41	4
63	Zegris_eupheme	Pieridae	36	4
64	Polyommatus_nivescens	Lycaenidae	26	4
65	Colias_hecla	Pieridae	24	4
66	Erebia_epistygne	Nymphalidae	24	4
67	Euphydryas_iduna	Nymphalidae	24	4
68	Boloria_chariclea	Nymphalidae	22	4
69	Erebia_claudina	Nymphalidae	8	4
70	Muschampia_cribrellum	Hesperiidae	7	4

71	Erebia_flavofasciata	Nymphalidae	5	4
72	Agriades_dardanus	Lycaenidae	2	4
73	Hipparchia_leighebi	Nymphalidae	1	4
74	Hipparchia_sbordonii	Nymphalidae	NA	4
75	Maniola_halicarnassus	Nymphalidae	NA	4
76	Polyommatus_nephohiptamenos	Lycaenidae	NA	4
77	Polyommatus_icarus	Lycaenidae	1476	5
78	Pieris_napi	Pieridae	1405	5
79	Vanessa_cardui	Nymphalidae	1373	5
80	Coenonympha_pamphilus	Nymphalidae	1371	5
81	Pieris_rapae	Pieridae	1363	5
82	Pieris_brassicae	Pieridae	1353	5
83	Vanessa_atalanta	Nymphalidae	1343	5
84	Lycaena_phlaeas	Lycaenidae	1340	5
85	Maniola_jurtina	Nymphalidae	1289	5
86	Aglais_urticae	Nymphalidae	1271	5
87	Anthocharis_cardamines	Pieridae	1245	5
88	Papilio_machaon	Papilionidae	1224	5
89	Callophrys_rubi	Lycaenidae	1192	5
90	Celastrina_argiolus	Lycaenidae	1190	5
91	Pararge_aegeria	Nymphalidae	1178	5
92	Gonepteryx_rhamni	Pieridae	1177	5
93	Aglais_io	Nymphalidae	1136	5
94	Speyeria_aglaja	Nymphalidae	1132	5
95	Polygonia_c-album	Nymphalidae	1098	5
96	Leptidea_sinapis	Pieridae	1089	5
97	Ochlodes_sylvanus	Hesperiidae	1058	5
98	Lasiommata_megera	Nymphalidae	1053	5
99	Colias_crocea	Pieridae	1028	5
100	Argynnis_paphia	Nymphalidae	1024	5
101	Melitaea_athalia	Nymphalidae	1011	5
102	Aphantopus_hyperantus	Nymphalidae	1002	5
103	Boloria_selene	Nymphalidae	998	5
104	Plebejus_argus	Lycaenidae	991	5
105	Issoria_lathonia	Nymphalidae	976	5
106	Boloria_euphrosyne	Nymphalidae	963	5
107	Pyrgus_malvae	Hesperiidae	959	5
108	Cyaniris_semiargus	Lycaenidae	930	5
109	Thymelicus_lineola	Hesperiidae	926	5
110	Pontia_daplidice	Pieridae	921	5
111	Nymphalis_antiopa	Nymphalidae	910	5
112	Aporia_crataegi	Pieridae	894	5
113	Fabriciana_adippe	Nymphalidae	888	5

114	Lasiommata_maera	Nymphalidae	888	5
115	Erynnis_tages	Hesperiidae	842	5
116	Thymelicus_sylvestris	Hesperiidae	832	5
117	Hipparchia_semele	Nymphalidae	814	5
118	Hesperia_comma	Hesperiidae	807	5
119	Melanargia_galathea	Nymphalidae	802	5
120	Favonius_quercus	Lycaenidae	777	5
121	Plebejus_idas	Lycaenidae	774	5
122	Lycaena_virgaureae	Lycaenidae	756	5
123	Iphiclides_podalirius	Papilionidae	755	5
124	Cupido_minimus	Lycaenidae	753	5
125	Coenonympha_arcania	Nymphalidae	736	5
126	Aricia_agestis	Lycaenidae	700	5
127	Brenthis_ino	Nymphalidae	699	5
128	Colias_hyale	Pieridae	682	5
129	Lycaena_tityrus	Lycaenidae	673	5
130	Melitaea_cinxia	Nymphalidae	673	5
131	Thecla_betulae	Lycaenidae	628	5
132	Araschnia_levana	Nymphalidae	626	5
133	Melitaea_didyma	Nymphalidae	621	5
134	Carcharodus_alceae	Hesperiidae	615	5
135	Glaucopsyche_alexis	Lycaenidae	609	5
136	Lysandra_bellargus	Lycaenidae	601	5
137	Satyrium_ilicis	Lycaenidae	586	5
138	Carterocephalus_palaemon	Hesperiidae	585	5
139	Coenonympha_glycerion	Nymphalidae	574	5
140	Apatura_iris	Nymphalidae	571	5
141	Erebia_ligea	Nymphalidae	564	5
142	Boloria_dia	Nymphalidae	554	5
143	Coenonympha_tullia	Nymphalidae	553	5
144	Satyrium_w-album	Lycaenidae	553	5
145	Polyommatus_amandus	Lycaenidae	544	5
146	Euphydryas_aurinia	Nymphalidae	538	5
147	Apatura_ilia	Nymphalidae	528	5
148	Limenitis_camilla	Nymphalidae	526	5
149	Melitaea_phoebe	Nymphalidae	521	5
150	Pyronia_tithonus	Nymphalidae	515	5
151	Hamearis_lucina	Riodinidae	497	5
152	Colias_alfacariensis	Pieridae	494	5
153	Satyrium_spini	Lycaenidae	483	5
154	Agriades_optilete	Lycaenidae	480	5
155	Boloria_aquilonaris	Nymphalidae	478	5
156	Cupido_argiades	Lycaenidae	478	5

157	Pyrgus_alveus	Hesperiidae	476	5
158	Eumedonia_eumedon	Lycaenidae	441	5
159	Aricia_artaxerxes	Lycaenidae	435	5
160	Colias_palaeno	Pieridae	417	5
161	Brintesia_circe	Nymphalidae	416	5
162	Limenitis_reducta	Nymphalidae	410	5
163	Satyrium_pruni	Lycaenidae	408	5
164	Lycaena_dispar	Lycaenidae	383	5
165	Spialia_sertorius	Hesperiidae	380	5
166	Parnassius_mnemosyne	Papilionidae	371	4
167	Hyponephele_lycaon	Nymphalidae	365	5
168	Erebia_medusa	Nymphalidae	361	5
169	Lampides_boeticus	Lycaenidae	361	5
170	Euchloe_ausonia	Pieridae	352	5
171	Lasiommata_petropolitana	Nymphalidae	352	5
172	Polyommatus_thersites	Lycaenidae	351	5
173	Satyrium_acaciae	Lycaenidae	349	5
174	Erebia_aethiops	Nymphalidae	326	5
175	Brenthis_daphne	Nymphalidae	323	5
176	Argynnis_pandora	Nymphalidae	320	5
177	Boloria_eunomia	Nymphalidae	311	5
178	Pyrgus_armoricanus	Hesperiidae	311	5
179	Polyommatus_daphnis	Lycaenidae	305	5
180	Gonepteryx_cleopatra	Pieridae	303	5
181	Plebejus_argyrognomon	Lycaenidae	290	5
182	Leptotes_pirithous	Lycaenidae	287	5
183	Carcharodus_floccifera	Hesperiidae	277	4
184	Heteropterus_morpheus	Hesperiidae	270	5
185	Melitaea_aurelia	Nymphalidae	268	4
186	Pyrgus_carthami	Hesperiidae	264	5
187	Arethusana_arethusa	Nymphalidae	229	5
188	Carterocephalus_silvicola	Hesperiidae	222	5
189	Pseudophilotes_baton	Lycaenidae	222	5
190	Pyronia_cecilia	Nymphalidae	219	5
191	Zerynthia_polyxena	Papilionidae	215	5
192	Euphydryas_maturna	Nymphalidae	210	3
193	Erebia_euryale	Nymphalidae	203	5
194	Pieris_mannii	Pieridae	203	5
195	Lycaena_thersamon	Lycaenidae	199	5
196	Euchloe_crameri	Pieridae	197	5
197	Erebia_pandrose	Nymphalidae	194	5
198	Brenthis_hecate	Nymphalidae	190	5
199	Libythea_celtis	Nymphalidae	181	5

200	Melitaea_parthenoides	Nymphalidae	172	5
201	Polyommatus_escheri	Lycaenidae	167	5
202	Oeneis_jutta	Nymphalidae	166	5
203	Pyrgus_centaureae	Hesperiidae	162	5
204	Polygonia_egea	Nymphalidae	158	5
205	Neptis_rivularis	Nymphalidae	150	5
206	Lycaena_helle	Lycaenidae	148	2
207	Cupido_alcetas	Lycaenidae	146	5
208	Boloria_frigga	Nymphalidae	145	5
209	Boloria_freija	Nymphalidae	144	5
210	Satyrus_ferula	Nymphalidae	144	5
211	Hyponephele_lupina	Nymphalidae	143	5
212	Boloria_titania	Nymphalidae	141	4
213	Erebia_meolans	Nymphalidae	139	5
214	Aricia_cramera	Lycaenidae	138	5
215	Colias_erate	Pieridae	138	5
216	Erebia_epiphron	Nymphalidae	137	5
217	Anthocharis_euphenoides	Pieridae	131	5
218	Cupido_osiris	Lycaenidae	131	5
219	Spialia_orbifer	Hesperiidae	129	5
220	Zerynthia_rumina	Papilionidae	128	5
221	Charaxes_jasius	Nymphalidae	127	5
222	Pieris_ergane	Pieridae	125	5
223	Erebia_embla	Nymphalidae	123	5
224	Pieris_bryoniae	Pieridae	114	5
225	Boloria_napaea	Nymphalidae	112	5
226	Melanargia_lachesis	Nymphalidae	111	5
227	Melanargia_russiae	Nymphalidae	111	5
228	Melitaea_deione	Nymphalidae	108	5
229	Coenonympha_dorus	Nymphalidae	107	5
230	Satyrium_esculi	Lycaenidae	106	5
231	Pyrgus_onopordi	Hesperiidae	105	5
232	Neptis_sappho	Nymphalidae	104	5
233	Pyronia_bathseba	Nymphalidae	104	5
234	Glaucopsyche_melanops	Lycaenidae	103	5
235	Boloria_pales	Nymphalidae	101	5
236	Erebia_gorge	Nymphalidae	92	5
237	Hipparchia_fidia	Nymphalidae	92	5
238	Erebia_manto	Nymphalidae	89	5
239	Erebia_oeme	Nymphalidae	89	5
240	Muschampia_proto	Hesperiidae	88	5
241	Kirinia_roxelana	Nymphalidae	86	5
242	Melanargia_occitanica	Nymphalidae	85	5

243	Pyrgus_andromedae	Hesperiidae	83	5
244	Laeosopis_roboris	Lycaenidae	82	5
245	Erebia_pronoe	Nymphalidae	81	5
246	Boloria_thore	Nymphalidae	79	5
247	Melanargia_ines	Nymphalidae	79	5
248	Aricia_nicias	Lycaenidae	78	5
249	Pyrgus_sidae	Hesperiidae	77	5
250	Gegenes_pumilio	Hesperiidae	76	5
251	Melanargia_larissa	Nymphalidae	73	5
252	Satyrus_actaea	Nymphalidae	73	5
253	Erebia_triarius	Nymphalidae	72	5
254	Nymphalis_vaualbum	Nymphalidae	72	5
255	Cupido_decoloratus	Lycaenidae	67	4
256	Leptidea_duponcheli	Pieridae	67	5
257	Erebia_albergana	Nymphalidae	65	5
258	Erebia_cassioides	Nymphalidae	65	5
259	Gegenes_nostrodamus	Hesperiidae	65	5
260	Agriades_orbitulus	Lycaenidae	63	5
261	Euchloe_belemia	Pieridae	63	5
262	Coenonympha_gardetta	Nymphalidae	61	5
263	Pontia_callidice	Pieridae	60	5
264	Erebia_pharte	Nymphalidae	59	5
265	Euphydryas_cynthia	Nymphalidae	58	5
266	Polyommatus_admetus	Lycaenidae	57	5
267	Carcharodus_baeticus	Hesperiidae	56	5
268	Erebia_melampus	Nymphalidae	56	5
269	Euchloe_tagis	Pieridae	56	5
270	Hipparchia_senthes	Nymphalidae	56	5
271	Pyrgus_cacaliae	Hesperiidae	55	5
272	Carcharodus_orientalis	Hesperiidae	54	5
273	Hipparchia_syriaca	Nymphalidae	54	5
274	Coenonympha_oedippus	Nymphalidae	52	2
275	Erebia_pluto	Nymphalidae	51	5
276	Pieris_krueperi	Pieridae	51	5
277	Tomares_ballus	Lycaenidae	51	5
278	Gonepteryx_farinosa	Pieridae	50	5
279	Lysandra_hispana	Lycaenidae	50	5
280	Papilio_alexanor	Papilionidae	49	5
281	Erebia_neoridas	Nymphalidae	48	5
282	Hipparchia_fatua	Nymphalidae	48	5
283	Minois_dryas	Nymphalidae	48	5
284	Apatura_metis	Nymphalidae	47	5
285	Oeneis_glacialis	Nymphalidae	46	5

286	Agriades_glandon	Lycaenidae	45	5
287	Pseudochazara_anthelea	Nymphalidae	45	5
288	Aricia_anteros	Lycaenidae	43	4
289	Erebia_ottomana	Nymphalidae	42	5
290	Hipparchia_volgensis	Nymphalidae	42	5
291	Melitaea_varia	Nymphalidae	41	5
292	Lysandra_albicans	Lycaenidae	40	5
293	Coenonympha_rhodopensis	Nymphalidae	39	5
294	Erebia_montana	Nymphalidae	38	5
295	Boloria_graeca	Nymphalidae	37	5
296	Callophrys_avis	Lycaenidae	37	5
297	Lycaena_ottomana	Lycaenidae	37	5
298	Anthocharis_gruneri	Pieridae	36	5
299	Erebia_disa	Nymphalidae	36	5
300	Erebia_eriphyle	Nymphalidae	34	5
301	Melanargia_arge	Nymphalidae	33	5
302	Aricia_montensis	Lycaenidae	32	5
303	Euchloe_simplonia	Pieridae	32	5
304	Erebia_melas	Nymphalidae	31	5
305	Erynnis_marloyi	Hesperiidae	31	5
306	Pyrgus_carlinae	Hesperiidae	30	5
307	Pyrgus_warrenensis	Hesperiidae	29	5
308	Euphydryas_intermedia	Nymphalidae	28	5
309	Coenonympha_leander	Nymphalidae	27	5
310	Polyommatus_fulgens	Lycaenidae	27	5
311	Pseudophilotes_abencerragus	Lycaenidae	27	5
312	Melitaea_aetherie	Nymphalidae	26	5
313	Erebia_styx	Nymphalidae	25	5
314	Erebia_tyndarus	Nymphalidae	25	5
315	Spialia_phlomidis	Hesperiidae	25	5
316	Polyommatus_dolus	Lycaenidae	24	5
317	Erebia_mnestra	Nymphalidae	22	5
318	Muschampia_tessellum	Hesperiidae	22	5
319	Agriades_aquilo	Lycaenidae	21	5
320	Pseudophilotes_bavius	Lycaenidae	20	5
321	Anthocharis_damone	Pieridae	19	5
322	Freyeria_trochylus	Lycaenidae	19	5
323	Oeneis_bore	Nymphalidae	19	5
324	Pseudochazara_graeca	Nymphalidae	19	5
325	Tarucus_balkanicus	Lycaenidae	19	5
326	Coenonympha_corinna	Nymphalidae	17	5
327	Cupido_lorquinii	Lycaenidae	17	5
328	Erebia_hispania	Nymphalidae	17	5

329	Erebia_stiria	Nymphalidae	17	5
330	Erebia_polaris	Nymphalidae	16	5
331	Euchloe_insularis	Pieridae	16	5
332	Aricia_morronensis	Lycaenidae	15	5
333	Lasiommata_paramegaera	Nymphalidae	15	5
334	Melitaea_asteria	Nymphalidae	15	5
335	Colias_aurorina	Pieridae	14	5
336	Erebia_nivalis	Nymphalidae	14	5
337	Euchloe_penia	Pieridae	14	5
338	Melitaea_arduinna	Nymphalidae	14	5
339	Papilio_hospiton	Papilionidae	14	5
340	Pyrgus_cinarae	Hesperiidae	14	5
341	Archon_apollinus	Papilionidae	13	4
342	Colias_caucasica	Pieridae	13	5
343	Erebia_gorgone	Nymphalidae	13	5
344	Hipparchia_aristaeus	Nymphalidae	13	5
345	Polyommatus_aroaniensis	Lycaenidae	13	5
346	Erebia_lefebvrei	Nymphalidae	12	5
347	Polyommatus_fabressei	Lycaenidae	11	5
348	Pontia_chloridice	Pieridae	11	5
349	Erebia_aethiopella	Nymphalidae	10	5
350	Erebia_rhodopensis	Nymphalidae	10	5
351	Erebia_sthennyo	Nymphalidae	10	5
352	Plebejus_bellieri	Lycaenidae	10	5
353	Thymelicus_hyrax	Hesperiidae	10	5
354	Coenonympha_thyrsis	Nymphalidae	9	5
355	Erebia_calcarius	Nymphalidae	9	5
356	Erebia_scipio	Nymphalidae	9	5
357	Hipparchia_cretica	Nymphalidae	9	5
358	Hipparchia_neomiris	Nymphalidae	9	5
359	Kirinia_climene	Nymphalidae	9	5
360	Chazara_prieuri	Nymphalidae	8	5
361	Fabriciana_elisa	Nymphalidae	8	5
362	Kretania_hesperica	Lycaenidae	8	5
363	Maniola_telmessia	Nymphalidae	7	5
364	Spialia_therapne	Hesperiidae	7	5
365	Zerynthia_cretica	Papilionidae	7	5
366	Colias_tyche	Pieridae	6	5
367	Erebia_zapateri	Nymphalidae	6	5
368	Pseudochazara_geyeri	Nymphalidae	6	5
369	Agriades_pyrenaicus	Lycaenidae	5	5
370	Erebia_orientalis	Nymphalidae	5	5
371	Erebia_palarica	Nymphalidae	5	5

372	Kretania_psylorita	Lycaenidae	5	5
373	Maniola_nurag	Nymphalidae	5	5
374	Melanargia_pherusa	Nymphalidae	4	5
375	Tarucus_theophrastus	Lycaenidae	4	5
376	Hipparchia_pellucida	Nymphalidae	2	5
377	Maniola_chia	Nymphalidae	2	5
378	Hipparchia_christenseni	Nymphalidae	1	5
379	Pseudophilotes_barbagiae	Lycaenidae	1	5
380	Carcharodus_tripolinus	Hesperiidae	NA	5
381	Cyclyrius_webbianus	Lycaenidae	NA	5
382	Erebia_rondoui	Nymphalidae	NA	5
383	Euchloe_charlonia	Pieridae	NA	5
384	Euchloe_eversi	Pieridae	NA	5
385	Euchloe_grancanariensis	Pieridae	NA	5
386	Euchloe_hesperidum	Pieridae	NA	5
387	Glaucopsyche_paphos	Lycaenidae	NA	5
388	Hipparchia_azorina	Nymphalidae	NA	5
389	Hipparchia_cypriensis	Nymphalidae	NA	5
390	Hipparchia_gomera	Nymphalidae	NA	5
391	Hipparchia_maderensis	Nymphalidae	NA	5
392	Hipparchia_miguelensis	Nymphalidae	NA	5
393	Hipparchia_neapolitana	Nymphalidae	NA	5
394	Hipparchia_tamadabae	Nymphalidae	NA	5
395	Hipparchia_wyssii	Nymphalidae	NA	5
396	Kretania_sephirus	Lycaenidae	NA	5
397	Leptidea_reali	Pieridae	NA	5
398	Lycaena_candens	Lycaenidae	NA	5
399	Maniola_cypricola	Nymphalidae	NA	5
400	Pararge_xiphioides	Nymphalidae	NA	5
401	Pieris_balcana	Pieridae	NA	5
402	Pontia_edusa	Pieridae	NA	5
403	Pyrgus_malvoides	Hesperiidae	NA	5
404	Thymelicus_christi	Hesperiidae	NA	5
405	Vanessa_vulcania	Nymphalidae	NA	5
406	Zerynthia_cassandra	Papilionidae	44	NA
407	Zizeeria_knysna	Lycaenidae	39	NA
408	Danaus_chrysippus	Nymphalidae	38	NA
409	Cacyreus_marshalli	Lycaenidae	33	NA
410	Pyrgus_foulquieri	Hesperiidae	29	NA
411	Kretania_pylaon	Lycaenidae	16	4
412	Danaus_plexippus	Nymphalidae	15	NA
413	Vanessa_virginiensis	Nymphalidae	12	NA
414	Coenonympha_orientalis	Nymphalidae	11	3

415	Colotis_evagore	Pieridae	10	NA	
416	Hipparchia_blachieri	Nymphalidae	9	NA	
417	Kretania_trappi	Lycaenidae	6	4	
418	Lycaena_thetis	Lycaenidae	6	NA	
419	Pseudochazara_mercurius	Nymphalidae	6	NA	
420	Proterebia_phegea	Nymphalidae	5	NA	
421	Pseudochazara_williamsi	Nymphalidae	5	NA	
422	Hipparchia_mersina	Nymphalidae	3	NA	
423	Plebejidea_loewii	Lycaenidae	3	NA	
424	Carcharodus_stauderi	Hesperiidae	2	NA	
425	Kretania_eurypilus	Lycaenidae	2	NA	
426	Maniola_megala	Nymphalidae	2	NA	
427	Polyommatus_iphigenia	Lycaenidae	2	NA	
428	Pseudochazara_cingovskii	Nymphalidae	2	1	
429	Ypthima_asterope	Nymphalidae	2	NA	
430	Borbo_borbonica	Hesperiidae	1	NA	
431	Pelopidas_thrax	Hesperiidae	1	NA	
432	Satyrium_ledereri	Lycaenidae	1	NA	
433	Aglais_ichnusa	Nymphalidae	NA	NA	
434	Azanus_jesous	Lycaenidae	NA	NA	
435	Azanus_ubaldus	Lycaenidae	NA	NA	
436	Catopsilia_florella	Pieridae	NA	NA	
437	Hipparchia_autonoe	Nymphalidae	NA	5	
438	Iolana_debilitata	Lycaenidae	NA	NA	
439	Iphiclides_feisthamelii	Papilionidae	NA	NA	
440	Leptidea_juvernica	Pieridae	NA	NA	
441	Luthrodes_galba	Lycaenidae	NA	NA	
442	Lysandra_corydonius	Lycaenidae	NA	5	
443	Melitaea_celadussa	Nymphalidae	NA	NA	
444	Melitaea_ornata	Nymphalidae	NA	NA	
445	Polyommatus_celina	Lycaenidae	NA	NA	
446	Polyommatus_damocles	Lycaenidae	NA	NA	
447	Pseudochazara_euxina	Nymphalidae	NA	2	
448	Spialia_rosae	Lycaenidae	NA	NA	
449	Tomares_callimachus	Lycaenidae	NA	5	
450	Zizeeria_karsandra	Lycaenidae	NA	NA	

	conserv.eu	OWS_egg	OWS_larvae	OWS_pupae	OWS_adult	GEN_Average	GEN_Min
1	0	NA	NA	NA	NA	1.00	1.0
2	1	0	1	0	0	2.50	2.0
3	2	0	1	0	0	1.00	1.0
4	2	0	0	1	0	2.00	2.0
5	2	0	1	0	0	1.00	1.0
6	2	0	0	1	0	1.50	1.0

7	2	0	1	0	0	1.00	1.0
8	2	0	1	0	0	1.00	1.0
9	2	0	0	0	1	3.00	3.0
10	2	1	1	1	1	3.00	3.0
11	2	1	1	1	1	3.00	3.0
12	3	0	0	0	1	1.50	1.0
13	3	0	1	0	0	1.00	1.0
14	3	0	1	0	0	1.00	1.0
15	3	0	1	0	0	1.00	1.0
16	3	1	1	0	0	1.00	1.0
17	3	0	1	0	0	2.50	2.0
18	3	0	1	0	0	1.00	1.0
19	3	0	1	0	0	1.00	1.0
20	3	NA	NA	NA	NA	1.00	1.0
21	3	0	0	1	0	1.50	1.0
22	3	0	1	0	0	1.00	1.0
23	3	0	1	0	0	1.00	1.0
24	3	0	1	0	0	0.50	0.5
25	3	NA	NA	NA	NA	1.00	1.0
26	3	1	1	1	1	3.00	3.0
27	3	0	1	0	0	1.00	1.0
28	3	0	1	0	0	1.00	1.0
29	3	0	1	0	0	1.00	1.0
30	4	1	1	0	0	1.00	1.0
31	4	1	1	0	0	1.00	1.0
32	4	1	0	0	0	1.50	1.0
33	4	0	1	0	0	1.00	1.0
34	4	0	1	0	0	1.00	1.0
35	4	0	1	0	0	1.50	1.0
36	4	0	1	0	0	1.50	1.0
37	4	0	1	0	0	1.00	1.0
38	4	1	1	0	0	1.00	1.0
39	4	0	1	0	0	1.00	1.0
40	4	0	1	0	0	1.00	1.0
41	4	0	1	0	0	1.50	1.0
42	4	0	1	0	0	1.00	1.0
43	4	0	1	0	0	1.00	1.0
44	4	0	1	0	0	2.00	1.0
45	4	0	0	1	0	1.50	1.0
46	4	0	1	0	0	1.00	1.0
47	4	0	1	1	0	1.50	1.0
48	4	0	1	0	0	1.00	1.0
49	4	1	1	0	0	1.00	1.0

50	4	0	1	0	0	1.00	1.0
51	4	0	0	0	1	1.00	1.0
52	4	0	0	1	0	1.50	1.5
53	4	0	1	0	0	1.00	1.0
54	4	0	1	0	0	1.50	1.0
55	4	0	1	0	0	1.00	1.0
56	4	0	1	0	0	1.25	1.0
57	4	0	0	1	0	1.00	1.0
58	4	0	1	0	0	1.00	1.0
59	4	0	1	0	0	0.50	0.5
60	4	1	1	0	0	1.00	1.0
61	4	0	1	0	0	1.00	1.0
62	4	0	0	1	0	2.00	2.0
63	4	0	0	1	0	1.00	1.0
64	4	0	1	0	0	1.00	1.0
65	4	0	1	1	0	1.00	1.0
66	4	0	1	0	0	1.00	1.0
67	4	0	1	0	0	1.00	1.0
68	4	NA	NA	NA	NA	1.00	1.0
69	4	0	1	0	0	0.75	0.5
70	4	0	1	0	0	1.00	1.0
71	4	0	1	0	0	0.50	0.5
72	4	NA	NA	NA	NA	1.00	1.0
73	4	0	1	0	0	1.00	1.0
74	4	0	1	0	0	1.00	1.0
75	4	0	1	0	0	1.00	1.0
76	4	NA	NA	NA	NA	1.00	1.0
77	5	0	1	0	0	2.50	1.0
78	5	0	0	1	0	2.00	1.0
79	5	0	0	0	1	2.00	1.0
80	5	0	1	0	0	2.00	1.0
81	5	0	0	1	0	2.00	1.0
82	5	0	0	1	0	2.50	2.0
83	5	0	0	0	1	2.00	1.0
84	5	0	1	0	0	2.00	1.0
85	5	0	1	0	0	1.00	1.0
86	5	0	0	0	1	2.00	1.0
87	5	0	0	1	0	1.00	1.0
88	5	0	0	1	0	2.00	1.0
89	5	0	0	1	0	1.25	1.0
90	5	0	0	1	0	1.75	1.0
91	5	0	1	1	0	2.00	1.0
92	5	0	0	0	1	1.00	1.0

93	5	0	0	0	1	2.00	1.0
94	5	1	1	0	0	1.00	1.0
95	5	0	0	0	1	2.00	1.0
96	5	0	0	1	0	2.00	1.0
97	5	0	1	0	0	1.50	1.0
98	5	0	1	0	0	2.00	1.0
99	5	0	1	1	0	3.00	3.0
100	5	1	1	0	0	1.00	1.0
101	5	0	1	0	0	1.50	1.0
102	5	0	1	0	0	1.00	1.0
103	5	0	1	1	0	1.50	1.0
104	5	1	0	0	0	1.50	1.0
105	5	1	1	1	1	2.00	1.0
106	5	0	1	0	0	1.50	1.0
107	5	0	0	1	0	1.50	1.0
108	5	0	1	0	0	1.25	1.0
109	5	1	0	0	0	1.00	1.0
110	5	0	0	1	0	3.00	3.0
111	5	0	0	0	1	1.25	1.0
112	5	0	1	0	0	1.00	1.0
113	5	1	1	0	0	1.00	1.0
114	5	0	1	0	0	2.00	1.0
115	5	0	1	0	0	1.50	1.0
116	5	0	1	0	0	1.00	1.0
117	5	0	1	0	0	1.00	1.0
118	5	1	1	0	0	1.00	1.0
119	5	0	1	0	0	1.00	1.0
120	5	1	0	0	0	1.00	1.0
121	5	1	0	0	0	1.50	1.0
122	5	0	1	0	0	1.00	1.0
123	5	0	0	1	0	2.00	1.0
124	5	0	1	0	0	1.50	1.0
125	5	0	1	0	0	1.25	1.0
126	5	0	1	0	0	2.00	1.0
127	5	1	1	0	0	1.00	1.0
128	5	0	1	1	0	2.50	2.0
129	5	0	1	0	0	2.00	1.0
130	5	0	1	0	0	1.50	1.0
131	5	1	0	0	0	1.00	1.0
132	5	0	0	1	0	2.00	1.0
133	5	0	1	0	0	2.50	2.0
134	5	0	1	0	0	2.50	2.0
135	5	0	0	1	0	1.00	1.0

136	5	0	1	0	0	2.00	1.0
137	5	1	0	0	0	1.00	1.0
138	5	0	1	0	0	1.00	1.0
139	5	0	1	0	0	1.50	1.0
140	5	0	1	0	0	1.00	1.0
141	5	1	1	0	0	0.75	0.5
142	5	0	1	0	0	2.00	1.0
143	5	0	1	0	0	1.00	1.0
144	5	1	0	0	0	1.00	1.0
145	5	0	1	0	0	1.50	1.0
146	5	0	1	0	0	1.00	1.0
147	5	0	1	0	0	1.50	1.0
148	5	0	1	0	0	1.00	1.0
149	5	0	1	0	0	1.50	1.0
150	5	0	1	0	0	1.00	1.0
151	5	0	0	1	0	1.00	1.0
152	5	0	1	0	0	2.50	2.0
153	5	1	0	0	0	1.00	1.0
154	5	0	1	0	0	1.00	1.0
155	5	0	1	0	0	1.00	1.0
156	5	0	1	0	0	2.00	2.0
157	5	0	1	0	0	1.00	1.0
158	5	0	1	0	0	1.00	1.0
159	5	0	1	0	0	1.00	1.0
160	5	1	1	0	0	1.00	1.0
161	5	0	1	0	0	1.00	1.0
162	5	0	1	0	0	2.00	1.0
163	5	1	0	0	0	1.00	1.0
164	5	0	1	0	0	2.00	1.0
165	5	0	1	0	0	2.00	1.0
166	5	1	0	0	0	1.00	1.0
167	5	0	1	0	0	1.00	1.0
168	5	0	1	0	0	0.75	0.5
169	5	1	1	1	0	3.00	3.0
170	5	0	0	1	0	2.00	1.0
171	5	0	1	1	0	1.50	1.0
172	5	0	1	0	0	2.00	1.0
173	5	1	0	0	0	1.00	1.0
174	5	0	1	0	0	1.00	1.0
175	5	1	1	0	0	1.00	1.0
176	5	0	1	0	0	1.50	1.0
177	5	0	1	0	0	1.00	1.0
178	5	0	1	0	0	1.50	1.0

179	5	1	0	0	0	1.00	1.0
180	5	0	0	0	1	2.00	1.0
181	5	1	1	0	0	1.50	1.0
182	5	0	1	1	0	3.00	3.0
183	5	0	1	0	0	1.50	1.0
184	5	0	1	0	0	1.00	1.0
185	5	0	1	0	0	1.00	1.0
186	5	0	1	0	0	1.00	1.0
187	5	0	1	0	0	1.00	1.0
188	5	0	1	0	0	1.00	1.0
189	5	0	1	1	0	1.50	1.0
190	5	0	1	0	0	1.00	1.0
191	5	0	0	1	0	1.00	1.0
192	5	0	1	1	0	0.75	0.5
193	5	1	1	0	0	0.75	0.5
194	5	0	0	1	0	3.00	3.0
195	5	0	1	1	0	2.00	1.0
196	5	0	0	1	0	1.50	1.0
197	5	0	1	0	0	0.50	0.5
198	5	1	0	0	0	1.00	1.0
199	5	0	0	0	1	1.25	1.0
200	5	0	1	0	0	1.50	1.0
201	5	0	1	0	0	1.00	1.0
202	5	0	1	0	0	0.75	0.5
203	5	0	1	0	0	1.00	1.0
204	5	0	0	0	1	2.00	1.0
205	5	0	1	0	0	1.00	1.0
206	5	0	0	1	0	1.25	1.0
207	5	0	1	0	0	2.50	2.0
208	5	0	1	0	0	1.00	1.0
209	5	0	1	0	0	1.00	1.0
210	5	0	1	0	0	1.00	1.0
211	5	0	1	0	0	1.00	1.0
212	5	1	1	0	0	1.00	1.0
213	5	0	1	0	0	1.00	1.0
214	5	1	1	1	1	2.50	2.0
215	5	0	1	1	0	2.50	2.0
216	5	0	1	0	0	0.75	0.5
217	5	0	0	1	0	1.00	1.0
218	5	0	1	0	0	1.50	1.0
219	5	0	1	0	0	1.50	1.0
220	5	0	0	1	0	1.25	1.0
221	5	0	1	0	0	1.50	1.0

222	5	0	0	1	0	2.00	1.0
223	5	NA	NA	NA	NA	1.00	1.0
224	5	0	0	1	0	1.50	1.0
225	5	0	1	0	0	1.00	1.0
226	5	0	1	0	0	1.00	1.0
227	5	0	1	0	0	1.00	1.0
228	5	0	1	0	0	1.50	1.0
229	5	0	1	0	0	1.00	1.0
230	5	1	0	0	0	1.00	1.0
231	5	0	1	0	0	2.50	2.0
232	5	0	1	0	0	1.50	1.0
233	5	0	1	0	0	1.00	1.0
234	5	0	0	1	0	1.00	1.0
235	5	0	1	0	0	1.00	1.0
236	5	0	1	0	0	0.50	0.5
237	5	0	1	0	0	1.00	1.0
238	5	1	1	0	0	0.50	0.5
239	5	0	1	0	0	0.75	0.5
240	5	1	0	0	0	1.00	1.0
241	5	0	1	0	0	1.00	1.0
242	5	0	1	0	0	1.00	1.0
243	5	0	1	0	0	1.00	1.0
244	5	1	0	0	0	1.00	1.0
245	5	0	1	0	0	1.00	1.0
246	5	0	1	0	0	1.25	1.0
247	5	0	1	0	0	1.00	1.0
248	5	0	1	0	0	1.00	1.0
249	5	0	1	0	0	1.00	1.0
250	5	0	1	0	0	3.00	3.0
251	5	0	1	0	0	1.00	1.0
252	5	0	1	0	0	1.00	1.0
253	5	0	1	0	0	1.00	1.0
254	5	0	0	0	1	1.00	1.0
255	5	0	1	1	0	2.50	2.0
256	5	0	0	1	0	2.00	2.0
257	5	0	1	0	0	1.00	1.0
258	5	0	1	0	0	1.00	1.0
259	5	1	1	1	1	3.00	3.0
260	5	0	1	0	0	1.00	1.0
261	5	0	0	1	0	2.00	2.0
262	5	0	1	0	0	1.00	1.0
263	5	0	0	1	0	1.50	1.0
264	5	0	1	0	0	0.50	0.5

265	5	0	1	0	0	0.75	0.5
266	5	0	1	0	0	1.00	1.0
267	5	0	1	0	0	2.50	2.0
268	5	0	1	0	0	1.00	1.0
269	5	0	0	1	0	1.00	1.0
270	5	0	1	0	0	1.00	1.0
271	5	0	1	0	0	1.00	1.0
272	5	NA	NA	NA	NA	2.50	2.0
273	5	0	1	0	0	1.00	1.0
274	5	0	1	0	0	1.00	1.0
275	5	0	1	0	0	0.75	0.5
276	5	0	0	1	0	4.00	4.0
277	5	0	0	1	0	1.00	1.0
278	5	0	0	0	1	1.00	1.0
279	5	1	0	0	0	2.00	2.0
280	5	0	0	1	0	1.00	1.0
281	5	0	1	0	0	1.00	1.0
282	5	0	1	0	0	1.00	1.0
283	5	0	1	0	0	1.00	1.0
284	5	0	1	0	0	1.50	1.0
285	5	0	1	0	0	0.50	0.5
286	5	0	1	0	0	1.00	1.0
287	5	NA	NA	NA	NA	1.00	1.0
288	5	0	1	0	0	2.00	1.0
289	5	0	1	0	0	1.00	1.0
290	5	NA	NA	NA	NA	1.00	1.0
291	5	0	1	0	0	1.00	1.0
292	5	1	0	0	0	1.00	1.0
293	5	0	1	0	0	1.00	1.0
294	5	0	1	0	0	1.00	1.0
295	5	0	1	0	0	1.00	1.0
296	5	0	0	1	0	1.00	1.0
297	5	0	1	0	0	2.00	2.0
298	5	0	0	1	0	1.00	1.0
299	5	0	1	0	0	0.50	0.5
300	5	1	1	0	0	0.50	0.5
301	5	0	1	0	0	1.00	1.0
302	5	0	1	0	0	1.00	1.0
303	5	0	0	1	0	0.75	0.5
304	5	0	1	0	0	1.00	1.0
305	5	0	1	0	0	2.00	1.0
306	5	0	1	0	0	1.00	1.0
307	5	0	1	0	0	1.00	1.0

308	5	0	1	0	0	0.75	0.5
309	5	0	1	0	0	1.00	1.0
310	5	0	1	0	0	1.00	1.0
311	5	0	1	0	0	1.50	1.0
312	5	0	1	0	0	1.50	1.0
313	5	0	1	0	0	0.75	0.5
314	5	0	1	0	0	1.00	1.0
315	5	0	1	0	0	1.00	1.0
316	5	0	1	0	0	1.00	1.0
317	5	0	1	0	0	0.75	0.5
318	5	NA	NA	NA	NA	1.00	1.0
319	5	0	1	0	0	0.75	0.5
320	5	0	0	1	0	1.00	1.0
321	5	0	0	1	0	1.00	1.0
322	5	NA	NA	NA	NA	3.00	3.0
323	5	0	1	0	0	0.50	0.5
324	5	0	1	0	0	1.00	1.0
325	5	0	0	1	0	3.00	3.0
326	5	0	1	0	0	2.25	1.5
327	5	0	0	1	0	1.00	1.0
328	5	0	1	0	0	1.00	1.0
329	5	0	1	0	0	1.00	1.0
330	5	0	1	0	0	0.75	0.5
331	5	0	0	1	0	1.75	1.5
332	5	0	1	0	0	1.50	1.0
333	5	0	1	0	0	3.00	3.0
334	5	0	1	0	0	0.50	0.5
335	5	0	1	0	0	1.00	1.0
336	5	0	1	0	0	0.50	0.5
337	5	0	0	1	0	1.50	1.0
338	5	0	1	0	0	1.00	1.0
339	5	0	0	1	0	1.25	1.0
340	5	0	1	0	0	1.00	1.0
341	5	0	0	1	0	1.00	1.0
342	5	0	1	0	0	1.00	1.0
343	5	0	1	0	0	1.00	1.0
344	5	0	1	0	0	1.00	1.0
345	5	0	1	0	0	1.00	1.0
346	5	0	1	0	0	1.00	1.0
347	5	0	1	0	0	1.00	1.0
348	5	0	0	1	0	2.50	2.0
349	5	0	1	0	0	1.00	1.0
350	5	0	1	0	0	1.00	1.0

351	5	0	1	0	0	1.00	1.0
352	5	NA	NA	NA	NA	1.00	1.0
353	5	NA	NA	NA	NA	1.00	1.0
354	5	0	1	0	0	2.00	1.0
355	5	0	1	0	0	1.00	1.0
356	5	0	1	0	0	0.75	0.5
357	5	0	1	0	0	1.00	1.0
358	5	0	1	0	0	1.00	1.0
359	5	0	1	0	0	1.00	1.0
360	5	0	1	0	0	1.00	1.0
361	5	1	1	0	0	1.00	1.0
362	5	0	1	0	0	1.00	1.0
363	5	0	1	0	0	1.00	1.0
364	5	NA	NA	NA	NA	2.00	2.0
365	5	0	0	1	0	1.00	1.0
366	5	0	1	0	0	1.00	1.0
367	5	0	1	0	0	1.00	1.0
368	5	0	1	0	0	1.00	1.0
369	5	0	1	0	0	1.00	1.0
370	5	0	1	0	0	1.00	1.0
371	5	NA	NA	NA	NA	1.00	1.0
372	5	NA	NA	NA	NA	1.00	1.0
373	5	0	1	0	0	1.00	1.0
374	5	0	1	0	0	1.00	1.0
375	5	NA	NA	NA	NA	3.00	3.0
376	5	0	1	0	0	1.00	1.0
377	5	0	1	0	0	1.00	1.0
378	5	NA	NA	NA	NA	1.00	1.0
379	5	0	1	0	0	1.00	1.0
380	5	NA	NA	NA	NA	3.00	3.0
381	5	1	1	1	1	3.00	3.0
382	5	0	1	0	0	1.00	1.0
383	5	0	0	1	0	2.50	2.0
384	5	0	0	1	0	2.00	2.0
385	5	NA	NA	NA	NA	2.00	2.0
386	5	NA	NA	NA	NA	2.00	2.0
387	5	0	0	1	0	1.00	1.0
388	5	NA	NA	NA	NA	1.00	1.0
389	5	0	1	0	0	1.00	1.0
390	5	0	1	0	0	1.00	1.0
391	5	0	1	0	0	1.00	1.0
392	5	NA	NA	NA	NA	1.00	1.0
393	5	0	1	0	0	1.00	1.0

394	5	NA	NA	NA	NA	1.00	1.0
395	5	0	1	0	0	1.00	1.0
396	5	0	1	0	0	1.00	1.0
397	5	0	0	1	0	2.00	1.0
398	5	0	1	0	0	1.00	1.0
399	5	0	1	0	0	1.00	1.0
400	5	1	1	1	1	3.00	3.0
401	5	0	0	1	0	2.50	2.0
402	5	0	0	1	0	3.00	3.0
403	5	0	0	1	0	1.50	1.0
404	5	0	1	0	0	2.50	2.0
405	5	1	1	1	1	3.00	3.0
406	NA	0	0	1	0	1.00	1.0
407	NA	1	1	1	1	3.00	3.0
408	NA	1	1	1	1	3.00	3.0
409	NA	0	1	1	0	3.00	3.0
410	NA	0	1	0	0	1.00	1.0
411	NA	0	1	0	0	1.00	1.0
412	NA	0	0	0	1	3.00	3.0
413	NA	NA	NA	NA	NA	3.00	3.0
414	NA	NA	NA	NA	NA	1.00	1.0
415	NA	0	0	1	0	3.00	3.0
416	NA	NA	NA	NA	NA	1.00	1.0
417	NA	0	1	0	0	1.00	1.0
418	NA	NA	NA	NA	NA	1.00	1.0
419	NA	0	1	0	0	1.00	1.0
420	NA	0	1	0	0	1.00	1.0
421	NA	0	1	0	0	1.00	1.0
422	NA	0	1	0	0	1.00	1.0
423	NA	NA	NA	NA	NA	1.00	1.0
424	NA	NA	NA	NA	NA	3.00	3.0
425	NA	0	1	0	0	1.00	1.0
426	NA	0	1	0	0	1.00	1.0
427	NA	NA	NA	NA	NA	1.00	1.0
428	NA	0	1	0	0	1.00	1.0
429	NA	0	1	0	0	3.00	3.0
430	NA	0	1	0	0	2.50	2.0
431	NA	0	1	1	0	3.00	3.0
432	NA	1	0	0	0	1.00	1.0
433	NA	0	0	0	1	2.00	2.0
434	NA	NA	NA	NA	NA	3.00	3.0
435	NA	1	1	1	1	3.00	3.0
436	NA	1	1	1	1	3.00	3.0

437	NA	NA	NA	NA	NA	1.00	1.0
438	NA	0	0	1	0	1.50	1.5
439	NA	0	0	1	0	3.00	3.0
440	NA	0	0	1	0	1.00	1.0
441	NA	NA	NA	NA	NA	3.00	3.0
442	NA	0	1	0	0	1.00	1.0
443	NA	0	1	0	0	1.50	1.0
444	NA	0	1	0	0	1.00	1.0
445	NA	0	1	0	0	4.00	4.0
446	NA	NA	NA	NA	NA	1.00	1.0
447	NA	NA	NA	NA	NA	1.00	1.0
448	NA	NA	NA	NA	NA	3.00	3.0
449	NA	0	0	1	0	1.00	1.0
450	NA	1	1	1	1	3.00	3.0

	GEN_Max	GEN_Range	WSP_Female_average	WSP_Female_range	HSI	LEV_buried
1	1.0	0.0	32.5	5	1.000	NA
2	3.0	1.0	47.0	6	0.316	0
3	1.0	0.0	36.0	6	0.500	1
4	2.0	0.0	41.5	9	0.577	0
5	1.0	0.0	32.5	7	0.500	0
6	2.0	1.0	21.0	2	0.577	NA
7	1.0	0.0	23.5	3	1.000	1
8	1.0	0.0	30.5	5	1.000	NA
9	3.0	0.0	61.5	13	1.000	NA
10	3.0	0.0	45.5	3	0.102	0
11	3.0	0.0	62.5	5	0.289	0
12	2.0	1.0	62.0	12	0.136	0
13	1.0	0.0	44.0	8	0.086	0
14	1.0	0.0	34.0	4	1.000	1
15	1.0	0.0	30.0	4	0.154	0
16	1.0	0.0	27.0	2	0.408	0
17	3.0	1.0	44.0	8	0.408	0
18	1.0	0.0	41.5	5	0.204	NA
19	1.0	0.0	28.5	3	1.000	NA
20	1.0	0.0	33.0	6	0.577	NA
21	2.0	1.0	34.0	4	0.500	0
22	1.0	0.0	28.0	4	1.000	1
23	1.0	0.0	31.0	6	1.000	0
24	0.5	0.0	38.0	4	1.000	NA
25	1.0	0.0	53.5	3	0.289	NA
26	3.0	0.0	61.5	13	0.577	0
27	1.0	0.0	59.0	6	0.289	NA
28	1.0	0.0	59.0	6	0.289	NA

29	1.0	0.0	53.0	2	0.289	NA
30	1.0	0.0	30.5	7	0.289	0
31	1.0	0.0	49.5	9	0.408	0
32	2.0	1.0	33.0	6	1.000	0
33	1.0	0.0	77.5	11	0.577	0
34	1.0	0.0	34.0	4	0.577	0
35	2.0	1.0	24.0	4	0.118	0
36	2.0	1.0	35.5	9	0.126	0
37	1.0	0.0	45.0	2	0.123	0
38	1.0	0.0	80.0	30	0.204	0
39	1.0	0.0	36.0	4	0.577	1
40	1.0	0.0	55.0	26	0.333	0
41	2.0	1.0	32.0	4	0.204	0
42	1.0	0.0	28.0	8	0.316	0
43	1.0	0.0	66.0	8	0.250	0
44	3.0	2.0	33.0	10	0.447	0
45	2.0	1.0	27.5	5	0.333	0
46	1.0	0.0	61.0	10	0.408	0
47	2.0	1.0	23.0	6	0.069	0
48	1.0	0.0	35.0	2	1.000	1
49	1.0	0.0	32.0	4	0.447	0
50	1.0	0.0	31.0	6	0.408	0
51	1.0	0.0	62.0	12	0.707	0
52	1.5	0.0	39.0	6	0.707	0
53	1.0	0.0	55.0	10	0.707	NA
54	2.0	1.0	33.0	6	0.224	0
55	1.0	0.0	31.0	10	0.408	0
56	1.5	0.5	45.0	10	0.169	0
57	1.0	0.0	57.0	10	0.354	0
58	1.0	0.0	31.0	6	0.447	0
59	0.5	0.0	47.0	14	0.236	0
60	1.0	0.0	65.0	30	0.158	0
61	1.0	0.0	46.0	12	1.000	0
62	2.0	0.0	21.5	1	0.500	NA
63	1.0	0.0	48.5	5	0.192	0
64	1.0	0.0	33.0	6	1.000	0
65	1.0	0.0	43.0	8	0.177	0
66	1.0	0.0	47.0	6	1.000	NA
67	1.0	0.0	41.0	8	0.316	0
68	1.0	0.0	38.0	8	0.354	NA
69	1.0	0.5	35.0	2	0.500	0
70	1.0	0.0	29.0	6	0.289	NA
71	0.5	0.0	35.0	2	1.000	NA

72	1.0	0.0	25.0	6	0.577	NA
73	1.0	0.0	52.0	4	0.289	NA
74	1.0	0.0	52.0	4	0.289	NA
75	1.0	0.0	44.5	5	0.289	0
76	1.0	0.0	30.5	5	1.000	NA
77	4.0	3.0	28.5	11	0.144	0
78	3.0	2.0	40.0	16	0.114	0
79	3.0	2.0	54.0	16	0.083	0
80	3.0	2.0	28.0	10	0.096	0
81	3.0	2.0	44.5	11	0.118	0
82	3.0	1.0	57.0	12	0.115	0
83	3.0	2.0	59.5	13	0.316	0
84	3.0	2.0	26.5	11	0.333	0
85	1.0	0.0	41.5	9	0.289	0
86	3.0	2.0	48.0	10	0.707	0
87	1.0	0.0	40.5	15	0.101	0
88	3.0	2.0	75.0	30	0.053	0
89	1.5	0.5	23.0	6	0.033	0
90	2.5	1.5	27.0	10	0.020	0
91	3.0	2.0	40.0	4	0.154	0
92	1.0	0.0	58.0	12	0.218	0
93	3.0	2.0	53.5	17	0.236	0
94	1.0	0.0	51.5	9	0.500	0
95	3.0	2.0	46.0	12	0.050	0
96	3.0	2.0	38.0	10	0.144	0
97	2.0	1.0	30.0	6	0.083	0
98	3.0	2.0	42.5	9	0.120	0
99	3.0	0.0	48.0	12	0.041	0
100	1.0	0.0	62.0	8	0.258	0
101	2.0	2.0	35.5	9	0.107	0
102	1.0	0.0	38.5	7	0.063	0
103	2.0	1.0	36.5	7	0.577	0
104	2.0	1.0	22.5	9	0.069	0
105	3.0	2.0	42.5	5	0.408	0
106	2.0	1.0	36.0	10	0.577	0
107	2.0	1.0	23.0	6	0.192	0
108	1.5	0.5	29.0	8	0.169	0
109	1.0	0.0	25.5	7	0.067	0
110	3.0	0.0	41.5	7	0.061	0
111	1.5	0.5	67.5	17	0.192	0
112	1.0	0.0	62.5	11	0.082	0
113	1.0	0.0	53.5	9	0.500	0
114	3.0	2.0	47.5	7	0.072	0

115	2.0	1.0	30.0	4	0.129	0
116	1.0	0.0	26.5	5	0.101	0
117	1.0	0.0	51.0	16	0.143	0
118	1.0	0.0	31.0	6	0.333	0
119	1.0	0.0	47.5	5	0.107	0
120	1.0	0.0	32.0	6	0.408	0
121	2.0	1.0	24.5	5	0.041	0
122	1.0	0.0	27.0	6	0.408	0
123	3.0	2.0	77.0	26	0.105	0
124	2.0	1.0	23.0	4	0.105	0
125	1.5	0.5	37.0	6	0.169	0
126	3.0	2.0	25.0	6	0.102	0
127	1.0	0.0	37.0	8	0.204	0
128	3.0	1.0	45.0	10	0.204	0
129	3.0	2.0	30.0	4	0.136	0
130	2.0	1.0	35.5	9	0.289	0
131	1.0	0.0	35.0	10	0.129	0
132	3.0	2.0	33.5	11	0.707	0
133	3.0	1.0	37.0	14	0.051	0
134	3.0	1.0	30.0	8	0.167	0
135	1.0	0.0	29.0	8	0.065	0
136	3.0	2.0	31.0	6	0.183	0
137	1.0	0.0	34.0	4	0.112	0
138	1.0	0.0	27.0	6	0.126	0
139	2.0	1.0	28.0	6	0.258	0
140	1.0	0.0	70.0	10	0.316	0
141	1.0	0.5	41.0	10	0.183	0
142	3.0	2.0	33.0	2	0.447	0
143	1.0	0.0	31.5	11	0.115	0
144	1.0	0.0	30.0	4	0.065	0
145	2.0	1.0	31.0	6	0.204	0
146	1.0	0.0	36.5	13	0.102	0
147	2.0	1.0	68.0	8	0.267	0
148	1.0	0.0	56.0	8	0.289	0
149	2.0	1.0	44.5	11	0.154	0
150	1.0	0.0	36.0	4	0.081	0
151	1.0	0.0	32.5	3	0.577	0
152	3.0	1.0	43.5	3	0.167	0
153	1.0	0.0	30.0	4	0.167	0
154	1.0	0.0	25.0	8	0.218	0
155	1.0	0.0	36.0	8	0.289	0
156	2.0	0.0	29.0	2	0.072	0
157	1.0	0.0	28.5	7	0.354	0

158	1.0	0.0	28.0	8	0.218	0
159	1.0	0.0	27.5	7	0.056	0
160	1.0	0.0	47.0	10	0.707	0
161	1.0	0.0	73.0	14	0.204	0
162	3.0	2.0	50.0	8	0.577	0
163	1.0	0.0	31.5	9	0.134	0
164	3.0	2.0	37.0	8	0.408	0
165	3.0	2.0	24.0	4	1.000	0
166	1.0	0.0	58.0	12	0.354	0
167	1.0	0.0	38.0	8	0.204	0
168	1.0	0.5	38.0	8	0.224	0
169	3.0	0.0	33.0	6	0.058	0
170	3.0	2.0	44.0	8	0.126	0
171	2.0	1.0	38.0	6	0.258	0
172	3.0	2.0	29.0	6	0.500	0
173	1.0	0.0	30.0	4	1.000	0
174	1.0	0.0	47.0	10	0.043	0
175	1.0	0.0	47.0	10	0.447	0
176	2.0	1.0	72.0	16	0.577	1
177	1.0	0.0	36.5	7	0.183	0
178	2.0	1.0	26.0	4	0.183	0
179	1.0	0.0	35.0	6	0.129	0
180	3.0	2.0	59.0	18	0.577	0
181	2.0	1.0	31.0	6	0.224	0
182	3.0	0.0	25.0	2	0.045	0
183	2.0	1.0	30.0	4	0.174	0
184	1.0	0.0	33.5	7	0.250	0
185	1.0	0.0	30.0	4	0.083	0
186	1.0	0.0	32.0	4	0.218	0
187	1.0	0.0	41.0	6	0.333	0
188	1.0	0.0	25.0	6	0.200	0
189	2.0	1.0	24.0	4	0.124	0
190	1.0	0.0	31.0	2	0.177	0
191	1.0	0.0	49.0	6	0.500	0
192	1.0	0.5	41.5	9	0.046	0
193	1.0	0.5	44.0	4	0.096	0
194	3.0	0.0	43.0	6	0.408	0
195	3.0	2.0	30.0	4	0.089	NA
196	2.0	1.0	44.0	8	0.154	0
197	0.5	0.0	40.0	10	0.192	0
198	1.0	0.0	40.0	8	0.408	0
199	1.5	0.5	44.5	5	0.707	0
200	2.0	1.0	33.0	6	0.105	0

201	1.0	0.0	28.0	8	0.500	0
202	1.0	0.5	53.0	10	0.354	0
203	1.0	0.0	29.5	5	1.000	NA
204	3.0	2.0	45.0	2	0.577	0
205	1.0	0.0	52.0	4	0.258	NA
206	1.5	0.5	24.0	6	0.289	0
207	3.0	1.0	29.0	6	0.183	0
208	1.0	0.0	42.5	11	0.707	0
209	1.0	0.0	34.5	11	0.158	0
210	1.0	0.0	55.0	10	0.500	0
211	1.0	0.0	45.0	6	0.169	0
212	1.0	0.0	39.5	9	0.500	0
213	1.0	0.0	46.0	16	0.200	0
214	3.0	1.0	25.0	6	0.112	0
215	3.0	1.0	49.0	6	0.113	NA
216	1.0	0.5	38.0	8	0.224	0
217	1.0	0.0	37.0	6	0.577	0
218	2.0	1.0	27.0	6	0.289	0
219	2.0	1.0	25.0	6	0.224	NA
220	1.5	0.5	45.0	2	0.577	0
221	2.0	1.0	79.5	7	0.102	0
222	3.0	2.0	42.0	12	0.408	0
223	1.0	0.0	47.5	7	0.224	0
224	2.0	1.0	38.5	13	0.204	0
225	1.0	0.0	39.0	6	0.354	0
226	1.0	0.0	49.0	8	0.136	0
227	1.0	0.0	55.0	10	0.120	0
228	2.0	1.0	39.0	14	0.120	0
229	1.0	0.0	31.0	6	0.169	0
230	1.0	0.0	32.0	4	0.707	0
231	3.0	1.0	25.0	6	0.577	0
232	2.0	1.0	54.0	8	0.408	NA
233	1.0	0.0	37.0	2	0.354	0
234	1.0	0.0	27.0	10	0.224	0
235	1.0	0.0	36.0	8	0.258	0
236	0.5	0.0	37.0	6	0.316	0
237	1.0	0.0	59.0	6	0.144	0
238	0.5	0.0	39.0	10	0.316	0
239	1.0	0.5	42.0	8	0.100	0
240	1.0	0.0	34.5	9	0.577	0
241	1.0	0.0	60.0	4	0.204	NA
242	1.0	0.0	51.0	10	0.154	0
243	1.0	0.0	28.5	5	0.289	NA

244	1.0	0.0	27.0	6	0.707	0
245	1.0	0.0	46.0	8	0.707	NA
246	1.5	1.0	44.0	6	0.577	0
247	1.0	0.0	48.0	4	0.500	0
248	1.0	0.0	25.5	5	0.707	0
249	1.0	0.0	35.0	6	0.316	NA
250	3.0	0.0	32.0	4	0.354	0
251	1.0	0.0	55.0	10	0.707	0
252	1.0	0.0	55.0	10	0.236	0
253	1.0	0.0	47.0	6	0.289	0
254	1.0	0.0	63.0	10	0.354	0
255	3.0	1.0	25.0	2	0.258	0
256	2.0	0.0	38.0	8	0.408	0
257	1.0	0.0	43.0	6	0.333	NA
258	1.0	0.0	37.0	6	1.000	0
259	3.0	0.0	32.0	4	0.289	0
260	1.0	0.0	26.0	4	0.258	NA
261	2.0	0.0	40.0	8	0.354	0
262	1.0	0.0	31.0	2	0.577	NA
263	2.0	1.0	47.0	10	0.102	0
264	0.5	0.0	36.0	8	0.167	NA
265	1.0	0.5	37.0	10	0.289	0
266	1.0	0.0	34.0	8	0.707	1
267	3.0	1.0	30.0	4	0.408	0
268	1.0	0.0	33.0	6	0.289	NA
269	1.0	0.0	35.0	10	0.577	0
270	1.0	0.0	52.0	4	1.000	NA
271	1.0	0.0	28.5	5	0.577	NA
272	3.0	1.0	29.0	2	0.577	NA
273	1.0	0.0	65.0	6	0.289	0
274	1.0	0.0	38.0	8	0.258	0
275	1.0	0.5	45.0	10	0.354	0
276	4.0	0.0	46.0	8	0.707	0
277	1.0	0.0	29.0	2	0.125	0
278	1.0	0.0	60.0	8	0.577	0
279	2.0	0.0	34.0	4	1.000	0
280	1.0	0.0	64.0	4	0.118	0
281	1.0	0.0	41.0	10	0.289	0
282	1.0	0.0	57.5	15	0.354	0
283	1.0	0.0	62.0	16	0.200	0
284	2.0	1.0	62.0	4	1.000	0
285	0.5	0.0	53.0	6	1.000	NA
286	1.0	0.0	23.0	2	0.354	0

287	1.0	0.0	51.0	4	0.289	1
288	3.0	2.0	28.0	8	0.289	0
289	1.0	0.0	39.0	10	0.707	NA
290	1.0	0.0	53.5	9	1.000	0
291	1.0	0.0	34.0	8	0.289	0
292	1.0	0.0	39.0	6	1.000	0
293	1.0	0.0	33.0	2	0.354	0
294	1.0	0.0	47.0	6	0.354	0
295	1.0	0.0	36.0	8	1.000	0
296	1.0	0.0	35.5	3	0.250	NA
297	2.0	0.0	29.0	2	1.000	NA
298	1.0	0.0	33.0	6	0.408	NA
299	0.5	0.0	45.5	7	0.577	NA
300	0.5	0.0	34.0	4	0.500	0
301	1.0	0.0	53.0	6	0.289	NA
302	1.0	0.0	27.5	7	0.183	NA
303	1.0	0.5	43.0	6	0.333	0
304	1.0	0.0	45.0	6	1.000	NA
305	3.0	2.0	31.0	6	1.000	NA
306	1.0	0.0	29.0	6	0.500	NA
307	1.0	0.0	24.5	3	0.577	NA
308	1.0	0.5	40.0	4	0.577	0
309	1.0	0.0	33.0	2	0.500	0
310	1.0	0.0	32.0	4	1.000	0
311	2.0	1.0	20.0	4	0.354	0
312	2.0	1.0	44.0	4	0.408	NA
313	1.0	0.5	51.0	10	0.707	NA
314	1.0	0.0	35.0	2	0.500	NA
315	1.0	0.0	27.0	6	0.500	NA
316	1.0	0.0	35.0	6	1.000	NA
317	1.0	0.0	36.0	4	0.500	0
318	1.0	0.0	33.5	5	0.500	NA
319	1.0	0.5	23.0	2	0.289	0
320	1.0	0.0	27.0	6	0.577	0
321	1.0	0.0	39.5	5	1.000	NA
322	3.0	0.0	16.5	3	0.707	NA
323	0.5	0.0	43.0	10	1.000	0
324	1.0	0.0	51.0	2	0.289	NA
325	3.0	0.0	20.0	4	0.267	0
326	3.0	1.5	29.0	2	0.577	NA
327	1.0	0.0	25.0	6	1.000	0
328	1.0	0.0	38.0	8	1.000	NA
329	1.0	0.0	49.0	6	0.408	NA

330	1.0	0.5	39.0	10	0.250	0
331	2.0	0.5	34.5	3	0.250	0
332	2.0	1.0	28.0	4	0.577	0
333	3.0	0.0	42.5	9	0.354	0
334	0.5	0.0	29.0	2	1.000	0
335	1.0	0.0	55.0	2	0.577	0
336	0.5	0.0	32.0	4	1.000	NA
337	2.0	1.0	34.0	4	0.408	0
338	1.0	0.0	44.0	4	0.577	0
339	1.5	0.5	76.0	10	0.177	0
340	1.0	0.0	31.0	2	1.000	NA
341	1.0	0.0	57.0	6	0.577	0
342	1.0	0.0	52.0	4	0.707	0
343	1.0	0.0	41.0	2	0.577	NA
344	1.0	0.0	52.0	4	1.000	NA
345	1.0	0.0	30.5	5	1.000	0
346	1.0	0.0	44.0	8	0.707	NA
347	1.0	0.0	30.5	5	1.000	0
348	3.0	1.0	38.5	3	0.236	0
349	1.0	0.0	38.0	4	1.000	NA
350	1.0	0.0	36.5	3	0.577	NA
351	1.0	0.0	42.0	4	0.577	NA
352	1.0	0.0	23.0	6	0.354	NA
353	1.0	0.0	32.5	5	0.102	NA
354	3.0	2.0	32.0	14	0.289	0
355	1.0	0.0	38.0	4	0.500	NA
356	1.0	0.5	48.0	4	0.500	NA
357	1.0	0.0	56.0	8	0.289	NA
358	1.0	0.0	48.0	4	1.000	NA
359	1.0	0.0	47.0	2	0.707	0
360	1.0	0.0	60.0	12	1.000	NA
361	1.0	0.0	49.0	6	1.000	0
362	1.0	0.0	30.0	4	0.500	0
363	1.0	0.0	41.5	9	0.354	0
364	2.0	0.0	24.0	4	1.000	0
365	1.0	0.0	52.5	5	0.707	0
366	1.0	0.0	45.0	10	0.289	0
367	1.0	0.0	38.0	4	0.289	NA
368	1.0	0.0	49.0	2	1.000	NA
369	1.0	0.0	25.0	6	1.000	0
370	1.0	0.0	30.5	3	0.289	NA
371	1.0	0.0	58.0	4	0.289	0
372	1.0	0.0	24.5	3	0.577	0

373	1.0	0.0	38.0	4	1.000	0
374	1.0	0.0	48.0	4	0.289	NA
375	3.0	0.0	21.0	2	0.354	0
376	1.0	0.0	51.0	16	0.289	0
377	1.0	0.0	41.5	9	0.289	0
378	1.0	0.0	51.0	16	0.289	NA
379	1.0	0.0	22.0	2	1.000	0
380	3.0	0.0	30.0	8	1.000	NA
381	3.0	0.0	27.5	5	0.289	0
382	1.0	0.0	38.0	8	1.000	NA
383	3.0	1.0	34.0	4	0.036	0
384	2.0	0.0	40.0	8	0.289	NA
385	2.0	0.0	40.0	8	1.000	NA
386	2.0	0.0	40.0	8	0.289	NA
387	1.0	0.0	29.0	6	0.289	0
388	1.0	0.0	41.0	6	1.000	0
389	1.0	0.0	56.5	13	0.408	0
390	1.0	0.0	59.0	6	0.289	NA
391	1.0	0.0	44.0	8	NA	0
392	1.0	0.0	41.0	6	1.000	NA
393	1.0	0.0	NA	NA	0.408	NA
394	1.0	0.0	55.5	5	0.289	NA
395	1.0	0.0	59.0	6	0.289	0
396	1.0	0.0	31.0	6	0.577	NA
397	3.0	2.0	38.0	10	1.000	0
398	1.0	0.0	34.5	1	1.000	0
399	1.0	0.0	NA	NA	0.289	0
400	3.0	0.0	37.5	1	0.102	0
401	3.0	1.0	38.5	13	0.289	NA
402	3.0	0.0	41.5	7	0.102	0
403	2.0	1.0	23.0	6	NA	0
404	3.0	1.0	24.0	4	NA	0
405	3.0	0.0	57.0	6	0.289	0
406	1.0	0.0	49.0	6	0.577	0
407	3.0	0.0	22.0	4	0.105	NA
408	3.0	0.0	70.0	20	0.354	0
409	3.0	0.0	23.5	5	1.000	NA
410	1.0	0.0	28.5	3	0.500	NA
411	1.0	0.0	29.5	3	1.000	0
412	3.0	0.0	95.5	13	0.500	0
413	3.0	0.0	45.0	10	0.048	0
414	1.0	0.0	30.5	3	0.500	NA
415	3.0	0.0	33.0	6	0.707	0

416	1.0	0.0	52.0	4	0.289	NA
417	1.0	0.0	31.0	6	0.707	0
418	1.0	0.0	27.5	1	0.707	NA
419	1.0	0.0	50.0	4	1.000	NA
420	1.0	0.0	46.0	4	1.000	0
421	1.0	0.0	50.0	4	NA	NA
422	1.0	0.0	51.0	16	0.289	NA
423	1.0	0.0	28.5	3	0.707	NA
424	3.0	0.0	30.0	4	0.289	NA
425	1.0	0.0	29.5	3	0.447	0
426	1.0	0.0	41.5	9	0.289	0
427	1.0	0.0	30.0	4	1.000	NA
428	1.0	0.0	52.0	4	0.577	NA
429	3.0	0.0	30.0	4	0.500	0
430	3.0	1.0	29.0	2	0.333	0
431	3.0	0.0	39.5	5	0.218	0
432	1.0	0.0	29.0	4	0.577	0
433	2.0	0.0	47.0	10	0.577	NA
434	3.0	0.0	21.5	1	0.289	NA
435	3.0	0.0	12.5	5	0.577	0
436	3.0	0.0	50.0	10	NA	0
437	1.0	0.0	54.0	8	0.102	NA
438	1.5	0.0	39.0	6	NA	NA
439	3.0	0.0	77.0	26	0.408	0
440	1.0	0.0	42.0	0	NA	0
441	3.0	0.0	20.0	4	0.289	NA
442	1.0	0.0	33.0	6	NA	0
443	2.0	1.0	35.5	9	0.102	NA
444	1.0	0.0	41.5	7	0.289	0
445	4.0	0.0	27.0	12	1.000	NA
446	1.0	0.0	31.5	5	NA	NA
447	1.0	0.0	54.5	7	NA	NA
448	3.0	0.0	20.0	4	0.289	NA
449	1.0	0.0	28.0	4	NA	1
450	3.0	0.0	22.0	4	0.289	NA

	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
1	NA	NA	NA	NA
2	0	1	0	0
3	1	1	0	0
4	0	1	0	0
5	0	1	0	0
6	NA	NA	NA	NA
7	1	1	0	0

8	NA	NA	NA	NA
9	NA	NA	NA	NA
10	1	1	0	0
11	1	1	1	0
12	0	0	1	1
13	1	1	0	0
14	1	1	0	0
15	0	1	0	0
16	1	1	0	0
17	1	1	0	0
18	NA	NA	NA	NA
19	NA	NA	NA	NA
20	NA	NA	NA	NA
21	1	0	0	0
22	1	1	0	0
23	0	1	0	0
24	NA	NA	NA	NA
25	NA	NA	NA	NA
26	0	0	1	1
27	NA	NA	NA	NA
28	NA	NA	NA	NA
29	NA	NA	NA	NA
30	1	1	0	0
31	1	1	0	0
32	1	0	0	0
33	0	0	0	1
34	1	1	0	0
35	0	1	0	0
36	1	1	0	0
37	1	1	0	0
38	1	0	0	0
39	1	1	0	0
40	1	1	0	0
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44	0	1	0	0
45	0	1	0	0
46	1	1	0	0
47	0	1	0	0
48	1	1	0	0
49	1	0	0	0
50	1	1	0	0

51	0	0	0	1
52	1	1	0	0
53	NA	NA	NA	NA
54	0	1	0	0
55	0	1	0	0
56	1	0	0	0
57	0	1	0	0
58	1	1	0	0
59	0	1	0	0
60	1	1	0	0
61	0	1	0	0
62	NA	NA	NA	NA
63	0	1	0	0
64	1	1	0	0
65	1	0	0	0
66	NA	NA	NA	NA
67	0	1	0	0
68	NA	NA	NA	NA
69	0	1	0	0
70	NA	NA	NA	NA
71	NA	NA	NA	NA
72	NA	NA	NA	NA
73	NA	NA	NA	NA
74	NA	NA	NA	NA
75	1	1	0	0
76	NA	NA	NA	NA
77	1	1	0	0
78	1	1	0	0
79	0	1	0	0
80	0	1	0	0
81	1	1	0	0
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88	0	1	0	0
89	1	1	1	0
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92	0	0	1	0
93	0	1	0	0

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131	0	0	1	0
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190	0	1	0	0
191	0	1	0	0
192	0	1	1	1
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194	1	1	0	0
195	NA	NA	NA	NA
196	0	1	0	0
197	1	1	0	0
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200	0	1	0	0
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202	0	1	0	0
203	NA	NA	NA	NA
204	0	1	0	0
205	NA	NA	NA	NA
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227	1	1	0	0
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229	0	1	0	0
230	0	0	1	1
231	1	1	0	0
232	NA	NA	NA	NA
233	1	1	0	0
234	0	1	0	0
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240	1	1	0	0
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242	1	1	0	0
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249	NA	NA	NA	NA
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256	1	1	0	0
257	NA	NA	NA	NA
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259	0	1	0	0
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295	0	1	0	0
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297	NA	NA	NA	NA
298	NA	NA	NA	NA
299	NA	NA	NA	NA
300	0	1	0	0
301	NA	NA	NA	NA
302	NA	NA	NA	NA
303	1	1	0	0
304	NA	NA	NA	NA
305	NA	NA	NA	NA
306	NA	NA	NA	NA
307	NA	NA	NA	NA
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313	NA	NA	NA	NA
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319	0	1	0	0
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323	0	1	0	0
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326	NA	NA	NA	NA
327	0	1	0	0
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336	NA	NA	NA	NA
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351	NA	NA	NA	NA

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373	1	1	0	0
374	NA	NA	NA	NA
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376	1	1	0	0
377	1	1	0	0
378	NA	NA	NA	NA
379	0	1	0	0
380	NA	NA	NA	NA
381	0	1	0	0
382	NA	NA	NA	NA
383	1	1	0	0
384	NA	NA	NA	NA
385	NA	NA	NA	NA
386	NA	NA	NA	NA
387	0	1	0	0
388	0	1	0	0
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393	NA	NA	NA	NA
394	NA	NA	NA	NA

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409	NA	NA	NA	NA
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413	0	1	0	0
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419	NA	NA	NA	NA
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421	NA	NA	NA	NA
422	NA	NA	NA	NA
423	NA	NA	NA	NA
424	NA	NA	NA	NA
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427	NA	NA	NA	NA
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429	0	1	0	0
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432	0	0	1	0
433	NA	NA	NA	NA
434	NA	NA	NA	NA
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436	0	0	1	1
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441	NA	NA	NA	NA
442	1	1	0	0
443	NA	NA	NA	NA
444	0	1	0	0
445	NA	NA	NA	NA
446	NA	NA	NA	NA
447	NA	NA	NA	NA
448	NA	NA	NA	NA
449	1	1	0	0
450	NA	NA	NA	NA

	ELT_single	ELT_small_batch	ELT_large_batch	ALT_Min	ALT_Range	FM_Average
1	NA	NA	NA	0	2300	3.5
2	1	0	0	0	500	5.5
3	1	0	0	0	2400	4.0
4	1	0	0	0	1400	5.0
5	NA	NA	NA	600	450	2.0
6	NA	NA	NA	1500	800	4.0
7	1	0	0	2400	600	3.0
8	NA	NA	NA	1000	100	2.0
9	NA	NA	NA	500	1000	9.0
10	1	0	0	0	1000	12.0
11	0	1	1	200	1200	12.0
12	0	0	1	0	2600	6.5
13	1	0	0	100	1400	2.5
14	1	0	0	100	1500	3.0
15	1	0	0	0	800	3.5
16	1	0	0	0	1000	3.0
17	1	0	0	0	1500	7.0
18	1	0	0	100	1300	2.5
19	1	0	0	600	1600	2.5
20	NA	NA	NA	400	1600	NA
21	1	1	0	0	800	4.0
22	1	0	0	1900	1100	2.0
23	NA	NA	NA	1200	600	2.0
24	NA	NA	NA	1300	800	2.5
25	NA	NA	NA	300	1600	3.0
26	1	0	0	300	1700	4.0
27	NA	NA	NA	300	1200	2.0
28	NA	NA	NA	400	900	3.0
29	NA	NA	NA	500	1000	2.5

30	1	0	0	0	2500	4.5
31	1	0	0	0	2500	2.5
32	1	0	0	100	2400	3.0
33	1	0	0	100	1550	2.5
34	1	0	0	0	2500	4.0
35	0	1	0	0	2500	4.5
36	0	0	1	100	2100	3.5
37	1	0	0	0	2500	4.0
38	1	1	0	0	3000	4.5
39	1	1	0	100	1200	3.0
40	1	1	0	0	2500	4.0
41	1	0	0	100	2200	4.0
42	1	0	0	0	2800	3.0
43	1	0	0	0	2400	4.5
44	0	0	1	0	2400	5.0
45	1	0	0	0	1500	5.0
46	1	0	0	0	1900	2.0
47	NA	NA	NA	0	2000	5.0
48	1	0	0	100	1500	3.0
49	1	0	0	600	1800	2.0
50	1	0	0	0	1600	4.0
51	0	0	1	0	2000	4.5
52	1	0	0	100	1700	4.0
53	NA	NA	NA	NA	NA	2.0
54	0	0	1	200	700	3.0
55	1	0	0	600	2100	3.0
56	1	0	0	900	1600	3.5
57	0	1	0	0	1700	5.0
58	1	0	0	100	1900	4.0
59	1	0	0	200	700	2.0
60	1	0	0	1600	1200	3.0
61	0	0	1	0	2800	3.0
62	NA	NA	NA	200	1700	6.0
63	1	0	0	500	900	4.0
64	1	0	0	1000	1200	4.0
65	1	1	0	0	900	3.0
66	NA	NA	NA	400	1150	3.0
67	0	1	0	300	400	2.0
68	NA	NA	NA	100	1300	1.5
69	NA	NA	NA	1400	900	3.0
70	NA	NA	NA	0	1000	3.0
71	1	0	0	1800	800	3.0
72	NA	NA	NA	800	3400	4.0

73	NA	NA	NA	0	500	4.0
74	NA	NA	NA	0	200	2.0
75	1	1	0	0	450	3.0
76	NA	NA	NA	1200	800	2.0
77	1	0	0	0	2900	7.0
78	1	0	0	0	2500	5.5
79	1	0	0	0	3000	8.0
80	1	0	0	0	2700	7.0
81	0	1	0	0	3000	9.5
82	0	1	1	0	2500	7.0
83	1	0	0	0	2500	8.5
84	1	0	0	0	2400	9.5
85	0	1	0	0	2500	5.0
86	0	0	1	0	3000	7.5
87	1	0	0	0	2300	4.0
88	1	0	0	0	3000	6.5
89	1	0	0	0	2300	6.0
90	1	0	0	0	1900	7.0
91	1	0	0	0	2500	7.0
92	1	0	0	0	2000	8.0
93	0	0	1	0	2500	7.5
94	1	0	0	0	2500	3.5
95	1	0	0	0	2700	6.5
96	1	0	0	0	2000	6.0
97	1	0	0	0	2300	4.0
98	1	1	0	0	2500	6.5
99	1	0	0	0	3000	7.0
100	1	0	0	0	2300	4.0
101	0	0	1	0	2300	3.5
102	1	1	0	0	2000	3.0
103	1	0	0	0	2200	3.5
104	1	0	0	0	2400	4.0
105	1	0	0	0	2750	7.0
106	1	0	0	0	2300	4.0
107	1	0	0	0	2500	5.0
108	1	0	0	0	2400	6.0
109	0	1	1	0	2500	3.5
110	1	1	0	0	3000	5.5
111	0	0	1	0	2000	5.5
112	0	0	1	0	2600	3.5
113	1	0	0	0	2300	3.5
114	1	1	0	0	2600	5.5
115	1	0	0	0	2000	4.0

116	0	1	0	0	2600	4.5
117	1	0	0	0	2000	3.5
118	1	0	0	0	2200	3.5
119	1	1	0	0	2500	3.5
120	1	0	0	0	2000	5.0
121	1	0	0	100	2300	5.0
122	1	0	0	200	2300	5.0
123	1	0	0	0	2000	6.0
124	1	0	0	0	2800	6.0
125	1	1	0	0	2300	3.5
126	1	0	0	0	1900	7.0
127	1	1	0	0	2000	2.5
128	1	0	0	0	1800	6.5
129	1	0	0	0	2500	7.0
130	0	0	1	0	2600	4.0
131	1	0	0	0	1600	4.5
132	0	1	1	0	1700	5.0
133	0	0	1	0	2700	5.5
134	1	0	0	0	3000	8.0
135	1	0	0	0	1900	5.0
136	1	0	0	100	1900	7.0
137	1	0	0	0	1800	4.0
138	1	0	0	0	1800	2.5
139	1	0	0	200	2200	3.0
140	1	0	0	0	2300	2.5
141	1	0	0	0	2500	3.0
142	1	0	0	0	2000	5.5
143	1	0	0	0	1400	2.0
144	1	0	0	0	1700	3.0
145	1	0	0	100	2000	3.0
146	0	0	1	0	2600	3.5
147	1	0	0	50	1850	4.5
148	1	0	0	0	1500	3.0
149	0	0	1	0	2700	4.5
150	1	0	0	0	2300	3.5
151	0	1	0	0	1700	6.0
152	1	0	0	0	2600	6.5
153	1	1	0	0	2000	3.5
154	1	0	0	0	2800	3.0
155	1	0	0	100	1900	2.0
156	1	0	0	0	1600	6.0
157	1	0	0	0	2300	3.5
158	1	0	0	0	2400	4.0

159	1	0	0	0	2200	4.0
160	1	0	0	0	2500	3.0
161	0	1	0	0	2300	4.5
162	1	0	0	0	1950	5.0
163	1	0	0	100	600	3.0
164	1	1	0	0	1000	6.5
165	1	0	0	0	1700	7.0
166	1	0	0	0	2500	3.0
167	1	0	0	0	2500	3.5
168	1	0	0	200	2350	3.5
169	1	0	0	0	2700	9.0
170	1	0	0	0	1900	5.0
171	1	0	0	100	1250	3.5
172	1	0	0	0	2200	7.0
173	1	0	0	0	2000	3.0
174	1	0	0	0	2000	3.5
175	1	0	0	0	2300	3.5
176	1	0	0	0	2600	5.0
177	1	1	0	50	1850	3.0
178	1	0	0	0	1900	5.5
179	1	0	0	200	1800	3.0
180	1	0	0	0	2000	7.5
181	1	0	0	300	1400	4.0
182	1	0	0	0	1900	8.0
183	1	0	0	0	2000	4.5
184	1	0	0	0	1500	3.0
185	0	1	1	100	2000	2.0
186	1	1	0	0	1800	5.0
187	0	1	0	0	2300	3.5
188	1	0	0	0	500	2.5
189	1	0	0	100	1900	5.0
190	1	0	0	0	2300	3.5
191	1	1	0	0	1700	4.0
192	0	0	1	100	900	2.5
193	1	0	0	600	1900	3.0
194	1	0	0	0	2000	7.5
195	1	0	0	0	2200	9.0
196	1	0	0	NA	NA	3.0
197	1	0	0	0	3100	2.5
198	1	0	0	25	2275	3.0
199	1	0	0	0	1800	6.5
200	0	1	1	100	2300	3.0
201	1	0	0	100	1900	3.0

202	NA	NA	NA	NA	NA	2.5
203	NA	NA	NA	0	1000	2.5
204	1	1	0	0	2100	8.5
205	1	0	0	100	1500	3.5
206	1	0	0	100	1700	6.0
207	1	0	0	0	1000	7.0
208	1	0	0	100	350	2.0
209	1	0	0	200	800	2.5
210	0	1	0	0	2200	4.0
211	1	0	0	0	2300	4.5
212	1	0	0	100	2000	3.0
213	1	0	0	150	2250	4.0
214	1	0	0	0	2500	9.5
215	1	0	0	0	2000	4.5
216	1	0	0	350	2350	2.5
217	1	0	0	0	1800	3.5
218	1	0	0	200	1800	6.0
219	NA	NA	NA	0	2500	5.5
220	1	1	0	0	1500	5.0
221	1	1	0	0	2400	6.5
222	1	0	0	0	2200	7.5
223	NA	NA	NA	100	300	2.0
224	1	1	0	600	2700	4.0
225	1	0	0	0	2500	3.0
226	1	0	0	0	1600	2.5
227	1	0	0	500	1900	3.0
228	0	1	1	200	1900	4.5
229	1	0	0	100	1600	3.0
230	1	0	0	100	1200	4.0
231	1	0	0	0	2800	7.0
232	1	0	0	100	1450	4.5
233	1	0	0	100	1900	4.5
234	1	0	0	100	1000	2.0
235	1	0	0	1500	1600	3.0
236	NA	NA	NA	1600	1500	3.0
237	1	0	0	0	1400	3.5
238	1	0	0	900	1600	3.0
239	1	0	0	800	1800	3.0
240	1	0	0	0	2000	4.0
241	NA	NA	NA	0	2300	6.5
242	1	0	0	0	2000	2.5
243	NA	NA	NA	1600	1700	3.0
244	1	0	0	100	1500	3.0

245	NA	NA	NA	900	1900	3.5
246	1	0	0	300	1500	2.0
247	NA	NA	NA	0	2600	4.0
248	1	0	0	0	300	2.0
249	NA	NA	NA	0	2300	4.0
250	1	0	0	0	1800	9.0
251	1	0	0	0	2400	4.0
252	1	0	0	100	1900	3.0
253	NA	NA	NA	400	2100	4.0
254	0	0	1	0	1500	3.5
255	NA	NA	NA	0	1200	5.0
256	1	0	0	0	2400	5.0
257	NA	NA	NA	900	1300	3.0
258	1	0	0	1500	1100	3.0
259	1	0	0	0	1900	9.0
260	1	0	0	800	1900	3.0
261	1	0	0	0	1500	5.0
262	1	1	0	800	2200	4.0
263	1	0	0	0	3400	4.0
264	NA	NA	NA	1000	1500	2.0
265	0	1	1	900	2200	3.0
266	NA	NA	NA	100	1700	3.0
267	1	0	0	500	1100	4.0
268	NA	NA	NA	800	1600	3.0
269	1	0	0	0	1600	3.0
270	NA	NA	NA	0	2200	7.0
271	NA	NA	NA	1800	1000	2.5
272	NA	NA	NA	0	2000	4.5
273	1	0	0	0	2000	5.5
274	1	0	0	0	500	3.0
275	1	0	0	1600	1600	2.5
276	1	0	0	0	2000	8.0
277	1	0	0	200	1100	4.0
278	1	0	0	0	2500	11.0
279	1	0	0	100	900	7.0
280	NA	NA	NA	0	2400	4.0
281	1	0	0	500	1100	2.5
282	NA	NA	NA	0	1800	6.5
283	0	1	0	0	1600	3.0
284	1	0	0	0	650	4.0
285	1	0	0	1400	1500	3.0
286	NA	NA	NA	1600	1100	2.0
287	NA	NA	NA	0	2400	4.0

288	1	0	0	300	2100	5.0
289	NA	NA	NA	450	2150	3.0
290	1	0	0	0	2500	4.0
291	0	1	1	1200	1400	3.0
292	NA	NA	NA	500	1000	3.0
293	1	0	0	750	1750	2.5
294	NA	NA	NA	1100	1400	3.0
295	1	0	0	750	1850	4.0
296	1	0	0	100	900	3.0
297	NA	NA	NA	0	1600	7.0
298	1	0	0	0	2300	4.0
299	NA	NA	NA	300	200	2.0
300	NA	NA	NA	1200	1050	3.0
301	NA	NA	NA	300	1200	2.0
302	NA	NA	NA	0	2800	4.0
303	1	1	0	1000	1400	4.0
304	NA	NA	NA	200	2600	3.5
305	NA	NA	NA	0	2100	6.0
306	NA	NA	NA	1500	1000	2.0
307	NA	NA	NA	1800	800	2.0
308	0	1	1	1400	1000	3.0
309	1	0	0	0	2100	3.5
310	NA	NA	NA	900	300	2.0
311	NA	NA	NA	100	1400	2.0
312	0	1	1	0	1800	2.5
313	NA	NA	NA	200	2000	3.0
314	NA	NA	NA	1200	1500	3.0
315	NA	NA	NA	0	2200	4.0
316	1	0	0	200	800	2.0
317	NA	NA	NA	1500	1100	2.0
318	NA	NA	NA	0	1900	4.5
319	NA	NA	NA	0	900	3.0
320	1	0	0	500	1000	3.0
321	1	0	0	0	1300	3.0
322	NA	NA	NA	0	1000	8.0
323	NA	NA	NA	100	900	1.5
324	1	0	0	750	1650	3.0
325	1	0	0	0	1200	7.0
326	1	0	0	0	2000	4.5
327	NA	NA	NA	100	1900	3.0
328	NA	NA	NA	1650	1250	2.5
329	NA	NA	NA	300	1500	3.0
330	1	0	0	0	400	1.5

331	1	0	0	0	1300	5.0
332	1	0	0	900	2100	4.0
333	1	0	0	0	1500	6.0
334	0	1	1	2000	1000	2.0
335	1	0	0	450	1950	5.0
336	1	0	0	2100	500	1.5
337	1	0	0	0	2100	5.0
338	0	0	1	500	1350	3.5
339	1	0	0	50	1450	3.0
340	NA	NA	NA	0	2000	4.0
341	0	1	0	0	900	3.5
342	1	0	0	900	1400	3.0
343	NA	NA	NA	1500	950	2.0
344	NA	NA	NA	0	2000	4.5
345	1	0	0	400	1600	3.0
346	1	0	0	1600	1400	3.0
347	NA	NA	NA	900	600	3.0
348	1	0	0	0	2500	6.0
349	NA	NA	NA	1800	800	2.0
350	NA	NA	NA	1400	1200	1.5
351	NA	NA	NA	1700	800	2.5
352	NA	NA	NA	0	1400	3.0
353	NA	NA	NA	0	2000	3.0
354	NA	NA	NA	0	1800	5.0
355	NA	NA	NA	1600	0	3.0
356	NA	NA	NA	1200	1300	2.0
357	NA	NA	NA	0	1500	5.5
358	1	0	0	0	2000	3.0
359	1	0	0	700	1100	2.5
360	NA	NA	NA	900	1100	2.0
361	1	0	0	400	1600	3.0
362	NA	NA	NA	600	900	4.0
363	1	1	0	0	1300	7.5
364	1	0	0	0	1500	5.0
365	1	1	0	0	1000	4.5
366	1	0	0	0	700	3.0
367	NA	NA	NA	1000	650	3.5
368	NA	NA	NA	1250	500	2.0
369	1	0	0	1800	400	NA
370	NA	NA	NA	1800	800	2.5
371	0	1	0	1000	650	3.0
372	NA	NA	NA	950	1050	2.0
373	1	1	0	400	900	3.5

374	NA	NA	NA	600	800	2.5
375	1	0	0	0	250	6.0
376	1	0	0	0	1000	4.0
377	1	1	0	0	800	5.0
378	NA	NA	NA	250	650	2.0
379	NA	NA	NA	700	800	4.0
380	NA	NA	NA	0	2500	7.0
381	0	1	0	200	3300	NA
382	NA	NA	NA	1500	1000	2.0
383	1	1	0	0	3000	8.5
384	1	0	0	1700	800	4.0
385	NA	NA	NA	50	1900	7.0
386	NA	NA	NA	0	400	6.0
387	1	0	0	0	1800	NA
388	NA	NA	NA	480	1520	5.0
389	1	0	0	0	1500	9.0
390	NA	NA	NA	200	100	5.0
391	NA	NA	NA	800	1000	3.0
392	NA	NA	NA	600	400	4.0
393	NA	NA	NA	800	300	3.0
394	NA	NA	NA	400	1600	6.0
395	NA	NA	NA	1400	600	3.0
396	1	0	0	1000	1600	NA
397	1	0	0	0	2000	6.0
398	1	1	0	900	1500	3.5
399	1	1	0	NA	NA	4.0
400	1	0	0	0	2000	12.0
401	NA	NA	NA	0	1000	7.0
402	1	0	0	0	3000	5.5
403	1	0	0	0	1800	3.5
404	NA	NA	NA	100	900	9.0
405	1	0	0	0	1500	12.0
406	1	1	0	0	1700	4.0
407	NA	NA	NA	0	800	9.0
408	NA	NA	NA	0	1100	10.5
409	1	0	0	0	1500	8.0
410	NA	NA	NA	1000	700	3.0
411	1	0	0	0	800	2.0
412	1	0	0	0	400	11.0
413	1	0	0	0	1500	10.0
414	NA	NA	NA	800	1200	3.0
415	1	0	0	0	400	9.0
416	NA	NA	NA	0	1900	4.5

417	NA	NA	NA	1000	1000	3.0
418	NA	NA	NA	1500	800	2.0
419	NA	NA	NA	1400	1300	2.0
420	1	1	0	150	1450	2.5
421	NA	NA	NA	2000	700	3.0
422	NA	NA	NA	0	1300	4.5
423	NA	NA	NA	0	3000	3.5
424	NA	NA	NA	700	1700	8.0
425	NA	NA	NA	1000	1200	2.0
426	1	1	0	0	900	3.5
427	NA	NA	NA	500	2300	2.5
428	NA	NA	NA	1000	200	2.0
429	1	0	0	0	1200	7.5
430	1	0	0	0	100	4.5
431	1	0	0	500	1500	10.0
432	1	0	0	600	1900	3.5
433	NA	NA	NA	700	1800	8.0
434	1	0	0	0	1800	NA
435	1	1	0	0	1500	NA
436	1	1	0	0	2000	11.0
437	1	0	0	0	1600	2.0
438	NA	NA	NA	800	1300	5.0
439	1	0	0	0	2700	7.5
440	1	0	0	NA	NA	3.0
441	NA	NA	NA	0	800	NA
442	1	0	0	0	2900	3.0
443	NA	NA	NA	0	2600	3.0
444	0	0	1	0	1900	4.0
445	NA	NA	NA	0	2800	11.0
446	NA	NA	NA	1700	300	2.5
447	NA	NA	NA	500	700	3.0
448	NA	NA	NA	0	1400	NA
449	1	0	0	0	2300	3.0
450	NA	NA	NA	0	1500	NA

	FM_Range	AFB_herb.flower	AFB_grass	AFB_shrub_flower	AFB_honeydew	AFB_sap
1	1	NA	NA	NA	NA	NA
2	1	1	0	0	0	0
3	0	1	0	0	0	0
4	0	1	0	0	0	0
5	2	1	0	0	0	0
6	0	1	0	0	0	0
7	0	1	0	0	0	0
8	0	1	0	0	0	0

9	6	0	0	1	0	0
10	0	0	0	1	1	1
11	0	1	0	0	0	0
12	7	1	0	1	0	1
13	1	1	0	0	1	1
14	0	1	0	0	0	0
15	3	1	0	1	0	0
16	2	1	0	0	0	0
17	0	1	0	0	0	0
18	3	NA	NA	NA	NA	NA
19	1	1	0	0	0	0
20	NA	NA	NA	NA	NA	NA
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25	2	1	0	0	0	0
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28	0	NA	NA	NA	NA	NA
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37	4	1	0	1	0	0
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75	4	1	0	0	0	0
76	0	NA	NA	NA	NA	NA
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79	8	1	0	1	1	0
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83	7	1	0	1	1	1
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241	NA	NA
242	0	0
243	0	0
244	0	0
245	0	0

246	0	0
247	0	0
248	0	0
249	0	1
250	0	0
251	0	0
252	0	0
253	0	1
254	0	1
255	0	0
256	0	0
257	0	1
258	0	1
259	0	1
260	0	1
261	0	0
262	0	0
263	0	0
264	0	0
265	0	0
266	0	0
267	0	1
268	0	0
269	0	0
270	0	0
271	0	0
272	NA	NA
273	0	0
274	0	0
275	NA	NA
276	0	0
277	0	0
278	0	0
279	0	1
280	0	0
281	0	0
282	NA	NA
283	1	0
284	1	1
285	0	0
286	0	0
287	0	0
288	0	0

289	0	0
290	0	0
291	0	0
292	0	1
293	0	0
294	0	0
295	0	0
296	0	0
297	0	0
298	0	0
299	NA	NA
300	0	0
301	0	0
302	0	1
303	0	0
304	0	0
305	0	0
306	0	0
307	NA	NA
308	0	0
309	0	0
310	0	0
311	0	1
312	0	1
313	0	0
314	0	0
315	NA	NA
316	0	0
317	0	0
318	0	0
319	NA	NA
320	0	0
321	0	0
322	0	0
323	NA	NA
324	0	0
325	0	0
326	0	0
327	0	1
328	0	1
329	0	0
330	NA	NA
331	0	0

332	0	0
333	0	0
334	0	0
335	0	0
336	0	0
337	0	0
338	0	0
339	0	0
340	0	0
341	0	0
342	0	0
343	0	0
344	0	0
345	NA	NA
346	NA	NA
347	0	1
348	NA	NA
349	NA	NA
350	0	0
351	NA	NA
352	0	0
353	0	0
354	0	0
355	0	0
356	0	0
357	0	0
358	NA	NA
359	0	0
360	0	0
361	0	0
362	0	1
363	0	0
364	NA	NA
365	0	0
366	0	0
367	0	0
368	0	0
369	0	1
370	0	0
371	0	0
372	0	0
373	0	0
374	0	0

375	NA	NA
376	1	0
377	0	0
378	NA	NA
379	0	0
380	NA	NA
381	0	0
382	0	0
383	0	0
384	0	0
385	NA	NA
386	0	0
387	NA	NA
388	0	0
389	0	0
390	NA	NA
391	NA	NA
392	0	0
393	NA	NA
394	NA	NA
395	NA	NA
396	0	0
397	1	1
398	0	0
399	0	0
400	0	0
401	0	0
402	0	0
403	0	1
404	NA	NA
405	0	0
406	0	0
407	0	1
408	0	0
409	0	0
410	0	0
411	0	0
412	0	0
413	NA	NA
414	NA	NA
415	0	0
416	NA	NA
417	NA	NA

```
418          0           0
419          0           0
420          0           0
421          0           1
422          1           1
423          0           0
424         NA          NA
425         NA          NA
426          0           0
427         NA          NA
428         NA          NA
429          0           0
430          0           0
431          0           0
432          0           0
433          0           0
434         NA          NA
435          0           0
436         NA          NA
437          1           0
438          0           0
439          0           0
440          0           0
441         NA          NA
442          0           0
443          0           1
444          0           0
445          0           1
446         NA          NA
447         NA          NA
448         NA          NA
449         NA          NA
450         NA          NA
```

4.6 Select columns with `select()`

```
# choose which columns to keep
be %>%
  select(species, range.size, conserv.eu, FM_Average, WSP_Female_average)
```

	species	range.size	conserv.eu	FM_Average
1	Aglais_ichnusa	NA	NA	8.0
2	Aglais_io	1136	5	7.5
3	Aglais_urticae	1271	5	7.5
4	Agriades_aquilo	21	5	3.0
5	Agriades_dardanus	2	4	4.0
6	Agriades_glandon	45	5	2.0
7	Agriades_optilete	480	5	3.0
8	Agriades_orbitulus	63	5	3.0
9	Agriades_pyrenaicus	5	5	NA
10	Agriades_zullichi	2	2	3.0
11	Anthocharis_cardamines	1245	5	4.0
12	Anthocharis_damone	19	5	3.0
13	Anthocharis_euphenoides	131	5	3.5
14	Anthocharis_gruneri	36	5	4.0
15	Apatura_ilia	528	5	4.5
16	Apatura_iris	571	5	2.5
17	Apatura_metis	47	5	4.0
18	Aphantopus_hyperantus	1002	5	3.0
19	Aporia_crataegi	894	5	3.5
20	Araschnia_levana	626	5	5.0
21	Archon_apollinus	13	5	3.5
22	Arethusana_arethusa	229	5	3.5
23	Argynnis_laodice	100	4	2.0
24	Argynnis_pandora	320	5	5.0
25	Argynnis_paphia	1024	5	4.0
26	Aricia_agestis	700	5	7.0
27	Aricia_anteros	43	5	5.0
28	Aricia_artaxerxes	435	5	4.0
29	Aricia_cramera	138	5	9.5
30	Aricia_montensis	32	5	4.0
31	Aricia_morronensis	15	5	4.0
32	Aricia_nicias	78	5	2.0
33	Azanus_jesous	NA	NA	NA
34	Azanus_ubaldus	NA	NA	NA
35	Boloria_aquilonaris	478	5	2.0
36	Boloria_chariclea	22	4	1.5
37	Boloria_dia	554	5	5.5
38	Boloria_eunomia	311	5	3.0
39	Boloria_euphrosyne	963	5	4.0
40	Boloria_freija	144	5	2.5
41	Boloria_frigga	145	5	2.0
42	Boloria_graeca	37	5	4.0

43	Boloria_improba	6	2	2.0
44	Boloria_napaea	112	5	3.0
45	Boloria_pales	101	5	3.0
46	Boloria_polaris	18	3	2.5
47	Boloria_selene	998	5	3.5
48	Boloria_thore	79	5	2.0
49	Boloria_titania	141	5	3.0
50	Borbo_borbonica	1	NA	4.5
51	Brenthis_daphne	323	5	3.5
52	Brenthis_hecate	190	5	3.0
53	Brenthis_ino	699	5	2.5
54	Brintesia_circe	416	5	4.5
55	Cacyreus_marshalli	33	NA	8.0
56	Callophrys_avis	37	5	3.0
57	Callophrys_rubi	1192	5	6.0
58	Carcharodus_alceae	615	5	8.0
59	Carcharodus_baeticus	56	5	4.0
60	Carcharodus_floccifera	277	5	4.5
61	Carcharodus_lavatherae	146	4	4.0
62	Carcharodus_orientalis	54	5	4.5
63	Carcharodus_stauderi	2	NA	8.0
64	Carcharodus_tripolinus	NA	5	7.0
65	Carterocephalus_palaemon	585	5	2.5
66	Carterocephalus_silvicola	222	5	2.5
67	Catopsilia_florella	NA	NA	11.0
68	Celastrina_argiolus	1190	5	7.0
69	Charaxes_jasius	127	5	6.5
70	Chazara_briseis	353	4	4.0
71	Chazara_prieuri	8	5	2.0
72	Coenonympha_arcania	736	5	3.5
73	Coenonympha_corinna	17	5	4.5
74	Coenonympha_dorus	107	5	3.0
75	Coenonympha_gardetta	61	5	4.0
76	Coenonympha_glycerion	574	5	3.0
77	Coenonympha_hero	173	3	3.5
78	Coenonympha_leander	27	5	3.5
79	Coenonympha_oedippus	52	5	3.0
80	Coenonympha_orientalis	11	NA	3.0
81	Coenonympha_pamphilus	1371	5	7.0
82	Coenonympha_rhodopensis	39	5	2.5
83	Coenonympha_thyrsis	9	5	5.0
84	Coenonympha_tullia	553	5	2.0
85	Colias_alfacariensis	494	5	6.5

86	Colias_aurorina	14	5	5.0
87	Colias_caucasica	13	5	3.0
88	Colias_chrysotheme	36	3	7.0
89	Colias_crocea	1028	5	7.0
90	Colias_erate	138	5	4.5
91	Colias_hecla	24	4	3.0
92	Colias_hyale	682	5	6.5
93	Colias_myrmidone	94	1	5.5
94	Colias_palaeno	417	5	3.0
95	Colias_phicomone	83	4	3.5
96	Colias_tyche	6	5	3.0
97	Colotis_evagore	10	NA	9.0
98	Cupido_alcetas	146	5	7.0
99	Cupido_argiades	478	5	6.0
100	Cupido_decoloratus	67	5	5.0
101	Cupido_lorquinii	17	5	3.0
102	Cupido_minimus	753	5	6.0
103	Cupido_osiris	131	5	6.0
104	Cyaniris_semiargus	930	5	6.0
105	Cyclyrius_webbianus	NA	5	NA
106	Danaus_chrysippus	38	NA	10.5
107	Danaus_plexippus	15	NA	11.0
108	Erebia_aethiopella	10	5	2.0
109	Erebia_aethiops	326	5	3.5
110	Erebia_albergana	65	5	3.0
111	Erebia_calcarius	9	5	3.0
112	Erebia_cassioides	65	5	3.0
113	Erebia_christi	1	3	2.5
114	Erebia_claudina	8	4	3.0
115	Erebia_disa	36	5	2.0
116	Erebia_embla	123	5	2.0
117	Erebia_epiphron	137	5	2.5
118	Erebia_epistygne	24	4	3.0
119	Erebia_eriphyle	34	5	3.0
120	Erebia_euryale	203	5	3.0
121	Erebia_flavofasciata	5	4	3.0
122	Erebia_gorge	92	5	3.0
123	Erebia_gorgone	13	5	2.0
124	Erebia_hispania	17	5	2.5
125	Erebia_lefebvrei	12	5	3.0
126	Erebia_ligea	564	5	3.0
127	Erebia_manto	89	5	3.0
128	Erebia_medusa	361	5	3.5

129	Erebia_melampus	56	5	3.0
130	Erebia_melas	31	5	3.5
131	Erebia_meolans	139	5	4.0
132	Erebia_mnestra	22	5	2.0
133	Erebia_montana	38	5	3.0
134	Erebia_neoridas	48	5	2.5
135	Erebia_nivalis	14	5	1.5
136	Erebia_oeme	89	5	3.0
137	Erebia_orientalis	5	5	2.5
138	Erebia_ottomana	42	5	3.0
139	Erebia_palarica	5	5	3.0
140	Erebia_pandrose	194	5	2.5
141	Erebia_pharte	59	5	2.0
142	Erebia_pluto	51	5	2.5
143	Erebia_polaris	16	5	1.5
144	Erebia_pronoe	81	5	3.5
145	Erebia_rhodopensis	10	5	1.5
146	Erebia_rondoui	NA	5	2.0
147	Erebia_scipio	9	5	2.0
148	Erebia_sthennyo	10	5	2.5
149	Erebia_stiria	17	5	3.0
150	Erebia_styx	25	5	3.0
151	Erebia_sudetica	13	3	2.5
152	Erebia_triarius	72	5	4.0
153	Erebia_tyndarus	25	5	3.0
154	Erebia_zapateri	6	5	3.5
155	Erynnis_marloyi	31	5	6.0
156	Erynnis_tages	842	5	4.0
157	Euchloe_ausonia	352	5	5.0
158	Euchloe_bazae	5	3	4.0
159	Euchloe_belemia	63	5	5.0
160	Euchloe_charlonia	NA	5	8.5
161	Euchloe_crameri	197	5	3.0
162	Euchloe_eversi	NA	5	4.0
163	Euchloe_grancanariensis	NA	5	7.0
164	Euchloe_hesperidum	NA	5	6.0
165	Euchloe_insularis	16	5	5.0
166	Euchloe_penia	14	5	5.0
167	Euchloe_simplonia	32	5	4.0
168	Euchloe_tagis	56	5	3.0
169	Eumedonia_eumedon	441	5	4.0
170	Euphydryas_aurinia	538	5	3.5
171	Euphydryas_cynthia	58	5	3.0

172	Euphydryas_desfontainii	41	4	3.0
173	Euphydryas_iduna	24	4	2.0
174	Euphydryas_intermedia	28	5	3.0
175	Euphydryas_maturna	210	5	2.5
176	Fabriciana_adippe	888	5	3.5
177	Fabriciana_elisa	8	5	3.0
178	Fabriciana_niobe	646	4	2.5
179	Favonius_quercus	777	5	5.0
180	Freyeria_trochylus	19	5	8.0
181	Gegenes_nostrodamus	65	5	9.0
182	Gegenes_pumilio	76	5	9.0
183	Glaucopsyche_alexis	609	5	5.0
184	Glaucopsyche_melanops	103	5	2.0
185	Glaucopsyche_paphos	NA	5	NA
186	Gonepteryx_cleobule	NA	3	4.0
187	Gonepteryx_cleopatra	303	5	7.5
188	Gonepteryx_farinosa	50	5	11.0
189	Gonepteryx_maderensis	NA	2	9.0
190	Gonepteryx_rhamni	1177	5	8.0
191	Hamearis_lucina	497	5	6.0
192	Hesperia_comma	807	5	3.5
193	Heteropterus_morpheus	270	5	3.0
194	Hipparchia_aristaeus	13	5	4.5
195	Hipparchia_autonoe	NA	NA	2.0
196	Hipparchia_azorina	NA	5	5.0
197	Hipparchia_bacchus	NA	3	2.0
198	Hipparchia_blachieri	9	NA	4.5
199	Hipparchia_christenseni	1	5	2.0
200	Hipparchia_cretica	9	5	5.5
201	Hipparchia_cypriensis	NA	5	9.0
202	Hipparchia_fagi	309	4	4.5
203	Hipparchia_fatua	48	5	6.5
204	Hipparchia_fidia	92	5	3.5
205	Hipparchia_gomera	NA	5	5.0
206	Hipparchia_hermione	237	4	2.0
207	Hipparchia_leighebi	1	4	4.0
208	Hipparchia_maderensis	NA	5	3.0
209	Hipparchia_mersina	3	NA	4.5
210	Hipparchia_miguelensis	NA	5	4.0
211	Hipparchia_neapolitana	NA	5	3.0
212	Hipparchia_neomiris	9	5	3.0
213	Hipparchia_pellucida	2	5	4.0
214	Hipparchia_sbordonii	NA	4	2.0

215	Hipparchia_semele	814	5	3.5
216	Hipparchia_senthes	56	5	7.0
217	Hipparchia_statilinus	360	4	4.0
218	Hipparchia_syriaca	54	5	5.5
219	Hipparchia_tamadabae	NA	5	6.0
220	Hipparchia_tilosi	NA	3	3.0
221	Hipparchia_volgensis	42	5	4.0
222	Hipparchia_wyssii	NA	5	3.0
223	Hyponephele_lupina	143	5	4.5
224	Hyponephele_lycaon	365	5	3.5
225	Iolana_debilitata	NA	NA	5.0
226	Iolana_iolas	102	4	4.0
227	Iphiclides_feisthamelii	NA	NA	7.5
228	Iphiclides_podalirius	755	5	6.0
229	Issoria_lathonia	976	5	7.0
230	Kirinia_climene	9	5	2.5
231	Kirinia_roxelana	86	5	6.5
232	Kretania_eurypilus	2	NA	2.0
233	Kretania_hesperica	8	5	4.0
234	Kretania_psylorita	5	5	2.0
235	Kretania_pylaon	16	NA	2.0
236	Kretania_sephirus	NA	5	NA
237	Kretania_trappi	6	NA	3.0
238	Laeosopis_roboris	82	5	3.0
239	Lampides_boeticus	361	5	9.0
240	Lasiommata_maera	888	5	5.5
241	Lasiommata_megera	1053	5	6.5
242	Lasiommata_paramegaera	15	5	6.0
243	Lasiommata_petropolitana	352	5	3.5
244	Leptidea_duponcheli	67	5	5.0
245	Leptidea_juvernica	NA	NA	3.0
246	Leptidea_morsei	49	2	5.0
247	Leptidea_reali	NA	5	6.0
248	Leptidea_sinapis	1089	5	6.0
249	Leptotes_pirithous	287	5	8.0
250	Libythea_celtis	181	5	6.5
251	Limenitis_camilla	526	5	3.0
252	Limenitis_populi	529	4	2.5
253	Limenitis_reducta	410	5	5.0
254	Lopinga_achine	275	3	2.5
255	Luthrodes_galba	NA	NA	NA
256	Lycaena_alciphron	519	4	4.0
257	Lycaena_candens	NA	5	3.5

258	Lycaena_dispar	383	5	6.5
259	Lycaena_helle	148	5	6.0
260	Lycaena_hippothoe	689	4	4.5
261	Lycaena_ottomana	37	5	7.0
262	Lycaena_phlaeas	1340	5	9.5
263	Lycaena_thersamon	199	5	9.0
264	Lycaena_thetis	6	NA	2.0
265	Lycaena_tityrus	673	5	7.0
266	Lycaena_virgaureae	756	5	5.0
267	Lysandra_albicans	40	5	3.0
268	Lysandra_bellargus	601	5	7.0
269	Lysandra_coridon	575	4	3.0
270	Lysandra_corydonius	NA	NA	3.0
271	Lysandra_hispana	50	5	7.0
272	Maniola_chia	2	5	5.0
273	Maniola_cypricola	NA	5	4.0
274	Maniola_halicarnassus	NA	4	3.0
275	Maniola_jurtina	1289	5	5.0
276	Maniola_megala	2	NA	3.5
277	Maniola_nurag	5	5	3.5
278	Maniola_telmessia	7	5	7.5
279	Melanargia_arge	33	5	2.0
280	Melanargia_galathea	802	5	3.5
281	Melanargia_ines	79	5	4.0
282	Melanargia_lachesis	111	5	2.5
283	Melanargia_larissa	73	5	4.0
284	Melanargia_occitanica	85	5	2.5
285	Melanargia_pherusa	4	5	2.5
286	Melanargia_russiae	111	5	3.0
287	Melitaea_aetherie	26	5	2.5
288	Melitaea_arduinna	14	5	3.5
289	Melitaea_asteria	15	5	2.0
290	Melitaea_athalia	1011	5	3.5
291	Melitaea_aurelia	268	5	2.0
292	Melitaea_britomartis	99	4	3.0
293	Melitaea_celadussa	NA	NA	3.0
294	Melitaea_cinxia	673	5	4.0
295	Melitaea_deione	108	5	4.5
296	Melitaea_diamina	461	4	3.5
297	Melitaea_didyma	621	5	5.5
298	Melitaea_ornata	NA	NA	4.0
299	Melitaea_parthenoides	172	5	3.0
300	Melitaea_phoebe	521	5	4.5

301	Melitaea_trivia	260	4	5.0
302	Melitaea_varia	41	5	3.0
303	Minois_dryas	48	5	3.0
304	Muschampia_cribrellum	7	4	3.0
305	Muschampia_proto	88	5	4.0
306	Muschampia_tessellum	22	5	4.5
307	Neptis_rivularis	150	5	3.5
308	Neptis_sappho	104	5	4.5
309	Nymphalis_antiopa	910	5	5.5
310	Nymphalis_polychloros	845	3	6.5
311	Nymphalis_vaualbum	72	5	3.5
312	Nymphalis_xanthomelas	113	4	4.5
313	Ochlodes_sylvanus	1058	5	4.0
314	Oeneis_bore	19	5	1.5
315	Oeneis_glacialis	46	5	3.0
316	Oeneis_jutta	166	5	2.5
317	Oeneis_norna	54	4	2.0
318	Papilio_alexanor	49	5	4.0
319	Papilio_hospiton	14	5	3.0
320	Papilio_machaon	1224	5	6.5
321	Pararge_aegeria	1178	5	7.0
322	Pararge_xiphia	NA	2	12.0
323	Pararge_xiphioides	NA	5	12.0
324	Parnassius_apollo	354	4	4.5
325	Parnassius_mnemosyne	371	5	3.0
326	Parnassius_phoebus	48	4	3.0
327	Pelopidas_thrax	1	NA	10.0
328	Phengaris_alcon	354	4	3.0
329	Phengaris_arion	522	2	4.0
330	Phengaris_nausithous	188	4	3.0
331	Phengaris_teleius	252	3	3.0
332	Pieris_balcana	NA	5	7.0
333	Pieris_brassicae	1353	5	7.0
334	Pieris_bryoniae	114	5	4.0
335	Pieris_cheiranthi	NA	2	12.0
336	Pieris_ergane	125	5	7.5
337	Pieris_krueperi	51	5	8.0
338	Pieris_mannii	203	5	7.5
339	Pieris_napi	1405	5	5.5
340	Pieris_rapae	1363	5	9.5
341	Plebejidea_loewii	3	NA	3.5
342	Plebejus_argus	991	5	4.0
343	Plebejus_argyrognomon	290	5	4.0

344	Plebejus_bellieri	10	5	3.0
345	Plebejus_idas	774	5	5.0
346	Polygonia_c-album	1098	5	6.5
347	Polygonia_egea	158	5	8.5
348	Polyommatus_admetus	57	5	3.0
349	Polyommatus_amandus	544	5	3.0
350	Polyommatus_aroaniensis	13	5	3.0
351	Polyommatus_celina	NA	NA	11.0
352	Polyommatus_damocles	NA	NA	2.5
353	Polyommatus_damon	163	4	2.0
354	Polyommatus_daphnis	305	5	3.0
355	Polyommatus_dolus	24	5	2.0
356	Polyommatus_dorylas	330	4	4.0
357	Polyommatus_eros	88	4	3.0
358	Polyommatus_escheri	167	5	3.0
359	Polyommatus_fabressei	11	5	3.0
360	Polyommatus_fulgens	27	5	2.0
361	Polyommatus_golgus	3	3	2.0
362	Polyommatus_humedasae	2	2	2.0
363	Polyommatus_icarus	1476	5	7.0
364	Polyommatus_iphigenia	2	NA	2.5
365	Polyommatus_nephohiptamenos	NA	4	2.0
366	Polyommatus_nivescens	26	4	4.0
367	Polyommatus_orphicus	9	3	NA
368	Polyommatus_ripartii	59	4	4.0
369	Polyommatus_thersites	351	5	7.0
370	Polyommatus_violetae	3	3	2.0
371	Pontia_callidice	60	5	4.0
372	Pontia_chloridice	11	5	6.0
373	Pontia_daplidice	921	5	5.5
374	Pontia_edusa	NA	5	5.5
375	Proterebia_phegea	5	NA	2.5
376	Pseudochazara_amymone	NA	3	2.5
377	Pseudochazara_anthelea	45	5	4.0
378	Pseudochazara_cingovskii	2	NA	2.0
379	Pseudochazara_euxina	NA	NA	3.0
380	Pseudochazara_geyeri	6	5	2.0
381	Pseudochazara_graeca	19	5	3.0
382	Pseudochazara_mercurius	6	NA	2.0
383	Pseudochazara_orestes	1	3	3.0
384	Pseudochazara_williamsi	5	NA	3.0
385	Pseudophilotes_abencerragus	27	5	2.0
386	Pseudophilotes_barbagiae	1	5	4.0

387	Pseudophilotes_baton	222	5	5.0
388	Pseudophilotes_bavius	20	5	3.0
389	Pseudophilotes_panoptes	41	4	6.0
390	Pseudophilotes_vicrama	212	4	5.0
391	Pyrgus_alveus	476	5	3.5
392	Pyrgus_andromedae	83	5	3.0
393	Pyrgus_armoricanus	311	5	5.5
394	Pyrgus_cacaliae	55	5	2.5
395	Pyrgus_carlinae	30	5	2.0
396	Pyrgus_carthami	264	5	5.0
397	Pyrgus_centaureae	162	5	2.5
398	Pyrgus_cinarae	14	5	4.0
399	Pyrgus_cirsii	94	3	3.0
400	Pyrgus_foulquieri	29	NA	3.0
401	Pyrgus_malvae	959	5	5.0
402	Pyrgus_malvoides	NA	5	3.5
403	Pyrgus_onopordi	105	5	7.0
404	Pyrgus_serratulae	318	4	3.0
405	Pyrgus_sidae	77	5	4.0
406	Pyrgus_warrenensis	29	5	2.0
407	Pyronia_bathseba	104	5	4.5
408	Pyronia_cecilia	219	5	3.5
409	Pyronia_tithonus	515	5	3.5
410	Satyrium_acaciae	349	5	3.0
411	Satyrium_esculi	106	5	4.0
412	Satyrium_ilicis	586	5	4.0
413	Satyrium_ledereri	1	NA	3.5
414	Satyrium_pruni	408	5	3.0
415	Satyrium_spini	483	5	3.5
416	Satyrium_w-album	553	5	3.0
417	Satyrus_actaea	73	5	3.0
418	Satyrus_ferula	144	5	4.0
419	Scolitantides_orion	260	4	5.0
420	Speyeria_aglaja	1132	5	3.5
421	Spialia_orbifer	129	5	5.5
422	Spialia_phlomidis	25	5	4.0
423	Spialia_rosae	NA	NA	NA
424	Spialia_sertorius	380	5	7.0
425	Spialia_therapne	7	5	5.0
426	Tarucus_balkanicus	19	5	7.0
427	Tarucus_theophrastus	4	5	6.0
428	Thecla_betulae	628	5	4.5
429	Thymelicus_acteon	496	4	4.5

430	Thymelicus_christi	NA	5	9.0	
431	Thymelicus_hyrax	10	5	3.0	
432	Thymelicus_lineola	926	5	3.5	
433	Thymelicus_sylvestris	832	5	4.5	
434	Tomares_ballus	51	5	4.0	
435	Tomares_callimachus	NA	NA	3.0	
436	Tomares_nogelii	2	0	3.5	
437	Turanana_taygetica	3	2	4.0	
438	Vanessa_atalanta	1343	5	8.5	
439	Vanessa_cardui	1373	5	8.0	
440	Vanessa_virginiensis	12	NA	10.0	
441	Vanessa_vulcania	NA	5	12.0	
442	Ypthima_asterope	2	NA	7.5	
443	Zegris_eupheme	36	4	4.0	
444	Zerynthia_cassandra	44	NA	4.0	
445	Zerynthia_cerisy	61	4	5.0	
446	Zerynthia_cretica	7	5	4.5	
447	Zerynthia_polyxena	215	5	4.0	
448	Zerynthia_rumina	128	5	5.0	
449	Zizeeria_karsandra	NA	NA	NA	
450	Zizeeria_knysna	39	NA	9.0	

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229	42.5
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438	59.5
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440	45.0
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443	48.5
444	49.0
445	57.0
446	52.5
447	49.0
448	45.0
449	22.0
450	22.0

```
# or specify which columns to remove
be %>%
  select(-(OWS_egg:OWS_adult))
```

	species	family	range.size	conserv.europe
1	Aglais_ichnusa	Nymphalidae	NA	NA
2	Aglais_io	Nymphalidae	1136	5
3	Aglais_urticae	Nymphalidae	1271	5
4	Agriades_aquilo	Lycaenidae	21	5
5	Agriades_dardanus	Lycaenidae	2	4
6	Agriades_glandon	Lycaenidae	45	5
7	Agriades_optilete	Lycaenidae	480	5
8	Agriades_orbitulus	Lycaenidae	63	5
9	Agriades_pyrenaicus	Lycaenidae	5	5
10	Agriades_zullichi	Lycaenidae	2	2
11	Anthocharis_cardamines	Pieridae	1245	5
12	Anthocharis_damone	Pieridae	19	5
13	Anthocharis_euphenoides	Pieridae	131	5
14	Anthocharis_gruneri	Pieridae	36	5
15	Apatura_ilia	Nymphalidae	528	5
16	Apatura_iris	Nymphalidae	571	5
17	Apatura_metis	Nymphalidae	47	5
18	Aphantopus_hyperantus	Nymphalidae	1002	5
19	Aporia_crataegi	Pieridae	894	5
20	Araschnia_levana	Nymphalidae	626	5
21	Archon_apollinus	Papilionidae	13	4
22	Arethusana_arethusa	Nymphalidae	229	5
23	Argynnis_laodice	Nymphalidae	100	5
24	Argynnis_pandora	Nymphalidae	320	5
25	Argynnis_paphia	Nymphalidae	1024	5
26	Aricia_agestis	Lycaenidae	700	5
27	Aricia_anteros	Lycaenidae	43	4
28	Aricia_artaxerxes	Lycaenidae	435	5
29	Aricia_cramera	Lycaenidae	138	5
30	Aricia_montensis	Lycaenidae	32	5
31	Aricia_morronensis	Lycaenidae	15	5
32	Aricia_nicias	Lycaenidae	78	5
33	Azanus_jesous	Lycaenidae	NA	NA
34	Azanus_ubaldus	Lycaenidae	NA	NA
35	Boloria_aquilonaris	Nymphalidae	478	5
36	Boloria_chariclea	Nymphalidae	22	4
37	Boloria_dia	Nymphalidae	554	5

38	Boloria_eunomia	Nymphalidae	311	5
39	Boloria_euphrosyne	Nymphalidae	963	5
40	Boloria_freija	Nymphalidae	144	5
41	Boloria_frigga	Nymphalidae	145	5
42	Boloria_graeca	Nymphalidae	37	5
43	Boloria_improba	Nymphalidae	6	2
44	Boloria_napaea	Nymphalidae	112	5
45	Boloria_pales	Nymphalidae	101	5
46	Boloria_polaris	Nymphalidae	18	3
47	Boloria_selene	Nymphalidae	998	5
48	Boloria_thore	Nymphalidae	79	5
49	Boloria_titania	Nymphalidae	141	4
50	Borbo_borbonica	Hesperiidae	1	NA
51	Brenthis_daphne	Nymphalidae	323	5
52	Brenthis_hecate	Nymphalidae	190	5
53	Brenthis_ino	Nymphalidae	699	5
54	Brintesia_circe	Nymphalidae	416	5
55	Cacyreus_marshalli	Lycaenidae	33	NA
56	Callophrys_avis	Lycaenidae	37	5
57	Callophrys_rubi	Lycaenidae	1192	5
58	Carcharodus_alceae	Hesperiidae	615	5
59	Carcharodus_baeticus	Hesperiidae	56	5
60	Carcharodus_floccifera	Hesperiidae	277	4
61	Carcharodus_lavatherae	Hesperiidae	146	4
62	Carcharodus_orientalis	Hesperiidae	54	5
63	Carcharodus_stauderi	Hesperiidae	2	NA
64	Carcharodus_tripolinus	Hesperiidae	NA	5
65	Carterocephalus_palaemon	Hesperiidae	585	5
66	Carterocephalus_silvicola	Hesperiidae	222	5
67	Catopsilia_florella	Pieridae	NA	NA
68	Celastrina_argiolus	Lycaenidae	1190	5
69	Charaxes_jasius	Nymphalidae	127	5
70	Chazara_briseis	Nymphalidae	353	4
71	Chazara_prieuri	Nymphalidae	8	5
72	Coenonympha_arcania	Nymphalidae	736	5
73	Coenonympha_corinna	Nymphalidae	17	5
74	Coenonympha_dorus	Nymphalidae	107	5
75	Coenonympha_gardetta	Nymphalidae	61	5
76	Coenonympha_glycerion	Nymphalidae	574	5
77	Coenonympha_hero	Nymphalidae	173	3
78	Coenonympha_leander	Nymphalidae	27	5
79	Coenonympha_oedippus	Nymphalidae	52	2
80	Coenonympha_orientalis	Nymphalidae	11	3

81	Coenonympha_pamphilus	Nymphalidae	1371	5
82	Coenonympha_rhodopensis	Nymphalidae	39	5
83	Coenonympha_thyrsis	Nymphalidae	9	5
84	Coenonympha_tullia	Nymphalidae	553	5
85	Colias_alfacariensis	Pieridae	494	5
86	Colias_aurorina	Pieridae	14	5
87	Colias_caucasica	Pieridae	13	5
88	Colias_chrysotheme	Pieridae	36	3
89	Colias_crocea	Pieridae	1028	5
90	Colias_erate	Pieridae	138	5
91	Colias_hecla	Pieridae	24	4
92	Colias_hyale	Pieridae	682	5
93	Colias_myrmidone	Pieridae	94	2
94	Colias_palaeno	Pieridae	417	5
95	Colias_phicomone	Pieridae	83	4
96	Colias_tyche	Pieridae	6	5
97	Colotis_evagore	Pieridae	10	NA
98	Cupido_alcetas	Lycaenidae	146	5
99	Cupido_argiades	Lycaenidae	478	5
100	Cupido_decoloratus	Lycaenidae	67	4
101	Cupido_lorquinii	Lycaenidae	17	5
102	Cupido_minimus	Lycaenidae	753	5
103	Cupido_osiris	Lycaenidae	131	5
104	Cyaniris_semiargus	Lycaenidae	930	5
105	Cyclyrius_webbianus	Lycaenidae	NA	5
106	Danaus_chrysippus	Nymphalidae	38	NA
107	Danaus_plexippus	Nymphalidae	15	NA
108	Erebia_aethiopella	Nymphalidae	10	5
109	Erebia_aethiops	Nymphalidae	326	5
110	Erebia_albergana	Nymphalidae	65	5
111	Erebia_calcarius	Nymphalidae	9	5
112	Erebia_cassioides	Nymphalidae	65	5
113	Erebia_christi	Nymphalidae	1	3
114	Erebia_claudina	Nymphalidae	8	4
115	Erebia_disa	Nymphalidae	36	5
116	Erebia_embla	Nymphalidae	123	5
117	Erebia_epiphron	Nymphalidae	137	5
118	Erebia_epistygne	Nymphalidae	24	4
119	Erebia_eriphyle	Nymphalidae	34	5
120	Erebia_euryale	Nymphalidae	203	5
121	Erebia_flavofasciata	Nymphalidae	5	4
122	Erebia_gorge	Nymphalidae	92	5
123	Erebia_gorgone	Nymphalidae	13	5

124	Erebia_hispania	Nymphalidae	17	5
125	Erebia_lefebvrei	Nymphalidae	12	5
126	Erebia_ligea	Nymphalidae	564	5
127	Erebia_manto	Nymphalidae	89	5
128	Erebia_medusa	Nymphalidae	361	5
129	Erebia_melampus	Nymphalidae	56	5
130	Erebia_melas	Nymphalidae	31	5
131	Erebia_meolans	Nymphalidae	139	5
132	Erebia_mnestra	Nymphalidae	22	5
133	Erebia_montana	Nymphalidae	38	5
134	Erebia_neoridas	Nymphalidae	48	5
135	Erebia_nivalis	Nymphalidae	14	5
136	Erebia_oeme	Nymphalidae	89	5
137	Erebia_orientalis	Nymphalidae	5	5
138	Erebia_ottomana	Nymphalidae	42	5
139	Erebia_palarica	Nymphalidae	5	5
140	Erebia_pandrose	Nymphalidae	194	5
141	Erebia_pharte	Nymphalidae	59	5
142	Erebia_pluto	Nymphalidae	51	5
143	Erebia_polaris	Nymphalidae	16	5
144	Erebia_pronoe	Nymphalidae	81	5
145	Erebia_rhodopensis	Nymphalidae	10	5
146	Erebia_rondoui	Nymphalidae	NA	5
147	Erebia_scipio	Nymphalidae	9	5
148	Erebia_sthennyo	Nymphalidae	10	5
149	Erebia_stiria	Nymphalidae	17	5
150	Erebia_styx	Nymphalidae	25	5
151	Erebia_sudetica	Nymphalidae	13	3
152	Erebia_triarius	Nymphalidae	72	5
153	Erebia_tyndarus	Nymphalidae	25	5
154	Erebia_zapateri	Nymphalidae	6	5
155	Erynnis_marloyi	Hesperiidae	31	5
156	Erynnis_tages	Hesperiidae	842	5
157	Euchloe_ausonia	Pieridae	352	5
158	Euchloe_bazae	Pieridae	5	3
159	Euchloe_belemia	Pieridae	63	5
160	Euchloe_charlonia	Pieridae	NA	5
161	Euchloe_crameri	Pieridae	197	5
162	Euchloe_eversi	Pieridae	NA	5
163	Euchloe_grancanariensis	Pieridae	NA	5
164	Euchloe_hesperidum	Pieridae	NA	5
165	Euchloe_insularis	Pieridae	16	5
166	Euchloe_penia	Pieridae	14	5

167	Euchloe_simplonia	Pieridae	32	5
168	Euchloe_tagis	Pieridae	56	5
169	Eumedonia_eumedon	Lycaenidae	441	5
170	Euphydryas_aurinia	Nymphalidae	538	5
171	Euphydryas_cynthia	Nymphalidae	58	5
172	Euphydryas_desfontainii	Nymphalidae	41	4
173	Euphydryas_iduna	Nymphalidae	24	4
174	Euphydryas_intermedia	Nymphalidae	28	5
175	Euphydryas_maturna	Nymphalidae	210	3
176	Fabriciana_adippe	Nymphalidae	888	5
177	Fabriciana_elisa	Nymphalidae	8	5
178	Fabriciana_niobe	Nymphalidae	646	5
179	Favonius_quercus	Lycaenidae	777	5
180	Freyeria_trochylus	Lycaenidae	19	5
181	Gegenes_nostrodamus	Hesperiidae	65	5
182	Gegenes_pumilio	Hesperiidae	76	5
183	Glaucopsyche_alexis	Lycaenidae	609	5
184	Glaucopsyche_melanops	Lycaenidae	103	5
185	Glaucopsyche_paphos	Lycaenidae	NA	5
186	Gonepteryx_cleobule	Pieridae	NA	3
187	Gonepteryx_cleopatra	Pieridae	303	5
188	Gonepteryx_farinosa	Pieridae	50	5
189	Gonepteryx_maderensis	Pieridae	NA	2
190	Gonepteryx_rhamni	Pieridae	1177	5
191	Hamearis_lucina	Riodinidae	497	5
192	Hesperia_comma	Hesperiidae	807	5
193	Heteropterus_morpheus	Hesperiidae	270	5
194	Hipparchia_aristaeus	Nymphalidae	13	5
195	Hipparchia_autonoe	Nymphalidae	NA	5
196	Hipparchia_azorina	Nymphalidae	NA	5
197	Hipparchia_bacchus	Nymphalidae	NA	3
198	Hipparchia_blachieri	Nymphalidae	9	NA
199	Hipparchia_christenseni	Nymphalidae	1	5
200	Hipparchia_cretica	Nymphalidae	9	5
201	Hipparchia_cypriensis	Nymphalidae	NA	5
202	Hipparchia_fagi	Nymphalidae	309	4
203	Hipparchia_fatua	Nymphalidae	48	5
204	Hipparchia_fidia	Nymphalidae	92	5
205	Hipparchia_gomera	Nymphalidae	NA	5
206	Hipparchia_hermione	Nymphalidae	237	4
207	Hipparchia_leighebi	Nymphalidae	1	4
208	Hipparchia_maderensis	Nymphalidae	NA	5
209	Hipparchia_mersina	Nymphalidae	3	NA

210	Hipparchia_miguelensis	Nymphalidae	NA	5
211	Hipparchia_neapolitana	Nymphalidae	NA	5
212	Hipparchia_neomiris	Nymphalidae	9	5
213	Hipparchia_pellucida	Nymphalidae	2	5
214	Hipparchia_sbordonii	Nymphalidae	NA	4
215	Hipparchia_semele	Nymphalidae	814	5
216	Hipparchia_senthes	Nymphalidae	56	5
217	Hipparchia_statilinus	Nymphalidae	360	4
218	Hipparchia_syriaca	Nymphalidae	54	5
219	Hipparchia_tamadabae	Nymphalidae	NA	5
220	Hipparchia_tilosi	Nymphalidae	NA	3
221	Hipparchia_volgensis	Nymphalidae	42	5
222	Hipparchia_wyssii	Nymphalidae	NA	5
223	Hyponephele_lupina	Nymphalidae	143	5
224	Hyponephele_lycaon	Nymphalidae	365	5
225	Iolana_debilitata	Lycaenidae	NA	NA
226	Iolana_iolas	Lycaenidae	102	4
227	Iphiclides_feisthamelii	Papilionidae	NA	NA
228	Iphiclides_podalirius	Papilionidae	755	5
229	Issoria_lathonia	Nymphalidae	976	5
230	Kirinia_climene	Nymphalidae	9	5
231	Kirinia_roxelana	Nymphalidae	86	5
232	Kretania_eurypilus	Lycaenidae	2	NA
233	Kretania_hesperica	Lycaenidae	8	5
234	Kretania_psylorita	Lycaenidae	5	5
235	Kretania_pylaon	Lycaenidae	16	4
236	Kretania_sephirus	Lycaenidae	NA	5
237	Kretania_trappi	Lycaenidae	6	4
238	Laeosopis_roboris	Lycaenidae	82	5
239	Lampides_boeticus	Lycaenidae	361	5
240	Lasiommata_maera	Nymphalidae	888	5
241	Lasiommata_megera	Nymphalidae	1053	5
242	Lasiommata_paramegaera	Nymphalidae	15	5
243	Lasiommata_petropolitana	Nymphalidae	352	5
244	Leptidea_duponcheli	Pieridae	67	5
245	Leptidea_juvernica	Pieridae	NA	NA
246	Leptidea_morsei	Pieridae	49	4
247	Leptidea_reali	Pieridae	NA	5
248	Leptidea_sinapis	Pieridae	1089	5
249	Leptotes_pirithous	Lycaenidae	287	5
250	Libythea_celtis	Nymphalidae	181	5
251	Limenitis_camilla	Nymphalidae	526	5
252	Limenitis_populi	Nymphalidae	529	5

253	Limenitis_reducta	Nymphalidae	410	5
254	Lopinga_achine	Nymphalidae	275	3
255	Luthrodes_galba	Lycaenidae	NA	NA
256	Lycaena_alciphron	Lycaenidae	519	5
257	Lycaena_candens	Lycaenidae	NA	5
258	Lycaena_dispar	Lycaenidae	383	5
259	Lycaena_helle	Lycaenidae	148	2
260	Lycaena_hippothoe	Lycaenidae	689	5
261	Lycaena_ottomana	Lycaenidae	37	5
262	Lycaena_phlaeas	Lycaenidae	1340	5
263	Lycaena_thersamon	Lycaenidae	199	5
264	Lycaena_thetis	Lycaenidae	6	NA
265	Lycaena_tityrus	Lycaenidae	673	5
266	Lycaena_virgaureae	Lycaenidae	756	5
267	Lysandra_albicans	Lycaenidae	40	5
268	Lysandra_bellargus	Lycaenidae	601	5
269	Lysandra_coridon	Lycaenidae	575	4
270	Lysandra_corydonius	Lycaenidae	NA	5
271	Lysandra_hispana	Lycaenidae	50	5
272	Maniola_chia	Nymphalidae	2	5
273	Maniola_cypricola	Nymphalidae	NA	5
274	Maniola_halicarnassus	Nymphalidae	NA	4
275	Maniola_jurtina	Nymphalidae	1289	5
276	Maniola_megala	Nymphalidae	2	NA
277	Maniola_nurag	Nymphalidae	5	5
278	Maniola_telmessia	Nymphalidae	7	5
279	Melanargia_arge	Nymphalidae	33	5
280	Melanargia_galathea	Nymphalidae	802	5
281	Melanargia_ines	Nymphalidae	79	5
282	Melanargia_lachesis	Nymphalidae	111	5
283	Melanargia_larissa	Nymphalidae	73	5
284	Melanargia_occitanica	Nymphalidae	85	5
285	Melanargia_pherusa	Nymphalidae	4	5
286	Melanargia_russiae	Nymphalidae	111	5
287	Melitaea_aetherie	Nymphalidae	26	5
288	Melitaea_arduinna	Nymphalidae	14	5
289	Melitaea_asteria	Nymphalidae	15	5
290	Melitaea_athalia	Nymphalidae	1011	5
291	Melitaea_aurelia	Nymphalidae	268	4
292	Melitaea_britomartis	Nymphalidae	99	4
293	Melitaea_celadussa	Nymphalidae	NA	NA
294	Melitaea_cinxia	Nymphalidae	673	5
295	Melitaea_deione	Nymphalidae	108	5

296	Melitaea_diamina	Nymphalidae	461	5
297	Melitaea_didyma	Nymphalidae	621	5
298	Melitaea_ornata	Nymphalidae	NA	NA
299	Melitaea_parthenoides	Nymphalidae	172	5
300	Melitaea_phoebe	Nymphalidae	521	5
301	Melitaea_trivia	Nymphalidae	260	5
302	Melitaea_varia	Nymphalidae	41	5
303	Minois_dryas	Nymphalidae	48	5
304	Muschampia_cribrellum	Hesperiidae	7	4
305	Muschampia_proto	Hesperiidae	88	5
306	Muschampia_tessellum	Hesperiidae	22	5
307	Neptis_rivularis	Nymphalidae	150	5
308	Neptis_sappho	Nymphalidae	104	5
309	Nymphalis_antiopa	Nymphalidae	910	5
310	Nymphalis_polychloros	Nymphalidae	845	5
311	Nymphalis_vaualbum	Nymphalidae	72	5
312	Nymphalis_xanthomelas	Nymphalidae	113	5
313	Ochlodes_sylvanus	Hesperiidae	1058	5
314	Oeneis_bore	Nymphalidae	19	5
315	Oeneis_glacialis	Nymphalidae	46	5
316	Oeneis_jutta	Nymphalidae	166	5
317	Oeneis_norna	Nymphalidae	54	4
318	Papilio_alexanor	Papilionidae	49	5
319	Papilio_hospiton	Papilionidae	14	5
320	Papilio_machaon	Papilionidae	1224	5
321	Pararge_aegeria	Nymphalidae	1178	5
322	Pararge_xiphia	Nymphalidae	NA	2
323	Pararge_xiphioides	Nymphalidae	NA	5
324	Parnassius_apollo	Papilionidae	354	4
325	Parnassius_mnemosyne	Papilionidae	371	4
326	Parnassius_phoebus	Papilionidae	48	4
327	Pelopidas_thrax	Hesperiidae	1	NA
328	Phengaris_alcon	Lycaenidae	354	5
329	Phengaris_arion	Lycaenidae	522	2
330	Phengaris_nausithous	Lycaenidae	188	4
331	Phengaris_teleius	Lycaenidae	252	3
332	Pieris_balcana	Pieridae	NA	5
333	Pieris_brassicae	Pieridae	1353	5
334	Pieris_bryoniae	Pieridae	114	5
335	Pieris_cheiranthi	Pieridae	NA	2
336	Pieris_ergane	Pieridae	125	5
337	Pieris_krueperi	Pieridae	51	5
338	Pieris_mannii	Pieridae	203	5

339	Pieris_napi	Pieridae	1405	5
340	Pieris_rapae	Pieridae	1363	5
341	Plebejidea_loewii	Lycaenidae	3	NA
342	Plebejus_argus	Lycaenidae	991	5
343	Plebejus_argyrognomon	Lycaenidae	290	5
344	Plebejus_bellieri	Lycaenidae	10	5
345	Plebejus_idas	Lycaenidae	774	5
346	Polygonia_c-album	Nymphalidae	1098	5
347	Polygonia_egea	Nymphalidae	158	5
348	Polyommatus_admetus	Lycaenidae	57	5
349	Polyommatus_amandus	Lycaenidae	544	5
350	Polyommatus_aroaniensis	Lycaenidae	13	5
351	Polyommatus_celina	Lycaenidae	NA	NA
352	Polyommatus_damocles	Lycaenidae	NA	NA
353	Polyommatus_damon	Lycaenidae	163	4
354	Polyommatus_daphnis	Lycaenidae	305	5
355	Polyommatus_dolus	Lycaenidae	24	5
356	Polyommatus_dorylas	Lycaenidae	330	4
357	Polyommatus_eros	Lycaenidae	88	4
358	Polyommatus_escheri	Lycaenidae	167	5
359	Polyommatus_fabressei	Lycaenidae	11	5
360	Polyommatus_fulgens	Lycaenidae	27	5
361	Polyommatus_golgus	Lycaenidae	3	3
362	Polyommatus_humedasae	Lycaenidae	2	2
363	Polyommatus_icarus	Lycaenidae	1476	5
364	Polyommatus_iphigenia	Lycaenidae	2	NA
365	Polyommatus_nephohiptamenos	Lycaenidae	NA	4
366	Polyommatus_nivescens	Lycaenidae	26	4
367	Polyommatus_orphicus	Lycaenidae	9	3
368	Polyommatus_ripartii	Lycaenidae	59	5
369	Polyommatus_thersites	Lycaenidae	351	5
370	Polyommatus_violetae	Lycaenidae	3	3
371	Pontia_callidice	Pieridae	60	5
372	Pontia_chloridice	Pieridae	11	5
373	Pontia_daplidice	Pieridae	921	5
374	Pontia_edusa	Pieridae	NA	5
375	Proterebia_phegea	Nymphalidae	5	NA
376	Pseudochazara_amymone	Nymphalidae	NA	3
377	Pseudochazara_anthelea	Nymphalidae	45	5
378	Pseudochazara_cingovskii	Nymphalidae	2	1
379	Pseudochazara_euxina	Nymphalidae	NA	2
380	Pseudochazara_geyeri	Nymphalidae	6	5
381	Pseudochazara_graeca	Nymphalidae	19	5

382	Pseudochazara_mercurius	Nymphalidae	6	NA
383	Pseudochazara_orestes	Nymphalidae	1	3
384	Pseudochazara_williamsi	Nymphalidae	5	NA
385	Pseudophilotes_abencerragus	Lycaenidae	27	5
386	Pseudophilotes_barbagiae	Lycaenidae	1	5
387	Pseudophilotes_baton	Lycaenidae	222	5
388	Pseudophilotes_bavius	Lycaenidae	20	5
389	Pseudophilotes_panoptes	Lycaenidae	41	4
390	Pseudophilotes_vicrama	Lycaenidae	212	4
391	Pyrgus_alveus	Hesperiidae	476	5
392	Pyrgus_andromedae	Hesperiidae	83	5
393	Pyrgus_armoricanus	Hesperiidae	311	5
394	Pyrgus_cacaliae	Hesperiidae	55	5
395	Pyrgus_carlinae	Hesperiidae	30	5
396	Pyrgus_carthami	Hesperiidae	264	5
397	Pyrgus_centaureae	Hesperiidae	162	5
398	Pyrgus_cinarae	Hesperiidae	14	5
399	Pyrgus_cirsii	Hesperiidae	94	3
400	Pyrgus_foulquieri	Hesperiidae	29	NA
401	Pyrgus_malvae	Hesperiidae	959	5
402	Pyrgus_malvoides	Hesperiidae	NA	5
403	Pyrgus_onopordi	Hesperiidae	105	5
404	Pyrgus_serratulae	Hesperiidae	318	5
405	Pyrgus_sidae	Hesperiidae	77	5
406	Pyrgus_warrenensis	Hesperiidae	29	5
407	Pyronia_bathseba	Nymphalidae	104	5
408	Pyronia_cecilia	Nymphalidae	219	5
409	Pyronia_tithonus	Nymphalidae	515	5
410	Satyrium_acaciae	Lycaenidae	349	5
411	Satyrium_esculi	Lycaenidae	106	5
412	Satyrium_ilicis	Lycaenidae	586	5
413	Satyrium_ledereri	Lycaenidae	1	NA
414	Satyrium_pruni	Lycaenidae	408	5
415	Satyrium_spini	Lycaenidae	483	5
416	Satyrium_w-album	Lycaenidae	553	5
417	Satyrus_actaea	Nymphalidae	73	5
418	Satyrus_ferula	Nymphalidae	144	5
419	Scolitantides_orion	Lycaenidae	260	5
420	Speyeria_aglaja	Nymphalidae	1132	5
421	Spialia_orbifer	Hesperiidae	129	5
422	Spialia_phlomidis	Hesperiidae	25	5
423	Spialia_rosae	Lycaenidae	NA	NA
424	Spialia_sertorius	Hesperiidae	380	5

425	Spialia_therapne	Hesperiidae	7	5
426	Tarucus_balkanicus	Lycaenidae	19	5
427	Tarucus_theophrastus	Lycaenidae	4	5
428	Thecla_betulae	Lycaenidae	628	5
429	Thymelicus_acteon	Hesperiidae	496	4
430	Thymelicus_christi	Hesperiidae	NA	5
431	Thymelicus_hyrax	Hesperiidae	10	5
432	Thymelicus_lineola	Hesperiidae	926	5
433	Thymelicus_sylvestris	Hesperiidae	832	5
434	Tomares_ballus	Lycaenidae	51	5
435	Tomares_callimachus	Lycaenidae	NA	5
436	Tomares_nogelii	Lycaenidae	2	3
437	Turanana_taygetica	Lycaenidae	3	2
438	Vanessa_atalanta	Nymphalidae	1343	5
439	Vanessa_cardui	Nymphalidae	1373	5
440	Vanessa_virginiensis	Nymphalidae	12	NA
441	Vanessa_vulcania	Nymphalidae	NA	5
442	Ypthima_asterope	Nymphalidae	2	NA
443	Zegris_eupheme	Pieridae	36	4
444	Zerynthia_cassandra	Papilionidae	44	NA
445	Zerynthia_cerisy	Papilionidae	61	4
446	Zerynthia_cretica	Papilionidae	7	5
447	Zerynthia_polyxena	Papilionidae	215	5
448	Zerynthia_rumina	Papilionidae	128	5
449	Zizeeria_karsandra	Lycaenidae	NA	NA
450	Zizeeria_knysna	Lycaenidae	39	NA

	conserv.eu	GEN_Average	GEN_Min	GEN_Max	GEN_Range	WSP_Female_average
1	NA	2.00	2.0	2.0	0.0	47.0
2	5	2.00	1.0	3.0	2.0	53.5
3	5	2.00	1.0	3.0	2.0	48.0
4	5	0.75	0.5	1.0	0.5	23.0
5	4	1.00	1.0	1.0	0.0	25.0
6	5	1.00	1.0	1.0	0.0	23.0
7	5	1.00	1.0	1.0	0.0	25.0
8	5	1.00	1.0	1.0	0.0	26.0
9	5	1.00	1.0	1.0	0.0	25.0
10	2	1.00	1.0	1.0	0.0	23.5
11	5	1.00	1.0	1.0	0.0	40.5
12	5	1.00	1.0	1.0	0.0	39.5
13	5	1.00	1.0	1.0	0.0	37.0
14	5	1.00	1.0	1.0	0.0	33.0
15	5	1.50	1.0	2.0	1.0	68.0
16	5	1.00	1.0	1.0	0.0	70.0

17	5	1.50	1.0	2.0	1.0	62.0
18	5	1.00	1.0	1.0	0.0	38.5
19	5	1.00	1.0	1.0	0.0	62.5
20	5	2.00	1.0	3.0	2.0	33.5
21	5	1.00	1.0	1.0	0.0	57.0
22	5	1.00	1.0	1.0	0.0	41.0
23	4	1.00	1.0	1.0	0.0	55.0
24	5	1.50	1.0	2.0	1.0	72.0
25	5	1.00	1.0	1.0	0.0	62.0
26	5	2.00	1.0	3.0	2.0	25.0
27	5	2.00	1.0	3.0	2.0	28.0
28	5	1.00	1.0	1.0	0.0	27.5
29	5	2.50	2.0	3.0	1.0	25.0
30	5	1.00	1.0	1.0	0.0	27.5
31	5	1.50	1.0	2.0	1.0	28.0
32	5	1.00	1.0	1.0	0.0	25.5
33	NA	3.00	3.0	3.0	0.0	21.5
34	NA	3.00	3.0	3.0	0.0	12.5
35	5	1.00	1.0	1.0	0.0	36.0
36	4	1.00	1.0	1.0	0.0	38.0
37	5	2.00	1.0	3.0	2.0	33.0
38	5	1.00	1.0	1.0	0.0	36.5
39	5	1.50	1.0	2.0	1.0	36.0
40	5	1.00	1.0	1.0	0.0	34.5
41	5	1.00	1.0	1.0	0.0	42.5
42	5	1.00	1.0	1.0	0.0	36.0
43	2	1.00	1.0	1.0	0.0	32.5
44	5	1.00	1.0	1.0	0.0	39.0
45	5	1.00	1.0	1.0	0.0	36.0
46	3	1.00	1.0	1.0	0.0	41.5
47	5	1.50	1.0	2.0	1.0	36.5
48	5	1.25	1.0	1.5	1.0	44.0
49	5	1.00	1.0	1.0	0.0	39.5
50	NA	2.50	2.0	3.0	1.0	29.0
51	5	1.00	1.0	1.0	0.0	47.0
52	5	1.00	1.0	1.0	0.0	40.0
53	5	1.00	1.0	1.0	0.0	37.0
54	5	1.00	1.0	1.0	0.0	73.0
55	NA	3.00	3.0	3.0	0.0	23.5
56	5	1.00	1.0	1.0	0.0	35.5
57	5	1.25	1.0	1.5	0.5	23.0
58	5	2.50	2.0	3.0	1.0	30.0
59	5	2.50	2.0	3.0	1.0	30.0

60	5	1.50	1.0	2.0	1.0	30.0
61	4	1.00	1.0	1.0	0.0	31.0
62	5	2.50	2.0	3.0	1.0	29.0
63	NA	3.00	3.0	3.0	0.0	30.0
64	5	3.00	3.0	3.0	0.0	30.0
65	5	1.00	1.0	1.0	0.0	27.0
66	5	1.00	1.0	1.0	0.0	25.0
67	NA	3.00	3.0	3.0	0.0	50.0
68	5	1.75	1.0	2.5	1.5	27.0
69	5	1.50	1.0	2.0	1.0	79.5
70	4	1.00	1.0	1.0	0.0	55.0
71	5	1.00	1.0	1.0	0.0	60.0
72	5	1.25	1.0	1.5	0.5	37.0
73	5	2.25	1.5	3.0	1.5	29.0
74	5	1.00	1.0	1.0	0.0	31.0
75	5	1.00	1.0	1.0	0.0	31.0
76	5	1.50	1.0	2.0	1.0	28.0
77	3	1.00	1.0	1.0	0.0	30.0
78	5	1.00	1.0	1.0	0.0	33.0
79	5	1.00	1.0	1.0	0.0	38.0
80	NA	1.00	1.0	1.0	0.0	30.5
81	5	2.00	1.0	3.0	2.0	28.0
82	5	1.00	1.0	1.0	0.0	33.0
83	5	2.00	1.0	3.0	2.0	32.0
84	5	1.00	1.0	1.0	0.0	31.5
85	5	2.50	2.0	3.0	1.0	43.5
86	5	1.00	1.0	1.0	0.0	55.0
87	5	1.00	1.0	1.0	0.0	52.0
88	3	2.50	2.0	3.0	1.0	44.0
89	5	3.00	3.0	3.0	0.0	48.0
90	5	2.50	2.0	3.0	1.0	49.0
91	4	1.00	1.0	1.0	0.0	43.0
92	5	2.50	2.0	3.0	1.0	45.0
93	1	2.50	2.0	3.0	1.0	47.0
94	5	1.00	1.0	1.0	0.0	47.0
95	4	1.25	1.0	1.5	0.5	45.0
96	5	1.00	1.0	1.0	0.0	45.0
97	NA	3.00	3.0	3.0	0.0	33.0
98	5	2.50	2.0	3.0	1.0	29.0
99	5	2.00	2.0	2.0	0.0	29.0
100	5	2.50	2.0	3.0	1.0	25.0
101	5	1.00	1.0	1.0	0.0	25.0
102	5	1.50	1.0	2.0	1.0	23.0

103	5	1.50	1.0	2.0	1.0	27.0
104	5	1.25	1.0	1.5	0.5	29.0
105	5	3.00	3.0	3.0	0.0	27.5
106	NA	3.00	3.0	3.0	0.0	70.0
107	NA	3.00	3.0	3.0	0.0	95.5
108	5	1.00	1.0	1.0	0.0	38.0
109	5	1.00	1.0	1.0	0.0	47.0
110	5	1.00	1.0	1.0	0.0	43.0
111	5	1.00	1.0	1.0	0.0	38.0
112	5	1.00	1.0	1.0	0.0	37.0
113	3	0.50	0.5	0.5	0.0	38.0
114	4	0.75	0.5	1.0	0.5	35.0
115	5	0.50	0.5	0.5	0.0	45.5
116	5	1.00	1.0	1.0	0.0	47.5
117	5	0.75	0.5	1.0	0.5	38.0
118	4	1.00	1.0	1.0	0.0	47.0
119	5	0.50	0.5	0.5	0.0	34.0
120	5	0.75	0.5	1.0	0.5	44.0
121	4	0.50	0.5	0.5	0.0	35.0
122	5	0.50	0.5	0.5	0.0	37.0
123	5	1.00	1.0	1.0	0.0	41.0
124	5	1.00	1.0	1.0	0.0	38.0
125	5	1.00	1.0	1.0	0.0	44.0
126	5	0.75	0.5	1.0	0.5	41.0
127	5	0.50	0.5	0.5	0.0	39.0
128	5	0.75	0.5	1.0	0.5	38.0
129	5	1.00	1.0	1.0	0.0	33.0
130	5	1.00	1.0	1.0	0.0	45.0
131	5	1.00	1.0	1.0	0.0	46.0
132	5	0.75	0.5	1.0	0.0	36.0
133	5	1.00	1.0	1.0	0.0	47.0
134	5	1.00	1.0	1.0	0.0	41.0
135	5	0.50	0.5	0.5	0.0	32.0
136	5	0.75	0.5	1.0	0.5	42.0
137	5	1.00	1.0	1.0	0.0	30.5
138	5	1.00	1.0	1.0	0.0	39.0
139	5	1.00	1.0	1.0	0.0	58.0
140	5	0.50	0.5	0.5	0.0	40.0
141	5	0.50	0.5	0.5	0.0	36.0
142	5	0.75	0.5	1.0	0.5	45.0
143	5	0.75	0.5	1.0	0.5	39.0
144	5	1.00	1.0	1.0	0.0	46.0
145	5	1.00	1.0	1.0	0.0	36.5

146	5	1.00	1.0	1.0	0.0	38.0
147	5	0.75	0.5	1.0	0.5	48.0
148	5	1.00	1.0	1.0	0.0	42.0
149	5	1.00	1.0	1.0	0.0	49.0
150	5	0.75	0.5	1.0	0.5	51.0
151	3	1.00	1.0	1.0	0.0	28.5
152	5	1.00	1.0	1.0	0.0	47.0
153	5	1.00	1.0	1.0	0.0	35.0
154	5	1.00	1.0	1.0	0.0	38.0
155	5	2.00	1.0	3.0	2.0	31.0
156	5	1.50	1.0	2.0	1.0	30.0
157	5	2.00	1.0	3.0	2.0	44.0
158	3	1.50	1.0	2.0	1.0	34.0
159	5	2.00	2.0	2.0	0.0	40.0
160	5	2.50	2.0	3.0	1.0	34.0
161	5	1.50	1.0	2.0	1.0	44.0
162	5	2.00	2.0	2.0	0.0	40.0
163	5	2.00	2.0	2.0	0.0	40.0
164	5	2.00	2.0	2.0	0.0	40.0
165	5	1.75	1.5	2.0	0.5	34.5
166	5	1.50	1.0	2.0	1.0	34.0
167	5	0.75	0.5	1.0	0.5	43.0
168	5	1.00	1.0	1.0	0.0	35.0
169	5	1.00	1.0	1.0	0.0	28.0
170	5	1.00	1.0	1.0	0.0	36.5
171	5	0.75	0.5	1.0	0.5	37.0
172	4	1.00	1.0	1.0	0.0	46.0
173	4	1.00	1.0	1.0	0.0	41.0
174	5	0.75	0.5	1.0	0.5	40.0
175	5	0.75	0.5	1.0	0.5	41.5
176	5	1.00	1.0	1.0	0.0	53.5
177	5	1.00	1.0	1.0	0.0	49.0
178	4	1.00	1.0	1.0	0.0	49.5
179	5	1.00	1.0	1.0	0.0	32.0
180	5	3.00	3.0	3.0	0.0	16.5
181	5	3.00	3.0	3.0	0.0	32.0
182	5	3.00	3.0	3.0	0.0	32.0
183	5	1.00	1.0	1.0	0.0	29.0
184	5	1.00	1.0	1.0	0.0	27.0
185	5	1.00	1.0	1.0	0.0	29.0
186	3	3.00	3.0	3.0	0.0	61.5
187	5	2.00	1.0	3.0	2.0	59.0
188	5	1.00	1.0	1.0	0.0	60.0

189	2	3.00	3.0	3.0	0.0	61.5
190	5	1.00	1.0	1.0	0.0	58.0
191	5	1.00	1.0	1.0	0.0	32.5
192	5	1.00	1.0	1.0	0.0	31.0
193	5	1.00	1.0	1.0	0.0	33.5
194	5	1.00	1.0	1.0	0.0	52.0
195	NA	1.00	1.0	1.0	0.0	54.0
196	5	1.00	1.0	1.0	0.0	41.0
197	3	1.00	1.0	1.0	0.0	59.0
198	NA	1.00	1.0	1.0	0.0	52.0
199	5	1.00	1.0	1.0	0.0	51.0
200	5	1.00	1.0	1.0	0.0	56.0
201	5	1.00	1.0	1.0	0.0	56.5
202	4	1.00	1.0	1.0	0.0	66.0
203	5	1.00	1.0	1.0	0.0	57.5
204	5	1.00	1.0	1.0	0.0	59.0
205	5	1.00	1.0	1.0	0.0	59.0
206	4	1.00	1.0	1.0	0.0	61.0
207	4	1.00	1.0	1.0	0.0	52.0
208	5	1.00	1.0	1.0	0.0	44.0
209	NA	1.00	1.0	1.0	0.0	51.0
210	5	1.00	1.0	1.0	0.0	41.0
211	5	1.00	1.0	1.0	0.0	NA
212	5	1.00	1.0	1.0	0.0	48.0
213	5	1.00	1.0	1.0	0.0	51.0
214	4	1.00	1.0	1.0	0.0	52.0
215	5	1.00	1.0	1.0	0.0	51.0
216	5	1.00	1.0	1.0	0.0	52.0
217	4	1.00	1.0	1.0	0.0	45.0
218	5	1.00	1.0	1.0	0.0	65.0
219	5	1.00	1.0	1.0	0.0	55.5
220	3	1.00	1.0	1.0	0.0	59.0
221	5	1.00	1.0	1.0	0.0	53.5
222	5	1.00	1.0	1.0	0.0	59.0
223	5	1.00	1.0	1.0	0.0	45.0
224	5	1.00	1.0	1.0	0.0	38.0
225	NA	1.50	1.5	1.5	0.0	39.0
226	4	1.50	1.5	1.5	0.0	39.0
227	NA	3.00	3.0	3.0	0.0	77.0
228	5	2.00	1.0	3.0	2.0	77.0
229	5	2.00	1.0	3.0	2.0	42.5
230	5	1.00	1.0	1.0	0.0	47.0
231	5	1.00	1.0	1.0	0.0	60.0

232	NA	1.00	1.0	1.0	0.0	29.5
233	5	1.00	1.0	1.0	0.0	30.0
234	5	1.00	1.0	1.0	0.0	24.5
235	NA	1.00	1.0	1.0	0.0	29.5
236	5	1.00	1.0	1.0	0.0	31.0
237	NA	1.00	1.0	1.0	0.0	31.0
238	5	1.00	1.0	1.0	0.0	27.0
239	5	3.00	3.0	3.0	0.0	33.0
240	5	2.00	1.0	3.0	2.0	47.5
241	5	2.00	1.0	3.0	2.0	42.5
242	5	3.00	3.0	3.0	0.0	42.5
243	5	1.50	1.0	2.0	1.0	38.0
244	5	2.00	2.0	2.0	0.0	38.0
245	NA	1.00	1.0	1.0	0.0	42.0
246	2	2.00	2.0	2.0	0.0	41.5
247	5	2.00	1.0	3.0	2.0	38.0
248	5	2.00	1.0	3.0	2.0	38.0
249	5	3.00	3.0	3.0	0.0	25.0
250	5	1.25	1.0	1.5	0.5	44.5
251	5	1.00	1.0	1.0	0.0	56.0
252	4	1.00	1.0	1.0	0.0	77.5
253	5	2.00	1.0	3.0	2.0	50.0
254	3	1.00	1.0	1.0	0.0	44.0
255	NA	3.00	3.0	3.0	0.0	20.0
256	4	1.00	1.0	1.0	0.0	34.0
257	5	1.00	1.0	1.0	0.0	34.5
258	5	2.00	1.0	3.0	2.0	37.0
259	5	1.25	1.0	1.5	0.5	24.0
260	4	1.00	1.0	1.0	0.0	30.5
261	5	2.00	2.0	2.0	0.0	29.0
262	5	2.00	1.0	3.0	2.0	26.5
263	5	2.00	1.0	3.0	2.0	30.0
264	NA	1.00	1.0	1.0	0.0	27.5
265	5	2.00	1.0	3.0	2.0	30.0
266	5	1.00	1.0	1.0	0.0	27.0
267	5	1.00	1.0	1.0	0.0	39.0
268	5	2.00	1.0	3.0	2.0	31.0
269	4	1.50	1.0	2.0	1.0	33.0
270	NA	1.00	1.0	1.0	0.0	33.0
271	5	2.00	2.0	2.0	0.0	34.0
272	5	1.00	1.0	1.0	0.0	41.5
273	5	1.00	1.0	1.0	0.0	NA
274	4	1.00	1.0	1.0	0.0	44.5

275	5	1.00	1.0	1.0	0.0	41.5
276	NA	1.00	1.0	1.0	0.0	41.5
277	5	1.00	1.0	1.0	0.0	38.0
278	5	1.00	1.0	1.0	0.0	41.5
279	5	1.00	1.0	1.0	0.0	53.0
280	5	1.00	1.0	1.0	0.0	47.5
281	5	1.00	1.0	1.0	0.0	48.0
282	5	1.00	1.0	1.0	0.0	49.0
283	5	1.00	1.0	1.0	0.0	55.0
284	5	1.00	1.0	1.0	0.0	51.0
285	5	1.00	1.0	1.0	0.0	48.0
286	5	1.00	1.0	1.0	0.0	55.0
287	5	1.50	1.0	2.0	1.0	44.0
288	5	1.00	1.0	1.0	0.0	44.0
289	5	0.50	0.5	0.5	0.0	29.0
290	5	1.50	1.0	2.0	2.0	35.5
291	5	1.00	1.0	1.0	0.0	30.0
292	4	1.50	1.0	2.0	1.0	33.0
293	NA	1.50	1.0	2.0	1.0	35.5
294	5	1.50	1.0	2.0	1.0	35.5
295	5	1.50	1.0	2.0	1.0	39.0
296	4	1.50	1.0	2.0	1.0	35.5
297	5	2.50	2.0	3.0	1.0	37.0
298	NA	1.00	1.0	1.0	0.0	41.5
299	5	1.50	1.0	2.0	1.0	33.0
300	5	1.50	1.0	2.0	1.0	44.5
301	4	2.00	1.0	3.0	2.0	33.0
302	5	1.00	1.0	1.0	0.0	34.0
303	5	1.00	1.0	1.0	0.0	62.0
304	4	1.00	1.0	1.0	0.0	29.0
305	5	1.00	1.0	1.0	0.0	34.5
306	5	1.00	1.0	1.0	0.0	33.5
307	5	1.00	1.0	1.0	0.0	52.0
308	5	1.50	1.0	2.0	1.0	54.0
309	5	1.25	1.0	1.5	0.5	67.5
310	3	1.50	1.0	2.0	1.0	62.0
311	5	1.00	1.0	1.0	0.0	63.0
312	4	1.00	1.0	1.0	0.0	62.0
313	5	1.50	1.0	2.0	1.0	30.0
314	5	0.50	0.5	0.5	0.0	43.0
315	5	0.50	0.5	0.5	0.0	53.0
316	5	0.75	0.5	1.0	0.5	53.0
317	4	0.50	0.5	0.5	0.0	47.0

318	5	1.00	1.0	1.0	0.0	64.0
319	5	1.25	1.0	1.5	0.5	76.0
320	5	2.00	1.0	3.0	2.0	75.0
321	5	2.00	1.0	3.0	2.0	40.0
322	2	3.00	3.0	3.0	0.0	45.5
323	5	3.00	3.0	3.0	0.0	37.5
324	4	1.00	1.0	1.0	0.0	80.0
325	5	1.00	1.0	1.0	0.0	58.0
326	4	1.00	1.0	1.0	0.0	65.0
327	NA	3.00	3.0	3.0	0.0	39.5
328	4	1.00	1.0	1.0	0.0	36.0
329	2	1.00	1.0	1.0	0.0	36.0
330	4	1.00	1.0	1.0	0.0	35.0
331	3	1.00	1.0	1.0	0.0	34.0
332	5	2.50	2.0	3.0	1.0	38.5
333	5	2.50	2.0	3.0	1.0	57.0
334	5	1.50	1.0	2.0	1.0	38.5
335	2	3.00	3.0	3.0	0.0	62.5
336	5	2.00	1.0	3.0	2.0	42.0
337	5	4.00	4.0	4.0	0.0	46.0
338	5	3.00	3.0	3.0	0.0	43.0
339	5	2.00	1.0	3.0	2.0	40.0
340	5	2.00	1.0	3.0	2.0	44.5
341	NA	1.00	1.0	1.0	0.0	28.5
342	5	1.50	1.0	2.0	1.0	22.5
343	5	1.50	1.0	2.0	1.0	31.0
344	5	1.00	1.0	1.0	0.0	23.0
345	5	1.50	1.0	2.0	1.0	24.5
346	5	2.00	1.0	3.0	2.0	46.0
347	5	2.00	1.0	3.0	2.0	45.0
348	5	1.00	1.0	1.0	0.0	34.0
349	5	1.50	1.0	2.0	1.0	31.0
350	5	1.00	1.0	1.0	0.0	30.5
351	NA	4.00	4.0	4.0	0.0	27.0
352	NA	1.00	1.0	1.0	0.0	31.5
353	4	1.00	1.0	1.0	0.0	32.0
354	5	1.00	1.0	1.0	0.0	35.0
355	5	1.00	1.0	1.0	0.0	35.0
356	4	1.50	1.0	2.0	1.0	32.0
357	4	1.00	1.0	1.0	0.0	31.0
358	5	1.00	1.0	1.0	0.0	28.0
359	5	1.00	1.0	1.0	0.0	30.5
360	5	1.00	1.0	1.0	0.0	32.0

361	3	1.00	1.0	1.0	0.0	28.0
362	2	1.00	1.0	1.0	0.0	30.5
363	5	2.50	1.0	4.0	3.0	28.5
364	NA	1.00	1.0	1.0	0.0	30.0
365	4	1.00	1.0	1.0	0.0	30.5
366	4	1.00	1.0	1.0	0.0	33.0
367	3	1.00	1.0	1.0	0.0	33.0
368	4	1.00	1.0	1.0	0.0	31.0
369	5	2.00	1.0	3.0	2.0	29.0
370	3	1.00	1.0	1.0	0.0	31.0
371	5	1.50	1.0	2.0	1.0	47.0
372	5	2.50	2.0	3.0	1.0	38.5
373	5	3.00	3.0	3.0	0.0	41.5
374	5	3.00	3.0	3.0	0.0	41.5
375	NA	1.00	1.0	1.0	0.0	46.0
376	3	1.00	1.0	1.0	0.0	53.0
377	5	1.00	1.0	1.0	0.0	51.0
378	NA	1.00	1.0	1.0	0.0	52.0
379	NA	1.00	1.0	1.0	0.0	54.5
380	5	1.00	1.0	1.0	0.0	49.0
381	5	1.00	1.0	1.0	0.0	51.0
382	NA	1.00	1.0	1.0	0.0	50.0
383	3	1.00	1.0	1.0	0.0	53.5
384	NA	1.00	1.0	1.0	0.0	50.0
385	5	1.50	1.0	2.0	1.0	20.0
386	5	1.00	1.0	1.0	0.0	22.0
387	5	1.50	1.0	2.0	1.0	24.0
388	5	1.00	1.0	1.0	0.0	27.0
389	4	2.00	2.0	2.0	0.0	21.5
390	4	1.50	1.0	2.0	1.0	23.0
391	5	1.00	1.0	1.0	0.0	28.5
392	5	1.00	1.0	1.0	0.0	28.5
393	5	1.50	1.0	2.0	1.0	26.0
394	5	1.00	1.0	1.0	0.0	28.5
395	5	1.00	1.0	1.0	0.0	29.0
396	5	1.00	1.0	1.0	0.0	32.0
397	5	1.00	1.0	1.0	0.0	29.5
398	5	1.00	1.0	1.0	0.0	31.0
399	3	1.00	1.0	1.0	0.0	27.0
400	NA	1.00	1.0	1.0	0.0	28.5
401	5	1.50	1.0	2.0	1.0	23.0
402	5	1.50	1.0	2.0	1.0	23.0
403	5	2.50	2.0	3.0	1.0	25.0

404	4	1.00	1.0	1.0	0.0	28.0
405	5	1.00	1.0	1.0	0.0	35.0
406	5	1.00	1.0	1.0	0.0	24.5
407	5	1.00	1.0	1.0	0.0	37.0
408	5	1.00	1.0	1.0	0.0	31.0
409	5	1.00	1.0	1.0	0.0	36.0
410	5	1.00	1.0	1.0	0.0	30.0
411	5	1.00	1.0	1.0	0.0	32.0
412	5	1.00	1.0	1.0	0.0	34.0
413	NA	1.00	1.0	1.0	0.0	29.0
414	5	1.00	1.0	1.0	0.0	31.5
415	5	1.00	1.0	1.0	0.0	30.0
416	5	1.00	1.0	1.0	0.0	30.0
417	5	1.00	1.0	1.0	0.0	55.0
418	5	1.00	1.0	1.0	0.0	55.0
419	4	1.50	1.0	2.0	1.0	27.5
420	5	1.00	1.0	1.0	0.0	51.5
421	5	1.50	1.0	2.0	1.0	25.0
422	5	1.00	1.0	1.0	0.0	27.0
423	NA	3.00	3.0	3.0	0.0	20.0
424	5	2.00	1.0	3.0	2.0	24.0
425	5	2.00	2.0	2.0	0.0	24.0
426	5	3.00	3.0	3.0	0.0	20.0
427	5	3.00	3.0	3.0	0.0	21.0
428	5	1.00	1.0	1.0	0.0	35.0
429	4	1.50	1.0	2.0	1.0	24.0
430	5	2.50	2.0	3.0	1.0	24.0
431	5	1.00	1.0	1.0	0.0	32.5
432	5	1.00	1.0	1.0	0.0	25.5
433	5	1.00	1.0	1.0	0.0	26.5
434	5	1.00	1.0	1.0	0.0	29.0
435	NA	1.00	1.0	1.0	0.0	28.0
436	0	1.00	1.0	1.0	0.0	32.5
437	2	1.50	1.0	2.0	1.0	21.0
438	5	2.00	1.0	3.0	2.0	59.5
439	5	2.00	1.0	3.0	2.0	54.0
440	NA	3.00	3.0	3.0	0.0	45.0
441	5	3.00	3.0	3.0	0.0	57.0
442	NA	3.00	3.0	3.0	0.0	30.0
443	4	1.00	1.0	1.0	0.0	48.5
444	NA	1.00	1.0	1.0	0.0	49.0
445	4	1.00	1.0	1.0	0.0	57.0
446	5	1.00	1.0	1.0	0.0	52.5

447	5	1.00	1.0	1.0	0.0	49.0
448	5	1.25	1.0	1.5	0.5	45.0
449	NA	3.00	3.0	3.0	0.0	22.0
450	NA	3.00	3.0	3.0	0.0	22.0

	WSP_Female_range	HSI	LEV_buried	LEV_ground_layer	LEV_field_layer
1	10	0.577	NA	NA	NA
2	17	0.236	0	0	1
3	10	0.707	0	0	1
4	2	0.289	0	0	1
5	6	0.577	NA	NA	NA
6	2	0.354	0	0	1
7	8	0.218	0	1	1
8	4	0.258	NA	NA	NA
9	6	1.000	0	1	0
10	3	1.000	1	1	1
11	15	0.101	0	0	1
12	5	1.000	NA	NA	NA
13	6	0.577	0	0	1
14	6	0.408	NA	NA	NA
15	8	0.267	0	0	0
16	10	0.316	0	0	0
17	4	1.000	0	0	0
18	7	0.063	0	1	1
19	11	0.082	0	0	1
20	11	0.707	0	0	1
21	6	0.577	0	0	1
22	6	0.333	0	1	1
23	10	0.707	NA	NA	NA
24	16	0.577	1	1	1
25	8	0.258	0	0	1
26	6	0.102	0	1	1
27	8	0.289	0	0	1
28	7	0.056	0	1	1
29	6	0.112	0	1	1
30	7	0.183	NA	NA	NA
31	4	0.577	0	0	1
32	5	0.707	0	0	1
33	1	0.289	NA	NA	NA
34	5	0.577	0	0	0
35	8	0.289	0	1	1
36	8	0.354	NA	NA	NA
37	2	0.447	0	0	1
38	7	0.183	0	0	1

39	10	0.577	0	0	1
40	11	0.158	0	0	0
41	11	0.707	0	0	0
42	8	1.000	0	0	1
43	7	0.500	0	0	1
44	6	0.354	0	1	1
45	8	0.258	0	0	1
46	5	0.204	NA	NA	NA
47	7	0.577	0	0	1
48	6	0.577	0	0	1
49	9	0.500	0	0	1
50	2	0.333	0	1	1
51	10	0.447	0	0	0
52	8	0.408	0	0	1
53	8	0.204	0	1	1
54	14	0.204	0	1	1
55	5	1.000	NA	NA	NA
56	3	0.250	NA	NA	NA
57	6	0.033	0	1	1
58	8	0.167	0	0	1
59	4	0.408	0	1	1
60	4	0.174	0	0	1
61	6	0.408	0	1	1
62	2	0.577	NA	NA	NA
63	4	0.289	NA	NA	NA
64	8	1.000	NA	NA	NA
65	6	0.126	0	0	1
66	6	0.200	0	0	1
67	10	NA	0	0	0
68	10	0.020	0	0	0
69	7	0.102	0	0	0
70	26	0.333	0	1	1
71	12	1.000	NA	NA	NA
72	6	0.169	0	0	1
73	2	0.577	NA	NA	NA
74	6	0.169	0	0	1
75	2	0.577	NA	NA	NA
76	6	0.258	0	0	1
77	4	0.154	0	0	1
78	2	0.500	0	0	1
79	8	0.258	0	0	1
80	3	0.500	NA	NA	NA
81	10	0.096	0	0	1

82	2	0.354	0	0	1
83	14	0.289	0	0	1
84	11	0.115	0	0	1
85	3	0.167	0	1	1
86	2	0.577	0	0	1
87	4	0.707	0	0	1
88	8	0.408	0	1	1
89	12	0.041	0	0	1
90	6	0.113	NA	NA	NA
91	8	0.177	0	1	0
92	10	0.204	0	1	1
93	6	0.316	0	0	1
94	10	0.707	0	1	1
95	10	0.169	0	1	0
96	10	0.289	0	1	0
97	6	0.707	0	0	1
98	6	0.183	0	0	1
99	2	0.072	0	0	1
100	2	0.258	0	0	1
101	6	1.000	0	0	1
102	4	0.105	0	0	1
103	6	0.289	0	0	1
104	8	0.169	0	0	1
105	5	0.289	0	0	1
106	20	0.354	0	0	1
107	13	0.500	0	0	1
108	4	1.000	NA	NA	NA
109	10	0.043	0	1	1
110	6	0.333	NA	NA	NA
111	4	0.500	NA	NA	NA
112	6	1.000	0	1	1
113	4	1.000	NA	NA	NA
114	2	0.500	0	0	1
115	7	0.577	NA	NA	NA
116	7	0.224	0	0	1
117	8	0.224	0	0	1
118	6	1.000	NA	NA	NA
119	4	0.500	0	0	1
120	4	0.096	0	0	1
121	2	1.000	NA	NA	NA
122	6	0.316	0	0	1
123	2	0.577	NA	NA	NA
124	8	1.000	NA	NA	NA

125	8	0.707	NA	NA	NA
126	10	0.183	0	1	1
127	10	0.316	0	0	1
128	8	0.224	0	1	1
129	6	0.289	NA	NA	NA
130	6	1.000	NA	NA	NA
131	16	0.200	0	1	1
132	4	0.500	0	0	1
133	6	0.354	0	1	0
134	10	0.289	0	0	1
135	4	1.000	NA	NA	NA
136	8	0.100	0	1	1
137	3	0.289	NA	NA	NA
138	10	0.707	NA	NA	NA
139	4	0.289	0	1	1
140	10	0.192	0	1	1
141	8	0.167	NA	NA	NA
142	10	0.354	0	1	1
143	10	0.250	0	0	1
144	8	0.707	NA	NA	NA
145	3	0.577	NA	NA	NA
146	8	1.000	NA	NA	NA
147	4	0.500	NA	NA	NA
148	4	0.577	NA	NA	NA
149	6	0.408	NA	NA	NA
150	10	0.707	NA	NA	NA
151	3	1.000	NA	NA	NA
152	6	0.289	0	1	1
153	2	0.500	NA	NA	NA
154	4	0.289	NA	NA	NA
155	6	1.000	NA	NA	NA
156	4	0.129	0	0	1
157	8	0.126	0	0	1
158	4	0.500	0	1	0
159	8	0.354	0	1	0
160	4	0.036	0	1	1
161	8	0.154	0	0	1
162	8	0.289	NA	NA	NA
163	8	1.000	NA	NA	NA
164	8	0.289	NA	NA	NA
165	3	0.250	0	0	1
166	4	0.408	0	1	1
167	6	0.333	0	1	1

168	10	0.577	0	1	1
169	8	0.218	0	1	1
170	13	0.102	0	1	1
171	10	0.289	0	1	1
172	12	1.000	0	0	1
173	8	0.316	0	0	1
174	4	0.577	0	1	0
175	9	0.046	0	0	1
176	9	0.500	0	0	1
177	6	1.000	0	0	1
178	9	0.408	0	1	1
179	6	0.408	0	0	0
180	3	0.707	NA	NA	NA
181	4	0.289	0	0	1
182	4	0.354	0	0	1
183	8	0.065	0	0	1
184	10	0.224	0	0	1
185	6	0.289	0	0	1
186	13	0.577	0	0	0
187	18	0.577	0	0	0
188	8	0.577	0	0	0
189	13	1.000	NA	NA	NA
190	12	0.218	0	0	0
191	3	0.577	0	1	1
192	6	0.333	0	1	1
193	7	0.250	0	0	1
194	4	1.000	NA	NA	NA
195	8	0.102	NA	NA	NA
196	6	1.000	0	0	1
197	6	0.289	NA	NA	NA
198	4	0.289	NA	NA	NA
199	16	0.289	NA	NA	NA
200	8	0.289	NA	NA	NA
201	13	0.408	0	1	1
202	8	0.250	0	1	1
203	15	0.354	0	1	1
204	6	0.144	0	0	1
205	6	0.289	NA	NA	NA
206	10	0.408	0	1	1
207	4	0.289	NA	NA	NA
208	8	NA	0	0	1
209	16	0.289	NA	NA	NA
210	6	1.000	NA	NA	NA

211	NA	0.408	NA	NA	NA
212	4	1.000	NA	NA	NA
213	16	0.289	0	1	1
214	4	0.289	NA	NA	NA
215	16	0.143	0	1	1
216	4	1.000	NA	NA	NA
217	2	0.123	0	1	1
218	6	0.289	0	1	1
219	5	0.289	NA	NA	NA
220	6	0.289	NA	NA	NA
221	9	1.000	0	1	1
222	6	0.289	0	1	1
223	6	0.169	0	1	1
224	8	0.204	0	0	1
225	6	NA	NA	NA	NA
226	6	0.707	0	1	1
227	26	0.408	0	0	0
228	26	0.105	0	1	1
229	5	0.408	0	1	1
230	2	0.707	0	1	1
231	4	0.204	NA	NA	NA
232	3	0.447	0	0	1
233	4	0.500	0	0	1
234	3	0.577	0	0	1
235	3	1.000	0	0	1
236	6	0.577	NA	NA	NA
237	6	0.707	0	1	1
238	6	0.707	0	1	0
239	6	0.058	0	0	1
240	7	0.072	0	0	1
241	9	0.120	0	0	1
242	9	0.354	0	0	1
243	6	0.258	0	0	1
244	8	0.408	0	1	1
245	0	NA	0	0	1
246	9	0.577	0	0	1
247	10	1.000	0	0	1
248	10	0.144	0	0	1
249	2	0.045	0	0	1
250	5	0.707	0	0	0
251	8	0.289	0	0	0
252	11	0.577	0	0	0
253	8	0.577	0	0	0

254	8	0.086	0	1	1
255	4	0.289	NA	NA	NA
256	4	0.577	0	1	1
257	1	1.000	0	1	0
258	8	0.408	0	1	1
259	6	0.289	0	0	1
260	7	0.289	0	1	1
261	2	1.000	NA	NA	NA
262	11	0.333	0	1	0
263	4	0.089	NA	NA	NA
264	1	0.707	NA	NA	NA
265	4	0.136	0	1	1
266	6	0.408	0	1	0
267	6	1.000	0	0	1
268	6	0.183	0	1	0
269	6	1.000	0	1	0
270	6	NA	0	1	1
271	4	1.000	0	0	1
272	9	0.289	0	1	1
273	NA	0.289	0	1	1
274	5	0.289	0	1	1
275	9	0.289	0	1	1
276	9	0.289	0	1	1
277	4	1.000	0	1	1
278	9	0.354	0	1	1
279	6	0.289	NA	NA	NA
280	5	0.107	0	1	1
281	4	0.500	0	0	1
282	8	0.136	0	1	1
283	10	0.707	0	1	1
284	10	0.154	0	1	1
285	4	0.289	NA	NA	NA
286	10	0.120	0	1	1
287	4	0.408	NA	NA	NA
288	4	0.577	0	1	0
289	2	1.000	0	1	1
290	9	0.107	0	1	1
291	4	0.083	0	0	1
292	6	0.224	0	0	1
293	9	0.102	NA	NA	NA
294	9	0.289	0	1	1
295	14	0.120	0	1	1
296	9	0.126	0	1	1

297	14	0.051	0	0	1
298	7	0.289	0	0	1
299	6	0.105	0	0	1
300	11	0.154	0	0	1
301	10	0.447	0	0	1
302	8	0.289	0	1	1
303	16	0.200	0	1	1
304	6	0.289	NA	NA	NA
305	9	0.577	0	1	1
306	5	0.500	NA	NA	NA
307	4	0.258	NA	NA	NA
308	8	0.408	NA	NA	NA
309	17	0.192	0	0	0
310	12	0.136	0	0	0
311	10	0.354	0	0	0
312	12	0.707	0	0	0
313	6	0.083	0	0	1
314	10	1.000	0	0	1
315	6	1.000	NA	NA	NA
316	10	0.354	0	0	1
317	14	0.236	0	0	1
318	4	0.118	0	0	1
319	10	0.177	0	1	1
320	30	0.053	0	0	1
321	4	0.154	0	0	1
322	3	0.102	0	1	1
323	1	0.102	0	1	1
324	30	0.204	0	1	0
325	12	0.354	0	1	0
326	30	0.158	0	1	1
327	5	0.218	0	0	1
328	4	0.577	1	1	1
329	6	0.500	1	1	1
330	2	1.000	1	1	1
331	4	1.000	1	1	1
332	13	0.289	NA	NA	NA
333	12	0.115	0	1	1
334	13	0.204	0	1	0
335	5	0.289	0	1	1
336	12	0.408	0	1	1
337	8	0.707	0	0	1
338	6	0.408	0	1	1
339	16	0.114	0	1	1

340	11	0.118	0	1	1
341	3	0.707	NA	NA	NA
342	9	0.069	0	1	1
343	6	0.224	0	0	1
344	6	0.354	NA	NA	NA
345	5	0.041	0	0	1
346	12	0.050	0	0	1
347	2	0.577	0	0	1
348	8	0.707	1	1	1
349	6	0.204	0	1	1
350	5	1.000	0	0	1
351	12	1.000	NA	NA	NA
352	5	NA	NA	NA	NA
353	4	0.447	0	1	0
354	6	0.129	0	1	1
355	6	1.000	NA	NA	NA
356	4	0.204	0	1	1
357	10	0.408	0	0	1
358	8	0.500	0	1	1
359	5	1.000	0	0	1
360	4	1.000	0	0	1
361	4	1.000	1	1	1
362	5	1.000	NA	NA	NA
363	11	0.144	0	1	1
364	4	1.000	NA	NA	NA
365	5	1.000	NA	NA	NA
366	6	1.000	0	1	1
367	6	0.577	NA	NA	NA
368	6	0.447	0	1	1
369	6	0.500	0	1	1
370	6	1.000	0	0	1
371	10	0.102	0	1	0
372	3	0.236	0	0	1
373	7	0.061	0	0	1
374	7	0.102	0	1	0
375	4	1.000	0	1	1
376	2	0.289	NA	NA	NA
377	4	0.289	1	1	1
378	4	0.577	NA	NA	NA
379	7	NA	NA	NA	NA
380	2	1.000	NA	NA	NA
381	2	0.289	NA	NA	NA
382	4	1.000	NA	NA	NA

383	3	0.289	NA	NA	NA
384	4	NA	NA	NA	NA
385	4	0.354	0	0	1
386	2	1.000	0	0	1
387	4	0.124	0	0	1
388	6	0.577	0	0	1
389	1	0.500	NA	NA	NA
390	6	0.069	0	0	1
391	7	0.354	0	0	1
392	5	0.289	NA	NA	NA
393	4	0.183	0	0	1
394	5	0.577	NA	NA	NA
395	6	0.500	NA	NA	NA
396	4	0.218	0	1	1
397	5	1.000	NA	NA	NA
398	2	1.000	NA	NA	NA
399	2	0.408	0	1	1
400	3	0.500	NA	NA	NA
401	6	0.192	0	0	1
402	6	NA	0	1	1
403	6	0.577	0	1	1
404	8	0.316	0	1	1
405	6	0.316	NA	NA	NA
406	3	0.577	NA	NA	NA
407	2	0.354	0	1	1
408	2	0.177	0	0	1
409	4	0.081	0	1	1
410	4	1.000	0	1	0
411	4	0.707	0	0	0
412	4	0.112	0	0	0
413	4	0.577	0	0	0
414	9	0.134	0	0	0
415	4	0.167	0	0	0
416	4	0.065	0	0	0
417	10	0.236	0	1	1
418	10	0.500	0	1	1
419	5	0.333	0	0	1
420	9	0.500	0	1	1
421	6	0.224	NA	NA	NA
422	6	0.500	NA	NA	NA
423	4	0.289	NA	NA	NA
424	4	1.000	0	1	1
425	4	1.000	0	1	1

426	4	0.267	0	0	1
427	2	0.354	0	0	0
428	10	0.129	0	0	0
429	4	0.118	0	0	1
430	4	NA	0	0	1
431	5	0.102	NA	NA	NA
432	7	0.067	0	0	1
433	5	0.101	0	0	1
434	2	0.125	0	0	1
435	4	NA	1	1	1
436	5	1.000	NA	NA	NA
437	2	0.577	NA	NA	NA
438	13	0.316	0	0	1
439	16	0.083	0	0	1
440	10	0.048	0	0	1
441	6	0.289	0	0	1
442	4	0.500	0	0	1
443	5	0.192	0	0	1
444	6	0.577	0	0	1
445	10	0.354	0	0	1
446	5	0.707	0	0	1
447	6	0.500	0	0	1
448	2	0.577	0	1	1
449	4	0.289	NA	NA	NA
450	4	0.105	NA	NA	NA

	LEV_shrub_layer	LEV_canopy_layer	ELT_single	ELT_small_batch	ELT_large_batch
1	NA	NA	NA	NA	NA
2	0	0	0	0	1
3	0	0	0	0	1
4	0	0	NA	NA	NA
5	NA	NA	NA	NA	NA
6	0	0	NA	NA	NA
7	0	0	1	0	0
8	NA	NA	1	0	0
9	0	0	1	0	0
10	0	0	1	0	0
11	0	0	1	0	0
12	NA	NA	1	0	0
13	0	0	1	0	0
14	NA	NA	1	0	0
15	1	1	1	0	0
16	1	0	1	0	0
17	1	1	1	0	0

18	0	0	1	1	0
19	1	0	0	0	1
20	0	0	0	1	1
21	0	0	0	1	0
22	0	0	0	1	0
23	NA	NA	NA	NA	NA
24	0	0	1	0	0
25	0	0	1	0	0
26	0	0	1	0	0
27	0	0	1	0	0
28	0	0	1	0	0
29	0	0	1	0	0
30	NA	NA	NA	NA	NA
31	0	0	1	0	0
32	0	0	1	0	0
33	NA	NA	1	0	0
34	1	0	1	1	0
35	0	0	1	0	0
36	NA	NA	NA	NA	NA
37	0	0	1	0	0
38	0	0	1	1	0
39	0	0	1	0	0
40	1	0	1	0	0
41	1	0	1	0	0
42	0	0	1	0	0
43	0	0	NA	NA	NA
44	0	0	1	0	0
45	0	0	1	0	0
46	NA	NA	1	0	0
47	0	0	1	0	0
48	0	0	1	0	0
49	0	0	1	0	0
50	0	0	1	0	0
51	1	0	1	0	0
52	0	0	1	0	0
53	0	0	1	1	0
54	0	0	0	1	0
55	NA	NA	1	0	0
56	NA	NA	1	0	0
57	1	0	1	0	0
58	0	0	1	0	0
59	0	0	1	0	0
60	0	0	1	0	0

61	0	0	1	0	0
62	NA	NA	NA	NA	NA
63	NA	NA	NA	NA	NA
64	NA	NA	NA	NA	NA
65	0	0	1	0	0
66	0	0	1	0	0
67	1	1	1	1	0
68	1	1	1	0	0
69	0	1	1	1	0
70	0	0	1	1	0
71	NA	NA	NA	NA	NA
72	0	0	1	1	0
73	NA	NA	1	0	0
74	0	0	1	0	0
75	NA	NA	1	1	0
76	0	0	1	0	0
77	0	0	1	0	0
78	0	0	1	0	0
79	0	0	1	0	0
80	NA	NA	NA	NA	NA
81	0	0	1	0	0
82	0	0	1	0	0
83	0	0	NA	NA	NA
84	0	0	1	0	0
85	0	0	1	0	0
86	0	0	1	0	0
87	0	0	1	0	0
88	0	0	1	0	0
89	0	0	1	0	0
90	NA	NA	1	0	0
91	0	0	1	1	0
92	0	0	1	0	0
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94	0	0	1	0	0
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97	0	0	1	0	0
98	0	0	1	0	0
99	0	0	1	0	0
100	0	0	NA	NA	NA
101	0	0	NA	NA	NA
102	0	0	1	0	0
103	0	0	1	0	0

104	0	0	1	0	0
105	0	0	0	1	0
106	0	0	NA	NA	NA
107	0	0	1	0	0
108	NA	NA	NA	NA	NA
109	0	0	1	0	0
110	NA	NA	NA	NA	NA
111	NA	NA	NA	NA	NA
112	0	0	1	0	0
113	NA	NA	NA	NA	NA
114	0	0	NA	NA	NA
115	NA	NA	NA	NA	NA
116	0	0	NA	NA	NA
117	0	0	1	0	0
118	NA	NA	NA	NA	NA
119	0	0	NA	NA	NA
120	0	0	1	0	0
121	NA	NA	1	0	0
122	0	0	NA	NA	NA
123	NA	NA	NA	NA	NA
124	NA	NA	NA	NA	NA
125	NA	NA	1	0	0
126	0	0	1	0	0
127	0	0	1	0	0
128	0	0	1	0	0
129	NA	NA	NA	NA	NA
130	NA	NA	NA	NA	NA
131	0	0	1	0	0
132	0	0	NA	NA	NA
133	0	0	NA	NA	NA
134	0	0	1	0	0
135	NA	NA	1	0	0
136	0	0	1	0	0
137	NA	NA	NA	NA	NA
138	NA	NA	NA	NA	NA
139	0	0	0	1	0
140	0	0	1	0	0
141	NA	NA	NA	NA	NA
142	0	0	1	0	0
143	0	0	1	0	0
144	NA	NA	NA	NA	NA
145	NA	NA	NA	NA	NA
146	NA	NA	NA	NA	NA

147	NA	NA	NA	NA	NA
148	NA	NA	NA	NA	NA
149	NA	NA	NA	NA	NA
150	NA	NA	NA	NA	NA
151	NA	NA	1	0	0
152	0	0	NA	NA	NA
153	NA	NA	NA	NA	NA
154	NA	NA	NA	NA	NA
155	NA	NA	NA	NA	NA
156	0	0	1	0	0
157	0	0	1	0	0
158	0	0	1	1	0
159	0	0	1	0	0
160	0	0	1	1	0
161	0	0	1	0	0
162	NA	NA	1	0	0
163	NA	NA	NA	NA	NA
164	NA	NA	NA	NA	NA
165	0	0	1	0	0
166	0	0	1	0	0
167	0	0	1	1	0
168	1	0	1	0	0
169	0	0	1	0	0
170	0	0	0	0	1
171	0	0	0	1	1
172	0	0	0	0	1
173	0	0	0	1	0
174	1	0	0	1	1
175	1	1	0	0	1
176	0	0	1	0	0
177	0	0	1	0	0
178	0	0	1	0	0
179	0	1	1	0	0
180	NA	NA	NA	NA	NA
181	0	0	1	0	0
182	0	0	1	0	0
183	0	0	1	0	0
184	0	0	1	0	0
185	0	0	1	0	0
186	1	1	1	0	0
187	1	0	1	0	0
188	1	0	1	0	0
189	NA	NA	NA	NA	NA

190	1	0	1	0	0
191	0	0	0	1	0
192	0	0	1	0	0
193	0	0	1	0	0
194	NA	NA	NA	NA	NA
195	NA	NA	1	0	0
196	0	0	NA	NA	NA
197	NA	NA	NA	NA	NA
198	NA	NA	NA	NA	NA
199	NA	NA	NA	NA	NA
200	NA	NA	NA	NA	NA
201	0	0	1	0	0
202	0	0	1	0	0
203	0	0	NA	NA	NA
204	0	0	1	0	0
205	NA	NA	NA	NA	NA
206	0	0	1	0	0
207	NA	NA	NA	NA	NA
208	0	0	NA	NA	NA
209	NA	NA	NA	NA	NA
210	NA	NA	NA	NA	NA
211	NA	NA	NA	NA	NA
212	NA	NA	1	0	0
213	0	0	1	0	0
214	NA	NA	NA	NA	NA
215	0	0	1	0	0
216	NA	NA	NA	NA	NA
217	0	0	1	0	0
218	0	0	1	0	0
219	NA	NA	NA	NA	NA
220	NA	NA	NA	NA	NA
221	0	0	1	0	0
222	0	0	NA	NA	NA
223	0	0	1	0	0
224	0	0	1	0	0
225	NA	NA	NA	NA	NA
226	0	0	1	0	0
227	1	0	1	0	0
228	0	0	1	0	0
229	0	0	1	0	0
230	0	0	1	0	0
231	NA	NA	NA	NA	NA
232	0	0	NA	NA	NA

233	0	0	NA	NA	NA
234	0	0	NA	NA	NA
235	0	0	1	0	0
236	NA	NA	1	0	0
237	0	0	NA	NA	NA
238	0	1	1	0	0
239	0	0	1	0	0
240	0	0	1	1	0
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245	0	0	1	0	0
246	0	0	1	0	0
247	0	0	1	0	0
248	0	0	1	0	0
249	0	0	1	0	0
250	0	1	1	0	0
251	1	1	1	0	0
252	0	1	1	0	0
253	1	0	1	0	0
254	0	0	1	0	0
255	NA	NA	NA	NA	NA
256	0	0	1	0	0
257	0	0	1	1	0
258	0	0	1	1	0
259	0	0	1	0	0
260	0	0	1	0	0
261	NA	NA	NA	NA	NA
262	0	0	1	0	0
263	NA	NA	1	0	0
264	NA	NA	NA	NA	NA
265	0	0	1	0	0
266	0	0	1	0	0
267	0	0	NA	NA	NA
268	0	0	1	0	0
269	0	0	1	0	0
270	0	0	1	0	0
271	0	0	1	0	0
272	0	0	1	1	0
273	0	0	1	1	0
274	0	0	1	1	0
275	0	0	0	1	0

276	0	0	1	1	0
277	0	0	1	1	0
278	0	0	1	1	0
279	NA	NA	NA	NA	NA
280	0	0	1	1	0
281	0	0	NA	NA	NA
282	0	0	1	0	0
283	0	0	1	0	0
284	0	0	1	0	0
285	NA	NA	NA	NA	NA
286	0	0	1	0	0
287	NA	NA	0	1	1
288	0	0	0	0	1
289	0	0	0	1	1
290	0	0	0	0	1
291	0	0	0	1	1
292	0	0	0	0	1
293	NA	NA	NA	NA	NA
294	0	0	0	0	1
295	0	0	0	1	1
296	0	0	0	0	1
297	0	0	0	0	1
298	0	0	0	0	1
299	0	0	0	1	1
300	0	0	0	0	1
301	0	0	0	0	1
302	0	0	0	1	1
303	0	0	0	1	0
304	NA	NA	NA	NA	NA
305	0	0	1	0	0
306	NA	NA	NA	NA	NA
307	NA	NA	1	0	0
308	NA	NA	1	0	0
309	1	1	0	0	1
310	1	1	0	0	1
311	0	1	0	0	1
312	0	1	0	0	1
313	0	0	1	0	0
314	0	0	NA	NA	NA
315	NA	NA	1	0	0
316	0	0	NA	NA	NA
317	0	0	1	0	0
318	0	0	NA	NA	NA

319	0	0	1	0	0
320	0	0	1	0	0
321	0	0	1	0	0
322	0	0	1	0	0
323	0	0	1	0	0
324	0	0	1	1	0
325	0	0	1	0	0
326	0	0	1	0	0
327	0	0	1	0	0
328	0	0	1	1	0
329	0	0	1	0	0
330	0	0	1	0	0
331	0	0	1	0	0
332	NA	NA	NA	NA	NA
333	0	0	0	1	1
334	0	0	1	1	0
335	1	0	0	1	1
336	0	0	1	0	0
337	0	0	1	0	0
338	0	0	1	0	0
339	0	0	1	0	0
340	0	0	0	1	0
341	NA	NA	NA	NA	NA
342	0	0	1	0	0
343	0	0	1	0	0
344	NA	NA	NA	NA	NA
345	0	0	1	0	0
346	1	1	1	0	0
347	0	0	1	1	0
348	0	0	NA	NA	NA
349	0	0	1	0	0
350	0	0	1	0	0
351	NA	NA	NA	NA	NA
352	NA	NA	NA	NA	NA
353	0	0	1	0	0
354	0	0	1	0	0
355	NA	NA	1	0	0
356	0	0	1	0	0
357	0	0	1	0	0
358	0	0	1	0	0
359	0	0	NA	NA	NA
360	0	0	NA	NA	NA
361	0	0	1	0	0

362	NA	NA	NA	NA	NA
363	0	0	1	0	0
364	NA	NA	NA	NA	NA
365	NA	NA	NA	NA	NA
366	0	0	1	0	0
367	NA	NA	NA	NA	NA
368	0	0	1	0	0
369	0	0	1	0	0
370	0	0	NA	NA	NA
371	0	0	1	0	0
372	0	0	1	0	0
373	0	0	1	1	0
374	0	0	1	0	0
375	0	0	1	1	0
376	NA	NA	NA	NA	NA
377	0	0	NA	NA	NA
378	NA	NA	NA	NA	NA
379	NA	NA	NA	NA	NA
380	NA	NA	NA	NA	NA
381	NA	NA	1	0	0
382	NA	NA	NA	NA	NA
383	NA	NA	NA	NA	NA
384	NA	NA	NA	NA	NA
385	0	0	NA	NA	NA
386	0	0	NA	NA	NA
387	0	0	1	0	0
388	0	0	1	0	0
389	NA	NA	NA	NA	NA
390	0	0	NA	NA	NA
391	0	0	1	0	0
392	NA	NA	NA	NA	NA
393	1	0	1	0	0
394	NA	NA	NA	NA	NA
395	NA	NA	NA	NA	NA
396	0	0	1	1	0
397	NA	NA	NA	NA	NA
398	NA	NA	NA	NA	NA
399	0	0	1	0	0
400	NA	NA	NA	NA	NA
401	0	0	1	0	0
402	0	0	1	0	0
403	0	0	1	0	0
404	0	0	1	0	0

405	NA	NA	NA	NA	NA
406	NA	NA	NA	NA	NA
407	0	0	1	0	0
408	0	0	1	0	0
409	0	0	1	0	0
410	1	0	1	0	0
411	1	1	1	0	0
412	1	0	1	0	0
413	1	0	1	0	0
414	1	0	1	0	0
415	1	0	1	1	0
416	1	1	1	0	0
417	0	0	1	0	0
418	0	0	0	1	0
419	0	0	1	0	0
420	0	0	1	0	0
421	NA	NA	NA	NA	NA
422	NA	NA	NA	NA	NA
423	NA	NA	NA	NA	NA
424	0	0	1	0	0
425	0	0	1	0	0
426	0	0	1	0	0
427	1	0	1	0	0
428	1	0	1	0	0
429	0	0	0	1	0
430	0	0	NA	NA	NA
431	NA	NA	NA	NA	NA
432	0	0	0	1	1
433	0	0	0	1	0
434	0	0	1	0	0
435	0	0	1	0	0
436	NA	NA	NA	NA	NA
437	NA	NA	NA	NA	NA
438	0	0	1	0	0
439	0	0	1	0	0
440	0	0	1	0	0
441	0	0	1	0	0
442	0	0	1	0	0
443	0	0	1	0	0
444	0	0	1	1	0
445	0	0	0	1	0
446	0	0	1	1	0
447	0	0	1	1	0

448	0	0	1	1	0	
449	NA	NA	NA	NA	NA	
450	NA	NA	NA	NA	NA	

	ALT_Min	ALT_Range	FM_Average	FM_Range	AFB_herb.flower	AFB_grass
1	700	1800	8.0	0	1	0
2	0	2500	7.5	3	1	0
3	0	3000	7.5	3	1	0
4	0	900	3.0	0	NA	NA
5	800	3400	4.0	0	NA	NA
6	1600	1100	2.0	0	1	0
7	0	2800	3.0	0	1	0
8	800	1900	3.0	0	0	0
9	1800	400	NA	NA	1	0
10	2400	600	3.0	0	1	0
11	0	2300	4.0	2	1	0
12	0	1300	3.0	2	1	0
13	0	1800	3.5	1	1	0
14	0	2300	4.0	4	1	0
15	50	1850	4.5	3	1	0
16	0	2300	2.5	1	1	0
17	0	650	4.0	0	1	0
18	0	2000	3.0	0	1	0
19	0	2600	3.5	1	1	1
20	0	1700	5.0	2	1	0
21	0	900	3.5	3	1	0
22	0	2300	3.5	1	1	0
23	NA	NA	2.0	0	0	0
24	0	2600	5.0	4	1	0
25	0	2300	4.0	2	1	0
26	0	1900	7.0	0	1	0
27	300	2100	5.0	0	1	0
28	0	2200	4.0	0	1	0
29	0	2500	9.5	5	1	0
30	0	2800	4.0	0	1	0
31	900	2100	4.0	0	1	0
32	0	300	2.0	0	1	0
33	0	1800	NA	NA	NA	NA
34	0	1500	NA	NA	0	0
35	100	1900	2.0	2	1	0
36	100	1300	1.5	1	1	0
37	0	2000	5.5	3	1	0
38	50	1850	3.0	0	1	0
39	0	2300	4.0	4	1	0

40	200	800	2.5	1	1	0
41	100	350	2.0	0	1	0
42	750	1850	4.0	2	1	0
43	600	450	2.0	2	1	0
44	0	2500	3.0	0	1	0
45	1500	1600	3.0	2	1	0
46	100	1300	2.5	3	NA	NA
47	0	2200	3.5	3	1	0
48	300	1500	2.0	2	1	0
49	100	2000	3.0	0	1	0
50	0	100	4.5	1	1	0
51	0	2300	3.5	1	1	0
52	25	2275	3.0	0	1	0
53	0	2000	2.5	1	1	0
54	0	2300	4.5	3	1	0
55	0	1500	8.0	0	1	0
56	100	900	3.0	0	1	0
57	0	2300	6.0	2	1	0
58	0	3000	8.0	4	1	0
59	500	1100	4.0	4	1	0
60	0	2000	4.5	1	1	0
61	0	1600	4.0	2	1	0
62	0	2000	4.5	1	NA	NA
63	700	1700	8.0	0	NA	NA
64	0	2500	7.0	0	NA	NA
65	0	1800	2.5	1	1	0
66	0	500	2.5	1	1	0
67	0	2000	11.0	2	NA	NA
68	0	1900	7.0	0	1	0
69	0	2400	6.5	3	0	0
70	0	2500	4.0	4	1	0
71	900	1100	2.0	0	1	0
72	0	2300	3.5	3	1	0
73	0	2000	4.5	1	1	0
74	100	1600	3.0	0	1	0
75	800	2200	4.0	0	1	0
76	200	2200	3.0	0	1	0
77	0	800	3.5	3	1	0
78	0	2100	3.5	3	1	0
79	0	500	3.0	0	1	0
80	800	1200	3.0	0	NA	NA
81	0	2700	7.0	6	1	0
82	750	1750	2.5	1	1	0

83	0	1800	5.0	4	1	0
84	0	1400	2.0	2	1	0
85	0	2600	6.5	1	1	0
86	450	1950	5.0	0	0	0
87	900	1400	3.0	0	1	0
88	0	1500	7.0	0	1	0
89	0	3000	7.0	4	1	0
90	0	2000	4.5	1	NA	NA
91	0	900	3.0	0	1	0
92	0	1800	6.5	1	1	0
93	0	500	5.5	1	1	0
94	0	2500	3.0	0	1	0
95	900	1600	3.5	1	1	0
96	0	700	3.0	0	1	0
97	0	400	9.0	0	1	0
98	0	1000	7.0	0	1	0
99	0	1600	6.0	0	1	0
100	0	1200	5.0	0	1	0
101	100	1900	3.0	0	1	0
102	0	2800	6.0	0	1	0
103	200	1800	6.0	0	1	0
104	0	2400	6.0	0	1	0
105	200	3300	NA	NA	1	0
106	0	1100	10.5	3	1	0
107	0	400	11.0	2	1	0
108	1800	800	2.0	0	NA	NA
109	0	2000	3.5	1	1	0
110	900	1300	3.0	0	1	0
111	1600	0	3.0	0	1	0
112	1500	1100	3.0	2	1	0
113	1300	800	2.5	1	1	0
114	1400	900	3.0	2	1	0
115	300	200	2.0	0	NA	NA
116	100	300	2.0	0	NA	NA
117	350	2350	2.5	1	1	0
118	400	1150	3.0	0	1	0
119	1200	1050	3.0	0	1	0
120	600	1900	3.0	2	1	0
121	1800	800	3.0	0	1	0
122	1600	1500	3.0	0	NA	NA
123	1500	950	2.0	0	1	0
124	1650	1250	2.5	1	1	0
125	1600	1400	3.0	0	NA	NA

126	0	2500	3.0	2	1	0
127	900	1600	3.0	0	1	0
128	200	2350	3.5	1	1	0
129	800	1600	3.0	0	1	0
130	200	2600	3.5	1	1	0
131	150	2250	4.0	0	1	0
132	1500	1100	2.0	0	1	0
133	1100	1400	3.0	0	1	0
134	500	1100	2.5	1	1	0
135	2100	500	1.5	1	1	0
136	800	1800	3.0	0	1	0
137	1800	800	2.5	1	1	0
138	450	2150	3.0	2	1	0
139	1000	650	3.0	0	1	0
140	0	3100	2.5	1	1	1
141	1000	1500	2.0	0	1	0
142	1600	1600	2.5	1	NA	NA
143	0	400	1.5	1	NA	NA
144	900	1900	3.5	1	1	0
145	1400	1200	1.5	1	1	0
146	1500	1000	2.0	0	1	0
147	1200	1300	2.0	0	1	0
148	1700	800	2.5	1	NA	NA
149	300	1500	3.0	0	1	0
150	200	2000	3.0	0	1	0
151	600	1600	2.5	1	1	0
152	400	2100	4.0	0	1	0
153	1200	1500	3.0	2	1	0
154	1000	650	3.5	1	1	0
155	0	2100	6.0	4	1	0
156	0	2000	4.0	4	1	0
157	0	1900	5.0	2	1	0
158	0	800	4.0	0	1	0
159	0	1500	5.0	0	1	0
160	0	3000	8.5	1	1	0
161	NA	NA	3.0	0	1	0
162	1700	800	4.0	0	1	0
163	50	1900	7.0	0	NA	NA
164	0	400	6.0	0	1	0
165	0	1300	5.0	0	1	0
166	0	2100	5.0	0	1	0
167	1000	1400	4.0	0	1	0
168	0	1600	3.0	0	1	0

169	0	2400	4.0	0	1	0
170	0	2600	3.5	3	1	0
171	900	2200	3.0	0	1	0
172	0	2800	3.0	0	1	0
173	300	400	2.0	0	NA	NA
174	1400	1000	3.0	0	1	0
175	100	900	2.5	1	1	0
176	0	2300	3.5	3	1	0
177	400	1600	3.0	0	1	0
178	0	2500	2.5	3	1	0
179	0	2000	5.0	2	0	0
180	0	1000	8.0	0	1	0
181	0	1900	9.0	0	1	0
182	0	1800	9.0	0	1	0
183	0	1900	5.0	0	1	0
184	100	1000	2.0	0	1	0
185	0	1800	NA	NA	NA	NA
186	300	1700	4.0	4	1	0
187	0	2000	7.5	3	1	0
188	0	2500	11.0	0	1	0
189	500	1000	9.0	6	0	0
190	0	2000	8.0	2	1	0
191	0	1700	6.0	0	1	0
192	0	2200	3.5	3	1	0
193	0	1500	3.0	2	1	0
194	0	2000	4.5	5	1	0
195	0	1600	2.0	0	1	0
196	480	1520	5.0	0	1	0
197	300	1200	2.0	0	NA	NA
198	0	1900	4.5	3	NA	NA
199	250	650	2.0	2	NA	NA
200	0	1500	5.5	3	1	0
201	0	1500	9.0	0	0	0
202	0	2400	4.5	3	1	0
203	0	1800	6.5	1	NA	NA
204	0	1400	3.5	1	1	0
205	200	100	5.0	0	NA	NA
206	0	1900	2.0	2	1	0
207	0	500	4.0	0	NA	NA
208	800	1000	3.0	0	NA	NA
209	0	1300	4.5	3	0	0
210	600	400	4.0	0	1	0
211	800	300	3.0	0	NA	NA

212	0	2000	3.0	0	NA	NA
213	0	1000	4.0	2	1	0
214	0	200	2.0	0	NA	NA
215	0	2000	3.5	3	1	1
216	0	2200	7.0	2	1	0
217	0	2500	4.0	4	1	0
218	0	2000	5.5	5	0	0
219	400	1600	6.0	0	NA	NA
220	400	900	3.0	0	NA	NA
221	0	2500	4.0	2	1	0
222	1400	600	3.0	0	NA	NA
223	0	2300	4.5	5	1	0
224	0	2500	3.5	3	1	0
225	800	1300	5.0	0	1	0
226	100	1700	4.0	0	1	0
227	0	2700	7.5	1	1	0
228	0	2000	6.0	4	1	0
229	0	2750	7.0	6	1	0
230	700	1100	2.5	1	1	0
231	0	2300	6.5	3	NA	NA
232	1000	1200	2.0	0	NA	NA
233	600	900	4.0	0	1	0
234	950	1050	2.0	0	1	0
235	0	800	2.0	0	1	0
236	1000	1600	NA	NA	1	0
237	1000	1000	3.0	0	NA	NA
238	100	1500	3.0	0	1	0
239	0	2700	9.0	0	1	0
240	0	2600	5.5	9	1	0
241	0	2500	6.5	7	1	0
242	0	1500	6.0	0	1	0
243	100	1250	3.5	3	1	0
244	0	2400	5.0	0	1	0
245	NA	NA	3.0	0	1	0
246	0	1400	5.0	0	1	0
247	0	2000	6.0	4	0	0
248	0	2000	6.0	4	1	0
249	0	1900	8.0	0	1	0
250	0	1800	6.5	3	1	0
251	0	1500	3.0	2	1	1
252	100	1550	2.5	1	0	0
253	0	1950	5.0	4	1	0
254	100	1400	2.5	1	1	0

255	0	800	NA	NA	NA	NA
256	0	2500	4.0	0	1	0
257	900	1500	3.5	1	1	0
258	0	1000	6.5	1	1	0
259	100	1700	6.0	0	1	0
260	0	2500	4.5	1	1	0
261	0	1600	7.0	2	1	0
262	0	2400	9.5	1	1	0
263	0	2200	9.0	4	1	0
264	1500	800	2.0	0	1	0
265	0	2500	7.0	0	1	0
266	200	2300	5.0	0	1	0
267	500	1000	3.0	0	1	0
268	100	1900	7.0	0	1	0
269	100	2400	3.0	0	1	0
270	0	2900	3.0	0	1	0
271	100	900	7.0	0	1	0
272	0	800	5.0	0	1	0
273	NA	NA	4.0	0	1	0
274	0	450	3.0	4	1	0
275	0	2500	5.0	6	1	0
276	0	900	3.5	3	1	0
277	400	900	3.5	1	1	0
278	0	1300	7.5	5	1	0
279	300	1200	2.0	0	1	0
280	0	2500	3.5	3	1	0
281	0	2600	4.0	0	1	0
282	0	1600	2.5	1	1	0
283	0	2400	4.0	2	1	0
284	0	2000	2.5	1	1	0
285	600	800	2.5	1	1	0
286	500	1900	3.0	0	1	0
287	0	1800	2.5	1	1	0
288	500	1350	3.5	1	1	0
289	2000	1000	2.0	0	1	0
290	0	2300	3.5	3	1	0
291	100	2000	2.0	0	1	0
292	200	700	3.0	2	1	0
293	0	2600	3.0	2	1	0
294	0	2600	4.0	4	1	0
295	200	1900	4.5	3	1	0
296	100	2100	3.5	5	1	0
297	0	2700	5.5	5	1	0

298	0	1900	4.0	0	1	0
299	100	2300	3.0	2	1	0
300	0	2700	4.5	5	1	0
301	0	2400	5.0	6	1	0
302	1200	1400	3.0	0	1	0
303	0	1600	3.0	2	1	0
304	0	1000	3.0	0	1	0
305	0	2000	4.0	2	1	0
306	0	1900	4.5	1	1	0
307	100	1500	3.5	1	0	0
308	100	1450	4.5	1	NA	NA
309	0	2000	5.5	7	1	0
310	0	2600	6.5	7	1	0
311	0	1500	3.5	3	0	0
312	0	2000	4.5	3	0	0
313	0	2300	4.0	0	1	0
314	100	900	1.5	1	NA	NA
315	1400	1500	3.0	0	1	0
316	NA	NA	2.5	1	0	0
317	200	700	2.0	0	NA	NA
318	0	2400	4.0	0	1	0
319	50	1450	3.0	0	1	0
320	0	3000	6.5	5	1	0
321	0	2500	7.0	10	1	0
322	0	1000	12.0	0	0	0
323	0	2000	12.0	0	0	0
324	0	3000	4.5	1	1	0
325	0	2500	3.0	0	1	0
326	1600	1200	3.0	0	1	0
327	500	1500	10.0	4	1	0
328	100	1200	3.0	0	1	0
329	0	2400	4.0	0	1	0
330	100	1500	3.0	0	1	0
331	100	1500	3.0	0	1	0
332	0	1000	7.0	0	1	0
333	0	2500	7.0	6	1	0
334	600	2700	4.0	0	1	0
335	200	1200	12.0	0	1	0
336	0	2200	7.5	5	1	0
337	0	2000	8.0	0	1	0
338	0	2000	7.5	5	1	0
339	0	2500	5.5	7	1	0
340	0	3000	9.5	1	1	0

341	0	3000	3.5	1	1	0
342	0	2400	4.0	0	1	0
343	300	1400	4.0	0	1	0
344	0	1400	3.0	0	1	0
345	100	2300	5.0	0	1	0
346	0	2700	6.5	7	1	0
347	0	2100	8.5	5	1	0
348	100	1700	3.0	0	1	0
349	100	2000	3.0	0	1	0
350	400	1600	3.0	0	NA	NA
351	0	2800	11.0	0	1	0
352	1700	300	2.5	1	NA	NA
353	600	1800	2.0	0	1	0
354	200	1800	3.0	0	1	0
355	200	800	2.0	0	1	0
356	100	2200	4.0	0	1	0
357	600	2100	3.0	0	1	0
358	100	1900	3.0	0	1	0
359	900	600	3.0	0	1	0
360	900	300	2.0	0	1	0
361	1900	1100	2.0	0	1	0
362	1000	100	2.0	0	1	0
363	0	2900	7.0	0	1	0
364	500	2300	2.5	1	NA	NA
365	1200	800	2.0	0	NA	NA
366	1000	1200	4.0	0	1	0
367	400	1600	NA	NA	NA	NA
368	100	1900	4.0	0	1	0
369	0	2200	7.0	0	1	0
370	1200	600	2.0	0	1	0
371	0	3400	4.0	0	1	0
372	0	2500	6.0	4	NA	NA
373	0	3000	5.5	3	1	0
374	0	3000	5.5	3	1	0
375	150	1450	2.5	1	1	0
376	500	1000	2.5	1	1	0
377	0	2400	4.0	2	1	0
378	1000	200	2.0	0	NA	NA
379	500	700	3.0	0	NA	NA
380	1250	500	2.0	0	1	0
381	750	1650	3.0	2	1	0
382	1400	1300	2.0	0	1	0
383	300	1600	3.0	2	1	0

384	2000	700	3.0	0	1	0
385	100	1400	2.0	0	1	0
386	700	800	4.0	0	1	0
387	100	1900	5.0	0	1	0
388	500	1000	3.0	0	1	0
389	200	1700	6.0	0	1	0
390	0	2000	5.0	0	1	0
391	0	2300	3.5	3	1	0
392	1600	1700	3.0	2	1	0
393	0	1900	5.5	5	1	0
394	1800	1000	2.5	1	1	0
395	1500	1000	2.0	0	1	0
396	0	1800	5.0	0	1	0
397	0	1000	2.5	1	1	0
398	0	2000	4.0	2	1	0
399	0	1000	3.0	2	1	0
400	1000	700	3.0	2	1	0
401	0	2500	5.0	4	1	0
402	0	1800	3.5	3	1	0
403	0	2800	7.0	0	1	0
404	0	2800	3.0	2	1	0
405	0	2300	4.0	2	1	0
406	1800	800	2.0	0	NA	NA
407	100	1900	4.5	1	1	0
408	0	2300	3.5	1	1	0
409	0	2300	3.5	3	1	0
410	0	2000	3.0	2	1	0
411	100	1200	4.0	0	1	0
412	0	1800	4.0	0	0	0
413	600	1900	3.5	3	1	0
414	100	600	3.0	0	1	0
415	0	2000	3.5	1	1	0
416	0	1700	3.0	0	1	0
417	100	1900	3.0	0	1	0
418	0	2200	4.0	2	1	0
419	0	1500	5.0	0	1	0
420	0	2500	3.5	3	1	0
421	0	2500	5.5	3	1	0
422	0	2200	4.0	0	NA	NA
423	0	1400	NA	NA	NA	NA
424	0	1700	7.0	4	1	0
425	0	1500	5.0	0	NA	NA
426	0	1200	7.0	0	1	0

427	0	250	6.0	0	NA	NA
428	0	1600	4.5	1	1	0
429	0	2500	4.5	3	1	0
430	100	900	9.0	0	NA	NA
431	0	2000	3.0	0	1	0
432	0	2500	3.5	3	1	0
433	0	2600	4.5	3	1	0
434	200	1100	4.0	2	1	0
435	0	2300	3.0	0	NA	NA
436	0	2300	3.5	1	NA	NA
437	1500	800	4.0	0	1	0
438	0	2500	8.5	7	1	0
439	0	3000	8.0	8	1	0
440	0	1500	10.0	0	NA	NA
441	0	1500	12.0	0	1	0
442	0	1200	7.5	1	1	0
443	500	900	4.0	0	1	0
444	0	1700	4.0	0	1	0
445	0	1700	5.0	0	1	0
446	0	1000	4.5	1	1	0
447	0	1700	4.0	0	1	0
448	0	1500	5.0	4	1	0
449	0	1500	NA	NA	NA	NA
450	0	800	9.0	0	1	0

	AFB_shrub_flower	AFB_honeydew	AFB_sap	AFB_animal	AFB_mineral
1	0	0	0	0	0
2	1	0	0	1	1
3	1	0	0	1	1
4	NA	NA	NA	NA	NA
5	NA	NA	NA	NA	NA
6	0	0	0	0	0
7	1	0	0	1	0
8	0	0	0	0	1
9	0	0	0	0	1
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	1	1	1	1
16	0	1	1	1	1
17	1	1	1	1	1
18	1	0	0	0	0

19	0	1	0	0	1
20	1	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	1	0	0	0	1
24	0	0	0	1	1
25	1	1	0	0	1
26	0	0	0	1	1
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	1
30	0	0	0	0	1
31	0	0	0	0	0
32	0	0	0	0	0
33	NA	NA	NA	NA	NA
34	1	0	0	0	0
35	1	0	0	0	0
36	0	0	0	0	0
37	0	0	0	0	0
38	0	0	0	0	0
39	0	0	0	0	0
40	0	0	0	0	0
41	0	0	0	0	0
42	0	0	0	0	0
43	0	0	0	0	0
44	0	0	0	0	0
45	0	0	0	0	0
46	NA	NA	NA	NA	NA
47	0	0	0	0	1
48	0	0	0	0	0
49	0	0	0	0	0
50	0	0	0	0	0
51	1	0	0	0	0
52	0	0	0	0	0
53	1	0	0	0	0
54	0	0	1	1	1
55	0	0	0	0	0
56	0	0	0	0	0
57	1	1	0	0	0
58	0	0	0	0	0
59	0	0	0	0	1
60	0	0	0	0	1
61	0	0	0	0	1

62	NA	NA	NA	NA	NA
63	NA	NA	NA	NA	NA
64	NA	NA	NA	NA	NA
65	0	0	0	0	0
66	0	0	0	0	0
67	NA	NA	NA	NA	NA
68	1	1	0	0	0
69	0	0	0	1	1
70	0	0	0	1	1
71	0	0	0	0	0
72	1	0	0	0	0
73	0	0	0	0	0
74	0	0	0	1	0
75	0	0	0	0	0
76	0	0	0	1	0
77	1	0	0	0	0
78	0	0	0	0	0
79	1	1	0	0	0
80	NA	NA	NA	NA	NA
81	0	0	0	0	0
82	0	0	0	0	0
83	0	0	0	0	0
84	1	0	0	0	0
85	0	0	0	0	0
86	1	0	0	0	0
87	0	0	0	0	0
88	0	0	0	0	0
89	0	0	0	0	1
90	NA	NA	NA	NA	NA
91	0	0	0	0	0
92	0	0	0	0	0
93	0	0	0	0	0
94	1	0	0	0	0
95	0	0	0	0	0
96	0	0	0	0	0
97	1	0	0	0	0
98	0	0	0	0	0
99	0	0	0	0	0
100	0	0	0	0	0
101	0	0	0	0	1
102	0	0	0	1	1
103	0	0	0	0	1
104	0	0	0	0	0

105	0	0	0	0	0
106	0	0	0	0	0
107	1	0	0	0	0
108	NA	NA	NA	NA	NA
109	0	0	0	0	0
110	0	0	0	0	1
111	0	0	0	0	0
112	0	0	0	0	1
113	0	0	0	0	1
114	0	0	0	0	0
115	NA	NA	NA	NA	NA
116	NA	NA	NA	NA	NA
117	0	0	0	0	0
118	0	0	0	0	0
119	0	0	0	0	0
120	0	0	0	0	0
121	0	0	0	0	0
122	NA	NA	NA	NA	NA
123	0	0	0	0	0
124	0	0	0	0	1
125	NA	NA	NA	NA	NA
126	0	0	0	0	1
127	0	0	0	0	0
128	0	0	0	0	0
129	0	0	0	0	0
130	0	0	0	0	0
131	0	0	0	0	0
132	0	0	0	0	0
133	0	0	0	0	0
134	0	0	0	0	0
135	0	0	0	0	0
136	0	0	0	0	0
137	0	0	0	0	0
138	0	0	0	0	0
139	0	0	0	0	0
140	0	0	0	0	0
141	0	0	0	0	0
142	NA	NA	NA	NA	NA
143	NA	NA	NA	NA	NA
144	0	0	0	0	0
145	0	0	0	0	0
146	0	0	0	0	0
147	0	0	0	0	0

148	NA	NA	NA	NA	NA
149	0	0	0	0	0
150	0	0	0	0	0
151	0	0	0	0	0
152	0	0	0	0	1
153	0	0	0	0	0
154	0	0	0	0	0
155	0	0	0	0	0
156	0	0	0	0	0
157	0	0	0	0	0
158	0	0	0	0	0
159	0	0	0	0	0
160	0	0	0	0	0
161	0	0	0	0	0
162	0	0	0	0	0
163	NA	NA	NA	NA	NA
164	0	0	0	0	0
165	0	0	0	0	0
166	0	0	0	0	0
167	0	0	0	0	0
168	0	0	0	0	0
169	0	0	0	0	0
170	0	0	0	0	0
171	0	0	0	0	0
172	0	0	0	0	0
173	NA	NA	NA	NA	NA
174	0	0	0	0	0
175	0	1	0	0	0
176	1	0	0	0	1
177	0	0	0	0	0
178	0	0	0	0	0
179	0	1	0	1	1
180	0	0	0	0	0
181	0	0	0	0	1
182	0	0	0	0	0
183	0	0	0	1	1
184	0	0	0	0	1
185	NA	NA	NA	NA	NA
186	0	0	0	0	0
187	0	0	0	0	0
188	0	0	0	0	0
189	1	0	0	0	0
190	1	0	0	0	0

191	0	0	0	0	0
192	0	0	0	0	0
193	0	0	0	0	0
194	0	0	0	0	0
195	1	0	0	1	0
196	1	0	0	0	0
197	NA	NA	NA	NA	NA
198	NA	NA	NA	NA	NA
199	NA	NA	NA	NA	NA
200	0	0	0	0	0
201	0	0	1	0	0
202	1	0	1	0	0
203	NA	NA	NA	NA	NA
204	0	0	0	1	1
205	NA	NA	NA	NA	NA
206	1	0	0	0	0
207	NA	NA	NA	NA	NA
208	NA	NA	NA	NA	NA
209	0	0	0	1	1
210	1	0	0	0	0
211	NA	NA	NA	NA	NA
212	NA	NA	NA	NA	NA
213	0	0	0	1	0
214	NA	NA	NA	NA	NA
215	1	0	1	0	0
216	0	0	0	0	0
217	1	0	0	1	1
218	0	0	1	0	0
219	NA	NA	NA	NA	NA
220	NA	NA	NA	NA	NA
221	0	0	0	0	0
222	NA	NA	NA	NA	NA
223	0	1	1	0	0
224	0	0	0	0	0
225	0	0	0	0	0
226	0	0	0	0	1
227	0	0	0	0	0
228	1	0	0	1	0
229	0	0	0	0	1
230	1	0	0	0	0
231	NA	NA	NA	NA	NA
232	NA	NA	NA	NA	NA
233	0	0	0	0	1

234	0	0	0	0	0
235	0	0	0	0	0
236	0	0	0	0	0
237	NA	NA	NA	NA	NA
238	0	0	0	0	0
239	0	0	0	0	0
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242	0	0	0	0	0
243	0	0	0	0	1
244	0	0	0	0	0
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246	0	0	0	0	1
247	1	1	1	1	1
248	0	0	0	0	1
249	1	0	0	0	0
250	0	0	0	0	1
251	1	1	1	1	1
252	0	0	1	1	0
253	1	1	1	1	1
254	0	1	1	0	1
255	NA	NA	NA	NA	NA
256	0	0	0	0	0
257	0	0	0	0	0
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266	0	0	0	0	0
267	0	0	0	0	1
268	0	0	0	1	1
269	0	0	0	1	1
270	0	0	0	0	0
271	0	0	0	0	1
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273	1	0	0	0	0
274	0	0	0	0	0
275	1	0	0	0	0
276	1	0	0	0	0

277	0	0	0	0	0
278	0	0	0	0	0
279	0	0	0	0	0
280	0	0	0	0	0
281	0	0	0	0	0
282	0	0	0	0	0
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285	0	0	0	0	0
286	0	0	0	0	0
287	0	0	0	0	1
288	0	0	0	0	0
289	0	0	0	0	0
290	0	0	0	1	0
291	0	0	0	0	0
292	0	0	0	0	0
293	0	0	0	0	1
294	0	0	0	0	0
295	0	0	0	0	1
296	0	0	0	0	1
297	0	0	0	0	0
298	0	0	0	0	0
299	0	0	0	1	1
300	0	0	0	0	1
301	0	0	0	0	1
302	0	0	0	0	0
303	0	0	0	1	0
304	0	0	0	0	1
305	0	0	0	0	1
306	0	0	0	0	0
307	1	0	0	0	0
308	NA	NA	NA	NA	NA
309	1	1	1	1	1
310	1	0	1	1	1
311	0	0	0	0	1
312	0	0	1	0	0
313	0	0	0	1	1
314	NA	NA	NA	NA	NA
315	0	0	0	0	0
316	1	0	0	0	0
317	NA	NA	NA	NA	NA
318	0	0	0	0	0
319	0	0	0	0	0

320	1	0	0	0	0
321	1	0	1	0	0
322	1	1	1	0	0
323	1	1	1	0	0
324	0	0	0	0	0
325	0	0	0	0	0
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344	0	0	0	0	0
345	0	0	0	0	0
346	1	1	1	1	1
347	0	0	0	0	0
348	0	0	0	0	0
349	0	0	0	0	1
350	NA	NA	NA	NA	NA
351	0	0	0	0	1
352	NA	NA	NA	NA	NA
353	0	0	0	0	1
354	0	0	0	0	1
355	0	0	0	0	0
356	0	0	0	0	0
357	0	0	0	0	1
358	0	0	0	0	0
359	0	0	0	0	1
360	0	0	0	0	0
361	0	0	0	0	0
362	0	0	0	0	0

363	0	0	0	1	1
364	NA	NA	NA	NA	NA
365	NA	NA	NA	NA	NA
366	0	0	0	0	1
367	NA	NA	NA	NA	NA
368	0	0	0	0	0
369	0	0	0	0	0
370	0	1	0	0	1
371	0	0	0	0	0
372	NA	NA	NA	NA	NA
373	0	0	0	0	0
374	0	0	0	0	0
375	0	0	0	0	0
376	0	0	0	0	1
377	0	0	0	0	0
378	NA	NA	NA	NA	NA
379	NA	NA	NA	NA	NA
380	0	0	0	0	0
381	0	0	0	0	0
382	0	0	0	0	0
383	0	0	0	0	0
384	0	0	0	0	1
385	0	0	0	0	1
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400	0	0	0	0	0
401	0	0	0	0	0
402	0	0	0	0	1
403	0	0	0	0	1
404	0	0	0	0	0
405	0	0	0	0	1

406	NA	NA	NA	NA	NA
407	0	0	0	0	0
408	0	0	0	0	1
409	1	0	0	0	0
410	1	0	0	0	0
411	0	0	0	0	0
412	1	0	0	0	0
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417	0	0	0	0	0
418	0	0	0	1	1
419	0	0	0	0	0
420	0	0	0	1	1
421	0	0	0	0	0
422	NA	NA	NA	NA	NA
423	NA	NA	NA	NA	NA
424	0	0	0	0	0
425	NA	NA	NA	NA	NA
426	0	0	0	0	0
427	NA	NA	NA	NA	NA
428	0	1	0	0	0
429	0	0	0	0	0
430	NA	NA	NA	NA	NA
431	0	0	0	0	0
432	0	0	0	0	1
433	0	0	0	0	1
434	0	0	0	0	0
435	NA	NA	NA	NA	NA
436	NA	NA	NA	NA	NA
437	0	0	0	0	1
438	1	1	1	1	1
439	1	1	0	0	0
440	NA	NA	NA	NA	NA
441	0	0	0	0	0
442	0	0	0	0	0
443	0	0	0	0	0
444	0	0	0	0	0
445	0	0	0	0	0
446	0	0	0	0	0
447	0	0	0	0	0
448	0	0	0	0	0

```
449               NA           NA       NA         NA          NA
450                0            0        0          0           1
```

```
# contains is another useful command to select columns.
be %>%
  select(species, contains("LEV")) %>%
  drop_na()
```

	species	LEV_buried	LEV_ground_layer	LEV_field_layer
1	Aglais_io	0	0	1
2	Aglais_urticae	0	0	1
3	Agriades_aquilo	0	0	1
4	Agriades_glandon	0	0	1
5	Agriades_optilete	0	1	1
6	Agriades_pyrenaicus	0	1	0
7	Agriades_zullichi	1	1	1
8	Anthocharis_cardamines	0	0	1
9	Anthocharis_euphenoides	0	0	1
10	Apatura_ilia	0	0	0
11	Apatura_iris	0	0	0
12	Apatura_metis	0	0	0
13	Aphantopus_hyperantus	0	1	1
14	Aporia_crataegi	0	0	1
15	Araschnia_levana	0	0	1
16	Archon_apollinus	0	0	1
17	Arethusana_arethusa	0	1	1
18	Argynnis_pandora	1	1	1
19	Argynnis_paphia	0	0	1
20	Aricia_agestis	0	1	1
21	Aricia_anteros	0	0	1
22	Aricia_artaxerxes	0	1	1
23	Aricia_cramera	0	1	1
24	Aricia_morronensis	0	0	1
25	Aricia_nicias	0	0	1
26	Azanus_ubaldus	0	0	0
27	Boloria_aquilonaris	0	1	1
28	Boloria_dia	0	0	1
29	Boloria_eunomia	0	0	1
30	Boloria_euphrosyne	0	0	1
31	Boloria_freija	0	0	0
32	Boloria_frigga	0	0	0
33	Boloria_graeca	0	0	1

34	Boloria_improba	0	0	1
35	Boloria_napaea	0	1	1
36	Boloria_pales	0	0	1
37	Boloria_selene	0	0	1
38	Boloria_thore	0	0	1
39	Boloria_titania	0	0	1
40	Borbo_borbonica	0	1	1
41	Brenthis_daphne	0	0	0
42	Brenthis_hecate	0	0	1
43	Brenthis_ino	0	1	1
44	Brintesia_circe	0	1	1
45	Callophrys_rubi	0	1	1
46	Carcharodus_alceae	0	0	1
47	Carcharodus_baeticus	0	1	1
48	Carcharodus_floccifera	0	0	1
49	Carcharodus_lavatherae	0	1	1
50	Carterocephalus_palaemon	0	0	1
51	Carterocephalus_silvicola	0	0	1
52	Catopsilia_florella	0	0	0
53	Celastrina_argiolus	0	0	0
54	Charaxes_jasius	0	0	0
55	Chazara_briseis	0	1	1
56	Coenonympha_arcania	0	0	1
57	Coenonympha_dorus	0	0	1
58	Coenonympha_glycerion	0	0	1
59	Coenonympha_hero	0	0	1
60	Coenonympha_leander	0	0	1
61	Coenonympha_oedippus	0	0	1
62	Coenonympha_pamphilus	0	0	1
63	Coenonympha_rhodopensis	0	0	1
64	Coenonympha_thyrsis	0	0	1
65	Coenonympha_tullia	0	0	1
66	Colias_alfacariensis	0	1	1
67	Colias_aurorina	0	0	1
68	Colias_caucasica	0	0	1
69	Colias_chrysotheme	0	1	1
70	Colias_crocea	0	0	1
71	Colias_hecla	0	1	0
72	Colias_hyale	0	1	1
73	Colias_myrmidone	0	0	1
74	Colias_palaeno	0	1	1
75	Colias_phicomone	0	1	0
76	Colias_tyche	0	1	0

77	Colotis_evagore	0	0	1
78	Cupido_alcetas	0	0	1
79	Cupido_argiades	0	0	1
80	Cupido_decoloratus	0	0	1
81	Cupido_lorquinii	0	0	1
82	Cupido_minimus	0	0	1
83	Cupido_osiris	0	0	1
84	Cyaniris_semiargus	0	0	1
85	Cyclyrius_webbianus	0	0	1
86	Danaus_chrysippus	0	0	1
87	Danaus_plexippus	0	0	1
88	Erebia_aethiops	0	1	1
89	Erebia_cassioides	0	1	1
90	Erebia_claudina	0	0	1
91	Erebia_embla	0	0	1
92	Erebia_epiphron	0	0	1
93	Erebia_eriphyle	0	0	1
94	Erebia_euryale	0	0	1
95	Erebia_gorge	0	0	1
96	Erebia_ligea	0	1	1
97	Erebia_manto	0	0	1
98	Erebia_medusa	0	1	1
99	Erebia_meolans	0	1	1
100	Erebia_mnestra	0	0	1
101	Erebia_montana	0	1	0
102	Erebia_neoridas	0	0	1
103	Erebia_oeme	0	1	1
104	Erebia_palarica	0	1	1
105	Erebia_pandrose	0	1	1
106	Erebia_pluto	0	1	1
107	Erebia_polaris	0	0	1
108	Erebia_triarius	0	1	1
109	Erynnis_tages	0	0	1
110	Euchloe_ausonia	0	0	1
111	Euchloe_bazae	0	1	0
112	Euchloe_belemia	0	1	0
113	Euchloe_charlonia	0	1	1
114	Euchloe_crameri	0	0	1
115	Euchloe_insularis	0	0	1
116	Euchloe_penia	0	1	1
117	Euchloe_simplonia	0	1	1
118	Euchloe_tagis	0	1	1
119	Eumedonia_eumedon	0	1	1

120	Euphydryas_aurinia	0	1	1
121	Euphydryas_cynthia	0	1	1
122	Euphydryas_desfontainii	0	0	1
123	Euphydryas_iduna	0	0	1
124	Euphydryas_intermedia	0	1	0
125	Euphydryas_maturna	0	0	1
126	Fabriciana_adippe	0	0	1
127	Fabriciana_elisa	0	0	1
128	Fabriciana_niobe	0	1	1
129	Favonius_quercus	0	0	0
130	Gegenes_nostrodamus	0	0	1
131	Gegenes_pumilio	0	0	1
132	Glaucopsyche_alexis	0	0	1
133	Glaucopsyche_melanops	0	0	1
134	Glaucopsyche_paphos	0	0	1
135	Gonepteryx_cleobule	0	0	0
136	Gonepteryx_cleopatra	0	0	0
137	Gonepteryx_farinosa	0	0	0
138	Gonepteryx_rhamni	0	0	0
139	Hamearis_lucina	0	1	1
140	Hesperia_comma	0	1	1
141	Heteropterus_morpheus	0	0	1
142	Hipparchia_azorina	0	0	1
143	Hipparchia_cypriensis	0	1	1
144	Hipparchia_fagi	0	1	1
145	Hipparchia_fatua	0	1	1
146	Hipparchia_fidia	0	0	1
147	Hipparchia_hermione	0	1	1
148	Hipparchia_maderensis	0	0	1
149	Hipparchia_pellucida	0	1	1
150	Hipparchia_semele	0	1	1
151	Hipparchia_statilinus	0	1	1
152	Hipparchia_syriaca	0	1	1
153	Hipparchia_volgensis	0	1	1
154	Hipparchia_wyssii	0	1	1
155	Hyponephele_lupina	0	1	1
156	Hyponephele_lycaon	0	0	1
157	Iolana_iolas	0	1	1
158	Iphiclides_feisthamelii	0	0	0
159	Iphiclides_podalirius	0	1	1
160	Issoria_lathonia	0	1	1
161	Kirinia_climene	0	1	1
162	Kretania_eurypilus	0	0	1

163	Kretania_hesperica	0	0	1
164	Kretania_psylorita	0	0	1
165	Kretania_pylaon	0	0	1
166	Kretania_trappi	0	1	1
167	Laeosopis_roboris	0	1	0
168	Lampides_boeticus	0	0	1
169	Lasiommata_maera	0	0	1
170	Lasiommata_megera	0	0	1
171	Lasiommata_paramegaera	0	0	1
172	Lasiommata_petropolitana	0	0	1
173	Leptidea_duponcheli	0	1	1
174	Leptidea_juvernica	0	0	1
175	Leptidea_morsei	0	0	1
176	Leptidea_reali	0	0	1
177	Leptidea_sinapis	0	0	1
178	Leptotes_pirithous	0	0	1
179	Libythea_celtis	0	0	0
180	Limenitis_camilla	0	0	0
181	Limenitis_populi	0	0	0
182	Limenitis_reducta	0	0	0
183	Lopinga_achine	0	1	1
184	Lycaena_alciphron	0	1	1
185	Lycaena_candens	0	1	0
186	Lycaena_dispar	0	1	1
187	Lycaena_helle	0	0	1
188	Lycaena_hippothoe	0	1	1
189	Lycaena_phlaeas	0	1	0
190	Lycaena_tityrus	0	1	1
191	Lycaena_virgaureae	0	1	0
192	Lysandra_albicans	0	0	1
193	Lysandra_bellargus	0	1	0
194	Lysandra_coridon	0	1	0
195	Lysandra_corydonius	0	1	1
196	Lysandra_hispana	0	0	1
197	Maniola_chia	0	1	1
198	Maniola_cypricola	0	1	1
199	Maniola_halicarnassus	0	1	1
200	Maniola_jurtina	0	1	1
201	Maniola_megala	0	1	1
202	Maniola_nurag	0	1	1
203	Maniola_telmessia	0	1	1
204	Melanargia_galathea	0	1	1
205	Melanargia_ines	0	0	1

206	Melanargia_lachesis	0	1	1
207	Melanargia_larissa	0	1	1
208	Melanargia_occitanica	0	1	1
209	Melanargia_russiae	0	1	1
210	Melitaea_arduinna	0	1	0
211	Melitaea_asteria	0	1	1
212	Melitaea_athalia	0	1	1
213	Melitaea_aurelia	0	0	1
214	Melitaea_britomartis	0	0	1
215	Melitaea_cinxia	0	1	1
216	Melitaea_deione	0	1	1
217	Melitaea_diamina	0	1	1
218	Melitaea_didyma	0	0	1
219	Melitaea_ornata	0	0	1
220	Melitaea_parthenoides	0	0	1
221	Melitaea_phoebe	0	0	1
222	Melitaea_trivia	0	0	1
223	Melitaea_varia	0	1	1
224	Minois_dryas	0	1	1
225	Muschampia_proto	0	1	1
226	Nymphalis_antiopa	0	0	0
227	Nymphalis_polychloros	0	0	0
228	Nymphalis_vaualbum	0	0	0
229	Nymphalis_xanthomelas	0	0	0
230	Ochlodes_sylvanus	0	0	1
231	Oeneis_bore	0	0	1
232	Oeneis_jutta	0	0	1
233	Oeneis_norna	0	0	1
234	Papilio_alexanor	0	0	1
235	Papilio_hospiton	0	1	1
236	Papilio_machaon	0	0	1
237	Pararge_aegeria	0	0	1
238	Pararge_xiphia	0	1	1
239	Pararge_xiphioides	0	1	1
240	Parnassius_apollo	0	1	0
241	Parnassius_mnemosyne	0	1	0
242	Parnassius_phoebus	0	1	1
243	Pelopidas_thrax	0	0	1
244	Phengaris_alcon	1	1	1
245	Phengaris_arion	1	1	1
246	Phengaris_nausithous	1	1	1
247	Phengaris_teleius	1	1	1
248	Pieris_brassicae	0	1	1

249	Pieris_bryoniae	0	1	0
250	Pieris_cheiranthi	0	1	1
251	Pieris_ergane	0	1	1
252	Pieris_krueperi	0	0	1
253	Pieris_mannii	0	1	1
254	Pieris_napi	0	1	1
255	Pieris_rapae	0	1	1
256	Plebejus_argus	0	1	1
257	Plebejus_argyrognomon	0	0	1
258	Plebejus_idas	0	0	1
259	Polygonia_c-album	0	0	1
260	Polygonia_egea	0	0	1
261	Polyommatus_admetus	1	1	1
262	Polyommatus_amandus	0	1	1
263	Polyommatus_aroaniensis	0	0	1
264	Polyommatus_damon	0	1	0
265	Polyommatus_daphnis	0	1	1
266	Polyommatus_dorylas	0	1	1
267	Polyommatus_eros	0	0	1
268	Polyommatus_escheri	0	1	1
269	Polyommatus_fabressei	0	0	1
270	Polyommatus_fulgens	0	0	1
271	Polyommatus_golgus	1	1	1
272	Polyommatus_icarus	0	1	1
273	Polyommatus_nivescens	0	1	1
274	Polyommatus_ripartii	0	1	1
275	Polyommatus_thersites	0	1	1
276	Polyommatus_violetae	0	0	1
277	Pontia_callidice	0	1	0
278	Pontia_chloridice	0	0	1
279	Pontia_daplidice	0	0	1
280	Pontia_edusa	0	1	0
281	Proterebia_phegea	0	1	1
282	Pseudochazara_anthelea	1	1	1
283	Pseudophilotes_abencerragus	0	0	1
284	Pseudophilotes_barbagiae	0	0	1
285	Pseudophilotes_baton	0	0	1
286	Pseudophilotes_bavius	0	0	1
287	Pseudophilotes_vicrama	0	0	1
288	Pyrgus_alveus	0	0	1
289	Pyrgus_armoricanus	0	0	1
290	Pyrgus_carthami	0	1	1
291	Pyrgus_cirsii	0	1	1

292	Pyrgus_malvae	0	0	1
293	Pyrgus_malvoides	0	1	1
294	Pyrgus_onopordi	0	1	1
295	Pyrgus_serratulae	0	1	1
296	Pyronia_bathseba	0	1	1
297	Pyronia_cecilia	0	0	1
298	Pyronia_tithonus	0	1	1
299	Satyrium_acaciae	0	1	0
300	Satyrium_esculi	0	0	0
301	Satyrium_ilicis	0	0	0
302	Satyrium_ledereri	0	0	0
303	Satyrium_pruni	0	0	0
304	Satyrium_spini	0	0	0
305	Satyrium_w-album	0	0	0
306	Satyrus_actaea	0	1	1
307	Satyrus_ferula	0	1	1
308	Scolitantides_orion	0	0	1
309	Speyeria_aglaja	0	1	1
310	Spialia_sertorius	0	1	1
311	Spialia_therapne	0	1	1
312	Tarucus_balkanicus	0	0	1
313	Tarucus_theophrastus	0	0	0
314	Thecla_betulae	0	0	0
315	Thymelicus_acteon	0	0	1
316	Thymelicus_christi	0	0	1
317	Thymelicus_lineola	0	0	1
318	Thymelicus_sylvestris	0	0	1
319	Tomares_ballus	0	0	1
320	Tomares_callimachus	1	1	1
321	Vanessa_atalanta	0	0	1
322	Vanessa_cardui	0	0	1
323	Vanessa_virginiensis	0	0	1
324	Vanessa_vulcania	0	0	1
325	Ypthima_asterope	0	0	1
326	Zegris_eupheme	0	0	1
327	Zerynthia_cassandra	0	0	1
328	Zerynthia_cerisy	0	0	1
329	Zerynthia_cretica	0	0	1
330	Zerynthia_polyxena	0	0	1
331	Zerynthia_rumina	0	1	1

	LEV_shrub_layer	LEV_canopy_layer
1	0	0
2	0	0

3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	1	1
11	1	0
12	1	1
13	0	0
14	1	0
15	0	0
16	0	0
17	0	0
18	0	0
19	0	0
20	0	0
21	0	0
22	0	0
23	0	0
24	0	0
25	0	0
26	1	0
27	0	0
28	0	0
29	0	0
30	0	0
31	1	0
32	1	0
33	0	0
34	0	0
35	0	0
36	0	0
37	0	0
38	0	0
39	0	0
40	0	0
41	1	0
42	0	0
43	0	0
44	0	0
45	1	0

46	0	0
47	0	0
48	0	0
49	0	0
50	0	0
51	0	0
52	1	1
53	1	1
54	0	1
55	0	0
56	0	0
57	0	0
58	0	0
59	0	0
60	0	0
61	0	0
62	0	0
63	0	0
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109	0	0
110	0	0
111	0	0
112	0	0
113	0	0
114	0	0
115	0	0
116	0	0
117	0	0
118	1	0
119	0	0
120	0	0
121	0	0
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124	1	0
125	1	1
126	0	0
127	0	0
128	0	0
129	0	1
130	0	0
131	0	0

132	0	0
133	0	0
134	0	0
135	1	1
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138	1	0
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147	0	0
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149	0	0
150	0	0
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153	0	0
154	0	0
155	0	0
156	0	0
157	0	0
158	1	0
159	0	0
160	0	0
161	0	0
162	0	0
163	0	0
164	0	0
165	0	0
166	0	0
167	0	1
168	0	0
169	0	0
170	0	0
171	0	0
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179	0	1
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226	1	1
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228	0	1
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242	0	0
243	0	0
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245	0	0
246	0	0
247	0	0
248	0	0
249	0	0
250	1	0
251	0	0
252	0	0
253	0	0
254	0	0
255	0	0
256	0	0
257	0	0
258	0	0
259	1	1
260	0	0

261	0	0
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282	0	0
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284	0	0
285	0	0
286	0	0
287	0	0
288	0	0
289	1	0
290	0	0
291	0	0
292	0	0
293	0	0
294	0	0
295	0	0
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297	0	0
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299	1	0
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304	1	0
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315	0	0
316	0	0
317	0	0
318	0	0
319	0	0
320	0	0
321	0	0
322	0	0
323	0	0
324	0	0
325	0	0
326	0	0
327	0	0
328	0	0
329	0	0
330	0	0
331	0	0

Funtions like `contains` can be powerful for filtering and selecting. `starts_with` and `ends_with` work just the same way and are equally useful.

4.7 Create new variables with `mutate()`

This is a very powerful and flexible function that uses existing variables to create novel ones. Let's look at a simple example

```
# Create a new variable summarizing all the overwintering stages that are not
 ↪  adults
be %>%
  mutate(OWS_juvenile = 1-OWS_adult) %>%
```

```
  select(OWS_juvenile, OWS_adult) %>%
  drop_na()
```

```
   OWS_juvenile OWS_adult
1             0         1
2             0         1
3             0         1
4             1         0
5             1         0
6             1         0
7             1         0
8             1         0
9             1         0
10            1         0
11            1         0
12            1         0
13            1         0
14            1         0
15            1         0
16            1         0
17            1         0
18            1         0
19            1         0
20            1         0
21            1         0
22            1         0
23            1         0
24            1         0
25            1         0
26            1         0
27            1         0
28            0         1
29            1         0
30            1         0
31            1         0
32            0         1
33            1         0
34            1         0
35            1         0
36            1         0
37            1         0
```

38	1	0
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269	1	0
270	1	0
271	1	0
272	1	0
273	1	0
274	1	0
275	1	0
276	1	0
277	1	0
278	1	0
279	1	0
280	1	0
281	1	0
282	1	0
283	1	0
284	1	0
285	1	0
286	0	1
287	0	1
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289	0	1
290	1	0
291	1	0
292	1	0
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296	1	0
297	1	0
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310	1	0
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312	0	1
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314	1	0
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325	1	0
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327	1	0
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374	1	0
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380	1	0
381	1	0

```
382            1          0
383            1          0
384            1          0
385            1          0
386            1          0
387            1          0
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406            1          0
407            1          0
408            1          0
409            1          0
410            1          0
411            0          1
412            0          1
```

```
# Determine how different the protection levels between EU and Europe and
 ↪  extract the species for which the difference is striking
be %>%
  mutate(protect_diff = abs(conserv.europe - conserv.eu)) %>%
  filter(protect_diff > 2)
```

```
                species      family range.size conserv.europe conserv.eu OWS_egg
1 Coenonympha_oedippus Nymphalidae         52              2          5       0
2        Lycaena_helle  Lycaenidae        148              2          5       0
3      Tomares_nogelii  Lycaenidae          2              3          0      NA
```

```
  OWS_larvae OWS_pupae OWS_adult GEN_Average GEN_Min GEN_Max GEN_Range
1          1         0         0        1.00       1     1.0       0.0
2          0         1         0        1.25       1     1.5       0.5
3         NA        NA        NA        1.00       1     1.0       0.0
  WSP_Female_average WSP_Female_range   HSI LEV_buried LEV_ground_layer
1               38.0                8 0.258          0                0
2               24.0                6 0.289          0                0
3               32.5                5 1.000         NA               NA
  LEV_field_layer LEV_shrub_layer LEV_canopy_layer ELT_single ELT_small_batch
1               1               0                0          1               0
2               1               0                0          1               0
3              NA              NA               NA         NA              NA
  ELT_large_batch ALT_Min ALT_Range FM_Average FM_Range AFB_herb.flower
1               0       0       500        3.0        0               1
2               0     100      1700        6.0        0               1
3              NA       0      2300        3.5        1              NA
  AFB_grass AFB_shrub_flower AFB_honeydew AFB_sap AFB_animal AFB_mineral
1         0                1            1       0          0           0
2         0                1            0       0          0           0
3        NA               NA           NA      NA         NA          NA
  protect_diff
1            3
2            3
3            3
```

4.8 Exercise

a) From our dataset, filter out all butterflies with average wingspans larger than 60mm and smaller than 30mm. Only keep the species that have a conservation classification on the EU level. Only keep the species names and all variables associated with adult feeding, and store this in a new data frame. How many rows and columns does the new data frame have?

b) Re-calculate the generation range from the provided minima and maxima. Check if your calculations match the original range values given in the data.

4.9 `group_by()` and `summarise()` as powerful data exploration tools

Although `dplyr` has a simpler syntax overall, everything we have looked at so far could have been done fairly easily with base `R` functions: data frame filtering, sorting, and adding and

removing columns. One of the strengths of `dplyr` is explorative data analysis, and this is where `group_by()` and `summarize()` are really helpful. We'll only look at very simple examples today.

When browsing through the complete data table, it is very hard to recognize any patterns. Let's assume we wanted to compare the average wing span of butterflies with that overwinter as adults vs all other butterflies:

```
# Are butterflies that overwinter as adults larger than other species?
be %>%
  drop_na() %>%
  group_by(OWS_adult) %>%
  summarise(mean_wsp = mean(WSP_Female_average))
```

```
# A tibble: 2 x 2
  OWS_adult mean_wsp
      <int>    <dbl>
1         0     39.4
2         1     51.9
```

After choosing which variable to group by (here: OWS_adult), `summarise()` then calculates a function for each group. In our simple example, there are 2 groups: 0 (not overwintering as adult) and 1 (overwintering as adult); and the function to be calculated is the mean of the female wing span. This is a very flexible set of functions, because you can group by multiple groups and also use `summarise()` with many different functions (e.g., `mean()`, `sum()`, `min()`, `max()`, `median()` – just to name a few). Let's look at a more complex example:

```
# Let's add another group. How large is the standard deviation? How large is
 ↪  each group?
be %>%
  drop_na() %>%
  group_by(OWS_adult, LEV_ground_layer) %>%
  summarise(mean_wsp = mean(WSP_Female_average),
            sd = sd(WSP_Female_average),
            group_size=n())
```

```
`summarise()` has grouped output by 'OWS_adult'. You can override using the
`.groups` argument.
```

```
# A tibble: 4 x 5
# Groups:   OWS_adult [2]
```

```
  OWS_adult LEV_ground_layer mean_wsp    sd group_size
      <int>            <int>    <dbl> <dbl>      <int>
1         0                0     38.1 12.3         115
2         0                1     40.7 12.2         118
3         1                0     54.3  9.46         15
4         1                1     33.8 12.4           2
```

4.10 More exercises

Using `dplyr` functions, determine

a) If butterflies overwintering as pupae have higher level of legal protection

b) If butterflies occuring at higher altitudes on average have a higher level of protection

c) If feeding on honeydew is more common in larger butterflies.

d) How many butterfly species are there per family?

For a–c also determine how many species belong to each group.

5 The ggplot2 package

5.1 Very (!) brief introduction

ggplot2 is a graphing library, i.e., a tool to make graphs in R. Compared with base graphs and other graphics packages, it comes with a number of advantages:

- Beautiful!
- Highly customizable (which is not always necessary though)
- Easiest way to create very complex plots
- Tightly integrated into the tidyverse

Compared with other packages the major drawbacks would be that it comes with a steep(ish) learning curve and is probably less intuitive for beginners. The reason is that ggplot2 doesn't have fixed commands for scatterplots, boxplots, barplots, etc, but rather creates the plot in layers. The most important elements (or layers) of a plot in ggplot2 are:

- *Data*: as we are still in the tidyverse, this is always a data frame
- *Aesthetics*: i.e., **what** you want to plot. Often, this will correpond to variables (columns) in your dataframe
- *Geometric objects*: i.e., **how** you want to plot the data. This can be points, bars, boxplots, lines, etc..
- *Facets*: more about this later
- *Additional (optional) adjustments*: this includes themes that specify the overall design

5.2 Building up the plot

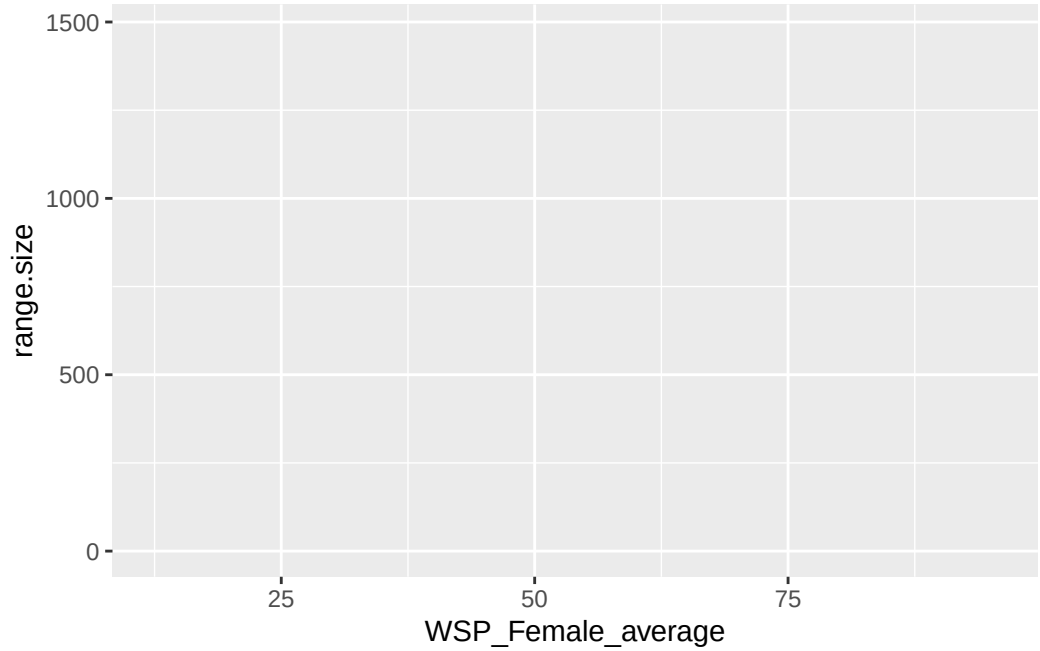
We will start off with a very simple scatterplot and gradually increase the complexity to illustrate ggplot2 functionality.

```
# data and packages
library(tidyverse, quietly = TRUE)
```

```
-- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
v dplyr     1.1.4     v readr     2.1.6
v forcats   1.0.1     v stringr   1.6.0
v ggplot2   4.0.1     v tibble    3.3.1
v lubridate 1.9.4     v tidyr     1.3.2
v purrr     1.2.1
-- Conflicts ------------------------------------------ tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to becor
```

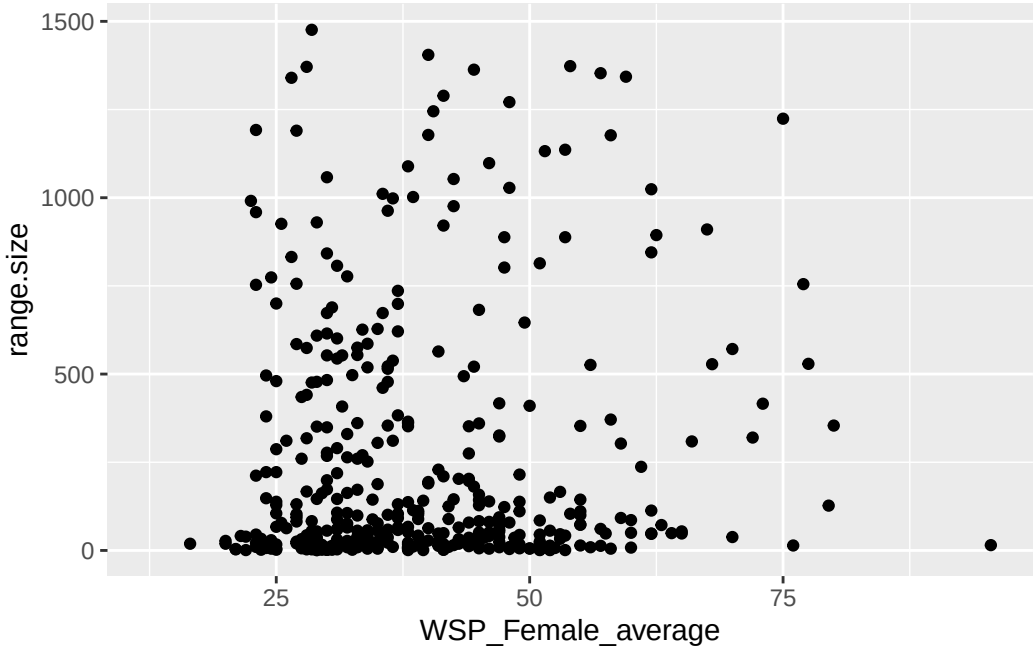
```r
be <-  read.table("data/butterfly_ecology.csv", header = TRUE, sep = ",")

# simple plot
be %>%                                  # DATA
  ggplot(aes(x = WSP_Female_average,  # AESTHETICS
             y = range.size))
```



In the above example, the data is the data frame that we have been using the whole time. Notice how we can simply pipe it to `ggplot2`. `aes` specifies our aesthetics, i.e., **what** we want to plot. What is missing?

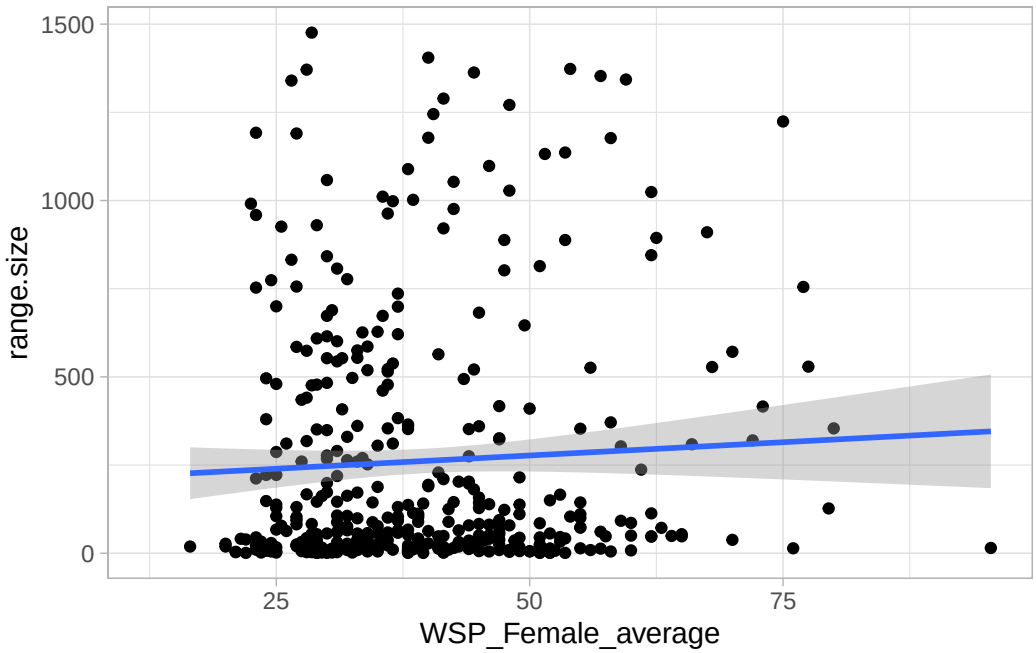
```
# simple scatter plot
be %>%                                  # DATA
  ggplot(aes(x = WSP_Female_average, # Aesthetics
             y = range.size)) +
  geom_point()                          # Geometric object
```



The geometric object, i.e., **how** we want to plot our aesthetics. Notice that elements in `ggplot2` are added with the `+` symbol (this is specific to `ggplot2`). We can add more geometric objects that will use the same aesthetics:

```
# lets add another geom (a regression line), and also change the theme
be %>%                                  # DATA
  ggplot(aes(x = WSP_Female_average, # Aesthetics
             y = range.size)) +
  geom_point() +                        # Geometric object
  geom_smooth(method = "lm") +          # Another geometric object
  theme_light()                         # Let's also change the theme
```

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



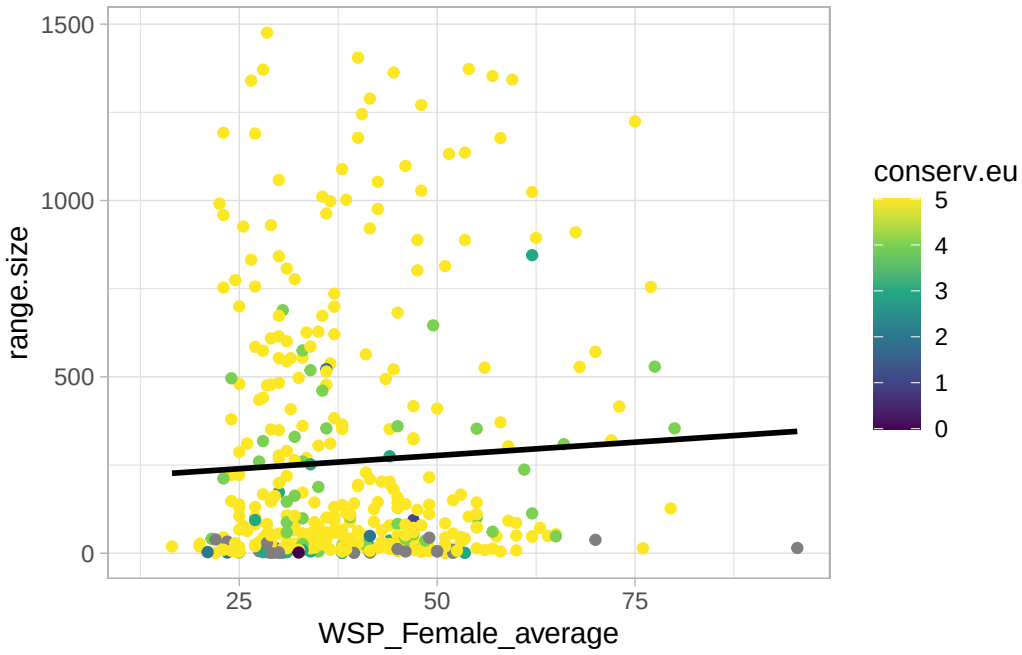
Changing the theme changes many layout options. For different applications, different themes might be appropriate. There are many additional themes available through packages such as ggthemr or ggthemes.

A bit more on aesthetics: have you noticed that you only specify x and y once, and all geoms know **what** you want to plot. You can also specify additional aesthetics for each geom.

```
# Add additional aesthetics, here: we want to plot the sonservation status.
 ↪  How? With colour!

be %>%                                      # DATA
  ggplot(aes(x = WSP_Female_average,        # Aesthetics
             y = range.size)) +
  geom_point(aes(color = conserv.eu)) +  # aesthetics specific to the points
   ↪  only
  geom_smooth(method = "lm",
              color = "black",
              se = FALSE) +
  theme_light() +
  scale_color_viridis_c()                   # let's use some nicer colors
   ↪
```

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



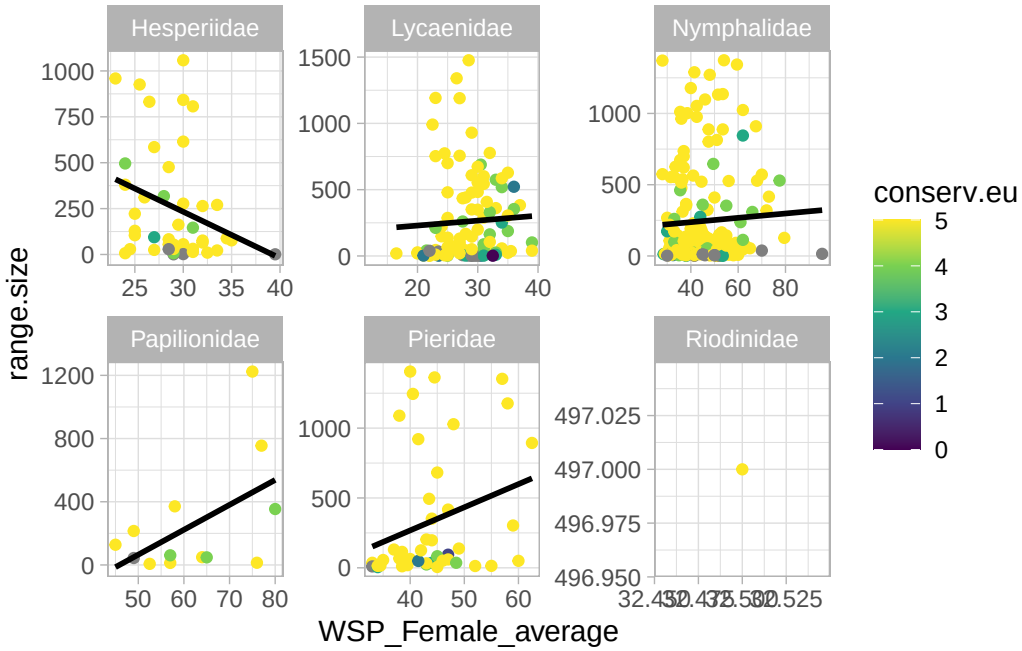
Aesthetics can be added through colors or shapes

5.3 Faceting

So far, we have cramped as much information as possible into the plot. This was useful to illustrate the functionality of `ggplot2`, but did not create very readable plots. Often, faceting is a better solution. The implementation in `ggplot2` is very straightforward.

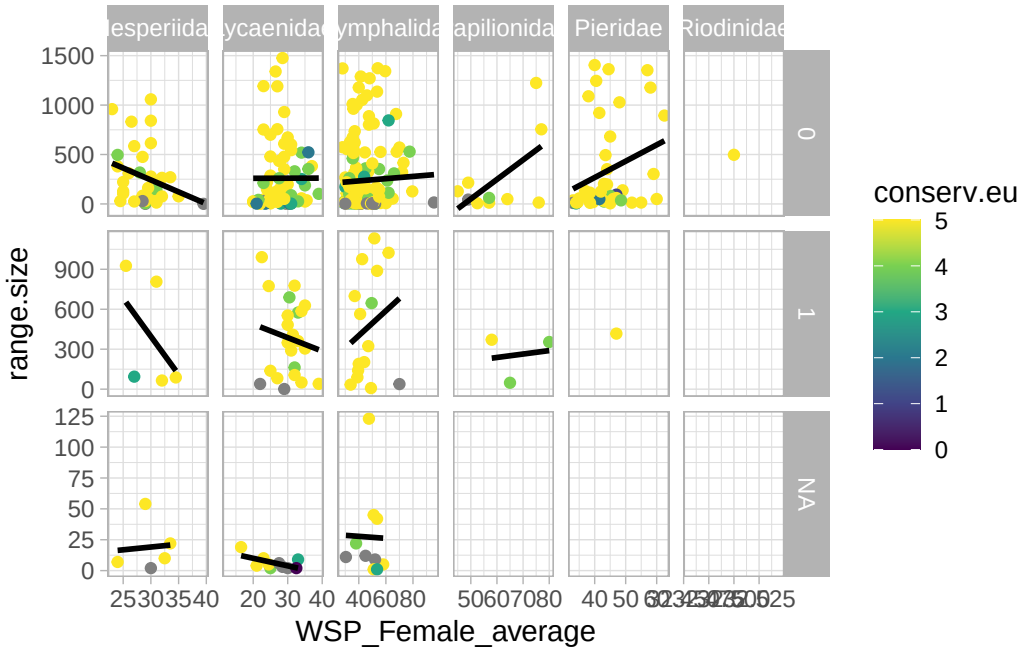
```
# Same example as before, faceted over family
be %>%
  ggplot(aes(x = WSP_Female_average,
             y = range.size)) +
  geom_point(aes(color = conserv.eu)) +
  geom_smooth(method = "lm",
              color = "black",
              se = FALSE) +
  theme_light() +
  scale_color_viridis_c() +
  facet_wrap(~family, scales = "free")
```

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




```
# And now, faceting over 2 variables
be %>%
  ggplot(aes(x = WSP_Female_average,
             y = range.size)) +
  geom_point(aes(color = conserv.eu)) +
  geom_smooth(method = "lm",
              color = "black",
              se = FALSE) +
  theme_light() +
  scale_color_viridis_c() +
  facet_grid(OWS_egg ~ family, scales = "free") # faceting
```

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

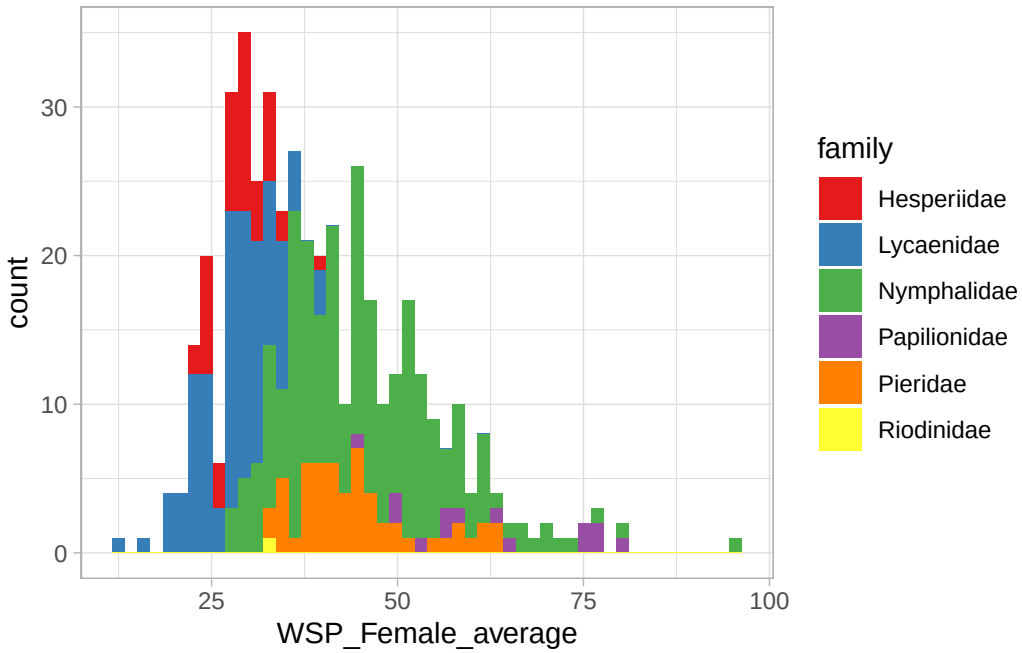


The above plot would need a little 'cleaning up'. How would you do that?

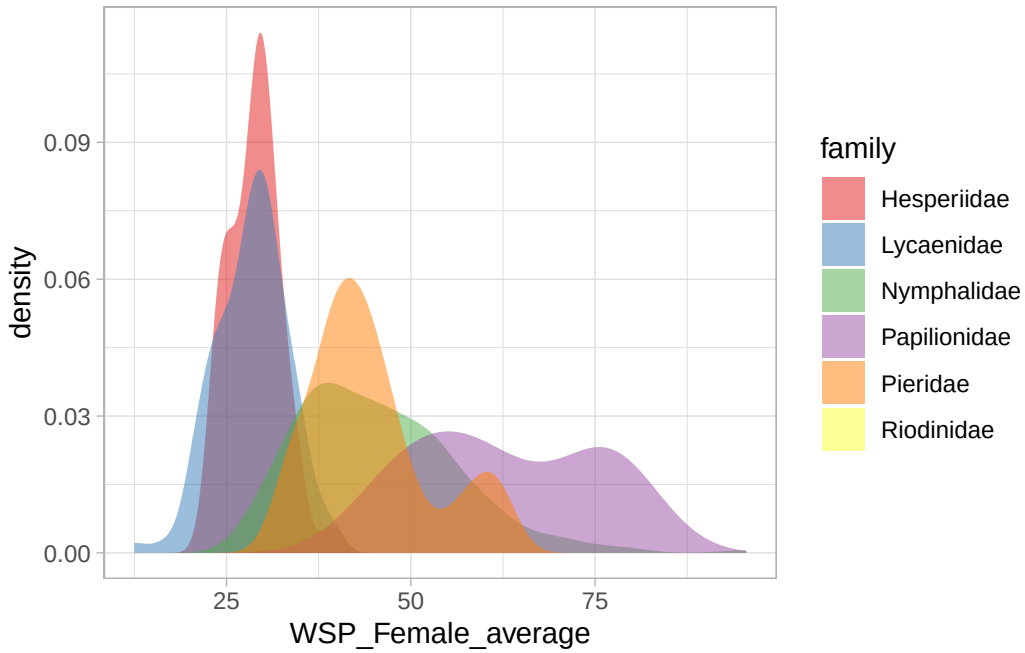
5.4 Some common plot types

We have looked at scatterplots, now let's look at a number of other commonly used plots.

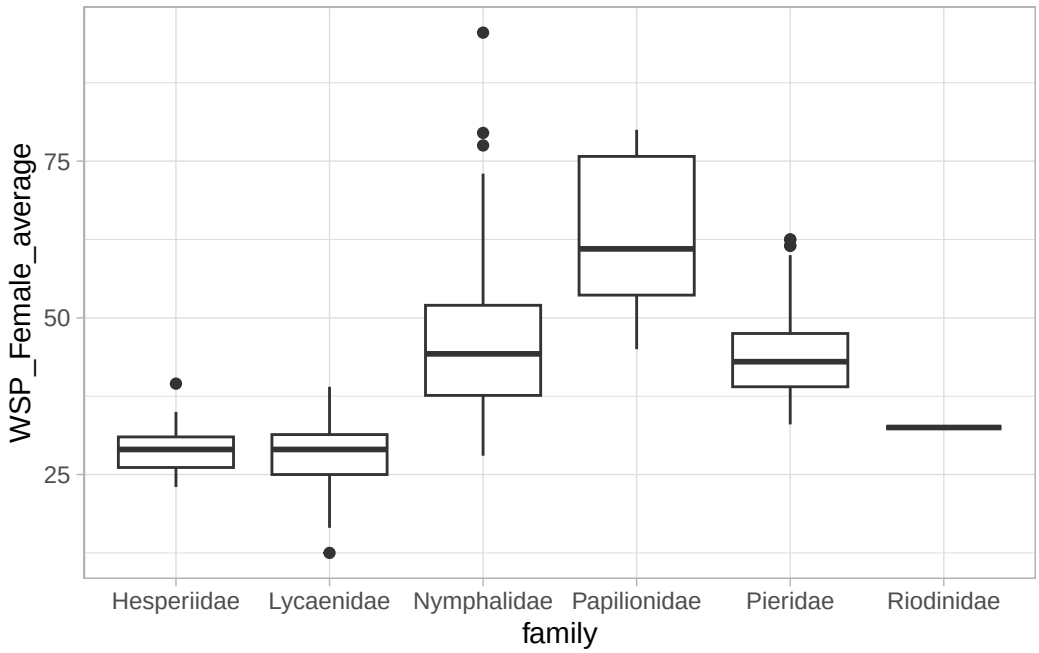
```
# histograms
be %>%
  ggplot(aes(x = WSP_Female_average, fill = family)) +
  geom_histogram(bins = 50) +
  theme_light() +
  scale_fill_brewer(palette = "Set1")
```



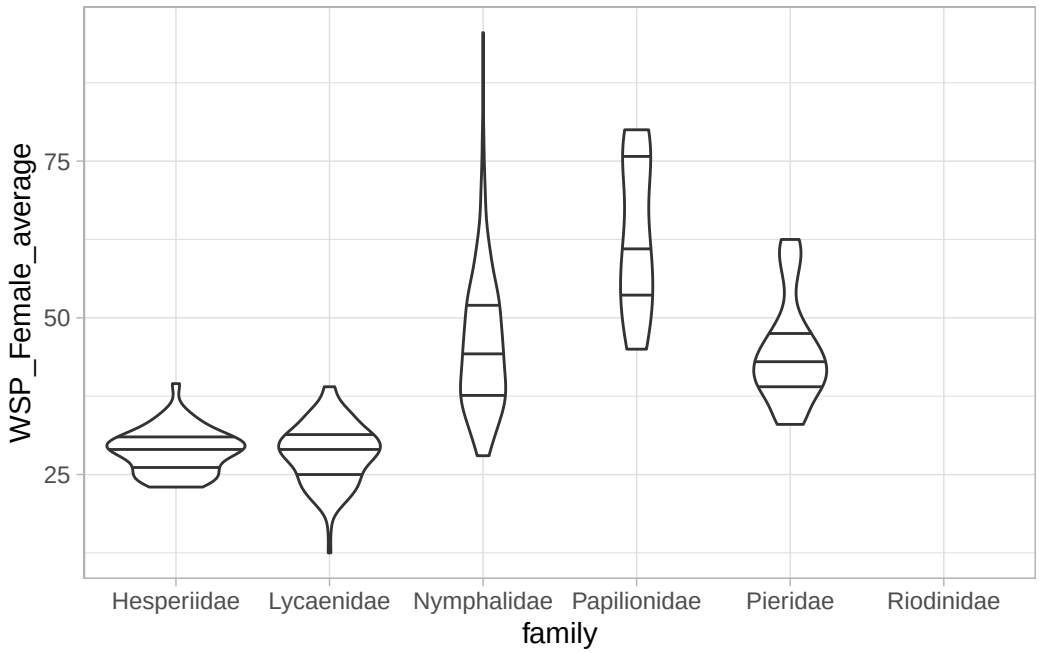

```
# better alternative are often density plots
be %>%
  ggplot(aes(x = WSP_Female_average, fill = family)) +
  geom_density(alpha = 0.5, colour = NA) +
  theme_light() +
  scale_fill_brewer(palette = "Set1")
```




```
# boxplots
be %>%
  ggplot(aes(y = WSP_Female_average, x = family)) +
  geom_boxplot() +
  theme_light()
```



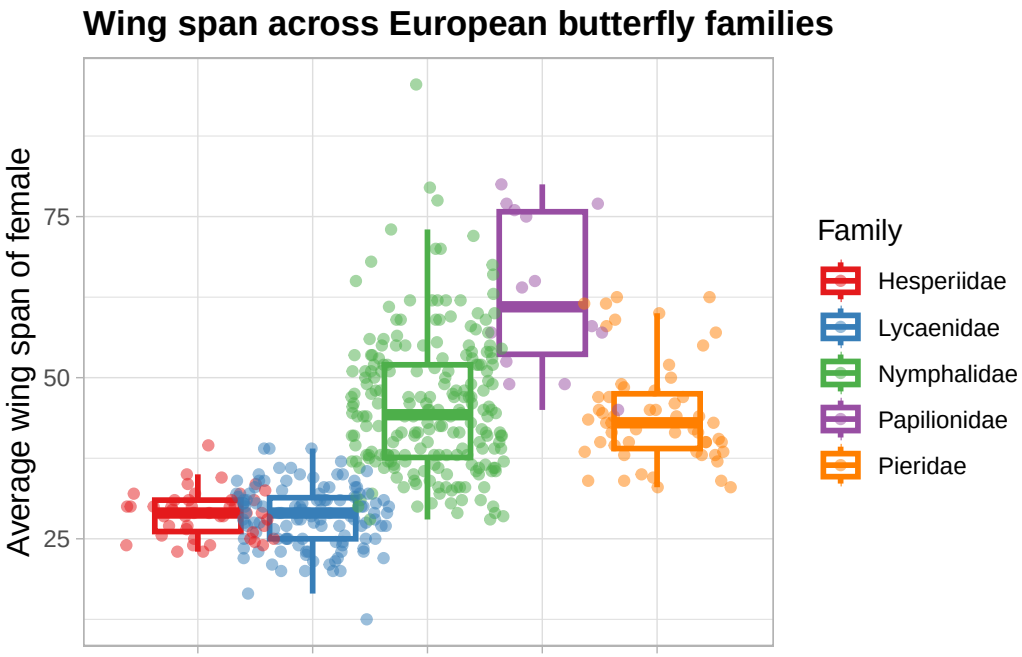

```
# better alternative are violin plots
be %>%
  ggplot(aes(y = WSP_Female_average, x = family)) +
  geom_violin(draw_quantiles = c(0.25, 0.5, 0.75)) +
  theme_light()
```



5.5 Fine tuning plots

We now know how to plot some common chart types but most of these don't look publishable yet. Lets return to one of our first examples and see how to polish it a little.

```
# A publication ready plot
be %>%
  filter(family != "Riodinidae") %>%
  ggplot(aes(y = WSP_Female_average, x = family, color = family)) +
  geom_boxplot(lwd = 1, outlier.shape = NA) +
  geom_point(position = position_jitterdodge(jitter.width = 2), alpha = 0.5)
   ↪  +
  theme_light() +
  labs(title = "Wing span across European butterfly families",
       y = "Average wing span of female")+
  theme(plot.title = element_text(face = "bold"),
        axis.title.y = element_text(size = 12),
        axis.title.x = element_blank(),
        axis.text.x = element_blank(),
        strip.text = element_text(size = 11)) +
  scale_color_brewer(palette = "Set1", name = "Family")
```



5.6 Exercise

Using `ggplot2`, explore how range size differs between butterfly families and plot check if butterflies with smaller ranges have higher protection status. Try to find appropriate plot types for this, use the help pages to find plot types that were not introduced to you yet. Explore other variables that may explain some trends in the data. Find a theme that you like! Remember, start with the **data**, add **aesthetics (what do you want to plot)**, and then think about **geometric objects (how do you want to plot the data)**. How can colour help in your visualisations? Does faceting make sense?

Part II

UNIX

Part III

Phylogenetics

Part IV

Microbiome

References