

# Assignment 7, Part I

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2025-03-04

## 2. When Did You Knit This Document? (5 pts)

```
## [1] "2025-03-04"
```

```
## [1] "2025-03-04 15:27:02 MST"
```

## 3. Plant Vouchers (20 pts)

```
## Rows: 165 Columns: 17
## -- Column specification -----
## Delimiter: ","
## chr (11): season, sp_code, sci_name_fieldID, sci_name_profID, voucher, DNA, ...
## dbl (6): year, month, day, easting, northing, elevation (m)
##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.

## # A tibble: 165 x 18
##   year month   day collection_date season sp_code  sci_name_fieldID
##   <dbl> <dbl> <dbl> <date>          <chr>  <chr>    <chr>
## 1  2017     1    26 2017-01-26      <NA>  <NA>    Panicum miliaceum
## 2  2016     3    20 2016-03-20    winter cass bauh Cassia bauhinioides
## 3  2016     3    20 2016-03-20    winter spha hast Sphaeralcea coccinea
## 4  2016     3    20 2016-03-20    winter amsi tess Amsinckia tessellata
## 5  2016     3    20 2016-03-20    winter micr lene Uropappus lindleyi
## 6  2016     3    20 2016-03-20    winter erig conc Erigeron concinnus
## 7  2016     3    20 2016-03-20    winter atri cane Atriplex canescens
## 8  2016     3    20 2016-03-20    winter euro lana Eurotia lanata
## 9  2016     3    20 2016-03-20    winter pros glan Prosopis glandulosa
## 10 2016     3    20 2016-03-20    winter phac ariz Phacelia arizonica
## # i 155 more rows
## # i 11 more variables: sci_name_profID <chr>, voucher <chr>, DNA <chr>,
## #   label_number <chr>, collector <chr>, location <chr>, easting <dbl>,
## #   northing <dbl>, 'elevation (m)' <dbl>, vial_barcode <chr>, notes <chr>

## [1] "2016-03-20"

## [1] "2019-04-01"

## [1] "95644800s (~3.03 years)"
```

```
## # A tibble: 165 x 19
##   year month   day collection_date DOY season sp_code sci_name_fieldID
##   <dbl> <dbl> <dbl> <date>         <dbl> <chr> <chr>    <chr>
## 1 2017     1    26 2017-01-26         26 <NA>  <NA>    Panicum miliaceum
## 2 2016     3    20 2016-03-20         80 winter cass bauh Cassia bauhinoides
## 3 2016     3    20 2016-03-20         80 winter spha hast Sphaeralcea coccinea
## 4 2016     3    20 2016-03-20         80 winter amsi tess Amsinckia tessellata
## 5 2016     3    20 2016-03-20         80 winter micr lene Uropappus lindleyi
## 6 2016     3    20 2016-03-20         80 winter erig conc Erigeron concinnus
## 7 2016     3    20 2016-03-20         80 winter atri cane Atriplex canescens
## 8 2016     3    20 2016-03-20         80 winter euro lana Eurotia lanata
## 9 2016     3    20 2016-03-20         80 winter pros glan Prosopis glandulosa
## 10 2016     3    20 2016-03-20         80 winter phac ariz Phacelia arizonica
## # i 155 more rows
## # i 11 more variables: sci_name_profID <chr>, voucher <chr>, DNA <chr>,
## #   label_number <chr>, collector <chr>, location <chr>, easting <dbl>,
## #   northing <dbl>, 'elevation (m)' <dbl>, vial_barcode <chr>, notes <chr>
```

#### 4. NDVI from the Santa Rita Experimental Range (20 pts)

```
## # A tibble: 110,270 x 6
##   datetime          r_mean g_mean b_mean ir_mean NDVI_c
##   <chr>          <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 2017-02-24 17:15:05      66    57    33     93 -0.0136
## 2 2017-02-24 17:30:05      67    56    31     92  0.0244
## 3 2017-02-24 17:45:06      72    58    30     91  0.0893
## 4 2017-02-24 18:00:05      77    58    28     87  0.179
## 5 2017-02-24 18:15:06      66    67    42     85  0.0668
## 6 2017-02-24 18:30:06      70    63    44     73 -0.792
## 7 2017-02-24 18:45:06      38    24    30     66 -0.0219
## 8 2017-02-24 19:00:06      21    12    15     19 -0.694
## 9 2017-02-25 06:15:05      24    14    19     19 -0.909
## 10 2017-02-25 06:30:05      48    37    43    104  0.127
## # i 110,260 more rows
```

```
## # A tibble: 110,270 x 6
##   datetime          r_mean g_mean b_mean ir_mean NDVI_c
##   <dtm>          <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 2017-02-24 17:15:05      66    57    33     93 -0.0136
## 2 2017-02-24 17:30:05      67    56    31     92  0.0244
## 3 2017-02-24 17:45:06      72    58    30     91  0.0893
## 4 2017-02-24 18:00:05      77    58    28     87  0.179
## 5 2017-02-24 18:15:06      66    67    42     85  0.0668
## 6 2017-02-24 18:30:06      70    63    44     73 -0.792
## 7 2017-02-24 18:45:06      38    24    30     66 -0.0219
## 8 2017-02-24 19:00:06      21    12    15     19 -0.694
## 9 2017-02-25 06:15:05      24    14    19     19 -0.909
## 10 2017-02-25 06:30:05      48    37    43    104  0.127
## # i 110,260 more rows
```

```
## [1] "220585501s (~6.99 years)"
```

```
## # A tibble: 110,270 x 9
```

```
##      datetime      r_mean g_mean b_mean ir_mean NDVI_c  year month  DOY
##      <dtm>      <dbl>  <dbl>  <dbl>  <dbl>  <dbl> <dbl> <dbl> <dbl>
##  1 2017-02-24 17:15:05      66     57     33      93 -0.0136 2017     2    55
##  2 2017-02-24 17:30:05      67     56     31      92  0.0244 2017     2    55
##  3 2017-02-24 17:45:06      72     58     30      91  0.0893 2017     2    55
##  4 2017-02-24 18:00:05      77     58     28      87  0.179 2017     2    55
##  5 2017-02-24 18:15:06      66     67     42      85  0.0668 2017     2    55
##  6 2017-02-24 18:30:06      70     63     44      73 -0.792 2017     2    55
##  7 2017-02-24 18:45:06      38     24     30      66 -0.0219 2017     2    55
##  8 2017-02-24 19:00:06      21     12     15      19 -0.694 2017     2    55
##  9 2017-02-25 06:15:05      24     14     19      19 -0.909 2017     2    56
## 10 2017-02-25 06:30:05      48     37     43     104  0.127 2017     2    56
## # i 110,260 more rows
```

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

```
## # A tibble: 85 x 3
## # Groups:   year [8]
##   year month mean_NVDI
##   <dbl> <dbl>     <dbl>
##  1 2017     2 -0.0907
##  2 2017     3 -0.0802
##  3 2017     4 -0.0739
##  4 2017     5 -0.0734
##  5 2017     6 -0.0976
##  6 2017     7 -0.0810
##  7 2017     8  0.00581
##  8 2017     9 -0.0542
##  9 2017    10 -0.105
## 10 2017    11 -0.129
## # i 75 more rows
```

## 5. Vectors (10 pts)

```
## [1] "2a:"
```

```
## [1] 23 24 40
```

```
## [1] "2b:"
```

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

```
## [1] "2c:"
```

```
## [1] 0 0 4
```

```
## [1] "2d:"
```

```
## [1] "(woo)" "(hey)" NA
```

## 6. Dugout Data (15 pts)

```
## Rows: 102 Columns: 16
## -- Column specification -----
## Delimiter: ","
## chr (8): Site_ID, Date, Soil Salinity, pH, Soil Zone, Location of nearest o...
## dbl (7): latitude, longitude, Elevation.m, ion Concentration in groundwater...
## time (1): Time
##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

```
## # A tibble: 102 x 16
##   Site_ID Date      Time latitude longitude SoilSalinity pH      SoilZone
##   <chr>   <chr>    <time>   <dbl>   <dbl> <chr>    <chr>    <chr>
## 1 5      24-Aug-17 10:03    51.4    -103. moderate alkaline  dark gr~
## 2 20     24-Jul-17 11:41    50.1    -102. very slight unclassifi~ black
## 3 36     10-Aug-17 15:05    52.5    -105. very slight alkaline  dark gr~
## 4 49     24-Jul-17 13:15    50.0    -102. slight unclassifi~ black
## 5 51     24-Jul-17 16:19    50.0    -102. slight unclassifi~ black
## 6 52     25-Jul-17 11:27    49.9    -102. slight unclassifi~ black
## 7 65     11-Aug-17 11:50    52.6    -110. very slight slightly a~ dark br~
## 8 68     8-Aug-17 09:30    50.6    -105. very slight alkaline  brown
## 9 10A    24-Aug-17 12:25    51.8    -103. slight alkaline  dark gr~
## 10 10B   24-Aug-17 13:14    51.8    -103. slight alkaline  dark gr~
## # i 92 more rows
## # i 8 more variables: Elevation.m <dbl>,
## #   'Location of nearest observation well' <chr>,
## #   'ion Concentration in groundwater (mg/L)' <dbl>, MajorSalts <chr>,
## #   Anion <chr>, '2017 Well groundwater depth' <dbl>,
## #   'dugout elevation above groundwater' <dbl>, Surface_Sal.ppt <dbl>
```

```
## [1] "3a:"
```

```
## # A tibble: 85 x 16
##   Site_ID Date      Time latitude longitude SoilSalinity pH      SoilZone
##   <chr>   <chr>    <time>   <dbl>   <dbl> <chr>    <chr>    <chr>
## 1 20     24-Jul-17 11:41    50.1    -102. very slight unclassifi~ black
## 2 36     10-Aug-17 15:05    52.5    -105. very slight alkaline  dark gr~
## 3 49     24-Jul-17 13:15    50.0    -102. slight unclassifi~ black
## 4 51     24-Jul-17 16:19    50.0    -102. slight unclassifi~ black
## 5 52     25-Jul-17 11:27    49.9    -102. slight unclassifi~ black
## 6 65     11-Aug-17 11:50    52.6    -110. very slight slightly a~ dark br~
## 7 68     8-Aug-17 09:30    50.6    -105. very slight alkaline  brown
## 8 10A    24-Aug-17 12:25    51.8    -103. slight alkaline  dark gr~
## 9 10B    24-Aug-17 13:14    51.8    -103. slight alkaline  dark gr~
## 10 10C   24-Aug-17 10:30    51.8     103. very slight alkaline  dark gr~
## # i 75 more rows
## # i 8 more variables: Elevation.m <dbl>,
## #   'Location of nearest observation well' <chr>,
## #   'ion Concentration in groundwater (mg/L)' <dbl>, MajorSalts <chr>,
## #   Anion <chr>, '2017 Well groundwater depth' <dbl>,
## #   'dugout elevation above groundwater' <dbl>, Surface_Sal.ppt <dbl>
```

```
## [1] "3b:"
```

```
## # A tibble: 94 x 16
##   Site_ID Date      Time    latitude longitude SoilSalinity pH      SoilZone
##   <chr>   <chr>    <time>    <dbl>    <dbl> <chr>    <chr>    <chr>
## 1 10A    24-Aug-17 12:25     51.8    -103. slight    alkaline  dark gr~
## 2 10B    24-Aug-17 13:14     51.8    -103. slight    alkaline  dark gr~
## 3 10C    24-Aug-17 10:30     51.8     103. very slight alkaline  dark gr~
## 4 10D    24-Aug-17 11:39     51.8    -103. very slight alkaline  dark gr~
## 5 14A    12-Jul-17 10:15     51.0    -105. very slight alkaline  brown
## 6 14B    12-Jul-17 12:50     51.0    -105. very slight alkaline  black
## 7 15A    3-Aug-17  11:41     49.6    -102. slight    neutral to~ dark gr~
## 8 15B    3-Aug-17  14:15     49.5    -102. slight    neutral to~ dark gr~
## 9 22B    8-Aug-17  12:28     51.1     106. very slight alkaline  brown
## 10 24A   14-Aug-17 14:15     49.9    -110. slight    neutral to~ brown
## # i 84 more rows
## # i 8 more variables: Elevation.m <dbl>,
## #   'Location of nearest observation well' <chr>,
## #   'ion Concentration in groundwater (mg/L)' <dbl>, MajorSalts <chr>,
## #   Anion <chr>, '2017 Well groundwater depth' <dbl>,
## #   'dugout elevation above groundwater' <dbl>, Surface_Sal.ppt <dbl>
```

```
## [1] "3c:"
```

```
## # A tibble: 102 x 16
##   Site_ID Date      Time    latitude longitude SoilSalinity pH      SoilZone
##   <chr>   <chr>    <time>    <dbl>    <dbl> <chr>    <chr>    <chr>
## 1 5      24-Aug-17 10:03     51.4    -103. moderate    alkaline  dark gr~
## 2 20     24-Jul-17 11:41     50.1    -102. very slight unclassifi~ black
## 3 36     10-Aug-17 15:05     52.5    -105. very slight alkaline  dark gr~
## 4 49     24-Jul-17 13:15     50.0    -102. slight    unclassifi~ black
## 5 51     24-Jul-17 16:19     50.0    -102. slight    unclassifi~ black
## 6 52     25-Jul-17 11:27     49.9    -102. slight    unclassifi~ black
## 7 65     11-Aug-17 11:50     52.6    -110. very slight slightly a~ dark br~
## 8 68     8-Aug-17  09:30     50.6    -105. very slight alkaline  brown
## 9 10A    24-Aug-17 12:25     51.8    -103. slight    alkaline  dark gr~
## 10 10B   24-Aug-17 13:14     51.8    -103. slight    alkaline  dark gr~
## # i 92 more rows
## # i 8 more variables: Elevation.m <dbl>,
## #   'Location of nearest observation well' <chr>,
## #   'ion Concentration in groundwater (mg/L)' <dbl>, MajorSalts <chr>,
## #   Anion <chr>, '2017 Well groundwater depth' <dbl>,
## #   'dugout elevation above groundwater' <dbl>, Surface_Sal.ppt <dbl>
```

## 7. Santa Cruz Rodents (20 pts)

```
## Rows: 51 Columns: 15
## -- Column specification -----
## Delimiter: ","
## chr  (10): Site, Trap ID, Species, Status (R/N), Sex, Tail length, Hair samp...
## dbl  (4): Total Weight, Bag weight, Animal Weight, Hind foot length
## date (1): Date
##
```

```
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

```
## [1] "Read in data:"
```

```
## [1] "4a:"
```

```
## # A tibble: 2 x 15
##   Date      Site 'Trap ID' Species 'Status (R/N)' Sex 'Total Weight'
##   <date>    <chr> <chr>    <chr>    <chr>          <chr>      <dbl>
## 1 2022-11-14 <NA>  4J      SIOC?    N              <NA>      NA
## 2 2022-11-18 <NA>  D6      DIME?    N              F          44
## # i 8 more variables: 'Bag weight' <dbl>, 'Animal Weight' <dbl>,
## #   'Hind foot length' <dbl>, TailLength <chr>, HairSample <chr>,
## #   Position <chr>, Handler <chr>, Notes <chr>
```

```
## [1] "4b:"
```

```
## # A tibble: 51 x 15
##   Date      Site 'Trap ID' Species 'Status (R/N)' Sex 'Total Weight'
##   <date>    <chr> <chr>    <chr>    <chr>          <chr>      <dbl>
## 1 2022-11-14 Heritage 4C      SIOC    N              F          134
## 2 2022-11-14 <NA>    4D      SIOC    N              M          136
## 3 2022-11-14 <NA>    4I      SIOC    N              <NA>       90
## 4 2022-11-14 <NA>    2H      REME    N              M           38
## 5 2022-11-14 <NA>    4J      SIOC?   N              <NA>      NA
## 6 2022-11-14 <NA>    2F      REME    N              F           22
## 7 2022-11-15 <NA>    4C      SIOC    R              <NA>      NA
## 8 2022-11-15 <NA>    4H      SIOC    N              F           95
## 9 2022-11-15 <NA>    1H      REME    N              <NA>       26
## 10 2022-11-15 <NA>    1B      REME    N              F           35
## # i 41 more rows
## # i 8 more variables: 'Bag weight' <dbl>, 'Animal Weight' <dbl>,
## #   'Hind foot length' <dbl>, TailLength <chr>, HairSample <chr>,
## #   Position <chr>, Handler <chr>, Notes <chr>
```

```
## [1] "4c"
```

```
## # A tibble: 51 x 15
##   Date      Site 'Trap ID' Species 'Status (R/N)' Sex 'Total Weight'
##   <date>    <chr> <chr>    <chr>    <chr>          <chr>      <dbl>
## 1 2022-11-14 Heritage 4C      SIOC    N              F          134
## 2 2022-11-14 <NA>    4D      SIOC    N              M          136
## 3 2022-11-14 <NA>    4I      SIOC    N              <NA>       90
## 4 2022-11-14 <NA>    2H      REME    N              M           38
## 5 2022-11-14 <NA>    4J      SIOC    N              <NA>      NA
## 6 2022-11-14 <NA>    2F      REME    N              F           22
## 7 2022-11-15 <NA>    4C      SIOC    R              <NA>      NA
## 8 2022-11-15 <NA>    4H      SIOC    N              F           95
## 9 2022-11-15 <NA>    1H      REME    N              <NA>       26
## 10 2022-11-15 <NA>    1B      REME    N              F           35
## # i 41 more rows
```

```
## # i 8 more variables: 'Bag weight' <dbl>, 'Animal Weight' <dbl>,
## #   'Hind foot length' <dbl>, TailLength <chr>, HairSample <chr>,
## #   Position <chr>, Handler <chr>, Notes <chr>
```

```
## [1] "4d:"
```

```
## # A tibble: 51 x 15
```

	Date	Site	'Trap ID'	Species	'Status (R/N)'	Sex	'Total Weight'
	<date>	<chr>	<chr>	<chr>	<chr>	<chr>	<dbl>
## 1	2022-11-14	Heritage	4C	SIOC	N	F	134
## 2	2022-11-14	<NA>	4D	SIOC	N	M	136
## 3	2022-11-14	<NA>	4I	SIOC	N	<NA>	90
## 4	2022-11-14	<NA>	2H	REME	N	M	38
## 5	2022-11-14	<NA>	4J	SIOC	N	<NA>	NA
## 6	2022-11-14	<NA>	2F	REME	N	F	22
## 7	2022-11-15	<NA>	4C	SIOC	R	<NA>	NA
## 8	2022-11-15	<NA>	4H	SIOC	N	F	95
## 9	2022-11-15	<NA>	1H	REME	N	<NA>	26
## 10	2022-11-15	<NA>	1B	REME	N	F	35

```
## # i 41 more rows
```

```
## # i 8 more variables: 'Bag weight' <dbl>, 'Animal Weight' <dbl>,
## #   'Hind foot length' <dbl>, TailLength <chr>, HairSample <chr>,
## #   Position <chr>, Handler <chr>, Notes <chr>
```