

Lab 2

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Section 4.3 Worked Example

https://bookdown.org/hhwagner1/LandGenCourse_book/WE_1.html

Make sure we have the packages, ONLY run once:

```
if(!require("adegenet")) install.packages("adegenet") if(!requireNamespace("popgraph", quietly = TRUE))
{ install.packages(c("RgoogleMaps", "geosphere", "proto", "sampling", "seqinr", "spacetime", "spdep"), de-
dependencies=TRUE) remotes::install_github("dyerlab/popgraph") } if(!requireNamespace("gstudio", quietly
= TRUE)) remotes::install_github("dyerlab/gstudio")
```

```
install.packages("here")
```

Load libraries (run every time)

```
library(adegenet)
```

```
## Loading required package: ade4
```

```
##
```

```
##    /// adegenet 2.1.10 is loaded //////////////////////////////////
```

```
##
```

```
##    > overview: '?adegenet'
```

```
##    > tutorials/doc/questions: 'adegenetWeb()'
```

```
##    > bug reports/feature requests: adegenetIssues()
```

```
library(gstudio)
```

```
## Warning: replacing previous import 'dplyr::union' by 'raster::union' when
## loading 'gstudio'
```

```
## Warning: replacing previous import 'dplyr::intersect' by 'raster::intersect'
## when loading 'gstudio'
```

```
## Warning: replacing previous import 'dplyr::select' by 'raster::select' when
## loading 'gstudio'
```

```
##
```

```
## Attaching package: 'gstudio'
```

```
## The following objects are masked from 'package:adegenet':
```

```
##
```

```
##    alleles, ploidy
```

```
library(LandGenCourse)
```

```
library(tibble)
```

```
library(here)
```

```
## here() starts at /uufs/chpc.utah.edu/common/home/u6036559/git/usu-biol4750
```

```
library(vcfR)

##
##      *****      ***   vcfR   ***      *****
##      This is vcfR 1.15.0
##      browseVignettes('vcfR') # Documentation
##      citation('vcfR') # Citation
##      *****      *****      *****      *****

library(pinfsc50)
library(utils)
```

1. Overview

The data set we will use is ralu.loci

Import straight from the package after library is loaded

```
data("ralu.loci")
```

As a .csv file:

To download the csv file...

```
if(!dir.exists(paste0(here(), "/downloads"))) dir.create(paste0(here(), "/downloads"))
file.copy(system.file("extdata", "ralu.loci.csv", package = "LandGenCourse"),
           paste0(here(), "/downloads/ralu.loci.csv"), overwrite=FALSE)
```

2. Import from csv file:

```
Frogs <- read.csv(file="./downloads/ralu.loci.csv", header=TRUE)
as_tibble(Frogs)
```

```
## # A tibble: 181 x 10
##   SiteName      Pop      A      B      C      D      E      F      G      H
##   <chr>         <chr>   <chr> <chr> <chr> <chr> <chr> <chr> <chr> <chr>
## 1 AirplaneLake Airplane 1:1   1:1   1:1   1:1   1:2   1:1   1:1   4:5
## 2 AirplaneLake Airplane 2:2   1:1   NA:NA 1:1   1:1   NA:NA 2:2   NA:NA
## 3 AirplaneLake Airplane 1:1   1:1   1:1   1:1   3:3   1:1   1:1   3:3
## 4 AirplaneLake Airplane 1:1   1:1   NA:NA 2:2   1:2   NA:NA NA:NA NA:NA
## 5 AirplaneLake Airplane 1:2   1:3   1:1   1:1   1:2   1:1   1:2   4:5
## 6 AirplaneLake Airplane 1:2   1:1   1:1   3:1   1:1   1:1   1:2   4:5
## 7 AirplaneLake Airplane 2:2   1:3   1:1   1:1   3:3   1:1   1:1   2:3
## 8 AirplaneLake Airplane 2:2   1:3   1:1   1:1   3:3   1:1   1:1   2:3
## 9 AirplaneLake Airplane 3:1   1:1   1:1   1:1   1:7   1:1   1:1   3:5
## 10 AirplaneLake Airplane 2:2   1:3   1:1   1:1   3:7   1:1   1:1   3:3
## # i 171 more rows
```

Adding a column that gives us Frogs\$FrogID

```
Frogs <- data.frame(FrogID = paste(substr(Frogs$Pop, 1, 3), row.names(Frogs), sep="."), Frogs)
as_tibble(Frogs)
```

```
## # A tibble: 181 x 11
##   FrogID SiteName      Pop      A      B      C      D      E      F      G      H
##   <chr>   <chr>         <chr>   <chr> <chr> <chr> <chr> <chr> <chr> <chr> <chr>
## 1 Air.1 AirplaneLake Airplane 1:1   1:1   1:1   1:1   1:2   1:1   1:1   4:5
```

```
## 2 Air.2 AirplaneLake Airplane 2:2 1:1 NA:NA 1:1 1:1 NA:NA 2:2 NA:NA
## 3 Air.3 AirplaneLake Airplane 1:1 1:1 1:1 1:1 3:3 1:1 1:1 3:3
## 4 Air.4 AirplaneLake Airplane 1:1 1:1 NA:NA 2:2 1:2 NA:NA NA:NA NA:NA
## 5 Air.5 AirplaneLake Airplane 1:2 1:3 1:1 1:1 1:2 1:1 1:2 4:5
## 6 Air.6 AirplaneLake Airplane 1:2 1:1 1:1 3:1 1:1 1:1 1:2 4:5
## 7 Air.7 AirplaneLake Airplane 2:2 1:3 1:1 1:1 3:3 1:1 1:1 2:3
## 8 Air.8 AirplaneLake Airplane 2:2 1:3 1:1 1:1 3:3 1:1 1:1 2:3
## 9 Air.9 AirplaneLake Airplane 3:1 1:1 1:1 1:1 1:7 1:1 1:1 3:5
## 10 Air.10 AirplaneLake Airplane 2:2 1:3 1:1 1:1 3:7 1:1 1:1 3:3
## # i 171 more rows
```

```
dim(Frogs)
```

```
## [1] 181 11
```

Some useful file directory functions

#file.choose() but don't leave within code chunk without commenting it out

```
paste0(here(), "/output", "/gobblygook")
```

```
## [1] "/uufs/chpc.utah.edu/common/home/u6036559/git/usu-biol4750/output/gobblygook"
```

Save output file

```
if(!dir.exists(paste0(here(), "/output"))) dir.create(paste0(here(), "/output"))

write.csv(ralu.loci, paste0(here(), "/output/ralu.loci.csv"),
          quote=FALSE, row.names=FALSE)
```

3. Create a 'genind' object using adegenet

```
Frogs[,c(4:11)]
```

```
##      A      B      C      D      E      F      G      H
## 1  1:1  1:1  1:1  1:1  1:2  1:1  1:1  4:5
## 2  2:2  1:1 NA:NA  1:1  1:1 NA:NA  2:2 NA:NA
## 3  1:1  1:1  1:1  1:1  3:3  1:1  1:1  3:3
## 4  1:1  1:1 NA:NA  2:2  1:2 NA:NA NA:NA NA:NA
## 5  1:2  1:3  1:1  1:1  1:2  1:1  1:2  4:5
## 6  1:2  1:1  1:1  3:1  1:1  1:1  1:2  4:5
## 7  2:2  1:3  1:1  1:1  3:3  1:1  1:1  2:3
## 8  2:2  1:3  1:1  1:1  3:3  1:1  1:1  2:3
## 9  3:1  1:1  1:1  1:1  1:7  1:1  1:1  3:5
## 10 2:2  1:3  1:1  1:1  3:7  1:1  1:1  3:3
## 11 1:1  1:1 NA:NA  1:1  1:3  1:1  1:1  4:5
## 12 1:1  1:1  1:1  1:2  1:1  1:1  1:1  3:3
## 13 1:1  1:1  1:1  1:1  1:3  1:1  1:1  4:5
## 14 1:1  1:1 NA:NA  1:1  2:7  1:1  1:1  3:5
## 15 1:1  1:1  1:1  1:2  1:3  1:1  1:2  4:5
## 16 1:1  1:3  1:1  3:1  1:1  1:1 NA:NA  4:4
## 17 1:2  1:3 NA:NA  3:1  1:3  1:1  1:1  4:5
## 18 1:1  1:1 NA:NA  1:1  1:2  1:1  1:1  3:5
## 19 1:2  1:1 NA:NA  1:1  2:3  1:1  1:1  5:5
```

## 20	NA:NA	1:3	NA:NA	3:1	1:1	1:1	1:1	1:4
## 21	2:2	1:1	1:1	1:2	3:7	1:1	1:1	2:3
## 22	1:1	1:1	1:2	2:2	6:8	1:1	2:2	6:4
## 23	1:1	2:2	1:1	2:2	2:2	1:1	1:2	6:4
## 24	1:1	1:2	1:1	3:2	1:2	1:1	NA:NA	1:4
## 25	NA:NA	1:3	NA:NA	2:2	2:5	1:1	NA:NA	4:5
## 26	1:1	1:2	1:1	3:2	2:5	1:1	1:2	4:5
## 27	1:1	2:2	1:2	2:2	2:3	1:1	1:1	6:4
## 28	1:1	1:1	NA:NA	2:2	2:3	1:1	1:1	4:4
## 29	1:1	1:1	NA:NA	2:2	2:8	1:1	2:2	5:5
## 30	1:1	1:1	NA:NA	4:4	1:3	1:1	1:1	5:5
## 31	1:1	1:1	1:1	4:2	1:3	1:1	NA:NA	5:5
## 32	1:1	1:1	2:2	2:2	1:2	1:1	NA:NA	4:4
## 33	1:1	1:1	1:1	2:2	3:3	1:1	1:1	NA:NA
## 34	3:1	1:1	1:1	4:4	1:1	1:1	NA:NA	5:5
## 35	1:1	1:1	1:1	4:2	1:3	1:1	NA:NA	5:5
## 36	1:1	1:3	NA:NA	4:2	1:5	1:1	1:2	4:5
## 37	1:1	1:1	NA:NA	4:2	1:3	1:1	1:2	5:5
## 38	1:1	1:1	NA:NA	2:2	1:1	1:1	1:1	5:5
## 39	1:1	2:2	1:1	4:2	3:5	1:1	1:1	5:5
## 40	1:1	1:1	NA:NA	4:2	1:2	1:1	NA:NA	3:5
## 41	1:1	1:1	1:1	4:2	1:3	1:1	1:1	3:5
## 42	1:1	1:2	1:1	2:2	1:5	2:1	1:1	5:5
## 43	1:1	1:1	NA:NA	4:2	1:3	1:1	1:1	5:5
## 44	1:1	1:2	1:2	2:2	3:5	1:1	1:1	3:5
## 45	1:1	1:1	1:2	1:2	1:3	NA:NA	NA:NA	NA:NA
## 46	1:1	1:1	1:1	2:2	1:4	1:1	1:1	6:4
## 47	1:1	4:1	1:1	2:2	NA:NA	1:1	1:1	6:5
## 48	1:1	1:1	1:1	2:2	3:5	1:1	1:1	6:4
## 49	1:1	1:1	1:2	2:2	1:2	1:1	1:1	3:4
## 50	1:1	1:1	NA:NA	2:2	3:5	1:1	1:1	6:4
## 51	1:1	1:2	1:1	2:2	1:8	1:1	NA:NA	5:5
## 52	1:1	1:2	1:1	2:2	1:8	1:1	NA:NA	5:5
## 53	3:1	1:1	1:2	2:2	1:3	1:1	1:1	4:5
## 54	1:1	1:1	1:1	2:2	3:5	1:1	1:1	6:4
## 55	1:1	4:1	1:2	1:2	2:2	1:1	NA:NA	4:4
## 56	3:1	1:1	1:1	2:2	1:8	1:1	1:2	5:5
## 57	1:1	NA:NA	NA:NA	1:2	1:2	1:1	1:1	6:4
## 58	NA:NA	1:2	1:1	2:2	2:5	1:1	NA:NA	6:4
## 59	1:1	4:1	NA:NA	2:2	2:8	1:1	NA:NA	6:4
## 60	1:1	1:2	1:1	2:2	1:4	1:1	1:2	4:5
## 61	1:1	2:2	NA:NA	1:2	1:4	1:1	1:1	6:5
## 62	1:1	1:2	2:2	2:2	2:4	1:1	2:2	5:5
## 63	1:1	1:2	1:1	2:2	4:5	1:1	1:2	1:5
## 64	1:1	1:2	1:1	2:2	NA:NA	1:1	2:2	3:4
## 65	1:1	1:2	1:1	2:2	4:5	1:1	1:2	6:5
## 66	1:1	1:1	1:1	2:2	2:8	1:1	1:2	6:4
## 67	1:1	1:1	1:1	2:2	2:5	1:1	NA:NA	6:4
## 68	1:1	1:1	1:1	2:2	4:5	1:1	1:2	4:5
## 69	1:1	1:1	NA:NA	2:2	1:6	1:1	2:2	5:5
## 70	1:1	1:2	1:1	2:2	4:5	1:1	1:2	6:5
## 71	1:1	1:2	1:1	2:2	4:5	NA:NA	NA:NA	NA:NA
## 72	1:1	1:1	1:1	2:2	1:1	1:1	NA:NA	NA:NA
## 73	1:1	2:2	1:1	2:2	2:5	1:1	1:1	4:4

## 74	1:1	1:2	NA:NA	2:2	1:4	1:1	NA:NA	1:5
## 75	1:1	1:1	1:1	2:2	2:5	1:1	NA:NA	6:4
## 76	1:1	1:1	1:1	2:2	2:8	1:1	NA:NA	6:4
## 77	1:1	1:1	1:1	2:2	2:4	1:1	1:1	6:5
## 78	1:1	1:2	NA:NA	2:2	2:2	1:1	1:1	4:5
## 79	1:1	1:1	1:1	2:2	NA:NA	1:1	1:1	6:5
## 80	1:1	1:2	1:1	2:2	1:4	1:1	1:1	1:5
## 81	1:1	1:2	1:1	3:2	2:4	1:1	NA:NA	6:4
## 82	1:1	1:1	NA:NA	1:2	NA:NA	NA:NA	NA:NA	NA:NA
## 83	1:1	2:2	1:1	3:2	2:4	1:1	1:2	4:5
## 84	1:1	1:1	1:1	1:2	2:2	NA:NA	NA:NA	NA:NA
## 85	1:1	1:1	4:4	2:2	3:4	1:1	1:1	4:5
## 86	1:1	1:1	1:2	2:2	1:4	NA:NA	NA:NA	NA:NA
## 87	1:1	1:2	NA:NA	2:2	NA:NA	NA:NA	NA:NA	NA:NA
## 88	1:1	1:2	1:1	3:2	2:4	NA:NA	NA:NA	4:5
## 89	1:1	NA:NA	1:1	2:2	2:4	1:1	2:2	4:5
## 90	1:1	1:3	1:1	3:3	1:1	1:1	2:2	5:5
## 91	1:1	1:2	1:1	3:2	3:5	1:1	1:2	3:5
## 92	1:1	1:3	NA:NA	3:1	2:6	1:3	1:2	3:4
## 93	1:1	1:3	NA:NA	3:1	1:7	1:1	1:2	3:5
## 94	NA:NA	1:3	1:1	1:1	2:5	1:1	1:1	4:5
## 95	1:2	1:2	1:1	3:1	1:2	1:1	NA:NA	4:5
## 96	1:1	NA:NA	1:1	4:2	2:2	1:3	1:2	4:4
## 97	1:1	2:3	NA:NA	3:1	1:5	1:1	2:2	5:5
## 98	1:1	2:3	1:1	4:2	1:2	1:1	1:2	4:5
## 99	1:1	1:3	NA:NA	1:2	5:7	1:1	1:2	3:5
## 100	1:1	2:3	1:1	3:2	1:6	1:1	2:2	3:5
## 101	1:2	2:3	NA:NA	3:4	1:6	1:1	2:2	3:5
## 102	1:1	2:3	NA:NA	4:2	1:2	1:3	1:2	1:4
## 103	1:1	2:3	NA:NA	3:2	5:6	1:1	1:2	1:8
## 104	1:1	1:2	NA:NA	1:1	5:7	1:1	1:2	NA:NA
## 105	1:1	2:3	NA:NA	4:2	1:7	1:1	1:2	1:4
## 106	1:1	2:2	1:1	1:1	5:7	1:1	1:1	1:3
## 107	1:1	1:2	NA:NA	1:1	5:6	1:1	NA:NA	3:5
## 108	1:1	1:2	1:1	NA:NA	1:2	1:1	2:2	4:5
## 109	1:1	2:3	1:1	3:1	2:3	1:1	2:2	1:4
## 110	1:1	1:1	1:1	2:2	1:1	1:1	1:2	3:5
## 111	1:1	1:1	1:1	2:2	1:4	1:1	1:2	3:5
## 112	1:1	4:1	1:1	2:2	1:1	1:1	1:1	5:5
## 113	1:1	1:1	NA:NA	2:2	1:2	1:1	NA:NA	2:5
## 114	1:1	4:4	1:1	2:2	1:4	1:1	1:1	5:5
## 115	1:1	1:1	NA:NA	2:2	1:4	1:1	2:2	3:5
## 116	1:1	1:1	1:5	2:2	1:1	1:1	2:2	3:3
## 117	1:1	1:1	NA:NA	2:2	1:1	1:1	2:2	3:5
## 118	1:1	1:1	1:1	2:2	1:1	1:1	1:2	5:5
## 119	1:1	1:1	1:1	2:2	1:1	1:1	1:2	3:5
## 120	NA:NA	1:1	NA:NA	2:2	1:2	1:1	NA:NA	4:8
## 121	1:1	1:1	1:1	2:2	1:1	1:1	1:1	5:5
## 122	1:1	1:1	1:1	2:2	1:1	1:1	NA:NA	3:3
## 123	1:1	1:1	1:1	4:2	1:1	1:1	NA:NA	5:5
## 124	1:1	1:1	NA:NA	4:2	1:4	1:1	1:2	3:5
## 125	1:1	1:1	1:1	4:2	1:1	1:1	1:1	3:3
## 126	1:1	4:1	1:1	2:2	1:1	1:1	2:2	5:5
## 127	1:1	1:1	NA:NA	2:2	1:1	1:1	1:1	3:3

## 128	1:1	1:1	1:1	2:2	NA:NA	1:1	NA:NA	3:5
## 129	1:1	1:1	1:1	3:1	1:1	NA:NA	NA:NA	NA:NA
## 130	1:1	1:1	1:1	1:1	1:7	1:1	NA:NA	3:5
## 131	1:1	1:1	NA:NA	NA:NA	1:1	1:1	3:2	1:5
## 132	1:1	1:1	1:1	1:1	1:1	1:1	NA:NA	5:5
## 133	1:1	1:1	1:1	1:1	1:7	1:1	3:2	3:3
## 134	1:1	1:1	NA:NA	1:1	NA:NA	1:1	1:1	NA:NA
## 135	1:1	1:1	1:1	3:1	1:7	1:1	NA:NA	3:5
## 136	1:1	1:1	1:1	1:1	1:1	1:1	2:2	5:5
## 137	1:1	1:1	1:1	1:1	1:1	1:1	3:2	1:3
## 138	1:1	1:1	1:1	1:1	1:7	1:1	2:2	1:3
## 139	1:1	1:1	NA:NA	1:1	1:7	1:1	1:2	3:5
## 140	1:1	1:1	NA:NA	3:1	1:1	1:1	NA:NA	1:5
## 141	1:1	1:1	NA:NA	3:1	1:7	1:1	NA:NA	3:5
## 142	1:2	3:3	NA:NA	3:3	2:3	1:1	NA:NA	5:5
## 143	1:1	1:1	NA:NA	1:1	10:10	NA:NA	NA:NA	3:3
## 144	2:2	1:1	1:1	1:1	2:2	1:1	1:1	4:4
## 145	1:1	1:1	NA:NA	3:1	1:3	1:1	2:2	4:5
## 146	1:2	3:3	1:1	1:1	2:2	1:1	1:1	4:5
## 147	1:1	3:3	1:1	1:1	2:3	1:1	1:1	3:5
## 148	1:1	1:3	1:1	1:1	2:2	1:1	1:1	3:3
## 149	1:2	1:1	1:1	3:1	1:2	1:1	1:2	3:4
## 150	1:2	1:1	1:1	1:2	2:2	1:1	1:1	3:4
## 151	1:1	1:3	1:1	1:2	1:2	1:1	1:2	3:4
## 152	1:2	3:3	1:1	3:1	1:2	1:1	2:2	4:4
## 153	1:1	1:3	1:1	1:2	2:2	1:1	1:1	4:5
## 154	2:2	1:3	1:1	3:1	2:2	1:1	1:1	4:5
## 155	1:1	1:1	NA:NA	1:1	1:1	1:1	1:2	4:5
## 156	1:2	1:3	NA:NA	3:1	1:2	1:1	1:2	4:5
## 157	1:2	1:3	NA:NA	1:2	1:2	1:1	1:2	4:5
## 158	1:1	1:3	1:1	3:1	1:3	1:1	NA:NA	3:5
## 159	1:1	1:1	NA:NA	2:2	2:2	1:1	1:2	6:4
## 160	1:1	1:1	1:1	2:2	2:2	1:1	1:2	6:4
## 161	1:1	1:2	1:1	3:2	2:8	1:1	1:1	6:4
## 162	1:1	2:2	1:1	2:2	2:3	1:1	1:2	3:4
## 163	1:1	1:2	1:1	2:2	1:5	1:1	NA:NA	7:6
## 164	1:1	1:2	1:1	1:2	2:2	1:1	1:1	6:4
## 165	3:1	1:1	1:1	2:2	2:2	1:1	2:5	6:6
## 166	1:1	1:2	1:1	1:2	2:2	1:1	NA:NA	6:4
## 167	1:1	1:2	1:2	1:2	8:8	1:1	NA:NA	6:4
## 168	1:1	1:1	1:2	2:2	1:8	1:1	1:2	4:4
## 169	1:1	1:2	1:1	1:2	2:5	1:1	NA:NA	NA:NA
## 170	1:1	1:1	NA:NA	4:4	1:4	NA:NA	NA:NA	5:5
## 171	1:1	1:2	NA:NA	2:2	2:8	1:1	1:2	6:6
## 172	1:1	1:2	1:1	2:2	2:2	1:1	1:2	4:4
## 173	1:1	2:2	NA:NA	2:2	2:5	1:1	NA:NA	4:5
## 174	1:1	1:1	1:1	2:2	2:5	1:1	NA:NA	4:4
## 175	1:1	1:1	1:1	2:2	2:8	1:1	NA:NA	6:4
## 176	1:1	1:2	1:1	2:2	2:2	1:1	1:2	6:4
## 177	1:1	1:2	1:1	1:2	3:8	1:1	1:1	6:4
## 178	1:1	1:2	NA:NA	3:2	2:2	1:1	NA:NA	5:5
## 179	1:1	1:2	1:1	2:2	2:2	1:1	1:2	6:4
## 180	1:1	4:2	1:1	2:2	3:3	1:1	1:2	4:4
## 181	1:1	1:1	2:2	2:2	1:2	1:1	NA:NA	4:4

```
Frogs.genind <- df2genind(X=Frogs[,c(4:11)], sep=":", ncode=NULL, ind.names= Frogs$FrogID, loc.names=NU
```

Check the genind object

```
Frogs.genind
```

```
## /// GENIND OBJECT ///////////
##
## // 181 individuals; 8 loci; 39 alleles; size: 55.2 Kb
##
## // Basic content
##   @tab: 181 x 39 matrix of allele counts
##   @loc.n.all: number of alleles per locus (range: 3-9)
##   @loc.fac: locus factor for the 39 columns of @tab
##   @all.names: list of allele names for each locus
##   @ploidy: ploidy of each individual (range: 2-2)
##   @type: codom
##   @call: df2genind(X = Frogs[, c(4:11)], sep = ":", ncode = NULL, ind.names = Frogs$FrogID,
##     loc.names = NULL, pop = Frogs$Pop, NA.char = "NA", ploidy = 2,
##     type = "codom", strata = NULL, hierarchy = NULL)
##
## // Optional content
##   @pop: population of each individual (group size range: 7-23)
```

```
summary(Frogs.genind)
```

```
##
## // Number of individuals: 181
## // Group sizes: 21 8 14 13 7 17 9 20 19 13 17 23
## // Number of alleles per locus: 3 4 4 4 9 3 4 8
## // Number of alleles per group: 21 21 20 22 20 19 19 25 18 14 18 26
## // Percentage of missing data: 10.64 %
## // Observed heterozygosity: 0.1 0.4 0.09 0.36 0.68 0.02 0.38 0.68
## // Expected heterozygosity: 0.17 0.47 0.14 0.59 0.78 0.02 0.48 0.74
```

4. View info stored in 'genind' object

Pull out subsets of info:

```
as_tibble(Frogs.genind@tab)
```

```
## # A tibble: 181 x 39
##   A.1 A.2 A.3 B.1 B.3 B.2 B.4 C.1 C.2 C.4 C.5 D.1 D.2
##   <int> <int> <int> <int> <int> <int> <int> <int> <int> <int> <int> <int> <int>
## 1     2     0     0     2     0     0     0     2     0     0     0     2     0
## 2     0     2     0     2     0     0     0    NA    NA    NA    NA     2     0
## 3     2     0     0     2     0     0     0     2     0     0     0     2     0
## 4     2     0     0     2     0     0     0    NA    NA    NA    NA     0     2
## 5     1     1     0     1     1     0     0     2     0     0     0     2     0
## 6     1     1     0     2     0     0     0     2     0     0     0     1     0
## 7     0     2     0     1     1     0     0     2     0     0     0     2     0
## 8     0     2     0     1     1     0     0     2     0     0     0     2     0
## 9     1     0     1     2     0     0     0     2     0     0     0     2     0
## 10    0     2     0     1     1     0     0     2     0     0     0     2     0
## # i 171 more rows
```

```
## # i 26 more variables: D.3 <int>, D.4 <int>, E.1 <int>, E.2 <int>, E.3 <int>,
## #   E.7 <int>, E.6 <int>, E.8 <int>, E.5 <int>, E.4 <int>, E.10 <int>,
## #   F.1 <int>, F.2 <int>, F.3 <int>, G.1 <int>, G.2 <int>, G.3 <int>,
## #   G.5 <int>, H.4 <int>, H.5 <int>, H.3 <int>, H.2 <int>, H.1 <int>,
## #   H.6 <int>, H.8 <int>, H.7 <int>
```

5. From here on, uses gstudio, and is OPTIONAL for now...

Part 2: Section 4.4 R exercise Week 1

Do this section on your own!

Download file:

```
file.copy(system.file("extdata", "pulsatilla_genotypes.csv", package = "LandGenCourse"),
           paste0(here(), "/downloads/pulsatilla_genotypes.csv"), overwrite=FALSE)
```

```
## [1] FALSE
```

Import from csv as data frame:

```
Flowers <- read.csv(paste0(here(), "/downloads/pulsatilla_genotypes.csv"), header=TRUE)
as_tibble(Flowers)
```

```
## # A tibble: 536 x 19
##       ID OffID Population      X      Y loc1_a loc1_b loc2_a loc2_b loc3_a
##   <int> <int> <chr>      <dbl> <dbl> <int> <int> <int> <int> <int>
## 1    62     0 A21      4426941. 5427173.   340   340   422   422   413
## 2    64     0 A21      4426933. 5427178.   334   334   424   424   417
## 3    65     0 A21      4426936. 5427173.   338   340   417   422   417
## 4    66     0 A21      4426937. 5427174.   340   344   422   422   411
## 5    68     0 A21      4426934. 5427171.   336   342   417   422   423
## 6    69     0 A21      4426933. 5427166.   336   346   422   422   417
## 7    75     0 A21      4426925. 5427175.   340   340   422   422   415
## 8    76     0 A21      4426925. 5427173.   338   340   417   422   413
## 9    77     0 A21      4426922. 5427174.   344   352   422   422   415
## 10   78     0 A21      4426922. 5427174.   342   352   417   424   425
## # i 526 more rows
## # i 9 more variables: loc3_b <int>, loc4_a <int>, loc4_b <int>, loc5_a <int>,
## #   loc5_b <int>, loc6_a <int>, loc6_b <int>, loc7_a <int>, loc7_b <int>
```

Create 'genind' object:

```
Flowers.genind <- df2genind(X=Flowers[,c(6:19)], sep="\t", ncode=NULL, ind.names= Flowers$ID, loc.names=)
```

```
## Warning in df2genind(X = Flowers[, c(6:19)], sep = "\t", ncode = NULL,
## ind.names = Flowers$ID, : duplicate labels detected for some individuals; using
## generic labels
```

Get info on genind object:

```
Flowers.genind
```

```
## /// GENIND OBJECT ///////////
##
## // 536 individuals; 14 loci; 184 alleles; size: 459.3 Kb
##
## // Basic content
##   @tab: 536 x 184 matrix of allele counts
```



```
## @loc.n.all: number of alleles per locus (range: 5-24)
## @loc.fac: locus factor for the 184 columns of @tab
## @all.names: list of allele names for each locus
## @ploidy: ploidy of each individual (range: 2-2)
## @type: codom
## @call: df2genind(X = Flowers[, c(6:19)], sep = "\t", ncode = NULL, ind.names = Flowers$ID,
## loc.names = NULL, pop = Flowers$Population, NA.char = "NA",
## ploidy = 2, type = "codom", strata = NULL, hierarchy = NULL)
##
## // Optional content
## @pop: population of each individual (group size range: 55-128)
```

Here, there is a problem because the genind object has 14 loci, but really this should be only 7 loci.

Going back to the Flowers dataframe and combining loci before creating the genind object

```
as_tibble(Flowers)
```

```
## # A tibble: 536 x 19
##       ID OffID Population      X      Y loc1_a loc1_b loc2_a loc2_b loc3_a
##   <int> <int> <chr>      <dbl>   <dbl> <int>  <int>  <int>  <int>  <int>
## 1    62     0 A21      4426941. 5427173.   340   340   422   422   413
## 2    64     0 A21      4426933. 5427178.   334   334   424   424   417
## 3    65     0 A21      4426936. 5427173.   338   340   417   422   417
## 4    66     0 A21      4426937. 5427174.   340   344   422   422   411
## 5    68     0 A21      4426934. 5427171.   336   342   417   422   423
## 6    69     0 A21      4426933. 5427166.   336   346   422   422   417
## 7    75     0 A21      4426925. 5427175.   340   340   422   422   415
## 8    76     0 A21      4426925. 5427173.   338   340   417   422   413
## 9    77     0 A21      4426922. 5427174.   344   352   422   422   415
## 10   78     0 A21      4426922. 5427174.   342   352   417   424   425
## # i 526 more rows
## # i 9 more variables: loc3_b <int>, loc4_a <int>, loc4_b <int>, loc5_a <int>,
## #   loc5_b <int>, loc6_a <int>, loc6_b <int>, loc7_a <int>, loc7_b <int>
```

I'll make a new data frame with the first 5 columns, then paste loc1_a:loc1_b, etc.

```
Flowers <- data.frame(Flowers[,1:5], loc1 = paste(Flowers$loc1_a, Flowers$loc1_b, sep=":"), loc2 = paste
as_tibble(Flowers)
```

```
## # A tibble: 536 x 12
##       ID OffID Population      X      Y loc1  loc2  loc3  loc4  loc5  loc6
##   <int> <int> <chr>      <dbl>   <dbl> <chr> <chr> <chr> <chr> <chr> <chr>
## 1    62     0 A21      4426941. 5427173. 340:3~ 422::~ 413::~ 446::~ 121::~ 155::~
## 2    64     0 A21      4426933. 5427178. 334:3~ 424::~ 417::~ 444::~ 122::~ 155::~
## 3    65     0 A21      4426936. 5427173. 338:3~ 417::~ 417::~ 446::~ 135::~ 153::~
## 4    66     0 A21      4426937. 5427174. 340:3~ 422::~ 411::~ 446::~ 122::~ 157::~
## 5    68     0 A21      4426934. 5427171. 336:3~ 417::~ 423::~ 448::~ 119::~ 155::~
## 6    69     0 A21      4426933. 5427166. 336:3~ 422::~ 417::~ 444::~ 122::~ 155::~
## 7    75     0 A21      4426925. 5427175. 340:3~ 422::~ 415::~ 442::~ 121::~ 152::~
## 8    76     0 A21      4426925. 5427173. 338:3~ 417::~ 413::~ 446::~ 126::~ 155::~
## 9    77     0 A21      4426922. 5427174. 344:3~ 422::~ 415::~ 446::~ 121::~ 155::~
## 10   78     0 A21      4426922. 5427174. 342:3~ 417::~ 425::~ 446::~ 121::~ 157::~
## # i 526 more rows
## # i 1 more variable: loc7 <chr>
```

Create 'genind' object:

```
Flowers.genind <- df2genind(X=Flowers[,c(6:12)], sep=":", ncode=NULL, ind.names= Flowers$ID, loc.names=)
```

```
## Warning in df2genind(X = Flowers[, c(6:12)], sep = ":", ncode = NULL, ind.names
## = Flowers$ID, : duplicate labels detected for some individuals; using generic
## labels
```

Get info on genind object:

```
Flowers.genind
```

```
## /// GENIND OBJECT ///////////
##
## // 536 individuals; 7 loci; 109 alleles; size: 291.1 Kb
##
## // Basic content
##   @tab: 536 x 109 matrix of allele counts
##   @loc.n.all: number of alleles per locus (range: 8-26)
##   @loc.fac: locus factor for the 109 columns of @tab
##   @all.names: list of allele names for each locus
##   @ploidy: ploidy of each individual (range: 2-2)
##   @type: codom
##   @call: df2genind(X = Flowers[, c(6:12)], sep = ":", ncode = NULL, ind.names = Flowers$ID,
##     loc.names = names(Flowers[, c(6:12)]), pop = Flowers$Population,
##     NA.char = "NA", ploidy = 2, type = "codom", strata = NULL,
##     hierarchy = NULL)
##
## // Optional content
##   @pop: population of each individual (group size range: 55-128)
```

```
summary(Flowers.genind)
```

```
##
## // Number of individuals: 536
## // Group sizes: 69 128 78 75 71 55 60
## // Number of alleles per locus: 19 8 26 9 20 14 13
## // Number of alleles per group: 63 68 55 53 55 73 54
## // Percentage of missing data: 1.79 %
## // Observed heterozygosity: 0.6 0.48 0.72 0.57 0.6 0.6 0.61
## // Expected heterozygosity: 0.83 0.59 0.88 0.75 0.77 0.79 0.85
```

Number of individuals per group/pop is 55-128.

With Gstudio this time

```
library(gstudio)
library(adeigenet)
```

```
g.Flowers <- read_population("./downloads/pulsatilla_genotypes.csv", type = "column", locus.columns = c(6
```

```
g.Flowers
```

```
##      ID OffID Population      X      Y loc1_a loc2_a loc3_a loc4_a
## 1    62     0         A21 4426941 5427173 340:340 422:422 413:425 446:448
## 2    64     0         A21 4426933 5427178 334:334 424:424 417:434 444:449
## 3    65     0         A21 4426936 5427173 338:340 417:422 417:419 446:452
## 4    66     0         A21 4426937 5427174 340:344 422:422 411:431 446:448
```

## 5	68	0	A21 4426934 5427171 336:342 417:422 423:438 448:448
## 6	69	0	A21 4426933 5427166 336:346 422:422 417:421 444:452
## 7	75	0	A21 4426925 5427175 340:340 422:422 415:425 442:446
## 8	76	0	A21 4426925 5427173 338:340 417:422 413:421 446:452
## 9	77	0	A21 4426922 5427174 344:352 422:422 415:421 446:452
## 10	78	0	A21 4426922 5427174 342:352 417:424 425:450 446:446
## 11	82	0	A21 4426922 5427169 340:344 422:424 398:413 452:452
## 12	88	0	A21 4426912 5427147 340:342 417:422 421:450 446:446
## 13	89	0	A21 4426912 5427147 334:352 417:422 409:427 448:448
## 14	90	0	A21 4426912 5427147 338:340 422:422 392:417 444:447
## 15	92	0	A21 4426912 5427146 334:346 417:422 409:417
## 16	211	0	A25 4422658 5425371 354:358 417:422 392:411 446:448
## 17	212	0	A25 4422659 5425372 340:342 417:417 409:417 446:452
## 18	213	0	A25 4422659 5425371 340:344 417:422 392:448 446:452
## 19	214	0	A25 4422658 5425370 354:358 422:422 392:392 442:446
## 20	215	0	A25 4422659 5425371 338:358 422:422 392:411 448:452
## 21	217	0	A25 4422659 5425371 334:352 422:422 409:434
## 22	218	0	A25 4422659 5425371 338:340 417:417 409:417 446:452
## 23	219	0	A25 4422658 5425370 340:358 422:424 392:392 444:452
## 24	220	0	A25 4422659 5425372 334:356 422:422 421:448 446:452
## 25	222	0	A25 4422659 5425370 344:356 417:422 392:411 446:446
## 26	223	0	A25 4422659 5425369 340:356 417:422 392:421 447:452
## 27	224	0	A25 4422658 5425368 356:356 417:422 392:392 444:446
## 28	225	0	A25 4422660 5425367 334:358 422:422 411:448 446:448
## 29	228	0	A25 4422658 5425365 334:362 417:422 409:417 446:452
## 30	229	0	A25 4422659 5425366 340:342 422:424 409:448 447:447
## 31	230	0	A25 4422659 5425365 338:356 422:424 430:430 446:452
## 32	231	0	A25 4422660 5425365 334:334 417:422 411:413 446:452
## 33	232	0	A25 4422661 5425364 344:352 417:422 392:434 446:448
## 34	233	0	A25 4422659 5425365 340:342 422:422 421:448 446:448
## 35	234	0	A25 4422659 5425364 340:340 417:422 392:392 446:452
## 36	235	0	A25 4422657 5425364 340:340 422:424 392:392 446:452
## 37	236	0	A25 4422657 5425365 334:352 424:424 392:411 447:452
## 38	237	0	A25 4422661 5425362 334:336 422:424 411:411 448:450
## 39	239	0	A25 4422658 5425364 340:352 422:424 392:409 446:452
## 40	240	0	A25 4422659 5425363 334:334 417:422 392:407 446:448
## 41	241	0	A25 4422659 5425362 338:344 422:422 392:417 446:452
## 42	242	0	A25 4422659 5425362 342:344 422:422 417:448 446:448
## 43	245	0	A25 4422655 5425361 338:340 422:424 392:413 444:452
## 44	246	0	A25 4422653 5425359 334:338 422:424 411:430 446:452
## 45	247	0	A25 4422655 5425360 334:334 411:417 452:452
## 46	248	0	A25 4422656 5425360 334:356 417:424 411:430 447:452
## 47	249	0	A25 4422655 5425361 334:334 422:422 407:434 446:446
## 48	251	0	A25 4422653 5425354 338:340 422:422 392:430 444:446
## 49	252	0	A25 4422654 5425354 340:360 422:422 409:413 448:450
## 50	253	0	A25 4422654 5425343 334:338 417:424 409:409 446:448
## 51	254	0	A25 4422656 5425345 338:340 422:424 409:440 446:446
## 52	255	0	A25 4422655 5425345 336:338 417:422 413:417 446:452
## 53	256	0	A25 4422654 5425345 342:350 409:417 446:446
## 54	257	0	A25 4422654 5425347 338:350 417:424 417:434 446:452
## 55	258	0	A25 4422654 5425347 338:360 417:422 409:419 446:446
## 56	259	0	A25 4422654 5425346 422:422 407:440 444:446
## 57	260	0	A25 4422654 5425346 338:338 422:424 417:434 446:446
## 58	261	0	A25 4422655 5425346 338:352 422:424 407:419 446:452

## 59	262	0	A25 4422656 5425347 340:352 417:422 411:434 446:446
## 60	263	0	A25 4422656 5425347 340:350 417:424 409:434 444:446
## 61	264	0	A25 4422667 5425354 332:336 422:422 411:440 444:446
## 62	265	0	A25 4422670 5425355 338:346 422:422 409:430 448:452
## 63	266	0	A25 4422669 5425356 336:336 422:426 421:434 446:448
## 64	267	0	A26 4422707 5425139 344:346 417:422 409:434 442:442
## 65	268	0	A26 4422707 5425139 326:338 417:422 407:411 442:448
## 66	269	0	A26 4422707 5425138 334:358 422:424 411:430 444:446
## 67	270	0	A26 4422704 5425138 340:358 417:424 434:436 444:452
## 68	272	0	A26 4422708 5425138 334:340 422:425 392:411 448:452
## 69	273	0	A26 4422706 5425137 340:340 417:422 392:411 446:448
## 70	274	0	A26 4422707 5425137 334:340 422:422 392:409 446:449
## 71	275	0	A26 4422707 5425137 340:344 422:422 411:411 446:450
## 72	276	0	A26 4422707 5425137 334:340 422:424 411:417 444:452
## 73	278	0	A26 4422708 5425137 340:340 422:424 411:417 444:452
## 74	279	0	A26 4422707 5425136 340:340 422:424 392:411 446:452
## 75	280	0	A26 4422708 5425136 340:340 417:422 411:417 446:450
## 76	282	0	A26 4422712 5425138 334:340 422:424 392:436 448:452
## 77	284	0	A26 4422709 5425143 340:364 422:424 405:411 444:446
## 78	334	0	A45 4423100 5427048 334:334 422:424 409:409 442:442
## 79	335	0	A45 4423096 5427012 334:342 417:423 415:430 446:450
## 80	336	0	A45 4423094 5427008 340:350 424:424 419:419 444:446
## 81	339	0	A45 4423092 5427017 338:338 422:422 411:430 442:452
## 82	340	0	A45 4423090 5427011 334:338 422:422 415:417 444:446
## 83	341	0	A45 4423090 5427012 334:340 422:422 392:419 446:452
## 84	342	0	A45 4423090 5427011 338:338 417:422 407:411 446:446
## 85	345	0	A45 4423090 5427007 332:334 417:417 411:417 446:452
## 86	346	0	A45 4423091 5427007 334:342 417:422 411:415 452:452
## 87	349	0	A45 4423096 5427008 334:340 422:424 409:411 442:452
## 88	353	0	A45 4423093 5427005 334:334 422:422 409:417 452:452
## 89	355	0	A45 4423091 5426993 334:340 417:422 417:419 446:450
## 90	356	0	A45 4423092 5426992 340:360 417:422 392:434 446:446
## 91	360	0	A45 4423098 5426985 340:342 422:422 411:415 446:452
## 92	361	0	A45 4423096 5426984 334:356 410:422 407:411 446:446
## 93	366	0	A45 4423092 5426971 334:334 422:422 409:411 450:450
## 94	495	0	A41 4426038 5423338 340:344 417:424 411:432 446:446
## 95	496	0	A41 4426039 5423338 340:344 417:422 392:411 447:447
## 96	498	0	A41 4426038 5423337 340:344 410:417 392:415 444:446
## 97	502	0	A41 4426037 5423337 340:344 409:411 449:449
## 98	503	0	A41 4426038 5423335 334:340 410:424 392:409 448:448
## 99	820	0	A03 4431326 5429379 336:340 410:422 431:431 446:448
## 100	821	0	A03 4431318 5429372 340:340 417:422 392:419 446:448
## 101	822	0	A03 4431317 5429373 340:354 417:422 411:417 446:446
## 102	823	0	A03 4431317 5429369 340:358 417:422 419:434 446:448
## 103	824	0	A03 4431316 5429369 340:342 424:424 419:421 446:448
## 104	825	0	A03 4431315 5429368 334:334 422:422 411:413 444:446
## 105	827	0	A03 4431315 5429371 338:340 418:418 409:425 446:448
## 106	828	0	A03 4431314 5429373 340:340 417:417 421:421 446:448
## 107	829	0	A03 4431313 5429371 340:352 417:422 409:411 444:444
## 108	830	0	A03 4431312 5429370 340:348 417:422 392:427 446:446
## 109	831	0	A03 4431312 5429369 340:352 422:422 392:413 446:446
## 110	832	0	A03 4431311 5429369 340:342 417:422 398:430 446:448
## 111	833	0	A03 4431308 5429365 338:340 418:424 394:409 446:448
## 112	834	0	A03 4431307 5429364 340:348 422:422 417:421 446:446

## 113	835	0	A03 4431311	5429364	340:344	422:422	411:411	446:448
## 114	836	0	A03 4431314	5429361	340:340	417:422	398:417	446:446
## 115	837	0	A03 4431316	5429361	340:344	417:417	392:411	446:448
## 116	838	0	A03 4431317	5429358	352:352	422:422	392:421	446:446
## 117	839	0	A03 4431322	5429362	326:340	417:422	392:411	446:448
## 118	840	0	A03 4431328	5429363	340:342	422:424	392:411	446:448
## 119	841	0	A03 4431328	5429358	334:340	422:424	411:442	446:446
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225 121:121 157:161 244:244
226 121:122 155:159 240:240
227 122:133 161:161 240:244
228 122:123 157:161 244:252
229 121:122 161:161 240:244
230 121:121 159:161 242:244
231 121:122 155:159 236:240
232 121:121 155:161 240:242
233 121:121 153:155 240:244
234 121:122 157:159 236:252
235 122:133 153:155 236:236
236 119:121 155:159 240:240
237 121:121 155:155
238 121:121 159:159 240:240
239 121:121 153:159 240:240
240 122:133 153:159 240:252
241 121:121 155:157
242 123:124 157:157 240:252
243 121:123 157:157 236:252
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246 121:124 157:157 242:252
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250 121:123 157:157 240:242
251 121:124 157:161 244:252
252 121:124 157:157 240:252
253 121:122 155:165 252:258
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255 121:122 155:155 252:252
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257 121:128 155:157 236:258
258 121:122 155:165 258:258
259 121:121 155:165 258:258
260 121:121 155:155 252:258
261 122:124 159:165 252:252
262 114:122 157:165 258:258
263 121:124 159:161 252:252
264 121:124 159:161 252:252
265 121:128 159:161 252:252
266 121:121 155:159 252:252
267 121:121 159:159 252:252
268 121:128 159:161 252:252
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272 121:128 159:161 252:252
273 121:128 159:159 252:252
274 121:121 159:159 252:252
275 121:121 157:159 252:256
276 121:128 155:159 252:256
277 124:128 159:159 246:252

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## 278 128:128 159:159 252:252
## 279 121:128 159:159 252:252
## 280 121:128 159:159 252:252
## 281 121:128 159:159 252:252
## 282 114:121 157:159 252:256
## 283 121:121 159:159 252:252
## 284 121:121 155:165 240:246
## 285 121:126 155:161 240:240
## 286 121:121 155:155 240:240
## 287 121:126 159:165 240:250
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## 289 121:121 155:165 246:256
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## 291 121:126 155:165 240:250
## 292 121:133 155:161 240:240
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## 300 121:126 159:165 246:246
## 301 121:121 165:165 242:246
## 302 121:121      246:246
## 303 121:126 159:165 240:246
## 304 121:126 155:159 250:250
## 305 121:126 155:159 250:250
## 306 121:121 155:155 250:250
## 307 121:121 155:159 250:250
## 308 126:126 155:159 250:250
## 309 126:126 155:155 250:250
## 310 121:128 157:167 236:242
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## 312 128:128 157:167 236:236
## 313 128:128 167:167 236:242
## 314 121:121 167:167 236:236
## 315 121:128 157:167 236:242
## 316 121:121 157:161 242:252
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## 318 121:121 165:165 242:256
## 319 121:121 165:165
## 320 121:121 157:157 242:256
## 321      242:242
## 322 121:121 165:165 242:256
## 323 121:121 157:157 242:256
## 324 121:121 157:157 242:256
## 325 121:121 157:157 242:242
## 326 121:121 155:155 246:252
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## 328 121:121 155:155 246:246
## 329 121:121 155:155 252:252
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## 331 121:121 155:155 246:246

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## 332 121:121 155:155 246:252
## 333 121:121 155:155 252:252
## 334 121:121 155:155 246:252
## 335 121:121 155:155 246:246
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## 337 121:121 165:167 246:246
## 338 121:126 155:161 252:252
## 339 121:126 155:165 246:246
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## 341 121:126 155:161 242:246
## 342 121:126 155:161 242:246
## 343 121:121 161:167 242:252
## 344 121:121 155:165 246:246
## 345 121:126 155:165 242:246
## 346 121:124 161:165 242:256
## 347 121:121 161:165 236:242
## 348 121:121 161:165 256:256
## 349      165:165 242:242
## 350 121:121 165:165 252:256
## 351 121:121 155:165 242:252
## 352 121:124 161:167 246:256
## 353 121:124 165:165 242:252
## 354 121:126 155:165 252:256
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## 356 122:124 159:165 252:256
## 357 124:133 155:159 242:256
## 358 122:122 165:165 256:256
## 359 122:124 159:165 252:256
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## 361 124:124 159:159 252:256
## 362 121:122 159:159 256:256
## 363 122:124 159:159 256:256
## 364 122:122 159:165 256:256
## 365 124:133 155:159 242:252
## 366 124:126 159:165 242:246
## 367 121:126 155:165 246:252
## 368 121:124 155:159 242:252
## 369 126:126 159:165 242:246
## 370 124:126 155:165 242:246
## 371 121:126 155:165 246:246
## 372 124:126 155:165 246:246
## 373 126:126 155:165 242:246
## 374 121:126      236:246
## 375 121:126 155:159 246:246
## 376 123:123 157:165 242:246
## 377 122:123 159:165 242:246
## 378 122:124 159:165 246:246
## 379 123:141 157:159 246:252
## 380 121:122 157:165 246:256
## 381 122:123 159:165 242:246
## 382 122:123 155:159 242:246
## 383 121:126 155:159 252:256
## 384 121:121 155:157 242:256
## 385 121:121 155:155 242:242

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## 386 121:121 157:157 256:256
## 387 121:121          256:256
## 388 121:133 157:165 242:250
## 389 121:121 155:157 240:242
## 390 121:122 155:157 236:242
## 391 121:121 155:157 242:242
## 392 121:121 157:157 236:242
## 393 121:122 155:159 236:242
## 394 122:126 157:165 236:236
## 395 121:122 155:157 242:242
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## 397 121:122 155:155 236:252
## 398 122:124 157:175 236:256
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## 400 121:123 157:159 242:252
## 401 123:123 159:159 240:242
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## 406 121:123 157:159 240:252
## 407 121:124 159:159 240:242
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## 419 123:133 157:165 246:250
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## 421 121:123 155:155 246:256
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## 426 121:123 155:157 256:256
## 427 121:126 155:165 236:242
## 428 121:133 155:165 242:250
## 429 122:126 155:155 236:236
## 430 122:126          236:242
## 431 126:126 155:155
## 432 122:126 165:165 236:236
## 433 114:114 157:161 240:242
## 434 114:126 157:157 240:242
## 435 114:121 157:161 240:246
## 436 114:114 161:161 242:242
## 437 114:126 157:161 240:240
## 438 114:114 157:157 240:240
## 439 114:114 157:161 240:242

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## 440 114:114 157:157 242:242
## 441 114:126 157:157 240:242
## 442 121:121 157:157 240:252
## 443 121:121 157:157 240:252
## 444 121:122 157:161 240:242
## 445 121:122 157:161 242:252
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## 447 121:122 157:161 240:244
## 448 121:121 157:157 240:252
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## 451 121:121 157:157 240:240
## 452 121:128 157:157 240:244
## 453 121:121 157:157 244:244
## 454 128:133 155:157 242:244
## 455 128:128 157:157 240:244
## 456 121:128      240:240
## 457 128:128 157:157
## 458 121:128 155:157 244:252
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## 460 121:128 157:157 240:244
## 461 122:128 157:161 244:252
## 462 128:137 155:157 240:240
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## 465 128:137 155:157 240:252
## 466 128:128 155:155 242:252
## 467 128:128 161:161 252:252
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## 469 128:133 155:161 242:252
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## 474 128:128 155:161 242:252
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## 483 128:133 155:157 242:242
## 484 128:133 155:155 242:242
## 485 128:128 155:157 242:242
## 486 121:121 155:161 240:242
## 487 121:137 161:161 240:252
## 488 121:137 155:161 240:252
## 489 121:121 152:161 242:242
## 490 121:137 152:161 242:252
## 491 121:137 152:161 240:252
## 492 121:137 161:161 240:240
## 493 121:137 155:161 240:240

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## 494 121:137 152:155 242:252
## 495 121:137 155:161 240:252
## 496 133:137 155:157 244:256
## 497 133:133 155:155 244:244
## 498 121:133 155:155 244:256
## 499 133:133 155:155 244:244
## 500 135:137 155:157 244:244
## 501 124:124 155:155 244:256
## 502 124:124 155:155 244:244
## 503 128:133 155:155 244:244
## 504 133:133 155:157 244:244
## 505 121:133 155:155 244:252
## 506 121:128 155:155 244:244
## 507 133:133 155:155 244:244
## 508 128:128 155:155 244:244
## 509 124:128 155:155 244:244
## 510 121:128 155:155 244:252
## 511 128:133 155:155 244:252
## 512 133:137 155:159 244:244
## 513 128:133 155:155 244:256
## 514 128:137 155:155 244:244
## 515 126:133 155:155 244:244
## 516 121:133 155:155 244:256
## 517 128:137 155:155 244:256
## 518 143:150 152:155 242:246
## 519 143:150 152:152 242:242
## 520 143:150 152:155 242:242
## 521 121:150 155:157 242:242
## 522 121:150 152:157 242:244
## 523 133:150 152:159 242:256
## 524 121:150 152:155 242:252
## 525 143:150 155:157 242:256
## 526 121:121 157:159 242:246
## 527 122:122 155:155 242:246
## 528 122:122 155:167 242:256
## 529 122:122 155:155 242:242
## 530 122:122 155:155 242:242
## 531 122:122 155:155 242:242
## 532 122:122 155:155 242:242
## 533 122:122 155:155 242:246
## 534 121:122 152:159 240:240
## 535 133:137 157:159 242:262
## 536 122:137 155:157 244:256

```

```
g.Flowers.genind <- df2genind(X=g.Flowers[,c(6:12)], sep=":", ncode=NULL, ind.names=g.Flowers$ID, loc.n
```

```
## Warning in df2genind(X = g.Flowers[, c(6:12)], sep = ":", ncode = NULL, :
## duplicate labels detected for some individuals; using generic labels
```

```
g.Flowers.genind
```

```
## /// GENIND OBJECT ///////////
```

```
##
```

```
## // 536 individuals; 7 loci; 109 alleles; size: 290.1 Kb
```

```
##
```

```
## // Basic content
##   @tab: 536 x 109 matrix of allele counts
##   @loc.n.all: number of alleles per locus (range: 8-26)
##   @loc.fac: locus factor for the 109 columns of @tab
##   @all.names: list of allele names for each locus
##   @ploidy: ploidy of each individual (range: 2-2)
##   @type: codom
##   @call: df2genind(X = g.Flowers[, c(6:12)], sep = ":", ncode = NULL,
##     ind.names = g.Flowers$ID, loc.names = NULL, pop = g.Flowers$Population,
##     NA.char = "", ploidy = 2, type = "codom", strata = NULL,
##     hierarchy = NULL)
##
## // Optional content
##   @pop: population of each individual (group size range: 55-128)
```

```
summary(g.Flowers.genind)
```

```
##
## // Number of individuals: 536
## // Group sizes: 69 128 78 75 71 55 60
## // Number of alleles per locus: 19 8 26 9 20 14 13
## // Number of alleles per group: 63 68 55 53 55 73 54
## // Percentage of missing data: 1.79 %
## // Observed heterozygosity: 0.6 0.48 0.72 0.57 0.6 0.6 0.61
## // Expected heterozygosity: 0.83 0.59 0.88 0.75 0.77 0.79 0.85
```

Compare the genind objects from both sources:

```
summary(g.Flowers.genind)
```

```
##
## // Number of individuals: 536
## // Group sizes: 69 128 78 75 71 55 60
## // Number of alleles per locus: 19 8 26 9 20 14 13
## // Number of alleles per group: 63 68 55 53 55 73 54
## // Percentage of missing data: 1.79 %
## // Observed heterozygosity: 0.6 0.48 0.72 0.57 0.6 0.6 0.61
## // Expected heterozygosity: 0.83 0.59 0.88 0.75 0.77 0.79 0.85
```

```
summary(Flowes.genind)
```

```
##
## // Number of individuals: 536
## // Group sizes: 69 128 78 75 71 55 60
## // Number of alleles per locus: 19 8 26 9 20 14 13
## // Number of alleles per group: 63 68 55 53 55 73 54
## // Percentage of missing data: 1.79 %
## // Observed heterozygosity: 0.6 0.48 0.72 0.57 0.6 0.6 0.61
## // Expected heterozygosity: 0.83 0.59 0.88 0.75 0.77 0.79 0.85
```