

R Programming For Natural Resource Professionals

Lab 1: Introduction to R markdown, basic math, objects

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“Special characters” in R

- Certain characters (letters, symbols, etc.) have specific meaning in R so they need to be treated different.

\$ * + . ? [] ^ { } | () \

- These require using an escape character “\”
- File paths are the most common issue
 - Windows file paths look like: G:\My Drive\. Won't work in R.
 - Need to use “G:\\My Drive\\” or “G:/My Drive/.”

Challenges of working in a computer lab

- Save your scripts to OneDrive
- We'll start working in "Projects" next week which will help
- Packages may need to be reinstalled (still figuring this one out for UWSP's computer labs)
 - This will need to happen on your personal/work computer
 - You're welcome to use your own computer in class rather than the lab's
 - Tools exist for package portability, but we likely won't cover them

The “Library” code block

Specific to this course, but you might find helpful elsewhere.

```
18 {r}
19 ### Set up your workspace with the necessary data and packages
20 list.of.packages <- c("remotes") ## Vector of required packages for the assignment
21 new.packages <- list.of.packages[!(list.of.packages %in% installed.packages()[, "Package"])] ## Check to see if these packages are installed
22 if(length(new.packages))
23   install.packages(new.packages) ## Install the packages that aren't installed
```

R markdown

- Platform for generating reports with embedded code

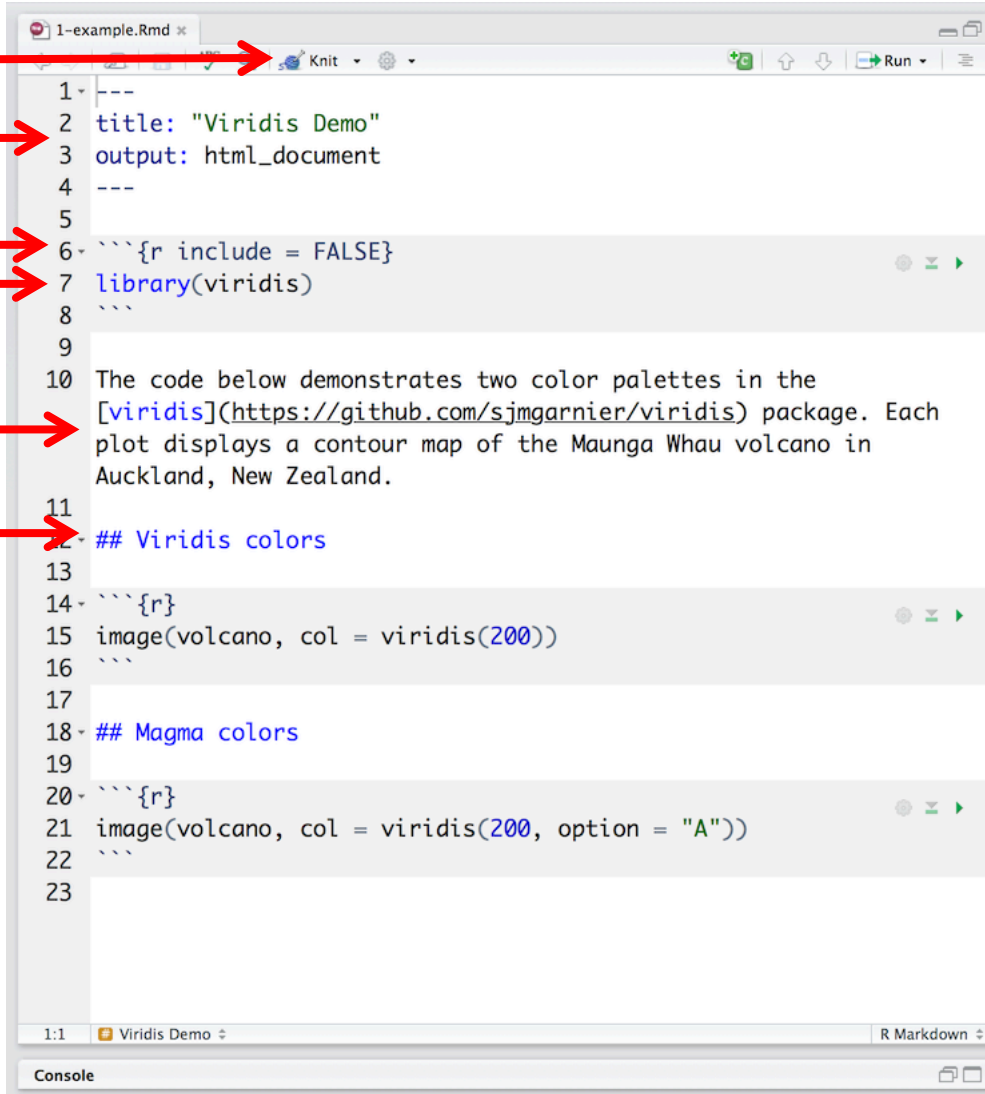


R markdown

Why use R markdown?

- Versatility: output as HTML, Word, PDF, and more
- Code and text side-by-side
- A lot of formatting can be automated
- Standardize reports and documents

Anatomy of a R markdown document



The image shows a screenshot of an R Markdown document editor window titled "1-example.Rmd". The document content is as follows:

```
1 ---
2 title: "Viridis Demo"
3 output: html_document
4 ---
5
6 ```{r include = FALSE}
7 library(viridis)
8 ```
9
10 The code below demonstrates two color palettes in the
11 [viridis](https://github.com/sjmgarnier/viridis) package. Each
12 plot displays a contour map of the Maunga Whau volcano in
13 Auckland, New Zealand.
14
15 ## Viridis colors
16
17 ```{r}
18 image(volcano, col = viridis(200))
19 ```
20
21 ## Magma colors
22
23 ```{r}
24 image(volcano, col = viridis(200, option = "A"))
25 ```
26
27 
```

Annotations with red arrows point to the following elements:

- "Knit" the report**: Points to the "Knit" button in the top toolbar.
- YAML header**: Points to the header section (lines 1-4).
- Code chunk parameters**: Points to the first code chunk (lines 6-8).
- Code chunks**: Points to the second code chunk (lines 14-16).
- Plain text narrative**: Points to the paragraph of text (lines 10-13).
- Headers**: Points to the section header "## Viridis colors" (line 15).


The bottom of the window shows a status bar with "1:1", "Viridis Demo", and "R Markdown". A "Console" pane is visible at the very bottom.

Anatomy of a R markdown document

YAML Header

- “Yet another markup language”
- High level formatting such as font size, figure size, title, subtitles, etc.
- Specify outputs:
output: pdf_document
output: word_document
output: rtf_document
output: md_document

YAML header



The screenshot shows an R Markdown document editor with a file named '1-example.Rmd'. A red arrow points from the text 'YAML header' to the first three lines of the document, which are the YAML header. The document content is as follows:

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```

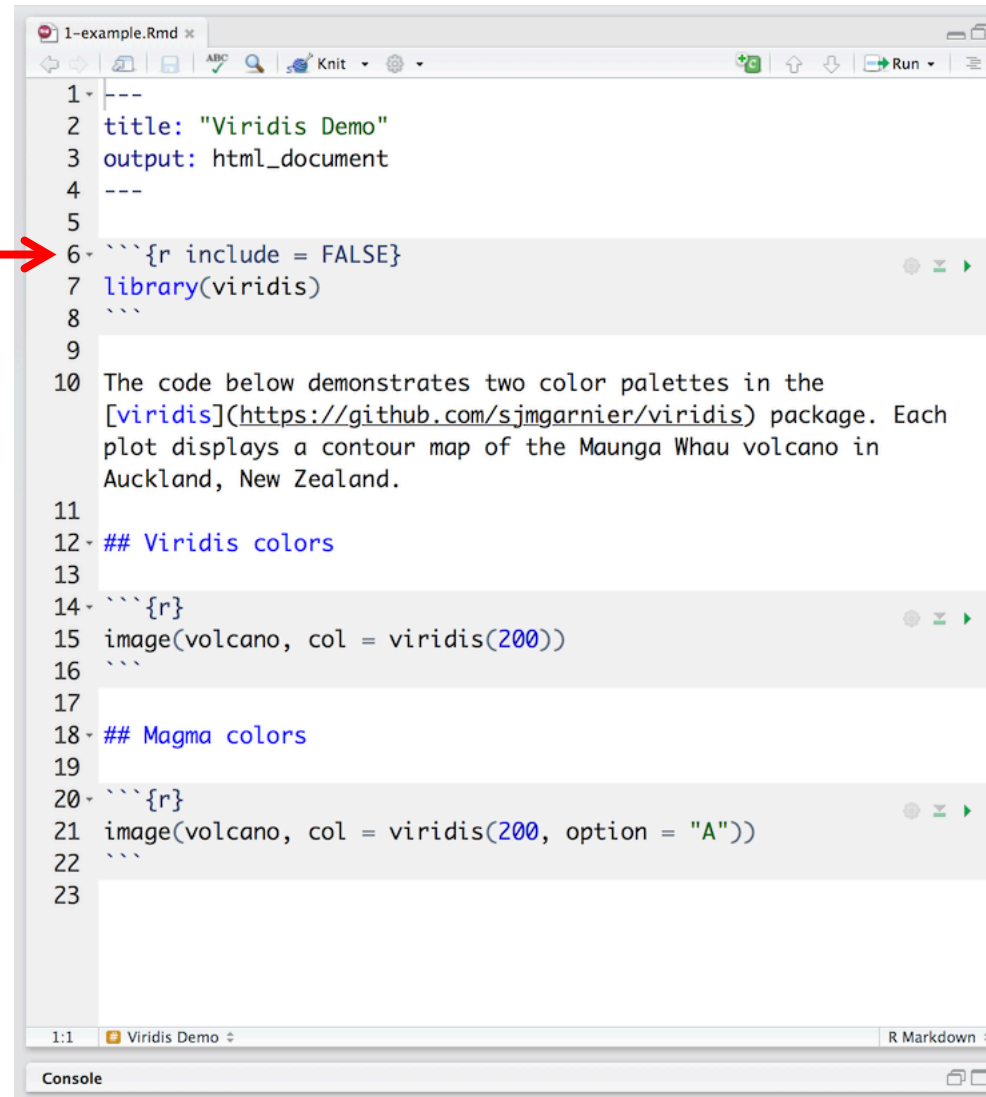
The editor interface includes a toolbar at the top with icons for undo, redo, save, and other functions. The status bar at the bottom shows the current line and column (1:1) and the document title (Viridis Demo).

Anatomy of a R markdown document

Code chunk parameters

OPTION	DEFAULT	EFFECTS
echo	TRUE	display code in output document
error	FALSE	TRUE (display error messages in doc) FALSE (stop render when error occurs)
eval	TRUE	run code in chunk
include	TRUE	include chunk in doc after running
message	TRUE	display code messages in document
warning	TRUE	display code warnings in document
results	"markup"	"asis" (passthrough results) "hide" (don't display results) "hold" (put all results below all code)
fig.align	"default"	"left", "right", or "center"
fig.alt	NULL	alt text for a figure
fig.cap	NULL	figure caption as a character string
fig.path	"figure/"	prefix for generating figure file paths
fig.width & fig.height	7	plot dimensions in inches
out.width		rescales output width, e.g. "75%", "300px"
collapse	FALSE	collapse all sources & output into a single block
comment	"##"	prefix for each line of results
child	NULL	files(s) to knit and then include
purl	TRUE	include or exclude a code chunk when extracting source code with knitr::purl()

See more options and defaults by running `str(knitr::opts_chunk$get())`



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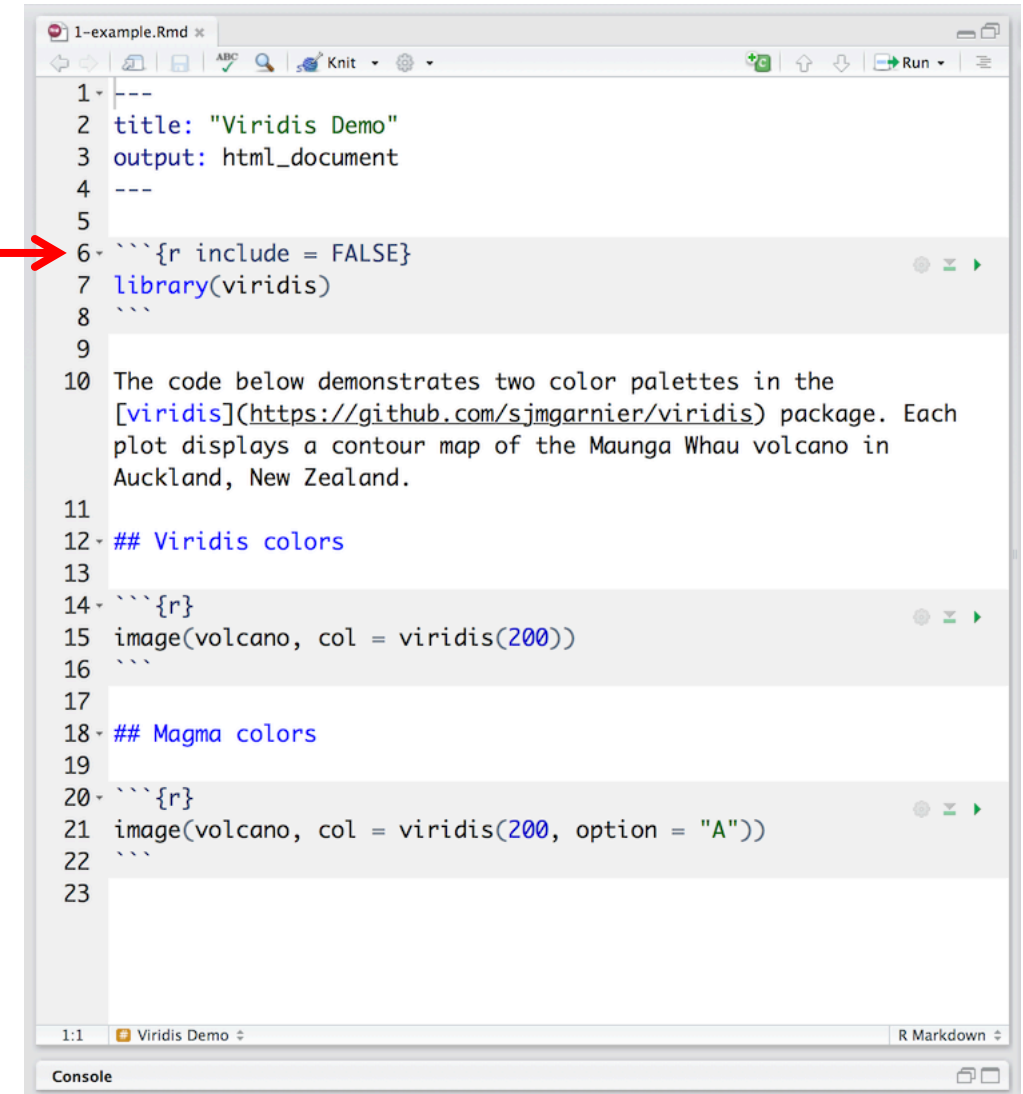
Anatomy of a R markdown document

Code chunk parameters



Global parameter specification

```
```\r setup, include = FALSE}
opts_chunk$set(echo = FALSE, message = FALSE)
```
```



Anatomy of a R markdown document

Table formatting

library(kableExtra)

Code chunks



```
head(mtcars)
```

```
##           mpg  cyl  disp  hp  drat    wt  qsec vs  am  gear  carb
## Mazda RX4      21.0   6  160 110  3.90  2.620 16.46 0   1    4    4
## Mazda RX4 Wag  21.0   6  160 110  3.90  2.875 17.02 0   1    4    4
## Datsun 710      22.8   4  108  93  3.85  2.320 18.61 1   1    4    1
## Hornet 4 Drive  21.4   6  258 110  3.08  3.215 19.44 1   0    3    1
## Hornet Sportabout 18.7   8  360 175  3.15  3.440 17.02 0   0    3    2
## Valiant        18.1   6  225 105  2.76  3.460 20.22 1   0    3    1
```

```
kbl(head(mtcars)) %>%
  kable_styling()
```

| | mpg | cyl | disp | hp | drat | wt | qsec | vs | am | gear | carb |
|-------------------|------|-----|------|-----|------|-------|-------|----|----|------|------|
| Mazda RX4 | 21.0 | 6 | 160 | 110 | 3.90 | 2.620 | 16.46 | 0 | 1 | 4 | 4 |
| Mazda RX4 Wag | 21.0 | 6 | 160 | 110 | 3.90 | 2.875 | 17.02 | 0 | 1 | 4 | 4 |
| Datsun 710 | 22.8 | 4 | 108 | 93 | 3.85 | 2.320 | 18.61 | 1 | 1 | 4 | 1 |
| Hornet 4 Drive | 21.4 | 6 | 258 | 110 | 3.08 | 3.215 | 19.44 | 1 | 0 | 3 | 1 |
| Hornet Sportabout | 18.7 | 8 | 360 | 175 | 3.15 | 3.440 | 17.02 | 0 | 0 | 3 | 2 |
| Valiant | 18.1 | 6 | 225 | 105 | 2.76 | 3.460 | 20.22 | 1 | 0 | 3 | 1 |

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22 image(volcano, col = viridis(200, option = "A"))
23 ```
```

The screenshot shows an R Markdown document titled "1-example.Rmd". It contains a YAML header with title "Viridis Demo" and output format "html_document". There are three code chunks. The first chunk (lines 6-8) is a library chunk that loads the "viridis" package. The second chunk (lines 10-13) is a text chunk explaining that the following code demonstrates two color palettes from the "viridis" package, used to create contour maps of the Maunga Whau volcano. The third chunk (lines 15-17) is a code chunk that uses the "image" function to plot the volcano using the "viridis" color palette with 200 colors. Below the code chunks, there is a preview of the rendered HTML document, showing the title "Viridis Demo" and the text from the second chunk. At the bottom, there is a console window.

Anatomy of a R markdown document

`*italics*`

`**bold**`

``code``

`[links](rmarkdown.rstudio.com)`

`~~strikethrough~~`

Superscript: `^2^`

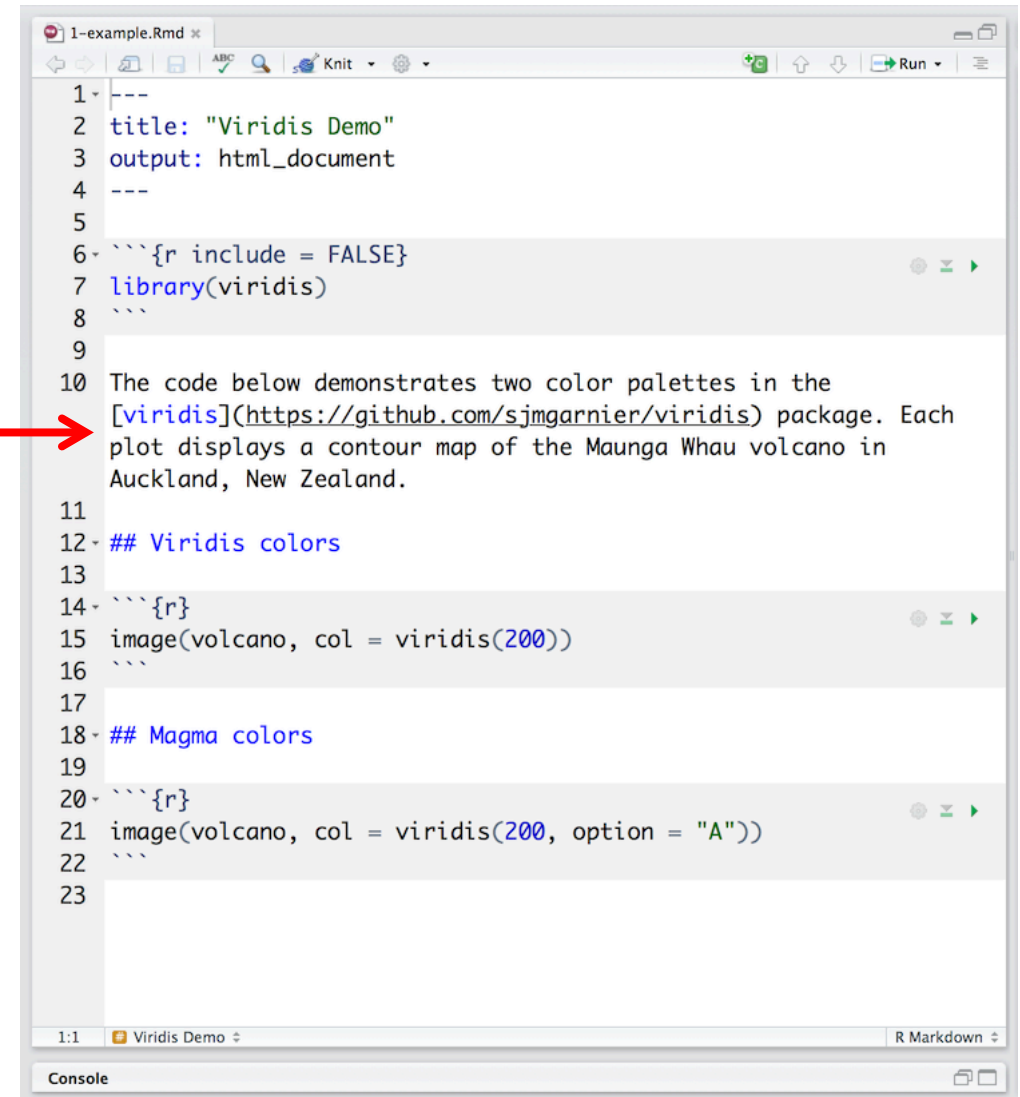
Subscript: `~2~`

Bulleted lists: `(*, +, <tab><tab>-)`

Quotations: `>`

Greek letters: `$_Delta$` or `$_delta$`

**Plain text
narrative**



The screenshot shows an R Markdown document titled "1-example.Rmd". The document contains a YAML header with title "Viridis Demo" and output "html_document". Below the header is a code chunk that loads the "viridis" package and includes two R code blocks. The first code block uses the "viridis" package to create a contour map of the Maunga Whau volcano. The second code block uses the "viridis" package to create a contour map of the Maunga Whau volcano with the "A" option. The text block between the code chunks describes the code and the resulting plots. A red arrow points from the text "Plain text narrative" to the text block in the document.

```
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25 ```
26
```

Homework reminders

Currently planning on some time in class on Wednesdays to work on homework assignments but that may change.

Use your resources (internet, colleagues, instructor, help files), but cite them.

- Either list who you worked with for specific questions or credit them in a comment near the top of the document.
- Do not turn in identical assignments.
- You won't necessarily receive all answers during instruction.
- Turn in via email (jhomola@uwsp.edu). Send both the .rmd and .html knitted version.

Strive for efficient coding. If a problem can be solved using substantially less code, you will not receive full credit.